
Core Foundation Framework Reference

Core Foundation



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Declared in	CFArray.h CFAttributedString.h CFBag.h CFBase.h CFBinaryHeap.h CFBitVector.h CFBundle.h CFByteOrder.h CFCalendar.h CFCharacterSet.h CFData.h CFDate.h CFDateFormatter.h CFDictionary.h CFError.h CFFTPStream.h CFFileDescriptor.h CFHTTPStream.h CFHost.h CFLocale.h CFMachPort.h CFMessagePort.h CFNetServices.h CFNotificationCenter.h CFNumber.h CFNumberFormatter.h CFPlugIn.h CFPreferences.h CFPropertyList.h CFRunLoop.h CFSet.h CFSocket.h CFSocketStream.h CFStream.h CFString.h CFStringEncodingExt.h CFStringTokenizer.h CFTimeZone.h CFTree.h CFURL.h CFURLAccess.h CFUUID.h CFUserNotification.h

CFXMLNode.h
CFXMLParser.h

Core Foundation is a framework that provides fundamental software services useful to application services, application environments, and to applications themselves. Core Foundation also provides abstractions for common data types, facilitates internationalization with Unicode string storage, and offers a suite of utilities such as plug-in support, XML property lists, URL resource access, and preferences.

For a summary of new API introduced in Mac OS X v10.5, see *Core Foundation Reference Update*.

Opaque Types

CFAllocator Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBase.h
Companion guide	Memory Management Programming Guide for Core Foundation

Overview

CFAllocator is an opaque type that allocates and deallocates memory for you. You never have to allocate, reallocate, or deallocate memory directly for Core Foundation objects—and rarely should you. You pass CFAllocator objects into functions that create objects; these functions have “Create” embedded in their names, for example, `CFStringCreateWithPascalString`. The creation functions use the allocators to allocate memory for the objects they create.

Functions by Task

Creating an Allocator

[CFAllocatorCreate](#) (page 23)
Creates an allocator object.

Managing Memory with an Allocator

[CFAllocatorAllocate](#) (page 22)
Allocates memory using the specified allocator.

[CFAllocatorDeallocate](#) (page 23)
Deallocates a block of memory with a given allocator.

[CFAllocatorGetPreferredSizeForSize](#) (page 25)
Obtains the number of bytes likely to be allocated upon a specific request.

[CFAllocatorReallocate](#) (page 26)
Reallocates memory using the specified allocator.

Getting and Setting the Default Allocator

[CFAllocatorGetDefault](#) (page 25)

Gets the default allocator object for the current thread.

[CFAllocatorSetDefault](#) (page 27)

Sets the given allocator as the default for the current thread.

Getting an Allocator's Context

[CFAllocatorGetContext](#) (page 24)

Obtains the context of the specified allocator or of the default allocator.

Getting the CFAllocator Type ID

[CFAllocatorGetTypeID](#) (page 26)

Returns the type identifier for the CFAllocator opaque type.

Functions

CFAllocatorAllocate

Allocates memory using the specified allocator.

```
void * CFAllocatorAllocate (
    CFAllocatorRef allocator,
    CFIndex size,
    CFOptionFlags hint
);
```

Parameters

allocator

The allocator to use to allocate the memory. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

size

The size of the memory to allocate.

hint

A bitfield containing flags that suggest how memory is to be allocated. 0 indicates no hints. No hints are currently defined, so only 0 should be passed for this value.

Return Value

A pointer to the newly allocated memory.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

Carbon Porting Tutorial

MoreIsBetter

MoreSCF

QISA

Declared In

CFBase.h

CFAllocatorCreate

Creates an allocator object.

```
CFAllocatorRef CFAllocatorCreate (
    CFAllocatorRef allocator,
    CFAllocatorContext *context
);
```

Parameters*allocator*

The existing allocator to use to allocate memory for the new allocator. Pass the [kCFAllocatorUseContext](#) (page 36) constant for this parameter to allocate memory using the appropriate function callback specified in the `context` parameter. Pass `NULL` or [kCFAllocatorDefault](#) (page 35) to allocate memory for the new allocator using the default allocator.

context

A structure of type [CFAllocatorContext](#) (page 33). The fields of this structure hold (among other things) function pointers to callbacks used for allocating, reallocating, and deallocating memory.

Return Value

The new allocator object, or `NULL` if there was a problem allocating memory. Ownership follows the Create Rule.

Discussion

You use this function to create custom allocators which you can then pass into various Core Foundation object-creation functions. You must implement a function callback that allocates memory and assign it to the `allocate` field of this structure. You typically also implement `deallocate`, `realloc`, and `preferred-size` callbacks.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorDeallocate

Deallocates a block of memory with a given allocator.

```
void CFAllocatorDeallocate (
    CFAllocatorRef allocator,
    void *ptr
);
```

Parameters*allocator*

The allocator that was used to allocate the block of memory pointed to by *ptr*.

ptr

An untyped pointer to a block of memory to deallocate using *allocator*.

Discussion

If the allocator does not specify a `deallocate` callback function, the memory is not deallocated.

Special Considerations

You must use the same allocator to deallocate memory as was used to allocate it.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

QISA

Declared In

CFBase.h

CFAllocatorGetContext

Obtains the context of the specified allocator or of the default allocator.

```
void CFAllocatorGetContext (
    CFAllocatorRef allocator,
    CFAllocatorContext *context
);
```

Parameters*allocator*

The allocator to examine. Pass `NULL` to obtain the context of the default allocator.

context

On return, contains the context of *allocator*.

Discussion

An allocator's context, a structure of type `CFAllocatorContext`, holds pointers to various function callbacks (particularly those that allocate, reallocate, and deallocate memory for an object). The context also contains a version number and the `info` field for program-defined data. To obtain the value of the `info` field you usually first have to get an allocator's context.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorGetDefault

Gets the default allocator object for the current thread.

```
CFAllocatorRef CFAllocatorGetDefault (
    void
);
```

Return Value

A reference to the default allocator for the current thread. If none has been explicitly set, returns the generic system allocator, `kCFAllocatorSystemDefault` (page 35). Ownership follows the Get Rule.

Discussion

See the discussion for `CFAllocatorSetDefault` (page 27) for more detail on the default allocator and for advice on how and when to set a custom allocator as the default.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicDataBrowser

Declared In

CFBase.h

CFAllocatorGetPreferredSizeForSize

Obtains the number of bytes likely to be allocated upon a specific request.

```
CFIndex CFAllocatorGetPreferredSizeForSize (
    CFAllocatorRef allocator,
    CFIndex size,
    CFOptionFlags hint
);
```

Parameters

allocator

The allocator to use, or NULL for the default allocator.

size

The number of bytes to allocate. If the value is 0 or less, the result is the same value.

hint

A bitfield of type `CFOptionFlags`. Pass flags to the allocator that suggest how memory is to be allocated. 0 indicates no hints. No hints are currently defined, only 0 should be passed for this argument.

Return Value

The number of bytes likely to be allocated upon a specific request.

Discussion

The return value depends on the allocator's internal allocation strategy, and will be equal to or larger than `size`. Calling this function may help you better match your memory allocation or reallocation strategy to that of the allocator.

Note that the return value depends on the internal implementation of the allocator and the results may change from release to release or from platform to platform.

If no function callback is assigned to the `preferredSize` field of the allocator's context (see the `CFAllocatorContext` structure), then the value of `size` is returned.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorGetTypeID

Returns the type identifier for the `CFAllocator` opaque type.

```
CTypeID CFAllocatorGetTypeID (
    void
);
```

Return Value

The type identifier for the `CFAllocator` opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorReallocate

Reallocates memory using the specified allocator.

```
void * CFAllocatorReallocate (
    CFAllocatorRef allocator,
    void *ptr,
    CFIndex newsize,
    CFOptionFlags hint
);
```

Parameters

allocator

The allocator to use for reallocating memory. Pass `NULL` to request the default allocator.

ptr

An untyped pointer to a block of memory to reallocate to a new size. If `ptr` is `NULL` and `newsize` is greater than 0, memory is allocated (using the `allocate` function callback of the allocator's context). If `ptr` is `NULL` and `newsize` is 0, the result is `NULL`.

newsize

The number of bytes to allocate. If you pass 0 and the `ptr` parameter is non-`NULL`, the block of memory that `ptr` points to is typically deallocated. If you pass 0 for this parameter and the `ptr` parameter is `NULL`, nothing happens and the result returned is `NULL`.

hint

A bitfield of type `CFOptionsFlags`. Pass flags to the allocator that suggest how memory is to be allocated. Zero indicates no hints. No hints are currently defined, only 0 should be passed for this argument.

Discussion

The `CFAllocatorReallocate` function's primary purpose is to reallocate a block of memory to a new (and usually larger) size. However, based on the values passed in certain of the parameters, this function can also allocate memory afresh or deallocate a given block of memory. The following summarizes the semantic combinations:

- If the `ptr` parameter is non- `NULL` and the `newsize` parameter is greater than 0, the behavior is to reallocate.
- If the `ptr` parameter is `NULL` and the `newsize` parameter is greater than 0, the behavior is to allocate.
- If the `ptr` parameter is non- `NULL` and the `newsize` parameter is 0, the behavior is to deallocate.

The result of the `CFAllocatorReallocate` function is either an untyped pointer to a block of memory or `NULL`. A `NULL` result indicates either a failure to allocate memory or some other outcome, the precise interpretation of which is determined by the values of certain parameters and the presence or absence of callbacks in the allocator context. To summarize, a `NULL` result can mean one of the following:

- An error occurred in the attempt to allocate memory, such as insufficient free space.
- No `allocate`, `reallocate`, or `deallocate` function callback (depending on parameters) was defined in the allocator context.
- The semantic operation is "deallocate" (that is, there is no need to return anything).
- The `ptr` parameter is `NULL` and the requested size is 0.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorSetDefault

Sets the given allocator as the default for the current thread.

```
void CFAllocatorSetDefault (
    CFAllocatorRef allocator
);
```

Parameters*allocator*

The allocator to set as the default for the current thread.

Discussion

The `CFAllocatorSetDefault` function sets the allocator that is used in the current thread whenever `NULL` is specified as an allocator argument. Generally, most allocations use the default allocator. Because of this, the default allocator must be prepared to deal with arbitrary memory-allocation requests. In addition, the size and number of requests can change between releases.

A further characteristic of the default allocator is that it can never be released, even if another allocator replaces it as the default. Not only is it impractical to release a default allocator (because there might be caches created somewhere that refer to the allocator) but it is generally safer and more efficient to keep it around.

If you wish to use a custom allocator in a context, the best approach is to specify it in the first parameter of creation functions rather than to set it as the default. Generally, setting the default allocator is not encouraged. If you do set an allocator as the default, either do it for the life time of your application or do it in a nested fashion (that is, restore the previous allocator before you exit your context). The latter approach might be more appropriate for plug-ins or libraries that wish to set the default allocator.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Callbacks

CFAllocatorAllocateCallback

A prototype for a function callback that allocates memory of a requested size.

```
typedef void *(*CFAllocatorAllocateCallback) (
    CFIndex allocSize,
    CFOptionFlags hint,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void *MyCallback (
    CFIndex allocSize,
    CFOptionFlags hint,
    void *info
);
```

Parameters*allocSize*

This function allocates a block of memory of at least `allocSize` bytes (always greater than 0).

hint

A bitfield that is currently not used (always set to 0).

info

An untyped pointer to program-defined data. Allocate memory for the data and assign a pointer to it. This data is often control information for the allocator. It may be `NULL`.

Return Value

A pointer to the start of the block.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorCopyDescriptionCallback

A prototype for a function callback that provides a description of the specified data.

```
typedef CFStringRef (*CFAllocatorCopyDescriptionCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *info
);
```

Parameters*info*

An untyped pointer to program-defined data.

Return Value

A `CFString` object that describes the allocator. The caller is responsible for releasing this object.

Discussion

A prototype for a function callback that provides a description of the data pointed to by the `info` field. In implementing this function, return a reference to a `CFString` object that describes your allocator, particularly some characteristics of your program-defined data.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorDeallocateCallback

A prototype for a function callback that deallocates a block of memory.

```
typedef void (*CFAllocatorDeallocateCallback) (
    void *ptr,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    void *ptr,
    void *info
);
```

Parameters

ptr

The block of memory to deallocate.

info

An untyped pointer to program-defined data.

Discussion

A prototype for a function callback that deallocates a given block of memory. In implementing this function, make the block of memory pointed to by `ptr` available for subsequent reuse by the allocator but unavailable for continued use by the program. The `ptr` parameter cannot be `NULL` and if the `ptr` parameter is not a block of memory that has been previously allocated by the allocator, the results are undefined; abnormal program termination can occur.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CFAllocatorPreferredSizeCallback

A prototype for a function callback that gives the size of memory likely to be allocated, given a certain request.

```
typedef CFIndex (*CFAllocatorPreferredSizeCallback) (
    CFIndex size,
    CFOptionFlags hint,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFIndex MyCallback (
    CFIndex size,
    CFOptionFlags hint,
    void *info
);
```

Parameters*size*

The amount of memory requested.

hint

A bitfield that is currently not used (always set to 0).

info

An untyped pointer to program-defined data.

Return Value

The actual size the allocator is likely to allocate given this request.

Discussion

A prototype for a function callback that determines whether there is enough free memory to satisfy a request. In implementing this function, return the actual size the allocator is likely to allocate given a request for a block of memory of size *size*. The *hint* argument is a bitfield that you should currently not use.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorReallocateCallback

A prototype for a function callback that reallocates memory of a requested size for an existing block of memory.

```
typedef void *(*CFAllocatorReallocateCallback) (
    void *ptr,
    CFIndex newsize,
    CFOptionFlags hint,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void *MyCallback (
    void *ptr,
    CFIndex newsize,
    CFOptionFlags hint,
    void *info
);
```

Parameters*ptr*

The block of memory to resize.

newsize

The size of the new allocation.

hint

A bitfield that is currently not used (always set to 0).

info

An untyped pointer to program-defined data.

Return Value

Pointer to the new block of memory.

Discussion

In implementing this function, change the size of the block of memory pointed to by `ptr` to the size specified by `newsize` and return the pointer to the larger block of memory. Return `NULL` on any reallocation failure, leaving the old block of memory untouched. Also return `NULL` immediately if any of the following conditions if the `ptr` parameter is `NULL` or the `newsize` parameter is not greater than 0. Leave the contents of the old block of memory unchanged up to the lesser of the new or old sizes. If the `ptr` parameter is not a block of memory that has been previously allocated by the allocator, the results are undefined; abnormal program termination can occur. The `hint` argument is a bitfield that you should currently not use (that is, assign 0).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorReleaseCallback

A prototype for a function callback that releases the given data.

```
typedef void (*CFAllocatorReleaseCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *info
);
```

Parameters

info

The data to be released.

Discussion

A prototype for a function callback that releases the data pointed to by the `info` field. In implementing this function, release (or free) the data you have defined for the allocator context.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorRetainCallback

A prototype for a function callback that retains the given data.


```
typedef const void *(*CFAllocatorRetainCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    const void *info
);
```

Parameters

info

The data to be retained.

Discussion

A prototype for a function callback that retains the data pointed to by the `info` field. In implementing this function, retain the data you have defined for the allocator context in this field. (This might make sense only if the data is a Core Foundation object.)

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Data Types

CFAllocatorContext

A structure that defines the context or operating environment for an allocator (CFAllocator) object. Every Core Foundation allocator object must have a context defined for it.

```
struct CFAllocatorContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
    CFAllocatorAllocateCallback allocate;
    CFAllocatorReallocateCallback reallocate;
    CFAllocatorDeallocateCallback deallocate;
    CFAllocatorPreferredSizeCallback preferredSize;
};
typedef struct CFAllocatorContext CFAllocatorContext;
```

Fields

version

An integer of type `CFIndex`. Assign the version number of the allocator. Currently the only valid value is 0.

info

An untyped pointer to program-defined data. Allocate memory for this data and assign a pointer to it. This data is often control information for the allocator. You may assign `NULL`.

retain

A prototype for a function callback that retains the data pointed to by the `info` field. In implementing this function, retain the data you have defined for the allocator context in this field. (This might make sense only if the data is a Core Foundation object.) You may set this function pointer to `NULL`.

release

A prototype for a function callback that releases the data pointed to by the `info` field. In implementing this function, release (or free) the data you have defined for the allocator context. You may set this function pointer to `NULL`, but doing so might result in memory leaks.

copyDescription

A prototype for a function callback that provides a description of the data pointed to by the `info` field. In implementing this function, return a reference to a `CFString` object that describes your allocator, particularly some characteristics of your program-defined data. You may set this function pointer to `NULL`, in which case Core Foundation will provide a rudimentary description.

allocate

A prototype for a function callback that allocates memory of a requested size. In implementing this function, allocate a block of memory of at least `size` bytes and return a pointer to the start of the block. The `hint` argument is a bitfield that you should currently not use (that is, assign 0). The `size` parameter should always be greater than 0. If it is not, or if problems in allocation occur, return `NULL`. This function pointer may not be assigned `NULL`.

reallocate

A prototype for a function callback that reallocates memory of a requested size for an existing block of memory. In implementing this function, change the size of the block of memory pointed to by `ptr` to the size specified by `newsize` and return the pointer to the larger block of memory. Return `NULL` on any reallocation failure, leaving the old block of memory untouched. Also return `NULL` immediately if any of the following conditions apply:

- The `ptr` parameter is `NULL`.
- The `newsize` parameter is not greater than 0.

Leave the contents of the old block of memory unchanged up to the lesser of the new or old sizes. If the `ptr` parameter is not a block of memory that has been previously allocated by the allocator, the results are undefined; abnormal program termination can occur. The `hint` argument is a bitfield that you should currently not use (that is, assign 0). If you set this callback to `NULL` the [CFAllocatorReallocate](#) (page 26) function returns `NULL` in most cases when it attempts to use this allocator.

deallocate

A prototype for a function callback that deallocates a given block of memory. In implementing this function, make the block of memory pointed to by `ptr` available for subsequent reuse by the allocator but unavailable for continued use by the program. The `ptr` parameter cannot be `NULL` and if the `ptr` parameter is not a block of memory that has been previously allocated by the allocator, the results are undefined; abnormal program termination can occur. You can set this callback to `NULL`, in which case the [CFAllocatorDeallocate](#) (page 23) function has no effect.

preferredSize

A prototype for a function callback that determines whether there is enough free memory to satisfy a request. In implementing this function, return the actual size the allocator is likely to allocate given a request for a block of memory of size `size`. The `hint` argument is a bitfield that you should currently not use.

Discussion

See the “Memory Management” topic for information on creating a custom `CFAllocator` object and, as part of that procedure, the steps for creating a properly initialized `CFAllocatorContext` structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFAllocatorRef

A reference to a CFAllocator object.

```
typedef const struct __CFAllocator *CFAllocatorRef;
```

Discussion

The `CFAllocatorRef` type is a reference type used in many Core Foundation parameters and function results. It refers to a CFAllocator object, which allocates, reallocates, and deallocates memory for Core Foundation objects.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Constants

Predefined Allocators

CFAllocator provides the following predefined allocators. In general, you should use `kCFAllocatorDefault` unless one of the special circumstances exist below.

```
const CFAllocatorRef kCFAllocatorDefault;
const CFAllocatorRef kCFAllocatorSystemDefault;
const CFAllocatorRef kCFAllocatorMalloc;
const CFAllocatorRef kCFAllocatorMallocZone;
const CFAllocatorRef kCFAllocatorNull;
const CFAllocatorRef kCFAllocatorUseContext;
```

Constants

`kCFAllocatorDefault`

This is a synonym for `NULL`.

Available in Mac OS X v10.0 and later.

Declared in `CFBase.h`.

`kCFAllocatorSystemDefault`

Default system allocator.

You rarely need to use this.

Available in Mac OS X v10.0 and later.

Declared in `CFBase.h`.

kCFAllocatorMalloc

This allocator uses `malloc()`, `realloc()`, and `free()`.

Typically you should not use this allocator, use `kCFAllocatorDefault` instead. This allocator is useful as the `bytesDeallocator` in `CFData` or `contentsDeallocator` in `CFString` where the memory was obtained as a result of `malloc` type functions.

Available in Mac OS X v10.0 and later.

Declared in `CFBase.h`.

kCFAllocatorMallocZone

This allocator explicitly uses the default malloc zone, returned by `malloc_default_zone()`.

You should only use this when an object is safe to be allocated in non-scanned memory.

Available in Mac OS X v10.4 and later.

Declared in `CFBase.h`.

kCFAllocatorNull

This allocator does nothing—it allocates no memory.

This allocator is useful as the `bytesDeallocator` in `CFData` or `contentsDeallocator` in `CFString` where the memory should not be freed.

Available in Mac OS X v10.0 and later.

Declared in `CFBase.h`.

kCFAllocatorUseContext

Special allocator argument to `CFAllocatorCreate` (page 23)—it uses the functions given in the context to allocate the allocator.

Available in Mac OS X v10.0 and later.

Declared in `CFBase.h`.

Declared In

`CFBase.h`

CFArray Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFArray.h
Companion guides	Collections Programming Topics for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFArray and its derived mutable type, CFMutableArray, manage ordered collections of values called arrays. CFArray creates static arrays and CFMutableArray creates dynamic arrays.

You create a static array object using either the [CFArrayCreate](#) (page 41) or [CFArrayCreateCopy](#) (page 42) function. These functions return an array containing the values you pass in as arguments. (Note that arrays can't contain `NULL` pointers; in most cases, though, you can use the `kCFNull` constant instead.) Values are not copied but retained using the retain callback provided when an array was created. Similarly, when a value is removed from an array, it is released using the release callback.

CFArray's two primitive functions [CFArrayGetCount](#) (page 43) and [CFArrayGetValueAtIndex](#) (page 46) provide the basis for all other functions in its interface. The [CFArrayGetCount](#) (page 43) function returns the number of elements in an array; [CFArrayGetValueAtIndex](#) (page 46) gives you access to an array's elements by index, with index values starting at 0.

A number of CFArray functions allow you to operate over a range of values in an array, for example [CFArrayApplyFunction](#) (page 39) lets you apply a function to values in an array, and [CFArrayBSearchValues](#) (page 39) searches an array for the value that matches its parameter. Recall that a range is defined as `{start, length}`, therefore to operate over the entire array the range you supply should be `{0, N}` (where N is the count of the array).

CFArray is “toll-free bridged” with its Cocoa Foundation counterpart, NSArray. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSArray *` parameter, you can pass in a `CFArrayRef`, and in a function where you see a `CFArrayRef` parameter, you can pass in an NSArray instance. This also applies to concrete subclasses of NSArray. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating an Array

[CFArrayCreate](#) (page 41)

Creates a new immutable array with the given values.

[CFArrayCreateCopy](#) (page 42)

Creates a new immutable array with the values from another array.

Examining an Array

[CFArrayBSearchValues](#) (page 39)

Searches an array for a value using a binary search algorithm.

[CFArrayContainsValue](#) (page 40)

Reports whether or not a value is in an array.

[CFArrayGetCount](#) (page 43)

Returns the number of values currently in an array.

[CFArrayGetCountOfValue](#) (page 44)

Counts the number of times a given value occurs in an array.

[CFArrayGetFirstIndexOfValue](#) (page 44)

Searches an array forward for a value.

[CFArrayGetLastIndexOfValue](#) (page 45)

Searches an array backward for a value.

[CFArrayGetValues](#) (page 47)

Fills a buffer with values from an array.

[CFArrayGetValueAtIndex](#) (page 46)

Retrieves a value at a given index.

Applying a Function to Elements

[CFArrayApplyFunction](#) (page 39)

Calls a function once for each element in range in an array.

Getting the CFArray Type ID

[CFArrayGetTypeID](#) (page 46)

Returns the type identifier for the CFArray opaque type.

Functions

CFArrayApplyFunction

Calls a function once for each element in range in an array.

```
void CFArrayApplyFunction (
    CFArrayRef theArray,
    CFRange range,
    CFArrayApplierFunction applier,
    void *context
);
```

Parameters

theArray

The array to whose elements to apply the function.

range

The range of values within *theArray* to which to apply the *applier* function. The range must not exceed the bounds of *theArray*. The range may be empty (length 0).

applier

The callback function to call once for each value in the given range in *theArray*. If there are values in the range that the *applier* function does not expect or cannot properly apply to, the behavior is undefined.

context

A pointer-sized program-defined value, which is passed as the second argument to the *applier* function, but is otherwise unused by this function. If the context is not what is expected by the applier function, the behavior is undefined.

Discussion

While this function iterates over a mutable collection, it is unsafe for the *applier* function to change the contents of the collection.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

GLCarbon1ContextPbuffer

GLCarbonSharedPbuffer

HID Manager Basics

HID Utilities Source

Declared In

CFArray.h

CFArrayBSearchValues

Searches an array for a value using a binary search algorithm.

```
CFIndex CFArrayBSearchValues (
    CFArrayRef theArray,
    CFRange range,
    const void *value,
    CFComparatorFunction comparator,
    void *context
);
```

Parameters*theArray*

An array, sorted from least to greatest according to the *comparator* function.

range

The range within *theArray* to search. The range must not exceed the bounds of *theArray*. The range may be empty (length 0).

value

The value for which to find a match in *theArray*. If *value*, or any other value in *theArray*, is not understood by the *comparator* callback, the behavior is undefined.

comparator

The function with the comparator function type signature that is used in the binary search operation to compare values in *theArray* with the given value. If there are values in the range that the *comparator* function does not expect or cannot properly compare, the behavior is undefined.

context

A pointer-sized program-defined value, which is passed as the third argument to the *comparator* function, but is otherwise unused by this function. If the context is not what is expected by the *comparator* function, the behavior is undefined.

Return Value

The return value is one of the following:

- The index of a value that matched, if the target value matches one or more in the range.
- Greater than or equal to the end point of the range, if the value is greater than all the values in the range.
- The index of the value greater than the target value, if the value lies between two of (or less than all of) the values in the range.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayContainsValue

Reports whether or not a value is in an array.


```
Boolean CFArrayContainsValue (
    CFArrayRef theArray,
    CFRange range,
    const void *value
);
```

Parameters*theArray*

The array to search.

*range*The range within *theArray* to search. The range must not exceed the bounds of *theArray*). The range may be empty (length 0).*value*The value to match in *theArray*. The equal callback provided when *theArray* was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in *theArray*, is not understood by the equal callback, the behavior is undefined.**Return Value**true, if *value* is in the specified range of *theArray*, otherwise false.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

PMPrinterPrintWithFile

QISA

SeeMyFriends

Declared In

CFArray.h

CFArrayCreate

Creates a new immutable array with the given values.

```
CFArrayRef CFArrayCreate (
    CFAllocatorRef allocator,
    const void **values,
    CFIndex numValues,
    const CFArrayCallBacks *callbacks
);
```

Parameters*allocator*The allocator to use to allocate memory for the new array and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

values

A C array of the pointer-sized values to be in the new array. The values in the new array are ordered in the same order in which they appear in this C array. This value may be `NULL` if *numValues* is 0. This C array is not changed or freed by this function. If *values* is not a valid pointer to a C array of at least *numValues* elements, the behavior is undefined.

numValues

The number of values to copy from the values C array into the new array. This number will be the count of the new array—it must not be negative or greater than the number of elements in *values*.

callBacks

A pointer to a [CFArrayCallbacks](#) (page 51) structure initialized with the callbacks for the array to use on each value in the collection. The retain callback is used within this function, for example, to retain all of the new values from the values C array. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this value is not a valid pointer to a [CFArrayCallbacks](#) (page 51) structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

If the collection contains only `CType` objects, then pass [kCTypeArrayCallbacks](#) (page 52) to use the default callback functions.

Return Value

A new immutable array containing *numValues* from *values*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPreferences

ImageClient

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayCreateCopy

Creates a new immutable array with the values from another array.

```
CFArrayRef CFArrayCreateCopy (
    CFAllocatorRef allocator,
    CFArrayRef theArray
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new array and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theArray

The array to copy.

Return Value

A new CFArray object that contains the same values as *theArray*. Ownership follows the Create Rule.

Discussion

The pointer values from *theArray* are copied into the new array; the values are also retained by the new array. The count of the new array is the same as *theArray*. The new array uses the same callbacks as *theArray*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

IdentitySample

Declared In

CFArray.h

CFArrayGetCount

Returns the number of values currently in an array.

```
CFIndex CFArrayGetCount (
    CFArrayRef theArray
);
```

Parameters*theArray*

The array to examine.

Return Value

The number of values in *theArray*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

ImageClient

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayGetCountOfValue

Counts the number of times a given value occurs in an array.

```
CFIndex CFArrayGetCountOfValue (
    CFArrayRef theArray,
    CFRange range,
    const void *value
);
```

Parameters*theArray*

The array to examine.

*range*The range within *theArray* to search. The range must lie within the bounds of *theArray*. The range may be empty (length 0).*value*The value for which to find matches in *theArray*. The equal callback provided when *theArray* was created is used to compare. If the equal callback was NULL, pointer equality (in C, ==) is used. If *value*, or any other value in *theArray*, is not understood by the equal callback, the behavior is undefined.**Return Value**The number of times *value* occurs in *theArray*, within the specified range.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayGetFirstIndexOfValue

Searches an array forward for a value.

```
CFIndex CFArrayGetFirstIndexOfValue (
    CFArrayRef theArray,
    CFRange range,
    const void *value
);
```

Parameters*theArray*

The array to examine.

*range*The range within *theArray* to search. The range must lie within the bounds of *theArray*. The range may be empty (length 0). The search progresses from the lowest index defined by the range to the highest.

value

The value for which to find a match in *theArray*. The equal callback provided when *theArray* was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in *theArray*, is not understood by the equal callback, the behavior is undefined.

Return Value

The lowest index of the matching values in the range, or -1 if no value in the range matched.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CoreRecipes

ImageClient

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayGetLastIndexOfValue

Searches an array backward for a value.

```
CFIndex CFArrayGetLastIndexOfValue (
    CFArrayRef theArray,
    CFRange range,
    const void *value
);
```

Parameters

theArray

The array to examine.

range

The range within *theArray* to search. The range must not exceed the bounds of *theArray*. The range may be empty (length 0). The search progresses from the highest index defined by the range to the lowest.

value

The value for which to find a match in *theArray*. The equal callback provided when *theArray* was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in *theArray*, is not understood by the equal callback, the behavior is undefined.

Return Value

The highest index of the matching values in the range, or -1 if no value in the range matched.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayGetTypeID

Returns the type identifier for the CFArray opaque type.

```
CTypeID CFArrayGetTypeID (
    void
);
```

Return Value

The type identifier for the CFArray opaque type.

Special Considerations

CFMutableArray objects have the same type identifier as CFArray objects.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest
MoreIsBetter
MoreSCF
QISA
UIElementInspector

Declared In

CFArray.h

CFArrayGetValueAtIndex

Retrieves a value at a given index.

```
const void * CFArrayGetValueAtIndex (
    CFArrayRef theArray,
    CFIndex idx
);
```

Parameters

theArray

The array to examine.

idx

The index of the value to retrieve. If the index is outside the index space of *theArray* (0 to N-1 inclusive (where N is the count of *theArray*), the behavior is undefined.

Return Value

The value at the *idx* index in *theArray*. If the return value is a Core Foundation Object, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Config Save
ImageClient
MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayGetValues

Fills a buffer with values from an array.

```
void CFArrayGetValues (
    CFArrayRef theArray,
    CFRange range,
    const void **values
);
```

Parameters*theArray*

The array to examine.

range

The range of values within *theArray* to retrieve. The range must lie within the bounds of *theArray*. The range may be empty (length 0), in which case no values are put into the buffer *values*.

values

A C array of pointer-sized values to be filled with values from *theArray*. The values in the C array are in the same order as they appear in *theArray*. If this value is not a valid pointer to a C array of at least `range.length` pointers, the behavior is undefined. If the values are Core Foundation objects, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

GrabBag

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

Callbacks

CFArrayApplierFunction

Prototype of a callback function that may be applied to every value in an array.

```
typedef void (*CFArrayApplierFunction) (
    const void *value,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *value,
    void *context
);
```

Parameters

value

The current value in an array.

context

The program-defined context parameter given to the applier function.

Discussion

This callback is passed to the [CFArrayApplyFunction](#) (page 39) function, which iterates over the values in an array and applies the behavior defined in the applier function to each value in an array.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayCopyDescriptionCallback

Prototype of a callback function used to get a description of a value in an array.

```
typedef CFStringRef (*CFArrayCopyDescriptionCallback) (
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *value
);
```

Parameters

value

The value to be described.

Return Value

A textual description of *value*. The caller is responsible for releasing this object.

Discussion

This callback is passed to [CFArrayCreate](#) (page 41) in a [CFArrayCallbacks](#) (page 51) structure. This callback is used by the [CFCopyDescription](#) (page 634) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayEqualCallback

Prototype of a callback function used to determine if two values in an array are equal.

```
typedef Boolean (*CFArrayEqualCallback) (
    const void *value1,
    const void *value2
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    const void *value1,
    const void *value2
);
```

Parameters

value1

A value in an array to be compared with *value2* for equality.

value2

A value in an array to be compared with *value1* for equality.

Return Value

true if *value1* and *value2* are equal, false otherwise.

Discussion

This callback is passed to [CFArrayCreate](#) (page 41) in a [CFArrayCallbacks](#) (page 51) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayReleaseCallback

Prototype of a callback function used to release a value before it's removed from an array.

```
typedef void (*CFArrayReleaseCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFAllocatorRef allocator,
```

```
    const void *value
);
```

Parameters*allocator*

The array's allocator.

value

The value being removed from an array.

DiscussionThis callback is passed to [CFArrayCreate](#) (page 41) in a [CFArrayCallbacks](#) (page 51) structure.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayRetainCallback

Prototype of a callback function used to retain a value being added to an array.

```
typedef const void *(*CFArrayRetainCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```

Parameters*allocator*

The array's allocator.

value

The value being added to an array.

Return ValueThe value to store in an array, which is usually the *value* parameter passed to this callback, but may be a different value if a different value should be stored in an array.**Discussion**This callback is passed to [CFArrayCreate](#) (page 41) in a [CFArrayCallbacks](#) (page 51) structure.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

Data Types

CFArrayCallbacks

Structure containing the callbacks of a CFArray.

```
struct CFArrayCallbacks {
    CFIndex version;
    CFArrayRetainCallback retain;
    CFArrayReleaseCallback release;
    CFArrayCopyDescriptionCallback copyDescription;
    CFArrayEqualCallback equal;
};
typedef struct CFArrayCallbacks CFArrayCallbacks;
```

Fields

version

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

retain

The callback used to retain each value as they are added to the collection. If `NULL`, values are not retained. See [CFArrayRetainCallback](#) (page 50) for a description of this callback.

release

The callback used to release values as they are removed from the collection. If `NULL`, values are not released. See [CFArrayReleaseCallback](#) (page 49) for a description of this callback.

copyDescription

The callback used to create a descriptive string representation of each value in the collection. If `NULL`, the collection will create a simple description of each value. See [CFArrayCopyDescriptionCallback](#) (page 48) for a description of this callback.

equal

The callback used to compare values in the array for equality for some operations. If `NULL`, the collection will use pointer equality to compare values in the collection. See [CFArrayEqualCallback](#) (page 49) for a description of this callback.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayRef

A reference to an immutable array object.

```
typedef const struct __CFArray *CFArrayRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

Constants

Predefined Callback Structures

CFArray provides some predefined callbacks for your convenience.

```
const CFArrayCallbacks kCFTypesArrayCallbacks;
```

Constants

`kCFTypesArrayCallbacks`

Predefined [CFArrayCallbacks](#) (page 51) structure containing a set of callbacks appropriate for use when the values in a CFArray are all CType-derived objects. The retain callback is `CFRetain`, the release callback is `CFRelease`, the copy callback is `CFCopyDescription`, and the equal callback is `CFEqual`. Therefore, if you use this constant when creating the collection, items are automatically retained when added to the collection, and released when removed from the collection.

Available in Mac OS X v10.0 and later.

Declared in `CFArray.h`.

CFAttributedString Reference

Derived From:	<i>CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFAttributedString.h CFBase.h
Companion guides	Property List Programming Topics for Core Foundation Strings Programming Guide for Core Foundation Data Formatting Guide for Core Foundation

Overview

Instances of `CFAttributedString` manage character strings and associated sets of attributes (for example, font and kerning information) that apply to individual characters or ranges of characters in the string. `CFAttributedString` as defined in `CoreFoundation` provides the basic container functionality, while higher levels provide definitions for standard attributes, their values, and additional behaviors involving these. `CFAttributedString` represents an immutable string—use `CFMutableAttributedString` to create and manage an attributed string that can be changed after it has been created.

iPhone OS Note: While Core Foundation on iPhone OS contains `CFAttributedString`, there are no additions to the APIs in UIKit to add specific attributes such as font, style, or color, and there are no APIs to draw attributed strings.

`CFAttributedString` is not a “subclass” of `CFString`; that is, it does not respond to `CFString` function calls. `CFAttributedString` conceptually contains a `CFString` to which it applies attributes. This protects you from ambiguities caused by the semantic differences between simple and attributed string.

Attributes are identified by key/value pairs stored in `CFDictionary` objects. Keys must be `CFString` objects, while the corresponding values are `CType` objects of an appropriate type. See the attribute constants in *NSAttributedString Application Kit Additions Reference* for standard attribute names.

Important: Attribute dictionaries set for an attributed string must always be created with `kFCopyStringDictionaryKeyCallbacks` for their dictionary key callbacks and `kCTypeDictionaryValueCallbacks` for their value callbacks; otherwise it's an error.

On Mac OS X, `CFAttributedString` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSAttributedString`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSAttributedString *` parameter, you can pass in a `CFAttributedStringRef`, and in a function where you see a

`CFAttributedStringRef` parameter, you can pass in an `NSAttributedString` instance. This also applies to concrete subclasses of `NSAttributedString`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

iPhone OS Note: `NSAttributedString` is not available on iPhone OS.

Functions by Task

Creating a CFAttributedString

[CFAttributedStringCreate](#) (page 55)

Creates an attributed string with specified string and attributes.

[CFAttributedStringCreateCopy](#) (page 55)

Creates an immutable copy of an attributed string.

[CFAttributedStringCreateWithSubstring](#) (page 56)

Creates a sub-attributed string from the specified range.

[CFAttributedStringGetLength](#) (page 59)

Returns the length of the attributed string in characters.

[CFAttributedStringGetString](#) (page 60)

Returns the string for an attributed string.

Accessing Attributes

[CFAttributedStringGetAttribute](#) (page 57)

Returns the value of a given attribute of an attributed string at a specified location.

[CFAttributedStringGetAttributes](#) (page 58)

Returns the attributes of an attributed string at a specified location.

[CFAttributedStringGetAttributeAndLongestEffectiveRange](#) (page 57)

Returns the value of a given attribute of an attributed string at a specified location.

[CFAttributedStringGetAttributesAndLongestEffectiveRange](#) (page 59)

Returns the attributes of an attributed string at a specified location.

Getting Attributed String Properties

[CFAttributedStringGetTypeID](#) (page 60)

Returns the type identifier for the `CFAttributedString` opaque type.

Functions

CFAttributedStringCreate

Creates an attributed string with specified string and attributes.

```
CFAttributedStringRef CFAttributedStringCreate (
    CFAllocatorRef alloc,
    CFStringRef str,
    CFDictionaryRef attributes
);
```

Parameters

alloc

The allocator to use to allocate memory for the new attributed string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

str

A string that specifies the characters to use in the new attributed string. This value is copied.

attributes

A dictionary that contains the attributes to apply to the new attributed string. This value is copied.

Return Value

An attributed string that contains the characters from *str* and the attributes specified by *attributes*. The result is `NULL` if there was a problem in creating the attributed string. Ownership follows the Create Rule.

Discussion

Note that both the string and the attributes dictionary are copied. The specified attributes are applied to the whole string. If you want to apply different attributes to different ranges of the string, you should use a mutable attributed string.

Availability

Available in Mac OS X v10.4 and later.

Related Sample Code

CoreTextArc

CoreTextTest

Declared In

CFAttributedString.h

CFAttributedStringCreateCopy

Creates an immutable copy of an attributed string.

```
CFAttributedStringRef CFAttributedStringCreateCopy (
    CFAllocatorRef alloc,
    CFAttributedStringRef aStr
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new attributed string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

aStr

The attributed string to copy.

Return Value

An immutable attributed string with characters and attributes identical to those of *aStr*. Returns `NULL` if there was a problem copying the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringCreateWithSubstring

Creates a sub-attributed string from the specified range.

```
CFAttributedStringRef CFAttributedStringCreateWithSubstring (
    CFAllocatorRef alloc,
    CFAttributedStringRef aStr,
    CFRange range
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new attributed string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theString

The attributed string to copy.

range

The range of the attributed string to copy. *range* must not exceed the bounds of *aStr*.

Return Value

A new attributed string whose string and attributes are copied from from the specified range of the supplied attributed string. Returns `NULL` if there was a problem copying the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetAttribute

Returns the value of a given attribute of an attributed string at a specified location.

```
CTypeRef CFAttributedStringGetAttribute (
    CFAttributedStringRef aStr,
    CFIndex loc,
    CFStringRef attrName,
    CFRange *effectiveRange
);
```

Parameters

str

The attributed string to examine.

loc

The location in *str* at which to determine the attributes. *loc* must not exceed the bounds of *str*.

attrName

The name of the attribute whose value you want to determine.

effectiveRange

If not NULL, upon return contains a range including *loc* over which exactly the same set of attributes apply as at *loc*.

Return Value

The value of the specified attribute at the specified location in *str*. Ownership follows the Get Rule.

Discussion

For performance reasons, a range returned in *effectiveRange* is not necessarily the maximal range. If you need the maximum range, you should use

[CFAttributedStringGetAttributeAndLongestEffectiveRange](#) (page 57).

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetAttributeAndLongestEffectiveRange

Returns the value of a given attribute of an attributed string at a specified location.

```
CTypeRef CFAttributedStringGetAttributeAndLongestEffectiveRange (
    CFAttributedStringRef aStr,
    CFIndex loc,
    CFStringRef attrName,
    CFRange inRange,
    CFRange *longestEffectiveRange
);
```

Parameters

str

The attributed string to examine.

loc

The location in *str* at which to determine the attributes. It is a programming error for *loc* to specify a location outside the bounds of *str*.

attrName

The name of the attribute whose value you want to determine.

inRange

The range in *str* within which you want to find the longest effective range of the attributes at *loc*. *inRange* must not exceed the bounds of *str*.

effectiveRange

If not NULL, upon return contains the maximal range within *inRange* over which the exact same set of attributes apply. The returned range is clipped to *inRange*.

Return Value

A dictionary that contains the attributes of *str* at the specified location. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetAttributes

Returns the attributes of an attributed string at a specified location.

```
CFDictionaryRef CFAttributedStringGetAttributes (
    CFAttributedStringRef aStr,
    CFIndex loc,
    CFRange *effectiveRange
);
```

Parameters

str

The attributed string to examine.

loc

The location in *str* at which to determine the attributes. *loc* must not exceed the bounds of *str*.

effectiveRange

If not NULL, upon return contains a range including *loc* over which exactly the same set of attributes apply as at *loc*.

Return Value

A dictionary that contains the attributes of *str* at the specified location. Ownership follows the Get Rule.

Discussion

For performance reasons, a range returned in *effectiveRange* is not necessarily the maximal range. If you need the maximum range, you should use

[CFAttributedStringGetAttributesAndLongestEffectiveRange](#) (page 59).

Note that the returned attribute dictionary might change in unpredictable ways if the attributed string is edited after this call. If you want to preserve the state of the dictionary, you should make an actual copy of it rather than just retaining it. In addition, you should make no assumptions about the relationship of the actual dictionary returned by this call and the dictionary originally used to set the attributes, other than the fact that the values stored in the dictionaries will be identical (that is, ==) to those originally specified.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetAttributesAndLongestEffectiveRange

Returns the attributes of an attributed string at a specified location.

```
CFDictionaryRef CFAttributedStringGetAttributesAndLongestEffectiveRange (
    CFAttributedStringRef aStr,
    CFIndex loc,
    CFRange inRange,
    CFRange *longestEffectiveRange
);
```

Parameters

str

The attributed string to examine.

loc

The location in *str* at which to determine the attributes. *loc* must not exceed the bounds of *str*.

inRange

The range in *str* within to find the longest effective range of the attributes at *loc*. *inRange* must not exceed the bounds of *str*.

effectiveRange

If not NULL, upon return contains the maximal range within *inRange* over which the exact same set of attributes apply. The returned range is clipped to *inRange*.

Return Value

A dictionary that contains the attributes of *str* at the specified location. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetLength

Returns the length of the attributed string in characters.

```
CFIndex CFAttributedStringGetLength (
    CFAttributedStringRef aStr
);
```

Parameters

str

The attributed string to examine.

Return Value

The length of the attributed string in characters; this is the same as `CFStringGetLength(CFAttributedStringGetString(aStr))`.

Availability

Available in Mac OS X v10.4 and later.

Related Sample Code

CoreTextTest

Declared In

CFAttributedString.h

CFAttributedStringGetString

Returns the string for an attributed string.

```
CFStringRef CFAttributedStringGetString (  
    CFAttributedStringRef aStr  
);
```

Parameters

aStr

The attributed string to examine.

Return Value

An immutable string containing the characters from *aStr*, or NULL if there was a problem creating the object. Ownership follows the Get Rule.

Discussion

For performance reasons, the string returned will often be the backing store of the attributed string, and it might therefore change if the attributed string is edited. However, this is an implementation detail, and you should not rely on this behavior.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetTypeID

Returns the type identifier for the CFAttributedString opaque type.

```
CFTypeID CFAttributedStringGetTypeID (  
    void  
);
```

Return Value

The type identifier for the CFAttributedString opaque type.

Discussion

CFMutableAttributedString objects have the same type identifier as CFAttributedString objects.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

Data Types

CFAttributedStringRef

A reference to a CFAttributedString object.

```
typedef const struct __CFAttributedString *CFAttributedStringRef;
```

Discussion

The CFAttributedStringRef type refers to an object that combines a CFString object with a collection of attributes that specify how the characters in the string should be displayed. CFAttributedString is an opaque type that defines the characteristics and behavior of CFAttributedString objects.

Values of type CFAttributedStringRef may refer to immutable or mutable strings, as CFMutableAttributedString objects respond to all functions intended for immutable CFAttributedString objects. Functions which accept CFAttributedStringRef values, and which need to hold on to the values immutably, should call [CFAttributedStringCreateWithSubstring](#) (page 56) (instead of [CFRetain](#) (page 639)) to do so.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFBag Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBag.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFBag and its derived mutable type, CFMutableBag, manage non-sequential collections of values called bags in which there can be duplicate values. CFBag creates static bags and CFMutableBag creates dynamic bags.

Use bags or sets as an alternative to arrays when the order of elements isn't important and performance in testing whether a value is contained in the collection is a consideration—while arrays are ordered, testing for membership is slower than with bags or sets. Use bags over sets if you want to allow duplicate values in your collections.

You create a static bag object using either the [CFBagCreate](#) (page 65) or [CFBagCreateCopy](#) (page 66) function. These functions return a bag containing the values you pass in as arguments. (Note that bags can't contain NULL pointers; in most cases, though, you can use the `kCFNull` constant instead.) Values are not copied but retained using the retain callback provided when the bag was created. Similarly, when a value is removed from a bag, it is released using the release callback.

CFBag provides functions for querying the values of a bag. The [CFBagGetCount](#) (page 67) returns the number of values in a bag, the [CFBagContainsValue](#) (page 65) function checks if a value is in a bag, and [CFBagGetValues](#) (page 69) returns a C array containing all the values in a bag.

The [CFBagApplyFunction](#) (page 64) function lets you apply a function to all values in a bag.

Functions by Task

Creating a Bag

[CFBagCreate](#) (page 65)

Creates an immutable bag containing specified values.

[CFBagCreateCopy](#) (page 66)

Creates an immutable bag with the values of another bag.

Examining a Bag

[CFBagContainsValue](#) (page 65)

Reports whether or not a value is in a bag.

[CFBagGetCount](#) (page 67)

Returns the number of values currently in a bag.

[CFBagGetCountOfValue](#) (page 67)

Returns the number of times a value occurs in a bag.

[CFBagGetValue](#) (page 68)

Returns a requested value from a bag.

[CFBagGetValueIfPresent](#) (page 69)

Reports whether or not a value is in a bag, and returns that value indirectly if it exists.

[CFBagGetValues](#) (page 69)

Fills a buffer with values from a bag.

Applying a Function to the Contents of a Bag

[CFBagApplyFunction](#) (page 64)

Calls a function once for each value in a bag.

Getting the CFBag Type ID

[CFBagGetTypeID](#) (page 68)

Returns the type identifier for the CFBag opaque type.

Functions

CFBagApplyFunction

Calls a function once for each value in a bag.

```
void CFBagApplyFunction (
    CFBagRef theBag,
    CFBagApplierFunction applier,
    void *context
);
```

Parameters

theBag

The bag to operate upon.

applier

The callback function to call once for each value in the *theBag*. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. If there are values in the range that the *applier* function does not expect or cannot properly apply to, the behavior is undefined.

context

A pointer-sized program-defined value, which is passed as the second parameter to the *applier* function, but is otherwise unused by this function. If the context is not what is expected by the *applier* function, the behavior is undefined.

Discussion

While this function iterates over a mutable collection, it is unsafe for the *applier* function to change the contents of the collection.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagContainsValue

Reports whether or not a value is in a bag.

```
Boolean CFBagContainsValue (
    CFBagRef theBag,
    const void *value
);
```

Parameters

theBag

The bag to examine.

value

The value to match in *theBag*. The equal callback provided when *theBag* was created is used to compare. If the equal callback was NULL, pointer equality (in C, ==) is used. If *value*, or any other value in *theBag*, is not understood by the equal callback, the behavior is undefined.

Return Value

true if *value* is contained in *theBag*, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagCreate

Creates an immutable bag containing specified values.

```
CFBagRef CFBagCreate (
    CFAllocatorRef allocator,
    const void **values,
    CFIndex numValues,
    const CFBagCallbacks *callbacks
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

values

A C array of the pointer-sized values to be in the new bag. This parameter may be `NULL` if the *numValues* parameter is 0. The C array is not changed or freed by this function. *values* must be a valid pointer to a C array of at least *numValues* elements.

numValues

The number of values to copy from the *values* C array in the new CFBag object. If the number is negative or is greater than the actual number of values, the behavior is undefined.

callbacks

A pointer to a [CFBagCallbacks](#) (page 74) structure initialized with the callbacks to use to retain, release, describe, and compare values in the bag. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations. This parameter may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a [CFBagCallbacks](#) (page 74) structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined. If the collection contains `CFTYPE` objects only, then pass [kCFTYPEBagCallbacks](#) (page 75) as this parameter to use the default callback functions.

Return Value

A new bag, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBag.h`

CFBagCreateCopy

Creates an immutable bag with the values of another bag.

```
CFBagRef CFBagCreateCopy (
    CFAllocatorRef allocator,
    CFBagRef theBag
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theBag

The bag to copy. The pointer values from *theBag* are copied into the new bag. However, the values are also retained by the new bag. The count of the new bag is the same as the count of *theBag*. The new bag uses the same callbacks as *theBag*.

Return Value

A new bag that contains the same values as *theBag*, or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetCount

Returns the number of values currently in a bag.

```
CFIndex CFBagGetCount (
    CFBagRef theBag
);
```

Parameters

theBag

The bag to examine.

Return Value

The number of values in *theBag*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetCountOfValue

Returns the number of times a value occurs in a bag.

```
CFIndex CFBagGetCountOfValue (
    CFBagRef theBag,
    const void *value
);
```

Parameters

theBag

The bag to examine.

value

The value for which to find matches in *theBag*. The equal callback provided when *theBag* was created is used to compare. If the equal callback was NULL, pointer equality (in C, ==) is used. If *value*, or any other value in *theBag*, is not understood by the equal callback, the behavior is undefined.

Return Value

The number of times *value* occurs in *theBag*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetTypeID

Returns the type identifier for the CFBag opaque type.

```
CTypeID CFBagGetTypeID (
    void
);
```

Return Value

The type identifier for the CFBag opaque type.

Special Considerations

CFMutableBag objects have the same type identifier as CFBag objects.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetValue

Returns a requested value from a bag.

```
const void * CFBagGetValue (
    CFBagRef theBag,
    const void *value
);
```

Parameters

theBag

The bag to examine.

value

The value for which to find matches in *theBag*. The equal callback provided when *theBag* was created is used to compare. If the equal callback was NULL, pointer equality (in C, ==) is used. If *value*, or any other value in *theBag*, is not understood by the equal callback, the behavior is undefined.

Return Value

A pointer to *value*, or NULL if *value* is not in *theBag*. If the value is a Core Foundation object, ownership follows the Get Rule.

Discussion

Depending on the implementation of the equal callback specified when creating *theBag*, the value returned may not have the same pointer equality as *value*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetValueIfPresent

Reports whether or not a value is in a bag, and returns that value indirectly if it exists.

```
Boolean CFBagGetValueIfPresent (
    CFBagRef theBag,
    const void *candidate,
    const void **value
);
```

Parameters

theBag

The bag to be searched.

candidate

The value for which to find matches in *theBag*. The equal callback provided when *theBag* was created is used to compare. If the equal callback was NULL, pointer equality (in C, ==) is used. If *candidate*, or any other value in *theBag*, is not understood by the equal callback, the behavior is undefined.

value

A pointer to a value object. Set to the matching value if it exists in the bag, otherwise NULL. If the value is a Core Foundation object, ownership follows the Get Rule.

Return Value

true if *value* is present in *theBag*, otherwise false.

Discussion

Depending on the implementation of the equal callback specified when creating *theBag*, the value returned in *value* may not have the same pointer equality as *candidate*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagGetValues

Fills a buffer with values from a bag.

```
void CFBagGetValues (
    CFBagRef theBag,
    const void **values
);
```

Parameters

theBag

The bag to examine.

values

A C array of pointer-sized values to be filled with values from *theBag*. The value must be a valid C array of the appropriate type and size (that is, a size equal to the count of *theBag*).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

Callbacks

CFBagApplierFunction

Prototype of a callback function that may be applied to every value in a bag.

```
typedef void (*CFBagApplierFunction) (
    const void *value,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *value,
    void *context
);
```

Parameters

value

The current value in a bag.

context

The program-defined context parameter given to the apply function.

Discussion

This callback is passed to the [CFBagApplyFunction](#) (page 64) function which iterates over the values in a bag and applies the behavior defined in the applier function to each value in a bag.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagCopyDescriptionCallback

Prototype of a callback function used to get a description of a value in a bag.

```
typedef CFStringRef (*CFBagCopyDescriptionCallback) (
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *value
);
```

Parameters

value

The value to be described.

Return Value

A textual description of *value*. `mmancreate`

Discussion

This callback is passed to `CFBagCreate` (page 65) in a `CFBagCallbacks` (page 74) structure. This callback is used by the `CFCopyDescription` (page 634) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBag.h`

CFBagEqualCallback

Prototype of a callback function used to determine if two values in a bag are equal.

```
typedef Boolean (*CFBagEqualCallback) (
    const void *value1,
    const void *value2
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    const void *value1,
    const void *value2
);
```

Parameters

value1

A value in the bag.

value2

Another value in the bag.

Return Value

true if *value1* and *value2* are equal, false otherwise.

Discussion

This callback is passed to `CFBagCreate` (page 65) in a `CFBagCallbacks` (page 74) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagHashCallback

Prototype of a callback function invoked to compute a hash code for a value. Hash codes are used when values are accessed, added, or removed from a collection.

```
typedef CFHashCode      (*CFBagHashCallback) (
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFHashCode CFBagHashCallback (
    const void *value
);
```

Parameters

value

The value used to compute the hash code.

Return Value

An integer that can be used as a table address in a hash table structure.

Discussion

This callback is passed to [CFBagCreate](#) (page 65) in a [CFBagCallbacks](#) (page 74) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagReleaseCallback

Prototype of a callback function used to release a value before it's removed from a bag.

```
typedef void (*CFBagReleaseCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```


Parameters*allocator*

The bag's allocator.

value

The value being removed from the bag.

DiscussionThis callback is passed to [CFBagCreate](#) (page 65) in a [CFBagCallbacks](#) (page 74) structure.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagRetainCallback

Prototype of a callback function used to retain a value being added to a bag.

```
typedef const void *(*CFBagRetainCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```

Parameters*allocator*

The bag's allocator.

value

The value being added to the bag.

Return ValueThe value to store in the bag, which is usually the *value* parameter passed to this callback, but may be a different value if a different value should be stored in the collection.**Discussion**This callback is passed to [CFBagCreate](#) (page 65) in a [CFBagCallbacks](#) (page 74) structure.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

Data Types

CFBagCallbacks

This structure contains the callbacks used to retain, release, describe, and compare the values of a CFBag object.

```
struct CFBagCallbacks {
    CFIndex version;
    CFBagRetainCallback retain;
    CFBagReleaseCallback release;
    CFBagCopyDescriptionCallback copyDescription;
    CFBagEqualCallback equal;
    CFBagHashCallback hash;
};
typedef struct CFBagCallbacks CFBagCallbacks;
```

Fields

`version`

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

`retain`

The callback used to retain each value as they are added to the collection. If `NULL`, values are not retained. See [CFBagRetainCallback](#) (page 73) for a descriptions of this function's parameters.

`release`

The callback used to release values as they are removed from the collection. If `NULL`, values are not released. See [CFBagReleaseCallback](#) (page 72) for a description of this callback.

`copyDescription`

The callback used to create a descriptive string representation of each value in the collection. If `NULL`, the collection will create a simple description of each value. See [CFBagCopyDescriptionCallback](#) (page 70) for a description of this callback.

`equal`

The callback used to compare values in the collection for equality for some operations. If `NULL`, the collection will use pointer equality to compare values in the collection. See [CFBagEqualCallback](#) (page 71) for a description of this callback.

`hash`

The callback used to compute a hash code for values in a collection. If `NULL`, the collection computes a hash code by converting the pointer value to an integer. See [CFBagHashCallback](#) (page 72) for a description of this callback.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagRef

A reference to an immutable bag object.

```
typedef const struct __CFBag *CFBagRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

Constants

Predefined Callback Structures

CFBag provides some predefined callbacks for your convenience.

```
const CFBagCallBacks kCFTYPEBagCallBacks;
const CFBagCallBacks kCFCopyStringBagCallBacks;
```

Constants

kCFTYPEBagCallBacks

Predefined [CFBagCallBacks](#) (page 74) structure containing a set of callbacks appropriate for use when the values in a CFBag are all CFTYPE-derived objects. The retain callback is `CFRetain`, the release callback is `CFRelease`, the copy callback is `CFCopyDescription`, the equal callback is `CFEqual`, and the hash callback is `CFHash`. Therefore, if you use this constant when creating the collection, items are automatically retained when added to the collection, and released when removed from the collection.

Available in Mac OS X v10.0 and later.

Declared in CFBag.h.

kCFCopyStringBagCallBacks

Predefined [CFBagCallBacks](#) (page 74) structure containing a set of callbacks appropriate for use when the values in a CFBag are all CFString objects. The bag makes immutable copies of the strings placed into it.

Available in Mac OS X v10.0 and later.

Declared in CFBag.h.

CFBinaryHeap Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBinaryHeap.h
Companion guide	Collections Programming Topics for Cocoa

Overview

`CFBinaryHeap` implements a container that stores values sorted using a binary search algorithm. All binary heaps are mutable; there is not a separate immutable variety. Binary heaps can be useful as priority queues.

Functions

CFBinaryHeapAddValue

Adds a value to a binary heap.

```
void CFBinaryHeapAddValue (
    CFBinaryHeapRef heap,
    const void *value
);
```

Parameters

heap

The binary heap to use.

value

The value to add to the binary heap. The value is retained by the binary heap using the retain callback provided in the `CFBinaryHeapCallbacks` (page 86) structure when the binary heap was created.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapApplyFunction

Iteratively applies a function to all the values in a binary heap.

```
void CFBinaryHeapApplyFunction (
    CFBinaryHeapRef heap,
    CFBinaryHeapApplierFunction applier,
    void *context
);
```

Parameters*heap*

The binary heap to use.

*applier*The callback function to call once for each value in *heap*.*context*A program-defined value that is passed to the *applier* callback function, but is otherwise unused by this function.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapContainsValue

Returns whether a given value is in a binary heap.

```
Boolean CFBinaryHeapContainsValue (
    CFBinaryHeapRef heap,
    const void *value
);
```

Parameters*heap*

The binary heap to search.

*value*The value for which to find matches in the binary heap. The compare callback provided in the [CFBinaryHeapCallbacks](#) (page 86) structure when the binary heap was created is used to compare values. If *value*, or any of the values in the binary heap, are not understood by the compare callback, the behavior is undefined.**Return Value**true if *value* is a member of *heap*, false otherwise.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapCreate

Creates a new mutable or fixed-mutable binary heap.

```
CFBinaryHeapRef CFBinaryHeapCreate (
    CFAllocatorRef allocator,
    CFIndex capacity,
    const CFBinaryHeapCallbacks *callBacks,
    const CFBinaryHeapCompareContext *compareContext
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the binary heap. The binary heap starts empty and can grow to this number of values. If this parameter is 0, the binary heap's maximum capacity is limited only by memory.

callBacks

A pointer to a `CFBinaryHeapCallbacks` (page 86) structure initialized with the callbacks that operate on the values placed into the binary heap. If the binary heap will be holding `CFString` objects, pass the `kCFStringBinaryHeapCallbacks` (page 87) constant. This function makes a copy of the contents of the callbacks structure, so that a pointer to a structure on the stack can be passed in, or can be reused for multiple binary heap creations. This callbacks parameter may not be `NULL`.

compareContext

Not used. Pass `NULL`.

Return Value

A new `CFBinaryHeap` object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBinaryHeap.h`

CFBinaryHeapCreateCopy

Creates a new mutable or fixed-mutable binary heap with the values from a pre-existing binary heap.

```
CFBinaryHeapRef CFBinaryHeapCreateCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFBinaryHeapRef heap
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the binary heap. The binary heap starts with the same number of values as *heap* and can grow to this number of values. If this parameter is 0, the binary heap's maximum capacity is limited only by memory. If nonzero, *capacity* must be large enough to hold all the values in *heap*.

heap

The binary heap which is to be copied. The values from the binary heap are copied as pointers into the new binary heap (that is, the values themselves are copied, not that to which the values point, if anything). However, the values are also retained by the new binary heap.

Return Value

A new `CFBinaryHeap` object holding the same values as *heap*. The new binary heap uses the same callbacks as *heap*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBinaryHeap.h`

CFBinaryHeapGetCount

Returns the number of values currently in a binary heap.

```
CFIndex CFBinaryHeapGetCount (
    CFBinaryHeapRef heap
);
```

Parameters*heap*

The binary heap to use.

Return Value

The number of values in *heap*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBinaryHeap.h`

CFBinaryHeapGetCountOfValue

Counts the number of times a given value occurs in a binary heap.

```
CFIndex CFBinaryHeapGetCountOfValue (
    CFBinaryHeapRef heap,
    const void *value
);
```

Parameters*heap*

The binary heap to search.

value

The value for which to find matches in the binary heap. The compare callback provided in the [CFBinaryHeapCallbacks](#) (page 86) structure when the binary heap was created is used to compare. If *value*, or any of the values in the binary heap, are not understood by the compare callback, the behavior is undefined.

Return Value

The number of times *value* occurs in *heap*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapGetMinimum

Returns the minimum value in a binary heap.

```
const void * CFBinaryHeapGetMinimum (
    CFBinaryHeapRef heap
);
```

Parameters

heap

The binary heap to use.

Return Value

The minimum value in *heap* as determined by the binary heap's compare callback. If *heap* contains several equal minimum values, any one may be returned. If the value is a Core Foundation object, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapGetMinimumIfPresent

Returns the minimum value in a binary heap, if present.

```
Boolean CFBinaryHeapGetMinimumIfPresent (
    CFBinaryHeapRef heap,
    const void **value
);
```

Parameters

heap

The binary heap to use.

value

On return, the minimum value in *heap* as determined by the binary heap's compare callback. If *heap* contains several equal minimum values, any one may be returned. If the value is a Core Foundation object, ownership follows the Get Rule.

Return Value

`true` if a minimum value exists in *heap*, `false` otherwise. `false` is returned only if *heap* is empty.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapGetTypeID

Returns the type identifier of the CFBinaryHeap opaque type.

```
CTypeID CFBinaryHeapGetTypeID (
    void
);
```

Return Value

The type identifier of the CFBinaryHeap opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapGetValues

Copies all the values from a binary heap into a sorted C array.

```
void CFBinaryHeapGetValues (
    CFBinaryHeapRef heap,
    const void **values
);
```

Parameters

heap

The binary heap to use.

values

On return, the memory pointed to by this argument holds a C array of all the values in *heap*, sorted from minimum to maximum values. You must allocate sufficient memory to hold all the values in *heap* before calling this function. If the values are Core Foundation objects, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapRemoveAllValues

Removes all values from a binary heap, making it empty.

```
void CFBinaryHeapRemoveAllValues (  
    CFBinaryHeapRef heap  
);
```

Parameters

heap

The binary heap to use.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapRemoveMinimumValue

Removes the minimum value from a binary heap.

```
void CFBinaryHeapRemoveMinimumValue (  
    CFBinaryHeapRef heap  
);
```

Parameters

heap

The binary heap to use.

Discussion

If *heap* contains several equal minimum values, only one of them is removed. If *heap* is empty, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

Callbacks

CFBinaryHeapApplierFunction

Callback function used to apply a function to all members of a binary heap.

```
typedef void (*CFBinaryHeapApplierFunction) (  
    const void *val,  
    void *context  
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallBack (
    const void *val,
    void *context
);
```

Parameters*val*

The current value from the binary heap.

*context*The program-defined context parameter given to the [CFBinaryHeapApplyFunction](#) (page 77) function.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapCompareCallback

Callback function used to compare two members of a binary heap.

```
typedef CFComparisonResult (*CFBinaryHeapCompareCallback) (
    const void *ptr1,
    const void *ptr2,
    void *info
);
```

If you name your function `MyCallBack`, you would declare it like this:

```
CFComparisonResult MyCallBack (
    const void *ptr1,
    const void *ptr2,
    void *info
);
```

Parameters*ptr1*

First value to compare.

ptr2

Second value to compare.

info

Not used. Should always be NULL.

Return ValuekCFCompareLessThan if *ptr1* is less than *ptr2*, kCFCompareEqualTo if *ptr1* and *ptr2* are equal, or kCFCompareGreaterThan if *ptr1* is greater than *ptr2*.**CFBinaryHeapCopyDescriptionCallback**

Callback function used to get a description of a value in a binary heap.

```
typedef CFStringRef (*CFBinaryHeapCopyDescriptionCallback) (
    const void *ptr
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *ptr
);
```

Parameters

ptr

The value to be described.

CFBinaryHeapReleaseCallback

Callback function used to release a value before it is removed from a binary heap.

```
typedef void (*CFBinaryHeapReleaseCallback) (
    CFAllocatorRef allocator,
    const void *ptr
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFAllocatorRef allocator,
    const void *ptr
);
```

Parameters

allocator

The binary heap's allocator.

ptr

The value to release.

CFBinaryHeapRetainCallback

Callback function used to retain a value being added to a binary heap.

```
typedef const void *(*CFBinaryHeapRetainCallback) (
    CFAllocatorRef allocator,
    const void *ptr
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    CFAllocatorRef allocator,
    const void *ptr
);
```

Parameters*allocator*

The binary heap's allocator.

ptr

The value to retain.

Return Value

The value to store in the binary heap, which is usually the *ptr* parameter passed to this callback, but may be a different value if a different value should be stored in the binary heap.

Data Types

CFBinaryHeapCallbacks

Structure containing the callbacks for values for a CFBinaryHeap object.

```
struct CFBinaryHeapCallbacks {
    CFIndex version;
    CFBinaryHeapRetainCallback retain;
    CFBinaryHeapReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
    CFBinaryHeapCompareCallback compare;
};
typedef struct CFBinaryHeapCallbacks CFBinaryHeapCallbacks;
```

Fields*version*

The version number of the structure type being passed in as a parameter to the CFBinaryHeap creation functions. This structure is version 0.

retain

The callback used to add a retain for the binary heap on values as they are put into the binary heap. This callback returns the value to use as the value in the binary heap, which is usually the value parameter passed to this callback, but may be a different value if a different value should be added to the binary heap. If this field is `NULL`, the binary heap does nothing to retain a value being added.

release

The callback used to remove a retain previously added for the binary heap from values as they are removed from the binary heap. If this field is `NULL`, the binary heap does nothing to release a value being removed.

copyDescription

The callback used to create a descriptive string representation of each value in the binary heap. This is used by the [CFCopyDescription](#) (page 634) function. If this field is `NULL`, the binary heap constructs a `CFString` object describing the value based on its pointer value.

compare

The callback used to compare values in the binary heap in some operations. This field cannot be `NULL`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapCompareContext

Not used.

```

struct CFBinaryHeapCompareContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFBinaryHeapCompareContext CFBinaryHeapCompareContext;

```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

CFBinaryHeapRef

A reference to a binary heap object.

```
typedef struct __CFBinaryHeap *CFBinaryHeapRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBinaryHeap.h

Constants

Predefined Callback Structures

CFBinaryHeap provides some predefined callbacks for your convenience.

```
const CFBinaryHeapCallbacks kCFStringBinaryHeapCallbacks;
```

Constants

kCFStringBinaryHeapCallbacks

Predefined [CFBinaryHeapCallbacks](#) (page 86) structure containing a set of callbacks appropriate for use when the values in a binary heap are all `CFString` objects.

Available in Mac OS X v10.0 and later.

Declared in `CFBinaryHeap.h`.

CFBitVector Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBitVector.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFBitVector and its derived mutable type, CFMutableBitVector, manage ordered collections of bit values, which are either 0 or 1. CFBitVector creates static bit vectors and CFMutableBitVector creates dynamic bit vectors.

Functions by Task

Creating a Bit Vector

- [CFBitVectorCreate](#) (page 90)
Creates an immutable bit vector from a block of memory.
- [CFBitVectorCreateCopy](#) (page 91)
Creates an immutable bit vector that is a copy of another bit vector.

Getting Information About a Bit Vector

- [CFBitVectorContainsBit](#) (page 90)
Returns whether a bit vector contains a particular bit value.
- [CFBitVectorGetBitAtIndex](#) (page 92)
Returns the bit value at a given index in a bit vector.
- [CFBitVectorGetBits](#) (page 92)
Returns the bit values in a range of indices in a bit vector.
- [CFBitVectorGetCount](#) (page 92)
Returns the number of bit values in a bit vector.
- [CFBitVectorGetCountOfBit](#) (page 93)
Counts the number of times a certain bit value occurs within a range of bits in a bit vector.

[CFBitVectorGetFirstIndexOfBit](#) (page 93)

Locates the first occurrence of a certain bit value within a range of bits in a bit vector.

[CFBitVectorGetLastIndexOfBit](#) (page 94)

Locates the last occurrence of a certain bit value within a range of bits in a bit vector.

Getting the CFBitVector Type ID

[CFBitVectorGetTypeID](#) (page 95)

Returns the type identifier for the CFBitVector opaque type.

Functions

CFBitVectorContainsBit

Returns whether a bit vector contains a particular bit value.

```
Boolean CFBitVectorContainsBit (
    CFBitVectorRef bv,
    CFRange range,
    CFBit value
);
```

Parameters

bv
The bit vector to search.

range
The range of bits in *bv* to search.

value
The bit value for which to search.

Return Value

true if the specified range of bits in *bv* contains *value*, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorCreate

Creates an immutable bit vector from a block of memory.

```
CFBitVectorRef CFBitVectorCreate (
    CFAllocatorRef allocator,
    const UInt8 *bytes,
    CFIndex numBits
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bit vector. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

A pointer to the bit values to store in the new bit vector. The values are copied into the bit vector's own memory. The bit indices are numbered left-to-right with 0 being the left-most, or most-significant, bit in the byte stream.

numBits

The number of bits in the bit vector.

Return Value

A new bit vector. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBitVector.h`

CFBitVectorCreateCopy

Creates an immutable bit vector that is a copy of another bit vector.

```
CFBitVectorRef CFBitVectorCreateCopy (
    CFAllocatorRef allocator,
    CFBitVectorRef bv
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bit vector. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bv

The bit vector to copy.

Return Value

A new bit vector holding the same bit values as *bv*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBitVector.h`

CFBitVectorGetBitAtIndex

Returns the bit value at a given index in a bit vector.

```
CFBit CFBitVectorGetBitAtIndex (
    CFBitVectorRef bv,
    CFIndex idx
);
```

Parameters

bv
The bit vector to examine.

idx
The index of the bit value in *bv* to return.

Return Value

The bit value at index *idx* in *bv*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetBits

Returns the bit values in a range of indices in a bit vector.

```
void CFBitVectorGetBits (
    CFBitVectorRef bv,
    CFRange range,
    UInt8 *bytes
);
```

Parameters

bv
The bit vector to examine.

range
The range of bit values to return.

bytes
On return, contains the requested bit values from *bv*. This argument must point to enough memory to hold the number of bits requested. The requested bits are left-aligned with the first requested bit stored in the left-most, or most-significant, bit of the byte stream.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetCount

Returns the number of bit values in a bit vector.

```
CFIndex CFBitVectorGetCount (
    CFBitVectorRef bv
);
```

Parameters

bv
The bit vector to examine.

Return Value

The current size of *bv*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetCountOfBit

Counts the number of times a certain bit value occurs within a range of bits in a bit vector.

```
CFIndex CFBitVectorGetCountOfBit (
    CFBitVectorRef bv,
    CFRange range,
    CFBit value
);
```

Parameters

bv
The bit vector to examine.

range
The range of bits in *bv* to search.

value
The bit value to count.

Return Value

The number of occurrences of *value* in the specified range of *bv*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetFirstIndexOfBit

Locates the first occurrence of a certain bit value within a range of bits in a bit vector.

```
CFIndex CFBitVectorGetFirstIndexOfBit (
    CFBitVectorRef bv,
    CFRange range,
    CFBit value
);
```

Parameters

bv
The bit vector to examine.

range
The range of bits in *bv* to search.

value
The bit value for which to search.

Return Value

The index of the first occurrence of *value* in the specified range of *bv*, or `kCFNotFound` if *value* is not present.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetLastIndexOfBit

Locates the last occurrence of a certain bit value within a range of bits in a bit vector.

```
CFIndex CFBitVectorGetLastIndexOfBit (
    CFBitVectorRef bv,
    CFRange range,
    CFBit value
);
```

Parameters

bv
The bit vector to examine.

range
The range of bits in *bv* to search.

value
The bit value for which to search.

Return Value

The index of the last occurrence of *value* in the specified range of *bv*, or `kCFNotFound` if *value* is not present.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorGetTypeID

Returns the type identifier for the CFBitVector opaque type.

```
CTypeID CFBitVectorGetTypeID (  
    void  
);
```

Return Value

The type identifier for the CFBitVector opaque type.

Discussion

CFMutableBitVector objects have the same type identifier as CFBitVector objects.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

Data Types

CFBit

A binary value of either 0 or 1.

```
typedef UInt32 CFBit;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorRef

A reference to an immutable bit vector object.

```
typedef const struct __CFBitVector *CFBitVectorRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBoolean Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFNumber.h
Companion guide	Property List Programming Topics for Core Foundation

Overview

CFBoolean objects are used to wrap boolean values for use in Core Foundation property lists and collection types.

Functions

CFBooleanGetTypeID

Returns the Core Foundation type identifier for the CFBoolean opaque type.

```
CTypeID CFBooleanGetTypeID (
    void
);
```

Return Value

The Core Foundation type identifier for CFBoolean opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

Cocoa PDE with Carbon Printing

DRDataBurnCarbonUI

DREraseCarbonUI

HID Manager Basics

QISA

Declared In

CFNumber.h

CFBooleanGetValue

Returns the value of a CFBoolean object as a standard C type `Boolean`.

```
Boolean CFBooleanGetValue (
    CFBooleanRef boolean
);
```

Parameters

boolean

The boolean to examine.

Return Value

The value of *boolean*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

databurntest

GLCarbon1ContextPbuffer

GLCarbonSharedPbuffer

HID Utilities Source

SeeMyFriends

Declared In

CFNumber.h

Data Types

CFBooleanRef

A reference to a CFBoolean object.

```
typedef const struct __CFBoolean *CFBooleanRef;
```

Discussion

CFBoolean objects are used to wrap boolean values for use in Core Foundation property lists and collection types.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFNumber.h

Constants

Boolean Values

CFBoolean evaluates to either true or false values where `kCFBooleanTrue` is the true, and `kCFBooleanFalse` is the false value.

```
const CFBooleanRef kCFBooleanTrue;  
const CFBooleanRef kCFBooleanFalse;
```

Constants

`kCFBooleanTrue`

Boolean true value.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFBooleanFalse`

Boolean false value.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

CFBundle Reference

Derived From:	<i>CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBundle.h
Companion guides	Bundle Programming Guide Plug-ins

Overview

CFBundle allows you to use a folder hierarchy called a bundle to organize and locate many types of application resources including images, sounds, localized strings, and executable code. In Mac OS X, bundles can also be used by CFM applications to load and execute functions from Mach-O frameworks. You can use bundles to support multiple languages or execute your application on multiple operating environments.

You create a bundle object using one of the `CFBundleCreate...` functions. CFBundle provides several functions for finding resources within a bundle. The `CFBundleCopyResourceURL` (page 115) function returns the location of a resource of the specified name and type, and in the specified subdirectory. Use `CFBundleCopyResourceURLForLocalization` (page 115) to restrict the search to a specific localization name. Use `CFBundleCopyResourceURLsOfType` (page 117) to get the locations of all resources of a specified type.

CFBundle provides functions for getting bundle information, such as its identifier and information dictionary. Use the `CFBundleGetIdentifier` (page 126) function to get the identifier of a bundle, and the `CFBundleGetInfoDictionary` (page 127) function to get its information dictionary. The principal intended purpose for locating bundles by identifier is so that code (in frameworks, plugins, etc.) can find its own bundle.

You can also obtain locations of subdirectories in a bundle represented as CFURL objects. The `CFBundleCopyExecutableURL` (page 109) function returns the location of the application's executable. The functions `CFBundleCopyResourceURL` (page 115), `CFBundleCopySharedFrameworksURL` (page 119), `CFBundleCopyPrivateFrameworksURL` (page 113), `CFBundleCopySharedSupportURL` (page 120), and `CFBundleCopyBuiltInPlugInsURL` (page 107) return the location of a bundle's subdirectory containing resources, shared frameworks, private frameworks, shared support files, and plug-ins respectively.

Other functions are used to manage localizations. The `CFBundleCopyLocalizedString` (page 112) and `CFBundleCopyLocalizationsForURL` (page 112) functions return a localized string from a bundle's strings file. The `CFBundleCopyLocalizationsForPreferences` (page 111) function returns the localizations that CFBundle would prefer, given the specified bundle and user preference localizations.

Unlike some other Core Foundation opaque types with similar Cocoa Foundation names (such as `CFString` and `NSString`), `NSBundle` objects cannot be cast ("toll-free bridged") to `CFBundle` objects.

Unlike `NSBundle`, which does not support unloading (because the Objective C runtime does not support the unloading of Objective C code), you can unload `CFBundle` objects.

`CFBundleGetFunctionPointerForName` (page 125) and related calls automatically load a bundle if it is not already loaded. When the last reference to the `CFBundle` object is released and it is finally deallocated, then the code will be unloaded if it is still loaded and if the executable is of a type that supports unloading. If you keep this in mind, and if you make sure that everything that uses the bundle keeps a retain on the `CFBundle` object, then you can just use the bundle naturally and never have to worry about when it is loaded and unloaded.

On the other hand, if you want to manually manage when the bundle is loaded and unloaded, then you can use `CFBundleLoadExecutable` (page 132) and `CFBundleUnloadExecutable` (page 135)—although this technique is not recommended. These functions force immediate loading and unloading of the executable (if it has not already been loaded/unloaded, and in the case of unloading if the executable is of a type that supports unloading). If you do this, then the code calling `CFBundleUnloadExecutable` is responsible for making sure that there are no remaining references to anything in the bundle's code before it is unloaded. In the previous approach, by contrast, this responsibility can be distributed to the individual code sections that use the bundle, by making sure that each one keeps its own retain on the `CFBundle` object.

One further point about `CFBundle` reference counting: if you are taking the first approach, but do not actually wish the bundle's code to be unloaded (as is often the case), or if you are taking the second approach of manually managing the unloading yourself, then in many cases you do not actually have to worry about releasing a `CFBundle` object. `CFBundle` instances are unique, so there is only one `CFBundle` object for a given bundle, and rarely are there so many bundles being considered at once that the memory usage for `CFBundle` objects would be significant. There are cases in which a process could create `CFBundle` objects for potentially an unlimited number of bundles, and such processes would wish to balance retains and releases carefully, but such cases are likely to be rare.

Note that it is best to compile any unloadable bundles with the flag `-fno-constant-cfstrings`—see *Bundle Programming Guide* for more details.

Functions by Task

Creating and Accessing Bundles

`CFBundleCreate` (page 121)

Creates a `CFBundle` object.

`CFBundleCreateBundlesFromDirectory` (page 122)

Searches a directory and constructs an array of `CFBundle` objects from all valid bundles in the specified directory.

`CFBundleGetAllBundles` (page 122)

Returns an array containing all of the bundles currently open in the application.

`CFBundleGetBundleWithIdentifier` (page 123)

Locate a bundle given its program-defined identifier.

`CFBundleGetMainBundle` (page 128)

Returns an application's main bundle.

Loading and Unloading a Bundle

[CFBundleIsExecutableLoaded](#) (page 131)

Obtains information about the load status for a bundle's main executable.

[CFBundlePreflightExecutable](#) (page 134)

Returns a Boolean value that indicates whether a given bundle is loaded or appears to be loadable.

[CFBundleLoadExecutable](#) (page 132)

Loads a bundle's main executable code into memory and dynamically links it into the running application.

[CFBundleLoadExecutableAndReturnError](#) (page 132)

Returns a Boolean value that indicates whether a given bundle is loaded, attempting to load it if necessary.

[CFBundleUnloadExecutable](#) (page 135)

Unloads the main executable for the specified bundle.

Finding Locations in a Bundle

[CFBundleCopyAuxiliaryExecutableURL](#) (page 106)

Returns the location of a bundle's auxiliary executable code.

[CFBundleCopyBuiltInPlugInsURL](#) (page 107)

Returns the location of a bundle's built in plug-in.

[CFBundleCopyExecutableURL](#) (page 109)

Returns the location of a bundle's main executable code.

[CFBundleCopyPrivateFrameworksURL](#) (page 113)

Returns the location of a bundle's private Frameworks directory.

[CFBundleCopyResourcesDirectoryURL](#) (page 114)

Returns the location of a bundle's Resources directory.

[CFBundleCopySharedFrameworksURL](#) (page 119)

Returns the location of a bundle's shared frameworks directory.

[CFBundleCopySharedSupportURL](#) (page 120)

Returns the location of a bundle's shared support files directory.

[CFBundleCopySupportFilesDirectoryURL](#) (page 120)

Returns the location of the bundle's support files directory.

Locating Bundle Resources

[CFBundleCloseBundleResourceMap](#) (page 106)

Closes an open resource map for a bundle.

[CFBundleCopyResourceURL](#) (page 115)

Returns the location of a resource contained in the specified bundle.

[CFBundleCopyResourceURLInDirectory](#) (page 116)

Returns the location of a resource contained in the specified bundle directory without requiring the creation of a CFBundle object.

[CFBundleCopyResourceURLsOfType](#) (page 117)

Assembles an array of URLs specifying all of the resources of the specified type found in a bundle.

[CFBundleCopyResourceURLsOfTypeInDirectory](#) (page 119)

Returns an array of CFURL objects describing the locations of all resources in a bundle of the specified type without needing to create a CFBundle object.

[CFBundleCopyResourceURLForLocalization](#) (page 115)

Returns the location of a localized resource in a bundle.

[CFBundleCopyResourceURLsOfTypeForLocalization](#) (page 118)

Returns an array containing copies of the URL locations for a specified bundle, resource, and localization name.

[CFBundleOpenBundleResourceFiles](#) (page 133)

Opens the non-localized and localized resource files (if any) for a bundle in separate resource maps.

[CFBundleOpenBundleResourceMap](#) (page 134)

Opens the non-localized and localized resource files (if any) for a bundle in a single resource map.

Managing Localizations

[CFBundleCopyBundleLocalizations](#) (page 107)

Returns an array containing a bundle's localizations.

[CFBundleCopyLocalizedString](#) (page 112)

Returns a localized string from a bundle's strings file.

[CFBundleCopyLocalizationsForPreferences](#) (page 111)

Given an array of possible localizations and preferred locations, returns the one or more of them that CFBundle would use, without reference to the current application context.

[CFBundleCopyLocalizationsForURL](#) (page 112)

Returns an array containing the localizations for a bundle or executable at a particular location.

[CFBundleCopyPreferredLocalizationsFromArray](#) (page 113)

Given an array of possible localizations, returns the one or more of them that CFBundle would use in the current application context.

[CFCopyLocalizedString](#) (page 135)

Searches the default strings file `Localizable.strings` for the string associated with the specified key.

[CFCopyLocalizedStringFromTable](#) (page 136)

Searches the specified strings file for the string associated with the specified key.

[CFCopyLocalizedStringFromTableInBundle](#) (page 136)

Returns a localized version of the specified string.

[CFCopyLocalizedStringWithDefaultValue](#) (page 137)

Returns a localized version of a localization string.

Managing Executable Code

[CFBundleGetDataPointerForName](#) (page 123)

Returns a data pointer to a symbol of the given name.

[CFBundleGetDataPointersForNames](#) (page 124)

Returns a C array of data pointer to symbols of the given names.

[CFBundleGetFunctionPointerForName](#) (page 125)

Returns a pointer to a function in a bundle's executable code using the function name as the search key.

[CFBundleGetFunctionPointersForNames](#) (page 126)

Constructs a function table containing pointers to all of the functions found in a bundle's main executable code.

[CFBundleGetPlugIn](#) (page 129)

Returns a bundle's plug-in.

Getting Bundle Properties

[CFBundleCopyBundleURL](#) (page 108)

Returns the location of a bundle.

[CFBundleGetDevelopmentRegion](#) (page 124)

Returns the bundle's development region from the bundle's information property list.

[CFBundleGetIdentifier](#) (page 126)

Returns the bundle identifier from a bundle's information property list.

[CFBundleGetInfoDictionary](#) (page 127)

Returns a bundle's information dictionary.

[CFBundleGetLocalInfoDictionary](#) (page 127)

Returns a bundle's localized information dictionary.

[CFBundleGetValueForInfoDictionaryKey](#) (page 130)

Returns a value (localized if possible) from a bundle's information dictionary.

[CFBundleCopyInfoDictionaryInDirectory](#) (page 110)

Returns a bundle's information dictionary.

[CFBundleCopyInfoDictionaryForURL](#) (page 110)

Returns the information dictionary for a given URL location.

[CFBundleGetPackageInfo](#) (page 128)

Returns a bundle's package type and creator.

[CFBundleGetPackageInfoInDirectory](#) (page 129)

Returns a bundle's package type and creator without having to create a CFBundle object.

[CFBundleCopyExecutableArchitectures](#) (page 108)

Returns an array of CFNumbers representing the architectures a given bundle provides.

[CFBundleCopyExecutableArchitecturesForURL](#) (page 109)

Returns an array of CFNumbers representing the architectures a given URL provides.

[CFBundleGetVersionNumber](#) (page 131)

Returns a bundle's version number.

Getting the CFBundle Type ID

[CFBundleGetTypeID](#) (page 130)

Returns the type identifier for the CFBundle opaque type.

Functions

CFBundleCloseBundleResourceMap

Closes an open resource map for a bundle.

```
void CFBundleCloseBundleResourceMap (
    CFBundleRef bundle,
    CFBundleRefNum refNum
);
```

Parameters

bundle

The bundle whose resource map is referenced by *refNum*.

refNum

The reference number for a resource map to close.

Discussion

You open a resource map using either [CFBundleOpenBundleResourceFiles](#) (page 133) or [CFBundleOpenBundleResourceMap](#) (page 134).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopyAuxiliaryExecutableURL

Returns the location of a bundle's auxiliary executable code.

```
CFURLRef CFBundleCopyAuxiliaryExecutableURL (
    CFBundleRef bundle,
    CFStringRef executableName
);
```

Parameters

bundle

The bundle to examine.

executableName

The name of *bundle*'s auxiliary executable code.

Return Value

The URL location of the specified bundle's auxiliary executable code, or NULL if it could not be found. Ownership follows the Create Rule.

Discussion

This function can be used to find executables other than your main executable. This is useful, for instance, for applications that have some command line tool that is packaged with and used by the application. The tool can be packaged in the various platform executable directories in the bundle and can be located with this function. This allows an application to ship versions of the tool for each platform as it does for the main application executable.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

BSDLLCTest

MoreIsBetter

QISA

Declared In

CFBundle.h

CFBundleCopyBuiltInPlugInsURL

Returns the location of a bundle's built in plug-in.

```
CFURLRef CFBundleCopyBuiltInPlugInsURL (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

A CFURL object describing the location of *bundle's* built in plug-ins, or NULL if it could not be found. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicPlugIn

PDEProject

QISA

Declared In

CFBundle.h

CFBundleCopyBundleLocalizations

Returns an array containing a bundle's localizations.

```
CFArrayRef CFBundleCopyBundleLocalizations (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

An array containing *bundle's* localizations. Ownership follows the Create Rule.

Discussion

The array returned by this function is typically passed as a parameter to either the [CFBundleCopyPreferredLocalizationsFromArray](#) (page 113) or [CFBundleCopyLocalizationsForPreferences](#) (page 111) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopyBundleURL

Returns the location of a bundle.

```
CFURLRef CFBundleCopyBundleURL (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

A CFURL object describing the location of *bundle*, or NULL if the specified bundle does not exist. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

GrabBag

HID Utilities Source

QISA

simpleJavaLauncher

Declared In

CFBundle.h

CFBundleCopyExecutableArchitectures

Returns an array of CFNumbers representing the architectures a given bundle provides.

```
CFArrayRef CFBundleCopyExecutableArchitectures (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

If the bundle's executable exists and is a Mach-o file, returns an array of CFNumbers whose values are integers representing the architectures the file provides. Possible values are listed in “[Architecture Types](#)” (page 140). If the executable is not a Mach-o file, returns NULL. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFBundleCopyExecutableArchitecturesForURL](#) (page 109)

Declared In

CFBundle.h

CFBundleCopyExecutableArchitecturesForURL

Returns an array of CFNumbers representing the architectures a given URL provides.

```
CFArrayRef CFBundleCopyExecutableArchitecturesForURL (
    CFURLRef url
);
```

Parameters

url

The URL to examine.

Return Value

For a directory URL, if the bundle's executable exists and is a Mach-o file, returns an array of CFNumbers whose values are integers representing the architectures the URL provides. For a plain file URL representing an unbundled executable, returns the architectures it provides if it is a Mach-o file. Possible values are listed in “[Architecture Types](#)” (page 140). If there is no bundle executable or if the executable is not a Mach-o file, returns NULL. Ownership follows the Create Rule.

Discussion

For a directory URL, this is equivalent to calling [CFBundleCopyExecutableArchitectures](#) (page 108) on the corresponding bundle.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFBundleCopyExecutableArchitectures](#) (page 108)

Declared In

CFBundle.h

CFBundleCopyExecutableURL

Returns the location of a bundle's main executable code.

```
CFURLRef CFBundleCopyExecutableURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return ValueA CFURL object describing the location of *bundle's* executable code, or NULL if none is found. Ownership follows the Create Rule.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

CheckExecutableArchitecture

MemoryBasedBundle

Declared In

CFBundle.h

CFBundleCopyInfoDictionaryForURL

Returns the information dictionary for a given URL location.

```
CFDictionaryRef CFBundleCopyInfoDictionaryForURL (
    CFURLRef url
);
```

Parameters*url*

A CFURL object describing the location of a file.

Return ValueA CFDictionary object containing *url's* information dictionary. Ownership follows the Create Rule.**Discussion**

For a directory URL, this is equivalent to [CFBundleCopyInfoDictionaryInDirectory](#) (page 110). For a plain file URL representing an unbundled application, this function will attempt to read an information dictionary either from the (`__TEXT`, `__info_plist`) section of the file (for a Mach-o file) or from a `plist` resource.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFBundle.h

CFBundleCopyInfoDictionaryInDirectory

Returns a bundle's information dictionary.

```
CFDictionaryRef CFBundleCopyInfoDictionaryInDirectory (
    CFURLRef bundleURL
);
```

Parameters*bundleURL*

A CFURL object describing the location of a bundle.

Return Value

A CFDictionary object containing the information dictionary for a bundle located at *bundleURL*. Ownership follows the Create Rule.

Discussion

This function provides a means to obtain an information dictionary for a bundle without first creating a CFBundle object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopyLocalizationsForPreferences

Given an array of possible localizations and preferred locations, returns the one or more of them that CFBundle would use, without reference to the current application context.

```
CFArrayRef CFBundleCopyLocalizationsForPreferences (
    CFArrayRef locArray,
    CFArrayRef prefArray
);
```

Parameters*locArray*

An array of possible localizations to search.

prefArray

An array of preferred localizations. If `NULL`, the user's actual preferred localizations will be used.

Return Value

An array containing the localizations that CFBundle would use. Ownership follows the Create Rule.

Discussion

This is not the same as [CFBundleCopyPreferredLocalizationsFromArray](#) (page 113), because that function takes the current application context into account. To determine the localizations that another application would use, apply this function to the result of [CFBundleCopyBundleLocalizations](#) (page 107).

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFBundle.h

CFBundleCopyLocalizationsForURL

Returns an array containing the localizations for a bundle or executable at a particular location.

```
CFArrayRef CFBundleCopyLocalizationsForURL (
    CFURLRef url
);
```

Parameters

url

The location of a bundle's localizations.

Return Value

An array containing the localizations available at *url*. Ownership follows the Create Rule.

Discussion

For a directory URL, this is equivalent to calling the [CFBundleCopyBundleLocalizations](#) (page 107) function on the corresponding bundle. For a plain file URL representing an unbundled application, this will attempt to determine its localizations using the [kCFBundleLocalizationsKey](#) (page 140) and [kCFBundleDevelopmentRegionKey](#) (page 139) keys in the dictionary returned by [CFBundleCopyInfoDictionaryForURL](#) (page 110), or a `vers` resource if those are not present.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFBundle.h

CFBundleCopyLocalizedString

Returns a localized string from a bundle's strings file.

```
CFStringRef CFBundleCopyLocalizedString (
    CFBundleRef bundle,
    CFStringRef key,
    CFStringRef value,
    CFStringRef tableName
);
```

Parameters

bundle

The bundle to examine.

key

The key for the localized string to retrieve. This key will be used to look up the localized string in the strings file. Typically the key is identical to the value of the localized string in the development language.

value

A default value to return if no value exists for *key*.

tableName

The name of the strings file to search. The name should not include the `strings` filename extension. The case of the string must match that of the file name, even on file systems (such as HFS+) that are not case sensitive with regards to file names

Return Value

A CFString object that contains the localized string. If no value exists for *key*, returns *value* unless *value* is NULL or an empty string, in which case *key* is returned instead. Ownership follows the Create Rule.

Discussion

This is the base function from which the other localized string macros are derived. In general you should not use this function because the `genstrings` development tool only recognizes the macro version of this call when generating strings files. See [CFCopyLocalizedString](#) (page 135) for details on how to use these macros.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreSCF

QISA

Declared In

CFBundle.h

CFBundleCopyPreferredLocalizationsFromArray

Given an array of possible localizations, returns the one or more of them that CFBundle would use in the current application context.

```
CFArrayRef CFBundleCopyPreferredLocalizationsFromArray (
    CFArrayRef locArray
);
```

Parameters

locArray

An array of possible localizations.

Return Value

A subset of *locArray* that CFBundle would use in the current application context. Ownership follows the Create Rule.

Discussion

You can obtain *locArray* using the [CFBundleCopyBundleLocalizations](#) (page 107) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopyPrivateFrameworksURL

Returns the location of a bundle's private Frameworks directory.

```
CFURLRef CFBundleCopyPrivateFrameworksURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return ValueA CFURL object describing the location of *bundle's* private frameworks directory, or NULL if it could not be found. Ownership follows the Create Rule.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

SpellingChecker CarbonCocoa Bundled

SpellingChecker-CarbonCocoa

Declared In

CFBundle.h

CFBundleCopyResourcesDirectoryURL

Returns the location of a bundle's Resources directory.

```
CFURLRef CFBundleCopyResourcesDirectoryURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return ValueA CFURL object describing the location of *bundle's* resources directory, or NULL if it could not be found. Ownership follows the Create Rule.**Discussion**In general, you should never need to use this function. Use [CFBundleCopyResourceURL](#) (page 115) and similar functions instead.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

AppleScriptRunner

CarbonCocoa_PictureCursor

FileNotification

PBORenderToVertexArray

Declared In

CFBundle.h

CFBundleCopyResourceURL

Returns the location of a resource contained in the specified bundle.

```
CFURLRef CFBundleCopyResourceURL (
    CFBundleRef bundle,
    CFStringRef resourceName,
    CFStringRef resourceType,
    CFStringRef subDirName
);
```

Parameters

bundle

The bundle to examine.

resourceName

The name of the requested resource.

resourceType

The abstract type of the requested resource. The type is expressed as a filename extension, such as `jpg`. Pass `NULL` if you don't need to search by type.

subDirName

The name of the subdirectory of the bundle's resources directory to search. Pass `NULL` to search the standard `CFBundle` resource locations.

Return Value

A `CFURL` object describing the location of the requested resource, or `NULL` if the resource cannot be found. Ownership follows the Create Rule.

Discussion

For example, if a bundle contains a subdirectory `WaterSounds` that includes a file `Water1.aiff`, you can retrieve the URL for the file using:

```
CFBundleCopyResourceURL(bundle, CFSTR("Water1"), CFSTR("aiff"),
    CFSTR("WaterSounds"));
```

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CoreTextTest

HID Utilities Source

QISA

QuartzCache

SampleDS

Declared In

`CFBundle.h`

CFBundleCopyResourceURLForLocalization

Returns the location of a localized resource in a bundle.

```
CFURLRef CFBundleCopyResourceURLForLocalization (
    CFBundleRef bundle,
    CFStringRef resourceName,
    CFStringRef resourceType,
    CFStringRef subDirName,
    CFStringRef localizationName
);
```

Parameters*bundle*

The bundle to examine.

resourceName

The name of the requested resource.

*resourceType*The abstract type of the resource to locate. The type is expressed as a filename extension, such as `jpg`.*subDirName*The name of the subdirectory of the bundle's resources directory to search. Pass `NULL` to search the standard `CFBundle` resource locations.*localizationName*The name of the localization. This value should correspond to the name of one of the bundle's language-specific resource directories without the `.lproj` extension. (This parameter is treated literally: If you pass `"de"`, the function will not match resources in a German `.lproj` directory in the bundle.)**Return Value**The location of a localized resource in *bundle*, or `NULL` if the resource could not be found. Ownership follows the Create Rule.**Discussion**

Note that file names are case-sensitive, even on file systems (such as HFS+) that are not case sensitive with regards to file names.

You should typically have little reason to use this function (see [Getting the Current Language and Locale](#))—`CFBundle`'s interfaces automatically apply the user's preferences to determine which localized resource files to return in response to a programmatic request. See also [CFBundleCopyBundleLocalizations](#) (page 107) for how to determine what localizations are available

Availability

Available in Mac OS X v10.0 and later.

Declared In`CFBundle.h`**CFBundleCopyResourceURLInDirectory**Returns the location of a resource contained in the specified bundle directory without requiring the creation of a `CFBundle` object.

```
CFURLRef CFBundleCopyResourceURLInDirectory (
    CFURLRef bundleURL,
    CFStringRef resourceName,
    CFStringRef resourceType,
    CFStringRef subDirName
);
```

Parameters*bundleURL*

The bundle to examine.

resourceName

The name of the requested resource.

*resourceType*The abstract type of the requested resource. The type is expressed as a filename extension, such as `jpg`. Pass `NULL` if you don't need to search by type.*subDirName*The name of the subdirectory of the bundle's resources directory to search. Pass `NULL` to search the standard `CFBundle` resource locations.**Return Value**A `CFURL` object describing the location of the requested resource, or `NULL` if the resource cannot be found. Ownership follows the Create Rule.**Discussion**

This function provides a means to obtain package information for a bundle without first creating a bundle. However, since `CFBundle` objects cache search results, it is faster to create a `CFBundle` object if you need to repeatedly access resources.

Note that searches are case-sensitive, even on file systems (such as HFS+) that are not case sensitive with regards to file names.

Availability

Available in Mac OS X v10.0 and later.

Declared In`CFBundle.h`**CFBundleCopyResourceURLsOfType**

Assembles an array of URLs specifying all of the resources of the specified type found in a bundle.

```
CFArrayRef CFBundleCopyResourceURLsOfType (
    CFBundleRef bundle,
    CFStringRef resourceType,
    CFStringRef subDirName
);
```

Parameters*bundle*

The bundle to examine.

*resourceType*The abstract type of the resources to locate. The type is expressed as a filename extension, such as `jpg`.

subDirName

The name of the subdirectory of the bundle's resources directory to search. Pass `NULL` to search the standard `CFBundle` resource locations.

Return Value

A `CFArray` object containing `CFURL` objects of the requested resources. Ownership follows the Create Rule.

Discussion

Note that searches are case-sensitive, even on file systems (such as HFS+) that are not case sensitive with regards to file names.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Carbon Porting Tutorial

Declared In

`CFBundle.h`

CFBundleCopyResourceURLsOfTypeForLocalization

Returns an array containing copies of the URL locations for a specified bundle, resource, and localization name.

```
CFArrayRef CFBundleCopyResourceURLsOfTypeForLocalization (
    CFBundleRef bundle,
    CFStringRef resourceType,
    CFStringRef subDirName,
    CFStringRef localizationName
);
```

Parameters*bundle*

The bundle to examine.

resourceType

The abstract type of the resources to locate. The type is expressed as a filename extension, such as `jpg`.

subDirName

The name of the subdirectory of the bundle's Resources directory to search. Pass `NULL` to search the standard `CFBundle` resource locations.

localizationName

The name of the localization. This value should correspond to the name of one of the bundle's language-specific resource directories without the `.lproj` extension. (This parameter is treated literally: if you pass `"de"`, the function will not match resources in a German `.lproj` directory in the bundle.)

Return Value

A `CFArray` object containing copies of the requested locations. Ownership follows the Create Rule.

Discussion

Note that file names are case-sensitive, even on file systems (such as HFS+) that are not case sensitive with regards to file names.

You should typically have little reason to use this function (see [Getting the Current Language and Locale](#))—CFBundle’s interfaces automatically apply the user’s preferences to determine which localized resource files to return in response to a programmatic request. See also [CFBundleCopyBundleLocalizations](#) (page 107) for how to determine what localizations are available

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopyResourceURLsOfTypeInDirectory

Returns an array of CFURL objects describing the locations of all resources in a bundle of the specified type without needing to create a CFBundle object.

```
CFArrayRef CFBundleCopyResourceURLsOfTypeInDirectory (
    CFURLRef bundleURL,
    CFStringRef resourceType,
    CFStringRef subDirName
);
```

Parameters

bundleURL

The location of a bundle to examine.

resourceType

The abstract type of the resources to locate. The type is expressed as a filename extension, such as jpg.

subDirName

The name of the subdirectory of the bundle’s resources directory to search. Pass `NULL` to search the standard CFBundle resource locations.

Return Value

A CFArray object containing the CFURL objects of the requested resources. Ownership follows the Create Rule.

Discussion

This function provides a means to obtain an array containing the locations of all of the requested resources without first creating a CFBundle object. However, since CFBundle objects cache search results, it is faster to create a CFBundle object if you need to repeatedly access resources.

Note that file names are case-sensitive, even on file systems (such as HFS+) that are not case sensitive with regards to file names.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopySharedFrameworksURL

Returns the location of a bundle’s shared frameworks directory.

```
CFURLRef CFBundleCopySharedFrameworksURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return ValueA CFURL object containing the location of *bundle's* shared frameworks directory, or NULL if it could not be found. Ownership follows the Create Rule.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCopySharedSupportURL

Returns the location of a bundle's shared support files directory.

```
CFURLRef CFBundleCopySharedSupportURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return ValueA CFURL object containing the location of *bundle's* shared support files directory, or NULL if it could not be found. Ownership follows the Create Rule.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicInputMethod

Declared In

CFBundle.h

CFBundleCopySupportFilesDirectoryURL

Returns the location of the bundle's support files directory.

```
CFURLRef CFBundleCopySupportFilesDirectoryURL (
    CFBundleRef bundle
);
```

Parameters*bundle*

The CFBundle object whose support files directory you want to locate.

Return Value

A CFURL object describing the location of the bundle's support files directory, or NULL if it could not be found. Ownership follows the Create Rule.

Discussion

In general, you should never need to use this function. Use [CFBundleCopyResourceURL](#) (page 115) and similar functions instead.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleCreate

Creates a CFBundle object.

```
CFBundleRef CFBundleCreate (
    CFAllocatorRef allocator,
    CFURLRef bundleURL
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or [kCFAllocatorDefault](#) (page 35) to use the current default allocator.

bundleURL

The location of the bundle for which to create a CFBundle object.

Return Value

A CFBundle object created from the bundle at *bundleURL*. Ownership follows the Create Rule.

Returns NULL if there was a memory allocation problem. May return an existing CFBundle object with the reference count incremented. May return NULL if the bundle doesn't exist at *bundleURL* (see Discussion).

Discussion

Once a bundle has been created, it is cached; the bundle cache is flushed only periodically. `CFBundleCreate` does not check that a cached bundle still exists in the filesystem. If a bundle is deleted from the filesystem, it is therefore possible for `CFBundleCreate` to return a cached bundle that has actually been deleted.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MemoryBasedBundle

MoreIsBetter

QISA

SpellingChecker CarbonCocoa Bundled

SpellingChecker-CarbonCocoa

Declared In

CFBundle.h

CFBundleCreateBundlesFromDirectory

Searches a directory and constructs an array of CFBundle objects from all valid bundles in the specified directory.

```
CFArrayRef CFBundleCreateBundlesFromDirectory (
    CFAllocatorRef allocator,
    CFURLRef directoryURL,
    CFStringRef bundleType
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` (page 35) to use the current default allocator.

directoryURL

The location of the directory to search for valid bundles.

bundleType

The abstract type of the bundles to locate and create. The type is expressed as a filename extension, such as `bundle`. Pass `NULL` to create CFBundle objects for bundles of any type.

Return Value

A CFArray object containing CFBundle objects created from the contents of the specified directory. Returns an empty array if no bundles exist at *directoryURL*, and `NULL` if there was a memory allocation problem. Ownership follows the Create Rule.

Discussion

The array returned by this function will not contain stale CFBundle references.

Special Considerations

The Create Rule applies both to the array returned and to the bundles in the array. In order to properly dispose of the returned value, you must release the array *and* any bundles returned in the array.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetAllBundles

Returns an array containing all of the bundles currently open in the application.

```
CFArrayRef CFBundleGetAllBundles (
    void
);
```

Return Value

A CFArray object containing CFBundle objects for each open bundle in the application. Ownership follows the Get Rule.

Discussion

This function is potentially expensive, so use with care.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetBundleWithIdentifier

Locate a bundle given its program-defined identifier.

```
CFBundleRef CFBundleGetBundleWithIdentifier (
    CFStringRef bundleID
);
```

Parameters

bundleID

The identifier of the bundle to locate. Note that identifier names are case-sensitive.

Return Value

A CFBundle object, or NULL if the bundle was not found. Ownership follows the Get Rule.

Discussion

For a bundle to be located using its identifier, the bundle object must have already been created. The principal intended purpose for locating bundles by identifier is so that code (in frameworks, plugins, etc.) can find its own bundle. If a bundle is created, then the bundle deleted from the filesystem and this function invoked afterwards, it will still return the original bundle.

Bundle identifiers are created by entering a value for the key `CFBundleIdentifier` in the bundle's `Info.plist` file.

To guarantee uniqueness, bundle identifiers take the form of Java style package names, such as `com.MyCompany.MyApp.bundleName`.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonMDEF

FilterDemo

QTPixelBufferVCToCGImage

SampleCMPlugIn

SampleDS

Declared In

CFBundle.h

CFBundleGetDataPointerForName

Returns a data pointer to a symbol of the given name.

```
void * CFBundleGetDataPointerForName (
    CFBundleRef bundle,
    CFStringRef symbolName
);
```

Parameters*bundle*

The bundle to examine.

symbolName

The name of the symbol you are searching for.

Return Value

A data pointer to a symbol named *symbolName* in *bundle*, or NULL if *symbolName* cannot be found. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetDataPointersForNames

Returns a C array of data pointer to symbols of the given names.

```
void CFBundleGetDataPointersForNames (
    CFBundleRef bundle,
    CFArrayRef symbolNames,
    void *stbl[]
);
```

Parameters*bundle*

The bundle to examine.

symbolNames

A CFArray object containing CFString objects representing the symbol names to search for.

stbl

A C array into which this function stores the data pointers for the symbols specified in *symbolNames*. The array contains NULL for any names in *symbolNames* that cannot be found.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetDevelopmentRegion

Returns the bundle's development region from the bundle's information property list.

```
CFStringRef CFBundleGetDevelopmentRegion (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return Value

A CFString object containing the name of the bundle's development region. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetFunctionPointerForName

Returns a pointer to a function in a bundle's executable code using the function name as the search key.

```
void * CFBundleGetFunctionPointerForName (
    CFBundleRef bundle,
    CFStringRef functionName
);
```

Parameters*bundle*

The bundle to examine.

functionName

The name of the function to locate.

Return ValueA pointer to a function in a *bundle's* executable code, or NULL if *functionName* cannot be found. Ownership follows the Get Rule.**Discussion**

Calling this function will cause the bundle's code to be loaded if necessary.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

PDEProject

QISA

SpellingChecker CarbonCocoa Bundled

SpellingChecker-CarbonCocoa

VideoProcessing

Declared In

CFBundle.h

CFBundleGetFunctionPointersForNames

Constructs a function table containing pointers to all of the functions found in a bundle's main executable code.

```
void CFBundleGetFunctionPointersForNames (
    CFBundleRef bundle,
    CFArrayRef functionNames,
    void *ftbl[]
);
```

Parameters

bundle

The bundle to examine.

functionNames

A CFArray object containing a list of the function names to locate.

ftbl

A C array into which this function stores the function pointers for the symbols specified in *functionNames*. The array contains NULL for any names in *functionNames* that cannot be found.

Discussion

Calling this function causes the bundle's code to be loaded if necessary.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetIdentifier

Returns the bundle identifier from a bundle's information property list.

```
CFStringRef CFBundleGetIdentifier (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

A CFString object containing the bundle's identifier, or NULL if none was specified in the information property list. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPrefTopScores

Declared In

CFBundle.h

CFBundleGetInfoDictionary

Returns a bundle's information dictionary.

```
CFDictionaryRef CFBundleGetInfoDictionary (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

A `CFDictionary` object containing the data stored in the bundle's information property list (the `Info.plist` file). This is a global information dictionary. `CFBundle` may add extra keys to this dictionary for its own use. Ownership follows the Get Rule.

Discussion

You should typically use [CFBundleGetValueForInfoDictionaryKey](#) (page 130) rather than retrieving values directly from the info dictionary because the function will return localized values if any are available. Use `CFBundleGetInfoDictionary` only if you know that the key you are interested in will not be localized.

To retrieve an info dictionary without creating a `CFBundle` object, see [CFBundleCopyInfoDictionaryInDirectory](#) (page 110) and [CFBundleCopyInfoDictionaryForURL](#) (page 110).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

`BSDLLCTest`

Declared In

`CFBundle.h`

CFBundleGetLocalInfoDictionary

Returns a bundle's localized information dictionary.

```
CFDictionaryRef CFBundleGetLocalInfoDictionary (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

A dictionary containing the key-value pairs in *bundle*'s localized information dictionary (from the `InfoPlist.strings` file for the current locale). Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

`VertexPerformanceTest`

Declared In

CFBundle.h

CFBundleGetMainBundle

Returns an application's main bundle.

```
CFBundleRef CFBundleGetMainBundle (
    void
);
```

Return Value

A CFBundle object representing the application's main bundle, or `NULL` if it is not possible to create a bundle. Ownership follows the Get Rule.

Discussion

CFBundle creates a main bundle whenever it possibly can, even for unbundled apps. There are a few situations in which it is not possible, so you should check the return value against `NULL`, but this happens only in exceptional circumstances.

For an explanation of the main bundle, see *Locating and Opening Bundles* in *Bundle Programming Guide*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

Carbon Porting Tutorial

HID Utilities Source

MoreIsBetter

QISA

Declared In

CFBundle.h

CFBundleGetPackageInfo

Returns a bundle's package type and creator.

```
void CFBundleGetPackageInfo (
    CFBundleRef bundle,
    UInt32 *packageType,
    UInt32 *packageCreator
);
```

Parameters

bundle

The bundle to examine.

packageType

On return, the four-letter Mac OS-style type code for the bundle. This is `APPL` for applications, `FMWK` for frameworks, and `BNDL` for generic bundles. Or a more specific type code for generic bundles.

packageCreator

On return, the four-letter Mac OS-style “creator” code for the bundle.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetPackageInfoInDirectory

Returns a bundle’s package type and creator without having to create a CFBundle object.

```
Boolean CFBundleGetPackageInfoInDirectory (
    CFURLRef url,
    UInt32 *packageType,
    UInt32 *packageCreator
);
```

Parameters

url

The location of a bundle.

packageType

On return, the four-letter Mac OS-style type code for the bundle. This is `APPL` for applications, `FMWK` for frameworks, and `BNDL` for generic bundles. Or a more specific type code for generic bundles.

packageCreator

On return, the four-letter Mac OS-style “creator” code for the bundle.

Return Value

`true` if the package type and creator were found, otherwise `false`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetPlugIn

Returns a bundle’s plug-in.

```
CFPlugInRef CFBundleGetPlugIn (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle to examine.

Return Value

The plug-in for *bundle*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetTypeID

Returns the type identifier for the CFBundle opaque type.

```
CTypeID CFBundleGetTypeID (
    void
);
```

Return Value

The type identifier for the CFBundle opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleGetValueForInfoDictionaryKey

Returns a value (localized if possible) from a bundle's information dictionary.

```
CTypeRef CFBundleGetValueForInfoDictionaryKey (
    CFBundleRef bundle,
    CFStringRef key
);
```

Parameters

bundle

The bundle to examine.

key

The key for the value to return.

Return Value

A value corresponding to *key* in *bundle*'s information dictionary. If available, a localized value is returned, otherwise the global value is returned. Ownership follows the Get Rule.

Discussion

You should use this function rather than retrieving values directly from the info dictionary (`Info.plist`) because `CFBundleGetValueForInfoDictionaryKey` returns localized values if any are available (from the `InfoPlist.strings` file for the current locale).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPreferences

GrabBag

PDEProject

SampleCMPlugIn

Declared In

CFBundle.h

CFBundleGetVersionNumber

Returns a bundle's version number.

```
UInt32 CFBundleGetVersionNumber (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine. The bundle's version number can be number or a string of the standard form "2.5.3d5".

Return Value

A Mac OS `vers` resource style version number. If the bundle's version number is a number, it is interpreted as the unsigned long integer format defined by the `vers` resource on Mac OS 9. If it is a string, it is automatically converted to the numeric representation, where the major version number is restricted to 2 BCD digits (in other words, it must be in the range 0-99) and the minor and bug fix version numbers are each restricted to a single BCD digit (0-9). See Technical Note TN1132 for more details.

Discussion

This function is only supported for the Mac OS `vers` resource style version numbers. Where other version number styles—namely X, or X.Y, or X.Y.Z—are used, you can use [CFBundleGetValueForInfoDictionaryKey](#) (page 130) with the key `kCFBundleVersionKey` to extract the version number as a string from the bundle's information dictionary.

Some version numbers of the form X, X.Y, and X.Y.Z may work with this function, if $X \leq 99$, $Y \leq 9$, and $Z \leq 9$. Thus a version number 76.5.4 will work, but 76.12 will not work.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

iTunesController

Declared In

CFBundle.h

CFBundleIsExecutableLoaded

Obtains information about the load status for a bundle's main executable.

```
Boolean CFBundleIsExecutableLoaded (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle to examine.

Return Value

`true` if *bundle*'s main executable has been loaded, otherwise `false`.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

VideoProcessing

Declared In

CFBundle.h

CFBundleLoadExecutable

Loads a bundle's main executable code into memory and dynamically links it into the running application.

```
Boolean CFBundleLoadExecutable (
    CFBundleRef bundle
);
```

Parameters

bundle

The bundle whose main executable you want to load.

Return Value

`true` if the executable was successfully loaded, otherwise `false`.

Discussion

You should typically try to avoid using this function, but instead use [CFBundleGetFunctionPointerForName](#) (page 125) and related functions since these make memory management of the bundle easier.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CallMachOFramework

CFM_MachO_CFM

MoreIsBetter

SpellingChecker CarbonCocoa Bundled

SpellingChecker-CarbonCocoa

Declared In

CFBundle.h

CFBundleLoadExecutableAndReturnError

Returns a Boolean value that indicates whether a given bundle is loaded, attempting to load it if necessary.

```
Boolean CFBundleLoadExecutableAndReturnError (
    CFBundleRef bundle,
    CFErrorRef *error
);
```

Parameters*bundle*

The bundle to examine.

error

Upon return, if an error occurs contains a CFError that describes the problem. Ownership follows the Create Rule.

Return ValueIf *bundle* is already loaded, returns `true`. If *bundle* is not already loaded, attempts to load *bundle*; if that attempt succeeds returns `true`, otherwise returns `false`.**Availability**

Available in Mac OS X v10.5 and later.

Declared In

CFBundle.h

CFBundleOpenBundleResourceFiles

Opens the non-localized and localized resource files (if any) for a bundle in separate resource maps.

```
SInt32 CFBundleOpenBundleResourceFiles (
    CFBundleRef bundle,
    CFBundleRefNum *refNum,
    CFBundleRefNum *localizedRefNum
);
```

Parameters*bundle*

The bundle whose resource map you want to open.

refNum

On return, the reference number of the non-localized resource map.

localizedRefNum

On return, the reference number of the localized resource map.

Return ValueAn error code. The function returns 0 (`noErr`) if successful. If the bundle contains more than one resource file, the function returns an error code only if none was opened. The most common error is `resFNotFound`, but the function may also pass through other errors returned from the Resource Manager.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFBundleOpenBundleResourceMap

Opens the non-localized and localized resource files (if any) for a bundle in a single resource map.

```

CFBundleRefNum CFBundleOpenBundleResourceMap (
    CFBundleRef bundle
);

```

Parameters

bundle

The bundle whose resource map you want to open.

Return Value

A distinct reference number for the resource map.

Discussion

Creates and makes current a single read-only resource map containing the non-localized and localized resource files. If this function is called multiple times, it opens the files multiple times and returns distinct reference numbers for each. Use [CFBundleCloseBundleResourceMap](#) (page 106) to close a resource map.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

SampleDS

Declared In

CFBundle.h

CFBundlePreflightExecutable

Returns a Boolean value that indicates whether a given bundle is loaded or appears to be loadable.

```

Boolean CFBundlePreflightExecutable (
    CFBundleRef bundle,
    CFErrorRef *error
);

```

Parameters

bundle

The bundle to examine.

error

Upon return, if an error occurs contains a CFError that describes the problem. Ownership follows the Create Rule.

Return Value

true if *bundle* is loaded or upon inspection appears to be loadable, otherwise false.

Discussion

If this function returns true, this does not mean that the bundle is definitively loadable, since it may fail to load due to link errors or other problems not readily detectable.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFBundle.h

CFBundleUnloadExecutable

Unloads the main executable for the specified bundle.

```
void CFBundleUnloadExecutable (
    CFBundleRef bundle
);
```

Parameters*bundle*

The bundle whose main executable you want to unload.

Discussion

You should typically try to avoid using this function, but instead use [CFBundleGetFunctionPointerForName](#) (page 125) and related functions since these make management of the bundle easier (when the last reference to the CFBundle object is released, and it is finally deallocated, then the code will be unloaded if it is still loaded, and if the executable is of a type that supports unloading).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFM_MachO_CFM

HID Utilities Source

Declared In

CFBundle.h

CFCopyLocalizedString

Searches the default strings file `Localizable.strings` for the string associated with the specified key.

```
CFStringRef CFCopyLocalizedString (
    CFStringRef key,
    const char *comment
);
```

Parameters*key*

The development language version of the string. This string is used as the search key to locate the localized version of the string.

comment

A comment to provide the translators with contextual information necessary for proper translation.

Return Value

The localized version of the requested string. Returns *key* if no value corresponding to *key* is found. Ownership follows the Create Rule.

Discussion

This is a macro variant of [CFBundleCopyLocalizedString](#) (page 112) for use with the `genstrings` tool.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonQuartzDrawingWPrinting

PDEProject

QISA

Quartz2DBasics

TypeServicesForUnicode

Declared In

CFBundle.h

CFCopyLocalizedStringFromTable

Searches the specified strings file for the string associated with the specified key.

```
CFStringRef CFCopyLocalizedStringFromTable (
    CFStringRef key,
    CFStringRef tableName,
    const char *comment
);
```

Parameters

key

The development language version of the string. This string is used as the search key to locate the localized version of the string.

tableName

The name of the strings file to search. The name should not include the `strings` filename extension. The case of the string must match that of the file name, even on file systems (such as HFS+) that are not case sensitive with regards to file names

comment

A comment to provide the translators with contextual information necessary for proper translation.

Return Value

The localized version of the requested string, or *key* if no value corresponding to *key* is found. Ownership follows the Create Rule.

Discussion

This is a macro variant of [CFBundleCopyLocalizedString](#) (page 112) for use with the `genstrings` tool.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBundle.h

CFCopyLocalizedStringFromTableInBundle

Returns a localized version of the specified string.


```
CFStringRef CFCopyLocalizedStringFromTableInBundle (
    CFStringRef key,
    CFStringRef tableName,
    CFBundleRef bundle,
    const char *comment
);
```

Parameters*key*

The development language version of the string. This string is used as the search key to locate the localized version of the string.

tableName

The name of the strings file to search. The name should not include the `strings` filename extension. The case of the string must match that of the file name, even on file systems (such as HFS+) that are not case sensitive with regards to file names

bundle

The bundle to examine.

comment

A comment to provide the translators with contextual information necessary for proper translation.

Return Value

The localized version of the requested string, or *key* if no value corresponding to *key* is found. Ownership follows the Create Rule.

Discussion

This is a macro variant of [CFBundleCopyLocalizedString](#) (page 112) for use with the `genstrings` tool.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Carbon Porting Tutorial

PDEProject

Declared In

CFBundle.h

CFCopyLocalizedStringWithDefaultValue

Returns a localized version of a localization string.

```
CFStringRef CFCopyLocalizedStringWithDefaultValue (
    CFStringRef key,
    CFStringRef tableName,
    CFBundleRef bundle,
    CFStringRef value,
    const char *comment
);
```

Parameters*key*

The development language version of the string. This string is used as the search key to locate the localized version of the string.

tableName

The name of the strings file to search. The name should not include the `strings` filename extension.

bundle

The bundle to examine.

value

The default value for the requested localization string.

comment

A comment to provide the translators with contextual information necessary for proper translation.

Return Value

The localized version of the requested string, or *key* if no value corresponding to *key* is found. Ownership follows the Create Rule.

Discussion

This is a macro variant of `CFBundleCopyLocalizedString` (page 112) for use with the `genstrings` tool.

Availability

Available in Mac OS X v10.2 and later.

Declared In

`CFBundle.h`

Data Types

CFBundleRef

A reference to a `CFBundle` object.

```
typedef struct __CFBundle *CFBundleRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBundle.h`

CFBundleRefNum

Type that identifies a distinct reference number for a resource map.

```
#if __LP64__
typedef int CFBundleRefNum;
#else /* __LP64__ */
typedef SInt16 CFBundleRefNum;
#endif /* __LP64__ */
```

Availability

Available in Mac OS X v10.5 and later.

Declared In

`CFBundle.h`

Constants

Information Property List Keys

Standard keys found in a bundle's information property list file.

```
const CFStringRef kCFBundleInfoDictionaryVersionKey;
const CFStringRef kCFBundleExecutableKey;
const CFStringRef kCFBundleIdentifierKey;
const CFStringRef kCFBundleVersionKey;
const CFStringRef kCFBundleDevelopmentRegionKey;
const CFStringRef kCFBundleNameKey;
const CFStringRef kCFBundleLocalizationsKey;
```

Constants

`kCFBundleInfoDictionaryVersionKey`

The version of the information property list format.

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleExecutableKey`

The name of the executable in this bundle (if any).

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleIdentifierKey`

The bundle identifier.

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleVersionKey`

The version number of the bundle.

For Mac OS 9 style version numbers (for example “2.5.3d5”), clients can use [CFBundleGetVersionNumber](#) (page 131) instead of accessing this key directly since that function will properly convert the version string into its compact integer representation.

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleDevelopmentRegionKey`

The name of the development language of the bundle.

When `CFBundle` looks for resources, the fallback is to look in the `lproj` whose name is given by the `kCFBundleDevelopmentRegionKey` in the `Info.plist` file. You must, therefore, ensure that a bundle contains an `lproj` with that exact name containing a copy of every localized resource, otherwise `CFBundle` cannot guarantee the fallback mechanism will work.

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleNameKey`

The human-readable name of the bundle.

This key is often found in the `Info.plist.strings` since it is usually localized.

Available in Mac OS X v10.0 and later.

Declared in `CFBundle.h`.

`kCFBundleLocalizationsKey`

Allows an unbundled application that handles localization itself to specify which localizations it has available.

Available in Mac OS X v10.2 and later.

Declared in `CFBundle.h`.

Declared In

`CFBundle.h`

Architecture Types

Constants that identify executable architecture types.

```
enum {
    kCFBundleExecutableArchitectureI386      = 0x00000007,
    kCFBundleExecutableArchitecturePPC      = 0x00000012,
    kCFBundleExecutableArchitectureX86_64  = 0x01000007,
    kCFBundleExecutableArchitecturePPC64   = 0x01000012
};
```

Constants

`kCFBundleExecutableArchitectureI386`

Specifies the 32-bit Intel architecture.

Available in Mac OS X v10.5 and later.

Declared in `CFBundle.h`.

`kCFBundleExecutableArchitecturePPC`

Specifies the 32-bit PowerPC architecture.

Available in Mac OS X v10.5 and later.

Declared in `CFBundle.h`.

`kCFBundleExecutableArchitectureX86_64`

Specifies the 64-bit Intel architecture.

Available in Mac OS X v10.5 and later.

Declared in `CFBundle.h`.

`kCFBundleExecutableArchitecturePPC64`

Specifies the 64-bit PowerPC architecture.

Available in Mac OS X v10.5 and later.

Declared in `CFBundle.h`.

Declared In

`CFBundle.h`

CFCalendar Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFCalendar.h
Companion guides	Locales Programming Guide Dates and Times Programming Guide for Core Foundation Internationalization Programming Topics

Overview

The CFCalendar opaque type represents a calendar system. The associated API provides information about a calendar and supports calendrical computations such as determining the range of a given calendrical unit and adding units to a given absolute time.

CFAbsoluteTime is the operational lingua franca of CFCalendar—to do calendar arithmetic, you start and end with an absolute time; to convert between a decomposed date in one calendar and another calendar, you first convert to an absolute time. CFAbsoluteTime provides the absolute scale and epoch for dates and times, which can then be rendered into a particular calendar, for calendrical computations or user display.

In a calendar, day, week, weekday, month, and year numbers are generally 1-based, but there may be calendar-specific exceptions. Ordinal numbers, where they occur, are 1-based. Some calendars represented by this API may have to map their basic unit concepts into year/month/week/day/... nomenclature. For example, a calendar composed of 4 quarters in a year instead of 12 months uses the “month” unit to represent quarters. The particular values of the unit are defined by each calendar, and are not necessarily “consistent with” or have a “correspondence with,” values for that unit in another calendar.

Several CFCalendar functions ([CFCalendarComposeAbsoluteTime](#) (page 145), [CFCalendarDecomposeAbsoluteTime](#) (page 148), [CFCalendarAddComponents](#) (page 144), and [CFCalendarGetComponentDifference](#) (page 149)) take a description string that describes the calendrical components provided in a varargs parameter area. You can provide as many components as you need (or choose to), in whatever order you choose. When there is incomplete information to compute an absolute time, default values similar to 0 and 1 are usually chosen by a calendar, but this is a calendar-specific choice. If you provide inconsistent information, calendar-specific disambiguation is performed (which may involve ignoring one or more of the parameters). The characters of the description string specify the units and order of the parameters which follow. The characters are adopted from the corresponding format characters used by CFDateFormatter when possible, as shown in Table 9-1.

Table 9-1 Calendrical components parameter descriptors

Symbol	Meaning	Value Type
y	year	int
M	month	int
d	day	int
H	hour	int
m	minute	int
s	second	int

Information related to formatting dates and times and name-related calendar information is managed by `CDateFormatter`.

`CFCalendar` is subject to some limitations. There is no leap second handling—the existence of leap seconds is ignored as in the other Core Foundation API. In general, historical accuracy of calendars is not guaranteed. There is currently no API for defining your own calendars.

`CFCalendar` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSCalendar`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSCalendar *` parameter, you can pass in a `CFCalendarRef`, and in a function where you see a `CFCalendarRef` parameter, you can pass in an `NSCalendar` instance. See [Interchangeable Data Types](#) for more information on toll-free bridging.

The `CFCalendar` opaque type is available in Mac OS X v10.4 and later.

Functions by Task

Creating a Calendar

[CFCalendarCopyCurrent](#) (page 146)

Returns a copy of the logical calendar for the current user.

[CFCalendarCreateWithIdentifier](#) (page 147)

Returns a calendar object for the calendar identified by a calendar identifier.

Calendrical Calculations

[CFCalendarAddComponents](#) (page 144)

Computes the absolute time when specified components are added to a given absolute time.

[CFCalendarComposeAbsoluteTime](#) (page 145)

Computes the absolute time from components in a description string.

[CFCalendarDecomposeAbsoluteTime](#) (page 148)

Computes the components which are indicated by the componentDesc description string for the given absolute time.

[CFCalendarGetComponentDifference](#) (page 149)

Computes the difference between the two absolute times, in terms of specified calendrical components.

Getting Ranges of Units

[CFCalendarGetRangeOfUnit](#) (page 153)

Returns the range of values that one unit can take on within a larger unit during which a specific absolute time occurs.

[CFCalendarGetOrdinalityOfUnit](#) (page 152)

Returns the ordinal number of a calendrical unit within a larger unit at a specified absolute time.

[CFCalendarGetTimeRangeOfUnit](#) (page 153)

Returns by reference the start time and duration of a given calendar unit that contains a given absolute time.

[CFCalendarGetMaximumRangeOfUnit](#) (page 150)

Returns the maximum range limits of the values that a specified unit can take on in a given calendar.

[CFCalendarGetMinimumRangeOfUnit](#) (page 151)

Returns the minimum range limits of the values that a specified unit can take on in a given calendar.

Getting and Setting the Time Zone

[CFCalendarCopyTimeZone](#) (page 147)

Returns a time zone object for a specified calendar.

[CFCalendarSetTimeZone](#) (page 155)

Sets the time zone for a calendar.

Getting the Identifier

[CFCalendarGetIdentifier](#) (page 150)

Returns the given calendar's identifier.

Getting and Setting the Locale

[CFCalendarCopyLocale](#) (page 146)

Returns a locale object for a specified calendar.

[CFCalendarSetLocale](#) (page 155)

Sets the locale for a calendar.

Getting and Setting Day Information

[CFCalendarGetFirstWeekday](#) (page 150)

Returns the index of first weekday for a specified calendar.

[CFCalendarSetFirstWeekday](#) (page 154)

Sets the first weekday for a calendar.

[CFCalendarGetMinimumDaysInFirstWeek](#) (page 151)

Returns the minimum number of days in the first week of a specified calendar.

[CFCalendarSetMinimumDaysInFirstWeek](#) (page 155)

Sets the minimum number of days in the first week of a specified calendar.

Getting the Type ID

[CFCalendarGetTypeID](#) (page 154)

Returns the type identifier for the CFCalendar opaque type.

Functions

CFCalendarAddComponents

Computes the absolute time when specified components are added to a given absolute time.

```
Boolean CFCalendarAddComponents (
    CFCalendarRef calendar,
    CFAbsoluteTime *at,
    CFOptionFlags options,
    const unsigned char *componentDesc,
    ...
);
```

Parameters

calendar

The calendar to use for the computation.

at

A reference to an absolute time. On input, points to the absolute time to which components are to be added; on output, points to the result of the computation.

options

Options for the calculation. For valid values, see “Constants” (page 156).

componentDesc

A string that describes the components provided in the vararg parameters.

...

Vararg parameters giving amounts of each calendrical component in the order specified by *componentDesc*. The amounts to add may be negative, zero, positive, or any combination thereof.

Return Value

TRUE—and in *at* the computed time—if *at* falls inside the defined range of the calendar and it is possible to calculate the absolute time when the components (the calendrical components specified by *componentDesc* and given in the varargs) are added to the input absolute time *at*; otherwise FALSE.

Discussion

Some operations can be ambiguous, and the behavior of the computation is calendar-specific, but generally components are added in the order specified.

If you specify a “wrap” option (`kCFCalendarComponentsWrap` (page 158)), the specified components should be incremented and wrap around to zero/one on overflow, but should not cause higher units to be incremented. When “Wrap” is false, overflow in a unit carries into the higher units, as in typical addition.

Note that some computations can take a relatively long time to perform.

The following example shows how to add 2 months and 3 days to absolute time *at*’s current value using an existing calendar (`gregorian`):

```
CFCalendarAddComponents(gregorian, &at, 0, "Md", 2, 3);
```

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFCalendar.h`

CFCalendarComposeAbsoluteTime

Computes the absolute time from components in a description string.

```
Boolean CFCalendarComposeAbsoluteTime (
    CFCalendarRef calendar,
    CFAbsoluteTime *at,
    const unsigned char *componentDesc,
    ...
);
```

Parameters

calendar

The calendar to use for the computation.

at

Upon return, contains the computed absolute time.

componentDesc

A string that describes the components provided in the vararg parameters.

...

Vararg parameters giving amounts of each calendrical component in the order specified by *componentDesc*. The amounts to add may be negative, zero, positive, or any combination thereof.

Return Value

TRUE—and in *at* the absolute time computed from the given components—if the *componentDesc* description string can be converted into an absolute time, otherwise FALSE. Also returns FALSE for out-of-range values.

Discussion

When there are insufficient components provided to completely specify an absolute time, a calendar uses default values of its choice. When there is inconsistent information, a calendar may ignore some of the parameters or the function may return `FALSE`. Unnecessary components are ignored (for example, `Day` takes precedence over `Weekday + Weekday ordinal`). Note that some computations can take a relatively long time to perform.

The following example shows how to use this function to initialize an absolute time, `at`, to 6 January 1965 14:10:00, for a given calendar `gregorian`.

```
CFCalendarComposeAbsoluteTime(gregorian, &at, "yMdHms", 1965, 1, 6, 14, 10, 00);
```

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFCalendar.h`

CFCalendarCopyCurrent

Returns a copy of the logical calendar for the current user.

```
CFCalendarRef CFCalendarCopyCurrent (
    void
);
```

Return Value

The logical calendar for the current user that is formed from the settings for the current user's chosen system locale overlaid with any custom settings the user has specified in System Preferences. This function may return a retained cached object, not a new object. Ownership follows the Create Rule.

Discussion

Settings you get from this calendar do not change if user defaults change so that your operations are consistent.

Typically you perform some operations on the returned object and then release it. The returned object may be cached, so you do not need to hold on to it indefinitely.

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFCalendar.h`

CFCalendarCopyLocale

Returns a locale object for a specified calendar.

```
CFLocaleRef CFCalendarCopyLocale (
    CFCalendarRef calendar
);
```

Parameters

calendar

The calendar to examine.

Return Value

A copy of the locale object for the specified calendar. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarCopyTimeZone

Returns a time zone object for a specified calendar.

```
CFTimeZoneRef CFCalendarCopyTimeZone (
    CFCalendarRef calendar
);
```

Parameters

calendar

The calendar to examine.

Return Value

A copy of the time zone object for the specified calendar. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarCreateWithIdentifier

Returns a calendar object for the calendar identified by a calendar identifier.

```
CFCalendarRef CFCalendarCreateWithIdentifier (
    CFAllocatorRef allocator,
    CFStringRef identifier
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

ident

A calendar identifier. Calendar identifier constants are given in [CFLocaleRef](#) (page 248).

Return Value

A calendar object for the calendar identified by *ident*. If the identifier is unknown (if, for example, it is either an unrecognized string, or the calendar is not supported by the current version of the operating system), returns NULL. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarDecomposeAbsoluteTime

Computes the components which are indicated by the *componentDesc* description string for the given absolute time.

```
Boolean CFCalendarDecomposeAbsoluteTime (
    CFCalendarRef calendar,
    CFAbsoluteTime at,
    const unsigned char *componentDesc,
    ...
);
```

Parameters

calendar

The calendar to use for the computation.

at

An absolute time.

componentDesc

A string that describes the components provided in the vararg parameters.

...

Vararg pointers to storage for each of the desired components. On successful return, the pointers are filled with values of the corresponding components. The type of all units is *int*.

Return Value

TRUE if the function is able to compute the components indicated by the *componentDesc* description string for the given absolute time, and fills the values to the components given in the varargs. Returns FALSE if the absolute time falls outside the defined range of the calendar, or the computation cannot be performed.

Discussion

The Weekday ordinality, when requested, refers to the next larger (than Week) of the requested units. Some computations can take a relatively long time to perform.

The following example shows how to use this function to determine the current year, month, and day, using an existing calendar (*gregorian*):

```
CFCalendarDecomposeAbsoluteTime(gregorian, CFAbsoluteTimeGetCurrent(), "yMd",
    &year, &month, &day);
```

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetComponentDifference

Computes the difference between the two absolute times, in terms of specified calendrical components.

```
Boolean CFCalendarGetComponentDifference (
    CFCalendarRef calendar,
    CFAbsoluteTime startingAT,
    CFAbsoluteTime resultAT,
    CFOptionFlags options,
    const unsigned char *componentDesc,
    ...
);
```

Parameters

calendar

The calendar to use for the computation.

startingAT

The starting absolute time.

resultAT

The result absolute time.

options

Options for the calculation. For valid values, see “Constants” (page 156).

componentDesc

A string that describes the components provided in the vararg parameters.

...

Vararg pointers to storage for each of the desired components. On successful return, the pointers are filled with values of the corresponding components. The type of all units is `int`.

Return Value

TRUE—and in the varargs the differences—if it is possible to calculate the difference (`result - starting`) between *resultAT* and *startingAT* in terms of the calendrical components specified by *componentDesc*. Returns FALSE if either absolute time falls outside the defined range of the calendar, or the computation cannot be performed.

Discussion

The result is lossy if there isn't a small enough unit requested to hold the full precision of the difference. Some operations can be ambiguous, and the behavior of the computation is calendar-specific, but generally larger components will be computed before smaller components; for example, in the Gregorian calendar a result might be 1 month and 5 days, instead of, for example, 0 months and 35 days. The resulting component values may be negative if later is before earlier.

This computation is roughly the inverse of the [CFCalendarAddComponents](#) (page 144) operation, but calendrical arithmetic is invertible only in simple cases. This computation tends to be several times more expensive than the Add operation.

The following example shows how to get the approximate number of days between two absolute times (*at1*, *at2*) using an existing calendar (`gregorian`):

```
CFCalendarGetComponentDifference(gregorian, at1, at2, 0, "d", &days);
```

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetFirstWeekday

Returns the index of first weekday for a specified calendar.

```
CFIndex CFCalendarGetFirstWeekday (
    CFCalendarRef calendar
);
```

Parameters*calendar*

The calendar to examine.

Return Value

The index of the first weekday of the specified calendar.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetIdentifier

Returns the given calendar's identifier.

```
CFStringRef CFCalendarGetIdentifier (
    CFCalendarRef calendar
);
```

Parameters*calendar*

The calendar to examine.

Return Value

A string representation of *calendar's* identifier. Calendar identifier constants can be found in [CFLocaleRef](#) (page 248). Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetMaximumRangeOfUnit

Returns the maximum range limits of the values that a specified unit can take on in a given calendar.

```
CFRange CFCalendarGetMaximumRangeOfUnit (
    CFCalendarRef calendar,
    CFCalendarUnit unit
);
```

Parameters*calendar*

The calendar to examine.

*unit*A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).**Return Value**The maximum range limits of the values that the specified unit can take on in *calendar*. For example, in the Gregorian calendar the maximum ranges for the Day unit is 1-31.**Availability**

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetMinimumDaysInFirstWeek

Returns the minimum number of days in the first week of a specified calendar.

```
CFIndex CFCalendarGetMinimumDaysInFirstWeek (
    CFCalendarRef calendar
);
```

Parameters*calendar*

The calendar to examine.

Return ValueThe minimum number of days in the first week of *calendar*.**Availability**

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetMinimumRangeOfUnit

Returns the minimum range limits of the values that a specified unit can take on in a given calendar.

```
CFRange CFCalendarGetMinimumRangeOfUnit (
    CFCalendarRef calendar,
    CFCalendarUnit unit
);
```

Parameters*calendar*

The calendar to examine.

unit

A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).

Return Value

The minimum range limits of the values that the specified unit can take on in *calendar*. For example, in the Gregorian calendar the minimum ranges for the Day unit is 1-28.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetOrdinalityOfUnit

Returns the ordinal number of a calendrical unit within a larger unit at a specified absolute time.

```
CFIndex CFCalendarGetOrdinalityOfUnit (
    CFCalendarRef calendar,
    CFCalendarUnit smallerUnit,
    CFCalendarUnit biggerUnit,
    CFAbsoluteTime at
);
```

Parameters

calendar

The calendar to examine.

smallerUnit

A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).

biggerUnit

A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).

at

An absolute time.

Return Value

The ordinal number of the calendar unit specified by *smallerUnit* within the calendar unit specified by *biggerUnit* at the absolute time *at*. For example, the time 00:45 is in the first hour of the day, and for units Hour and Day respectively, the result would be 1.

If the *biggerUnit* parameter is not logically bigger than the *smallerUnit* parameter in the calendar, or the given combination of units does not make sense (or is a computation which is undefined), the result is `kCFNotFound`.

Discussion

The ordinality is in most cases not the same as the decomposed value of the unit. Typically return values are 1 and greater; an exception is the week-in-month calculation, which returns 0 for days before the first week in the month containing the date. Note that some computations can take a relatively long time to perform.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetRangeOfUnit

Returns the range of values that one unit can take on within a larger unit during which a specific absolute time occurs.

```
CFRange CFCalendarGetRangeOfUnit (
    CFCalendarRef calendar,
    CFCalendarUnit smallerUnit,
    CFCalendarUnit biggerUnit,
    CFAbsoluteTime at
);
```

Parameters

calendar

The calendar to examine.

smallerUnit

A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).

biggerUnit

A calendar unit. For valid values see [CFCalendarUnit](#) (page 156).

at

An absolute time.

Return Value

The range of values that the calendar unit specified by *smallerUnit* can take on within the calendar unit specified by *biggerUnit* that includes the absolute time *at*. For example, the range the Day unit can take on in the Month in which the absolute time lies.

If *biggerUnit* is not logically bigger than *smallerUnit* in the calendar, or the given combination of units does not make sense (or is a computation which is undefined), the result is {kCFNotFound, kCFNotFound}.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarGetTimeRangeOfUnit

Returns by reference the start time and duration of a given calendar unit that contains a given absolute time.

```
Boolean CFCalendarGetTimeRangeOfUnit (
    CFCalendarRef calendar,
    CFCalendarUnit unit,
    CFAbsoluteTime at,
    CFAbsoluteTime *startp,
    CFTimeInterval *tip
);
```

Parameters

calendar

The calendar to examine.

unit

A calendar unit (for valid values, see [CFCalendarUnit](#) (page 156)).

at

An absolute time.

*startp*Upon return, contains the beginning of the calendar unit specified by *unit* that contains the time *at*.*tip*Upon return, contains the duration of the calendar unit specified by *unit* that contains the time *at*.**Return Value**`true` if the values of *startp* and *tip* could be calculated, otherwise `false`.**Discussion**The function may fail if, for example, you try to get the range of a `kCFCalendarUnitWeekday` and specify a time (*at*) that is during a weekend.**Availability**

Available in Mac OS X v10.5 and later.

Declared In`CFCalendar.h`**CFCalendarGetTypeID**

Returns the type identifier for the CFCalendar opaque type.

```

CTypeID CFCalendarGetTypeID (
    void
);

```

Return Value

The type identifier for the CFCalendar opaque type.

Availability

Available in Mac OS X v10.4 and later.

Declared In`CFCalendar.h`**CFCalendarSetFirstWeekday**

Sets the first weekday for a calendar.

```

void CFCalendarSetFirstWeekday (
    CFCalendarRef calendar,
    CFIndex wkdy
);

```

Parameters*calendar*

The calendar to modify.

*wkdy*The index to set for the first weekday of *calendar*.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarSetLocale

Sets the locale for a calendar.

```
void CFCalendarSetLocale (
    CFCalendarRef calendar,
    CFLocaleRef locale
);
```

Parameters

calendar

The calendar to modify.

locale

The locale to set for *calendar*.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarSetMinimumDaysInFirstWeek

Sets the minimum number of days in the first week of a specified calendar.

```
void CFCalendarSetMinimumDaysInFirstWeek (
    CFCalendarRef calendar,
    CFIndex mwd
);
```

Parameters

calendar

The calendar to modify.

mwd

The number to set as the minimum number of days in the first week of *calendar*.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

CFCalendarSetTimeZone

Sets the time zone for a calendar.

```
void CFCalendarSetTimeZone (
    CFCalendarRef calendar,
    CFTimeZoneRef tz
);
```

Parameters

calendar

The calendar to modify.

locale

The time zone to set for *calendar*.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

Data Types

CFCalendarRef

A reference to a CFCalendar object.

```
typedef const struct __CFCalendar *CFCalendarRef;
```

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFCalendar.h

Constants

CFCalendarUnit

CFCalendarUnit constants are used to specify calendrical units, such as day or month, in various calendar calculations.

```
typedef enum {
    kCFCalendarUnitEra = (1 << 1),
    kCFCalendarUnitYear = (1 << 2),
    kCFCalendarUnitMonth = (1 << 3),
    kCFCalendarUnitDay = (1 << 4),
    kCFCalendarUnitHour = (1 << 5),
    kCFCalendarUnitMinute = (1 << 6),
    kCFCalendarUnitSecond = (1 << 7),
    kCFCalendarUnitWeek = (1 << 8),
    kCFCalendarUnitWeekday = (1 << 9),
    kCFCalendarUnitWeekdayOrdinal = (1 << 10),
} CFCalendarUnit;
```

Constants

`kCFCalendarUnitEra`

Specifies the era unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitYear`

Specifies the year unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitMonth`

Specifies the month unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitDay`

Specifies the day unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitHour`

Specifies the hour unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitMinute`

Specifies the minute unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitSecond`

Specifies the second unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitWeek`

Specifies the week unit.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitWeekday`

Specifies the weekday unit.

The weekday units are the numbers 1-N (where for the Gregorian calendar N=7 and 1 is Sunday).

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

`kCFCalendarUnitWeekdayOrdinal`

Specifies the ordinal weekday unit.

The weekday ordinal unit describes ordinal position within the month unit of the corresponding weekday unit. For example, in the Gregorian calendar a weekday ordinal unit of 2 for a weekday unit 3 indicates "the second Tuesday in the month".

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

Component Wrapping Options

The wrapping option specifies overflow behavior for calendar components in calendrical calculations—see [CFCalendarAddComponents](#) (page 144) and [CFCalendarGetComponentDifference](#) (page 149).

```
enum {
    kCFCalendarComponentsWrap = (1 << 0)
}
```

Constants

`kCFCalendarComponentsWrap`

Specifies that the components specified for calendar components should be incremented and wrap around to zero/one on overflow, but should not cause higher units to be incremented.

Available in Mac OS X v10.4 and later.

Declared in `CFCalendar.h`.

CFCharacterSet Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFCharacterSet.h
Companion guide	Strings Programming Guide for Core Foundation

Overview

A `CFCharacterSet` object represents a set of Unicode compliant characters. `CFString` uses `CFCharacterSet` objects to group characters together for searching operations, so that they can find any of a particular set of characters during a search. The two opaque types, `CFCharacterSet` and `CFMutableCharacterSet`, define the interface for static and dynamic character sets, respectively. The objects you create using these opaque types are referred to as character set objects (and when no confusion will result, merely as character sets).

`CFCharacterSet`'s principal function, [CFCharacterSetIsCharacterMember](#) (page 165), provides the basis for all other functions in its interface. You create a character set using one of the `CFCharacterSetCreate...` functions. You may also use any one of the predefined character sets using the [CFCharacterSetGetPredefined](#) (page 164) function.

`CFCharacterSet` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSCharacterSet`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSCharacterSet *` parameter, you can pass in a `CFCharacterSetRef`, and in a function where you see a `CFCharacterSetRef` parameter, you can pass in an `NSCharacterSet` instance. This capability also applies to concrete subclasses of `NSCharacterSet`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating Character Sets

[CFCharacterSetCreateCopy](#) (page 161)

Creates a new character set with the values from a given character set.

[CFCharacterSetCreateInvertedSet](#) (page 161)

Creates a new immutable character set that is the invert of the specified character set.

[CFCharacterSetCreateWithCharactersInRange](#) (page 163)

Creates a new character set with the values from the given range of Unicode characters.

[CFCharacterSetCreateWithCharactersInString](#) (page 163)

Creates a new character set with the values in the given string.

[CFCharacterSetCreateWithBitmapRepresentation](#) (page 162)

Creates a new immutable character set with the bitmap representation specified by given data.

Getting Predefined Character Sets

[CFCharacterSetGetPredefined](#) (page 164)

Returns a predefined character set.

Querying Character Sets

[CFCharacterSetCreateBitmapRepresentation](#) (page 160)

Creates a new immutable data with the bitmap representation from the given character set.

[CFCharacterSetHasMemberInPlane](#) (page 164)

Reports whether or not a character set contains at least one member character in the specified plane.

[CFCharacterSetIsCharacterMember](#) (page 165)

Reports whether or not a given Unicode character is in a character set.

[CFCharacterSetIsLongCharacterMember](#) (page 165)

Reports whether or not a given UTF-32 character is in a character set.

[CFCharacterSetIsSupersetOfSet](#) (page 166)

Reports whether or not a character set is a superset of another set.

Getting the Character Set Type Identifier

[CFCharacterSetGetTypeID](#) (page 164)

Returns the type identifier of the CFCharacterSet opaque type.

Functions

CFCharacterSetCreateBitmapRepresentation

Creates a new immutable data with the bitmap representation from the given character set.

```
CFDataRef CFCharacterSetCreateBitmapRepresentation (
    CFAllocatorRef alloc,
    CFCharacterSetRef theSet
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theSet

The set from which to create a bitmap representation. Refer to the comments for [CFCharacterSetCreateWithBitmapRepresentation](#) (page 162) for the detailed discussion of the bitmap representation format.

Return Value

A new CFData object containing a bitmap representation of *theSet*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateCopy

Creates a new character set with the values from a given character set.

```
CFCharacterSetRef CFCharacterSetCreateCopy (
    CFAllocatorRef alloc,
    CFCharacterSetRef theSet
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

theSet

The character set to copy.

Return Value

A new character set that is a copy of *theSet*. Ownership follows the Create Rule.

Discussion

This function tries to compact the backing store where applicable.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateInvertedSet

Creates a new immutable character set that is the invert of the specified character set.

```
CFCharacterSetRef CFCharacterSetCreateInvertedSet (
    CFAllocatorRef alloc,
    CFCharacterSetRef theSet
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theSet

The character set from which to create an inverted set.

Return Value

A new character set that is the invert of *theSet*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateWithBitmapRepresentation

Creates a new immutable character set with the bitmap representation specified by given data.

```
CFCharacterSetRef CFCharacterSetCreateWithBitmapRepresentation (
    CFAllocatorRef alloc,
    CFDataRef theData
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theData

A `CFData` object that specifies the bitmap representation of the Unicode character points for the new character set. The bitmap representation could contain all the Unicode character range starting from BMP to Plane 16. The first 8KiB (8192 bytes) of the data represent the BMP range. The BMP range 8KiB can be followed by zero to sixteen 8KiB bitmaps, each prepended with the plane index byte. For example, the bitmap representing the BMP and Plane 2 has the size of 16385 bytes (8KiB for BMP, 1 byte index, and a 8KiB bitmap for Plane 2). The plane index byte, in this case, contains the integer value two.

If the data contains a Plane index byte outside of the valid Plane range (1 to 16), the behavior is undefined.

Return Value

A new character set containing the indicated characters from *theData*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateWithCharactersInRange

Creates a new character set with the values from the given range of Unicode characters.

```
CFCharacterSetRef CFCharacterSetCreateWithCharactersInRange (
    CFAllocatorRef alloc,
    CFRange theRange
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theRange

The Unicode range of characters of the new character set. The function accepts the range in 32-bit in the UTF-32 format. The valid character point range is from `0x00000` to `0x10FFFF`.

Return Value

A new character set that contains a contiguous range of Unicode characters. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFCharacterSet.h`

CFCharacterSetCreateWithCharactersInString

Creates a new character set with the values in the given string.

```
CFCharacterSetRef CFCharacterSetCreateWithCharactersInString (
    CFAllocatorRef alloc,
    CFStringRef theString
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theString

A string containing the characters for the new set.

Return Value

A new character set containing the characters from *theString*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFCharacterSet.h`

CFCharacterSetGetPredefined

Returns a predefined character set.

```
CFCharacterSetRef CFCharacterSetGetPredefined (
    CFCharacterSetPredefinedSet theSetIdentifier
);
```

Parameters

theSetIdentifier

A predefined character set. See [“Predefined CFCharacterSet Selector Values”](#) (page 167) for the list of available character sets.

Return Value

A predefined character set. This instance is owned by Core Foundation.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetGetTypeID

Returns the type identifier of the CFCharacterSet opaque type.

```
CTypeID CFCharacterSetGetTypeID (
    void
);
```

Return Value

The type identifier of the CFCharacterSet opaque type.

Discussion

CFMutableCharacterSet objects have the same type identifier as CFCharacterSet objects.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetHasMemberInPlane

Reports whether or not a character set contains at least one member character in the specified plane.

```
Boolean CFCharacterSetHasMemberInPlane (
    CFCharacterSetRef theSet,
    CFIndex thePlane
);
```

Parameters*theSet*

The character set to examine.

thePlane

The plane number to be checked for the membership. The valid value range is from 0 to 16. If the value is outside of the valid plane number range, the behavior is undefined.

Return Value`true` if at least one member character is in the specified plane, otherwise `false`.**Availability**

Available in Mac OS X v10.2 and later.

Declared In

CFCharacterSet.h

CFCharacterSetIsCharacterMember

Reports whether or not a given Unicode character is in a character set.

```
Boolean CFCharacterSetIsCharacterMember (
    CFCharacterSetRef theSet,
    UniChar theChar
);
```

Parameters*theSet*

The character set to examine.

theChar

The Unicode character for which to test against the character set. Note that this function takes 16-bit Unicode character value; hence, it does not support access to the non-BMP planes.

Return Value`true` if *theSet* contains *theChar*, otherwise `false`.**Availability**

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetIsLongCharacterMember

Reports whether or not a given UTF-32 character is in a character set.

```
Boolean CFCharacterSetIsLongCharacterMember (
    CFCharacterSetRef theSet,
    UTF32Char theChar
);
```

Parameters*theSet*

The character set to examine.

theChar

The UTF-32 character for which to test against the character set.

Return Valuetrue if *theSet* contains *theChar*, otherwise false.**Availability**

Available in Mac OS X v10.2 and later.

Declared In

CFCharacterSet.h

CFCharacterSetIsSupersetOfSet

Reports whether or not a character set is a superset of another set.

```
Boolean CFCharacterSetIsSupersetOfSet (
    CFCharacterSetRef theSet,
    CFCharacterSetRef theOtherSet
);
```

Parameters*theSet*The character set to be checked for the membership of *theOtherSet*.*theOtherSet*The character set to be checked whether or not it is a subset of *theSet*.**Return Value**true if *theSet* is a superset of *theOtherSet*, otherwise false.**Availability**

Available in Mac OS X v10.2 and later.

Declared In

CFCharacterSet.h

Data Types

CFCharacterSetPredefinedSet

Defines a predefined character set.

```
typedef CFIndex CFCharacterSetPredefinedSet;
```

Discussion

See [“Predefined CFCharacterSet Selector Values”](#) (page 167) for values.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetRef

A reference to an immutable character set object.

```
typedef const struct __CFCharacterSet *CFCharacterSetRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

Constants

Predefined CFCharacterSet Selector Values

Identifiers for the available predefined CFCharacterSet objects.

```
enum {
    kCFCharacterSetControl = 1,
    kCFCharacterSetWhitespace,
    kCFCharacterSetWhitespaceAndNewline,
    kCFCharacterSetDecimalDigit,
    kCFCharacterSetLetter,
    kCFCharacterSetLowercaseLetter,
    kCFCharacterSetUppercaseLetter,
    kCFCharacterSetNonBase,
    kCFCharacterSetDecomposable,
    kCFCharacterSetAlphaNumeric,
    kCFCharacterSetPunctuation,
    kCFCharacterSetCapitalizedLetter = 13,
    kCFCharacterSetSymbol = 14,
    kCFCharacterSetNewline = 15,
    kCFCharacterSetIllegal = 12
};
```

Constants

`kCFCharacterSetControl`

Control character set (Unicode General Category Cc and Cf).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetWhitespace`

Whitespace character set (Unicode General Category Zs and U0009 CHARACTER TABULATION).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetWhitespaceAndNewline`

Whitespace and Newline character set (Unicode General Category Z*, U000A ~ U000D, and U0085).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetDecimalDigit`

Decimal digit character set.

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetLetter`

Letter character set (Unicode General Category L* & M*).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetLowercaseLetter`

Lowercase character set (Unicode General Category Ll).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetUppercaseLetter`

Uppercase character set (Unicode General Category Lu and Lt).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetNonBase`

Non-base character set (Unicode General Category M*).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetDecomposable`

Canonically decomposable character set.

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetAlphaNumeric`

Alpha Numeric character set (Unicode General Category L*, M*, & N*).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetPunctuation`

Punctuation character set (Unicode General Category P*).

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetCapitalizedLetter`

Titlecase character set (Unicode General Category Lt).

Available in Mac OS X v10.2 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetSymbol`

Symbol character set (Unicode General Category S*).

Available in Mac OS X v10.3 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetNewline`

Newline character set (U000A ~ U000D, U0085, U2028, and U2029).

Available in Mac OS X v10.5 and later.

Declared in `CFCharacterSet.h`.

`kCFCharacterSetIllegal`

Illegal character set.

Available in Mac OS X v10.0 and later.

Declared in `CFCharacterSet.h`.

Discussion

Use these constants with the `CFCharacterSetGetPredefined` (page 164) function to get one of the predefined character sets.

Declared In

`CFCharacterSet.h`

CFData Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFData.h
Companion guides	Binary Data Programming Guide for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFData and its derived mutable type, CFMutableData, provide support for data objects, object-oriented wrappers for byte buffers. Data objects let simple allocated buffers (that is, data with no embedded pointers) take on the behavior of Core Foundation objects. CFData creates static data objects, and CFMutableData creates dynamic data objects. Data objects are typically used for raw data storage.

You use the [CFDataCreate](#) (page 172) and [CFDataCreateCopy](#) (page 173) functions to create static data objects. These functions make a new copy of the supplied data. To create a data object that uses the supplied buffer instead of making a separate copy, use the [CFDataCreateWithBytesNoCopy](#) (page 174) function. You use the [CFDataGetBytes](#) (page 176) function to retrieve the bytes and the [CFDataGetLength](#) (page 176) function to get the length of the bytes.

CFData is “toll-free bridged” with its Cocoa Foundation counterpart, NSData. What this means is that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. In other words, in a method where you see an `NSData *` parameter, you can pass in a `CFDataRef`, and in a function where you see a `CFDataRef` parameter, you can pass in an `NSData` instance. This also applies to concrete subclasses of `NSData`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a CFData Object

[CFDataCreate](#) (page 172)

Creates an immutable CFData object using data copied from a specified byte buffer.

[CFDataCreateCopy](#) (page 173)

Creates an immutable copy of a CFData object.

[CFDataCreateWithBytesNoCopy](#) (page 174)

Creates an immutable CFData object from an external (client-owned) byte buffer.

Examining a CFData Object

[CFDataGetBytePtr](#) (page 175)

Returns a read-only pointer to the bytes of a CFData object.

[CFDataGetBytes](#) (page 176)

Copies the byte contents of a CFData object to an external buffer.

[CFDataGetLength](#) (page 176)

Returns the number of bytes contained by a CFData object.

Getting the CFData Type ID

Functions

CFDataGetTypeID

Returns the type identifier for the CFData opaque type.

```
CTypeID CFDataGetTypeID (  
    void  
);
```

Return Value

The type identifier for the CFData opaque type.

Discussion

CFMutableData objects have the same type identifier as CFData objects.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

MoreSCF

RecentItems

Declared In

CFData.h

CFDataCreate

Creates an immutable CFData object using data copied from a specified byte buffer.

```
CFDataRef CFDataCreate (
    CFAllocatorRef allocator,
    const UInt8 *bytes,
    CFIndex length
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

A pointer to the byte buffer that contains the raw data to be copied into *theData*.

length

The number of bytes in the buffer (*bytes*).

Return Value

A new `CFData` object, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

You must supply a count of the bytes in the buffer. This function always copies the bytes in the provided buffer into internal storage.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

BasicInputMethod

DTSCarbonShell

QTCarbonShell

TypeServicesForUnicode

Declared In

`CFData.h`

CFDataCreateCopy

Creates an immutable copy of a `CFData` object.

```
CFDataRef CFDataCreateCopy (
    CFAllocatorRef allocator,
    CFDataRef theData
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theData

The `CFData` object to copy.

Return Value

An immutable copy of *theData*, or *NULL* if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

The resulting object has the same byte contents as the original object, but it is always immutable. If the specified allocator and the allocator of the original object are the same, and the string is already immutable, this function may simply increment the retain count without making a true copy. To the caller, however, the resulting object is a true immutable copy, except the operation was more efficient.

Use this function when you need to pass a CFData object into another function by value (not reference).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

Declared In

CFData.h

CFDataCreateWithBytesNoCopy

Creates an immutable CFData object from an external (client-owned) byte buffer.

```
CFDataRef CFDataCreateWithBytesNoCopy (
    CFAllocatorRef allocator,
    const UInt8 *bytes,
    CFIndex length,
    CFAllocatorRef bytesDeallocator
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass *NULL* or *kCFAllocatorDefault* to use the current default allocator.

bytes

A pointer to the byte buffer to be used as the backing store of the CFData object.

length

The number of bytes in the buffer *bytes*.

bytesDeallocator

The allocator to use to deallocate the external buffer when the CFData object is deallocated. If the default allocator is suitable for this purpose, pass *NULL* or *kCFAllocatorDefault*. If you do not want the created CFData object to deallocate the buffer (that is, you assume responsibility for freeing it yourself), pass *kCFAllocatorNull*.

Return Value

A new CFData object, or *NULL* if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an immutable CFData object from a buffer of unstructured bytes. Unless the situation warrants otherwise, the created object does not copy the external buffer to internal storage but instead uses the buffer as its backing store. However, you should never count on the object using the external buffer since it could copy the buffer to internal storage or might even dump the buffer altogether and use alternative means for storing the bytes.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

MoreIsBetter

QISA

Declared In

CFData.h

CFDataGetBytePtr

Returns a read-only pointer to the bytes of a CFData object.

```
const UInt8 * CFDataGetBytePtr (
    CFDataRef theData
);
```

Parameters

theData

The CFData object to examine.

Return Value

A read-only pointer to the bytes associated with *theData*.

Discussion

This function is guaranteed to return a pointer to a CFData object's internal bytes. CFData, unlike CFString, does not hide its internal storage.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

CFHostSample

CFLocalServer

MoreSCF

TypeServicesForUnicode

Declared In

CFData.h

CFDataGetBytes

Copies the byte contents of a CFData object to an external buffer.

```
void CFDataGetBytes (
    CFDataRef theData,
    CFRange range,
    UInt8 *buffer
);
```

Parameters

theData

The CFData object to examine.

range

The range of bytes in *theData* to get. To get all of the contents, pass `CFRangeMake(0, CFDataGetLength(theData))`.

buffer

A pointer to the byte buffer of length `range.length` that is allocated on the stack or heap. On return, the buffer contains the requested range of bytes.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicInputMethod

DTSCarbonShell

MoreIsBetter

QISA

QTCarbonShell

Declared In

CFData.h

CFDataGetLength

Returns the number of bytes contained by a CFData object.

```
CFIndex CFDataGetLength (
    CFDataRef theData
);
```

Parameters

theData

The CFData object to examine.

Return Value

An index that specifies the number of bytes in *theData*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

MoreIsBetter

QISA

RecentItems

TypeServicesForUnicode

Declared In

CFData.h

Data Types

CFDataRef

A reference to an immutable CFData object.

```
typedef const struct __CFData *CFDataRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

CFDate Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFDate.h
Companion guides	Dates and Times Programming Guide for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFDate objects store dates and times that can be compared to other dates and times. CFDate objects are immutable—there is no mutable counterpart for this opaque type.

CFDate provides functions for creating dates, comparing dates, and computing intervals. You use the [CFDateCreate](#) (page 180) function to create CFDate objects. You use the [CFDateCompare](#) (page 179) function to compare two dates, and the [CFDateGetTimeIntervalSinceDate](#) (page 181) function to compute a time interval. Additional functions for managing dates and times are described in *Time Utilities Reference*

CFDate is “toll-free bridged” with its Core Foundation counterpart, NSDate. What this means is that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. In other words, in a method where you see an NSDate * parameter, you can pass in a CFDateRef, and in a function where you see a CFDateRef parameter, you can pass in an NSDate instance. This also applies to concrete subclasses of NSDate. See *Interchangeable Data Types* for more information on toll-free bridging.

Functions

CFDateCompare

Compares two CFDate objects and returns a comparison result.

```
CFComparisonResult CFDateCompare (
    CFDateRef theDate,
    CFDateRef otherDate,
    void *context
);
```

Parameters

theDate

The date to compare to *otherDate*.

otherDate

The date to compare to *theDate*.

context

Unused. Pass `NULL`.

Return Value

A `CFComparisonResult` (page 764) value that indicates whether *theDate* is equal to, less than, or greater than *otherDate*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFDate.h`

CFDateCreate

Creates a `CFDate` object given an absolute time.

```
CFDateRef CFDateCreate (
    CFAllocatorRef allocator,
    CFAbsoluteTime at
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

at

The absolute time to convert to a `CFDate` object.

Return Value

A date object that represents the absolute time *at*. Ownership follows the Create Rule.

Discussion

`CFDate` objects must always be created using absolute time. Time intervals are not supported.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

`CFPrefTopScores`

`NSOperationSample`

Declared In

`CFDate.h`

CFDateGetAbsoluteTime

Returns a `CFDate` object's absolute time.

```
CFAbsoluteTime CFDateGetAbsoluteTime (
    CFDateRef theDate
);
```

Parameters*theDate*

The date to examine.

Return ValueThe absolute time of *theDate*.**Discussion**

Absolute time is measured in seconds relative to the absolute reference date of Jan 1 2001 00:00:00 GMT. A positive value represents a date after the reference date, a negative value represents a date before it. For example, the absolute time -32940326 is equivalent to December 16th, 1999 at 17:54:34.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFDateGetTimeIntervalSinceDate

Returns the number of elapsed seconds between the given CFDate objects.

```
CFTimeInterval CFDateGetTimeIntervalSinceDate (
    CFDateRef theDate,
    CFDateRef otherDate
);
```

Parameters*theDate*The date to compare to *otherDate*.*otherDate*The date to compare to *theDate*.**Return Value**

The number of elapsed seconds between *theDate* and *otherDate*. The result is positive if *theDate* is later than *otherDate*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFDateGetTypeID

Returns the type identifier for the CFDate opaque type.

```
CFTypeID CFDateGetTypeID (
    void
);
```

Return Value

The type identifier for the CFDate opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFFTPSample

CFPrefTopScores

Declared In

CFDate.h

Data Types

CFDateRef

A reference to an immutable CFDate object.

```
typedef const struct __CFDate *CFDateRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFDateFormatter Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFDateFormatter.h
Companion guide	Data Formatting Guide for Core Foundation

Overview

CFDateFormatter objects format the textual representations of CFDate and CFAbsoluteTime objects, and convert textual representations of dates and times into CFDate and CFAbsoluteTime objects. You can express the representation of dates and times very flexibly, for example “Thu 22 Dec 1994” is just as acceptable as “12/22/94.” You specify how strings are formatted and parsed by setting a format string and other properties of a CFDateFormatter object. The format of the format string itself is defined by [Unicode Technical Standard #35](#).

The CFDateFormatter opaque type is available in Mac OS X v10.3 and later.

Functions by Task

Creating a Date Formatter

[CFDateFormatterCreate](#) (page 185)

Creates a new CFDateFormatter object, localized to the given locale, which will format dates to the given date and time styles.

Configuring a Date Formatter

[CFDateFormatterSetFormat](#) (page 190)

Sets the format string of the given date formatter to the specified value.

[CFDateFormatterSetProperty](#) (page 191)

Sets a date formatter property using a key-value pair.

Parsing Strings

[CFDateFormatterCreateDateFromString](#) (page 186)

Returns a date object representing a given string.

[CFDateFormatterGetAbsoluteTimeFromString](#) (page 188)

Returns an absolute time object representing a given string.

Creating Strings From Data

[CFDateFormatterCreateStringWithAbsoluteTime](#) (page 187)

Returns a string representation of the given absolute time using the specified date formatter.

[CFDateFormatterCreateStringWithDate](#) (page 187)

Returns a string representation of the given date using the specified date formatter.

Getting Information About a Date Formatter

[CFDateFormatterCopyProperty](#) (page 184)

Returns a copy of a date formatter's value for a given key.

[CFDateFormatterGetDateStyle](#) (page 189)

Returns the date style used to create the given date formatter object.

[CFDateFormatterGetFormat](#) (page 189)

Returns a format string for the given date formatter object.

[CFDateFormatterGetLocale](#) (page 189)

Returns the locale object used to create the given date formatter object.

[CFDateFormatterGetTimeStyle](#) (page 190)

Returns the time style used to create the given date formatter object.

Getting the CFDateFormatter Type ID

[CFDateFormatterGetTypeID](#) (page 190)

Returns the type identifier for CFDateFormatter.

Functions

CFDateFormatterCopyProperty

Returns a copy of a date formatter's value for a given key.


```

CTypeRef NSDateFormatterCopyProperty (
    NSDateFormatterRef formatter,
    CFStringRef key
);

```

Parameters*formatter*

The date formatter to examine.

key

The property key for the value to obtain. See [“Date Formatter Property Keys”](#) (page 194) for a description of possible values for this parameter.

Return Value

A CType object that is a copy of the property value for *key*, or NULL if there is no value specified for *key*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterCreate

Creates a new NSDateFormatter object, localized to the given locale, which will format dates to the given date and time styles.

```

NSDateFormatterRef NSDateFormatterCreate (
    CFAllocatorRef allocator,
    CFLocaleRef locale,
    NSDateFormatterStyle dateStyle,
    NSDateFormatterStyle timeStyle
);

```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

locale

The locale to use for localization. If NULL uses the default system local. Use [CFLocaleCopyCurrent](#) (page 240) to specify the locale of the current user.

dateStyle

The date style to use when formatting dates. See [“Date Formatter Styles”](#) (page 192) for possible values.

timeStyle

The time style to use when formatting times. See [“Date Formatter Styles”](#) (page 192) for possible values.

Return Value

A new date formatter, localized to the given locale, which will format dates to the given date and time styles. Returns NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

You can use `kNSDateFormatterNoStyle` to suppress output for the date or time. The following code fragment illustrates the creation and use of a date formatter that only outputs the date information (memory management is omitted for clarity).

```

CFLocaleRef locale = CFLocaleCreate(kCFAllocatorDefault, CFSTR("en_GB"));

NSDateFormatterRef formatter = NSDateFormatterCreate(
    kCFAllocatorDefault, locale, kNSDateFormatterMediumStyle,
    kNSDateFormatterNoStyle);

NSDateRef date = NSDateCreate(kCFAllocatorDefault, 123456);
CFStringRef dateAsString = NSDateFormatterCreateStringWithDate (
    kCFAllocatorDefault, formatter, date);

CFShow(dateAsString);
// outputs "2 Jan 2001"

```

Availability

Available in Mac OS X v10.3 and later.

Related Sample Code

CFFTPSample

CFPrefTopScores

Declared In

NSDateFormatter.h

NSDateFormatterCreateDateFromString

Returns a date object representing a given string.

```

NSDateRef NSDateFormatterCreateDateFromString (
    CFAllocatorRef allocator,
    NSDateFormatterRef formatter,
    CFStringRef string,
    CFRange *rangep
);

```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatter

The date formatter object to use to parse *string*.

string

The string that contains the date.

rangep

A reference to the range within the string specifying the substring to be parsed. If `NULL`, the whole string is parsed. Upon return, contains the range that defines the extent of the parse (may be less than the given range).

Return Value

A new date that represents *string*, or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterCreateStringWithAbsoluteTime

Returns a string representation of the given absolute time using the specified date formatter.

```
NSStringRef NSDateFormatterCreateStringWithAbsoluteTime (
    CFAllocatorRef allocator,
    NSDateFormatterRef formatter,
    CFAbsoluteTime at
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

formatter

The date formatter object that specifies the format of the returned string.

at

The absolute time for which to generate a string representation.

Return Value

A new string that represents *at* in the specified format. Returns NULL if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterCreateStringWithDate

Returns a string representation of the given date using the specified date formatter.

```
NSStringRef NSDateFormatterCreateStringWithDate (
    CFAllocatorRef allocator,
    NSDateFormatterRef formatter,
    NSDateRef date
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

formatter

The date formatter object that specifies the format of the returned string.

date

The date object for which to create a string representation.

Return Value

A new string that represents *date* in the specified format. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Related Sample Code

CFFTPSSample

CFPrefTopScores

Declared In

NSDateFormatter.h

NSDateFormatterGetAbsoluteTimeFromString

Returns an absolute time object representing a given string.

```
Boolean NSDateFormatterGetAbsoluteTimeFromString (
    NSDateFormatterRef formatter,
    CFStringRef string,
    CFRange *rangep,
    CFAbsoluteTime *atp
);
```

Parameters

formatter

The date formatter object to use to parse *string*.

string

The string that contains the time to be parsed.

rangep

Reference to the range within the string specifying the substring to be parsed. If `NULL`, the whole string is parsed. On return, the range that defines the extent of the parse (may be less than the given range).

atp

An absolute time value, returned by reference, that represents *string*. Ownership follows the Get Rule.

Return Value

`true` if the string was parsed successfully, otherwise `false`.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterGetDateStyle

Returns the date style used to create the given date formatter object.

```
NSDateFormatterStyle NSDateFormatterGetDateStyle (
    NSDateFormatterRef formatter
);
```

Parameters

formatter

The date formatter to examine.

Return Value

The date style used to create *formatter*.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterGetFormat

Returns a format string for the given date formatter object.

```
CFStringRef NSDateFormatterGetFormat (
    NSDateFormatterRef formatter
);
```

Parameters

formatter

The date formatter to examine.

Return Value

The format string for *formatter* as was specified by calling the [NSDateFormatterSetFormat](#) (page 190) function, or derived from the date formatter's date or time styles. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterGetLocale

Returns the locale object used to create the given date formatter object.

```
CFLocaleRef NSDateFormatterGetLocale (
    NSDateFormatterRef formatter
);
```

Parameters

formatter

The date formatter object to examine.

Return Value

The locale object used to create *formatter*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterGetTimeStyle

Returns the time style used to create the given date formatter object.

```
NSDateFormatterStyle NSDateFormatterGetTimeStyle (
    NSDateFormatterRef formatter
);
```

Parameters

formatter

The date formatter to examine.

Return Value

The time style used to create *formatter*.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterGetTypeID

Returns the type identifier for NSDateFormatter.

```
OSTypeID NSDateFormatterGetTypeID (
    void
);
```

Return Value

The type identifier for the NSDateFormatter opaque type.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterSetFormat

Sets the format string of the given date formatter to the specified value.

```
void NSDateFormatterSetFormat (
    NSDateFormatterRef formatter,
    CFStringRef formatString
);
```

Parameters*formatter*

The date formatter to modify.

*formatString*The format string for *formatter*. The syntax of this string is defined by [Unicode Technical Standard #35](#).**Discussion**

The format string may override other properties previously set using other functions. If this function is not called, the default value of the format string is derived from the date formatter's date and time styles.

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterSetProperty

Sets a date formatter property using a key-value pair.

```
void NSDateFormatterSetProperty (
    NSDateFormatterRef formatter,
    CFStringRef key,
    CTypeRef value
);
```

Parameters*formatter*

The date formatter to modify.

*key*The name of the property to set. See ["Date Formatter Property Keys"](#) (page 194) for a description of possible values for this parameter.*value*The value for *key*. This should be a CType object corresponding to the specified key.**Availability**

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

Data Types

NSDateFormatterRef

A reference to a NSDateFormatter object.

```
typedef struct __NSDateFormatter *NSDateFormatterRef;
```

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

NSDateFormatterStyle

Data type for predefined date and time format styles.

```
typedef CFIndex NSDateFormatterStyle;
```

Discussion

For possible values, see [“Date Formatter Styles”](#) (page 192).

Availability

Available in Mac OS X v10.3 and later.

Declared In

NSDateFormatter.h

Constants

Date Formatter Styles

Predefined date and time format styles.


```
enum {
    kNSDateFormatterNoStyle = 0,
    kNSDateFormatterShortStyle = 1,
    kNSDateFormatterMediumStyle = 2,
    kNSDateFormatterLongStyle = 3,
    kNSDateFormatterFullStyle = 4
};
```

Constants`kNSDateFormatterNoStyle`

Specifies no output.

You use this constant to suppress output for the date or time (see [NSDateFormatterCreate](#) (page 185) for more details).

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterShortStyle`

Specifies a short style, typically numeric only, such as "11/23/37" or "3:30pm".

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterMediumStyle`

Specifies a medium style, typically with abbreviated text, such as "Nov 23, 1937".

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterLongStyle`

Specifies a long style, typically with full text, such as "November 23, 1937" or "3:30:32pm".

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterFullStyle`

Specifies a full style with complete details, such as "Tuesday, April 12, 1952 AD" or "3:30:42pm PST".

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

Discussion

The format for these date and time styles is not exact because they depend on the locale, user preference settings, and the operating system version. Do not use these constants if you want an exact format, for example if you are parsing an external data file which contains date information in a fixed format. There are several different "lengths" of the formats:

- "long" era names, for example "Anno Domini" instead of "AD"
- "very short" names for months and weekdays; for example, "F" instead of "Friday"
- "standalone" names for months and weekdays (for some locales or languages, a month name displayed in isolation needs to be written differently than a month name within a displayed date)
- names of quarters; for example, "Q2" for a short quarter name

Declared In`NSDateFormatter.h`

Date Formatter Property Keys

Keys used in key-value pairs to discover and specify the value of date formatter properties—used in conjunction with [NSDateFormatterCopyProperty](#) (page 184) and [NSDateFormatterSetProperty](#) (page 191).

```
const CFStringRef kNSDateFormatterIsLenient;
const CFStringRef kNSDateFormatterTimeZone;
const CFStringRef kNSDateFormatterCalendarName;
const CFStringRef kNSDateFormatterDefaultFormat;

const CFStringRef kNSDateFormatterTwoDigitStartDate;
const CFStringRef kNSDateFormatterDefaultDate;
const CFStringRef kNSDateFormatterCalendar;
const CFStringRef kNSDateFormatterEraSymbols;
const CFStringRef kNSDateFormatterMonthSymbols;
const CFStringRef kNSDateFormatterShortMonthSymbols;
const CFStringRef kNSDateFormatterWeekdaySymbols;
const CFStringRef kNSDateFormatterShortWeekdaySymbols;
const CFStringRef kNSDateFormatterAMSymbol;
const CFStringRef kNSDateFormatterPMSymbol;

const CFStringRef kNSDateFormatterLongEraSymbols;
const CFStringRef kNSDateFormatterVeryShortMonthSymbols;
const CFStringRef kNSDateFormatterStandaloneMonthSymbols;
const CFStringRef kNSDateFormatterShortStandaloneMonthSymbols;
const CFStringRef kNSDateFormatterVeryShortStandaloneMonthSymbols;
const CFStringRef kNSDateFormatterVeryShortWeekdaySymbols;
const CFStringRef kNSDateFormatterStandaloneWeekdaySymbols;
const CFStringRef kNSDateFormatterShortStandaloneWeekdaySymbols;
const CFStringRef kNSDateFormatterVeryShortStandaloneWeekdaySymbols;
const CFStringRef kNSDateFormatterQuarterSymbols;
const CFStringRef kNSDateFormatterShortQuarterSymbols;
const CFStringRef kNSDateFormatterStandaloneQuarterSymbols;
const CFStringRef kNSDateFormatterShortStandaloneQuarterSymbols;
const CFStringRef kNSDateFormatterGregorianStartDate;
```

Constants

`kNSDateFormatterIsLenient`

Specifies the lenient property, a `CFBoolean` object where a true value indicates that the parsing of strings into date or absolute time values will be fuzzy.

The formatter will use heuristics to guess at the date which is intended by the string. As with any guessing, it may get the result date wrong (that is, a date other than that which was intended).

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterTimeZone`

Specifies the time zone property, a `CFTimeZone` object.

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterCalendarName`

Specifies the calendar name, a `CFString` object.

With Mac OS X version 10.3, `kCFGregorianCalendar` (page 197) is the only possible value. With Mac OS X version 10.4, `kCFGregorianCalendar` and other calendar names are specified by `CFLocale`.

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterDefaultFormat`

The original format string for the formatter (given the date & time style and locale specified at creation).

Available in Mac OS X v10.3 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterTwoDigitStartDate`

Specifies the property representing the date from which two-digit years start, a `NSDate` object.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterDefaultDate`

Specifies the default date property, a `NSDate` object.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterCalendar`

Specifies the calendar property, a `CFCalendar` object.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterEraSymbols`

Specifies the era symbols property, a `CFArray` of `CFString` objects.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterMonthSymbols`

Specifies the month symbols property, a `CFArray` of `CFString` objects.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterShortMonthSymbols`

Specifies the short month symbols property, a `CFArray` of `CFString` objects.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterWeekdaySymbols`

Specifies the weekday symbols property, a `CFArray` of `CFString` objects.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterShortWeekdaySymbols`

Specifies the short weekday symbols property, a `CFArray` of `CFString` objects.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterAMSymbol`

Specifies the AM symbol property, a CFString object.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterPMSymbol`

Specifies the PM symbol property, a CFString object.

Available in Mac OS X v10.4 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterLongEraSymbols`

Specifies the long era symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterVeryShortMonthSymbols`

Specifies the very short month symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterStandaloneMonthSymbols`

Specifies the standalone month symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterShortStandaloneMonthSymbols`

Specifies the short standalone month symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterVeryShortStandaloneMonthSymbols`

Specifies the very short standalone month symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterVeryShortWeekdaySymbols`

Specifies the very short weekday symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterStandaloneWeekdaySymbols`

Specifies the standalone weekday symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kNSDateFormatterShortStandaloneWeekdaySymbols`

Specifies the short standalone weekday symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `NSDateFormatter.h`.

`kCFDateFormatterVeryShortStandaloneWeekdaySymbols`

Specifies the very short standalone weekday symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

`kCFDateFormatterQuarterSymbols`

Specifies the quarter symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

`kCFDateFormatterShortQuarterSymbols`

Specifies the short quarter symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

`kCFDateFormatterStandaloneQuarterSymbols`

Specifies the standalone quarter symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

`kCFDateFormatterShortStandaloneQuarterSymbols`

Specifies the short standalone quarter symbols property, a CFArray of CFString objects.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

`kCFDateFormatterGregorianStartDate`

Specifies the Gregorian start date property, a CFDate object.

This is used to specify the start date for the Gregorian calendar switch from the Julian calendar. Different locales switched at different times. Normally you should just accept the locale's default date for the switch.

Available in Mac OS X v10.5 and later.

Declared in `CFDateFormatter.h`.

Discussion

The values for these keys are all CType objects. The specific types for each key are specified above.

Declared In

`CFDateFormatter.h`

Calendar Names

Calendar names used by `CFDateFormatter`.

```
const CFStringRef kCFGregorianCalendar;
```

Constants

`kCFGregorianCalendar`

The name of the calendar currently supported by the `kCFDateFormatterCalendarName` (page 195) property.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

Declared In

NSDateFormatter.h

CFDictionary Reference

Derived From:	<i>CFPropertyList Reference : CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFDictionary.h
Companion guides	Collections Programming Topics for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFDictionary and its derived mutable type, *CFMutableDictionary Reference*, manage associations of key-value pairs. CFDictionary creates static dictionaries where you set the key-value pairs when first creating a dictionary and cannot modify them afterward; CFMutableDictionary creates dynamic dictionaries where you can add or delete key-value pairs at any time, and the dictionary automatically allocates memory as needed.

A key-value pair within a dictionary is called an entry. Each entry consists of one object that represents the key and a second object that is that key's value. Within a dictionary, the keys are unique. That is, no two keys in a single dictionary are equal (as determined by the equal callback). Internally, a dictionary uses a hash table to organize its storage and to provide rapid access to a value given the corresponding key.

Keys for a CFDictionary may be of any C type, however note that if you want to convert a CFPropertyList to XML, any dictionary's keys must be CFString objects.

You create static dictionaries using either the [CFDictionaryCreate](#) (page 203) or [CFDictionaryCreateCopy](#) (page 204) function. Key-value pairs are passed as parameters to [CFDictionaryCreate](#) (page 203). When adding key-value pairs to a dictionary, the keys and values are not copied—they are retained so they are not invalidated before the dictionary is deallocated.

CFDictionary provides functions for querying the values of a dictionary. The function [CFDictionaryGetCount](#) (page 205) returns the number of key-value pairs in a dictionary; the [CFDictionaryContainsValue](#) (page 202) function checks if a value is in a dictionary; and [CFDictionaryGetKeysAndValues](#) (page 206) returns a C array containing all the values and a C array containing all the keys in a dictionary.

The [CFDictionaryApplyFunction](#) (page 201) function lets you apply a function to all key-value pairs in a dictionary.

CFDictionary is “toll-free bridged” with its Cocoa Foundation counterpart, *NSDictionary*. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an *NSDictionary ** parameter, you can pass in a *CFDictionaryRef*, and in a function where you see a *CFDictionaryRef* parameter, you can pass in an *NSDictionary* instance. This also applies to concrete subclasses of *NSDictionary*. See *Interchangeable Data Types* for more information on toll-free bridging.

Functions by Task

Creating a dictionary

[CFDictionaryCreate](#) (page 203)

Creates an immutable dictionary containing the specified key-value pairs.

[CFDictionaryCreateCopy](#) (page 204)

Creates and returns a new immutable dictionary with the key-value pairs of another dictionary.

Examining a dictionary

[CFDictionaryContainsKey](#) (page 201)

Returns a Boolean value that indicates whether a given key is in a dictionary.

[CFDictionaryContainsValue](#) (page 202)

Returns a Boolean value that indicates whether a given value is in a dictionary.

[CFDictionaryGetCount](#) (page 205)

Returns the number of key-value pairs in a dictionary.

[CFDictionaryGetCountOfKey](#) (page 205)

Returns the number of times a key occurs in a dictionary.

[CFDictionaryGetCountOfValue](#) (page 206)

Counts the number of times a given value occurs in the dictionary.

[CFDictionaryGetKeysAndValues](#) (page 206)

Fills two buffers with the keys and values from a dictionary.

[CFDictionaryGetValue](#) (page 208)

Returns the value associated with a given key.

[CFDictionaryGetValueIfPresent](#) (page 208)

Returns a Boolean value that indicates whether a given value for a given key is in a dictionary, and returns that value indirectly if it exists.

Applying a function to a dictionary

[CFDictionaryApplyFunction](#) (page 201)

Calls a function once for each key-value pair in a dictionary.

Getting the CFDictionary type ID

[CFDictionaryGetTypeID](#) (page 207)

Returns the type identifier for the CFDictionary opaque type.

Functions

CFDictionaryApplyFunction

Calls a function once for each key-value pair in a dictionary.

```
void CFDictionaryApplyFunction (
    CFDictionaryRef theDict,
    CFDictionaryApplierFunction applier,
    void *context
);
```

Parameters

theDict

The dictionary to operate upon.

applier

The callback function to call once for each key-value pair in *theDict*. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. If there are keys or values which the *applier* function does not expect or cannot properly apply to, the behavior is undefined.

context

A pointer-sized program-defined value, which is passed as the third parameter to the *applier* function, but is otherwise unused by this function. The value must be appropriate for the *applier* function.

Discussion

If this function iterates over a mutable collection, it is unsafe for the *applier* function to change the contents of the collection.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

ColorSyncDevices

IOPrintSuperClasses

MoreIsBetter

MoreSCF

QISA

Declared In

CFDictionary.h

CFDictionaryContainsKey

Returns a Boolean value that indicates whether a given key is in a dictionary.

```
Boolean CFDictionaryContainsKey (
    CFDictionaryRef theDict,
    const void *key
);
```

Parameters*theDict*

The dictionary to examine.

key

The key for which to find matches in *theDict*. The key hash and equal callbacks provided when the dictionary was created, are used to compare. If the hash callback is `NULL`, *key* is treated as a pointer and converted to an integer. If the equal callback is `NULL`, pointer equality (in C, `==`) is used. If *key*, or any of the keys in the dictionary, is not understood by the equal callback, the behavior is undefined.

Return Valuetrue if *key* is in the dictionary, otherwise false.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

MoreIsBetter

MoreSCF

QISA

SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryContainsValue

Returns a Boolean value that indicates whether a given value is in a dictionary.

```
Boolean CFDictionaryContainsValue (
    CFDictionaryRef theDict,
    const void *value
);
```

Parameters*theDict*

The dictionary to examine.

value

The value for which to find matches in *theDict*. The value equal callback provided when the dictionary was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in the dictionary, is not understood by the equal callback, the behavior is undefined.

Return Valuetrue if *value* is in the dictionary, otherwise false.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryCreate

Creates an immutable dictionary containing the specified key-value pairs.

```
CFDictionaryRef CFDictionaryCreate (
    CFAllocatorRef allocator,
    const void **keys,
    const void **values,
    CFIndex numValues,
    const CFDictionaryKeyCallBacks *keyCallBacks,
    const CFDictionaryValueCallBacks *valueCallBacks
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new dictionary. Pass `NULL` or `kCFAllocatorDefault` (page 35) to use the current default allocator.

keys

A C array of the pointer-sized keys to be in the new dictionary. This value may be `NULL` if the *numValues* parameter is 0. This C array is not changed or freed by this function. The value must be a valid pointer to a C array of at least *numValues* pointers.

values

A C array of the pointer-sized values to be in the new dictionary. This value may be `NULL` if the *numValues* parameter is 0. This C array is not changed or freed by this function. The value must be a valid pointer to a C array of at least *numValues* elements.

numValues

The number of key-value pairs to copy from the *keys* and *values* C arrays into the new dictionary. This number will be the count of the dictionary; it must be non-negative and less than or equal to the actual number of keys or values.

keyCallBacks

A pointer to a `CFDictionaryKeyCallBacks` (page 213) structure initialized with the callbacks to use to retain, release, describe, and compare keys in the dictionary. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a `CFDictionaryKeyCallBacks` (page 213) structure, the behavior is undefined. If any of the keys put into the collection is not one understood by one of the callback functions the behavior when that callback function is used is undefined.

If the collection will contain `CType` objects only, then pass a pointer to `kCTypeDictionaryKeyCallBacks` (page 216) as this parameter to use the default callback functions.

valueCallbacks

A pointer to a [CFDictionaryValueCallbacks](#) (page 214) structure initialized with the callbacks to use to retain, release, describe, and compare values in the dictionary. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a [CFDictionaryValueCallbacks](#) structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions the behavior when that callback function is used is undefined.

If the collection will contain `CType` objects only, then pass a pointer to [kCTypeDictionaryValueCallbacks](#) (page 216) as this parameter to use the default callback functions.

Return Value

A new dictionary, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

HITextViewDemo

MoreIsBetter

MoreSCF

QISA

Declared In

`CFDictionary.h`

CFDictionaryCreateCopy

Creates and returns a new immutable dictionary with the key-value pairs of another dictionary.

```
CFDictionaryRef CFDictionaryCreateCopy (
    CFAllocatorRef allocator,
    CFDictionaryRef theDict
);
```

Parameters

allocator

The allocator to use to allocate memory for the new dictionary. Pass `NULL` or [kCFAllocatorDefault](#) (page 35) to use the current default allocator.

theDict

The dictionary to copy. The keys and values from the dictionary are copied as pointers into the new dictionary. However, the keys and values are also retained by the new dictionary. The count of the new dictionary is the same as the count of *theDict*. The new dictionary uses the same callbacks as *theDict*.

Return Value

A new dictionary that contains the same key-value pairs as *theDict*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryGetCount

Returns the number of key-value pairs in a dictionary.

```
CFIndex CFDictionaryGetCount (
    CFDictionaryRef theDict
);
```

Parameters

theDict

The dictionary to examine.

Return Value

The number of number of key-value pairs in *theDict*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

MoreIsBetter

MoreSCF

QISA

SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryGetCountOfKey

Returns the number of times a key occurs in a dictionary.

```
CFIndex CFDictionaryGetCountOfKey (
    CFDictionaryRef theDict,
    const void *key
);
```

Parameters

theDict

The dictionary to examine.

key

The key for which to find matches in *theDict*. The key hash and equal callbacks provided when the dictionary was created are used to compare. If the hash callback was `NULL`, the key is treated as a pointer and converted to an integer. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *key*, or any of the keys in the dictionary, is not understood by the equal callback, the behavior is undefined.

Return Value

Returns 1 if a matching key is used by the dictionary, otherwise 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryGetCountOfValue

Counts the number of times a given value occurs in the dictionary.

```
CFIndex CFDictionaryGetCountOfValue (
    CFDictionaryRef theDict,
    const void *value
);
```

Parameters

theDict

The dictionary to examine.

value

The value for which to find matches in *theDict*. The value equal callback provided when the dictionary was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in the dictionary, is not understood by the equal callback, the behavior is undefined.

Return Value

The number of times the *value* occurs in *theDict*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryGetKeysAndValues

Fills two buffers with the keys and values from a dictionary.

```
void CFDictionaryGetKeysAndValues (
    CFDictionaryRef theDict,
    const void **keys,
    const void **values
);
```

Parameters

theDict

The dictionary to examine.

keys

A C array of pointer-sized values that, on return, is filled with keys from the *theDict*. The keys and values C arrays are parallel to each other (that is, the items at the same indices form a key-value pair from the dictionary). This value must be a valid pointer to a C array of the appropriate type and size (that is, a size equal to the count of *theDict*), or `NULL` if the keys are not required. If the keys are Core Foundation objects, ownership follows the Get Rule.

values

A C array of pointer-sized values that, on return, is filled with values from the *theDict*. The keys and values C arrays are parallel to each other (that is, the items at the same indices form a key-value pair from the dictionary). This value must be a valid pointer to a C array of the appropriate type and size (that is, a size equal to the count of *theDict*), or `NULL` if the values are not required. If the values are Core Foundation objects, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest
 MoreIsBetter
 MoreSCF
 QISA
 SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryGetTypeID

Returns the type identifier for the CFDictionary opaque type.

```
CFTypeID CFDictionaryGetTypeID (
    void
);
```

Return Value

The type identifier for the CFDictionary opaque type.

Discussion

CFMutableDictionary objects have the same type identifier as CFDictionary objects.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest
 HID Utilities Source
 MoreIsBetter
 MoreSCF
 QISA

Declared In

CFDictionary.h

CFDictionaryGetValue

Returns the value associated with a given key.

```
const void * CFDictionaryGetValue (
    CFDictionaryRef theDict,
    const void *key
);
```

Parameters

theDict

The dictionary to examine.

key

The key for which to find a match in *theDict*. The key hash and equal callbacks provided when the dictionary was created are used to compare. If the hash callback was `NULL`, the key is treated as a pointer and converted to an integer. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *key*, or any of the keys in *theDict*, is not understood by the equal callback, the behavior is undefined.

Return Value

The value associated with *key* in *theDict*, or `NULL` if no key-value pair matching *key* exists. Since `NULL` is also a valid value in some dictionaries, use [CFDictionaryGetValueIfPresent](#) (page 208) to distinguish between a value that is not found, and a `NULL` value. If the value is a Core Foundation object, ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

databurntest

MoreIsBetter

MoreSCF

QISA

Declared In

CFDictionary.h

CFDictionaryGetValueIfPresent

Returns a Boolean value that indicates whether a given value for a given key is in a dictionary, and returns that value indirectly if it exists.

```
Boolean CFDictionaryGetValueIfPresent (
    CFDictionaryRef theDict,
    const void *key,
    const void **value
);
```

Parameters

theDict

The dictionary to examine.

key

The key for which to find a match in *theDict*. The key hash and equal callbacks provided when the dictionary was created are used to compare. If the hash callback was `NULL`, *key* is treated as a pointer and converted to an integer. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *key*, or any of the keys in *theDict*, is not understood by the equal callback, the behavior is undefined.

value

A pointer to memory which, on return, is filled with the pointer-sized value if a matching key is found. If no key match is found, the contents of the storage pointed to by this parameter are undefined. This value may be `NULL`, in which case the value from the dictionary is not returned (but the return value of this function still indicates whether or not the key-value pair was present). If the value is a Core Foundation object, ownership follows the Get Rule.

Return Value

`true` if a matching key was found, otherwise `false`.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AlbumToSlideshow
HID Utilities Source
MoreIsBetter
MoreSCF
QISA

Declared In

CFDictionary.h

Callbacks

CFDictionaryApplierFunction

Prototype of a callback function that may be applied to every key-value pair in a dictionary.

```
typedef void (*CFDictionaryApplierFunction) (
    const void *key,
    const void *value,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *key,
    const void *value,
    void *context
);
```

Parameters*key*

The key associated with the current key-value pair.

value

The value associated with the current key-value pair.

context

The program-defined context parameter given to the apply function.

Discussion

This callback is passed to the [CFDictionaryApplyFunction](#) (page 201) function which iterates over the key-value pairs in a dictionary and applies the behavior defined in the applier function to each key-value pair in a dictionary.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryCopyDescriptionCallback

Prototype of a callback function used to get a description of a value or key in a dictionary.

```
typedef CFStringRef (*CFDictionaryCopyDescriptionCallback)(
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *value
);
```

Parameters*value*

The value to be described.

Return ValueA text description of *value*.**Discussion**

This callback is passed to [CFDictionaryCreate](#) (page 203) in a [CFDictionaryKeyCallbacks](#) (page 213) structure or [CFDictionaryValueCallbacks](#) (page 214). This callback is used by the [CFCopyDescription](#) (page 634) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryEqualCallback

Prototype of a callback function used to determine if two values or keys in a dictionary are equal.

```
typedef Boolean (*CFDictionaryEqualCallback) (
    const void *value1,
    const void *value2
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    const void *value1,
    const void *value2
);
```

Parameters

value1

A value in the dictionary.

value2

Another value in the dictionary.

Discussion

This callback is passed to [CFDictionaryCreate](#) (page 203) in a [CFDictionaryKeyCallbacks](#) (page 213) and [CFDictionaryValueCallbacks](#) (page 214) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryHashCallback

Prototype of a callback function invoked to compute a hash code for a key. Hash codes are used when key-value pairs are accessed, added, or removed from a collection.

```
typedef CFHashCode (*CFDictionaryHashCallback) (
    const void *value
);
```

If you name your function `MyDictionaryHashCallback`, you would declare it like this:

```
CFHashCode MyDictionaryHashCallback (
    const void *value
);
```

Parameters

value

The value used to compute the hash code.

Return Value

An integer that can be used as a table address in a hash table structure.

Discussion

This callback is passed to [CFDictionaryCreate](#) (page 203) in a [CFDictionaryKeyCallbacks](#) (page 213) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryReleaseCallback

Prototype of a callback function used to release a key-value pair before it's removed from a dictionary.

```
typedef void (*CFDictionaryReleaseCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```

Parameters

allocator

The dictionary's allocator.

value

The value being removed from the dictionary.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFDictionaryRetainCallback

Prototype of a callback function used to retain a value or key being added to a dictionary.

```
typedef const void *(*CFDictionaryRetainCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    CFAllocatorRef allocator,
    const void *value
```

```
);
```

Parameters*allocator*

The dictionary's allocator.

value

The value being added to the dictionary.

Return Value

The value or key to store in the dictionary, which is usually the *value* parameter passed to this callback, but may be a different value if a different value should be stored in the collection.

Discussion

This callback is passed to [CFDictionaryCreate](#) (page 203) in a [CFDictionaryKeyCallbacks](#) (page 213) and [CFDictionaryValueCallbacks](#) (page 214) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

Data Types

CFDictionaryKeyCallbacks

This structure contains the callbacks used to retain, release, describe, and compare the keys in a dictionary.

```
struct CFDictionaryKeyCallbacks {
    CFIndex version;
    CFDictionaryRetainCallback retain;
    CFDictionaryReleaseCallback release;
    CFDictionaryCopyDescriptionCallback copyDescription;
    CFDictionaryEqualCallback equal;
    CFDictionaryHashCallback hash;
};
typedef struct CFDictionaryKeyCallbacks CFDictionaryKeyCallbacks;
```

Fields*version*

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

retain

The callback used to retain each key as they are added to the collection. This callback returns the value to use as the key in the dictionary, which is usually the value parameter passed to this callback, but may be a different value if a different value should be used as the key. If NULL, keys are not retained. See [CFDictionaryRetainCallback](#) (page 212) for a descriptions of this function's parameters.

release

The callback used to release keys as they are removed from the dictionary. If `NULL`, keys are not released. See [CFDictionaryReleaseCallback](#) (page 212) for a description of this callback.

copyDescription

The callback used to create a descriptive string representation of each key in the dictionary. If `NULL`, the collection will create a simple description of each key. See [CFDictionaryCopyDescriptionCallback](#) (page 210) for a description of this callback.

equal

The callback used to compare keys in the dictionary for equality. If `NULL`, the collection will use pointer equality to compare keys in the collection. See [CFDictionaryEqualCallback](#) (page 211) for a description of this callback.

hash

The callback used to compute a hash code for keys as they are used to access, add, or remove values in the dictionary. If `NULL`, the collection computes a hash code by converting the pointer value to an integer. See [CFDictionaryHashCallback](#) (page 211) for a description of this callback.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFDictionary.h`

CFDictionaryRef

A reference to an immutable dictionary object.

```
typedef const struct __CFDictionary *CFDictionaryRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFDictionary.h`

CFDictionaryValueCallbacks

This structure contains the callbacks used to retain, release, describe, and compare the values in a dictionary.

```
struct CFDictionaryValueCallbacks {
    CFIndex version;
    CFDictionaryRetainCallback retain;
    CFDictionaryReleaseCallback release;
    CFDictionaryCopyDescriptionCallback copyDescription;
    CFDictionaryEqualCallback equal;
};
typedef struct CFDictionaryValueCallbacks CFDictionaryValueCallbacks;
```

Fields**version**

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

retain

The callback used to retain each value as they are added to the collection. This callback returns the value to use as the value in the dictionary, which is usually the value parameter passed to this callback, but may be a different value if a different value should be used as the value. If `NULL`, values are not retained. See [CFDictionaryRetainCallback](#) (page 212) for a descriptions of this function's parameters.

release

The callback used to release values as they are removed from the dictionary. If `NULL`, values are not released. See [CFDictionaryReleaseCallback](#) (page 212) for a description of this callback.

copyDescription

The callback used to create a descriptive string representation of each value in the dictionary. If `NULL`, the collection will create a simple description of each value. See [CFDictionaryCopyDescriptionCallback](#) (page 210) for a description of this callback.

equal

The callback used to compare values in the dictionary for equality. If `NULL`, the collection will use pointer equality to compare values in the collection. See [CFDictionaryEqualCallback](#) (page 211) for a description of this callback.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFDictionary.h`

Constants

Predefined Callback Structures

CFDictionary provides some predefined callbacks for your convenience.

```
const CFDictionaryKeyCallBacks kCFCopyStringDictionaryKeyCallBacks;
const CFDictionaryKeyCallBacks kCFTypeDictionaryKeyCallBacks;
const CFDictionaryValueCallBacks kCFTypeDictionaryValueCallBacks;
```

Constants

`kCFCopyStringDictionaryKeyCallBacks`

Predefined [CFDictionaryKeyCallBacks](#) (page 213) structure containing a set of callbacks appropriate for use when the keys of a `CFDictionary` are all `CFString` objects, which may be mutable and need to be copied in order to serve as constant keys for the values in the dictionary.

You typically use a pointer to this constant when creating a new dictionary.

Important: For performance reasons, the default `kCFCopyStringDictionaryKeyCallBacks` behavior uses [CFEqual](#) (page 635) which does not normalize the strings. This means that, for example, it does not consider `CFStrings` to be equal when they are the same but one is in pre-composed form (say, originating from a UTF-16 text file) and the other in decomposed form (say, originating from a file name). In cases where you use strings from different sources, you may want to pre-normalize the keys or else use a different set of functions to perform the comparison.

Available in Mac OS X v10.0 and later.

Declared in `CFDictionary.h`.

`kCFTypeDictionaryKeyCallBacks`

Predefined [CFDictionaryKeyCallBacks](#) (page 213) structure containing a set of callbacks appropriate for use when the keys of a `CFDictionary` are all `CType`-derived objects.

The retain callback is `CFRetain`, the release callback is `CFRelease`, the copy callback is `CFCopyDescription`, the equal callback is `CFEqual`. Therefore, if you use a pointer to this constant when creating the dictionary, keys are automatically retained when added to the collection, and released when removed from the collection.

Available in Mac OS X v10.0 and later.

Declared in `CFDictionary.h`.

`kCFTypeDictionaryValueCallBacks`

Predefined [CFDictionaryValueCallBacks](#) (page 214) structure containing a set of callbacks appropriate for use when the values in a `CFDictionary` are all `CType`-derived objects.

The retain callback is `CFRetain`, the release callback is `CFRelease`, the copy callback is `CFCopyDescription`, and the equal callback is `CFEqual`. Therefore, if you use a pointer to this constant when creating the dictionary, values are automatically retained when added to the collection, and released when removed from the collection.

Available in Mac OS X v10.0 and later.

Declared in `CFDictionary.h`.

CFError Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFError.h
Companion guide	Error Handling Programming Guide For Cocoa

Overview

A `CFError` object encapsulates rich and extensible error information than is possible using only an error code or error string. The core attributes of a `CFError` object are an error domain (represented by a string), a domain-specific error code and a user info dictionary containing application specific information. Errors are required to have a domain and an error code within that domain. The optional "userInfo" dictionary may provide additional information that might be useful for the interpretation and reporting of the error. This dictionary can even contain an "underlying" error, which is wrapped as an error bubbles up through various layers.

Several well-known domains are defined corresponding to Mach, POSIX, and `OSStatus` errors. In addition, `CFError` allows you to attach an arbitrary user info dictionary to an error object, and provides the means to return a human-readable description for the error.

In general, a method should signal an error condition by—for example—returning `false` or `NULL` rather than by the simple presence of an error object. The method can then optionally return a `CFError` object by reference, in order to further describe the error.

`CFError` is toll-free bridged to `NSError` in the Foundation framework—for more details on toll-free bridging, see *Interchangeable Data Types*. `NSError` has some additional guidelines which makes it easy to automatically report errors to users and even try to recover from them. See *Error Handling Programming Guide For Cocoa* for more information on `NSError` programming guidelines.

Functions by Task

Creating a CFError

[CFErrorCreate](#) (page 221)

Creates a new `CFError` object.

[CFErrorCreateWithUserInfoKeysAndValues](#) (page 221)

Creates a new `CFError` object using given keys and values to create the user info dictionary.

Getting Information About an Error

[CFErrorGetDomain](#) (page 223)

Returns the error domain for a given CFError.

[CFErrorGetCode](#) (page 222)

Returns the error code for a given CFError.

[CFErrorCopyUserInfo](#) (page 220)

Returns the user info dictionary for a given CFError.

[CFErrorCopyDescription](#) (page 218)

Returns a human-presentable description for a given error.

[CFErrorCopyFailureReason](#) (page 219)

Returns a human-presentable failure reason for a given error.

[CFErrorCopyRecoverySuggestion](#) (page 220)

Returns a human presentable recovery suggestion for a given error.

Getting the CFError Type ID

[CFErrorGetTypeID](#) (page 223)

Returns the type identifier for the CFError opaque type.

Functions

CFErrorCopyDescription

Returns a human-presentable description for a given error.

```
CFStringRef CFErrorCopyDescription (
    CFErrorRef err
);
```

Parameters

err

The CFError to examine. If this is not a valid CFError, the behavior is undefined.

Return Value

A localized, human-presentable description of *err*. This function never returns NULL. Ownership follows the Create Rule.

Discussion

This is a complete sentence or two which says what failed and why it failed. The structure of the description depends on the details provided in the user info dictionary. The rules for computing the return value are as follows:

1. If the value in the user info dictionary for [kCFErrorLocalizedDescriptionKey](#) (page 225) is not NULL, returns that value as-is.
2. If the value in the user info dictionary for [kCFErrorLocalizedFailureReasonKey](#) (page 225) is not NULL, generate an error from that.

The description is something like: "Operation could not be completed." + `kCFErrorLocalizedFailureReasonKey`

3. Generate as good a user-presentable string as possible from `kCFErrorDescriptionKey` (page 225), the domain, and code.

The description is something like like: "Operation could not be completed. Error domain/code occurred." or "Operation could not be completed." + `kCFErrorDescriptionKey` + " (Error domain/code)"

Toll-free bridged instances of `NSError` might provide additional behaviors for manufacturing a description string.

You should not depend on the exact contents or format of the returned string, as it might change in different releases of the operating system.

When you create a `CFError`, you should try to make sure the return value is human-presentable and localized by providing a value for `kCFErrorLocalizedDescriptionKey` (page 225) in the user info dictionary.

Availability

Available in Mac OS X v10.5 and later.

Declared In

`CFError.h`

CFErrorCopyFailureReason

Returns a human-presentable failure reason for a given error.

```
CFStringRef CFErrorCopyFailureReason (
    CFErrorRef err
);
```

Parameters

err

The `CFError` to examine. If this is not a valid `CFError`, the behavior is undefined.

Return Value

A localized, human-presentable failure reason for *err*, or `NULL` if no user-presentable string is available. Ownership follows the Create Rule.

Discussion

The failure reason is a complete sentence which describes why the operation failed. In many cases this will be just the "because" part of the description (but as a complete sentence, which makes localization easier). For example, an error description "Could not save file 'Letter' in folder 'Documents' because the volume 'MyDisk' doesn't have enough space." might have a corresponding failure reason, "The volume 'MyDisk' doesn't have enough space."

By default, this function looks for a value for the `kCFErrorLocalizedFailureReasonKey` (page 225) key in the user info dictionary. Toll-free bridged instances of `NSError` might provide additional behaviors for manufacturing this value.

When you create a `CFError`, you should try to make sure the return value is human-presentable and localized by providing a value for `kCFErrorLocalizedFailureReasonKey` (page 225) in the user info dictionary.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorCopyRecoverySuggestion

Returns a human presentable recovery suggestion for a given error.

```
CFStringRef CFErrorCopyRecoverySuggestion (
    CFErrorRef err
);
```

Parameters

err

The CFError to examine. If this is not a valid CFError, the behavior is undefined.

Return Value

A localized, human-presentable recovery suggestion for *err*, or NULL if no user-presentable string is available. Ownership follows the Create Rule.

Discussion

This is the string that can be displayed as the “informative” (or “secondary”) message on an alert panel. For example, an error description “Could not save file ‘Letter’ in folder ‘Documents’ because the volume ‘MyDisk’ doesn’t have enough space.” might have a corresponding recovery suggestion, “Remove some files from the volume and try again.”

By default, this function looks for a value for the [kCFErrorLocalizedRecoverySuggestionKey](#) (page 225) key in the user info dictionary. Toll-free bridged instances of `NSError` might provide additional behaviors for manufacturing this value.

When you create a CFError, you should try to make sure the return value is human-presentable and localized by providing a value for [kCFErrorLocalizedRecoverySuggestionKey](#) (page 225) in the user info dictionary.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorCopyUserInfo

Returns the user info dictionary for a given CFError.

```
CFDictionaryRef CFErrorCopyUserInfo (
    CFErrorRef err
);
```

Parameters

err

The error to examine. If this is not a valid CFError, the behavior is undefined.

Return Value

A dictionary containing the same keys and values as in the userInfo dictionary *err* was created with. Returns an empty dictionary if NULL was supplied to the create function. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorCreate

Creates a new CFError object.

```
CFErrorRef CFErrorCreate (
    CFAllocatorRef allocator,
    CFStringRef domain,
    CFIndex code,
    CFDictionaryRef userInfo
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

domain

A CFString that identifies the error domain. If this reference is NULL or is otherwise not a valid CFString, the behavior is undefined.

code

A CFIndex that identifies the error code. The code is interpreted within the context of the error domain.

userInfo

A CFDictionary created with `kCFCopyStringDictionaryKeyCallbacks` and `kCFTypeDictionaryValueCallbacks` (page 216). The dictionary is copied with `CFDictionaryCreateCopy` (page 204). If you do not want the userInfo dictionary, you can pass NULL, in which case an empty dictionary will be assigned.

Return Value

A new CFError object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorCreateWithUserInfoKeysAndValues

Creates a new CFError object using given keys and values to create the user info dictionary.

```
CFErrorRef CFErrorCreateWithUserInfoKeysAndValues (
    CFAllocatorRef allocator,
    CFStringRef domain,
    CFIndex code,
    const void *const *userInfoKeys,
    const void *const *userInfoValues,
    CFIndex numUserInfoValues
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

domain

A `CFStringRef` that identifies the error domain. If this reference is `NULL` or is otherwise not a valid `CFString`, the behavior is undefined.

code

A `CFIndex` that identifies the error code. The code is interpreted within the context of the error domain.

userInfoKeys

An array of *numUserInfoValues* `CFStrings` used as keys in creating the userInfo dictionary. The value of this parameter can be `NULL` if *numUserInfoValues* is 0.

userInfoValues

An array of *numUserInfoValues* `CF types` used as values in creating the userInfo dictionary. The value of this parameter can be `NULL` if *numUserInfoValues* is 0.

numUserInfoValues

The number of keys and values in the *userInfoKeys* and *userInfoValues* arrays.

Return Value

A new `CFError` object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

`CFError.h`

CFErrorGetCode

Returns the error code for a given `CFError`.

```
CFIndex CFErrorGetCode (
    CFErrorRef err
);
```

Parameters*err*

The error to examine. If this is not a valid `CFError`, the behavior is undefined.

Return Value

The error code of *err*.

Discussion

Note that this function returns the error code for the specified CFError, not an error return for the current call.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorGetDomain

Returns the error domain for a given CFError.

```
CFStringRef CFErrorGetDomain (  
    CFErrorRef err  
);
```

Parameters

err

The error to examine. If this is not a valid CFError, the behavior is undefined.

Return Value

The error domain for *err*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

CFErrorGetTypeID

Returns the type identifier for the CFError opaque type.

```
CTypeID CFErrorGetTypeID (  
    void  
);
```

Return Value

The type identifier for the CFError opaque type.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

Data Types

CFErrorRef

A reference to a CFError object.

```
typedef struct __CFError * CFErrorRef;
```

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

Constants

Error domains

These constants define domains for CFError objects.

```
const CFStringRef kCFErrorDomainPOSIX;  
const CFStringRef kCFErrorDomainOSStatus;  
const CFStringRef kCFErrorDomainMach;  
const CFStringRef kCFErrorDomainCocoa;
```

Constants

`kCFErrorDomainPOSIX`

A constant that specified the POSIX domain.

Available in Mac OS X v10.5 and later.

Declared in `CFError.h`.

`kCFErrorDomainOSStatus`

A constant that specified the OS domain.

Available in Mac OS X v10.5 and later.

Declared in `CFError.h`.

`kCFErrorDomainMach`

A constant that specified the Mach domain.

Available in Mac OS X v10.5 and later.

Declared in `CFError.h`.

`kCFErrorDomainCocoa`

A constant that specified the Cocoa domain.

Available in Mac OS X v10.5 and later.

Declared in `CFError.h`.

Discussion

The value of "code" will correspond to preexisting values in these domains.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFError.h

Keys for the user info dictionary

Keys in the userInfo dictionary.

```
const CFStringRef kCFErrorLocalizedDescriptionKey;
const CFStringRef kCFErrorLocalizedFailureReasonKey;
const CFStringRef kCFErrorLocalizedRecoverySuggestionKey;
const CFStringRef kCFErrorDescriptionKey;
const CFStringRef kCFErrorUnderlyingErrorKey;
```

Constants

kCFErrorLocalizedDescriptionKey

Key to identify the end user-presentable description in the userInfo dictionary.

Available in Mac OS X v10.5 and later.

Declared in CFError.h.

kCFErrorLocalizedFailureReasonKey

Key to identify the end user-presentable failure reason in the userInfo dictionary.

Available in Mac OS X v10.5 and later.

Declared in CFError.h.

kCFErrorLocalizedRecoverySuggestionKey

Key to identify the end user-presentable recovery suggestion in the userInfo dictionary.

Available in Mac OS X v10.5 and later.

Declared in CFError.h.

kCFErrorDescriptionKey

Key to identify the description in the userInfo dictionary.

When you create a CFError, you can provide a value for this key if you do not have localizable error strings. The description should be a complete sentence if possible, and should not contain the domain name or error code.

Available in Mac OS X v10.5 and later.

Declared in CFError.h.

kCFErrorUnderlyingErrorKey

Key to identify the underlying error in the userInfo dictionary.

Available in Mac OS X v10.5 and later.

Declared in CFError.h.

Discussion

When you create a user info dictionary, at a minimum you should provide values for one of kCFErrorLocalizedDescriptionKey and kCFErrorLocalizedFailureReasonKey; ideally you should provide values for kCFErrorLocalizedDescriptionKey, kCFErrorLocalizedFailureReasonKey, and kCFErrorLocalizedRecoverySuggestionKey.

Availability

Available in Mac OS X v10.5 and later.

Declared In

NSError.h

CFFileDescriptor Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFFileDescriptor.h

Overview

The CFFileDescriptor provides an opaque type to monitor file descriptors for read and write activity via CFRunLoop.

You use CFFileDescriptor to monitor file descriptors for read and write activity via CFRunLoop using callbacks. Each call back is one-shot, and must be re-enabled if you want to get another one.

You can re-enable the callback in the callback function itself, but you must completely service the file descriptor before doing so. For example, if you create a CFFileDescriptor for a pipe and get a callback because there are bytes to be read, then if you don't read all of the bytes but nevertheless re-enable the CFFileDescriptor for read activity, you'll get called back again immediately.

You can monitor kqueue file descriptors for read activity to find out when an event the kqueue is filtering for has occurred. You are responsible for understanding the use of the kevent() API and inserting and removing filters from the kqueue file descriptor yourself.

The following example takes a UNIX process ID as argument, and watches up to 20 seconds, and reports if the process terminates in that time:

```
// cc test.c -framework CoreFoundation -0
#include <CoreFoundation/CoreFoundation.h>
#include <unistd.h>
#include <sys/event.h>
static void noteProcDeath(CFFileDescriptorRef fdref, CFOptionFlags callBackTypes,
void *info) {
    struct kevent kev;
    int fd = CFFileDescriptorGetNativeDescriptor(fdref);
    kevent(fd, NULL, 0, &kev, 1, NULL);
    // take action on death of process here
    printf("process with pid '%u' died\n", (unsigned int)kev.ident);
    CFFileDescriptorInvalidate(fdref);
    CFRelease(fdref); // the CFFileDescriptorRef is no longer of any use in this
example
}
// one argument, an integer pid to watch, required
int main(int argc, char *argv[]) {
    if (argc < 2) exit(1);
    int fd = kqueue();
    struct kevent kev;
```

```

    EV_SET(&kev, atoi(argv[1]), EVFILT_PROC, EV_ADD|EV_ENABLE, NOTE_EXIT, 0,
    NULL);
    kevent(fd, &kev, 1, NULL, 0, NULL);
    CFFileDescriptorRef fdref = CFFileDescriptorCreate(kCFAllocatorDefault, fd,
    true, noteProcDeath, NULL);
    CFFileDescriptorEnableCallbacks(fdref, kCFFileDescriptorReadCallback);
    CFRunLoopSourceRef source =
    CFFileDescriptorCreateRunLoopSource(kCFAllocatorDefault, fdref, 0);
    CFRunLoopAddSource(CFRunLoopGetMain(), source, kCFRunLoopDefaultMode);
    CFRelease(source);
    // run the run loop for 20 seconds
    CFRunLoopRunInMode(kCFRunLoopDefaultMode, 20.0, false);
    return 0;
}

```

Functions by Task

Creating a CFFileDescriptor

[CFFileDescriptorCreate](#) (page 229)

Creates a new CFFileDescriptor.

Getting Information About a File Descriptor

[CFFileDescriptorGetNativeDescriptor](#) (page 232)

Returns the native file descriptor for a given CFFileDescriptor.

[CFFileDescriptorIsValid](#) (page 233)

Returns a Boolean value that indicates whether the native file descriptor for a given CFFileDescriptor is valid.

[CFFileDescriptorGetContext](#) (page 231)

Gets the context for a given CFFileDescriptor.

Invalidating a File Descriptor

[CFFileDescriptorInvalidate](#) (page 232)

Invalidates the native file descriptor for a given CFFileDescriptor.

Managing Callbacks

[CFFileDescriptorEnableCallbacks](#) (page 231)

Enables callbacks for a given CFFileDescriptor.

[CFFileDescriptorDisableCallbacks](#) (page 230)

Disables callbacks for a given CFFileDescriptor.

Creating a Run Loop Source

[CFFileDescriptorCreateRunLoopSource](#) (page 230)

Creates a new runloop source for a given CFFileDescriptor.

Getting the CFFileDescriptor Type ID

[CFFileDescriptorGetTypeID](#) (page 232)

Returns the type identifier for the CFFileDescriptor opaque type.

Functions

CFFileDescriptorCreate

Creates a new CFFileDescriptor.

```
CFFileDescriptorRef CFFileDescriptorCreate (
    CFAllocatorRef allocator,
    CFFileDescriptorNativeDescriptor fd,
    Boolean closeOnInvalidate,
    CFFileDescriptorCallback callout,
    const CFFileDescriptorContext *context
);
```

Parameters

allocator

The allocator to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

fd

The file descriptor for the new CFFileDescriptor.

closeOnInvalidate

`true` if the new CFFileDescriptor should close *fd* when it is invalidated, otherwise `false`.

callout

The CFFileDescriptorCallback for the new CFFileDescriptor.

context

Contextual information for the new CFFileDescriptor.

Return Value

A new CFFileDescriptor or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFFileDescriptorGetContext](#) (page 231)

[CFFileDescriptorInvalidate](#) (page 232)

Declared In

CFFileDescriptor.h

CFFileDescriptorCreateRunLoopSource

Creates a new runloop source for a given CFFileDescriptor.

```
CFRunLoopSourceRef CFFileDescriptorCreateRunLoopSource (
    CFAllocatorRef allocator,
    CFFileDescriptorRef f,
    CFIndex order
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

f

A CFFileDescriptor.

order

The order for the new run loop (see [CFRunLoopSourceCreate](#) (page 468)).

Return Value

A new runloop source for *f*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

The context for the new runloop (see [CFRunLoopSourceCreate](#) (page 468)) is the same as the context passed in when the CFFileDescriptor was created (see [CFFileDescriptorCreate](#) (page 229)).

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFFileDescriptor.h

CFFileDescriptorDisableCallbacks

Disables callbacks for a given CFFileDescriptor.

```
void CFFileDescriptorDisableCallbacks (
    CFFileDescriptorRef f,
    CFOptionFlags callbackTypes
);
```

Parameters*f*

A CFFileDescriptor.

callbackTypes

A bitmask that specifies which callbacks to disable (see [“Callback Identifiers”](#) (page 235) for possible components).

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFFileDescriptorEnableCallbacks](#) (page 231)

Declared In

CFFileDescriptor.h

CFFileDescriptorEnableCallbacks

Enables callbacks for a given CFFileDescriptor.

```
void CFFileDescriptorEnableCallbacks (
    CFFileDescriptorRef f,
    CFOptionFlags callbackTypes
);
```

Parameters

f

A CFFileDescriptor.

callbackTypes

A bitmask that specifies which callbacks to enable (see “[Callback Identifiers](#)” (page 235) for possible components).

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFFileDescriptorDisableCallbacks](#) (page 230)

Declared In

CFFileDescriptor.h

CFFileDescriptorGetContext

Gets the context for a given CFFileDescriptor.

```
void CFFileDescriptorGetContext (
    CFFileDescriptorRef f,
    CFFileDescriptorContext *context
);
```

Parameters

f

A CFFileDescriptor.

context

Upon return, contains the context passed to *f* in [CFFileDescriptorCreate](#) (page 229).

Availability

Available in Mac OS X v10.5 and later.

See Also[CFFileDescriptorCreate](#) (page 229)**Declared In**

CFFileDescriptor.h

CFFileDescriptorGetNativeDescriptor

Returns the native file descriptor for a given CFFileDescriptor.

```
CFFileDescriptorNativeDescriptor CFFileDescriptorGetNativeDescriptor (
    CFFileDescriptorRef f
);
```

Parameters*f*

A CFFileDescriptor.

Return ValueThe native file descriptor for *f*.**Availability**

Available in Mac OS X v10.5 and later.

See Also[CFFileDescriptorInvalidate](#) (page 232)**Declared In**

CFFileDescriptor.h

CFFileDescriptorGetTypeID

Returns the type identifier for the CFFileDescriptor opaque type.

```
CTypeID CFFileDescriptorGetTypeID (
    void
);
```

Return Value

The type identifier for the CFFileDescriptor opaque type.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFFileDescriptor.h

CFFileDescriptorInvalidate

Invalidates the native file descriptor for a given CFFileDescriptor.


```
void CFFileDescriptorInvalidate (
    CFFileDescriptorRef f,
);
```

Parameters

f
A CFFileDescriptor.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFFileDescriptorIsValid](#) (page 233)

[CFFileDescriptorGetNativeDescriptor](#) (page 232)

Declared In

CFFileDescriptor.h

CFFileDescriptorIsValid

Returns a Boolean value that indicates whether the native file descriptor for a given CFFileDescriptor is valid.

```
Boolean CFFileDescriptorIsValid (
    CFFileDescriptorRef f,
);
```

Parameters

f
A CFFileDescriptor.

Return Value

true if the native file descriptor for *f* is valid, otherwise false.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFFileDescriptorInvalidate](#) (page 232)

Declared In

CFFileDescriptor.h

Data Types

CFFileDescriptorNativeDescriptor

Defines a type for the native file descriptor.

```
typedef int CFFileDescriptorNativeDescriptor;
```

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFFileDescriptor.h

CFFileDescriptorCallback

Defines a structure for a callback for a CFFileDescriptor.

```
typedef void (*CFFileDescriptorCallback) (
    CFFileDescriptorRef f,
    CFOptionFlags callBackTypes,
    void *info
);
```

Declared In

CFFileDescriptor.h

CFFileDescriptorContext

Defines a structure for the context of a CFFileDescriptor.

```
typedef struct {
    CFIndex    version;
    void *     info;
    void *     (*retain)(void *info);
    void *     (*release)(void *info);
    CFStringRef (*copyDescription)(void *info);
} CFFileDescriptorContext;
```

Fields

version

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

info

retain

The retain callback used by the CFFileDescriptor.

release

The release callback used by the CFFileDescriptor.

copyDescription

The callback used to create a descriptive string representation of the CFFileDescriptor.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFFileDescriptor.h

CFFileDescriptorRef

A reference to an CFFileDescriptor object.

```
typedef struct __CFFileDescriptor * CFFileDescriptorRef;
```

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFFileDescriptor.h

Constants

Callback Identifiers

Constants that identify the read and write callbacks.

```
enum {  
    kCFFileDescriptorReadCallback = 1 << 0,  
    kCFFileDescriptorWriteCallback = 1 << 1  
};
```

Constants

kCFFileDescriptorReadCallback

Identifies the read callback.

Available in Mac OS X v10.5 and later.

Declared in CFFileDescriptor.h.

kCFFileDescriptorWriteCallback

Identifies the write callback.

Available in Mac OS X v10.5 and later.

Declared in CFFileDescriptor.h.

Declared In

CFFileDescriptor.h

CFLocale Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFLocale.h
Companion guides	Locales Programming Guide Internationalization Programming Topics

Overview

Unicode operations such as collation and text boundary determination can be affected by the conventions of a particular language or region. CFLocale objects specify language-specific or region-specific information for locale-sensitive operations.

The CFLocale opaque type provides support for obtaining available locales, obtaining localized locale names, and converting among locale data formats. Locale identifiers in Mac OS X follow the IETF's [BCP 47](#). CFLocale never uses Script Manager codes (except for the legacy support provided by [CFLocaleCreateCanonicalLocaleIdentifierFromScriptManagerCodes](#) (page 243))—the Script Manager and all its concepts are deprecated.

For more information on locale identifiers and the use of CFLocale, see *Locales Programming Guide*. It is also useful to read the ICU's [User Guide for the Locale Class](#).

CFLocale is “toll-free bridged” with its Cocoa Foundation counterpart, NSLocale. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSLocale *` parameter, you can pass in a `CFLocaleRef`, and in a function where you see a `CFLocaleRef` parameter, you can pass in an `NSLocale` instance. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Locale

[CFLocaleCopyCurrent](#) (page 240)

Returns a copy of the logical locale for the current user.

[CFLocaleCreate](#) (page 242)

Creates a locale for the given arbitrary locale identifier.

[CFLocaleCreateCopy](#) (page 245)

Returns a copy of a locale.

[CFLocaleGetSystem](#) (page 247)

Returns the root, canonical locale.

Getting System Locale Information

[CFLocaleCopyAvailableLocaleIdentifiers](#) (page 239)

Returns an array of CFString objects that represents all locales for which locale data is available.

Getting ISO Information

[CFLocaleCopyISOCountryCodes](#) (page 241)

Returns an array of CFString objects that represents all known legal ISO country codes.

[CFLocaleCopyISOLanguageCodes](#) (page 242)

Returns an array of CFString objects that represents all known legal ISO language codes.

[CFLocaleCopyISOCurrencyCodes](#) (page 241)

Returns an array of CFString objects that represents all known legal ISO currency codes.

[CFLocaleCopyCommonISOCurrencyCodes](#) (page 239)

Returns an array of strings that represents ISO currency codes for currencies in common use.

Language Preferences

[CFLocaleCopyPreferredLanguages](#) (page 242)

Returns the array of canonicalized locale IDs that the user prefers.

Getting Information About a Locale

[CFLocaleCopyDisplayNameForPropertyValue](#) (page 240)

Returns the display name for the given value.

[CFLocaleGetValue](#) (page 247)

Returns the corresponding value for the given key of a locale's key-value pair.

[CFLocaleGetIdentifier](#) (page 246)

Returns the given locale's identifier.

Getting and Creating Locale Identifiers

[CFLocaleCreateCanonicalLocaleIdentifierFromScriptManagerCodes](#) (page 243)

Returns a canonical locale identifier from given language and region codes.

[CFLocaleCreateCanonicalLanguageIdentifierFromString](#) (page 243)

Returns a canonical language identifier by mapping an arbitrary locale identification string to the canonical identifier

[CFLocaleCreateCanonicalLocaleIdentifierFromString](#) (page 244)

Returns a canonical locale identifier by mapping an arbitrary locale identification string to the canonical identifier.

[CFLocaleCreateComponentsFromLocaleIdentifier](#) (page 245)

Returns a dictionary containing the result from parsing a locale ID consisting of language, script, country, variant, and keyword/value pairs.

[CFLocaleCreateLocaleIdentifierFromComponents](#) (page 246)

Returns a locale identifier consisting of language, script, country, variant, and keyword/value pairs derived from a dictionary containing the source information.

Getting the CFLocale Type ID

[CFLocaleGetTypeID](#) (page 247)

Returns the type identifier for the CFLocale opaque type.

Functions

CFLocaleCopyAvailableLocaleIdentifiers

Returns an array of CFString objects that represents all locales for which locale data is available.

```
CFArrayRef CFLocaleCopyAvailableLocaleIdentifiers (
    void
);
```

Return Value

An array of CFString objects that represents all locales for which locale data is available. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCopyCommonISOCurrencyCodes

Returns an array of strings that represents ISO currency codes for currencies in common use.

```
CFArrayRef CFLocaleCopyCommonISOCurrencyCodes (
    void
);
```

Return Value

An array of CFString objects that represents ISO currency codes for currencies in common use. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFLocale.h

CFLocaleCopyCurrent

Returns a copy of the logical locale for the current user.

```
CFLocaleRef CFLocaleCopyCurrent (
    void
);
```

Return Value

The logical locale for the current user that is formed from the settings for the current user's chosen system locale overlaid with any custom settings the user has specified in System Preferences. May return a retained cached object, not a new object. Ownership follows the Create Rule.

Discussion

Settings you get from this locale do not change as a user's preferences are changed so that your operations are consistent. Typically you perform some operations on the returned object and then release it. Since the returned object may be cached, you do not need to hold on to it indefinitely.

Note that locale settings are independent of the user's language setting. The language of the current locale may not correspond to the language at the first index in the `AppleLanguages` array from user defaults. For more details, see *Locale Concepts in [Locales Programming Guide](#)*; see also [CFLocaleCopyPreferredLanguages](#) (page 242).

Availability

Available in Mac OS X v10.3 and later.

Related Sample Code

CFFTPSample
CFPrefTopScores

Declared In

CFLocale.h

CFLocaleCopyDisplayNameForPropertyValue

Returns the display name for the given value.

```
CFStringRef CFLocaleCopyDisplayNameForPropertyValue (
    CFLocaleRef displayLocale,
    CFStringRef key,
    CFStringRef value
);
```

Parameters

displayLocale

A locale object.

key

A string that identifies the type that *value* is. It must be one of the standard locale property keys (see *"Locale Property Keys"* (page 248)).

value

The value for which the display name is required.

Return Value

The display name for *value*. Returns NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

Note that not all locale property keys have values with display name values.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCopyISOCountryCodes

Returns an array of CFString objects that represents all known legal ISO country codes.

```
CFArrayRef CFLocaleCopyISOCountryCodes (
    void
);
```

Return Value

An array of CFString objects that represents all known legal ISO country codes. Ownership follows the Create Rule.

Discussion

Note: many of these will not have any supporting locale data in Mac OS X.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCopyISOCurrencyCodes

Returns an array of CFString objects that represents all known legal ISO currency codes.

```
CFArrayRef CFLocaleCopyISOCurrencyCodes (
    void
);
```

Return Value

An array of CFString objects that represents all known legal ISO currency codes. Ownership follows the Create Rule.

Discussion

Note: many of these will not have any supporting locale data in Mac OS X.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCopyISOLanguageCodes

Returns an array of CFString objects that represents all known legal ISO language codes.

```
CFArrayRef CFLocaleCopyISOLanguageCodes (  
    void  
);
```

Return Value

An array of CFString objects that represents all known legal ISO language codes. Ownership follows the Create Rule.

Discussion

Note: many of these will not have any supporting locale data in Mac OS X.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCopyPreferredLanguages

Returns the array of canonicalized locale IDs that the user prefers.

```
CFArrayRef CFLocaleCopyPreferredLanguages (  
    void  
);
```

Return Value

The array of canonicalized CFString locale IDs that the current user prefers. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFLocale.h

CFLocaleCreate

Creates a locale for the given arbitrary locale identifier.

```

CFLocaleRef CFLocaleCreate (
    CFAllocatorRef allocator,
    CFStringRef localeIdentifier
);

```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

localeIdentifier

A string representation of an arbitrary locale identifier.

Return Value

A new locale that corresponds to the arbitrary locale identifier *localeIdentifier*. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleCreateCanonicalLanguageIdentifierFromString

Returns a canonical language identifier by mapping an arbitrary locale identification string to the canonical identifier

```

CFStringRef CFLocaleCreateCanonicalLanguageIdentifierFromString (
    CFAllocatorRef allocator,
    CFStringRef localeIdentifier
);

```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

localeIdentifier

A string representation of an arbitrary locale identifier.

Return Value

A string that represents the canonical language identifier for the specified arbitrary locale identifier. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleCreateCanonicalLocaleIdentifierFromScriptManagerCodes

Returns a canonical locale identifier from given language and region codes.

```
CFStringRef CFLocaleCreateCanonicalLocaleIdentifierFromScriptManagerCodes (
    CFAllocatorRef allocator,
    LangCode lcode,
    RegionCode rcode
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

lcode

A Mac OS X language code.

rcode

A Mac OS X region code.

Return Value

A canonical locale identifier created by mapping *lcode* and *rcode* to a locale. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleCreateCanonicalLocaleIdentifierFromString

Returns a canonical locale identifier by mapping an arbitrary locale identification string to the canonical identifier.

```
CFStringRef CFLocaleCreateCanonicalLocaleIdentifierFromString (
    CFAllocatorRef allocator,
    CFStringRef localeIdentifier
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

localeIdentifier

A string representation of an arbitrary locale identifier (for example, "English").

Return Value

A canonical locale identifier created by mapping the arbitrary locale identification string to the canonical identifier for the corresponding locale (for example, "en"). Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleCreateComponentsFromLocaleIdentifier

Returns a dictionary containing the result from parsing a locale ID consisting of language, script, country, variant, and keyword/value pairs.

```
CFDictionaryRef CFLocaleCreateComponentsFromLocaleIdentifier (
    CFAllocatorRef allocator,
    CFStringRef localeID
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

localeID

The locale ID to be used when creating the locale dictionary.

Return Value

A dictionary containing the result from parsing a locale ID consisting of language, script, country, variant, and keyword/value pairs. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

The dictionary keys are the constant `CFString` objects that correspond to the locale ID components; the values correspond to constants where available. For example: the string "en_US@calendar=japanese" yields a dictionary with three entries: `kCFLocaleLanguageCode=en`, `kCFLocaleCountryCode=US`, and `kCFLocaleCalendarIdentifier=kCFJapaneseCalendar`. See also [CFLocaleCreateLocaleIdentifierFromComponents](#) (page 246).

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFLocale.h`

CFLocaleCreateCopy

Returns a copy of a locale.

```
CFLocaleRef CFLocaleCreateCopy (
    CFAllocatorRef allocator,
    CFLocaleRef locale
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

locale

The locale object to copy.

Return Value

A new locale that is a copy of *locale*. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleCreateLocaleIdentifierFromComponents

Returns a locale identifier consisting of language, script, country, variant, and keyword/value pairs derived from a dictionary containing the source information.

```
CFStringRef CFLocaleCreateLocaleIdentifierFromComponents (
    CFAllocatorRef allocator,
    CFDictionaryRef dictionary
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

dictionary

The dictionary to use when creating the locale identifier.

Return Value

A locale identifier consisting of language, script, country, variant, and keyword/value pairs derived from *dictionary*. Returns `NULL` if there was a problem creating the string. Ownership follows the Create Rule.

Discussion

Reverses the actions of [CFLocaleCreateComponentsFromLocaleIdentifier](#) (page 245), creating a single string from the data in the specified dictionary. For example, the dictionary `{kCFLocaleLanguageCode=en, kCFLocaleCountryCode=US, kCFLocaleCalendarIdentifier=kCFJapaneseCalendar}` becomes `"en_US@calendar=japanese"`.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFLocale.h

CFLocaleGetIdentifier

Returns the given locale's identifier.

```
CFStringRef CFLocaleGetIdentifier (
    CFLocaleRef locale
);
```

Parameters

locale

The locale object to examine.

Return Value

A string representation of *locale's* identifier. This may not be the same string that was used to create the locale—it may be canonicalized. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleGetSystem

Returns the root, canonical locale.

```
CFLocaleRef CFLocaleGetSystem (
    void
);
```

Return Value

The root, canonical locale. Ownership follows the Get Rule.

Discussion

The root locale contains fixed backstop settings for all locale information.

Availability

Available in Mac OS X v10.3 and later.

Related Sample Code

LSMSmartCategorizer

Declared In

CFLocale.h

CFLocaleGetTypeID

Returns the type identifier for the CFLocale opaque type.

```
CTypeID CFLocaleGetTypeID (
    void
);
```

Return Value

The type identifier for the CFLocale opaque type.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

CFLocaleGetValue

Returns the corresponding value for the given key of a locale's key-value pair.

```
CTypeRef CFLocaleGetValue (
    CFLocaleRef locale,
    CFStringRef key
);
```

Parameters

locale

The locale object to examine.

key

The key for which to obtain the corresponding value. Possible values are described in [“Locale Property Keys”](#) (page 248).

Return Value

The value corresponding to the given key in locale. The value may be any type of CType object. Ownership follows the Get Rule.

Discussion

Locale objects use key-value pairs to store property values. Use this function to get the value of a specific property.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFLocale.h

Data Types

CFLocaleRef

A reference to a CFLocale object.

```
typedef const struct __CFLocale *CFLocaleRef;
```

Availability

Available in Mac OS X version 10.3 and later.

Declared In

CFLocale.h

Constants

Locale Property Keys

Predefined locale keys used to get property values.


```

const CFStringRef kCFLocaleMeasurementSystem;
const CFStringRef kCFLocaleDecimalSeparator;
const CFStringRef kCFLocaleGroupingSeparator;
const CFStringRef kCFLocaleCurrencySymbol;
const CFStringRef kCFLocaleCurrencyCode;

const CFStringRef kCFLocaleIdentifier;
const CFStringRef kCFLocaleLanguageCode;
const CFStringRef kCFLocaleCountryCode;
const CFStringRef kCFLocaleScriptCode;
const CFStringRef kCFLocaleVariantCode;
const CFStringRef kCFLocaleExemplarCharacterSet;
const CFStringRef kCFLocaleCalendarIdentifier;
const CFStringRef kCFLocaleCalendar;
const CFStringRef kCFLocaleCollationIdentifier;
const CFStringRef kCFLocaleUsesMetricSystem;

```

Constants

`kCFLocaleMeasurementSystem`

Specifies the measurement system used.

The corresponding value is a CFString, for example “Metric” or “U.S.”.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFLocaleDecimalSeparator`

Specifies the decimal point string.

The corresponding value is a CFString, for example “.” or “,”.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFLocaleGroupingSeparator`

Specifies the separator string between groups of digits.

The corresponding value is a CFString, for example “,” or “.”.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFLocaleCurrencySymbol`

Specifies the currency symbol.

The corresponding value is a CFString, for example “\$” or “£”.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFLocaleCurrencyCode`

Specifies the locale currency code.

The corresponding value is a CFString, for example “USD” or “GBP”.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFLocaleIdentifier`

Specifies locale identifier.

The corresponding value is a CFString containing the POSIX locale identifier as used by ICU, such as “ja_JP”. If you have a variant locale or a different currency or calendar, it can be as complex as “en_US_POSIX@calendar=japanese;currency=EUR” or “az_Cyrl_AZ@calendar=buddhist;currency=JPY”.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleLanguageCode`

Specifies the locale language code.

The corresponding value is a CFString containing an ISO 639-x/IETF BCP 47 language identifier, such as “ja”.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleCountryCode`

Specifies the locale country code.

The corresponding value is a CFString containing an ISO county code, such as “JP”.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleScriptCode`

Specifies the locale script code.

The corresponding value is a CFString containing a Unicode script tag (strictly, an ISO 15924 script tag). Usually this is empty (it is for “ja_JP”). It may be present for locales where a script *must* be specified, for example “uz-Latn-UZ” vs. “uz-Cyrl-UZ” for Uzbek in Latin vs. Cyrillic (in the first case the script code is “Latn”, and in the second it is “Cyrl”).

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleVariantCode`

Specifies the locale variant code.

The corresponding value is a CFString containing the variant name. The variant code is arbitrary and application-specific. ICU adds “_EURO” to its locale designations for locales that support the Euro currency. For “en_US_POSIX” the variant is “POSIX”, and for “hy_AM_REVISIED” it is “REVISIED”.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleExemplarCharacterSet`

Specifies the locale character set.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleCalendarIdentifier`

Specifies the locale calendar identifier.

The corresponding value is a CFString containing the calendar identifier (for possible values, see “[Locale Calendar Identifiers](#)” (page 251)).

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleCalendar`

Specifies the locale calendar.

The corresponding value is a `CFCalendar`.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleCollationIdentifier`

Specifies the locale collation identifier.

The corresponding value is a collation.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFLocaleUsesMetricSystem`

Specifies the whether the locale uses the metric system.

The corresponding value is a `CFBoolean`.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

Discussion

Locale objects use key-value pairs to store property values. Use the [CFLocaleGetValue](#) (page 247) function to get the value of a specific property listed above.

Locale Calendar Identifiers

Predefined locale keys used to get calendar values—values for `kCFLocaleCalendarIdentifier`.

```
const CFStringRef kCFGregorianCalendar;
const CFStringRef kCFBuddhistCalendar;
const CFStringRef kCFChineseCalendar;
const CFStringRef kCFHebrewCalendar;
const CFStringRef kCFIslamicCalendar;
const CFStringRef kCFIslamicCivilCalendar;
const CFStringRef kCFJapaneseCalendar;
```

Constants

`kCFGregorianCalendar`

Specifies the Gregorian calendar.

Available in Mac OS X v10.3 and later.

Declared in `CFLocale.h`.

`kCFBuddhistCalendar`

Specifies the Buddhist calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFChineseCalendar`

Specifies the Chinese calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFHebrewCalendar`

Specifies the Hebrew calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFIslamicCalendar`

Specifies the Islamic calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFIslamicCivilCalendar`

Specifies the Islamic Civil calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

`kCFJapaneseCalendar`

Specifies the Japanese calendar.

Available in Mac OS X v10.4 and later.

Declared in `CFLocale.h`.

Discussion

Locale objects use key-value pairs to store property values. Use the [CFLocaleGetValue](#) (page 247) function to get the value of a specific property listed above.

Locale Change Notification

Identifier for notification sent if the current locale changes.

```
const CFStringRef kCFLocaleCurrentLocaleDidChangeNotification
```

Constants

`kCFLocaleCurrentLocaleDidChangeNotification`

Identifier for the notification sent if the current locale changes.

This is a local notification posted when the user changes locale information in the System Preferences panel. Keep in mind that there is no order in how notifications are delivered to observers; frameworks or other parts of your code may also be observing this notification to take their own actions, and these may not have occurred at the time you receive the notification.

There is no object or user info for this notification.

Available in Mac OS X v10.5 and later.

Declared in `CFLocale.h`.

Declared In

`CFLocale.h`

CFMachPort Reference

Derived From:	<i>CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFMachPort.h

Overview

A CFMachPort object is a wrapper for a native Mach port (`mach_port_t`). Mach ports are the native communication channel for the Mac OS X kernel.

CFMachPort does not provide a function to send messages, so you primarily use a CFMachPort object if you need to listen to a Mach port that you obtained by other means. You can get a callback when a message arrives on the port or when the port becomes invalid, such as when the native port dies.

To listen for messages you need to create a run loop source with [CFMachPortCreateRunLoopSource](#) (page 255) and add it to a run loop with [CFRunLoopAddSource](#) (page 445).

Important: If you want to tear down the connection, you must invalidate the port (using [CFMachPortInvalidate](#) (page 258)) before releasing the runloop source and the Mach port object.

To send data, you must use the Mach APIs with the native Mach port, which is not described here. Alternatively, you can use a *CFMessagePort Reference* object, which can send arbitrary data.

Mach ports only support communication on the local machine. For network communication, you have to use a *CFSocket Reference* object.

Functions by Task

Creating a CFMachPort Object

[CFMachPortCreate](#) (page 254)

Creates a CFMachPort object with a new Mach port.

[CFMachPortCreateWithPort](#) (page 256)

Creates a CFMachPort object for a pre-existing native Mach port.

Configuring a CFMachPort Object

[CFMachPortInvalidate](#) (page 258)

Invalidates a CFMachPort object, stopping it from receiving any more messages.

[CFMachPortCreateRunLoopSource](#) (page 255)

Creates a CFRunLoopSource object for a CFMachPort object.

[CFMachPortSetInvalidationCallback](#) (page 259)

Sets the callback function invoked when a CFMachPort object is invalidated.

Examining a CFMachPort Object

[CFMachPortGetContext](#) (page 256)

Returns the context information for a CFMachPort object.

[CFMachPortGetInvalidationCallback](#) (page 257)

Returns the invalidation callback function for a CFMachPort object.

[CFMachPortGetPort](#) (page 257)

Returns the native Mach port represented by a CFMachPort object.

[CFMachPortIsValid](#) (page 259)

Returns a Boolean value that indicates whether a CFMachPort object is valid and able to receive messages.

Getting the CFMachPort Type ID

[CFMachPortGetTypeID](#) (page 258)

Returns the type identifier for the CFMachPort opaque type.

Functions

CFMachPortCreate

Creates a CFMachPort object with a new Mach port.

```
CFMachPortRef CFMachPortCreate (
    CFAllocatorRef allocator,
    CFMachPortCallback callout,
    CFMachPortContext *context,
    Boolean *shouldFreeInfo
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` (page 35) to use the current default allocator.

callout

The callback function invoked when a message is received on the new Mach port.

context

A structure holding contextual information for the new Mach port. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call.

shouldFreeInfo

A flag set by the function to indicate whether the *info* member of *context* should be freed. The flag is set to `true` on failure, `false` otherwise. *shouldFreeInfo* can be `NULL`.

Return Value

The new CFMachPort object or `NULL` on failure. The CFMachPort object has both send and receive rights. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortCreateRunLoopSource

Creates a CFRunLoopSource object for a CFMachPort object.

```
CFRunLoopSourceRef CFMachPortCreateRunLoopSource (
    CFAllocatorRef allocator,
    CFMachPortRef port,
    CFIndex order
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` (page 35) to use the current default allocator.

port

The Mach port for which to create a CFRunLoopSource object.

order

A priority index indicating the order in which run loop sources are processed. *order* is currently ignored by CFMachPort run loop sources. Pass 0 for this value.

Return Value

The new CFRunLoopSource object for *port*. Ownership follows the Create Rule.

Discussion

The run loop source is not automatically added to a run loop. To add the source to a run loop, use [CFRunLoopAddSource](#) (page 445).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

NotifyTool

Declared In

CFMachPort.h

CFMachPortCreateWithPort

Creates a CFMachPort object for a pre-existing native Mach port.

```
CFMachPortRef CFMachPortCreateWithPort (
    CFAllocatorRef allocator,
    mach_port_t portNum,
    CFMachPortCallBack callout,
    CFMachPortContext *context,
    Boolean *shouldFreeInfo
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` (page 35) to use the current default allocator.

portNum

The native Mach port to use.

callout

The callback function invoked when a message is received on the Mach port.

context

A structure holding contextual information for the Mach port. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call.

shouldFreeInfo

A flag set by the function to indicate whether the *info* member of *context* should be freed. The flag is set to `true` on failure or if a CFMachPort object already exists for *portNum*, `false` otherwise. *shouldFreeInfo* can be `NULL`.

Return Value

The new CFMachPort object or `NULL` on failure. If a CFMachPort object already exists for *portNum*, the function returns the pre-existing object instead of creating a new object; the *context* and *callout* parameters are ignored in this case. Ownership follows the Create Rule.

Discussion

The CFMachPort object does not take full ownership of the send and receive rights of the Mach port *portNum*. It is the caller's responsibility to deallocate the Mach port rights after the CFMachPort object is no longer needed and has been invalidated.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

NotifyTool

Declared In

CFMachPort.h

CFMachPortGetContext

Returns the context information for a CFMachPort object.


```
void CFMachPortGetContext (
    CFMachPortRef port,
    CFMachPortContext *context
);
```

Parameters*port*

The CFMachPort object to examine.

context

A pointer to the structure into which the context information for *port* is to be copied. The information being returned is usually the same information you passed to [CFMachPortCreate](#) (page 254) or [CFMachPortCreateWithPort](#) (page 256) when creating *port*. However, if [CFMachPortCreateWithPort](#) (page 256) returned a cached CFMachPort object instead of creating a new object, *context* is filled with information from the original CFMachPort object instead of the information you passed to the function.

Discussion

The context version number for CFMachPort objects is currently 0. Before calling this function, you need to initialize the *version* member of *context* to 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortGetInvalidationCallback

Returns the invalidation callback function for a CFMachPort object.

```
CFMachPortInvalidationCallback CFMachPortGetInvalidationCallback (
    CFMachPortRef port
);
```

Parameters*port*

The CFMachPort object to examine.

Return Value

The callback function invoked when *port* is invalidated. NULL if no callback has been set with [CFMachPortSetInvalidationCallback](#) (page 259).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortGetPort

Returns the native Mach port represented by a CFMachPort object.

```
mach_port_t CFMachPortGetPort (
    CFMachPortRef port
);
```

Parameters*port*

The CFMachPort object to examine.

Return ValueThe native Mach port represented by *port*.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortGetTypeID

Returns the type identifier for the CFMachPort opaque type.

```
CTypeID CFMachPortGetTypeID (
    void
);
```

Return Value

The type identifier for the CFMachPort opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortInvalidate

Invalidates a CFMachPort object, stopping it from receiving any more messages.

```
void CFMachPortInvalidate (
    CFMachPortRef port
);
```

Parameters*port*

The CFMachPort object to invalidate.

Discussion

Invalidating a CFMachPort object prevents the port from ever receiving any more messages. The CFMachPort object is not deallocated, though. If the port has not already been invalidated, the port's invalidation callback function is invoked, if one has been set with [CFMachPortSetInvalidationCallback](#) (page 259). The [CFMachPortContext](#) (page 261) info information for *port* is also released, if a release callback was specified in the port's context structure. Finally, if a run loop source was created for *port*, the run loop source is invalidated, as well.

If the underlying Mach port is destroyed, the CFMachPort object is automatically invalidated.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortIsValid

Returns a Boolean value that indicates whether a CFMachPort object is valid and able to receive messages.

```
Boolean CFMachPortIsValid (
    CFMachPortRef port
);
```

Parameters

port

The CFMachPort object to examine.

Return Value

true if *port* can be used for communication, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

CFMachPortSetInvalidationCallback

Sets the callback function invoked when a CFMachPort object is invalidated.

```
void CFMachPortSetInvalidationCallback (
    CFMachPortRef port,
    CFMachPortInvalidationCallback callout
);
```

Parameters

port

The CFMachPort object to modify.

callout

The callback function to invoke when *port* is invalidated. Pass NULL to remove a callback.

Discussion

If *port* is already invalid, *callout* is invoked immediately.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

Callbacks

CFMachPortCallback

Callback invoked to process a message received on a CFMachPort object.

```
typedef void (*CFMachPortCallback) (
    CFMachPortRef port,
    void *msg,
    CFIndex size,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFMachPortRef port,
    void *msg,
    CFIndex size,
    void *info
);
```

Parameters

port

The CFMachPort object on which the message *msg* was received.

msg

The Mach message received on *port*. The pointer is to a `mach_msg_header_t` structure.

size

Size of the Mach message *msg*, excluding the message trailer.

info

The `info` member of the [CFMachPortContext](#) (page 261) structure used when creating *port*.

Discussion

You specify this callback when creating a CFMachPort object with either [CFMachPortCreate](#) (page 254) or [CFMachPortCreateWithPort](#) (page 256). To receive messages on a CFMachPort object (and have this callback invoked), you must create a run loop source for the port and add it to a run loop.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFMachPort.h`

CFMachPortInvalidationCallback

Callback invoked when a CFMachPort object is invalidated.

```
typedef void (*CFMachPortInvalidationCallback) (
    CFMachPortRef port,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFMachPortRef port,
    void *info
);
```

Parameters

port

The CFMachPort object that has been invalidated.

info

The `info` member of the [CFMachPortContext](#) (page 261) structure used when creating *port*.

Discussion

Your callback should free any resources allocated for *port*.

You specify this callback with [CFMachPortSetInvalidationCallback](#) (page 259).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMachPort.h

Data Types

CFMachPortContext

A structure that contains program-defined data and callbacks with which you can configure a CFMachPort object's behavior.

```
struct CFMachPortContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFMachPortContext CFMachPortContext;
```

Fields

version

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the CFMachPort object at creation time. This pointer is passed to all the callbacks defined in the context.

`retain`

A retain callback for your program-defined `info` pointer. Can be `NULL`.

`release`

A release callback for your program-defined `info` pointer. Can be `NULL`.

`copyDescription`

A copy description callback for your program-defined `info` pointer. Can be `NULL`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFMachPort.h`

CFMachPortRef

A reference to a `CFMachPort` object.

```
typedef struct __CFMachPort *CFMachPortRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFMachPort.h`

CFMessagePort Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFMessagePort.h

Overview

CFMessagePort objects provide a communications channel that can transmit arbitrary data between multiple threads or processes on the local machine.

You create a local message port with [CFMessagePortCreateLocal](#) (page 264) and make it available to other processes by giving it a name, either when you create it or later with [CFMessagePortSetName](#) (page 271). Other processes then connect to it using [CFMessagePortCreateRemote](#) (page 265), specifying the name of the port.

To listen for messages, you need to create a run loop source with [CFMessagePortCreateRunLoopSource](#) (page 266) and add it to a run loop with [CFRunLoopAddSource](#) (page 445).

Important: If you want to tear down the connection, you must invalidate the port (using [CFMessagePortInvalidate](#) (page 268)) before releasing the runloop source and the message port object.

Your message port's callback function will be called when a message arrives. To send data, you store the data in a CFData object and call [CFMessagePortSendRequest](#) (page 270). You can optionally have the function wait for a reply and return the reply in another CFData object.

Message ports only support communication on the local machine. For network communication, you have to use a CFSocket object.

Functions by Task

Creating a CFMessagePort Object

[CFMessagePortCreateLocal](#) (page 264)
Returns a local CFMessagePort object.

[CFMessagePortCreateRemote](#) (page 265)
Returns a CFMessagePort object connected to a remote port.

Configuring a CFMessagePort Object

[CFMessagePortCreateRunLoopSource](#) (page 266)

Creates a CFRunLoopSource object for a CFMessagePort object.

[CFMessagePortSetInvalidationCallback](#) (page 271)

Sets the callback function invoked when a CFMessagePort object is invalidated.

[CFMessagePortSetName](#) (page 271)

Sets the name of a local CFMessagePort object.

Using a Message Port

[CFMessagePortInvalidate](#) (page 268)

Invalidates a CFMessagePort object, stopping it from receiving or sending any more messages.

[CFMessagePortSendRequest](#) (page 270)

Sends a message to a remote CFMessagePort object.

Examining a Message Port

[CFMessagePortGetContext](#) (page 267)

Returns the context information for a CFMessagePort object.

[CFMessagePortGetInvalidationCallback](#) (page 267)

Returns the invalidation callback function for a CFMessagePort object.

[CFMessagePortGetName](#) (page 268)

Returns the name with which a CFMessagePort object is registered.

[CFMessagePortIsRemote](#) (page 269)

Returns a Boolean value that indicates whether a CFMessagePort object represents a remote port.

[CFMessagePortIsValid](#) (page 269)

Returns a Boolean value that indicates whether a CFMessagePort object is valid and able to send or receive messages.

Getting the CFMessagePort Type ID

[CFMessagePortGetTypeID](#) (page 268)

Returns the type identifier for the CFMessagePort opaque type.

Functions

CFMessagePortCreateLocal

Returns a local CFMessagePort object.


```
CFMessagePortRef CFMessagePortCreateLocal (
    CFAllocatorRef allocator,
    CFStringRef name,
    CFMessagePortCallBack callout,
    CFMessagePortContext *context,
    Boolean *shouldFreeInfo
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

name

The name with which to register the port. *name* can be `NULL`.

callout

The callback function invoked when a message is received on the message port.

context

A structure holding contextual information for the message port. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call.

shouldFreeInfo

A flag set by the function to indicate whether the *info* member of *context* should be freed. The flag is set to `true` on failure or if a local port named *name* already exists, `false` otherwise. *shouldFreeInfo* can be `NULL`.

Return Value

The new `CFMessagePort` object, or `NULL` on failure. If a local port is already named *name*, the function returns that port instead of creating a new object; the *context* and *callout* parameters are ignored in this case. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter
BasicInputMethod

Declared In

CFMessagePort.h

CFMessagePortCreateRemote

Returns a `CFMessagePort` object connected to a remote port.

```
CFMessagePortRef CFMessagePortCreateRemote (
    CFAllocatorRef allocator,
    CFStringRef name
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

name

The name of the remote message port to which to connect.

Return Value

The new `CFMessagePort` object, or `NULL` on failure. If a message port has already been created for the remote port, the pre-existing object is returned. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

BasicInputMethod

Declared In

CFMessagePort.h

CFMessagePortCreateRunLoopSource

Creates a `CFRunLoopSource` object for a `CFMessagePort` object.

```
CFRunLoopSourceRef CFMessagePortCreateRunLoopSource (
    CFAllocatorRef allocator,
    CFMessagePortRef local,
    CFIndex order
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

ms

The message port for which to create a run loop source.

order

A priority index indicating the order in which run loop sources are processed. *order* is currently ignored by `CFMessagePort` object run loop sources. Pass `0` for this value.

Return Value

The new `CFRunLoopSource` object for *ms*. Ownership follows the Create Rule.

Discussion

The run loop source is not automatically added to a run loop. To add the source to a run loop, use [CFRunLoopAddSource](#) (page 445).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

BasicInputMethod

Declared In

CFMessagePort.h

CFMessagePortGetContext

Returns the context information for a CFMessagePort object.

```
void CFMessagePortGetContext (
    CFMessagePortRef ms,
    CFMessagePortContext *context
);
```

Parameters

ms

The message port to examine.

context

A pointer to the structure into which the context information for *ms* is to be copied. The information being returned is usually the same information you passed to [CFMessagePortCreateLocal](#) (page 264) when creating *ms*. However, if [CFMessagePortCreateLocal](#) (page 264) returned a cached object instead of creating a new object, *context* is filled with information from the original message port instead of the information you passed to the function.

Discussion

The context version number for message ports is currently 0. Before calling this function, you need to initialize the *version* member of *context* to 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortGetInvalidationCallback

Returns the invalidation callback function for a CFMessagePort object.

```
CFMessagePortInvalidationCallback CFMessagePortGetInvalidationCallback (
    CFMessagePortRef ms
);
```

Parameters

ms

The message port to examine.

Return Value

The callback function invoked when *ms* is invalidated. NULL if no callback has been set with [CFMessagePortSetInvalidationCallback](#) (page 271).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortGetName

Returns the name with which a CFMessagePort object is registered.

```
CFStringRef CFMessagePortGetName (  
    CFMessagePortRef ms  
);
```

Parameters

ms

The message port to examine.

Return Value

The registered name of *ms*, NULL if unnamed. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortGetTypeID

Returns the type identifier for the CFMessagePort opaque type.

```
CFTypeID CFMessagePortGetTypeID (  
    void  
);
```

Return Value

The type identifier for the CFMessagePort opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortInvalidate

Invalidates a CFMessagePort object, stopping it from receiving or sending any more messages.

```
void CFMessagePortInvalidate (
    CFMessagePortRef ms
);
```

Parameters*ms*

The message port to invalidate.

Discussion

Invalidating a message port prevents the port from ever sending or receiving any more messages; the message port is not deallocated, though. If the port has not already been invalidated, the port's invalidation callback function is invoked, if one has been set with [CFMessagePortSetInvalidationCallback](#) (page 271). The [CFMessagePortContext](#) (page 273) info information for *ms* is also released, if a release callback was specified in the port's context structure. Finally, if a run loop source was created for *ms*, the run loop source is also invalidated.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

Declared In

CFMessagePort.h

CFMessagePortIsRemote

Returns a Boolean value that indicates whether a CFMessagePort object represents a remote port.

```
Boolean CFMessagePortIsRemote (
    CFMessagePortRef ms
);
```

Parameters*ms*

The message port to examine.

Return Value

true if *ms* is a remote port, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortIsValid

Returns a Boolean value that indicates whether a CFMessagePort object is valid and able to send or receive messages.

```
Boolean CFMessagePortIsValid (
    CFMessagePortRef ms
);
```

Parameters

ms
The message port to examine.

Return Value

true if *ms* can be used for communication, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortSendRequest

Sends a message to a remote CFMessagePort object.

```
SInt32 CFMessagePortSendRequest (
    CFMessagePortRef remote,
    SInt32 msgid,
    CFDataRef data,
    CFTimeInterval sendTimeout,
    CFTimeInterval rcvTimeout,
    CFStringRef replyMode,
    CFDataRef *returnData
);
```

Parameters

remote
The message port to which *data* should be sent.

msgid
An arbitrary integer value that you can send with the message.

data
The data to send to *remote*.

sendTimeout
The time to wait for *data* to be sent.

rcvTimeout
The time to wait for a reply to be returned.

replyMode
The run loop mode in which the function should wait for a reply. If the message is a oneway (so no response is expected), then *replyMode* should be NULL. If *replyMode* is non-NULL, the function runs the run loop waiting for a reply, in that mode. *replyMode* can be any string name of a run loop mode, but it should be one with input sources installed. You should use the `kCFRunLoopDefaultMode` constant unless you have a specific reason to use a different mode.

returnData
Upon return, contains a CFData object containing the reply data. Ownership follows the Create Rule.

Return Value

Error code indicating success or failure. See “[CFMessagePortSendRequest Error Codes](#)” (page 274) for the possible return values.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BackgroundExporter

BasicInputMethod

Declared In

CFMessagePort.h

CFMessagePortSetInvalidationCallback

Sets the callback function invoked when a CFMessagePort object is invalidated.

```
void CFMessagePortSetInvalidationCallback (
    CFMessagePortRef ms,
    CFMessagePortInvalidationCallback callout
);
```

Parameters

ms

The message port to examine.

callout

The callback function to invoke when *ms* is invalidated. Pass NULL to remove a callback.

Discussion

If *ms* is already invalid, *callout* is invoked immediately.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortSetName

Sets the name of a local CFMessagePort object.

```
Boolean CFMessagePortSetName (
    CFMessagePortRef ms,
    CFStringRef newName
);
```

Parameters

ms

The local message port to examine.

newName

The new name for *ms*.

Return Value

true if the name change succeeds, otherwise false.

Discussion

Other threads and processes can connect to a named message port with [CFMessagePortCreateRemote](#) (page 265).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

Callbacks

CFMessagePortCallback

Callback invoked to process a message received on a CFMessagePort object.

```
typedef CFDataRef (*CFMessagePortCallback) (
    CFMessagePortRef local,
    SInt32 msgid,
    CFDataRef data,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFDataRef MyCallback (
    CFMessagePortRef local,
    SInt32 msgid,
    CFDataRef data,
    void *info
);
```

Parameters

local

The local message port that received the message.

msgid

An arbitrary integer value assigned to the message by the sender.

data

The message data.

info

The `info` member of the [CFMessagePortContext](#) (page 273) structure that was used when creating *local*.

Return Value

Data to send back to the sender of the message. The system releases the returned CFData object. Return NULL if you want an empty reply returned to the sender.

Discussion

If you want the message data to persist beyond this callback, you must explicitly create a copy of *data* rather than merely retain it; the contents of *data* will be deallocated after the callback exits.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortInvalidationCallback

Callback invoked when a CFMessagePort object is invalidated.

```
typedef void (*CFMessagePortInvalidationCallback) (
    CFMessagePortRef ms,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFMessagePortRef ms,
    void *info
);
```

Parameters

ms

The message port that has been invalidated.

info

The `info` member of the [CFMessagePortContext](#) (page 273) structure that was used when creating *ms*, if *ms* is a local port; NULL if *ms* is a remote port.

Discussion

Your callback should free any resources allocated for *ms*.

You specify this callback with [CFMessagePortSetInvalidationCallback](#) (page 271).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

Data Types

CFMessagePortContext

A structure that contains program-defined data and callbacks with which you can configure a CFMessagePort object's behavior.

```

struct CFMessagePortContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFMessagePortContext CFMessagePortContext;

```

Fields

version

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the message port at creation time. This pointer is passed to all the callbacks defined in the context.

retain

A retain callback for your program-defined `info` pointer. Can be `NULL`.

release

A release callback for your program-defined `info` pointer. Can be `NULL`.

copyDescription

A copy description callback for your program-defined `info` pointer. Can be `NULL`.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

CFMessagePortRef

A reference to a message port object.

```
typedef struct __CFMessagePort *CFMessagePortRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFMessagePort.h

Constants

CFMessagePortSendRequest Error CodesError codes for `CFMessagePortSendRequest`.

```
enum {  
    kCFMessagePortSuccess = 0,  
    kCFMessagePortSendTimeout = -1,  
    kCFMessagePortReceiveTimeout = -2,  
    kCFMessagePortIsInvalid = -3,  
    kCFMessagePortTransportError = -4  
};
```

Constants

kCFMessagePortSuccess

The message was successfully sent and, if a reply was expected, a reply was received.

Available in Mac OS X v10.0 and later.

Declared in CFMessagePort.h.

kCFMessagePortSendTimeout

The message could not be sent before the send timeout.

Available in Mac OS X v10.0 and later.

Declared in CFMessagePort.h.

kCFMessagePortReceiveTimeout

No reply was received before the receive timeout.

Available in Mac OS X v10.0 and later.

Declared in CFMessagePort.h.

kCFMessagePortIsInvalid

The message could not be sent because the message port is invalid.

Available in Mac OS X v10.0 and later.

Declared in CFMessagePort.h.

kCFMessagePortTransportError

An error occurred trying to send the message.

Available in Mac OS X v10.0 and later.

Declared in CFMessagePort.h.

CFMutableArray Reference

Derived From:	CFArray : CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFArray.h
Companion guides	Collections Programming Topics for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFMutableArray manages dynamic arrays. The basic interface for managing arrays is provided by CFArray. CFMutableArray adds functions to modify the contents of an array.

You create a mutable array object using either the [CFArrayCreateMutable](#) (page 279) or [CFArrayCreateMutableCopy](#) (page 280) function.

CFMutableArray provides several functions for changing the contents of an array, for example the [CFArrayAppendValue](#) (page 278) and [CFArrayInsertValueAtIndex](#) (page 281) functions add values to an array and [CFArrayRemoveValueAtIndex](#) (page 282) removes values from an array. You can also reorder the contents of an array using [CFArrayExchangeValuesAtIndexes](#) (page 281) and [CFArraySortValues](#) (page 285).

CFMutableArray is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableArray. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an NSMutableArray * parameter, you can pass in a CFMutableArrayRef, and in a function where you see a CFMutableArrayRef parameter, you can pass in an NSMutableArray instance. This fact also applies to concrete subclasses of NSMutableArray. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions

CFArrayAppendArray

Adds the values from one array to another array.

```
void CFArrayAppendArray (
    CFMutableArrayRef theArray,
    CFArrayRef otherArray,
    CFRange otherRange
);
```

Parameters*theArray*

The array to which values from *otherArray* are added. If *theArray* is a limited-capacity array, adding *otherRange.length* values from *otherArray* must not cause the capacity limit of *theArray* to be exceeded.

otherArray

An array providing the values to be added to *theArray*.

otherRange

The range within *otherArray* from which to add the values to *theArray*. The range must not exceed the index space of *otherArray*.

Discussion

The new values are retained by *theArray* using the retain callback provided when *theArray* was created. If the values are not of the type expected by the retain callback, the behavior is undefined. The values are assigned to the indices one larger than the previous largest index in *theArray*, and beyond, and the count of *theArray* is increased by *otherRange.length*. The values are assigned new indices in *theArray* from smallest to largest index in the order in which they appear in *otherArray*.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageBrowserView

Declared In

CFArray.h

CFArrayAppendValue

Adds a value to an array giving it the new largest index.

```
void CFArrayAppendValue (
    CFMutableArrayRef theArray,
    const void *value
);
```

Parameters*theArray*

The array to which *value* is to be added. If *theArray* is a limited-capacity array and it is full before this operation, the behavior is undefined.

value

A CType object or a pointer value to add to *theArray*.

Discussion

The *value* parameter is retained by *theArray* using the retain callback provided when *theArray* was created. If *value* is not of the type expected by the retain callback, the behavior is undefined. The *value* parameter is assigned to the index one larger than the previous largest index and the count of *theArray* is increased by one.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageBrowserView

ImageClient

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

CFArrayCreateMutable

Creates a new empty mutable array.

```
CFMutableArrayRef CFArrayCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity,
    const CFArrayCallBacks *callBacks
);
```

Parameters

allocator

The allocator to use to allocate memory for the new array and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new array. The array starts empty and can grow to this number of values (and it can have less). If this parameter is 0, the array's maximum capacity is not limited. The value must not be negative.

callBacks

A pointer to a `CFArrayCallBacks` structure initialized with the callbacks for the array to use on each value in the array. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple array creations. This parameter may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in.

If any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a `CFArrayCallBacks` structure, the behavior is undefined. If any value put into the array is not one understood by one of the callback functions, the behavior when that callback function is used is undefined. If the array contains `CType` objects only, then pass `kCTypeArrayCallBacks` as this parameter to use the default callback functions.

Return Value

A new mutable array, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Calibrator

HID Config Save

HID Explorer

ImageBrowserView

ImageClient

Declared In

CFArray.h

CFArrayCreateMutableCopy

Creates a new mutable array with the values from another array.

```
CFMutableArrayRef CFArrayCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFArrayRef theArray
);
```

Parameters

allocator

The allocator to use to allocate memory for the new array and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new array. The array starts with the same count as *theArray* and can grow to this number of values (and it can have less). If this parameter is 0, the array's maximum capacity is not limited. The capacity must not be negative, and must be greater than or equal to the count of *theArray*.

theArray

The array to copy. The pointer values from the array are copied into the new array. However, the values are also retained by the new array.

Return Value

A new mutable array that contains the same values as *theArray*. The new array has the same count as the *theArray* and uses the same callbacks. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPreferences

ComboBoxPrefs

databurntest

MFSLives

MoreSCF

Declared In

CFArray.h

CFArrayExchangeValuesAtIndices

Exchanges the values at two indices of an array.

```
void CFArrayExchangeValuesAtIndices (
    CFMutableArrayRef theArray,
    CFIndex idx1,
    CFIndex idx2
);
```

Parameters*theArray*

The array that contains the values to be swapped.

idx1

The index of the value to swap with the value at *idx2*. The index must not exceed the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray* before the operation).

idx2

The index of the value to swap with the value at *idx1*. The index must not exceed the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray* before the operation).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFArrayInsertValueAtIndex

Inserts a value into an array at a given index.

```
void CFArrayInsertValueAtIndex (
    CFMutableArrayRef theArray,
    CFIndex idx,
    const void *value
);
```

Parameters*theArray*

The array into which *value* is inserted. If *theArray* is a fixed-capacity array and it is full before this operation, the behavior is undefined.

idx

The index at which to insert *value*. The index must not exceed the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray* before the operation). If the index is the same as the count of *theArray*, this function has the same effect as [CFArrayAppendValue](#) (page 278).

value

The value to insert into *theArray*. The value is retained by *theArray* using the retain callback provided when *theArray* was created. If *value* is not of the type expected by the retain callback, the behavior is undefined.

Discussion

The *value* parameter is assigned to the index *idx*, and all values in *theArray* with equal and larger indices have their indices increased by one.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPreferences

CFPrefTopScores

ComboBoxPrefs

ImageBrowserView

QTCarbonShell

Declared In

CFArray.h

CFArrayRemoveAllValues

Removes all the values from an array, making it empty.

```
void CFArrayRemoveAllValues (
    CFMutableArrayRef theArray
);
```

Parameters

theArray

The array from which all of the values are removed.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

Declared In

CFArray.h

CFArrayRemoveValueAtIndex

Removes the value at a given index from an array.

```
void CFArrayRemoveValueAtIndex (
    CFMutableArrayRef theArray,
    CFIndex idx
);
```

Parameters*theArray*

The array from which the value is to be removed.

idx

The index of the value to remove. The value not lie outside the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray* before the operation).

Discussion

All values in *theArray* with indices larger than *idx* have their indices decreased by one.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ComboBoxPrefs

ImageClient

MFSLives

MoreSCF

QTCarbonShell

Declared In

CFArray.h

CFArrayReplaceValues

Replaces a range of values in an array.

```
void CFArrayReplaceValues (
    CFMutableArrayRef theArray,
    CFRange range,
    const void **newValues,
    CFIndex newCount
);
```

Parameters*theArray*

The array in which some values are to be replaced. If this parameter is not a valid CFMutableArray object, the behavior is undefined.

range

The range of values within *theArray* to replace. The range location or end point (defined by the location plus length minus 1) must not lie outside the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray*). The range length must not be negative. The range may be empty (length 0), in which case the new values are merely inserted at the range location.

newValues

A C array of the pointer-sized values to be placed into *theArray*. The new values in *theArray* are ordered in the same order in which they appear in this C array. This parameter may be NULL if the *newCount* parameter is 0. This C array is not changed or freed by this function. If this parameter is not a valid pointer to a C array of at least *newCount* pointers, the behavior is undefined.

newCount

The number of values to copy from the *newValues* C array into *theArray*. If this parameter is different from the range length, the excess *newCount* values are inserted after the range or the excess range values are deleted. This parameter may be 0, in which case no new values are replaced into *theArray* and the values in the range are simply removed. If this parameter is negative or greater than the number of values actually in the *newValues* C array, the behavior is undefined.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

Declared In

CFArray.h

CFArraySetValueAtIndex

Changes the value at a given index in an array.

```
void CFArraySetValueAtIndex (
    CFMutableArrayRef theArray,
    CFIndex idx,
    const void *value
);
```

Parameters*theArray*

The array in which the value is to be changed.

idx

The index at which to set the new value. The value must not lie outside the index space of *theArray* (0 to N-1 inclusive, where N is the count of the array before the operation).

value

The value to set in *theArray*. The value is retained by *theArray* using the retain callback provided when *theArray* was created and the previous value at *idx* is released. If the value is not of the type expected by the retain callback, the behavior is undefined. The indices of other values are not affected.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AlbumToSlideshow

Watcher

Declared In

CFArray.h

CFArraySortValues

Sorts the values in an array using a given comparison function.

```
void CFArraySortValues (
    CFMutableArrayRef theArray,
    CFRange range,
    CFComparatorFunction comparator,
    void *context
);
```

Parameters

theArray

The array whose values are sorted.

range

The range of values within *theArray* to sort. The range location or end point (defined by the location plus length minus 1) must not lie outside the index space of *theArray* (0 to N-1 inclusive, where N is the count of *theArray*). The range length must not be negative. The range may be empty (length 0).

comparator

The function with the comparator function type signature that is used in the sort operation to compare the values in *theArray*. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. If there are values in *theArray* that the *comparator* function does not expect or cannot properly compare, the behavior is undefined. The values in the range are sorted from least to greatest according to this function.

context

A pointer-sized program-defined value, which is passed as the third parameter to the *comparator* function, but is otherwise unused by this function. If the context is not what is expected by the *comparator* function, the behavior is undefined.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Calibrator

HID Explorer

MoreIsBetter

MoreSCF

QISA

Declared In

CFArray.h

Data Types

CFMutableArrayRef

A reference to a mutable array object.

```
typedef struct __CFArray *CFMutableArrayRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFArray.h

CFMutableAttributedString Reference

Derived From:	<i>CFPropertyList Reference</i> <i>CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFMutableAttributedString.h CFBase.h
Companion guides	Property List Programming Topics for Core Foundation Strings Programming Guide for Core Foundation Data Formatting Guide for Core Foundation

Overview

Instances of `CFMutableAttributedString` manage mutable character strings and associated sets of attributes (for example, font and kerning information) that apply to individual characters or ranges of characters in the string. `CFAttributedString` as defined in `CoreFoundation` provides the basic container functionality, while higher levels provide definitions for standard attributes, their values, and additional behaviors involving these. `CFMutableAttributedString` represents a mutable string—use `CFAttributedString` to create and manage an attributed string that cannot be changed after it has been created.

iPhone OS Note: While Core Foundation on iPhone OS contains `CFMutableAttributedString`, there are no additions to the APIs in UIKit to add specific attributes such as font, style, or color, and there are no APIs to draw attributed strings.

`CFMutableAttributedString` is not a “subclass” of `CFMutableString`; that is, it does not respond to `CFMutableString` (or `CFString`) function calls. `CFAttributedString` conceptually contains a `CFMutableString` to which it applies attributes. This protects you from ambiguities caused by the semantic differences between simple and attributed string. Functions defined for `CFAttributedString` can be applied to a `CFMutableAttributedString` object.

Attributes are identified by key/value pairs stored in `CFDictionary` objects. Keys must be `CFString` objects, while the corresponding values are `CType` objects of an appropriate type. See the attribute constants in *NSAttributedString Application Kit Additions Reference* for standard attribute names on Mac OS X.

Important: Attribute dictionaries set for an attributed string must always be created with `kCFCopyStringDictionaryKeyCallbacks` for their dictionary key callbacks and `kCFTypeDictionaryValueCallbacks` for their value callbacks; otherwise it's an error.

When you modify the contents of a mutable attributed string, it may have to do a lot of work to ensure it is internally consistent, and to coalesce runs of identical attributes. You can call [CFAttributedStringBeginEditing](#) (page 289) and [CFAttributedStringEndEditing](#) (page 290) around a set of related mutation calls that don't require the string to be in consistent state in between, and thereby reduce the amount of work necessary. These calls can be nested.

On Mac OS X, `NSMutableAttributedString` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSMutableAttributedString`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSMutableAttributedString *` parameter, you can pass in an object of type `NSMutableAttributedStringRef`, and in a function where you see a `NSMutableAttributedStringRef` parameter, you can pass in an `NSMutableAttributedString` instance. See [Interchangeable Data Types](#) for more information on toll-free bridging.

iPhone OS Note: `NSMutableAttributedString` is not available on iPhone OS.

There is not always a 1:1 mapping between `NSMutableAttributedString`'s methods and `NSMutableAttributedString`'s functions. For example, to perform an operation equivalent to `NSMutableAttributedString`'s `appendAttributedString:` method on a `NSMutableAttributedString` object, you can use [CFAttributedStringReplaceAttributedString](#) (page 292) and specify `CFRangeMake(CFAttributedStringGetLength(attrStr), 0)` as the range. Alternatively you can cast the `NSMutableAttributedString` object to an `NSMutableAttributedString` object and send the `appendAttributedString:` message.

Functions by Task

Creating a NSMutableAttributedString

[CFAttributedStringCreateMutableCopy](#) (page 290)

Creates a mutable copy of an attributed string.

[CFAttributedStringCreateMutable](#) (page 289)

Creates a mutable attributed string.

Modifying a NSMutableAttributedString

[CFAttributedStringBeginEditing](#) (page 289)

Defers internal consistency-checking and coalescing for a mutable attributed string.

[CFAttributedStringEndEditing](#) (page 290)

Re-enables internal consistency-checking and coalescing for a mutable attributed string.

[CFAttributedStringGetMutableString](#) (page 291)

Gets as a mutable string the string for an attributed string.

[CFAttributedStringRemoveAttribute](#) (page 291)

Removes the value of a single attribute over a specified range.

[CFAttributedStringReplaceString](#) (page 292)

Modifies the string of an attributed string.

[CFAttributedStringReplaceAttributedString](#) (page 292)

Replaces the attributed substring over a range with another attributed string.

[CFAttributedStringSetAttribute](#) (page 293)

Sets the value of a single attribute over the specified range.

[CFAttributedStringSetAttributes](#) (page 294)

Sets the value of attributes of a mutable attributed string over a specified range.

Functions

CFAttributedStringBeginEditing

Defers internal consistency-checking and coalescing for a mutable attributed string.

```
void CFAttributedStringBeginEditing (
    CFMutableAttributedStringRef aStr
);
```

Parameters

str

A mutable attributed string that is to be edited.

Discussion

Defers internal consistency-checking and coalescing for a mutable attributed string. You must balance a call to this function with a corresponding [CFAttributedStringEndEditing](#) (page 290).

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringCreateMutable

Creates a mutable attributed string.

```
CFMutableAttributedStringRef CFAttributedStringCreateMutable (
    CFAllocatorRef alloc,
    CFIndex maxLength
);
```

Parameters

alloc

An allocator to be used to allocate memory for the new attributed string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

maxLength

The limit on the length of the returned attributed string; exceeding this size during any subsequent editing operation is a programming error. Pass 0 to specify no limit.

Return Value

A new mutable attributed string. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringCreateMutableCopy

Creates a mutable copy of an attributed string.

```
CFMutableAttributedStringRef CFAttributedStringCreateMutableCopy (
    CFAllocatorRef alloc,
    CFIndex maxLength,
    CFAttributedStringRef aStr
);
```

Parameters

alloc

The allocator to be used to allocate memory for the new attributed string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

maxLength

The limit on the length of the returned attributed string; exceeding this size during any subsequent editing operation is a programming error. Pass 0 to specify no limit.

aStr

The attributed string to copy.

Return Value

A mutable copy of *aStr*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Related Sample Code

CoreTextTest

Declared In

CFAttributedString.h

CFAttributedStringEndEditing

Re-enables internal consistency-checking and coalescing for a mutable attributed string.

```
void CFAttributedStringEndEditing (
    CFMutableAttributedStringRef aStr
);
```

Parameters*str*

A mutable attributed string, following a call to [CFAttributedStringBeginEditing](#) (page 289).

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringGetMutableString

Gets as a mutable string the string for an attributed string.

```
CFMutableStringRef CFAttributedStringGetMutableString (
    CFMutableAttributedStringRef aStr
);
```

Parameters*str*

The mutable attributed string from which to retrieve the string.

Return Value

The string for the specified attributed string as a mutable string.

Discussion

This function allows you to edit the character contents of the attributed string as if it were a CFMutableString. Attributes corresponding to the edited range are appropriately modified. If, as a result of the edit, new characters are introduced into the string, they inherit the attributes of the first replaced character from range. If no existing characters are replaced by the edit, the new characters inherit the attributes of the character preceding range if it has any, otherwise of the character following range. If the initial string is empty, the attributes for the new characters are also empty.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringRemoveAttribute

Removes the value of a single attribute over a specified range.

```
void CFAttributedStringRemoveAttribute (
    CFMutableAttributedStringRef aStr,
    CFRange range,
    CFStringRef attrName
);
```

Parameters*str*

The mutable attributed string to modify.

*range*The range of *aStr* from which to remove the specified attribute. *range* must not exceed the bounds of *aStr*.*attrName*

The name of the attribute to remove.

DiscussionIt is *not* an error if the specified attribute does not exist over the given range.**Availability**

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringReplaceAttributedString

Replaces the attributed substring over a range with another attributed string.

```
void CFAttributedStringReplaceAttributedString (
    CFMutableAttributedStringRef aStr,
    CFRange range,
    CFAttributedStringRef replacement
);
```

Parameters*aStr*

The mutable attributed string to modify.

*range*The range of *aStr* to be modified. *range* must not specify characters outside the bounds of *aStr*.*replacement*The attributed string to replace the contents of *aStr* in *range*.**Availability**

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringReplaceString

Modifies the string of an attributed string.

```
void CFAttributedStringReplaceString (
    NSMutableAttributedStringRef aStr,
    CFRange range,
    CFStringRef replacement
);
```

Parameters*aStr*

The mutable attributed string to modify.

*range*The range of *aStr* to be modified. *range* must not specify characters outside the bounds of *aStr*.*replacement*The string to replace the existing string in *range*.**Availability**

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFAttributedStringSetAttribute

Sets the value of a single attribute over the specified range.

```
void CFAttributedStringSetAttribute (
    NSMutableAttributedStringRef aStr,
    CFRange range,
    CFStringRef attrName,
    CTypeRef value
);
```

Parameters*aStr*

The mutable attributed string to modify.

*range*The range of *aStr* over to which the new attributes apply. *range* must not exceed the bounds of *aStr*.*attrName*

The name of the attribute whose value to set.

*value*The value of the attribute *attrName* to apply over *range*. This value may not be NULL. If you want to remove an attribute, use [CFAttributedStringRemoveAttribute](#) (page 291).**Availability**

Available in Mac OS X v10.4 and later.

Related Sample Code

CoreTextTest

Declared In

CFAttributedString.h

CFAttributedStringSetAttributes

Sets the value of attributes of a mutable attributed string over a specified range.

```
void CFAttributedStringSetAttributes (
    CFMutableAttributedStringRef aStr,
    CFRange range,
    CFDictionaryRef replacement,
    Boolean clearOtherAttributes
);
```

Parameters

aStr

The mutable attributed string to modify.

range

The range of *aStr* over to which the new attributes apply. *range* must not exceed the bounds of *aStr*.

replacement

A dictionary that contains key-value pairs that specify the new attributes to apply to *range*. The keys must be CFString objects, and the corresponding values must be CFTYPE objects.

clearOtherAttributes

If `false`, existing attributes (that aren't being replaced) are left alone; otherwise they are cleared.

Discussion

Note that after this call, if it is mutable, changes to *replacement* will not affect the contents of the attributed string.

Availability

Available in Mac OS X v10.4 and later.

Related Sample Code

CoreTextTest

Declared In

CFAttributedString.h

Data Types

CFMutableAttributedStringRef

A reference to a CFMutableAttributedString object.

```
typedef struct __CFAttributedString *CFMutableAttributedStringRef;
```

Discussion

The `CFMutableAttributedStringRef` type refers to a mutable object that combines a CFString object with a collection of attributes that specify how the characters in the string should be displayed. CFMutableAttributedString is an opaque type that defines the characteristics and behavior of CFMutableAttributedString objects.

CFMutableAttributedString objects also respond to all functions intended for immutable CFAttributedString objects.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFAttributedString.h

CFMutableBag Reference

Derived From:	CFBag : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBag.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFMutableBag manages dynamic bags. The basic interface for managing bags is provided by CFBag. CFMutableBag adds functions to modify the contents of a bag.

You create a mutable bag object using either the [CFBagCreateMutable](#) (page 298) or [CFBagCreateMutableCopy](#) (page 299) function.

CFMutableBag provides several functions for adding and removing values from a bag. The [CFBagAddValue](#) (page 298) function adds a value to a bag and [CFBagRemoveValue](#) (page 300) removes values from a bag.

Functions by Task

Creating a Mutable Bag

[CFBagCreateMutable](#) (page 298)
Creates a new empty mutable bag.

[CFBagCreateMutableCopy](#) (page 299)
Creates a new mutable bag with the values from another bag.

Modifying a Mutable Bag

[CFBagAddValue](#) (page 298)
Adds a value to a mutable bag.

[CFBagRemoveAllValues](#) (page 300)
Removes all values from a mutable bag.

[CFBagRemoveValue](#) (page 300)
Removes a value from a mutable bag.

[CFBagReplaceValue](#) (page 301)

Replaces a value in a mutable bag.

[CFBagSetValue](#) (page 301)

Sets a value in a mutable bag.

Functions

CFBagAddValue

Adds a value to a mutable bag.

```
void CFBagAddValue (
    CFMutableBagRef theBag,
    const void *value
);
```

Parameters

theBag

The bag to which *value* is added.

value

A CType object or a pointer value to add to *theBag* (or the value itself, if it fits into the size of a pointer).

Discussion

The *value* parameter is retained by *theBag* using the retain callback provided when *theBag* was created. If *value* is not of the type expected by the retain callback, the behavior is undefined. If *value* already exists in the collection, it is simply retained again—no memory is allocated for the added value. Use a CFSet object if you don't want duplicate values in your collection.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagCreateMutable

Creates a new empty mutable bag.

```
CFMutableBagRef CFBagCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity,
    const CFBagCallbacks *callBacks
);
```

Parameters

allocator

The allocator object to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new bag. The bag starts empty and can grow to this number of values (and it can have less). If this parameter is 0, the bag's maximum capacity is not limited. This value must not be negative.

callbacks

A pointer to a `CFBagCallbacks` structure initialized with the callbacks to use to retain, release, describe, and compare values in the bag. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations. This parameter may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in.

If any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a `CFBagCallbacks` structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

If the collection contains only `CType` objects, then pass `kCTypeBagCallbacks` as this parameter to use the default callback functions.

Return Value

A new mutable bag, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates a new empty mutable bag to which you can add values using the [CFBagAddValue](#) (page 298) function. The `capacity` parameter specifies the maximum number of values that the `CFBag` object can contain. If it is 0, then there is no limit to the number of values that can be added (aside from constraints such as available memory).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFBag.h`

CFBagCreateMutableCopy

Creates a new mutable bag with the values from another bag.

```
CFMutableBagRef CFBagCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFBagRef theBag
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new bag and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new bag. The bag starts with the same count as *theBag*, and can grow to this number of values (and it can have less). If this value is 0, the bag's maximum capacity is not limited. This value must be greater than or equal to the count of *theBag*, and must not be negative.

theBag

The bag to copy. The pointer values from *theBag* are copied into the new bag. However, the values are also retained by the new bag. The count of the new bag is the same as the count of *theBag*. The new bag uses the same callbacks as *theBag*.

Return Value

A new mutable bag that contains the same values as *theBag*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagRemoveAllValues

Removes all values from a mutable bag.

```
void CFBagRemoveAllValues (
    CFMutableBagRef theBag
);
```

Parameters

theBag

The bag from which all of the values are to be removed.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagRemoveValue

Removes a value from a mutable bag.

```
void CFBagRemoveValue (
    CFMutableBagRef theBag,
    const void *value
);
```

Parameters

theBag

The bag from which *value* is to be removed.

value

The value to be removed from the collection.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagReplaceValue

Replaces a value in a mutable bag.

```
void CFBagReplaceValue (
    CFMutableBagRef theBag,
    const void *value
);
```

Parameters*theBag*The bag from which *value* is to be replaced.*value*

The value to be replaced in the collection. If this value does not already exist in the collection, the function does nothing. You may pass the value itself instead of a pointer if it is pointer-size or less. The equal callback provided when *theBag* was created is used to compare. If the equal callback was NULL, pointer equality (in C, `==`) is used. If *value*, or any other value in *theBag*, is not understood by the equal callback, the behavior is undefined.

Discussion

Depending on the implementation of the equal callback specified when creating *theBag*, the object that is replaced by *value* may not have the same pointer equality.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFBagSetValue

Sets a value in a mutable bag.

```
void CFBagSetValue (
    CFMutableBagRef theBag,
    const void *value
);
```

Parameters*theBag*The bag in which *value* is to be set.*value*

The value to be set in the collection. If this value already exists in *theBag*, it is replaced. You may pass the value itself instead of a pointer to it if the value is pointer-size or less. If *theBag* is fixed-size and the value is beyond its capacity, the behavior is undefined.

Discussion

Depending on the implementation of the equal callback specified when creating *theBag*, the value that is replaced by *value* may not have the same pointer equality.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

Data Types

CFMutableBagRef

A reference to a mutable bag object.

```
typedef struct __CFBag *CFMutableBagRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBag.h

CFMutableBitVector Reference

Derived From:	CFBitVector : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBitVector.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFMutableBitVector objects manage dynamic bit vectors. The basic interface for managing bit vectors is provided by CFBitVector. CFMutableBitVector adds functions to modify the contents of a bit vector.

You create a mutable bit vector object using either the [CFBitVectorCreateMutable](#) (page 304) or [CFBitVectorCreateMutableCopy](#) (page 304) function. You add to and remove from a bit vector by altering the size of the bit vector with the [CFBitVectorSetCount](#) (page 307) function

Functions by Task

Creating a CFMutableBitVector Object

[CFBitVectorCreateMutable](#) (page 304)

Creates a mutable bit vector.

[CFBitVectorCreateMutableCopy](#) (page 304)

Creates a new mutable bit vector from a pre-existing bit vector.

Modifying a Bit Vector

[CFBitVectorFlipBitAtIndex](#) (page 305)

Flips a bit value in a bit vector.

[CFBitVectorFlipBits](#) (page 305)

Flips a range of bit values in a bit vector.

[CFBitVectorSetAllBits](#) (page 306)

Sets all bits in a bit vector to a particular value.

[CFBitVectorSetBitAtIndex](#) (page 306)

Sets the value of a particular bit in a bit vector.

[CFBitVectorSetBits](#) (page 307)

Sets a range of bits in a bit vector to a particular value.

[CFBitVectorSetCount](#) (page 307)

Changes the size of a mutable bit vector.

Functions

CFBitVectorCreateMutable

Creates a mutable bit vector.

```
CFMutableBitVectorRef CFBitVectorCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new bit vector. The bit vector starts empty and can grow to this number of values. If 0, the new bit vector can grow to any size.

Return Value

A new bit vector. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBitVector.h`

CFBitVectorCreateMutableCopy

Creates a new mutable bit vector from a pre-existing bit vector.

```
CFMutableBitVectorRef CFBitVectorCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFBitVectorRef bv
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new bit vector. The bit vector starts with the same number of values as *bv* and can grow to this number of values. If 0, the new bit vector can grow to any size. If non-zero, *capacity* must be large enough to hold all bit values from *bv*.

bv

The bit vector to copy.

Return Value

A new bit vector holding the same bit values as *bv*. Ownership follows the Create Rule

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorFlipBitAtIndex

Flips a bit value in a bit vector.

```
void CFBitVectorFlipBitAtIndex (
    CFMutableBitVectorRef bv,
    CFIndex idx
);
```

Parameters

bv

The bit vector to modify.

idx

The index of the bit value to flip.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorFlipBits

Flips a range of bit values in a bit vector.

```
void CFBitVectorFlipBits (
    CFMutableBitVectorRef bv,
    CFRange range
);
```

Parameters

bv

The bit vector to modify.

range

The range of bit values in *bv* to flip.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorSetAllBits

Sets all bits in a bit vector to a particular value.

```
void CFBitVectorSetAllBits (
    CFMutableBitVectorRef bv,
    CFBits value
);
```

Parameters

bv

The bit vector to modify.

value

The bit value to which to set all bits in *bv*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorSetBitAtIndex

Sets the value of a particular bit in a bit vector.

```
void CFBitVectorSetBitAtIndex (
    CFMutableBitVectorRef bv,
    CFIndex idx,
    CFBits value
);
```

Parameters

bv

The bit vector to modify.

idx

The index of the bit value to set.

value

The bit value to which to set the bit at index *idx*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorSetBits

Sets a range of bits in a bit vector to a particular value.

```
void CFBitVectorSetBits (
    CFMutableBitVectorRef bv,
    CFRange range,
    CFBits value
);
```

Parameters

bv

The bit vector to modify.

range

The range of bits to set.

value

The bit value to which to set the range of bits.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFBitVectorSetCount

Changes the size of a mutable bit vector.

```
void CFBitVectorSetCount (
    CFMutableBitVectorRef bv,
    CFIndex count
);
```

Parameters

bv

The bit vector to modify.

count

The new size for *bv*. If *count* is greater than the current size of *bv*, the additional bit values are set to 0.

Discussion

If *bv* was created with a fixed capacity, you cannot increase its size beyond that capacity.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

Data Types

CFMutableBitVectorRef

A reference to a mutable bit vector object.

```
typedef struct __CFBitVector *CFMutableBitVectorRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBitVector.h

CFMutableCharacterSet Reference

Derived From:	CFCharacterSet : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFCharacterSet.h
Companion guide	Strings Programming Guide for Core Foundation

Overview

CFMutableCharacterSet manages dynamic character sets. The basic interface for managing character sets is provided by CFCharacterSet. CFMutableCharacterSet adds functions to modify the contents of a character set.

You create a mutable character set object using either the [CFCharacterSetCreateMutable](#) (page 311) or [CFCharacterSetCreateMutableCopy](#) (page 311) function.

CFMutableCharacterSet is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableCharacterSet. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an NSMutableCharacterSet * parameter, you can pass in a CFMutableCharacterSetRef, and in a function where you see a CFMutableCharacterSetRef parameter, you can pass in an NSMutableCharacterSet instance. This capability also applies to concrete subclasses of NSMutableCharacterSet. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Mutable Character Set

[CFCharacterSetCreateMutable](#) (page 311)

Creates a new empty mutable character set.

[CFCharacterSetCreateMutableCopy](#) (page 311)

Creates a new mutable character set with the values from another character set.

Adding Characters

[CFCharacterSetAddCharactersInRange](#) (page 310)

Adds a given range to a character set.

[CFCharacterSetAddCharactersInString](#) (page 311)

Adds the characters in a given string to a character set.

Removing Characters

[CFCharacterSetRemoveCharactersInRange](#) (page 313)

Removes a given range of Unicode characters from a character set.

[CFCharacterSetRemoveCharactersInString](#) (page 313)

Removes the characters in a given string from a character set.

Logical Operations

[CFCharacterSetIntersect](#) (page 312)

Forms an intersection of two character sets.

[CFCharacterSetInvert](#) (page 312)

Inverts the content of a given character set.

[CFCharacterSetUnion](#) (page 314)

Forms the union of two character sets.

Functions

CFCharacterSetAddCharactersInRange

Adds a given range to a character set.

```
void CFCharacterSetAddCharactersInRange (
    CFMutableCharacterSetRef theSet,
    CFRange theRange
);
```

Parameters

theSet

The character set to modify.

theRange

The range to add to the character set. The range is specified in 32-bits in UTF-32 format, and must lie within the valid Unicode character range (from 0x00000 to 0x10FFFF).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetAddCharactersInString

Adds the characters in a given string to a character set.

```
void CFCharacterSetAddCharactersInString (
    CFMutableCharacterSetRef theSet,
    CFStringRef theString
);
```

Parameters

theSet

The character set to modify.

theString

A string containing the characters to add to *theSet*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateMutable

Creates a new empty mutable character set.

```
CFMutableCharacterSetRef CFCharacterSetCreateMutable (
    CFAllocatorRef alloc
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

Return Value

A new empty mutable character set. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetCreateMutableCopy

Creates a new mutable character set with the values from another character set.

```
CFMutableCharacterSetRef CFCharacterSetCreateMutableCopy (
    CFAllocatorRef alloc,
    CFCharacterSetRef theSet
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theSet

The character set to copy.

Return Value

A new mutable character set containing the same characters as *theSet*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetIntersect

Forms an intersection of two character sets.

```
void CFCharacterSetIntersect (
    CFMutableCharacterSetRef theSet,
    CFCharacterSetRef theOtherSet
);
```

Parameters*theSet*

The source character set, modified by intersection with *theOtherSet*.

theOtherSet

The character set with which the intersection is formed.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetInvert

Inverts the content of a given character set.


```
void CFCharacterSetInvert (
    CFMutableCharacterSetRef theSet
);
```

Parameters*theSet*

The character set to invert.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetRemoveCharactersInRange

Removes a given range of Unicode characters from a character set.

```
void CFCharacterSetRemoveCharactersInRange (
    CFMutableCharacterSetRef theSet,
    CFRange theRange
);
```

Parameters*theSet*

The character set to modify.

theRange

The range to remove from the character set. The range is specified in 32-bits in UTF-32 format, and must lie within the valid Unicode character range (from 0x00000 to 0x10FFFF).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetRemoveCharactersInString

Removes the characters in a given string from a character set.

```
void CFCharacterSetRemoveCharactersInString (
    CFMutableCharacterSetRef theSet,
    CFStringRef theString
);
```

Parameters*theSet*

The character set to modify.

*theString*A string containing the characters to remove from *theSet*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFCharacterSetUnion

Forms the union of two character sets.

```
void CFCharacterSetUnion (
    CFMutableCharacterSetRef theSet,
    CFCharacterSetRef theOtherSet
);
```

Parameters

theSet

The source character set, modified by union with *theOtherSet*.

theOtherSet

The character set with which the union is formed.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

Data Types

CFMutableCharacterSetRef

A reference to a mutable character set object.

```
typedef struct __CFCharacterSet *CFMutableCharacterSetRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFCharacterSet.h

CFMutableData Reference

Derived From:	CFData : CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFData.h
Companion guides	Binary Data Programming Guide for Core Foundation Property List Programming Topics for Core Foundation

Overview

CFMutableData manages dynamic binary data. The basic interface for managing binary data is provided by CFData. CFMutableData adds functions to modify the contents of a binary data object.

You create a mutable data object using either the [CFDataCreateMutable](#) (page 316) or [CFDataCreateMutableCopy](#) (page 317) function.

Bytes are added to a data object with the [CFDataAppendBytes](#) (page 315) function. Bytes are removed from a data object with the [CFDataDeleteBytes](#) (page 317) function.

CFMutableData is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableData. What this means is that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. In other words, in a method where you see an `NSMutableData *` parameter, you can pass in a `CFMutableDataRef`, and in a function where you see a `CFMutableDataRef` parameter, you can pass in an `NSMutableData` instance. This also applies to concrete subclasses of `NSMutableData`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions

CFDataAppendBytes

Appends the bytes from a byte buffer to the contents of a CFData object.

```
void CFDataAppendBytes (
    CFMutableDataRef theData,
    const UInt8 *bytes,
    CFIndex length
);
```

Parameters*theData*

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

bytes

A pointer to the buffer of bytes to be added to *theData*.

length

The number of bytes in the byte buffer *bytes*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonSketch

CFLocalServer

ImageClient

Declared In

CFData.h

CFDataCreateMutable

Creates an empty CFMutableData object.

```
CFMutableDataRef CFDataCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity
);
```

Parameters*allocator*

The CFAllocator object to be used to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of bytes that the CFData object can contain. If 0, the object can grow to a size only limited by the constraints of available memory and address space.

Return Value

A CFMutableData object or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an empty (that is, content-less) CFMutableData object. You can add raw data to this object with the [CFDataAppendBytes](#) (page 315) function, and thereafter you can replace and delete characters with the appropriate CFMutableData functions. If the *capacity* parameter is greater than 0, any attempt to add characters beyond this limit can result in undefined behavior.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonSketch

CFLocalServer

ImageClient

SeeMyFriends

UnsharpMask

Declared In

CFData.h

CFDataCreateMutableCopy

Creates a CFMutableData object by copying another CFData object.

```
CFMutableDataRef CFDataCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFDataRef theData
);
```

Parameters

allocator

The CFAllocator object to be used to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of bytes the object should contain. If 0, the object can grow to a size only limited by the constraints of available memory and address space. Note that initially the created CFData object still has the same length as the original object; this parameter simply specifies what the maximum size is. CFData might try to optimize its internal storage by paying attention to this value.

theData

The CFData object to be copied.

Return Value

A CFMutableData object that has the same contents as the original object. Returns `NULL` if there was a problem copying the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

CFDataDeleteBytes

Deletes the bytes in a CFMutableData object within a specified range.

```
void CFDataDeleteBytes (
    CFMutableDataRef theData,
    CFRange range
);
```

Parameters*theData*

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

range

The range of bytes (that is, the starting byte and the number of bytes from that point) to delete from *theData*'s byte buffer.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFData.h

CFDataGetMutableBytePtr

Returns a pointer to a mutable byte buffer of a CFMutableData object.

```
UInt8 *CFDataGetMutableBytePtr (
    CFMutableDataRef theData
);
```

Parameters*theData*

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

Return Value

A pointer to the bytes associated with *theData*.

Discussion

If the length of *theData*'s data is not zero, this function is guaranteed to return a pointer to a CFMutableData object's internal bytes. If the length of *theData*'s data is zero, this function may or may not return NULL dependent upon many factors related to how the object was created (moreover, in this case the function result might change between different releases and on different platforms).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

CFDataIncreaseLength

Increases the length of a CFMutableData object's internal byte buffer, zero-filling the extension to the buffer.

```
void CFDataIncreaseLength (
    CFMutableDataRef theData,
    CFIndex extraLength
);
```

Parameters*theData*

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

extraLength

The number of bytes by which to increase the byte buffer.

Discussion

This function increases the length of a CFMutableData object's underlying byte buffer to a new size, initializing the new bytes to 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

CFDataReplaceBytes

Replaces those bytes in a CFMutableData object that fall within a specified range with other bytes.

```
void CFDataReplaceBytes (
    CFMutableDataRef theData,
    CFRange range,
    const UInt8 *newBytes,
    CFIndex newLength
);
```

Parameters*theData*

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

range

The range of bytes (that is, the starting byte and the number of bytes from that point) to delete from *theData*'s byte buffer.

newBytes

A pointer to the buffer containing the replacement bytes.

newLength

The number of bytes in the byte buffer *newBytes*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

CFDataSetLength

Resets the length of a CFMutableData object's internal byte buffer.

```
void CFDataSetLength (
    CFMutableDataRef theData,
    CFIndex length
);
```

Parameters

theData

A CFMutableData object. If you pass an immutable CFData object, the behavior is not defined.

length

The new size of *theData*'s byte buffer.

Discussion

This function resets the length of a CFMutableData object's underlying byte buffer to a new size. If that size is less than the current size, it truncates the excess bytes. If that size is greater than the current size, it zero-fills the extension to the byte buffer.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

Data Types

CFMutableDataRef

A reference to a CFMutableData object.

```
typedef struct __CFData *CFMutableDataRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFData.h

NSMutableDictionary Reference

Derived From:	NSDictionary : CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	NSDictionary.h
Companion guides	Collections Programming Topics for Core Foundation Property List Programming Topics for Core Foundation

Overview

NSMutableDictionary manages dynamic dictionaries. The basic interface for managing dictionaries is provided by NSDictionary. NSMutableDictionary adds functions to modify the contents of a dictionary.

You create a mutable dictionary object using either the [NSMutableDictionaryCreateMutable](#) (page 323) or [NSMutableDictionaryCreateMutableCopy](#) (page 324) function. You can add key-value pairs using the [NSMutableDictionaryAddValue](#) (page 322) and [NSMutableDictionarySetValue](#) (page 326) functions. When adding key-value pairs to a dictionary, the keys and values are not copied—they are retained so they are not invalidated before the dictionary is deallocated. You can remove key-value pairs using the [NSMutableDictionaryRemoveValue](#) (page 325) function. When removing key-value pairs from a dictionary, the keys and values are released.

NSMutableDictionary is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableDictionary. What this means is that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. This means that in a method where you see an NSMutableDictionary * parameter, you can pass in a NSMutableDictionaryRef, and in a function where you see a NSMutableDictionaryRef parameter, you can pass in an NSMutableDictionary instance. This also applies to concrete subclasses of NSMutableDictionary. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Mutable Dictionary

[NSMutableDictionaryCreateMutable](#) (page 323)
Creates a new mutable dictionary.

[NSMutableDictionaryCreateMutableCopy](#) (page 324)
Creates a new mutable dictionary with the key-value pairs from another dictionary.

Modifying a Dictionary

[CFDictionaryAddValue](#) (page 322)

Adds a key-value pair to a dictionary if the specified key is not already present.

[CFDictionaryRemoveAllValues](#) (page 325)

Removes all the key-value pairs from a dictionary, making it empty.

[CFDictionaryRemoveValue](#) (page 325)

Removes a key-value pair.

[CFDictionaryReplaceValue](#) (page 326)

Replaces a value corresponding to a given key.

[CFDictionarySetValue](#) (page 326)

Sets the value corresponding to a given key.

Functions

CFDictionaryAddValue

Adds a key-value pair to a dictionary if the specified key is not already present.

```
void CFDictionaryAddValue (
    CFMutableDictionaryRef theDict,
    const void *key,
    const void *value
);
```

Parameters

theDict

The dictionary to modify. If the dictionary is a fixed-capacity dictionary and it is full before this operation, the behavior is undefined.

key

The key for the value to add to the dictionary—a CType object or a pointer value. The *key* is retained by the dictionary using the retain callback provided when the dictionary was created, so must be of the type expected by the callback. If a key which matches *key* is already present in the dictionary, this function does nothing ("add if absent").

value

A CType object or a pointer value to add to the dictionary. The *value* is retained by the dictionary using the retain callback provided when the dictionary was created, so must be of the type expected by the callback.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AddressBookCarbon

MoreIsBetter

MoreSCF

QISA

SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryCreateMutable

Creates a new mutable dictionary.

```
CFMutableDictionaryRef CFDictionaryCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity,
    const CFDictionaryKeyCallbacks *keyCallbacks,
    const CFDictionaryValueCallbacks *valueCallbacks
);
```

Parameters

allocator

The allocator to use to allocate memory for the new dictionary and its storage for key-value pairs. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of key-value pairs that can be contained by the dictionary. The dictionary starts empty and can grow to this number of key-value pairs (and it can have less). Pass `0` to specify no limit. The value must not be negative.

keyCallbacks

A pointer to a `CFDictionaryKeyCallbacks` structure initialized with the callbacks to use to retain, release, describe, and compare keys in the dictionary. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as a valid structure of version `0` with all fields `NULL`. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this value is not a valid pointer to a `CFDictionaryKeyCallbacks` structure, the behavior is undefined. If any of the keys put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

If the dictionary will contain only `CType` objects, then pass a pointer to `kCTypeDictionaryKeyCallbacks` as this parameter to use the default callback functions.

valueCallbacks

A pointer to a `CFDictionaryValueCallbacks` structure initialized with the callbacks to use to retain, release, describe, and compare values in the dictionary. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as a valid structure of version `0` with all fields `NULL`. Otherwise, if any of the fields are not valid pointers to functions of the correct type, or this value is not a valid pointer to a `CFDictionaryValueCallbacks` structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

If the dictionary will contain `CType` objects only, then pass a pointer to `kCTypeDictionaryValueCallbacks` as this parameter to use the default callback functions.

Return Value

A new dictionary, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

MoreIsBetter

QISA

SCSIOldAndNew

SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryCreateMutableCopy

Creates a new mutable dictionary with the key-value pairs from another dictionary.

```
CFMutableDictionaryRef CFDictionaryCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFDictionaryRef theDict
);
```

Parameters

allocator

The allocator to use to allocate memory for the new dictionary and its storage for key-value pairs. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of key-value pairs that can be contained by the returned dictionary. The dictionary starts empty, and can grow to this number of key-value pairs (and it can have less). The value must be greater than or equal to the count of *theDict*, or 0 to specify no limit

theDict

The dictionary to copy. The keys and values from the dictionary are copied as pointers into the new dictionary, not that which the values point to (if anything). The keys and values are also retained by the new dictionary. The count of the new dictionary is the same as the count of *theDict*. The new dictionary uses the same callbacks as *theDict*.

Return Value

A new dictionary that contains the same values as *theDict*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

MoreIsBetter

MoreSCF

QISA

Quartz 2D Transformer

Declared In

CFDictionary.h

CFDictionaryRemoveAllValues

Removes all the key-value pairs from a dictionary, making it empty.

```
void CFDictionaryRemoveAllValues (
    CFMutableDictionaryRef theDict
);
```

Parameters*theDict*

The dictionary to modify.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

SeeMyFriends

Declared In

CFDictionary.h

CFDictionaryRemoveValue

Removes a key-value pair.

```
void CFDictionaryRemoveValue (
    CFMutableDictionaryRef theDict,
    const void *key
);
```

Parameters*theDict*

The dictionary to modify.

key

The key of the value to remove from *theDict*. If a key which matches *key* is present in *theDict*, the key-value pair is removed from the dictionary, otherwise this function does nothing ("remove if present").

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

ImageClient

MoreIsBetter

MoreSCF

QISA

Declared In

CFDictionary.h

CFDictionaryReplaceValue

Replaces a value corresponding to a given key.

```
void CFDictionaryReplaceValue (
    CFMutableDictionaryRef theDict,
    const void *key,
    const void *value
);
```

Parameters*theDict*

The dictionary to modify.

*key*The key of the value to replace in *theDict*. If a key which matches *key* is present in the dictionary, the value is changed to the *value*, otherwise this function does nothing ("replace if present").*value*The new value for *key*. The *value* object is retained by *theDict* using the retain callback provided when *theDict* was created, and the old value is released. *value* must be of the type expected by the retain and release callbacks.**Availability**

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

SeeMyFriends

Declared In

CFDictionary.h

CFDictionarySetValue

Sets the value corresponding to a given key.

```
void CFDictionarySetValue (
    CFMutableDictionaryRef theDict,
    const void *key,
    const void *value
);
```

Parameters*theDict*

The dictionary to modify. If this parameter is a fixed-capacity dictionary and it is full before this operation, and the key does not exist in the dictionary, the behavior is undefined.

key

The key of the value to set in *theDict*. If a key which matches *key* is already present in the dictionary, only the value for the key is changed ("add if absent, replace if present"). If no key matches *key*, the key-value pair is added to the dictionary.

If a key-value pair is added, both *key* and *value* are retained by the dictionary, using the retain callback provided when *theDict* was created. *key* must be of the type expected by the key retain callback.

value

The value to add to or replace in *theDict*. *value* is retained using the value retain callback provided when *theDict* was created, and the previous value if any is released. *value* must be of the type expected by the retain and release callbacks.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

MoreIsBetter

MoreSCF

QISA

SCSIOldAndNew

Declared In

CFDictionary.h

Data Types

CFMutableDictionaryRef

A reference to a mutable dictionary object.

```
typedef struct __CFDictionary *CFMutableDictionaryRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDictionary.h

CFMutableSet Reference

Derived From:	CFSet : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFSet.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFMutableSet manages dynamic sets. The basic interface for managing sets is provided by CFSet. CFMutableSet adds functions to modify the contents of a set.

You create a mutable set object using either the [CFSetCreateMutable](#) (page 330) or [CFSetCreateMutableCopy](#) (page 331) function.

CFMutableSet provides several functions for adding and removing values from a set. The [CFSetAddValue](#) (page 329) function adds a value to a set and [CFSetRemoveValue](#) (page 332) removes a value from a set.

CFMutableSet is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableSet. What this means is that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. This means that in a method where you see an `NSMutableSet *` parameter, you can pass in a `CFMutableSetRef`, and in a function where you see a `CFMutableSetRef` parameter, you can pass in an `NSMutableSet` instance. This also applies to concrete subclasses of `NSMutableSet`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions

CFSetAddValue

Adds a value to a CFMutableSet object.

```
void CFSetAddValue (
    CFMutableSetRef theSet,
    const void *value
);
```

Parameters

theSet

The set to modify.

value

A CType object or a pointer value to add to *theSet* (or the value itself, if it fits into the size of a pointer).

value is retained by *theSet* using the retain callback provided when *theSet* was created. If *value* is not of the type expected by the retain callback, the behavior is undefined. If *value* already exists in the collection, this function returns without doing anything.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

CFSetCreateMutable

Creates an empty CFMutableSet object.

```
CFMutableSetRef CFSetCreateMutable (
    CFAllocatorRef allocator,
    CFIndex capacity,
    const CFSetCallbacks *callbacks
);
```

Parameters

allocator

The allocator to use to allocate memory for the new set and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by new set. The set starts empty and can grow to this number of values (and it can have less). If this parameter is 0, the set's maximum capacity is not limited. The value must not be negative.

callbacks

A pointer to a `CFSetCallbacks` structure initialized with the callbacks to use to retain, release, describe, and compare values in the set. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations. This parameter may be `NULL`, which is treated as if a valid structure of version 0 with all fields `NULL` had been passed in.

If any of the fields are not valid pointers to functions of the correct type, or this parameter is not a valid pointer to a `CFSetCallbacks` structure, the behavior is undefined. If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

If the collection contains CType objects only, then pass `kCTypeSetCallbacks` as this parameter to use the default callback functions.

Return Value

A new mutable set, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

CFSetCreateMutableCopy

Creates a new mutable set with the values from another set.

```
CFMutableSetRef CFSetCreateMutableCopy (
    CFAllocatorRef allocator,
    CFIndex capacity,
    CFSetRef theSet
);
```

Parameters

allocator

The allocator to use to allocate memory for the new set and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

capacity

The maximum number of values that can be contained by the new set. The set starts with the same count as *theSet*, and can grow to this number of values (and it can have less). If this parameter is 0, the set's maximum capacity is not limited. This parameter must be greater than or equal to the count of *theSet*, or the behavior is undefined. If this parameter is negative, the behavior is undefined.

theSet

The set to copy. The pointer values from *theSet* are copied into the new set. The values are also retained by the new set. The count of the new set is the same as the count of *theSet*. The new set uses the same callbacks as *theSet*.

Return Value

A new mutable set that contains the same values as *theSet*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetRemoveAllValues

Removes all values from a CFMutableSet object.

```
void CFSetRemoveAllValues (
    CFMutableSetRef theSet
);
```

Parameters

theSet

The set to modify.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetRemoveValue

Removes a value from a CFMutableSet object.

```
void CFSetRemoveValue (
    CFMutableSetRef theSet,
    const void *value
);
```

Parameters

theSet

The set to modify.

value

The value to remove from *theSet*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

CFSetReplaceValue

Replaces a value in a CFMutableSet object.

```
void CFSetReplaceValue (
    CFMutableSetRef theSet,
    const void *value
);
```

Parameters

theSet

The set to modify.

value

The value to replace in *theSet*. If this value does not already exist in *theSet*, the function does nothing. You may pass the value itself instead of a pointer if it is pointer-size or less. The equal callback provided when *theSet* was created is used to compare. If the equal callback was `NULL`, pointer equality (in C, `==`) is used. If *value*, or any other value in *theSet*, is not understood by the equal callback, the behavior is undefined.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFSet.h`

CFSetSetValue

Sets a value in a CFMutableSet object.

```
void CFSetSetValue (
    CFMutableSetRef theSet,
    const void *value
);
```

Parameters

theSet

The set to modify.

value

The value to be set in *theSet*. If this value already exists in *theSet*, it is replaced. You may pass the value itself instead of a pointer to it if the value is pointer-size or less. If *theSet* is fixed-size and setting the value would increase its size beyond its capacity, the behavior is undefined.

Discussion

Depending on the implementation of the equal callback specified when creating *theSet*, the value that is replaced by *value* may not have the same pointer equality.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFSet.h`

Data Types

CFMutableSetRef

A reference to a mutable set object.

```
typedef struct __CFSet *CFMutableSetRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFMutableString Reference

Derived From:	CFString : CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFString.h CFBase.h
Companion guides	Property List Programming Topics for Core Foundation Strings Programming Guide for Core Foundation

Overview

CFMutableString manages dynamic strings. The basic interface for managing strings is provided by CFString. CFMutableString adds functions to modify the contents of a string.

CFMutableString is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableString. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an NSMutableString * parameter, you can pass in a CFMutableStringRef, and in a function where you see a CFMutableStringRef parameter, you can pass in an NSMutableString instance. This also applies to concrete subclasses of NSMutableString. See Interchangeable Data Types for more information on toll-free bridging.

Functions

CFStringAppend

Appends the characters of a string to those of a CFMutableString object.

```
void CFStringAppend (
    CFMutableStringRef theString,
    CFStringRef appendedString
);
```

Parameters

theString

The string to which *appendedString* is appended. If *theString* is not a CFMutableString object, an assertion is raised.

appendedString

The string to append.

Discussion

This function reallocates the backing store of *theString* to accommodate the new length.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

KillEveryoneButMe

MovieVideoChart

ProfileSystem

QTMetaData

TypeServicesForUnicode

Declared In

CFString.h

CFStringAppendCharacters

Appends a buffer of Unicode characters to the character contents of a CFMutableString object.

```
void CFStringAppendCharacters (
    CFMutableStringRef theString,
    const UniChar *chars,
    CFIndex numChars
);
```

Parameters

theString

The string to which the characters in *chars* are appended.

chars

A pointer to a buffer of Unicode characters.

numChars

The number of Unicode characters in *chars*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringAppendCString

Appends a C string to the character contents of a CFMutableString object.


```
void CFStringAppendCString (
    CFMutableStringRef theString,
    const char *cStr,
    CFStringEncoding encoding
);
```

Parameters*theString*

The string to which the characters from *cStr* are appended. If this value is not a CFMutableString object, an assertion is raised.

cStr

A pointer to a C string buffer.

encoding

The encoding of the characters in *cStr*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

simpleJavaLauncher

Declared In

CFString.h

CFStringAppendFormat

Appends a formatted string to the character contents of a CFMutableString object.

```
void CFStringAppendFormat (
    CFMutableStringRef theString,
    CFDictionaryRef formatOptions,
    CFStringRef format,
    ...
);
```

Parameters*theString*

The string to which the formatted characters from *format* are appended. If this value is not a CFMutableString object, an assertion is raised.

formatOptions

A dictionary containing formatting options for the string (such as the thousand-separator character, which is dependent on locale). Currently, these options are an unimplemented feature.

format

A formatted string with printf-style specifiers.

...

Variable list of the values to be inserted in *format*.

Discussion

A formatted string is one with `printf`-style format specifiers embedded in the text such as `%d` (decimal), `%f` (double), and `%@` (Core Foundation object). The subsequent arguments, in order, are substituted for the specifiers in the character data appended to *theString*. You can also reorder the arguments in the string by using modifiers of the form "n\$" with the format specifiers (for example, `%2$d`).

For more information on supported specifiers, see the relevant section in *Strings Programming Guide for Core Foundation*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Custom_HIView_Tutorial

DockBrowser

GetHWEthernetAddr

MoreIsBetter

MovieVideoChart

Declared In

CFString.h

CFStringAppendFormatAndArguments

Appends a formatted string to the character contents of a CFMutableString object.

```
void CFStringAppendFormatAndArguments (
    CFMutableStringRef theString,
    CFDictionaryRef formatOptions,
    CFStringRef format,
    va_list arguments
);
```

Parameters

theString

The string to which the formatted characters from *format* are appended. If this value is not a CFMutableString object, an assertion is raised.

formatOptions

A dictionary containing formatting options for the string (such as the thousand-separator character, which is dependent on locale). Currently, these options are an unimplemented feature.

format

A formatted string with `printf`-style specifiers.

arguments

List of values to be inserted in *format*.

Discussion

A formatted string is one with `printf`-style format specifiers embedded in the text such as `%d` (decimal), `%f` (double), and `%@` (Core Foundation object). The subsequent arguments, in order, are substituted for the specifiers in the character data appended to *theString*. You can also reorder the arguments in the string by using modifiers of the form "n\$" with the format specifiers (for example, `%2$d`).

For more information on supported specifiers, see the relevant section in *Strings Programming Guide for Core Foundation*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringAppendPascalString

Appends a Pascal string to the character contents of a CFMutableString object.

```
void CFStringAppendPascalString (
    CFMutableStringRef theString,
    ConstStr255Param pStr,
    CFStringEncoding encoding
);
```

Parameters

theString

The string to which the characters in *pStr* are appended. If this value is not a CFMutableString object, an assertion is raised.

pStr

A Pascal string buffer.

encoding

The string encoding of the characters in *pStr*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCapitalize

Changes the first character in each word of a string to uppercase (if it is a lowercase alphabetical character).

```
void CFStringCapitalize (
    CFMutableStringRef theString,
    CFLocaleRef locale
);
```

Parameters

theString

The string to be capitalized. If this value is not a CFMutableString object, an assertion is raised.

locale

A locale that specifies a particular language or region. Prior to Mac OS X v10.3, this parameter was an untyped pointer and not used.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCreateMutable

Creates an empty CFMutableString object.

```
CFMutableStringRef CFStringCreateMutable (
    CFAllocatorRef alloc,
    CFIndex maxLength
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

maxLength

The maximum number of Unicode characters that can be stored by the returned string. Pass `0` if there should be no character limit. Note that initially the string still has a length of `0`; this parameter simply specifies what the maximum size is. CFMutableString might try to optimize its internal storage by paying attention to this value.

Return Value

A new empty CFMutableString object or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an empty (that is, content-less) CFMutableString object. You can add character data to this object with any of the `CFStringAppend...` functions, and thereafter you can insert, delete, replace, pad, and trim characters with the appropriate CFString functions. If the *maxLength* parameter is greater than `0`, any attempt to add characters beyond this limit results in a run-time error.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

iTunesController
KillEveryoneButMe
MovieVideoChart
QTMetaData
simpleJavaLauncher

Declared In

CFString.h

CFStringCreateMutableCopy

Creates a mutable copy of a string.

```
CFMutableStringRef CFStringCreateMutableCopy (
    CFAllocatorRef alloc,
    CFIndex maxLength,
    CFStringRef theString
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

maxLength

The maximum number of Unicode characters that can be stored by the returned object. Pass `0` if there should be no character limit. Note that initially the returned object still has the same length as the string argument; this parameter simply specifies what the maximum size is. `CFString` might try to optimize its internal storage by paying attention to this value.

theString

A string to copy.

Return Value

A string that has the same contents as *theString*. Returns `NULL` if there was a problem copying the object. Ownership follows the Create Rule.

Discussion

The returned mutable string is identical to the original string except for (perhaps) the mutability attribute. You can add character data to the returned string with any of the `CFStringAppend...` functions, and you can insert, delete, replace, pad, and trim characters with the appropriate `CFString` functions. If the *maxLength* parameter is greater than `0`, any attempt to add characters beyond this limit results in a run-time error.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Custom_HIView_Tutorial

DTSCarbonShell

iTunesController

MFSLives

MoreSCF

Declared In

`CFString.h`

CFStringCreateMutableWithExternalCharactersNoCopy

Creates a `CFMutableString` object whose Unicode character buffer is controlled externally.

```
CFMutableStringRef CFStringCreateMutableWithExternalCharactersNoCopy (
    CFAllocatorRef alloc,
    UniChar *chars,
    CFIndex numChars,
    CFIndex capacity,
    CFAllocatorRef externalCharactersAllocator
);
```

Parameters*alloc*

The allocator to use to allocate memory for the string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

chars

The Unicode character buffer for the new `CFMutableString`. Before calling, create this buffer on the stack or heap and optionally initialize it with Unicode character data. Upon return, the created `CFString` object keeps its own copy of the pointer to this buffer. You may pass in `NULL` if there is no initial buffer being provided.

numChars

The number of characters initially in the Unicode buffer pointed to by *chars*.

capacity

The capacity of the external buffer (*chars*); that is, the maximum number of Unicode characters that can be stored. This value should be 0 if no initial buffer is provided.

externalCharactersAllocator

The allocator to use to reallocate the external buffer when editing takes place and for deallocating the buffer when string is deallocated. If the default allocator is suitable for these purposes, pass `NULL`. If you do not want the new string to reallocate or deallocate memory for the buffer (that is, you assume responsibility for these things yourself), pass `kCFAllocatorNull`.

Return Value

A new mutable string, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function permits you to create a `CFMutableString` object whose backing store is an external Unicode character buffer—that is, a buffer that you control (or can control) entirely. This function allows you to take advantage of the features of `CFString`, particularly the `CFMutableString` functions that add and modify character data. But at the same time you can directly add, delete, modify, and examine the characters in the buffer. You can even replace the buffer entirely. If, however, you directly modify or replace the character buffer, you should inform the `CFString` object of this change with the [CFStringSetExternalCharactersNoCopy](#) (page 349) function.

If you mutate the character contents with the `CFString` functions, and the buffer needs to be enlarged, the `CFString` object calls the allocation callbacks specified for the allocator *externalCharactersAllocator*.

This function should be used in special circumstances where you want to create a `CFString` wrapper around an existing, potentially large `UniChar` buffer you own. Using this function causes the `CFString` object to forgo some of its internal optimizations, so it should be avoided in general use. That is, if you want to create a `CFString` object from a small `UniChar` buffer, and you don't need to continue owning the buffer, use one of the other creation functions (for instance [CFStringCreateWithCharacters](#) (page 540)) instead.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringDelete

Deletes a range of characters in a string.

```
void CFStringDelete (
    CFMutableStringRef theString,
    CFRange range
);
```

Parameters*theString*

A string from which characters are to be deleted.

*range*The range of characters in *theString* to delete.**Discussion**

The characters after the deleted range are adjusted to “fill in” the gap.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

HID Calibrator

HID Config Save

HID Explorer

Declared In

CFString.h

CFStringFindAndReplace

Replaces all occurrences of a substring within a given range.

```
CFIndex CFStringFindAndReplace (
    CFMutableStringRef theString,
    CFStringRef stringToFind,
    CFStringRef replacementString,
    CFRange rangeToSearch,
    CFOptionFlags compareOptions
);
```

Parameters*theString*

The string to modify.

*stringToFind*The substring to search for in *theString*.*replacementString*The replacement string for *stringToFind*.

rangeToSearch

The range within which to search in *theString*.

compareOptions

Flags that select different types of comparisons, such as localized comparison, case-insensitive comparison, and non-literal comparison. If you want the default comparison behavior, pass 0. See [CFStringCompareFlags](#) (page 572) for the available flags.

Return Value

The number of instances of *stringToFind* that were replaced.

Discussion

The possible values of *compareOptions* are combinations of the [kCFCompareCaseInsensitive](#) (page 574), [kCFCompareBackwards](#) (page 574), [kCFCompareNonliteral](#) (page 574), and [kCFCompareAnchored](#) (page 574) constants.

The [kCFCompareBackwards](#) option can be used to replace a substring starting from the end, which could produce different results. For example, if the parameter *theString* is "AAAAA", *stringToFind* is "AA", and *replacementString* is "B", then the result is normally "BBA". However, if the [kCFCompareBackwards](#) constant is used, the result is "ABB."

The [kCFCompareAnchored](#) option assures that only anchored but multiple instances are found (the instances must be consecutive at start or end). For example, if the parameter *theString* is "AAXAA", *stringToFind* is "A", and *replacementString* is "B", then the result is normally "BBXBB." However, if the [kCFCompareAnchored](#) constant is used, the result is "BBXAA."

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

[simpleJavaLauncher](#)

Declared In

[CFString.h](#)

CFStringFold

Folds a given string into the form specified by optional flags.

```
void CFStringFold (
    CFMutableStringRef theString,
    CFOptionFlags theFlags,
    CFLocaleRef theLocale
);
```

Parameters

theString

The string which is to be folded. If this parameter is not a valid mutable CFString, the behavior is undefined.

theFlags

The equivalency flags which describes the character folding form. See “String Comparison Flags” in *CFString Reference* for possible values. Only those flags containing the word “insensitive” are recognized; other flags are ignored.

Folding with `kCFCompareCaseInsensitive` removes case distinctions in accordance with the mapping specified by <ftp://ftp.unicode.org/Public/UNIDATA/CaseFolding.txt>. Folding with `kCFCompareDiacriticInsensitive` removes distinctions of accents and other diacritics. Folding with `kCFCompareWidthInsensitive` removes character width distinctions by mapping characters in the range U+FF00-U+FFEF to their ordinary equivalents.

theLocale

The locale to use for the operation. `NULL` specifies the canonical locale (the return value from `CFLocaleGetSystem` (page 247)).

The locale argument affects the case mapping algorithm. For example, for the Turkish locale, case-insensitive compare matches “İ” to “i” (Unicode code point U+0131, Latin Small Dotless I), not the normal “i” character.

Discussion

Character foldings are operations that convert any of a set of characters sharing similar semantics into a single representative from that set.

You can use this function to preprocess strings that are to be compared, searched, or indexed. Note that folding does not include normalization, so you must use `CFStringNormalize` (page 346) in addition to `CFStringFold` in order to obtain the effect of `kCFCompareNonLiteral`.

Availability

Available in Mac OS X v10.5 and later.

Related Sample Code

DerivedProperty

Declared In

CFString.h

CFStringInsert

Inserts a string at a specified location in the character buffer of a `CFMutableString` object.

```
void CFStringInsert (
    CFMutableStringRef str,
    CFIndex idx,
    CFStringRef insertedStr
);
```

Parameters

str

The string to be modified. If this value is not a `CFMutableString` object, an assertion is raised.

index

The index of the character in *str* after which the new characters are to be inserted. If the index is out of bounds, an assertion is raised.

insertedStr

The string to insert into *str*.

Discussion

To accommodate the new characters, this function moves any existing characters to the right of the inserted characters the appropriate number of positions.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Explorer

iTunesController

Declared In

CFString.h

CFStringLowercase

Changes all uppercase alphabetical characters in a CFMutableString to lowercase.

```
void CFStringLowercase (
    CFMutableStringRef theString,
    CFLocaleRef locale
);
```

Parameters

theString

The string to be lowercased. If this value is not a CFMutableString object, an assertion is raised.

locale

The locale to use when the lowercasing operation is performed. Prior to Mac OS X v10.3 this parameter was an untyped pointer and not used.

The locale argument affects the case mapping algorithm. For example, for the Turkish locale, case-insensitive compare matches “İ” to “i” (Unicode code point U+0131, Latin Small Dotless I), not the normal “i” character.

Special Considerations

The *locale* parameter type changed from `void *` to `CFLocaleRef` in Mac OS X v10.3.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

NSLMiniBrowser

QISA

Declared In

CFString.h

CFStringNormalize

Normalizes the string into the specified form as described in Unicode Technical Report #15.

```
void CFStringNormalize (
    CFMutableStringRef theString,
    CFStringNormalizationForm theForm
);
```

Parameters*theString*

The string to be normalized.

*theForm*The form to normalize *theString*.**Availability**

Available in Mac OS X v10.2 and later.

Related Sample Code

DerivedProperty

MFSLives

MoreSCF

Declared In

CFString.h

CFStringPad

Enlarges a string, padding it with specified characters, or truncates the string.

```
void CFStringPad (
    CFMutableStringRef theString,
    CFStringRef padString,
    CFIndex length,
    CFIndex indexIntoPad
);
```

Parameters*theString*

The string to modify.

padString

A string containing the characters with which to fill the extended character buffer. Pass NULL to truncate the string.

*length*The new length of *theString*. If this length is greater than the current length, padding takes place; if it is less, truncation takes place.*indexIntoPad*The index of the character in *padString* with which to begin padding. If you are truncating the string represented by the object, this parameter is ignored.**Discussion**

This function has two purposes. It either enlarges the character buffer of a CFMutableString object to a given length, padding the added length with a given character or characters, or it truncates the character buffer to a smaller size. The key parameter for this behavior is *length*; if it is greater than the current length of the represented string, padding takes place, and if it less than the current length, truncation occurs.

For example, say you have a string, `aMutStr`, containing the characters "abcdef". The call

```
CFStringPad(aMutStr, CFSTR("123"), 9, 1);
```

results in `aMutStr` containing "abcdef231". However, the following call

```
CFStringPad(aMutStr, NULL, 3, 0);
```

results in `aMutStr` containing "abc".

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringReplace

Replaces part of the character contents of a CFMutableString object with another string.

```
void CFStringReplace (
    CFMutableStringRef theString,
    CFRange range,
    CFStringRef replacement
);
```

Parameters

theString

The string to modify. The characters are adjusted left or right (depending on the length of the substituted string) and the character buffer of the object is resized accordingly. If this value is not a CFMutableString object, an assertion is raised.

range

The range of characters in *theString* to replace.

replacement

The replacement string to put into *theString*.

Discussion

Although you can use this function to replace all characters in a CFMutableString object (by specifying a range of (0, CFStringGetLength(theString))), it is more convenient to use the [CFStringReplaceAll](#) (page 349) function for that purpose.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CIVideoDemoGL

MoreIsBetter

MoreSCF

QISA

QTCarbonShell

Declared In

CFString.h

CFStringReplaceAll

Replaces all characters of a CFMutableString object with other characters.

```
void CFStringReplaceAll (
    CFMutableStringRef theString,
    CFStringRef replacement
);
```

Parameters

theString

The string to modify. If this value is not a CFMutableString object, an assertion is raised.

replacement

The replacement string to put into *theString*.

Discussion

The character buffer of *theString* is resized according to the length of the new characters.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageBrowserView

iTunesController

Declared In

CFString.h

CFStringSetExternalCharactersNoCopy

Notifies a CFMutableString object that its external backing store of Unicode characters has changed.

```
void CFStringSetExternalCharactersNoCopy (
    CFMutableStringRef theString,
    UniChar *chars,
    CFIndex length,
    CFIndex capacity
);
```

Parameters

theString

The string to act as a “wrapper” for the external backing store (*chars*). If this value is not a CFMutableString object, an assertion is raised.

chars

The external (client-owned) Unicode buffer acting as the backing store for *theString*.

length

The current length of the contents of *chars* (in Unicode characters).

capacity

The capacity of the Unicode buffer—that is, the total number of Unicode characters that can be stored in it before the buffer has to be grown.

Discussion

You use this function to reallocate memory for a string, if necessary, and change its references to the data in the buffer. The object must have been created with the [CFStringCreateMutableWithExternalCharactersNoCopy](#) (page 341) function; see the discussion of this function for more information.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringTransform

Perform in-place transliteration on a mutable string.

```
Boolean CFStringTransform (
    CFMutableStringRef string,
    CFRange *range,
    CFStringRef transform,
    Boolean reverse
);
```

Parameters

string

The string to transform.

range

A pointer to the range over which the transformation is applied. NULL causes the whole string to be transformed. On return, *range* is modified to reflect the new range corresponding to the original range.

transform

A CFString object that identifies the transformation to apply. For a list of valid values, see [“Transform Identifiers for CFStringTransform”](#) (page 353). On Mac OS X v10.4 and later, you can also use any valid ICU transform ID defined in the [ICU User Guide for Transforms](#).

reverse

A Boolean that, if *true*, specifies that the inverse transform should be used (if it exists).

Return Value

true if the transform is successful; otherwise *false*.

Discussion

The transformation represented by *transform* is applied to the given range of *string*, modifying it in place. Only the specified range is modified, but the transform may look at portions of the string outside that range for context. Reasons that the transform may be unsuccessful include an invalid transform identifier, and attempting to reverse an irreversible transform.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFString.h

CFStringTrim

Trims a specified substring from the beginning and end of a CFMutableString object.

```
void CFStringTrim (
    CFMutableStringRef theString,
    CFStringRef trimString
);
```

Parameters

theString

The string to trim. If this value is not a CFMutableString object, an assertion is raised.

trimString

The string to trim from *theString*. The characters of the trim string are treated as a substring and not individually; for example, if the mutable characters are "abc X" and the trim string is "XY", the mutable characters are not affected.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreSCF

Declared In

CFString.h

CFStringTrimWhitespace

Trims whitespace from the beginning and end of a CFMutableString object.

```
void CFStringTrimWhitespace (
    CFMutableStringRef theString
);
```

Parameters

theString

The string to trim. If this value is not a CFMutableString object, an assertion is raised.

Discussion

Whitespace for this function includes space characters, tabs, newlines, carriage returns, and any similar characters that do not have a visible representation.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringUppercase

Changes all lowercase alphabetical characters in a CFMutableString object to uppercase.

```
void CFStringUppercase (
    CFMutableStringRef theString,
    CFLocaleRef locale
);
```

Parameters*theString*

The string to uppercase. If this value is not a CFMutableString object, an assertion is raised.

locale

A CFLocale object that specifies a particular language or region. Prior to Mac OS X v10.3, this parameter was an untyped pointer and not used.

The locale argument affects the case mapping algorithm. For example, for the Turkish locale, case-insensitive compare matches “I” to “i” (Unicode code point U+0131, Latin Small Dotless I), not the normal “i” character.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

Data Types

CFMutableStringRef

A reference to a CFMutableString object.

```
typedef CFStringRef CFMutableStringRef;
```

Discussion

The type refers to a CFMutableString object, which “encapsulates” a Unicode string along with its length; the object has the attribute of being mutable, which means that its character contents can be modified. CFString is an opaque type that defines the characteristics and behavior of CFString objects, both immutable and mutable.

CFMutableString derives from CFString. Therefore, you can pass CFMutableString objects into functions accepting CFString objects.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Constants

String Normalization Forms

Unicode normalization forms as described in Unicode Technical Report #15.

```
enum CFStringNormalizationForm {
    kCFStringNormalizationFormD = 0,
    kCFStringNormalizationFormKD = 1,
    kCFStringNormalizationFormC = 2,
    kCFStringNormalizationFormKC = 3
};
typedef enum CFStringNormalizationForm CFStringNormalizationForm;
```

Constants

`kCFStringNormalizationFormD`

Canonical decomposition.

Available in Mac OS X v10.2 and later.

Declared in `CFString.h`.

`kCFStringNormalizationFormKD`

Compatibility decomposition.

Available in Mac OS X v10.2 and later.

Declared in `CFString.h`.

`kCFStringNormalizationFormC`

Canonical decomposition followed by canonical composition.

Available in Mac OS X v10.2 and later.

Declared in `CFString.h`.

`kCFStringNormalizationFormKC`

Compatibility decomposition followed by canonical composition.

Available in Mac OS X v10.2 and later.

Declared in `CFString.h`.

Transform Identifiers for CFStringTransform

Constants that identify transforms used with `CFStringTransform` (page 350).

```

const CFStringRef kCFStringTransformStripCombiningMarks;
const CFStringRef kCFStringTransformToLatin;
const CFStringRef kCFStringTransformFullwidthHalfwidth;
const CFStringRef kCFStringTransformLatinKatakana;
const CFStringRef kCFStringTransformLatinHiragana;
const CFStringRef kCFStringTransformHiraganaKatakana;
const CFStringRef kCFStringTransformMandarinLatin;
const CFStringRef kCFStringTransformLatinHangul;
const CFStringRef kCFStringTransformLatinArabic;
const CFStringRef kCFStringTransformLatinHebrew;
const CFStringRef kCFStringTransformLatinThai;
const CFStringRef kCFStringTransformLatinCyrillic;
const CFStringRef kCFStringTransformLatinGreek;
const CFStringRef kCFStringTransformToXMLHex;
const CFStringRef kCFStringTransformToUnicodeName;
const CFStringRef kCFStringTransformStripDiacritics;

```

Constants

`kCFStringTransformStripCombiningMarks`

The identifier of a transform to strip combining marks (accents or diacritics).

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformToLatin`

The identifier of a transform to transliterate all text possible to Latin script. Ideographs are transliterated as Mandarin Chinese.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformFullwidthHalfwidth`

The identifier of a reversible transform to convert full-width characters to their half-width equivalents.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinKatakana`

The identifier of a reversible transform to transliterate text to Katakana from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinHiragana`

The identifier of a reversible transform to transliterate text to Hiragana from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformHiraganaKatakana`

The identifier of a reversible transform to transliterate text to Katakana from Hiragana.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformMandarinLatin`

The identifier of a reversible transform to transliterate text to Latin from ideographs interpreted as Mandarin Chinese.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinHangul`

The identifier of a reversible transform to transliterate text to Hangul from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinArabic`

The identifier of a reversible transform to transliterate text to Arabic from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinHebrew`

The identifier of a reversible transform to transliterate text to Hebrew from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinThai`

The identifier of a reversible transform to transliterate text to Thai from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinCyrillic`

The identifier of a reversible transform to transliterate text to Cyrillic from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformLatinGreek`

The identifier of a reversible transform to transliterate text to Greek from Latin.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformToXMLHex`

The identifier of a reversible transform to transliterate characters other than printable ASCII to XML/HTML numeric entities.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformToUnicodeName`

The identifier of a reversible transform to transliterate characters other than printable ASCII (minus braces) to their Unicode character name in braces.

Examples include `{AIRPLANE}` and `{GREEK CAPITAL LETTER PSI}`.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringTransformStripDiacritics`

The identifier of a transform to remove diacritic markings.

Available in Mac OS X v10.5 and later.

Declared in `CFString.h`.

Discussion

On Mac OS X v10.4 and later, with `CFStringTransform` (page 350) you can also use any valid ICU transform ID defined in the [ICU User Guide for Transforms](#).

CFNotificationCenter Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFNotificationCenter.h
Companion guide	Notification Programming Topics for Cocoa

Overview

A `CFNotificationCenter` object provides the means by which you can send a message, or notification, to any number of recipients, or observers, without having to know anything about the recipients. A notification message consists of a notification name (a `CFString`), a pointer value that identifies the object posting the notification, and an optional dictionary that contains additional information about the particular notification.

To register as an observer of a notification, you call `CFNotificationCenterAddObserver` (page 358), providing an identifier for your observer, the callback function that should be called when the notification is posted, and the name of the notification and the object in which you are interested. The observer identifier is passed back to the callback function, along with the notification information. You can use the identifier to distinguish multiple observers using the same callback function. The identifier is also used to unregister the observer with `CFNotificationCenterRemoveObserver` (page 364) and `CFNotificationCenterRemoveEveryObserver` (page 363).

To send a notification, you call `CFNotificationCenterPostNotification` (page 361), passing in the notification information. The notification center then looks up all the observers that registered for this notification and sends the notification information to their callback functions.

There are three types of `CFNotificationCenter`—a distributed notification center, a local notification center, and a Darwin notification center—an application may have at most one of each type. The distributed notification is obtained with `CFNotificationCenterGetDistributedCenter` (page 360). A distributed notification center delivers notifications between applications. In this case, the notification object must always be a `CFString` object and the notification dictionary must contain only property list values. The local and Darwin notification centers are available in Mac OS X version 10.4 and later, and obtained using `CFNotificationCenterGetLocalCenter` (page 361) and `CFNotificationCenterGetDarwinNotifyCenter` (page 360) respectively.

Unlike some other Core Foundation opaque types with names similar to a Cocoa Foundation class (such as `CFString` and `NSString`), `CFNotificationCenter` objects cannot be cast (“toll-free bridged”) to `NSNotificationCenter` objects or vice-versa.

Functions by Task

Accessing a Notification Center

[CFNotificationCenterGetDarwinNotifyCenter](#) (page 360)

Returns the application's Darwin notification center.

[CFNotificationCenterGetDistributedCenter](#) (page 360)

Returns the application's distributed notification center.

[CFNotificationCenterGetLocalCenter](#) (page 361)

Returns the application's local notification center.

Posting a Notification

[CFNotificationCenterPostNotification](#) (page 361)

Posts a notification for an object.

[CFNotificationCenterPostNotificationWithOptions](#) (page 362)

Posts a notification for an object using specified options.

Adding and Removing Observers

[CFNotificationCenterAddObserver](#) (page 358)

Registers an observer to receive notifications.

[CFNotificationCenterRemoveEveryObserver](#) (page 363)

Stops an observer from receiving any notifications from any object.

[CFNotificationCenterRemoveObserver](#) (page 364)

Stops an observer from receiving certain notifications.

Getting the CFNotificationCenter Type ID

[CFNotificationCenterGetTypeID](#) (page 361)

Returns the type identifier for the CFNotificationCenter opaque type.

Functions

CFNotificationCenterAddObserver

Registers an observer to receive notifications.

```
void CFNotificationCenterAddObserver (
    CFNotificationCenterRef center,
    const void *observer,
    CFNotificationCallback callBack,
    CFStringRef name,
    const void *object,
    CFNotificationSuspensionBehavior suspensionBehavior
);
```

Parameters*center*

The notification center to which to add the observer.

observer

The observer. In Mac OS X v10.3 and later, this parameter may be NULL.

callBack

The callback function to call when *object* posts the notification named *name*.

name

The name of the notification to observe. If NULL, *callBack* is called for any notification posted by *object*.

If *center* is a Darwin notification center, this value must *not* be NULL.

object

The object to observe. For distributed notifications, *object* must be a CFString object. If NULL, *callBack* is called when a notification named *name* is posted by any object.

If *center* is a Darwin notification center, this value is ignored.

suspensionBehavior

Flag indicating how notifications should be handled when the application is in the background. See [“Notification Delivery Suspension Behavior”](#) (page 366) for the list of available values.

If *center* is a Darwin notification center, this value is ignored.

Discussion

The first time an observer is registered with a distributed notification center, the notification center creates a connection with the system-wide notification server and places a listening port into the common modes of the current thread’s run loop. When a notification is delivered, it is processed on this initial thread, even if the observer that is receiving the notification registered for the notification on a different thread.

Because loaded frameworks may potentially spawn threads and add their own observers before your code executes, you cannot know for certain which thread will receive distributed notifications. If you need to control which thread processes a notification, your callback function must be able to forward the notification to the proper thread. You can use a CFMessagePort object or a custom CFRunLoopSource object to send notifications to the correct thread’s run loop.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

VideoViewer

XcodeClientServer

Declared In

CFNotificationCenter.h

CFNotificationCenterGetDarwinNotifyCenter

Returns the application's Darwin notification center.

```

CFNotificationCenterRef CFNotificationCenterGetDarwinNotifyCenter (
    void
);

```

Return Value

The application's Darwin notification center.

Discussion

This notification center is used to cover the `<notify.h>` Core OS notification mechanism (see `/usr/include/notify.h`). An application has only one Darwin notification center, so this function returns the same value each time it is called.

The Darwin Notify Center has no notion of per-user sessions, all notifications are system-wide. As with distributed notifications, the main thread's run loop must be running in one of the common modes (usually `kCFRunLoopDefaultMode`) for Darwin-style notifications to be delivered.

Important: Several function parameters are ignored by Darwin notification centers. To ensure future compatibility, you should pass `NULL` or `0` for all ignored arguments.

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFNotificationCenter.h`

CFNotificationCenterGetDistributedCenter

Returns the application's distributed notification center.

```

CFNotificationCenterRef CFNotificationCenterGetDistributedCenter (
    void
);

```

Return Value

The application's distributed notification center. An application has only one distributed notification center, so this function returns the same value each time it is called.

Discussion

A distributed notification center delivers notifications between applications. A notification object used with a distributed notification center must always be a `CFString` object and the notification dictionary must contain only property list values.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

`VideoViewer`

`XcodeClientServer`

Declared In

CFNotificationCenter.h

CFNotificationCenterGetLocalCenter

Returns the application's local notification center.

```
CFNotificationCenterRef CFNotificationCenterGetLocalCenter (
    void
);
```

Return Value

The application's local notification center. An application has only one local notification center, so this function returns the same value each time it is called.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFNotificationCenter.h

CFNotificationCenterGetTypeID

Returns the type identifier for the CFNotificationCenter opaque type.

```
CTypeID CFNotificationCenterGetTypeID (
    void
);
```

Return Value

The type identifier for the CFNotificationCenter opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFNotificationCenter.h

CFNotificationCenterPostNotification

Posts a notification for an object.

```
void CFNotificationCenterPostNotification (
    CFNotificationCenterRef center,
    CFStringRef name,
    const void *object,
    CFDictionaryRef userInfo,
    Boolean deliverImmediately
);
```

Parameters*center*

The notification center to post the notification.

name

The name of the notification to post. This value must not be `NULL`.

object

The object posting the notification. If `NULL`, the notification is sent only to observers that are observing all objects. In other words, only observers that registered for the notification with a `NULL` value for *object* will receive the notification.

If you want to allow your clients to register for notifications using Cocoa APIs (see *NSNotificationCenter Class Reference*), then *object* must be a Core Foundation or Cocoa object.

For distributed notifications, *object* must be a `CFString` object.

If *center* is a Darwin notification center, this value is ignored.

userInfo

A dictionary passed to observers. You populate this dictionary with additional information describing the notification. For distributed notifications, the dictionary must contain only property list objects. This value may be `NULL`.

If *center* is a Darwin notification center, this value is ignored.

deliverImmediately

If `true`, the notification is delivered to all observers immediately, even if some observers are in suspended (background) applications and they requested different suspension behavior when registering for the notification. If `false`, each observer's requested suspension behavior is respected.

If *center* is a Darwin notification center, this value is ignored.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

XcodeClientServer

Declared In

`CFNotificationCenter.h`

CFNotificationCenterPostNotificationWithOptions

Posts a notification for an object using specified options.

```
void CFNotificationCenterPostNotificationWithOptions (
    CFNotificationCenterRef center,
    CFStringRef name,
    const void *object,
    CFDictionaryRef userInfo,
    CFOptionFlags options
);
```

Parameters

center

The notification center to post the notification.

name

The name of the notification to post. This value must not be `NULL`.

object

The object posting the notification. If `NULL`, the notification is sent only to observers that are observing all objects. In other words, only observers that registered for the notification with a `NULL` value for *object* will receive the notification.

If you want to allow your clients to register for notifications using Cocoa APIs (see *NSNotificationCenter Class Reference*), then *object* must be a Core Foundation or Cocoa object.

For distributed notifications, *object* must be a `CFString` object.

If *center* is a Darwin notification center, this value is ignored.

userInfo

A dictionary to pass to observers. You populate this dictionary with additional information describing the notification. For distributed notifications, the dictionary must contain only property list objects. Can be `NULL`.

If *center* is a Darwin notification center, this value is ignored.

options

Specifies if the notification should be posted immediately, or to all sessions. See “[Notification Posting Options](#)” (page 367) for possible values.

If *center* is a Darwin notification center, this value is ignored.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNotificationCenter.h`

CFNotificationCenterRemoveEveryObserver

Stops an observer from receiving any notifications from any object.

```
void CFNotificationCenterRemoveEveryObserver (
    CFNotificationCenterRef center,
    const void *observer
);
```

Parameters*center*

The notification center from which to remove observers.

observer

The observer. This value must not be `NULL`.

Discussion

If you no longer want an observer to receive any notifications, perhaps because the observer is being deallocated, you can call this function to unregister the observer from all the notifications for which it had previously registered.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

`XcodeClientServer`

Declared In

CFNotificationCenter.h

CFNotificationCenterRemoveObserver

Stops an observer from receiving certain notifications.

```
void CFNotificationCenterRemoveObserver (
    CFNotificationCenterRef center,
    const void *observer,
    CFStringRef name,
    const void *object
);
```

Parameters*center*

The notification center to modify.

observer

The observer. This value must not be NULL.

name

The name of the notification to stop observing. If NULL, *observer* stops receiving callbacks for all notifications posted by *object*.

object

The object to stop observing. For distributed notifications, *object* must be a CFString object. If NULL, *observer* stops receiving callbacks for all objects posting notifications named *name*.

If *center* is a Darwin notification center, this value is ignored.

Discussion

If both *name* and *object* are NULL, this function unregisters *observer* from all the notifications for which it had previously registered with *center*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

VideoViewer

XcodeClientServer

Declared In

CFNotificationCenter.h

Callbacks

CFNotificationCenterCallback

Callback function invoked for each observer of a notification when the notification is posted.

```
typedef void (*CFNotificationCallback) (
    CFNotificationCenterRef center,
    void *observer,
    CFStringRef name,
    const void *object,
    CFDictionaryRef userInfo
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFNotificationCenterRef center,
    void *observer,
    CFStringRef name,
    const void *object,
    CFDictionaryRef userInfo
);
```

Parameters

center

The notification center handling the notification.

observer

An arbitrary value, other than `NULL`, that identifies the observer.

name

The name of the notification being posted.

object

An arbitrary value that identifies the object posting the notification. For distributed notifications, *object* is always a `CFString` object. This value could be `NULL`.

userInfo

A dictionary containing additional information regarding the notification. This value could be `NULL`.

If the notification center is a Darwin notification center, this value must be ignored.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFNotificationCenter.h`

Data Types

CFNotificationCenterRef

The type of a reference to a `CFNotificationCenter`.

```
typedef struct *CFNotificationCenterRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFNotificationCenter.h

Constants

Notification Delivery Suspension Behavior

Suspension flags that indicate how distributed notifications should be handled when the receiving application is in the background.

```
enum CFNotificationSuspensionBehavior {
    CFNotificationSuspensionBehaviorDrop = 1,
    CFNotificationSuspensionBehaviorCoalesce = 2,
    CFNotificationSuspensionBehaviorHold = 3,
    CFNotificationSuspensionBehaviorDeliverImmediately = 4
};
typedef enum CFNotificationSuspensionBehavior CFNotificationSuspensionBehavior;
```

Constants

CFNotificationSuspensionBehaviorDrop

The server will not queue any notifications of the specified name and object while the receiving application is in the background.

Available in Mac OS X v10.0 and later.

Declared in CFNotificationCenter.h.

CFNotificationSuspensionBehaviorCoalesce

The server will only queue the last notification of the specified name and object; earlier notifications are dropped.

Available in Mac OS X v10.0 and later.

Declared in CFNotificationCenter.h.

CFNotificationSuspensionBehaviorHold

The server will hold all matching notifications until the queue has been filled (queue size determined by the server) at which point the server may flush queued notifications.

Available in Mac OS X v10.0 and later.

Declared in CFNotificationCenter.h.

CFNotificationSuspensionBehaviorDeliverImmediately

The server will deliver notifications of the specified name and object whether or not the application is in the background. When a notification with this suspension behavior is matched, it has the effect of first flushing any queued notifications.

Available in Mac OS X v10.0 and later.

Declared in CFNotificationCenter.h.

Discussion

An application selects the suspension behavior for a given notification when it registers an observer for that notification with [CFNotificationCenterAddObserver](#) (page 358).

Notification Posting Options

Possible options when posting notifications.

```
enum {  
    kCFNotificationDeliverImmediately = (1 << 0),  
    kCFNotificationPostToAllSessions = (1 << 1)  
};
```

Constants

`kCFNotificationDeliverImmediately`
Delivers the notification immediately.
Available in Mac OS X v10.3 and later.
Declared in `CFNotificationCenter.h`.

`kCFNotificationPostToAllSessions`
Delivers the notification to all sessions.
Available in Mac OS X v10.3 and later.
Declared in `CFNotificationCenter.h`.

Discussion

Use these constants when calling the `CFNotificationCenterPostNotificationWithOptions` (page 362) function.

CFNull Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBase.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

The CFNull opaque type defines a unique object used to represent null values in collection objects (which don't allow `NULL` values). CFNull objects are neither created nor destroyed. Instead, a single CFNull constant object—`kCFNull` (page 370)—is defined and is used wherever a null value is needed.

The CFNull opaque type is available in Mac OS X v10.2 and later.

Functions

CFNullGetTypeID

Returns the type identifier for the CFNull opaque type.

```
CTypeID CFNullGetTypeID (
    void
);
```

Return Value

The type identifier for the CFNull opaque type.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFBase.h

Data Types

CFNullRef

A reference to a CFNull object.

```
typedef const struct __CFNull *CFNullRef;
```

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFBase.h

Constants

Predefined Value

Predefined CFNull object.

```
const CFNullRef kCFNull;
```

Constants

kCFNull

The singleton CFNull object.

Available in Mac OS X v10.2 and later.

Declared in CFBase.h.

CFNumber Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFNumber.h
Companion guide	Property List Programming Topics for Core Foundation

Overview

CFNumber encapsulates C scalar (numeric) types. It provides functions for setting and accessing the value as any basic C type. It also provides a compare function to determine the ordering of two CFNumber objects. CFNumber objects are used to wrap numerical values for use in Core Foundation property lists and collections.

CFNumber objects are not intended as a replacement for C scalar values and should not be used in APIs or implementations where scalar values are more appropriate and efficient.

Note: In order to improve performance, some commonly-used numbers (such as 0 and 1) are uniqued. You should not expect that allocating multiple CFNumber instances will necessarily result in distinct objects.

CFNumber is “toll-free bridged” with its Cocoa Foundation counterpart, NSNumber. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSNumber *` parameter, you can pass in a `CFNumberRef`, and in a function where you see a `CFNumberRef` parameter, you can pass in an `NSNumber` instance. This fact also applies to concrete subclasses of `NSNumber`. See *Integrating Carbon and Cocoa in Your Application* for more information on toll-free bridging.

Functions by Task

Creating a Number

[CFNumberCreate](#) (page 373)

Creates a CFNumber object using a specified value.

Getting Information About Numbers

[CFNumberGetByteSize](#) (page 374)

Returns the number of bytes used by a CFNumber object to store its value.

[CFNumberGetType](#) (page 374)

Returns the type used by a CFNumber object to store its value.

[CFNumberGetValue](#) (page 375)

Obtains the value of a CFNumber object cast to a specified type.

[CFNumberIsFloatType](#) (page 376)

Determines whether a CFNumber object contains a value stored as one of the defined floating point types.

Comparing Numbers

[CFNumberCompare](#) (page 372)

Compares two CFNumber objects and returns a comparison result.

Getting the CFNumber Type ID

[CFNumberGetTypeID](#) (page 375)

Returns the type identifier for the CFNumber opaque type.

Functions

CFNumberCompare

Compares two CFNumber objects and returns a comparison result.

```
CFComparisonResult CFNumberCompare (
    CFNumberRef number,
    CFNumberRef otherNumber,
    void *context
);
```

Parameters

number

The first CFNumber object to compare.

otherNumber

The second CFNumber object to compare.

context

Pass NULL.

Return Value

A [CFComparisonResult](#) (page 764) constant that indicates whether *number* is equal to, less than, or greater than *otherNumber*.

Discussion

When comparing two CFNumber objects using this function, one or both objects can represent a special-case number such as signed 0, signed infinity, or NaN.

The following rules apply:

- Negative 0 compares less than positive 0.
- Positive infinity compares greater than everything except itself, to which it compares equal.
- Negative infinity compares less than everything except itself, to which it compares equal.
- If both numbers are NaN, then they compare equal.
- If only one of the numbers is NaN, then the NaN compares greater than the other number if it is negative, and smaller than the other number if it is positive.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFNumber.h

CFNumberCreate

Creates a CFNumber object using a specified value.

```
CFNumberRef CFNumberCreate (
    CFAAllocatorRef allocator,
    CFNumberType theType,
    const void *valuePtr
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAAllocatorDefault` to use the default allocator.

theType

A constant that specifies the data type of the value to convert. See [Number Types](#) (page 377) for a list of possible values.

valuePtr

A pointer to the value for the returned number object.

Return Value

A new number with the value specified by *valuePtr*. Ownership follows the Create Rule.

Discussion

The *theType* parameter is not necessarily preserved when creating a new CFNumber object. The CFNumber object will be created using whatever internal storage type the creation function deems appropriate. Use the function [CFNumberGetType](#) (page 374) to find out what type the CFNumber object used to store your value.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest
HID Calibrator
HID Explorer
MoreIsBetter
QTMetaData

Declared In

CFNumber.h

CFNumberGetByteSize

Returns the number of bytes used by a CFNumber object to store its value.

```
CFIndex CFNumberGetByteSize (
    CFNumberRef number
);
```

Parameters

number

The CFNumber object to examine.

Return Value

The size in bytes of the value contained in *number*.

Discussion

Because a CFNumber object might store a value using a type different from that of the original value with which it was created, this function may return a size different from the size of the original value's type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFNumber.h

CFNumberGetType

Returns the type used by a CFNumber object to store its value.

```
CFNumberType CFNumberGetType (
    CFNumberRef number
);
```

Parameters

number

The CFNumber object to examine.

Return Value

A constant that indicates the data type of the value contained in *number*. See [Number Types](#) (page 377) for a list of possible values.

Discussion

The type specified in the call to `CFNumberCreate` (page 373) is not necessarily preserved when a new `CFNumber` object is created—it uses whatever internal storage type the creation function deems appropriate.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFNumber.h`

CFNumberGetTypeID

Returns the type identifier for the `CFNumber` opaque type.

```
CFTypeID CFNumberGetTypeID (
    void
);
```

Return Value

The type identifier for the `CFNumber` opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

`BSDLLCTest`

`CFFTPSample`

`MoreIsBetter`

`MoreSCF`

`QISA`

Declared In

`CFNumber.h`

CFNumberGetValue

Obtains the value of a `CFNumber` object cast to a specified type.

```
Boolean CFNumberGetValue (
    CFNumberRef number,
    CFNumberType theType,
    void *valuePtr
);
```

Parameters

number

The `CFNumber` object to examine.

theType

A constant that specifies the data type to return. See [Number Types](#) (page 377) for a list of possible values.

valuePtr

On return, contains the value of *number*.

Return Value

`true` if the operation was successful, otherwise `false`.

Discussion

If the argument type differs from the return type, and the conversion is lossy or the return value is out of range, then this function passes back an approximate value in *valuePtr* and returns `false`.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioCDSample

BSDLLCTest

MoreIsBetter

MoreSCF

QISA

Declared In

CFNumber.h

CFNumberIsFloatType

Determines whether a CFNumber object contains a value stored as one of the defined floating point types.

```
Boolean CFNumberIsFloatType (
    CFNumberRef number
);
```

Parameters

number

The CFNumber object to examine.

Return Value

`true` if *number*'s value is one of the defined floating point types, otherwise `false`. The valid floating point types are listed in [Number Types](#) (page 377).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFNumber.h

Data Types

CFNumberRef

A reference to a CFNumber object.

```
typedef const struct __CFNumber *CFNumberRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFNumber.h

Constants

Number Types

Flags used by CFNumber to indicate the data type of a value.

```
enum CFNumberType {
    kCFNumberSInt8Type = 1,
    kCFNumberSInt16Type = 2,
    kCFNumberSInt32Type = 3,
    kCFNumberSInt64Type = 4,
    kCFNumberFloat32Type = 5,
    kCFNumberFloat64Type = 6,
    kCFNumberCharType = 7,
    kCFNumberShortType = 8,
    kCFNumberIntType = 9,
    kCFNumberLongType = 10,
    kCFNumberLongLongType = 11,
    kCFNumberFloatType = 12,
    kCFNumberDoubleType = 13,
    kCFNumberCFIndexType = 14,
    kCFNumberNSIntegerType = 15,
    kCFNumberCGFloatType = 16,
    kCFNumberMaxType = 16
};
typedef enum CFNumberType CFNumberType;
```

Constants

kCFNumberSInt8Type

Eight-bit, signed integer. The SInt8 data type is defined in MacTypes.h.

Available in Mac OS X v10.0 and later.

Declared in CFNumber.h.

`kCFNumberSInt16Type`

Sixteen-bit, signed integer. The `SInt16` data type is defined in `MacTypes.h`.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberSInt32Type`

Thirty-two-bit, signed integer. The `SInt32` data type is defined in `MacTypes.h`.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberSInt64Type`

Sixty-four-bit, signed integer. The `SInt64` data type is defined in `MacTypes.h`.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberFloat32Type`

Thirty-two-bit real. The `Float32` data type is defined in `MacTypes.h`.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberFloat64Type`

Sixty-four-bit real. The `Float64` data type is defined in `MacTypes.h` and conforms to the 64-bit IEEE 754 standard.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberCharType`

Basic C `char` type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberShortType`

Basic C `short` type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberIntType`

Basic C `int` type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberLongType`

Basic C `long` type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberLongLongType`

Basic C `long long` type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberFloatType`

Basic C float type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberDoubleType`

Basic C double type.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberCFIndexType`

CFIndex value.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberNSIntegerType`

NSInteger value.

Available in Mac OS X v10.5 and later.

Declared in `CFNumber.h`.

`kCFNumberCGFloatType`

CGFloat value.

Available in Mac OS X v10.5 and later.

Declared in `CFNumber.h`.

`kCFNumberMaxType`

Same as `kCFNumberCGFloatType`.

Note that on Mac OS X v10.4, `kCFNumberMaxType` was the same as `kCFNumberCFIndexType`.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

Discussion

The type specified in the call to `CFNumberCreate` (page 373) is not necessarily preserved when creating a new `CFNumber` object. A `CFNumber` object uses whatever internal storage type the creation function deems appropriate. Use the `CFNumberGetType` (page 374) function to find out what type the `CFNumber` object used to store your value.

Predefined Values

`CFNumber` provides some predefined number values.

```
const CFNumberRef kCFNumberNaN;
const CFNumberRef kCFNumberNegativeInfinity;
const CFNumberRef kCFNumberPositiveInfinity;
```

Constants

`kCFNumberNaN`

“Not a Number.” This value is often the result of an invalid operation, such as the square-root of a negative number.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberNegativeInfinity`

Designates a negative infinity value.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

`kCFNumberPositiveInfinity`

Designates a positive infinity value.

Available in Mac OS X v10.0 and later.

Declared in `CFNumber.h`.

CFNumberFormatter Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFNumberFormatter.h
Companion guide	Data Formatting Guide for Core Foundation

Overview

CFNumberFormatter objects format the textual representations of *CFNumber* objects, and convert textual representations of numbers into *CFNumber* objects. The representation encompasses integers, floats, and doubles; floats and doubles can be formatted to a specified decimal position. You specify how strings are formatted and parsed by setting a format string and other properties of a *CFNumberFormatter* object. The format of the format string itself is defined by [Unicode Technical Standard #35](#).

Note that *CFNumberFormatter* is not thread-safe. Do not use a single instance from multiple threads.

The *CFNumberFormatter* opaque type is available in Mac OS X v10.3 and later.

Unlike some other Core Foundation opaque types with names similar to a corresponding Cocoa Foundation class (such as *CFString* and *NSString*), *CFNumberFormatter* objects cannot be cast ("toll-free bridged") to *NSNumberFormatter* objects.

Functions by Task

Creating a Number Formatter

[CFNumberFormatterCreate](#) (page 383)

Creates a new *CFNumberFormatter* object, localized to the given locale, which will format numbers to the given style.

Configuring a Number Formatter

[CFNumberFormatterSetFormat](#) (page 388)

Sets the format string of a number formatter.

[CFNumberFormatterSetProperty](#) (page 389)

Sets a number formatter property using a key-value pair.

Formatting Values

[CFNumberFormatterCreateNumberFromString](#) (page 383)

Returns a number object representing a given string.

[CFNumberFormatterCreateStringWithNumber](#) (page 384)

Returns a string representation of the given number using the specified number formatter.

[CFNumberFormatterCreateStringWithValue](#) (page 385)

Returns a string representation of the given number or value using the specified number formatter.

[CFNumberFormatterGetDecimalInfoForCurrencyCode](#) (page 385)

Returns the number of fraction digits that should be displayed, and the rounding increment, for a given currency.

[CFNumberFormatterGetValueFromString](#) (page 388)

Returns a number or value representing a given string.

Examining a Number Formatter

[CFNumberFormatterCopyProperty](#) (page 382)

Returns a copy of a number formatter's value for a given key.

[CFNumberFormatterGetFormat](#) (page 386)

Returns a format string for the given number formatter object.

[CFNumberFormatterGetLocale](#) (page 387)

Returns the locale object used to create the given number formatter object.

[CFNumberFormatterGetStyle](#) (page 387)

Returns the number style used to create the given number formatter object.

Getting the CFNumberFormatter Type ID

[CFNumberFormatterGetTypeID](#) (page 387)

Returns the type identifier for the `CFNumberFormatter` opaque type.

Functions

CFNumberFormatterCopyProperty

Returns a copy of a number formatter's value for a given key.

```
CTypeRef CFNumberFormatterCopyProperty (
    CFNumberFormatterRef formatter,
    CFStringRef key
);
```

Parameters

formatter

The number formatter to examine.

key

A property key. See “[Number Formatter Property Keys](#)” (page 392) for valid values.

Return Value

A `CFTYPE` object that is a copy of the property value for *key*. Returns `NULL` if there is no value specified for *key*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNumberFormatter.h`

CFNumberFormatterCreate

Creates a new `CFNumberFormatter` object, localized to the given locale, which will format numbers to the given style.

```
CFNumberFormatterRef CFNumberFormatterCreate (
    CFAllocatorRef allocator,
    CFLocaleRef locale,
    CFNumberFormatterStyle style
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

locale

A locale to use for localization. If `NULL`, the function uses the default system locale. Use [CFLocaleCopyCurrent](#) (page 240) to specify the locale of the current user.

style

A number style. See “[Number Formatter Styles](#)” (page 391) for possible values.

Return Value

A new number formatter, localized to the given locale, which will format numbers using the given style. Returns `NULL` if there was a problem creating the formatter. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNumberFormatter.h`

CFNumberFormatterCreateNumberFromString

Returns a number object representing a given string.

```

CFNumberRef CFNumberFormatterCreateNumberFromString (
    CFAllocatorRef allocator,
    CFNumberFormatterRef formatter,
    CFStringRef string,
    CFRange *rangep,
    CFOptionFlags options
);

```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatter

The number formatter to use.

string

The string to parse.

rangep

A reference to a range that specifies the substring of *string* to be parsed. If `NULL`, the whole string is parsed. On return, contains the range of the actual extent of the parse (may be less than the given range).

options

Specifies various configuration options to change the behavior of the parse. Currently, [kCFNumberFormatterParseIntegersOnly](#) (page 397) is the only possible value for this parameter.

Return Value

A new number that represents the given string. Returns `NULL` if there was a problem creating the number. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNumberFormatter.h`

CFNumberFormatterCreateStringWithNumber

Returns a string representation of the given number using the specified number formatter.

```

CFStringRef CFNumberFormatterCreateStringWithNumber (
    CFAllocatorRef allocator,
    CFNumberFormatterRef formatter,
    CFNumberRef number
);

```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatter

The number formatter to use.

number

The number from which to create a string representation.

Return Value

A new string that represents the given number in the specified format. Returns `NULL` if there was a problem creating the string. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNumberFormatter.h`

CFNumberFormatterCreateStringWithValue

Returns a string representation of the given number or value using the specified number formatter.

```
CFStringRef CFNumberFormatterCreateStringWithValue (
    CFAllocatorRef allocator,
    CFNumberFormatterRef formatter,
    CFNumberType numberType,
    const void *valuePtr
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatter

The number formatter to use.

numberType

The type of value that *valuePtr* references. Valid values are listed in [CFNumberType](#) (page 377).

valuePtr

A pointer to the value to be converted.

Return Value

A new string that represents the given number or value formatted by *formatter*. Returns `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFNumberFormatter.h`

CFNumberFormatterGetDecimalInfoForCurrencyCode

Returns the number of fraction digits that should be displayed, and the rounding increment, for a given currency.

```
Boolean CFNumberFormatterGetDecimalInfoForCurrencyCode (
    CFStringRef currencyCode,
    int32_t *defaultFractionDigits,
    double *roundingIncrement
);
```

Parameters*currencyCode*

A string containing a ISO 4217 3-letter currency code. For example, AUD for Australian Dollars, EUR for Euros.

defaultFractionDigits

Upon return, contains the number of fraction digits that should be displayed for the currency specified by *currencyCode*.

roundingIncrement

Upon return, contains the rounding increment for the currency specified by *currencyCode*, or 0.0 if no rounding is done by the currency.

Return Value

true if the information was obtained successfully, otherwise false (for example, if the currency code is unknown or the information is not available).

Discussion

The returned values are not localized because these are properties of the currency.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterGetFormat

Returns a format string for the given number formatter object.

```
CFStringRef CFNumberFormatterGetFormat (
    CFNumberFormatterRef formatter
);
```

Parameters*formatter*

The number formatter to examine.

Return Value

The format string for *formatter* as was specified by calling the [CFNumberFormatterSetFormat](#) (page 388) function, or derived from the number formatter's style. The format of this string is defined by [Unicode Technical Standard #35](#). Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterGetLocale

Returns the locale object used to create the given number formatter object.

```
CFLocaleRef CFNumberFormatterGetLocale (
    CFNumberFormatterRef formatter
);
```

Parameters

formatter

The number formatter to examine.

Return Value

The locale used to create *formatter*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterGetStyle

Returns the number style used to create the given number formatter object.

```
CFNumberFormatterStyle CFNumberFormatterGetStyle (
    CFNumberFormatterRef formatter
);
```

Parameters

formatter

The number formatter to examine.

Return Value

The number style used to create *formatter*.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterGetTypeID

Returns the type identifier for the CFNumberFormatter opaque type.

```
CFTypeID CFNumberFormatterGetTypeID (
    void
);
```

Return Value

The type identifier for the CFNumberFormatter opaque type.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterGetValueFromString

Returns a number or value representing a given string.

```
Boolean CFNumberFormatterGetValueFromString (
    CFNumberFormatterRef formatter,
    CFStringRef string,
    CFRange *rangeP,
    CFNumberType numberType,
    void *valuePtr
);
```

Parameters*formatter*

The number formatter to use.

string

The string to parse.

*rangeP*A reference to a range that specifies the substring of *string* to be parsed. If `NULL`, the whole string is parsed. Upon return, contains the range of the actual extent of the parse (may be less than the given range).*numberType*The type of value that *valuePtr* references. Valid values are listed in [CFNumberType](#) (page 377).*valuePtr*

Upon return, contains a number or value representing the string in the specified format. You are responsible for releasing this value.

Return Value`true` if the string was parsed successfully, otherwise `false`.**Availability**

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterSetFormat

Sets the format string of a number formatter.

```
void CFNumberFormatterSetFormat (
    CFNumberFormatterRef formatter,
    CFStringRef formatString
);
```

Parameters*formatter*

The number formatter to modify.

formatString

The format string to be used by *formatter*. The format of this string is defined by [Unicode Technical Standard #35](#).

Discussion

The format string may override other properties previously set using other functions. If this function is not called, the default value of the format string is derived from the number formatter's style.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterSetProperty

Sets a number formatter property using a key-value pair.

```
void CFNumberFormatterSetProperty (
    CFNumberFormatterRef formatter,
    CFStringRef key,
    CTypeRef value
);
```

Parameters

formatter

The number formatter to modify.

key

The name of the property of *formatter* to set. See [“Number Formatter Property Keys”](#) (page 392) for a description of possible values.

value

The value of the specified key. This must be an instance of the correct CType object for the corresponding key.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

Data Types

CFNumberFormatterOptionFlags

Type for constants specifying how numbers should be parsed.

```
typedef CFOptionFlags CFNumberFormatterOptionFlags;
```

Discussion

For values, see [“Number Format Options”](#) (page 397).

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterPadPosition

Type for constants specifying how numbers should be padded.

```
typedef CFIndex CFNumberFormatterPadPosition;
```

Discussion

For values, see [“Padding Positions”](#) (page 398).

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterRef

A reference to a `CFNumberFormatter` object.

```
typedef struct __CFNumberFormatter *CFNumberFormatterRef;
```

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

CFNumberFormatterStyle

Type for constants specifying a formatter style.

```
typedef CFIndex CFNumberFormatterStyle;
```

Discussion

For values, see [“Number Formatter Styles”](#) (page 391).

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFNumberFormatter.h

Constants

Number Formatter Styles

Predefined number format styles.

```
enum {
    kCFNumberFormatterNoStyle = 0,
    kCFNumberFormatterDecimalStyle = 1,
    kCFNumberFormatterCurrencyStyle = 2,
    kCFNumberFormatterPercentStyle = 3,
    kCFNumberFormatterScientificStyle = 4,
    kCFNumberFormatterSpellOutStyle = 5
};
```

Constants

`kCFNumberFormatterNoStyle`

Specifies no style.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterDecimalStyle`

Specifies a decimal style format.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterCurrencyStyle`

Specifies a currency style format.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterPercentStyle`

Specifies a percent style format.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterScientificStyle`

Specifies a scientific style format.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterSpellOutStyle`

Specifies a spelled out format.

Available in Mac OS X v10.4 and later.

Declared in `NSNumberFormatter.h`.

Discussion

The format for these number styles is not exact because they depend on the locale, user preference settings, and operating system version. Do not use these constants if you want an exact format (for example, if you are parsing data in a given format). In general, however, you are encouraged to use these styles to accommodate user preferences.

Declared In

CFNumberFormatter.h

Number Formatter Property Keys

The keys used in key-value pairs to specify the value of number formatter properties.

```

const CFStringRef kCFNumberFormatterCurrencyCode;
const CFStringRef kCFNumberFormatterDecimalSeparator;
const CFStringRef kCFNumberFormatterCurrencyDecimalSeparator;
const CFStringRef kCFNumberFormatterAlwaysShowDecimalSeparator;
const CFStringRef kCFNumberFormatterGroupingSeparator;
const CFStringRef kCFNumberFormatterUseGroupingSeparator;
const CFStringRef kCFNumberFormatterPercentSymbol;
const CFStringRef kCFNumberFormatterZeroSymbol;
const CFStringRef kCFNumberFormatterNaNSymbol;
const CFStringRef kCFNumberFormatterInfinitySymbol;
const CFStringRef kCFNumberFormatterMinusSign;
const CFStringRef kCFNumberFormatterPlusSign;
const CFStringRef kCFNumberFormatterCurrencySymbol;
const CFStringRef kCFNumberFormatterExponentSymbol;
const CFStringRef kCFNumberFormatterMinIntegerDigits;
const CFStringRef kCFNumberFormatterMaxIntegerDigits;
const CFStringRef kCFNumberFormatterMinFractionDigits;
const CFStringRef kCFNumberFormatterMaxFractionDigits;
const CFStringRef kCFNumberFormatterGroupingSize;
const CFStringRef kCFNumberFormatterSecondaryGroupingSize;
const CFStringRef kCFNumberFormatterRoundingMode;
const CFStringRef kCFNumberFormatterRoundingIncrement;
const CFStringRef kCFNumberFormatterFormatWidth;
const CFStringRef kCFNumberFormatterPaddingPosition;
const CFStringRef kCFNumberFormatterPaddingCharacter;
const CFStringRef kCFNumberFormatterDefaultFormat;
const CFStringRef kCFNumberFormatterMultiplier;
const CFStringRef kCFNumberFormatterPositivePrefix;
const CFStringRef kCFNumberFormatterPositiveSuffix;
const CFStringRef kCFNumberFormatterNegativePrefix;
const CFStringRef kCFNumberFormatterNegativeSuffix;
const CFStringRef kCFNumberFormatterPerMillsSymbol;
const CFStringRef kCFNumberFormatterInternationalCurrencySymbol;
const CFStringRef kCFNumberFormatterCurrencyGroupingSeparator;
const CFStringRef kCFNumberFormatterIsLenient;
const CFStringRef kCFNumberFormatterUseSignificantDigits;
const CFStringRef kCFNumberFormatterMinSignificantDigits;
const CFStringRef kCFNumberFormatterMaxSignificantDigits;

```

Constants

`kCFNumberFormatterCurrencyCode`

Specifies the currency code, a CFString object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

- `kCFNumberFormatterDecimalSeparator`
Specifies the decimal separator, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterCurrencyDecimalSeparator`
Specifies the currency decimal separator, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterAlwaysShowDecimalSeparator`
Specifies if the result of converting a value to a string should always contain the decimal separator, even if the number is an integer.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterGroupingSeparator`
Specifies the grouping separator, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterUseGroupingSeparator`
Specifies if the grouping separator should be used, a `CFBoolean` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterPercentSymbol`
Specifies the string that is used to represent the percent symbol, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterZeroSymbol`
Specifies the string that is used to represent zero, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterNaNSymbol`
Specifies the string that is used to represent NaN (“not a number”) when values are converted to strings, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterInfinitySymbol`
Specifies the string that is used to represent the symbol for infinity, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.
- `kCFNumberFormatterMinusSign`
Specifies the symbol for the minus sign, a `CFString` object.
Available in Mac OS X v10.3 and later.
Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterPlusSign`

Specifies the symbol for the plus sign, a `CFString` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterCurrencySymbol`

Specifies the symbol for the currency, a `CFString` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterExponentSymbol`

Specifies the exponent symbol (“E” or “e”) in the scientific notation of numbers (for example, as in 1.0e+56), a `CFString` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMinIntegerDigits`

Specifies the minimum number of integer digits before a decimal point, a `CFNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMaxIntegerDigits`

Specifies the maximum number of integer digits before a decimal point, a `CFNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMinFractionDigits`

Specifies the minimum number of digits after a decimal point, a `CFNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMaxFractionDigits`

Specifies the maximum number of digits after a decimal point, a `CFNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterGroupingSize`

Specifies how often the “thousands” or grouping separator appears, as in “10,000,000”; a `CFNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterSecondaryGroupingSize`

Specifies how often the secondary grouping separator appears, a `CFNumber` object. See [Unicode Technical Standard #35](#) for more information.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kNSNumberFormatterRoundingMode`

Specifies how the last digit is rounded, as when 3.1415926535... is rounded to three decimal places, as in 3.142, a `NSNumber` object. See “[Rounding Modes](#)” (page 397) for possible values.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterRoundingIncrement`

Specifies a positive rounding increment, or 0.0 to disable rounding, a `NSNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterFormatWidth`

Specifies the width of a formatted number within a string that is either left justified or right justified based on the value of `kNSNumberFormatterPaddingPosition` (page 395), a `NSNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterPaddingPosition`

Specifies the position of a formatted number within a string, a `NSNumber` object.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterPaddingCharacter`

Specifies the padding character to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterDefaultFormat`

The original format string for the formatter (given the date and time style and locale specified at creation), a `CFString` object.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterMultiplier`

Specifies the multiplier to use when placing a formatted number within a string, a `NSNumber` object.

Available in Mac OS X v10.4 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterPositivePrefix`

Specifies the plus sign prefix symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `NSNumberFormatter.h`.

`kNSNumberFormatterPositiveSuffix`

Specifies the plus sign suffix symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `NSNumberFormatter.h`.

`kCFNumberFormatterNegativePrefix`

Specifies the minus sign prefix symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterNegativeSuffix`

Specifies the minus sign suffix symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterPerMillSymbol`

Specifies the per mill (1/1000) symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterInternationalCurrencySymbol`

Specifies the international currency symbol to use when placing a formatted number within a string, a `CFString` object.

Available in Mac OS X v10.4 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterCurrencyGroupingSeparator`

Specifies the grouping symbol to use when placing a currency value within a string, a `CFString` object.

Available in Mac OS X v10.5 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterIsLenient`

Specifies whether the formatter is lenient, a `CFBoolean` object.

Available in Mac OS X v10.5 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterUseSignificantDigits`

Specifies the whether the formatter uses significant digits, a `CFBoolean` object.

Available in Mac OS X v10.5 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMinSignificantDigits`

Specifies the minimum number of significant digits to use, a `CFNumber` object.

Available in Mac OS X v10.5 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterMaxSignificantDigits`

Specifies the maximum number of significant digits to use, a `CFNumber` object.

Available in Mac OS X v10.5 and later.

Declared in `CFNumberFormatter.h`.

Discussion

The values for these keys are all `CType` objects. The specific types for each key are specified above.

Declared In

CFNumberFormatter.h

Number Format Options

These constants are used to specify how numbers should be parsed.

```
enum {
    kCFNumberFormatterParseIntegersOnly = 1
};
```

Constants

kCFNumberFormatterParseIntegersOnly
 Specifies that only integers should be parsed.
 Available in Mac OS X v10.3 and later.
 Declared in CFNumberFormatter.h.

Declared In

CFNumberFormatter.h

Rounding Modes

These constants are used to specify how numbers should be rounded.

```
typedef enum {
    kCFNumberFormatterRoundCeiling = 0,
    kCFNumberFormatterRoundFloor = 1,
    kCFNumberFormatterRoundDown = 2,
    kCFNumberFormatterRoundUp = 3,
    kCFNumberFormatterRoundHalfEven = 4,
    kCFNumberFormatterRoundHalfDown = 5,
    kCFNumberFormatterRoundHalfUp = 6
} CFNumberFormatterRoundingMode;
```

Constants

kCFNumberFormatterRoundCeiling
 Round up to next larger number with the proper number of fraction digits.
 Available in Mac OS X v10.3 and later.
 Declared in CFNumberFormatter.h.

kCFNumberFormatterRoundFloor
 Round down to next larger number with the proper number of fraction digits.
 Available in Mac OS X v10.3 and later.
 Declared in CFNumberFormatter.h.

kCFNumberFormatterRoundDown
 Round down to next larger number with the proper number of fraction digits.
 Available in Mac OS X v10.3 and later.
 Declared in CFNumberFormatter.h.

`kCFNumberFormatterRoundUp`

Round up to next larger number with the proper number of fraction digits.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterRoundHalfEven`

Round the last digit, when followed by a 5, toward an even digit (.25 -> .2, .35 -> .4)

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterRoundHalfDown`

Round down when a 5 follows putative last digit.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterRoundHalfUp`

Round up when a 5 follows putative last digit.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

Declared In

`CFNumberFormatter.h`

Padding Positions

These constants are used to specify how numbers should be padded.

```
typedef enum {
    kCFNumberFormatterPadBeforePrefix = 0,
    kCFNumberFormatterPadAfterPrefix = 1,
    kCFNumberFormatterPadBeforeSuffix = 2,
    kCFNumberFormatterPadAfterSuffix = 3
};
```

Constants

`kCFNumberFormatterPadBeforePrefix`

Specifies the number of padding characters before the prefix.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterPadAfterPrefix`

Specifies the number of padding characters after the prefix.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kCFNumberFormatterPadBeforeSuffix`

Specifies the number of padding characters before the suffix.

Available in Mac OS X v10.3 and later.

Declared in `CFNumberFormatter.h`.

`kNSNumberFormatterPadAfterSuffix`

Specifies the number of padding characters after the suffix.

Available in Mac OS X v10.3 and later.

Declared in `NSNumberFormatter.h`.

Declared In

`NSNumberFormatter.h`

CFPlugIn Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFPlugIn.h CFBundle.h
Companion guide	Plug-ins

Overview

`CFPlugIn` provides a standard architecture for application extensions. With `CFPlugIn`, you can design your application as a host framework that uses a set of executable code modules called plug-ins to provide certain well-defined areas of functionality. This approach allows third-party developers to add features to your application without requiring access to your source code. You can also bundle together plug-ins for multiple platforms and let `CFPlugIn` transparently load the appropriate plug-in at runtime. You can use `CFPlugIn` to add plug-in capability to, or write a plug-in for, your application.

Functions by Task

Creating Plug-Ins

[CFPlugInCreate](#) (page 403)

Creates a `CFPlugIn` given its URL.

[CFPlugInInstanceCreate](#) (page 405)

Creates a `CFPlugIn` instance of a given type using a given factory.

Registration

[CFPlugInRegisterFactoryFunction](#) (page 406)

Registers a factory function and its UUID with a `CFPlugIn` object.

[CFPlugInRegisterFactoryFunctionByName](#) (page 407)

Registers a factory function with a `CFPlugIn` object using the function's name instead of its UUID.

[CFPlugInRegisterPlugInType](#) (page 407)

Registers a type and its corresponding factory function with a `CFPlugIn` object.

[CFPlugInUnregisterFactory](#) (page 409)

Removes the given function from a plug-in's list of registered factory functions.

[CFPlugInUnregisterPlugInType](#) (page 409)

Removes the given type from a plug-in's list of registered types.

CFPlugIn Miscellaneous Functions

[CFPlugInAddInstanceForFactory](#) (page 402)

Registers a new instance of a type with `CFPlugIn`.

[CFPlugInFindFactoriesForPlugInType](#) (page 403)

Searches all registered plug-ins for factory functions capable of creating an instance of the given type.

[CFPlugInFindFactoriesForPlugInTypeInPlugIn](#) (page 404)

Searches the given plug-in for factory functions capable of creating an instance of the given type.

[CFPlugInGetBundle](#) (page 404)

Returns a plug-in's bundle.

[CFPlugInGetTypeID](#) (page 405)

Returns the type identifier for the `CFPlugIn` opaque type.

[CFPlugInIsLoadOnDemand](#) (page 406)

Determines where or not a plug-in is loaded on demand.

[CFPlugInRemoveInstanceForFactory](#) (page 408)

Unregisters an instance of a type with `CFPlugIn`.

[CFPlugInSetLoadOnDemand](#) (page 408)

Enables or disables load on demand for plug-ins that do dynamic registration (only when a client requests an instance of a supported type).

Functions

CFPlugInAddInstanceForFactory

Registers a new instance of a type with `CFPlugIn`.

```
void CFPlugInAddInstanceForFactory (
    CFUUIDRef factoryID
);
```

Parameters

factoryID

The `CFUUID` object representing the plug-in factory.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CIAnnotation

CoreRecipes

SampleCMPlugIn
Spotlight
SpotlightFortunes

Declared In

CFPlugIn.h

CFPlugInCreate

Creates a CFPlugIn given its URL.

```
CFPlugInRef CFPlugInCreate (
    CFAllocatorRef allocator,
    CFURLRef plugInURL
);
```

Parameters

allocator

The allocator to use to allocate memory for the new plug-in. Pass `NULL` or `kCFAllocatorDefault` to use the default allocator.

plugInURL

The location of the plug-in.

Return Value

A new plug-in. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicPlugIn

Declared In

CFPlugIn.h

CFPlugInFindFactoriesForPlugInType

Searches all registered plug-ins for factory functions capable of creating an instance of the given type.

```
CFArrayRef CFPlugInFindFactoriesForPlugInType (
    CFUUIDRef typeUUID
);
```

Parameters

typeUUID

A UUID type.

Return Value

An array of UUIDs for factory functions capable of creating an instance of the given type.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInFindFactoriesForPlugInTypeInPlugIn

Searches the given plug-in for factory functions capable of creating an instance of the given type.

```
CFArrayRef CFPlugInFindFactoriesForPlugInTypeInPlugIn (
    CFUUIDRef typeUUID,
    CFPlugInRef plugIn
);
```

Parameters

typeUUID

A UUID type.

plugIn

The plug-in to search.

Return Value

An array of UUIDs for factory functions capable of creating an instance of the given type.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicPlugIn

Declared In

CFPlugIn.h

CFPlugInGetBundle

Returns a plug-in's bundle.

```
CFBundleRef CFPlugInGetBundle (
    CFPlugInRef plugIn
);
```

Parameters

plugIn

The plug-in whose bundle to obtain.

Return Value

The bundle for *plugIn*. Ownership follows the Get Rule.

Discussion

You should *always* use this function to get a plug-in's bundle. Never attempt to access the plug-in directly as a bundle.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInGetTypeID

Returns the type identifier for the `CFPlugIn` opaque type.

```
CFTypeID CFPlugInGetTypeID (
    void
);
```

Return Value

The type identifier for the `CFPlugIn` opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceCreate

Creates a `CFPlugIn` instance of a given type using a given factory.

```
void * CFPlugInInstanceCreate (
    CFAAllocatorRef allocator,
    CFUUIDRef factoryUUID,
    CFUUIDRef typeUUID
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAAllocatorDefault` to use the default allocator.

factoryUUID

The UUID representing the factory function to use to create a plug-in of the given type.

typeUUID

The UUID type.

Return Value

Returns the `IUnknown` interface for the new plug-in.

Discussion

The plug-in host uses this function to create an instance of the given type. Unless the plug-in is using dynamic registration, this function causes the plug-in's code to be loaded into memory.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicPlugIn

Declared In

CFPlugIn.h

CFPlugInIsLoadOnDemand

Determines where or not a plug-in is loaded on demand.

```
Boolean CFPlugInIsLoadOnDemand (
    CFPlugInRef plugIn
);
```

Parameters*plugIn*

The plug-in to query.

Return Value`true` if the plug-in is loaded only when a client requests an instance of a supported type, otherwise `false`.**Discussion**

Plug-ins that do static registration are load on demand by default. Plug-ins that do dynamic registration are not load on demand by default.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInRegisterFactoryFunctionRegisters a factory function and its UUID with a `CFPlugIn` object.

```
Boolean CFPlugInRegisterFactoryFunction (
    CFUUIDRef factoryUUID,
    CFPlugInFactoryFunction func
);
```

Parameters*factoryUUID*The `CFUUID` object representing the factory function to register.*func*

The factory function pointer to register.

Return Value`true` if the factory function was successfully registered, otherwise `false`.**Discussion**

This function is used by a plug-in or host when performing dynamic registration.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInRegisterFactoryFunctionByName

Registers a factory function with a CFPlugIn object using the function's name instead of its UUID.

```
Boolean CFPlugInRegisterFactoryFunctionByName (
    CFUUIDRef factoryUUID,
    CFPlugInRef plugIn,
    CFStringRef functionName
);
```

Parameters

factoryUUID

The CFUUID object representing the factory function to register.

plugIn

The plug-in containing *functionName*.

functionName

The name of the factory function to register.

Return Value

true if the factory function was successfully registered, otherwise false.

Discussion

This function is used by a plug-in or host when performing dynamic registration.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInRegisterPlugInType

Registers a type and its corresponding factory function with a CFPlugIn object.

```
Boolean CFPlugInRegisterPlugInType (
    CFUUIDRef factoryUUID,
    CFUUIDRef typeUUID
);
```

Parameters

factoryUUID

The CFUUID object representing the factory function that can create the type being registered.

typeUUID

The UUID type to register.

Return Value

`true` if the factory function was successfully registered, otherwise `false`.

Discussion

This function is used by a plug-in or host when performing dynamic registration.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInRemoveInstanceForFactory

Unregisters an instance of a type with CFPlugIn.

```
void CFPlugInRemoveInstanceForFactory (
    CFUUIDRef factoryID
);
```

Parameters

factoryID

The CFUUID object representing the plug-in factory.

Discussion

If the instance counts of every factory in a plug-in are zero, the plug-in can be unloaded.]

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CIAnnotation

CoreRecipes

SampleCMPlugIn

Spotlight

SpotlightFortunes

Declared In

CFPlugIn.h

CFPlugInSetLoadOnDemand

Enables or disables load on demand for plug-ins that do dynamic registration (only when a client requests an instance of a supported type).


```
void CFPlugInSetLoadOnDemand (
    CFPlugInRef plugIn,
    Boolean flag
);
```

Parameters*plugIn*

The plug-in to be loaded on demand.

flag`true` to enable load on demand, `false` otherwise.**Discussion**

Plug-ins that do static registration are load on demand by default. Plug-ins that do dynamic registration are not load on demand by default.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInUnregisterFactory

Removes the given function from a plug-in's list of registered factory functions.

```
Boolean CFPlugInUnregisterFactory (
    CFUUIDRef factoryUUID
);
```

Parameters*factoryUUID*

The CFUUID object representing the factory to unregister.

Return Value`true` if the factory function was successfully unregistered, otherwise `false`.**Discussion**

Used by a plug-in or host when performing dynamic registration.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInUnregisterPlugInType

Removes the given type from a plug-in's list of registered types.

```
Boolean CFPlugInUnregisterPlugInType (
    CFUUIDRef factoryUUID,
    CFUUIDRef typeUUID
);
```

Parameters*factoryUUID*

The CFUUID object representing the factory function for the type to unregister.

typeUUID

The UUID type to unregister.

Return Value

true if the factory function was successfully unregistered, otherwise false.

Discussion

Used by a plug-in or host when performing dynamic registration.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

Callbacks

CFPlugInDynamicRegisterFunction

A callback which provides a plug-in the opportunity to dynamically register its types with a host.

```
typedef void (*CFPlugInDynamicRegisterFunction) (
    CFPlugInRef plugIn
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFPlugInRef plugIn
);
```

Parameters*plugIn*

The CFPlugIn object that is engaged in dynamic registration. When using in C++, this parameter functions as a `this` pointer for the plug-in.

Discussion

This callback is called as a plug-in is being loaded. This provides the plugin the means to dynamically register its types and factories with a plug-in's host. The call is triggered by the presence of [kCFPlugInDynamicRegistrationKey](#) (page 412) in the plug-in's information property list.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInFactoryFunction

Callback function that a plug-in author must implement to create a plug-in instance.

```
typedef void *(*CFPlugInFactoryFunction) (
    CFAllocatorRef allocator,
    CFUUIDRef typeUUID
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void *MyCallback (
    CFAllocatorRef allocator,
    CFUUIDRef typeUUID
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the default allocator.

typeUUID

The UUID type to instantiate.

Discussion

The plug-in author's implementation of this function is registered with `CFPlugIn` either statically in the plug-in's information property list, or dynamically. This function is executed as a result of a call to [CFPlugInInstanceCreate](#) (page 405) by the plug-in host.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInUnloadFunction

Callback function that is called, if present, just before a plug-in's code is unloaded.

```
typedef void (*CFPlugInUnloadFunction) (
    CFPlugInRef plugIn
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFPlugInRef plugIn
);
```

Parameters*plugIn*

The `CFPlugIn` object that is about to be unloaded from memory. When writing in C++, this parameter functions as a `this` pointer for the plug-in.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFPlugIn.h`

Data Types

CFPlugInRef

A reference to a `CFPlugIn` object.

```
typedef struct __CFBundle *CFPlugInRef;
```

Availability

Available in Mac OS X version 10.0 and later.

Declared In

`CFBundle.h`

Constants

Information Property List Keys

A plug-in's information property list can contain these keys used for registering types, factories, and interfaces.

```
const CFStringRef kCFPlugInDynamicRegistrationKey;
const CFStringRef kCFPlugInDynamicRegisterFunctionKey;
const CFStringRef kCFPlugInUnloadFunctionKey;
const CFStringRef kCFPlugInFactoriesKey;
const CFStringRef kCFPlugInTypesKey;
```

Constants

`kCFPlugInDynamicRegistrationKey`

Indicates whether a plug-in requires dynamic registration.

Available in Mac OS X v10.0 and later.

Declared in `CFPlugIn.h`.

`kCFPlugInDynamicRegisterFunctionKey`

Used to specify a plug-in's registration function.

Available in Mac OS X v10.0 and later.

Declared in `CFPlugIn.h`.

`kCFPlugInUnloadFunctionKey`

Used to specify a plug-in's unload function.

Available in Mac OS X v10.0 and later.

Declared in `CFPlugIn.h`.

`kCFPlugInFactoriesKey`

Used to statically register factory functions.

Available in Mac OS X v10.0 and later.

Declared in `CFPlugIn.h`.

`kCFPlugInTypesKey`

Used to statically register the factories that can create each supported type.

Available in Mac OS X v10.0 and later.

Declared in `CFPlugIn.h`.

Availability

Mac OS X version 10.0 and later

Declared In

`CFPlugIn.h`

CFPlugInInstance Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFPlugIn.h
Companion guide	Plug-ins

Overview

CFPlugInInstance is deprecated. Use the functions defined by CFPlugIn instead.

Functions

CFPlugInInstanceCreateWithInstanceDataSize

Not recommended.

Not recommended

```
CFPlugInInstanceRef CFPlugInInstanceCreateWithInstanceDataSize (
    CFAAllocatorRef allocator,
    CFIndex instanceDataSize,
    CFPlugInInstanceDeallocateInstanceDataFunction deallocateInstanceFunction,
    CFStringRef factoryName,
    CFPlugInInstanceGetInterfaceFunction getInterfaceFunction
);
```

Availability

Not recommended. Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceGetFactoryName

Not recommended.

Not recommended

```
CFStringRef CFPlugInInstanceGetFactoryName (
    CFPlugInInstanceRef instance
);
```

Availability

Not recommended. Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceGetInstanceData

Not recommended.

Not recommended

```
void * CFPlugInInstanceGetInstanceData (
    CFPlugInInstanceRef instance
);
```

Availability

Not recommended. Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceGetInterfaceFunctionTable

Not recommended.

Not recommended

```
Boolean CFPlugInInstanceGetInterfaceFunctionTable (
    CFPlugInInstanceRef instance,
    CFStringRef interfaceName,
    void **ftbl
);
```

Availability

Not recommended. Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceGetTypeID

Not recommended.

Not recommended


```

CTypeID CFPlugInInstanceGetTypeID (
    void
);

```

Availability

Not recommended. Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

Callbacks

CFPlugInInstanceDeallocateInstanceDataFunction

Not recommended.

Not recommended

```

typedef void (*CFPlugInInstanceDeallocateInstanceDataFunction) (
    void *instanceData
);

```

If you name your function `MyCallback`, you would declare it like this:

```

void MyCallback (
    void *instanceData
);

```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPlugInInstanceGetInterfaceFunction

Not recommended.

Not recommended

```

typedef Boolean (*CFPlugInInstanceGetInterfaceFunction) (
    CFPlugInInstanceRef instance,
    CFStringRef interfaceName,
    void **ftbl
);

```

If you name your function `MyCallback`, you would declare it like this:

```

Boolean MyCallback (
    CFPlugInInstanceRef instance,
    CFStringRef interfaceName,

```

```
void **ftbl  
);
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

Data Types

CFPlugInInstanceRef

Not recommended.

```
typedef struct __CFPlugInInstance *CFPlugInInstanceRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPlugIn.h

CFPropertyList Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFPropertyList.h CFBase.h
Companion guides	Property List Programming Topics for Core Foundation XML Programming Topics for Core Foundation

Overview

CFPropertyList provides functions that convert property list objects to and from several serialized formats such as XML. The [CFPropertyListRef](#) (page 425) type that denotes CFPropertyList objects is an abstract type for property list objects. Depending on the contents of the XML data used to create the property list, CFPropertyListRef can be any of the property list objects: CFData, CFString, CFArray, CFDictionary, CFDate, CFBoolean, and CFNumber. Note that if you use a property list to generate XML, the keys of any dictionaries in the property list must be CFString objects.

It is important to understand that CFPropertyList provides an abstraction for all the property list types—you can think of CFPropertyList in object-oriented terms as being the superclass of CFString, CFNumber, CFDictionary, and so on. When a Core Foundation function returns a CFPropertyListRef, it means that the value may be any of the property list types. For example, [CFPreferencesCopyAppValue](#) (page 795) returns a CFPropertyListRef. This means that the value returned can be a CFString object, a CFNumber object, a CFDictionary object, and so on again. You can use [CFGetTypeID](#) (page 637) to determine what type of object a property list value is.

You use one of the [CFPropertyListCreate...](#) functions to create a property list object given an existing property list object, raw XML data (as in a file), or a stream. You can also convert a property list object to XML using the [CFPropertyListCreateXMLData](#) (page 423) function. You use the [CFPropertyListWriteToStream](#) (page 424) function to write a property list to an output stream, and validate a property list object using the [CFPropertyListIsValid](#) (page 423) function. CFPropertyList properly takes care of endian issues—a property list (whether represented by a stream, XML, or a CFData object) created on a PowerPC-based Macintosh is correctly interpreted on an Intel-based Macintosh, and vice versa.

For code examples illustrating how to read and write property list files, see *Property List Programming Topics for Core Foundation* and in particular *Saving and Restoring Property Lists*.

Functions by Task

Creating a Property List

[CFPropertyListCreateDeepCopy](#) (page 420)

Recursively creates a copy of a given property list.

[CFPropertyListCreateFromXMLData](#) (page 422)

Creates a property list using the specified XML or binary property list data.

[CFPropertyListCreateFromStream](#) (page 421)

Creates a property list using data from a stream.

Exporting a Property List

[CFPropertyListCreateXMLData](#) (page 423)

Creates an XML representation of the specified property list.

[CFPropertyListWriteToStream](#) (page 424)

Writes the bytes of a property list serialization out to a stream.

Validating a Property List

[CFPropertyListIsValid](#) (page 423)

Determines if a property list is valid.

Functions

CFPropertyListCreateDeepCopy

Recursively creates a copy of a given property list.

```
CFPropertyListRef CFPropertyListCreateDeepCopy (
    CFAllocatorRef allocator,
    CFPropertyListRef propertyList,
    CFOptionFlags mutabilityOption
);
```

Parameters

allocator

The allocator to use to allocate memory for the new property list. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

propertyList

The property list to copy. This may be any of the standard property list objects, for example a `CFArray` or a `CFDictionary` object.

mutabilityOption

A constant that specifies the degree of mutability of the returned property list. See [Property List Mutability Options](#) (page 426) for descriptions of possible values.

Return Value

A new property list that is a copy of *propertyList*. Ownership follows the Create Rule.

Discussion

Recursively creates a copy of the given property list so nested arrays and dictionaries are copied as well as the top-most container.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

QISA

Declared In

CFPropertyList.h

CFPropertyListCreateFromStream

Creates a property list using data from a stream.

```
CFPropertyListRef CFPropertyListCreateFromStream (
    CFAllocatorRef allocator,
    CFReadStreamRef stream,
    CFIndex streamLength,
    CFOptionFlags mutabilityOption,
    CFPropertyListFormat *format,
    CFStringRef *errorString
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new property list. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

stream

The stream whose data contains the content. The stream must be opened and configured—this function simply reads bytes from the stream. The stream may contain any supported property list type (see [Property List Formats](#) (page 425)).

streamLength

The number of bytes to read. If 0, this function will read to the end of the stream.

mutabilityOption

A constant that specifies the degree of mutability for the returned property list. See [Property List Mutability Options](#) (page 426) for descriptions of possible values.

format

A constant that specifies the format of the property list. See [Property List Formats](#) (page 425) for possible values.

errorString

On return, `NULL` if the conversion is successful, otherwise a string that describes the nature of the error. Error messages are not localized, but may be in the future, so they are not suitable for comparison.

Pass `NULL` if you do not wish to receive an error string. Ownership follows the Create Rule.

Return Value

A new property list initialized with the data contained in *stream*. Ownership follows the Create Rule.

Discussion

This function simply reads bytes from *stream* starting at the current location to the end, which is expected to be the end of the property list, or up to the number of bytes specified by *streamLength* if it is not 0.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFPropertyList.h

CFPropertyListCreateFromXMLData

Creates a property list using the specified XML or binary property list data.

```
CFPropertyListRef CFPropertyListCreateFromXMLData (
    CFAllocatorRef allocator,
    CFDataRef xmlData,
    CFOptionFlags mutabilityOption,
    CFStringRef *errorString
);
```

Parameters

allocator

The allocator to use to allocate memory for the new property list. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

data

The raw bytes to convert into a property list. The bytes may be the content of an XML file or of a binary property list (see [Property List Formats](#) (page 425)).

mutabilityOption

A constant that specifies the degree of mutability for the returned property list. See [Property List Mutability Options](#) (page 426) for descriptions of possible values.

errorString

On return, `NULL` if the conversion is successful, otherwise a string that describes the nature of the error. Error messages are not localized, but may be in the future, so they are not currently suitable for comparison.

Pass `NULL` if you do not wish to receive an error string. Ownership follows the Create Rule.

Return Value

A new property list if the conversion is successful, otherwise `NULL`. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

HID Utilities Source

MoreIsBetter

QISA

StickiesExample

Declared In

CFPropertyList.h

CFPropertyListCreateXMLData

Creates an XML representation of the specified property list.

```
CFDataRef CFPropertyListCreateXMLData (
    CFAllocatorRef allocator,
    CFPropertyListRef propertyList
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new data object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

propertyList

The property list to convert. This may be any of the standard property list objects, for example a `CFArray` or a `CFDictionary` object.

Return Value

A `CFData` object containing the XML data. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

CFPrefTopScores

MoreIsBetter

QISA

StickiesExample

Declared In

CFPropertyList.h

CFPropertyListIsValid

Determines if a property list is valid.

```
Boolean CFPropertyListIsValid (
    CFPropertyListRef plist,
    CFPropertyListFormat format
);
```

Parameters*plist*

The property list to validate.

*format*A constant that specifies the allowable format of *plist*. See [Property List Formats](#) (page 425) for possible values.**Return Value**`true` if the object graph rooted at *plist* is a valid property list graph—that is, the property list contains no cycles, only contains property list objects, and all dictionary keys are strings; otherwise `false`.**Discussion**

The debugging library version of this function prints out some useful messages.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFPropertyList.h

CFPropertyListWriteToStream

Writes the bytes of a property list serialization out to a stream.

```
CFIndex CFPropertyListWriteToStream (
    CFPropertyListRef propertyList,
    CFWriteStreamRef stream,
    CFPropertyListFormat format,
    CFStringRef *errorString
);
```

Parameters*propertyList*

The property list to write out.

stream

The stream to write to. The stream must be opened and configured—this function simply writes bytes to the stream.

*format*A constant that specifies the format used to write *propertyList*. See [Property List Formats](#) (page 425) for possible values.*errorString*On return, `NULL` if the conversion is successful, otherwise a string that describes the nature of the errors. Error messages are not localized, but may be in the future, so they are not currently suitable for comparison.Pass `NULL` if you do not wish to receive an error string. Ownership follows the Create Rule.

Return Value

The number of bytes written, or 0 if an error occurred. If 0 is returned, *errorString* will contain an error message.

Discussion

This function leaves the stream open after reading the content. When reading a property list, this function expects the reading stream to end wherever the writing ended, so that the end of the property list data can be identified.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFPropertyList.h

Data Types

CFPropertyListRef

A reference to a CFPropertyList object.

```
typedef CTypeRef CFPropertyListRef;
```

Discussion

This is an abstract type for property list objects. The return value of the `CFPropertyListCreateFromXMLData` function depends on the contents of the given XML data. `CFPropertyListRef` can be a reference to any of the property list objects: `CFData`, `CFString`, `CFArray`, `CFDictionary`, `CFDate`, `CFBoolean`, and `CFNumber`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Constants

Property List Formats

Specifies the format of a property list.

```
enum CFPropertyListFormat {
    kCFPropertyListOpenStepFormat = 1,
    kCFPropertyListXMLFormat_v1_0 = 100,
    kCFPropertyListBinaryFormat_v1_0 = 200
};
typedef enum CFPropertyListFormat CFPropertyListFormat;
```

Constants

kCFPropertyListOpenStepFormat
OpenStep format (use of this format is discouraged).
 Available in Mac OS X v10.2 and later.
 Declared in `CFPropertyList.h`.

kCFPropertyListXMLFormat_v1_0
XML format version 1.0.
 Available in Mac OS X v10.2 and later.
 Declared in `CFPropertyList.h`.

kCFPropertyListBinaryFormat_v1_0
Binary format version 1.0.
 Available in Mac OS X v10.2 and later.
 Declared in `CFPropertyList.h`.

Property List Mutability Options

Option flags that determine the degree of mutability of newly created property lists.

```
enum CFPropertyListMutabilityOptions {
    kCFPropertyListImmutable = 0,
    kCFPropertyListMutableContainers = 1,
    kCFPropertyListMutableContainersAndLeaves = 2
};
typedef enum CFPropertyListMutabilityOptions CFPropertyListMutabilityOptions;
```

Constants

kCFPropertyListImmutable
Specifies that the property list should be immutable.
 Available in Mac OS X v10.0 and later.
 Declared in `CFPropertyList.h`.

kCFPropertyListMutableContainers
Specifies that the property list should have mutable containers but immutable leaves.
 Available in Mac OS X v10.0 and later.
 Declared in `CFPropertyList.h`.

kCFPropertyListMutableContainersAndLeaves
Specifies that the property list should have mutable containers and mutable leaves.
 Available in Mac OS X v10.0 and later.
 Declared in `CFPropertyList.h`.

CFReadStream Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFStream.h

Overview

`CFReadStream` provides an interface for reading a byte stream either synchronously or asynchronously. You can create streams that read bytes from a block of memory, a file, or a generic socket. All streams need to be opened, using [CFReadStreamOpen](#) (page 434), before reading.

Use `CFWriteStream` for writing byte streams. The `CFNetwork` framework defines an additional type of stream for reading responses to HTTP requests.

`CFReadStream` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSInputStream`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSInputStream *` parameter, you can pass in a `CFReadStreamRef`, and in a function where you see a `CFReadStreamRef` parameter, you can pass in an `NSInputStream` instance. Note, however, that you may have either a delegate or callbacks but not both. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Read Stream

[CFReadStreamCreateWithBytesNoCopy](#) (page 430)
Creates a readable stream for a block of memory.

[CFReadStreamCreateWithFile](#) (page 431)
Creates a readable stream for a file.

Opening and Closing a Read Stream

[CFReadStreamClose](#) (page 429)
Closes a readable stream.

[CFReadStreamOpen](#) (page 434)
Opens a stream for reading.

Reading from a Stream

[CFReadStreamRead](#) (page 434)

Reads data from a readable stream.

Scheduling a Read Stream

[CFReadStreamScheduleWithRunLoop](#) (page 435)

Schedules a stream into a run loop.

[CFReadStreamUnscheduleFromRunLoop](#) (page 438)

Removes a read stream from a given run loop.

Examining Stream Properties

[CFReadStreamCopyProperty](#) (page 430)

Returns the value of a property for a stream.

[CFReadStreamGetBuffer](#) (page 431)

Returns a pointer to a stream's internal buffer of unread data, if possible.

[CFReadStreamCopyError](#) (page 429)

Returns the error associated with a stream.

[CFReadStreamGetError](#) (page 432)

Returns the error status of a stream. (**Deprecated.** Use [CFReadStreamCopyError](#) (page 429) instead.)

[CFReadStreamGetStatus](#) (page 433)

Returns the current state of a stream.

[CFReadStreamHasBytesAvailable](#) (page 433)

Returns a Boolean value that indicates whether a readable stream has data that can be read without blocking.

Setting Stream Properties

[CFReadStreamSetClient](#) (page 436)

Assigns a client to a stream, which receives callbacks when certain events occur.

[CFReadStreamSetProperty](#) (page 437)

Sets the value of a property for a stream.

Getting the CFReadStream Type ID

[CFReadStreamGetTypeID](#) (page 433)

Returns the type identifier the `CFReadStream` opaque type.

Functions

CFReadStreamClose

Closes a readable stream.

```
void CFReadStreamClose (  
    CFReadStreamRef stream  
);
```

Parameters

stream

The stream to close.

Discussion

This function terminates the flow of bytes and releases any system resources required by the stream. The stream is removed from any run loops in which it was scheduled. Once closed, the stream cannot be reopened.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

CFReadStreamCopyError

Returns the error associated with a stream.

```
CFErrorRef CFReadStreamCopyError (  
    CFReadStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

A CFError object that describes the current problem with stream, or NULL if there is no error. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStream.h

CFReadStreamCopyProperty

Returns the value of a property for a stream.

```

CTypeRef CFReadStreamCopyProperty (
    CFReadStreamRef stream,
    CFStringRef propertyName
);

```

Parameters

stream

The stream to examine.

propertyName

The name of the stream property to obtain. The available properties for standard Core Foundation streams are listed in *CFStream Reference*.

Return Value

The value of the property *propertyName*. Ownership follows the Create Rule.

Discussion

Each type of stream can define a set of properties that either describe or configure individual streams. A property can be any information about a stream, other than the actual data the stream handles. Examples include the headers from an HTTP transmission, the expected number of bytes, file permission information, and so on. Use [CFReadStreamSetProperty](#) (page 437) to modify the value of a property, although some properties are read-only.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

ImageClient

Declared In

CFStream.h

CFReadStreamCreateWithBytesNoCopy

Creates a readable stream for a block of memory.

```

CFReadStreamRef CFReadStreamCreateWithBytesNoCopy (
    CFAllocatorRef alloc,
    const UInt8 *bytes,
    CFIndex length,
    CFAllocatorRef bytesDeallocator
);

```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

The memory buffer to read. This memory must exist for the lifetime of the new stream.

length

The size of *bytes*.

bytesDeallocator

The allocator to use to deallocate *bytes* when the stream is deallocated. Pass `kCFAllocatorNull` to prevent the stream from deallocating *bytes*.

Return Value

The new read stream, or `NULL` on failure. Ownership follows the Create Rule.

Discussion

You must open the stream, using [CFReadStreamOpen](#) (page 434), before reading from it.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFReadStreamCreateWithFile

Creates a readable stream for a file.

```
CFReadStreamRef CFReadStreamCreateWithFile (
    CFAllocatorRef alloc,
    CFURLRef fileURL
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

fileURL

The URL of the file to read. The URL must use the file scheme.

Return Value

The new readable stream object, or `NULL` on failure. Ownership follows the Create Rule.

Discussion

You must open the stream, using [CFReadStreamOpen](#) (page 434), before reading from it.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFReadStreamGetBuffer

Returns a pointer to a stream's internal buffer of unread data, if possible.

```
const UInt8 * CFReadStreamGetBuffer (
    CFReadStreamRef stream,
    CFIndex maxBytesToRead,
    CFIndex *numBytesRead
);
```

Parameters*stream*

The stream to examine.

*maxBytesToRead*The maximum number of bytes to read. If greater than 0, *maxBytesToRead* limits the number of bytes read; if 0 or less, all available bytes are read.*numBytesRead*On return, contains the length of returned buffer. If *stream* is not open or has encountered an error, *numBytesRead* is set to -1.**Return Value**

A pointer to the internal buffer of unread data for *stream*, if possible; NULL otherwise. The buffer is good only until the next stream operation called on the stream. You should neither change the contents of the returned buffer nor attempt to deallocate the buffer; it is still owned by the stream. The bytes returned in the buffer are considered read from the stream.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFReadStreamGetError

Returns the error status of a stream. (**Deprecated.** Use [CFReadStreamCopyError](#) (page 429) instead.)

```
CFStreamError CFReadStreamGetError (
    CFReadStreamRef stream
);
```

Parameters*stream*

The stream to examine.

Return ValueThe error status of *stream* returned in a [CFStreamError](#) (page 826) structure.

The error field is 0 if no error has occurred. If the error field is not 0, the *domain* field contains a code that identifies the domain in which the value of the *error* field should be interpreted.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFReadStreamGetStatus

Returns the current state of a stream.

```
CFStreamStatus CFReadStreamGetStatus (  
    CFReadStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

The current state of *stream*. See [CFStreamStatus](#) (page 827) for the list of possible states.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFReadStreamGetTypeID

Returns the type identifier the `CFReadStream` opaque type.

```
CTypeID CFReadStreamGetTypeID (  
    void  
);
```

Return Value

The type identifier for the `CFReadStream` opaque type.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFReadStreamHasBytesAvailable

Returns a Boolean value that indicates whether a readable stream has data that can be read without blocking.

```
Boolean CFReadStreamHasBytesAvailable (  
    CFReadStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

TRUE if data can be read from *stream* without blocking, otherwise FALSE. If *stream* cannot tell if data is available without actually trying to read the data, this function returns TRUE.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFReadStreamOpen

Opens a stream for reading.

```
Boolean CFReadStreamOpen (
    CFReadStreamRef stream
);
```

Parameters

stream

The stream to open.

Return Value

TRUE if *stream* was successfully opened, FALSE otherwise. If *stream* is not in the [kCFStreamStatusNotOpen](#) (page 828) state, this function returns FALSE.

Discussion

Opening a stream causes it to reserve all the system resources it requires. If the stream can open in the background without blocking, this function always returns `true`. To learn when a background open operation completes, you can either schedule the stream into a run loop with [CFReadStreamScheduleWithRunLoop](#) (page 435) and wait for the stream's client (set with [CFReadStreamSetClient](#) (page 436)) to be notified or you can poll the stream using [CFReadStreamGetStatus](#) (page 433), waiting for a status of [kCFStreamStatusOpen](#) (page 828) or [kCFStreamStatusError](#) (page 828).

You do not need to wait until a stream has finished opening in the background before calling the [CFReadStreamRead](#) (page 434) function. The read operation will simply block until the open has completed.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

CFReadStreamRead

Reads data from a readable stream.

```
CFIndex CFReadStreamRead (
    CFReadStreamRef stream,
    UInt8 *buffer,
    CFIndex bufferLength
);
```

Parameters*stream*

The stream from which to read.

buffer

The buffer into which to place the data.

*bufferLength*The size of *buffer* and the maximum number of bytes to read.**Return Value**

The number of bytes read; 0 if the stream has reached its end; or -1 if either the stream is not open or an error occurs.

Discussion

If *stream* is in the process of opening, this function waits until it has completed. This function blocks until at least one byte is available; it does not block until *buffer* is filled. To avoid blocking, call this function only if [CFReadStreamHasBytesAvailable](#) (page 433) returns TRUE or after the stream's client (set with [CFReadStreamSetClient](#) (page 436)) is notified of a [kCFStreamEventHasBytesAvailable](#) (page 831) event.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

CFReadStreamScheduleWithRunLoop

Schedules a stream into a run loop.

```
void CFReadStreamScheduleWithRunLoop (
    CFReadStreamRef stream,
    CFRunLoopRef runLoop,
    CFStringRef runLoopMode
);
```

Parameters*stream*

The stream to schedule.

*runLoop*The run loop with which to schedule *stream*.

runLoopMode

The run loop mode of *runLoop* in which to schedule *stream*.

Discussion

After scheduling *stream* with a run loop, its client (set with [CFReadStreamSetClient](#) (page 436)) is notified when various events happen with the stream, such as when it finishes opening, when it has bytes available, and when an error occurs. A stream can be scheduled with multiple run loops and run loop modes. Use [CFReadStreamUnscheduleFromRunLoop](#) (page 438) to later remove *stream* from the run loop.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

CFReadStreamSetClient

Assigns a client to a stream, which receives callbacks when certain events occur.

```
Boolean CFReadStreamSetClient (
    CFReadStreamRef stream,
    CFOptionFlags streamEvents,
    CFReadStreamClientCallback clientCB,
    CFStreamClientContext *clientContext
);
```

Parameters

stream

The stream to modify.

streamEvents

The set of events for which the client should receive callbacks. The events are listed in [CFStreamEventType](#) (page 831). If you pass [kCFStreamEventNone](#) (page 831), the current client for *stream* is removed.

clientCB

The client callback function to be called when one of the events requested in *streamEvents* occurs. If NULL, the current client for *stream* is removed.

clientContext

A structure holding contextual information for the stream client. The function copies the information out of the structure, so the memory pointed to by *clientContext* does not need to persist beyond the function call. If NULL, the current client for *stream* is removed.

Return Value

TRUE if the stream supports asynchronous notification, otherwise FALSE.

Discussion

To avoid polling and blocking, you can register a client to hear about interesting events that occur on a stream. Only one client per stream is allowed; registering a new client replaces the previous one.

Once you have set a client, you need to schedule the stream in a run loop using [CFReadStreamScheduleWithRunLoop](#) (page 435) so that the client can receive the asynchronous notifications. You can schedule each stream in multiple run loops (for example, if you are using a thread pool). It is the caller's responsibility to ensure that at least one of the scheduled run loops is being run, otherwise the callback cannot be called.

Although all Core Foundation streams currently support asynchronous notification, future stream types may not. If a stream does not support asynchronous notification, this function returns `false`. Typically, such streams never block for device I/O (for example, a stream reading memory) and don't benefit from asynchronous notification.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

CFReadStreamSetProperty

Sets the value of a property for a stream.

```
Boolean CFReadStreamSetProperty (
    CFReadStreamRef stream,
    CFStringRef propertyName,
    CTypeRef propertyValue
);
```

Parameters

stream

The stream to modify.

propertyName

The name of the property to set. The available properties for standard Core Foundation streams are listed in *CFStream Reference*.

propertyValue

The value to which to set the property *propertyName* for *stream*. The allowed data type of the value depends on the property being set.

Return Value

TRUE if *stream* recognizes and accepts the given property-value pair, otherwise FALSE.

Discussion

Each type of stream can define a set of properties that either describe or configure individual streams. A property can be any interesting information about a stream. Examples include the headers from an HTTP transmission, the expected number of bytes, file permission information, and so on. Properties that can be set configure the behavior of the stream and may be modifiable only at particular times, such as before the stream has been opened. (In fact, you should assume that you can set properties only before opening the stream, unless otherwise noted.) To read the value of a property use [CFReadStreamCopyProperty](#) (page 430), although some properties are write-only.

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

CFFTPSSample

CFNetworkHTTPDownload

CocoaEcho

CocoaHTTPServer

ImageClient

Declared In

CFStream.h

CFReadStreamUnscheduleFromRunLoop

Removes a read stream from a given run loop.

```
void CFReadStreamUnscheduleFromRunLoop (
    CFReadStreamRef stream,
    CFRunLoopRef runLoop,
    CFStringRef runLoopMode
);
```

Parameters

stream

The stream to unschedule.

runLoop

The run loop from which to remove *stream*.

runLoopMode

The run loop mode of *runLoop* from which to remove *stream*.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSSample

CFNetworkHTTPDownload

ImageClient

Declared In

CFStream.h

Callbacks

CFReadStreamClientCallback

Callback invoked when certain types of activity takes place on a readable stream.

```
typedef void (*CFReadStreamClientCallback) (
    CFReadStreamRef stream,
    CFStreamEventType eventType,
    void *clientCallbackInfo
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFReadStreamRef stream,
    CFStreamEventType eventType,
    void *clientCallbackInfo
);
```

Parameters

stream

The stream that experienced the event *eventType*.

eventType

The event that caused the callback to be called. The possible events are listed in [CFStreamEventType](#) (page 831).

clientCallbackInfo

The `info` member of the [CFStreamClientContext](#) (page 440) structure that was used when setting the client for *stream*.

Discussion

This callback is called only for the events requested when setting the client with [CFReadStreamSetClient](#) (page 436).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStream.h

Data Types

CFReadStreamRef

A reference to a readable stream object.

```
typedef struct __CFReadStream *CFReadStreamRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStream.h

CFStreamClientContext

A structure that contains program-defined data and callbacks with which you can configure a stream's client behavior.

```
struct CFStreamClientContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFStreamClientContext CFStreamClientContext;
```

Fields

version

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the client. This pointer is passed to the callbacks defined in the context and to the client callback function [CFReadStreamClientCallback](#) (page 438).

retain

A retain callback for your program-defined `info` pointer. Can be `NULL`.

release

A release callback for your program-defined `info` pointer. Can be `NULL`.

copyDescription

A copy description callback for your program-defined `info` pointer. Can be `NULL`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStream.h

CFRunLoop Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFRunLoop.h
Companion guide	Run Loops

Overview

A `CFRunLoop` object monitors sources of input to a task and dispatches control when they become ready for processing. Examples of input sources might include user input devices, network connections, periodic or time-delayed events, and asynchronous callbacks.

Three types of objects can be monitored by a run loop: sources (`CFRunLoopSource`), timers (`CFRunLoopTimer`), and observers (`CFRunLoopObserver`). To receive callbacks when these objects need processing, you must first place these objects into a run loop with `CFRunLoopAddSource` (page 445), `CFRunLoopAddTimer` (page 446), or `CFRunLoopAddObserver` (page 444). You can later remove an object from the run loop (or invalidate it) to stop receiving its callback.

Run loops have different modes in which they can run. Each mode has its own set of objects that the run loop monitors while running in that mode. Core Foundation defines a default mode, `kCFRunLoopDefaultMode` (page 458), to hold objects that should be monitored while the application (or thread) is sitting idle. Additional modes are created automatically when an object is added to an unrecognized mode. Each run loop has its own independent set of modes.

Core Foundation also defines a special pseudo-mode `kCFRunLoopCommonModes` (page 458) to hold objects that should be shared by a set of “common” modes. A mode is added to the set of “common” modes by calling `CFRunLoopAddCommonMode` (page 443). The default mode, `kCFRunLoopDefaultMode` (page 458), is always a member of the set of common modes. The `kCFRunLoopCommonModes` (page 458) constant is never passed to `CFRunLoopRunInMode` (page 454). Each run loop has its own independent set of common modes.

There is exactly one run loop per thread. You neither create nor destroy a thread’s run loop. Core Foundation automatically creates it for you as needed. You obtain the current thread’s run loop with `CFRunLoopGetCurrent` (page 450). Call `CFRunLoopRun` (page 454) to run the current thread’s run loop in the default mode until the run loop is stopped with `CFRunLoopStop` (page 455). You can also call `CFRunLoopRunInMode` (page 454) to run the current thread’s run loop in a specified mode for a set period of time (or until the run loop is stopped). A run loop can only run if the requested mode has at least one source or timer to monitor.

Run loops can be run recursively. You can call `CFRunLoopRun` (page 454) or `CFRunLoopRunInMode` (page 454) from within any run loop callout and create nested run loop activations on the current thread's call stack. You are not restricted in which modes you can run from within a callout. You can create another run loop activation running in any available run loop mode, including any modes already running higher in the call stack.

Cocoa and Carbon each build upon CFRunLoop to implement their own higher-level event loop. When writing a Cocoa or Carbon application, you can add your sources, timers, and observers to their run loop objects and modes. Your objects will then get monitored as part of the regular application event loop. Use the NSRunLoop instance method `getCFRunLoop` to obtain the CFRunLoop corresponding to a Cocoa run loop. In Carbon applications, use the `GetCFRunLoopFromEventLoop` function.

Functions by Task

Getting a Run Loop

`CFRunLoopGetCurrent` (page 450)

Returns the CFRunLoop object for the current thread.

`CFRunLoopGetMain` (page 450)

Returns the main CFRunLoop object.

Starting and Stopping a Run Loop

`CFRunLoopRun` (page 454)

Runs the current thread's CFRunLoop object in its default mode indefinitely.

`CFRunLoopRunInMode` (page 454)

Runs the current thread's CFRunLoop object in a particular mode.

`CFRunLoopWakeUp` (page 456)

Wakes a waiting CFRunLoop object.

`CFRunLoopStop` (page 455)

Forces a CFRunLoop object to stop running.

`CFRunLoopIsWaiting` (page 451)

Returns a Boolean value that indicates whether the run loop is waiting for an event.

Managing Sources

`CFRunLoopAddSource` (page 445)

Adds a CFRunLoopSource object to a run loop mode.

`CFRunLoopContainsSource` (page 447)

Returns a Boolean value that indicates whether a run loop mode contains a particular CFRunLoopSource object.

`CFRunLoopRemoveSource` (page 452)

Removes a CFRunLoopSource object from a run loop mode.

Managing Observers

[CFRunLoopAddObserver](#) (page 444)

Adds a `CFRunLoopObserver` object to a run loop mode.

[CFRunLoopContainsObserver](#) (page 446)

Returns a Boolean value that indicates whether a run loop mode contains a particular `CFRunLoopObserver` object.

[CFRunLoopRemoveObserver](#) (page 452)

Removes a `CFRunLoopObserver` object from a run loop mode.

Managing Run Loop Modes

[CFRunLoopAddCommonMode](#) (page 443)

Adds a mode to the set of run loop common modes.

[CFRunLoopCopyAllModes](#) (page 449)

Returns an array that contains all the defined modes for a `CFRunLoop` object.

[CFRunLoopCopyCurrentMode](#) (page 449)

Returns the name of the mode in which a given run loop is currently running.

Managing Timers

[CFRunLoopAddTimer](#) (page 446)

Adds a `CFRunLoopTimer` object to a run loop mode.

[CFRunLoopGetNextTimerFireDate](#) (page 450)

Returns the time at which the next timer will fire.

[CFRunLoopRemoveTimer](#) (page 453)

Removes a `CFRunLoopTimer` object from a run loop mode.

[CFRunLoopContainsTimer](#) (page 448)

Returns a Boolean value that indicates whether a run loop mode contains a particular `CFRunLoopTimer` object.

Getting the CFRunLoop Type ID

[CFRunLoopGetTypeID](#) (page 451)

Returns the type identifier for the `CFRunLoop` opaque type.

Functions

CFRunLoopAddCommonMode

Adds a mode to the set of run loop common modes.

```
void CFRunLoopAddCommonMode (
    CFRunLoopRef r1,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to modify. Each run loop has its own independent list of modes that are in the set of common modes.

mode

The run loop mode to add to the set of common modes of *r1*.

Discussion

Sources, timers, and observers get registered to one or more run loop modes and only run when the run loop is running in one of those modes. Common modes are a set of run loop modes for which you can define a set of sources, timers, and observers that are shared by these modes. Instead of registering a source, for example, to each specific run loop mode, you can register it once to the run loop's common pseudo-mode and it will be automatically registered in each run loop mode in the common mode set. Likewise, when a mode is added to the set of common modes, any sources, timers, or observers already registered to the common pseudo-mode are added to the newly added common mode.

Once a mode is added to the set of common modes, it cannot be removed.

The Add, Contains, and Remove functions for sources, timers, and observers operate on a run loop's set of common modes when you use the constant `kCFRunLoopCommonModes` (page 458) for the run loop mode.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopCopyAllModes](#) (page 449)

[CFRunLoopCopyCurrentMode](#) (page 449)

Declared In

CFRunLoop.h

CFRunLoopAddObserver

Adds a `CFRunLoopObserver` object to a run loop mode.

```
void CFRunLoopAddObserver (
    CFRunLoopRef r1,
    CFRunLoopObserverRef observer,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to modify.

observer

The run loop observer to add.

mode

The run loop mode to which to add *observer*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to add *observer* to the set of objects monitored by all the common modes.

Discussion

A run loop observer can be registered in only one run loop at a time, although it can be added to multiple run loop modes within that run loop.

If *rl* already contains *observer* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopContainsObserver](#) (page 446)

[CFRunLoopRemoveObserver](#) (page 452)

Declared In

CFRunLoop.h

CFRunLoopAddSource

Adds a CFRunLoopSource object to a run loop mode.

```
void CFRunLoopAddSource (
    CFRunLoopRef rl,
    CFRunLoopSourceRef source,
    CFStringRef mode
);
```

Parameters

rl

The run loop to modify.

source

The run loop source to add.

mode

The run loop mode to which to add *source*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to add *source* to the set of objects monitored by all the common modes.

Discussion

If *source* is a version 0 source, this function calls the `schedule` callback function specified in the context structure for *source*. See [CFRunLoopSourceContext](#) for more details.

A run loop source can be registered in multiple run loops and run loop modes at the same time. When the source is signaled, whichever run loop that happens to detect the signal first will fire the source.

If *rl* already contains *source* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopContainsSource](#) (page 447)

[CFRunLoopRemoveSource](#) (page 452)

Related Sample Code

audioburntest

bulkerase

CFLocalServer

databurntest

ImageClient

Declared In

CFRunLoop.h

CFRunLoopAddTimer

Adds a `CFRunLoopTimer` object to a run loop mode.

```
void CFRunLoopAddTimer (
    CFRunLoopRef r1,
    CFRunLoopTimerRef timer,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to modify.

timer

The run loop timer to add.

mode

The run loop mode of *r1* to which to add *timer*. Use the constant `kCFRunLoopCommonModes` (page 458) to add *timer* to the set of objects monitored by all the common modes.

Discussion

A run loop timer can be registered in only one run loop at a time, although it can be added to multiple run loop modes within that run loop.

If *r1* already contains *timer* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Watcher

Worm

Declared In

CFRunLoop.h

CFRunLoopContainsObserver

Returns a Boolean value that indicates whether a run loop mode contains a particular `CFRunLoopObserver` object.

```
Boolean CFRunLoopContainsObserver (
    CFRunLoopRef r1,
    CFRunLoopObserverRef observer,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to examine.

observer

The run loop observer for which to search.

*mode*The run loop mode in which to search for *observer*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to search for *observer* in the set of objects monitored by all the common modes.**Return Value**true if *observer* is in mode *mode* of the run loop *r1*, otherwise false.**Discussion**If *observer* was added to [kCFRunLoopCommonModes](#) (page 458), this function returns true if *mode* is either [kCFRunLoopCommonModes](#) (page 458) or any of the modes that has been added to the set of common modes.**Availability**

Available in Mac OS X v10.0 and later.

See Also[CFRunLoopAddObserver](#) (page 444)[CFRunLoopRemoveObserver](#) (page 452)**Declared In**

CFRunLoop.h

CFRunLoopContainsSource

Returns a Boolean value that indicates whether a run loop mode contains a particular CFRunLoopSource object.

```
Boolean CFRunLoopContainsSource (
    CFRunLoopRef r1,
    CFRunLoopSourceRef source,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to examine.

source

The run loop source for which to search.

*mode*The run loop mode of *r1* in which to search. Use the constant [kCFRunLoopCommonModes](#) (page 458) to search for *source* in the set of objects monitored by all the common modes.

Return Value

true if *source* is in mode *mode* of the run loop *rl*, otherwise false.

Discussion

If *source* was added to [kCFRunLoopCommonModes](#) (page 458), this function returns true if *mode* is either [kCFRunLoopCommonModes](#) (page 458) or any of the modes that has been added to the set of common modes.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopAddSource](#) (page 445)

[CFRunLoopRemoveSource](#) (page 452)

Related Sample Code

HID Manager Basics

HID Utilities Source

Declared In

CFRunLoop.h

CFRunLoopContainsTimer

Returns a Boolean value that indicates whether a run loop mode contains a particular CFRunLoopTimer object.

```
Boolean CFRunLoopContainsTimer (
    CFRunLoopRef rl,
    CFRunLoopTimerRef timer,
    CFStringRef mode
);
```

Parameters

rl

The run loop to examine.

timer

The run loop timer for which to search.

mode

The run loop mode of *rl* in which to search for *timer*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to search for *timer* in the set of objects monitored by all the common modes.

Return Value

true if *timer* is in mode *mode* of the run loop *rl*, false otherwise.

Discussion

If *timer* was added to [kCFRunLoopCommonModes](#) (page 458), this function returns true if *mode* is either [kCFRunLoopCommonModes](#) (page 458) or any of the modes that has been added to the set of common modes.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopCopyAllModes

Returns an array that contains all the defined modes for a CFRunLoop object.

```
CFArrayRef CFRunLoopCopyAllModes (
    CFRunLoopRef r1
);
```

Parameters

r1
The run loop to examine.

Return Value

An array that contains all the run loop modes defined for *r1*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopAddCommonMode](#) (page 443)

[CFRunLoopCopyCurrentMode](#) (page 449)

Declared In

CFRunLoop.h

CFRunLoopCopyCurrentMode

Returns the name of the mode in which a given run loop is currently running.

```
CFStringRef CFRunLoopCopyCurrentMode (
    CFRunLoopRef r1
);
```

Parameters

r1
The run loop to examine.

Return Value

The mode in which *r1* is currently running; NULL if *r1* is not running. Ownership follows the Create Rule.

Discussion

When run on the current thread's run loop, the returned value identifies the run loop mode that made the callout in which your code is currently executing.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopAddCommonMode](#) (page 443)

[CFRunLoopCopyAllModes](#) (page 449)

Declared In

CFRunLoop.h

CFRunLoopGetCurrent

Returns the CFRunLoop object for the current thread.

```
CFRunLoopRef CFRunLoopGetCurrent (  
    void  
);
```

Return Value

Current thread's run loop. Ownership follows the Get Rule.

Discussion

Each thread has exactly one run loop associated with it.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopGetMain](#) (page 450)

Related Sample Code

audioburntest

CFLocalServer

databurntest

DockBrowser

ImageClient

Declared In

CFRunLoop.h

CFRunLoopGetMain

Returns the main CFRunLoop object.

```
CFRunLoopRef CFRunLoopGetMain (  
    void  
);
```

Return Value

The main run loop. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFRunLoop.h

CFRunLoopGetNextTimerFireDate

Returns the time at which the next timer will fire.

```

CFAbsoluteTime CFRunLoopGetNextTimerFireDate (
    CFRunLoopRef r1,
    CFStringRef mode
);

```

Parameters*r1*

The run loop to examine.

*mode*The run loop mode within *r1* to test.**Return Value**The earliest firing time of the run loop timers registered in *mode* for the run loop *r1*.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopGetTypeID

Returns the type identifier for the CFRunLoop opaque type.

```

CFTypeID CFRunLoopGetTypeID (
    void
);

```

Return Value

The type identifier for the CFRunLoop opaque type.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFRunLoop.h

CFRunLoopIsWaiting

Returns a Boolean value that indicates whether the run loop is waiting for an event.

```

Boolean CFRunLoopIsWaiting (
    CFRunLoopRef r1
);

```

Parameters*r1*

The run loop to examine.

Return Value

`true` if *r1* has no events to process and is blocking, waiting for a source or timer to become ready to fire; `false` if *r1* either is not running or is currently processing a source, timer, or observer.

Discussion

This function is useful only to test the state of another thread's run loop. When called with the current thread's run loop, this function always returns `false`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopRemoveObserver

Removes a CFRunLoopObserver object from a run loop mode.

```
void CFRunLoopRemoveObserver (
    CFRunLoopRef r1,
    CFRunLoopObserverRef observer,
    CFStringRef mode
);
```

Parameters

r1

The run loop to modify.

observer

The run loop observer to remove.

mode

The run loop mode of *r1* from which to remove *observer*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to remove *observer* from the set of objects monitored by all the common modes.

Discussion

If *r1* does not contain *observer* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFRunLoopAddObserver](#) (page 444)

[CFRunLoopContainsObserver](#) (page 446)

Declared In

CFRunLoop.h

CFRunLoopRemoveSource

Removes a CFRunLoopSource object from a run loop mode.

```
void CFRunLoopRemoveSource (
    CFRunLoopRef r1,
    CFRunLoopSourceRef source,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to modify.

source

The run loop source to remove.

*mode*The run loop mode of *r1* from which to remove *source*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to remove *source* from the set of objects monitored by all the common modes.**Discussion**

If *source* is a version 0 source, this function calls the `cancel` callback function specified in the context structure for *source*. See [CFRunLoopSourceContext](#) and [CFRunLoopSourceContext1](#) for more details.

If *r1* does not contain *source* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

See Also[CFRunLoopAddSource](#) (page 445)[CFRunLoopContainsSource](#) (page 447)**Related Sample Code**

BackgroundExporter

DNSServiceMetaQuery

HID Manager Basics

HID Utilities Source

Declared In

CFRunLoop.h

CFRunLoopRemoveTimerRemoves a `CFRunLoopTimer` object from a run loop mode.

```
void CFRunLoopRemoveTimer (
    CFRunLoopRef r1,
    CFRunLoopTimerRef timer,
    CFStringRef mode
);
```

Parameters*r1*

The run loop to modify.

timer

The run loop timer to remove.

mode

The run loop mode of *rl* from which to remove *timer*. Use the constant [kCFRunLoopCommonModes](#) (page 458) to remove *timer* from the set of objects monitored by all the common modes.

Discussion

If *rl* does not contain *timer* in *mode*, this function does nothing.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopRun

Runs the current thread's CFRunLoop object in its default mode indefinitely.

```
void CFRunLoopRun (
    void
);
```

Discussion

The current thread's run loop runs in the default mode (see ["Default Run Loop Mode"](#) (page 458)) until the run loop is stopped with [CFRunLoopStop](#) (page 455) or all the sources and timers are removed from the default run loop mode.

Run loops can be run recursively. You can call `CFRunLoopRun` from within any run loop callout and create nested run loop activations on the current thread's call stack.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

bulkerase

CFLocalServer

databurntest

SimpleDial

Declared In

CFRunLoop.h

CFRunLoopRunInMode

Runs the current thread's CFRunLoop object in a particular mode.

```
SInt32 CFRunLoopRunInMode (
    CFStringRef mode,
    CFTimeInterval seconds,
    Boolean returnAfterSourceHandled
);
```

Parameters*mode*

The run loop mode to run. *mode* can be any arbitrary CFString. You do not need to explicitly create a run loop mode, although a run loop mode needs to contain at least one source or timer to run.

seconds

The length of time to run the run loop. If 0, only one pass is made through the run loop before returning; if multiple sources or timers are ready to fire immediately, only one (possibly two if one is a version 0 source) will be fired, regardless of the value of *returnAfterSourceHandled*.

returnAfterSourceHandled

A flag indicating whether the run loop should exit after processing one source. If *false*, the run loop continues processing events until *seconds* has passed.

Return Value

A value indicating the reason the run loop exited. Possible values are described below.

Discussion

Run loops can be run recursively. You can call `CFRunLoopRunInMode` from within any run loop callout and create nested run loop activations on the current thread's call stack. You are not restricted in which modes you can run from within a callout. You can create another run loop activation running in any available run loop mode, including any modes already running higher in the call stack.

The run loop exits with the following return values under the indicated conditions:

- `kCFRunLoopRunFinished`. The run loop mode *mode* has no sources or timers.
- `kCFRunLoopRunStopped`. The run loop was stopped with [CFRunLoopStop](#) (page 455).
- `kCFRunLoopRunTimedOut`. The time interval *seconds* passed.
- `kCFRunLoopRunHandledSource`. A source was processed. This exit condition only applies when *returnAfterSourceHandled* is *true*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTest

AudioQueueTools

CocoaSOAP

FSFileOperation

HID Manager Basics

Declared In

CFRunLoop.h

CFRunLoopStop

Forces a CFRunLoop object to stop running.

```
void CFRunLoopStop (
    CFRunLoopRef r1
);
```

Parameters

r1
The run loop to stop.

Discussion

This function forces *r1* to stop running and return control to the function that called [CFRunLoopRun](#) (page 454) or [CFRunLoopRunInMode](#) (page 454) for the current run loop activation. If the run loop is nested with a callout from one activation starting another activation running, only the innermost activation is exited.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest
bulkerase
CFFTPSample
CFLocalServer
databurntest

Declared In

CFRunLoop.h

CFRunLoopWakeUp

Wakes a waiting CFRunLoop object.

```
void CFRunLoopWakeUp (
    CFRunLoopRef r1
);
```

Parameters

r1
The run loop to wake up.

Discussion

A run loop goes to sleep when it is waiting for a source or timer to become ready to fire. If no source or timer fires, the run loop stays there until it times out or is explicitly woken up. If a run loop is modified, such as a new source added, you need to wake up the run loop to allow it to process the change. Version 0 sources use [CFRunLoopWakeUp](#) to cause the run loop to wake up after setting a source to be signaled, if they want the source handled immediately.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

Data Types

CFRunLoopRef

A reference to a run loop object.

```
typedef struct __CFRunLoop *CFRunLoopRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

Constants

CFRunLoopRunInMode Exit Codes

Return codes for `CFRunLoopRunInMode`, identifying the reason the run loop exited.

```
enum {
    kCFRunLoopRunFinished = 1,
    kCFRunLoopRunStopped = 2,
    kCFRunLoopRunTimedOut = 3,
    kCFRunLoopRunHandledSource = 4
};
```

Constants

`kCFRunLoopRunFinished`

The running run loop mode has no sources or timers to process.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

`kCFRunLoopRunStopped`

[CFRunLoopStop](#) (page 455) was called on the run loop.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

`kCFRunLoopRunTimedOut`

The specified time interval for running the run loop has passed.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

`kCFRunLoopRunHandledSource`

A source has been processed. This value is returned only if the run loop was told to run only until a source was processed.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

Common Mode Flag

A run loop pseudo-mode that manages objects monitored in the “common” modes.

```
const CFStringRef kCFRunLoopCommonModes;
```

Constants

`kCFRunLoopCommonModes`

Objects added to a run loop using this value as the mode are monitored by all run loop modes that have been declared as a member of the set of “common” modes with [CFRunLoopAddCommonMode](#) (page 443).

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

Discussion

Run loops never run in this mode. This pseudo-mode is used only as a special set of sources, timers, and observers that is shared by other modes. See [“Managing Objects in a Run Loop”](#) (page 443) for more details.

Default Run Loop Mode

Default run loop mode.

```
const CFStringRef kCFRunLoopDefaultMode;
```

Constants

`kCFRunLoopDefaultMode`

Run loop mode that should be used when a thread is in its default, or idle, state, waiting for an event. This mode is used when the run loop is started with [CFRunLoopRun](#) (page 454).

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

CFRunLoopObserver Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFRunLoop.h
Companion guide	Run Loops

Overview

A `CFRunLoopObserver` provides a general means to receive callbacks at different points within a running run loop. In contrast to sources, which fire when an asynchronous event occurs, and timers, which fire when a particular time passes, observers fire at special locations within the execution of the run loop, such as before sources are processed or before the run loop goes to sleep, waiting for an event to occur. Observers can be either one-time events or repeated every time through the run loop's loop.

Each run loop observer can be registered in only one run loop at a time, although it can be added to multiple run loop modes within that run loop.

Functions

CFRunLoopObserverCreate

Creates a `CFRunLoopObserver` object.

```
CFRunLoopObserverRef CFRunLoopObserverCreate (
    CFAllocatorRef allocator,
    CFOptionFlags activities,
    Boolean repeats,
    CFIndex order,
    CFRunLoopObserverCallback callout,
    CFRunLoopObserverContext *context
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

activities

Set of flags identifying the activity stages of the run loop during which the observer should be called. See [Run Loop Activities](#) (page 465) for the list of stages. To have the observer called at multiple stages in the run loop, combine the [Run Loop Activities](#) (page 465) values using the bitwise-OR operator.

repeats

A flag identifying whether the observer should be called only once or every time through the run loop. If *repeats* is `false`, the observer is invalidated after it is called once, even if the observer was scheduled to be called at multiple stages within the run loop.

order

A priority index indicating the order in which run loop observers are processed. When multiple run loop observers are scheduled in the same activity stage in a given run loop mode, the observers are processed in increasing order of this parameter. Pass 0 unless there is a reason to do otherwise.

callback

The callback function invoked when the observer runs.

context

A structure holding contextual information for the run loop observer. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be `NULL` if the observer does not need the context's `info` pointer to keep track of state.

Return Value

The new `CFRunLoopObserver` object. Ownership follows the Create Rule.

Discussion

The run loop observer is not automatically added to a run loop. To add the observer to a run loop, use [CFRunLoopAddObserver](#) (page 444). An observer can be registered to only one run loop, although it can be added to multiple run loop modes within that run loop.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFRunLoop.h`

CFRunLoopObserverDoesRepeat

Returns a Boolean value that indicates whether a `CFRunLoopObserver` repeats.

```
Boolean CFRunLoopObserverDoesRepeat (
    CFRunLoopObserverRef observer
);
```

Parameters*observer*

The run loop observer to examine.

Return Value

`true` if *observer* is processed during every pass through the run loop; `false` if *observer* is processed once and then is invalidated.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverGetActivities

Returns the run loop stages during which an observer runs.

```

CFOptionFlags CFRunLoopObserverGetActivities (
    CFRunLoopObserverRef observer
);

```

Parameters*observer*

The run loop observer to examine.

Return ValueA bitwise-OR combination of all the run loop stages in which *observer* is called. See [Run Loop Activities](#) (page 465) for the list of stages.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverGetContext

Returns the context information for a CFRunLoopObserver object.

```

void CFRunLoopObserverGetContext (
    CFRunLoopObserverRef observer,
    CFRunLoopObserverContext *context
);

```

Parameters*observer*

The run loop observer to examine.

*context*Upon return, contains the context information for *observer*. This is the same information passed to [CFRunLoopObserverCreate](#) (page 459) when creating *observer*.**Discussion**The context version number for run loop observers is currently 0. Before calling this function, you need to initialize the *version* member of *context* to 0.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverGetOrder

Returns the ordering parameter for a CFRunLoopObserver object.

```

CFIndex CFRunLoopObserverGetOrder (
    CFRunLoopObserverRef observer
);

```

Parameters

observer

The run loop observer to examine.

Return Value

The ordering parameter for *observer*. When multiple observers are scheduled in the same run loop mode and stage, this value determines the order (from small to large) in which the observers are called.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverGetTypeID

Returns the type identifier for the CFRunLoopObserver opaque type.

```

CFTypeID CFRunLoopObserverGetTypeID (
    void
);

```

Return Value

The type identifier for the CFRunLoopObserver opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverInvalidate

Invalidates a CFRunLoopObserver object, stopping it from ever firing again.

```

void CFRunLoopObserverInvalidate (
    CFRunLoopObserverRef observer
);

```

Parameters

observer

The run loop observer to invalidate.

Discussion

Once invalidated, *observer* will never fire and call its callback function again. This function automatically removes *observer* from all run loop modes in which it had been added. The memory is not deallocated unless the run loop held the only reference to *observer*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverIsValid

Returns a Boolean value that indicates whether a CFRunLoopObserver object is valid and able to fire.

```
Boolean CFRunLoopObserverIsValid (
    CFRunLoopObserverRef observer
);
```

Parameters

observer

The run loop observer to examine.

Return Value

true if *observer* is valid, otherwise false.

Discussion

A nonrepeating observer is automatically invalidated after it is called once.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

Callbacks

CFRunLoopObserverCallback

Callback invoked when a CFRunLoopObserver object is fired.

```
typedef void (*CFRunLoopObserverCallback) (
    CFRunLoopObserverRef observer,
    CFRunLoopActivity activity,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFRunLoopObserverRef observer,
    CFRunLoopActivity activity,
    void *info
);
```

Parameters*observer*

The run loop observer that is firing.

activity

The current activity stage of the run loop.

*info*The *info* member of the [CFRunLoopObserverContext](#) (page 464) structure that was used when creating the run loop observer.**Discussion**You specify this callback when you create the run loop observer with [CFRunLoopObserverCreate](#) (page 459).**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

Data Types

CFRunLoopObserverContext

A structure that contains program-defined data and callbacks with which you can configure a CFRunLoopObserver object's behavior.

```

struct CFRunLoopObserverContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFRunLoopObserverContext CFRunLoopObserverContext;

```

Fields*version*

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the run loop observer at creation time. This pointer is passed to all the callbacks defined in the context.

*retain*A retain callback for your program-defined *info* pointer. Can be NULL.*release*A release callback for your program-defined *info* pointer. Can be NULL.*copyDescription*A copy description callback for your program-defined *info* pointer. Can be NULL.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopObserverRef

A reference to a run loop observer object.

```
typedef struct __CFRunLoopObserver *CFRunLoopObserverRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

Constants

Run Loop Activities

Run loop activity stages in which run loop observers can be scheduled.

```
enum CFRunLoopActivity {
    kCFRunLoopEntry = (1 << 0),
    kCFRunLoopBeforeTimers = (1 << 1),
    kCFRunLoopBeforeSources = (1 << 2),
    kCFRunLoopBeforeWaiting = (1 << 5),
    kCFRunLoopAfterWaiting = (1 << 6),
    kCFRunLoopExit = (1 << 7),
    kCFRunLoopAllActivities = 0x0FFFFFFFU
};
typedef enum CFRunLoopActivity CFRunLoopActivity;
```

Constants

kCFRunLoopEntry

The entrance of the run loop, before entering the event processing loop. This activity occurs once for each call to [CFRunLoopRun](#) (page 454) and [CFRunLoopRunInMode](#) (page 454).

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopBeforeTimers

Inside the event processing loop before any timers are processed.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopBeforeSources

Inside the event processing loop before any sources are processed.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopBeforeWaiting

Inside the event processing loop before the run loop sleeps, waiting for a source or timer to fire. This activity does not occur if [CFRunLoopRunInMode](#) (page 454) is called with a timeout of 0 seconds. It also does not occur in a particular iteration of the event processing loop if a version 0 source fires.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopAfterWaiting

Inside the event processing loop after the run loop wakes up, but before processing the event that woke it up. This activity occurs only if the run loop did in fact go to sleep during the current loop.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopExit

The exit of the run loop, after exiting the event processing loop. This activity occurs once for each call to [CFRunLoopRun](#) (page 454) and [CFRunLoopRunInMode](#) (page 454).

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

kCFRunLoopAllActivities

A combination of all the preceding stages.

Available in Mac OS X v10.0 and later.

Declared in `CFRunLoop.h`.

Discussion

The run loop stages in which an observer is scheduled are selected when the observer is created with [CFRunLoopObserverCreate](#) (page 459).

CFRunLoopSource Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFRunLoop.h
Companion guide	Run Loops

Overview

A `CFRunLoopSource` object is an abstraction of an input source that can be put into a run loop. Input sources typically generate asynchronous events, such as messages arriving on a network port or actions performed by the user.

An input source type normally defines an API for creating and operating on objects of the type, as if it were a separate entity from the run loop, then provides a function to create a `CFRunLoopSource` for an object. The run loop source can then be registered with the run loop and act as an intermediary between the run loop and the actual input source type object. Examples of input sources include `CFMachPort`, `CFMessagePort`, and `CFSocket`.

There are two categories of sources. Version 0 sources, so named because the `version` field of their context structure is 0, are managed manually by the application. When a source is ready to fire, some part of the application, perhaps code on a separate thread waiting for an event, must call [CFRunLoopSourceSignal](#) (page 471) to tell the run loop that the source is ready to fire. The run loop source for `CFSocket` is currently implemented as a version 0 source.

Version 1 sources are managed by the run loop and kernel. These sources use Mach ports to signal when the sources are ready to fire. A source is automatically signaled by the kernel when a message arrives on the source's Mach port. The contents of the message are given to the source to process when the source is fired. The run loop sources for `CFMachPort` and `CFMessagePort` are currently implemented as version 1 sources.

When creating your own custom run loop source, you can choose which version works best for you.

A run loop source can be registered in multiple run loops and run loop modes at the same time. When the source is signaled, whichever run loop that happens to detect the signal first will fire the source. Adding a source to multiple threads' run loops can be used to manage a pool of "worker" threads that is processing discrete sets of data, such as client-server messages over a network or entries in a job queue filled by a "manager" thread. As messages arrive or jobs get added to the queue, the source gets signaled and a random thread receives and processes the request.

Functions

CFRunLoopSourceCreate

Creates a CFRunLoopSource object.

```
CFRunLoopSourceRef CFRunLoopSourceCreate (
    CFAllocatorRef allocator,
    CFIndex order,
    CFRunLoopSourceContext *context
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

order

A priority index indicating the order in which run loop sources are processed. When multiple run loop sources are firing in a single pass through the run loop, the sources are processed in increasing order of this parameter. If the run loop is set to process only one source per loop, only the highest priority source, the one with the lowest *order* value, is processed. This value is ignored for version 1 sources. Pass 0 unless there is a reason to do otherwise.

context

A structure holding contextual information for the run loop source. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call.

Return Value

The new CFRunLoopSource object. You are responsible for releasing this object.

Discussion

The run loop source is not automatically added to a run loop. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

SimpleAudioExtraction

simpleJavaLauncher

Declared In

CFRunLoop.h

CFRunLoopSourceGetContext

Returns the context information for a CFRunLoopSource object.

```
void CFRunLoopSourceGetContext (
    CFRunLoopSourceRef source,
    CFRunLoopSourceContext *context
);
```

Parameters*source*

The run loop source to examine.

context

A pointer to the structure into which the context information for *source* is to be copied. The information being returned is the same information passed to [CFRunLoopSourceCreate](#) (page 468) when creating *source*.

Discussion

Run loop sources come in two versions with different-sized context structures. *context* must point to the correct version of the structure for *source*. Before calling this function, you need to initialize the `version` member of *context* with the version number (either 0 or 1) of *source*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceGetOrder

Returns the ordering parameter for a CFRunLoopSource object.

```
CFIndex CFRunLoopSourceGetOrder (
    CFRunLoopSourceRef source
);
```

Parameters*source*

The run loop source to examine.

Return Value

The ordering parameter for *source*, which the run loop uses (for version 0 sources only) to determine the order in which sources are processed when multiple sources are firing.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceGetTypeID

Returns the type identifier of the CFRunLoopSource opaque type.

```

CTypeID CFRunLoopSourceGetTypeID (
    void
);

```

Return Value

The type identifier for the CFRunLoopSource opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceInvalidate

Invalidates a CFRunLoopSource object, stopping it from ever firing again.

```

void CFRunLoopSourceInvalidate (
    CFRunLoopSourceRef source
);

```

Parameters

source

The run loop source to invalidate.

Discussion

Once invalidated, *source* will never fire and call its perform callback function again. This function automatically removes *source* from all the run loop modes in which it was registered. If *source* is a version 0 source, this function calls its `cancel` callback function as it is removed from each run loop mode. The memory for *source* is not deallocated unless the run loop held the only reference to *source*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

bulkerase

CFLocalServer

databurntest

ImageClient

Declared In

CFRunLoop.h

CFRunLoopSourceIsValid

Returns a Boolean value that indicates whether a CFRunLoopSource object is valid and able to fire.

```
Boolean CFRunLoopSourceIsValid (
    CFRunLoopSourceRef source
);
```

Parameters*source*

The run loop source to examine.

Return Valuetrue if *source* is valid, otherwise false.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceSignal

Signals a CFRunLoopSource object, marking it as ready to fire.

```
void CFRunLoopSourceSignal (
    CFRunLoopSourceRef source
);
```

Parameters*source*

The run loop source to signal.

Discussion

This function has no effect on version 1 sources, which are automatically handled when Mach messages arrive for them. After signaling a version 0 source, you need to call [CFRunLoopWakeUp](#) (page 456) on one of the run loops in which the source is registered to get the source handled immediately.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

SimpleAudioExtraction

Declared In

CFRunLoop.h

Callbacks

CFRunLoopCancelCallback

Callback invoked when a version 0 CFRunLoopSource object is removed from a run loop mode.

```
typedef void (*CFRunLoopCancelCallback) (
    void *info,
    CFRunLoopRef r1,
    CFStringRef mode
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    void *info,
    CFRunLoopRef r1,
    CFStringRef mode
);
```

Parameters

info

The `info` member of the [CFRunLoopSourceContext](#) (page 476) structure that was used when creating the run loop source.

r1

The run loop from which the run loop source is being removed.

mode

The run loop mode from which the run loop source is being removed.

Discussion

You specify this callback in the [CFRunLoopSourceContext](#) (page 476) structure when creating the run loop source.

CFRunLoopEqualCallback

Callback invoked to test two `CFRunLoopSource` objects for equality.

```
typedef Boolean (*CFRunLoopEqualCallback) (
    const void *info1,
    const void *info2
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    const void *info1,
    const void *info2
);
```

Parameters

info1

The `info` member of the [CFRunLoopSourceContext](#) (page 476) or [CFRunLoopSourceContext1](#) (page 477) structure that was used when creating the first run loop source to test.

info2

The `info` member of the [CFRunLoopSourceContext](#) (page 476) or [CFRunLoopSourceContext1](#) (page 477) structure that was used when creating the second run loop source to test.

Return Value

true if *info1* and *info2* should be considered equal; otherwise false.

Discussion

You specify this callback in the [CFRunLoopSourceContext](#) (page 476) or [CFRunLoopSourceContext1](#) (page 477) structure when creating the run loop source.

CFRunLoopGetPortCallback

Callback invoked to obtain the native Mach port represented by a version 1 CFRunLoopSource object.

```
typedef mach_port_t (*CFRunLoopGetPortCallback) (
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
mach_port_t MyCallback (
    void *info
);
```

Parameters

info

The *info* member of the [CFRunLoopSourceContext1](#) (page 477) structure that was used when creating the run loop source.

Return Value

The native Mach port for the run loop source.

Discussion

This callback is called whenever the run loop needs a source's Mach port, which can happen in each iteration of the run loop's loop. Because of the frequency with which the run loop may call this callback, make the function as efficient as possible.

A version 1 run loop source must have a one-to-one relationship between itself and its Mach port. Each source must have only one Mach port associated with it and each Mach port must represent only one source.

You specify this callback in the [CFRunLoopSourceContext1](#) (page 477) structure when creating the run loop source.

CFRunLoopHashCallback

Callback invoked to compute a hash code for the *info* pointer of a CFRunLoopSource object.

```
typedef CFHashCode (*CFRunLoopHashCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFHashCode MyCallback (
    const void *info
);
```

Parameters*info*

The *info* member of the [CFRunLoopSourceContext](#) (page 476) or [CFRunLoopSourceContext1](#) (page 477) structure that was used when creating the run loop source.

Return Value

A hash code value for *info*.

Discussion

If a hash callback is not provided for a source, the *info* pointer is used.

You specify this callback in the [CFRunLoopSourceContext](#) (page 476) or [CFRunLoopSourceContext1](#) (page 477) structure when creating the run loop source.

CFRunLoopMachPerformCallback

Callback invoked to process and optionally reply to a message received on a version 1 CFRunLoopSource object (Mach port-based sources).

```
typedef void *(*CFRunLoopMachPerformCallback) (
    void *msg,
    CFIndex size,
    CFAllocatorRef allocator,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void *MyCallback (
    void *msg,
    CFIndex size,
    CFAllocatorRef allocator,
    void *info
);
```

Parameters*msg*

The Mach message received on the Mach port. The pointer is to a `mach_msg_header_t` structure. A version 0 format trailer (`mach_msg_format_0_trailer_t`) is at the end of the Mach message.

size

Size of the Mach message in *msg*, excluding the message trailer.

allocator

The allocator object that should be used to allocate a reply message.

info

The *info* member of the [CFRunLoopSourceContext1](#) (page 477) structure that was used when creating the run loop source.

Return Value

An optional Mach message to be sent in response to the received message. The message must be allocated using *allocator*. Return `NULL` if you want an empty reply returned to the sender.

Discussion

You only need to provide this callback if you create your own version 1 run loop source. CFMachPort and CFMessagePort run loop sources already implement this callback to forward the received message to the CFMachPort's or CFMessagePort's own callback function, which you do need to implement.

You specify this callback in the [CFRunLoopSourceContext1](#) (page 477) structure when creating the run loop source.

CFRunLoopPerformCallback

Callback invoked when a message is received on a version 0 CFRunLoopSource object.

```
typedef void (*CFRunLoopPerformCallback) (
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    void *info
);
```

Parameters

info

The `info` member of the [CFRunLoopSourceContext](#) (page 476) structure that was used when creating the run loop source.

Discussion

You only need to provide this callback if you create your own version 0 run loop source. CFSocket run loop sources already implement this callback to forward the received message to the CFSocket's own callback function, which you do need to implement.

You specify this callback in the [CFRunLoopSourceContext](#) (page 476) structure when creating the run loop source.

CFRunLoopScheduleCallback

Callback invoked when a version 0 CFRunLoopSource object is added to a run loop mode.

```
typedef void (*CFRunLoopScheduleCallback) (
    void *info,
    CFRunLoopRef r1,
    CFStringRef mode
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    void *info,
    CFRunLoopRef r1,
    CFStringRef mode
);
```

Parameters*info*

The *info* member of the [CFRunLoopSourceContext](#) (page 476) structure that was used when creating the run loop source.

r1

The run loop in which the source is being scheduled.

mode

The run loop mode in which the source is being scheduled.

Discussion

You specify this callback in the [CFRunLoopSourceContext](#) (page 476) structure when creating the run loop source.

Data Types

CFRunLoopSourceContext

A structure that contains program-defined data and callbacks with which you can configure a version 0 [CFRunLoopSource](#)'s behavior.

```
struct CFRunLoopSourceContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
    CFRunLoopEqualCallback equal;
    CFRunLoopHashCallback hash;
    CFRunLoopScheduleCallback schedule;
    CFRunLoopCancelCallback cancel;
    CFRunLoopPerformCallback perform;
};
typedef struct CFRunLoopSourceContext CFRunLoopSourceContext;
```

Fields*version*

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the [CFRunLoopSource](#) at creation time. This pointer is passed to all the callbacks defined in the context.

retain

A retain callback for your program-defined *info* pointer. Can be NULL.

release

A release callback for your program-defined *info* pointer. Can be NULL.

copyDescription

A copy description callback for your program-defined *info* pointer. Can be NULL.

equal

An equality test callback for your program-defined *info* pointer. Can be NULL.

hash

A hash calculation callback for your program-defined `info` pointer. Can be `NULL`.

schedule

A scheduling callback for the run loop source. This callback is called when the source is added to a run loop mode. Can be `NULL`.

cancel

A cancel callback for the run loop source. This callback is called when the source is removed from a run loop mode. Can be `NULL`.

perform

A perform callback for the run loop source. This callback is called when the source has fired.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceContext1

A structure that contains program-defined data and callbacks with which you can configure a version 1 `CFRunLoopSource`'s behavior.

```
struct CFRunLoopSourceContext1 {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
    CFRunLoopEqualCallback equal;
    CFRunLoopHashCallback hash;
    CFRunLoopGetPortCallback getPort;
    CFRunLoopMachPerformCallback perform;
};
typedef struct CFRunLoopSourceContext1 CFRunLoopSourceContext1;
```

Fields

version

Version number of the structure. Must be 1.

info

An arbitrary pointer to program-defined data, which can be associated with the run loop source at creation time. This pointer is passed to all the callbacks defined in the context.

retain

A retain callback for your program-defined `info` pointer. Can be `NULL`.

release

A release callback for your program-defined `info` pointer. Can be `NULL`.

copyDescription

A copy description callback for your program-defined `info` pointer. Can be `NULL`.

equal

An equality test callback for your program-defined `info` pointer. Can be `NULL`.

hash

A hash calculation callback for your program-defined `info` pointer. Can be `NULL`.

getPort

A callback to retrieve the native Mach port represented by the source. This callback is called when the source is either added to or removed from a run loop mode.

perform

A perform callback for the run loop source. This callback is called when the source has fired.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopSourceRef

A reference to a run loop source object.

```
typedef struct __CFRunLoopSource *CFRunLoopSourceRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimer Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFRunLoop.h
Companion guide	Run Loops

Overview

A `CFRunLoopTimer` object represents a specialized run loop source that fires at a preset time in the future. Timers can fire either only once or repeatedly at fixed time intervals. Repeating timers can also have their next firing time manually adjusted.

A timer is not a real-time mechanism; it fires only when one of the run loop modes to which the timer has been added is running and able to check if the timer's firing time has passed. If a timer's firing time occurs while the run loop is in a mode that is not monitoring the timer or during a long callout, the timer does not fire until the next time the run loop checks the timer. Therefore, the actual time at which the timer fires potentially can be a significant period of time after the scheduled firing time.

A repeating timer reschedules itself based on the scheduled firing time, not the actual firing time. For example, if a timer is scheduled to fire at a particular time and every 5 seconds after that, the scheduled firing time will always fall on the original 5 second time intervals, even if the actual firing time gets delayed. If the firing time is delayed so far that it passes one or more of the scheduled firing times, the timer is fired only once for that time period; the timer is then rescheduled, after firing, for the next scheduled firing time in the future.

Each run loop timer can be registered in only one run loop at a time, although it can be added to multiple run loop modes within that run loop.

`CFRunLoopTimer` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSTimer`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSTimer *` parameter, you can pass in a `CFRunLoopTimerRef`, and in a function where you see a `CFRunLoopTimerRef` parameter, you can pass in an `NSTimer` instance. This also applies to concrete subclasses of `NSTimer`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions

CFRunLoopTimerCreate

Creates a new `CFRunLoopTimer` object.

```
CFRunLoopTimerRef CFRunLoopTimerCreate (
    CFAllocatorRef allocator,
    CFAbsoluteTime fireDate,
    CFTimeInterval interval,
    CFOptionFlags flags,
    CFIndex order,
    CFRunLoopTimerCallback callout,
    CFRunLoopTimerContext *context
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

fireDate

The time at which the timer should first fire. The fine precision (sub-millisecond at most) of the fire date may be adjusted slightly by the timer if there are implementation reasons to do.

interval

The firing interval of the timer. If 0 or negative, the timer fires once and then is automatically invalidated. The fine precision (sub-millisecond at most) of the interval may be adjusted slightly by the timer if implementation reasons to do so exist.

flags

Currently ignored. Pass 0 for future compatibility.

order

A priority index indicating the order in which run loop timers are processed. Run loop timers currently ignore this parameter. Pass 0.

callout

The callback function that is called when the timer fires.

context

A structure holding contextual information for the run loop timer. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be `NULL` if the callback function does not need the context's `info` pointer to keep track of state.

Return Value

The new `CFRunLoopTimer` object. Ownership follows the Create Rule.

Discussion

A timer needs to be added to a run loop mode before it will fire. To add the timer to a run loop, use [CFRunLoopAddTimer](#) (page 446). A timer can be registered to only one run loop at a time, although it can be in multiple modes within that run loop.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Watcher

Worm

Declared In

`CFRunLoop.h`

CFRunLoopTimerDoesRepeat

Returns a Boolean value that indicates whether a `CFRunLoopTimer` object repeats.

```
Boolean CFRunLoopTimerDoesRepeat (
    CFRunLoopTimerRef timer
);
```

Parameters

timer

The run loop timer to test.

Return Value

`true` if *timer* repeats, or has a periodicity; otherwise `false`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFRunLoop.h`

CFRunLoopTimerGetContext

Returns the context information for a `CFRunLoopTimer` object.

```
void CFRunLoopTimerGetContext (
    CFRunLoopTimerRef timer,
    CFRunLoopTimerContext *context
);
```

Parameters

timer

The run loop timer to examine.

context

A pointer to the structure into which the context information for *timer* is to be copied. The information being returned is the same information passed to [CFRunLoopTimerCreate](#) (page 479) when creating *timer*.

Discussion

The context version number for run loop timers is currently 0. Before calling this function, you need to initialize the `version` member of *context* to 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFRunLoop.h`

CFRunLoopTimerGetInterval

Returns the firing interval of a repeating `CFRunLoopTimer` object.

```
CFTimeInterval CFRunLoopTimerGetInterval (
    CFRunLoopTimerRef timer
);
```

Parameters*timer*

The run loop timer to examine.

Return Value

The firing interval of *timer*. Returns 0 if *timer* does not repeat.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Worm

Declared In

CFRunLoop.h

CFRunLoopTimerGetNextFireDate

Returns the next firing time for a CFRunLoopTimer object.

```
CFAbsoluteTime CFRunLoopTimerGetNextFireDate (
    CFRunLoopTimerRef timer
);
```

Parameters*timer*

The run loop timer to examine.

Return Value

The next firing time for *timer*. This time could be a date in the past if a run loop has not been able to process the timer since the firing time arrived.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimerGetOrder

Returns the ordering parameter for a CFRunLoopTimer object.

```
CFIndex CFRunLoopTimerGetOrder (
    CFRunLoopTimerRef timer
);
```

Parameters*timer*

The run loop timer to examine.

Return Value

The ordering parameter for *timer*.

Discussion

The ordering parameter is currently ignored by run loop timers.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimerGetTypeID

Returns the type identifier of the CFRunLoopTimer opaque type.

```

CTypeID CFRunLoopTimerGetTypeID (
    void
);

```

Return Value

The type identifier for the CFRunLoopTimer opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimerInvalidate

Invalidates a CFRunLoopTimer object, stopping it from ever firing again.

```

void CFRunLoopTimerInvalidate (
    CFRunLoopTimerRef timer
);

```

Parameters

timer

The run loop timer to invalidate.

Discussion

Once invalidated, *timer* will never fire and call its callback function again. This function automatically removes *timer* from all run loop modes in which it had been added. The memory is not deallocated unless the run loop held the only reference to *timer*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Worm

Declared In

CFRunLoop.h

CFRunLoopTimerIsValid

Returns a Boolean value that indicates whether a `CFRunLoopTimer` object is valid and able to fire.

```
Boolean CFRunLoopTimerIsValid (
    CFRunLoopTimerRef timer
);
```

Parameters

timer

The run loop timer to examine.

Return Value

true if *timer* is valid; otherwise false.

Discussion

A nonrepeating timer is automatically invalidated after it fires.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimerSetNextFireDate

Sets the next firing date for a `CFRunLoopTimer` object .

```
void CFRunLoopTimerSetNextFireDate (
    CFRunLoopTimerRef timer,
    CFAbsoluteTime fireDate
);
```

Parameters

timer

The run loop timer to modify.

fireDate

The new firing time for *timer*.

Discussion

Resetting a timer's next firing time is a relatively expensive operation and should not be done if it can be avoided; letting timers autorepeat is more efficient. In some cases, however, manually-adjusted, repeating timers are useful. For example, if you have an action that will be performed multiple times in the future, but at irregular time intervals, it would be very expensive to create, add to run loop modes, and then destroy a timer for each firing event. Instead, you can create a repeating timer with an initial firing time in the distant future (or the initial firing time) and a very large repeat interval—on the order of decades or more—and add it to all the necessary run loop modes. Then, when you know when the timer should fire next, you reset the firing time with `CFRunLoopTimerSetNextFireDate`, perhaps from the timer's own callback function. This technique effectively produces a reusable, asynchronous timer.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Worm

Declared In
CFRunLoop.h

Callbacks

CFRunLoopTimerCallback

Callback invoked when a CFRunLoopTimer object fires.

```
typedef void (*CFRunLoopTimerCallback) (
    CFRunLoopTimerRef timer,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFRunLoopTimerRef timer,
    void *info
);
```

Parameters

timer

The run loop timer that is firing.

info

The `info` member of the [CFRunLoopTimerContext](#) (page 485) structure that was used when creating the run loop timer.

Discussion

If *timer* repeats, the run loop automatically schedules the next firing time after calling this function, unless you manually update the firing time within this callback by calling [CFRunLoopTimerSetNextFireDate](#) (page 484). If *timer* does not repeat, the run loop invalidates *timer*.

You specify this callback when you create the timer with [CFRunLoopTimerCreate](#) (page 479).

Availability

Available in Mac OS X v10.0 and later.

Declared In
CFRunLoop.h

Data Types

CFRunLoopTimerContext

A structure that contains program-defined data and callbacks with which you can configure a CFRunLoopTimer's behavior.

```

struct CFRunLoopTimerContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFRunLoopTimerContext CFRunLoopTimerContext;

```

Fields

version

Version number of the structure. Must be 0.

info

An arbitrary pointer to program-defined data, which can be associated with the run loop timer at creation time. This pointer is passed to all the callbacks defined in the context.

retain

A retain callback for your program-defined `info` pointer. Can be `NULL`.

release

A release callback for your program-defined `info` pointer. Can be `NULL`.

copyDescription

A copy description callback for your program-defined `info` pointer. Can be `NULL`.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFRunLoopTimerRef

A reference to a run loop timer object.

```
typedef struct __CFRunLoopTimer *CFRunLoopTimerRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFRunLoop.h

CFSet Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFSet.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

CFSet and its derived mutable type, CFMutableSet, provide support for the mathematical concept of a set. A set, both in its mathematical sense and in the implementation of CFSet, is an unordered collection of distinct elements. CFSet creates static sets and CFMutableSet creates dynamic sets.

Use bags or sets as an alternative to arrays when the order of elements isn't important and performance in testing whether a value is contained in the collection is a consideration—while arrays are ordered, testing for membership is slower than with bags or sets. Use bags over sets if you want to allow duplicate values in your collections.

You create a static set object using either the [CFSetCreate](#) (page 490) or [CFSetCreateCopy](#) (page 491) function. These functions return a set containing the values you pass in as arguments. (Note that sets can't contain NULL pointers; in most cases, though, you can use the `kCFNull` constant instead.) Values are not copied but retained using the retain callback provided when the set was created. Similarly, when a value is removed from a set, it is released using the release callback.

CFSet provides functions for querying the values of a set. The [CFSetGetCount](#) (page 491) returns the number of values in a set, the [CFSetContainsValue](#) (page 489) function checks if a value is in a set, and [CFSetGetValues](#) (page 494) returns a C array containing all the values in a set.

CFSet is “toll-free bridged” with its Cocoa Foundation counterpart, NSMutableSet. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSMutableSet *` parameter, you can pass in a `CFSetRef`, and in a function where you see a `CFSetRef` parameter, you can pass in an NSMutableSet instance. This also applies to concrete subclasses of NSMutableSet. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating Sets

[CFSetCreate](#) (page 490)

Creates an immutable CFSet object containing supplied values.

[CFSetCreateCopy](#) (page 491)

Creates an immutable set containing the values of an existing set.

Examining a Set

[CFSetContainsValue](#) (page 489)

Returns a Boolean that indicates whether a set contains a given value.

[CFSetGetCount](#) (page 491)

Returns the number of values currently in a set.

[CFSetGetCountOfValue](#) (page 492)

Returns the number of values in a set that match a given value.

[CFSetGetValue](#) (page 493)

Obtains a specified value from a set.

[CFSetGetValueIfPresent](#) (page 493)

Reports whether or not a value is in a set, and if it exists returns the value indirectly.

[CFSetGetValues](#) (page 494)

Obtains all values in a set.

Applying a Function to Set Members

[CFSetApplyFunction](#) (page 488)

Calls a function once for each value in a set.

Getting the CFSet Type ID

[CFSetGetTypeID](#) (page 492)

Returns the type identifier for the CFSet type.

Functions

CFSetApplyFunction

Calls a function once for each value in a set.


```
void CFSetApplyFunction (
    CFSetRef theSet,
    CFSetApplierFunction applier,
    void *context
);
```

Parameters*theSet*

The set to operate upon.

*applier*The callback function to call once for each value in the *theSet*. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. The *applier* function must be able to work with all values in *theSet*.*context*A pointer-sized program-defined value, which is passed as the second parameter to the *applier* function, but is otherwise unused by this function.**Discussion**If *theSet* is mutable, it is unsafe for the *applier* function to change the contents of the collection.**Availability**

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

HID Calibrator

HID Config Save

HID Explorer

Declared In

CFSet.h

CFSetContainsValue

Returns a Boolean that indicates whether a set contains a given value.

```
Boolean CFSetContainsValue (
    CFSetRef theSet,
    const void *value
);
```

Parameters*theSet*

The set to search.

*value*The value to match in *theSet*. Comparisons are made using the equal callback provided when *theSet* was created. If the equal callback was NULL, pointer equality (in C, ==) is used.**Return Value**true if *value* is contained in *theSet*, otherwise false.

Discussion

This function uses the equal callback. *value* and all elements in the set must be understood by the equal callback.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

CFSetCreate

Creates an immutable CFSet object containing supplied values.

```
CFSetRef CFSetCreate (
    CFAllocatorRef allocator,
    const void **values,
    CFIndex numValues,
    const CFSetCallbacks *callbacks
);
```

Parameters

allocator

The allocator to use to allocate memory for the new set and its storage for values. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

values

A C array of the pointer-sized values to be in the new set. This parameter may be `NULL` if the *numValues* parameter is 0. The C array is not changed or freed by this function. *values* must be a pointer to a C array of at least *numValues* elements.

numValues

The number of values to copy from the *values* C array in the new set.

callbacks

A pointer to a `CFSetCallbacks` (page 498) structure initialized with the callbacks to use to retain, release, describe, and compare values in the collection. A copy of the contents of the callbacks structure is made, so that a pointer to a structure on the stack can be passed in or can be reused for multiple collection creations.

This value may be `NULL`, which is treated as a valid structure of version 0 with all fields `NULL`. If the collection contains only `CType` objects, then pass `kCTypeSetCallbacks` (page 500) to use the default callback functions.

Return Value

A new immutable set, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

If any value put into the collection is not one understood by one of the callback functions, the behavior when that callback function is used is undefined.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetCreateCopy

Creates an immutable set containing the values of an existing set.

```
CFSetRef CFSetCreateCopy (
    CFAAllocatorRef allocator,
    CFSetRef theSet
);
```

Parameters

allocator

The allocator to use to allocate memory for the new set and its storage for values. Pass `NULL` or `kCFAAllocatorDefault` to use the current default allocator.

theSet

The set to copy.

Return Value

A new set that contains the same values as *theSet*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

The pointer values from *theSet* are copied into the new set, and the values are retained by the new set. The count of the new set is the same as the count of *theSet*. The new set uses the same callbacks as *theSet*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetGetCount

Returns the number of values currently in a set.

```
CFIndex CFSetGetCount (
    CFSetRef theSet
);
```

Parameters

theSet

The set to examine.

Return Value

The number of values in *theSet*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

CFSetGetCountOfValue

Returns the number of values in a set that match a given value.

```
CFIndex CFSetGetCountOfValue (
    CFSetRef theSet,
    const void *value
);
```

Parameters*theSet*

The set to examine.

*value*The value for which to search in *theSet*. Comparisons are made using the equal callback provided when *theSet* was created. If the equal callback was NULL, pointer equality (in C, ==) is used.**Return Value**The number of times *value* occurs in *theSet*. By definition, sets can not contain duplicate values, so returns 1 if *value* is contained in *theSet*, otherwise 0.**Discussion**This function uses the equal callback. *value* and all elements in the set must be understood by the equal callback.**Availability**

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetGetTypeID

Returns the type identifier for the CFSet type.

```
CTypeID CFSetGetTypeID (
    void
);
```

Return Value

The type identifier for the CFSet type.

Discussion

CFMutableSet has the same type identifier as CFSet.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetGetValue

Obtains a specified value from a set.

```
const void * CFSetGetValue (
    CFSetRef theSet,
    const void *value
);
```

Parameters

theSet

The set to examine.

value

The value for which to search in *theSet*. Comparisons are made using the equal callback provided when *theSet* was created. If the equal callback was NULL, pointer equality (in C, ==) is used.

Return Value

A pointer to the requested value, or NULL if the value is not in *theSet*. If the value is a Core Foundation object, Ownership follows the Get Rule.

Discussion

Since this function uses the equal callback, *value* all elements in the set must be understood by the equal callback. Depending on the implementation of the equal callback specified when creating *theSet*, the value returned may not have the same pointer equality as *value*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetGetValueIfPresent

Reports whether or not a value is in a set, and if it exists returns the value indirectly.

```
Boolean CFSetGetValueIfPresent (
    CFSetRef theSet,
    const void *candidate,
    const void **value
);
```

Parameters

theSet

The set to examine.

candidate

The value for which to search in *theSet*. Comparisons are made using the equal callback provided when *theSet* was created. If the equal callback was NULL, pointer equality (in C, ==) is used.

value

Upon return contains the matching value if it exists in *theSet*, otherwise NULL. If the value is a Core Foundation object, ownership follows the Get Rule.

Return Value

true if *value* exists in *theSet*, otherwise false.

Discussion

This function uses the equal callback. *candidate* and all elements in the set must be understood by the equal callback. Depending on the implementation of the equal callback specified when creating *theSet*, the value returned in *value* may not have the same pointer equality as *candidate*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetGetValues

Obtains all values in a set.

```
void CFSetGetValues (
    CFSetRef theSet,
    const void **values
);
```

Parameters

theSet

The set to examine.

values

A C array of pointer-sized values to be filled with values from *theSet*. The value must be a valid C array of the appropriate type and of a size at least equal to the count of *theSet*. If the values are Core Foundation objects, ownership follows the Get Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

Declared In

CFSet.h

Callbacks

CFSetApplierFunction

Prototype of a callback function that may be applied to every value in a set.

```
typedef void (*CFSetApplierFunction) (
    const void *value,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *value,
    void *context
);
```

Parameters

value

The current value in a set.

context

The program-defined context parameter given to the apply function.

Discussion

This callback is passed to the [CFSetApplyFunction](#) (page 488) function which iterates over the values in a set and applies the behavior defined in the applier function to each value in a set.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetCopyDescriptionCallback

Prototype of a callback function used to get a description of a value in a set.

```
typedef CFStringRef (*CFSetCopyDescriptionCallback) (
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *value
);
```

Parameters

value

The value to be described.

Return Value

A textual description of *value*. The caller is responsible for releasing this object.

Discussion

This callback is passed to [CFSetCreate](#) (page 490) in a [CFSetCallbacks](#) (page 498) structure. This callback is used by the [CFCopyDescription](#) (page 634) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetEqualCallback

Prototype of a callback function used to determine if two values in a set are equal.

```
typedef Boolean (*CFSetEqualCallback) (
    const void *value1,
    const void *value2
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    const void *value1,
    const void *value2
);
```

Parameters

value1

A value in the set.

value2

Another value in the set.

Return Value

true if *value1* and *value2* are equal, false otherwise.

Discussion

This callback is passed to [CFSetCreate](#) (page 490) in a [CFSetCallbacks](#) (page 498) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetHashCallback

Prototype of a callback function called to compute a hash code for a value. Hash codes are used when values are accessed, added, or removed from a collection.


```
typedef CFHashCode      (*CFSetHashCallback)
(
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFHashCode CFSetHashCallback (
    const void *value
);
```

Parameters

value

The value used to compute the hash code.

Return Value

An integer that can be used as a table address in a hash table structure.

Discussion

This callback is passed to [CFSetCreate](#) (page 490) in a [CFSetCallbacks](#) (page 498) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetReleaseCallback

Prototype of a callback function used to release a value before it's removed from a set.

```
typedef void (*CFSetReleaseCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```

Parameters

allocator

The set's allocator.

value

The value being removed from the set.

Discussion

This callback is passed to [CFSetCreate](#) (page 490) in a [CFSetCallbacks](#) (page 498) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

CFSetRetainCallback

Prototype of a callback function used to retain a value being added to a set.

```
typedef const void *(*CFSetRetainCallback) (
    CFAllocatorRef allocator,
    const void *value
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    CFAllocatorRef allocator,
    const void *value
);
```

Parameters*allocator*

The set's allocator.

value

The value being added to the set.

Return Value

The value to store in the set, which is usually the *value* parameter passed to this callback, but may be a different value if a different value should be stored in the collection.

Discussion

This callback is passed to [CFSetCreate](#) (page 490) in a [CFSetCallbacks](#) (page 498) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSet.h

Data Types

CFSetCallbacks

This structure contains the callbacks used to retain, release, describe, and compare the values of a CFSet object.

```

struct CFSetCallbacks {
    CFIndex version;
    CFSetRetainCallback retain;
    CFSetReleaseCallback release;
    CFSetCopyDescriptionCallback copyDescription;
    CFSetEqualCallback equal;
    CFSetHashCallback hash;
};
typedef struct CFSetCallbacks CFSetCallbacks;

```

Fields**version**

The version number of this structure. If not one of the defined version numbers for this opaque type, the behavior is undefined. The current version of this structure is 0.

retain

The callback used to retain each value as they are added to the collection. If `NULL`, values are not retained. See [CFSetRetainCallback](#) (page 498) for a descriptions of this function's parameters.

release

The callback used to release values as they are removed from the collection. If `NULL`, values are not released. See [CFSetReleaseCallback](#) (page 497) for a description of this callback.

copyDescription

The callback used to create a descriptive string representation of each value in the collection. If `NULL`, the collection will create a simple description of each value. See [CFSetCopyDescriptionCallback](#) (page 495) for a description of this callback.

equal

The callback used to compare values in the collection for equality for some operations. If `NULL`, the collection will use pointer equality to compare values in the collection. See [CFSetEqualCallback](#) (page 496) for a description of this callback.

hash

The callback used to compute a hash code for values in a collection. If `NULL`, the collection computes a hash code by converting the pointer value to an integer. See [CFSetHashCallback](#) (page 496) for a description of this callback.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFSet.h`

CFSetRef

A reference to an immutable set object.

```
typedef const struct __CFSet *CFSetRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFSet.h`

Constants

Predefined Callback Structures

CFSet provides some predefined callbacks for your convenience.

```
const CFSetCallbacks kCFTYPESetCallbacks;  
const CFSetCallbacks kCFCopyStringSetCallbacks;
```

Constants

`kCFTYPESetCallbacks`

Predefined [CFSetCallbacks](#) (page 498) structure containing a set of callbacks appropriate for use when the values in a CFSet are all CFTYPE-derived objects. The retain callback is [CFRetain](#) (page 639), the release callback is [CFRelease](#) (page 639), the copy callback is [CFCopyDescription](#) (page 634), the equal callback is [CFEqual](#) (page 635), and the hash callback is [CFHash](#) (page 638). Therefore, if you use this constant when creating the collection, items are automatically retained when added to the collection, and released when removed from the collection.

Available in Mac OS X v10.0 and later.

Declared in `CFSet.h`.

`kCFCopyStringSetCallbacks`

Predefined [CFSetCallbacks](#) (page 498) structure containing a set of callbacks appropriate for use when the values in a set are all CFString objects. The retain callback makes an immutable copy of strings added to the set.

Available in Mac OS X v10.0 and later.

Declared in `CFSet.h`.

CFSocket Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFSocket.h
Companion guides	CFNetwork Programming Guide Threading Programming Guide

Overview

A CFSocket is a communications channel implemented with a BSD socket.

CFSockets can be created from scratch ([CFSocketCreate](#) (page 504) and [CFSocketCreateWithSocketSignature](#) (page 507)), from a pre-existing BSD socket ([CFSocketCreateWithNative](#) (page 507)), or already connected to a remote socket ([CFSocketCreateConnectedToSocketSignature](#) (page 505)).

To listen for messages, you need to create a run loop source with [CFSocketCreateRunLoopSource](#) (page 506) and add it to a run loop with [CFRunLoopAddSource](#) (page 445). You can select the types of socket activities, such as connection attempts or data arrivals, that cause the source to fire and invoke your CFSocket's callback function. To send data, you store the data in a CFData and call [CFSocketSendData](#) (page 512).

Unlike Mach and message ports, sockets support communication over a network.

Functions by Task

Creating Sockets

[CFSocketCreate](#) (page 504)

Creates a CFSocket object of a specified protocol and type.

[CFSocketCreateConnectedToSocketSignature](#) (page 505)

Creates a CFSocket object and opens a connection to a remote socket.

[CFSocketCreateWithNative](#) (page 507)

Creates a CFSocket object for a pre-existing native socket.

[CFSocketCreateWithSocketSignature](#) (page 507)

Creates a CFSocket object using information from a CFSocketSignature structure.

Configuring Sockets

[CFSocketCopyAddress](#) (page 503)

Returns the local address of a CFSocket object.

[CFSocketCopyPeerAddress](#) (page 503)

Returns the remote address to which a CFSocket object is connected.

[CFSocketDisableCallbacks](#) (page 508)

Disables the callback function of a CFSocket object for certain types of socket activity.

[CFSocketEnableCallbacks](#) (page 509)

Enables the callback function of a CFSocket object for certain types of socket activity.

[CFSocketGetContext](#) (page 509)

Returns the context information for a CFSocket object.

[CFSocketGetNative](#) (page 510)

Returns the native socket associated with a CFSocket object.

[CFSocketGetSocketFlags](#) (page 510)

Returns flags that control certain behaviors of a CFSocket object.

[CFSocketSetAddress](#) (page 513)

Binds a local address to a CFSocket object.

[CFSocketSetSocketFlags](#) (page 514)

Sets flags that control certain behaviors of a CFSocket object.

Using Sockets

[CFSocketConnectToAddress](#) (page 502)

Opens a connection to a remote socket.

[CFSocketCreateRunLoopSource](#) (page 506)

Creates a CFRunLoopSource object for a CFSocket object.

[CFSocketGetTypeID](#) (page 511)

Returns the type identifier for the CFSocket opaque type.

[CFSocketInvalidate](#) (page 511)

Invalidates a CFSocket object, stopping it from sending or receiving any more messages.

[CFSocketIsValid](#) (page 512)

Returns a Boolean value that indicates whether a CFSocket object is valid and able to send or receive messages.

[CFSocketSendData](#) (page 512)

Sends data over a CFSocket object.

Functions

CFSocketConnectToAddress

Opens a connection to a remote socket.

```

CFSocketError CFSocketConnectToAddress (
    CFSocketRef s,
    CFDataRef address,
    CFTimeInterval timeout
);

```

Parameters*s*

The CFSocket object with which to connect to *address*.

address

A CFData object containing a `struct sockaddr` appropriate for the protocol family of *s*, indicating the remote address to which to connect.

timeout

The time to wait for a connection to succeed. If a negative value is used, this function does not wait for the connection and instead lets the connection attempt happen in the background. If *s* requested a `kCFSocketConnectCallback`, you will receive a callback when the background connection succeeds or fails.

Return Value

An error code indicating success or failure of the connection attempt.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketCopyAddress

Returns the local address of a CFSocket object.

```

CFDataRef CFSocketCopyAddress (
    CFSocketRef s
);

```

Parameters*s*

The CFSocket object to examine.

Return Value

The local address, stored as a `struct sockaddr` in a CFData object, of *s*. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketCopyPeerAddress

Returns the remote address to which a CFSocket object is connected.

```
CFDataRef CFSocketCopyPeerAddress (
    CFSocketRef s
);
```

Parameters

s
The CFSocket object to examine.

Return Value

The remote address, stored as a `struct sockaddr` in a CFData object, to which *s* is connected. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketCreate

Creates a CFSocket object of a specified protocol and type.

```
CFSocketRef CFSocketCreate (
    CFAllocatorRef allocator,
    SInt32 protocolFamily,
    SInt32 socketType,
    SInt32 protocol,
    CFOptionFlags callbackTypes,
    CFSocketCallback callout,
    const CFSocketContext *context
);
```

Parameters

allocator
The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

protocolFamily
The protocol family for the socket. If negative or 0 is passed, the socket defaults to `PF_INET`.

socketType
The socket type to create. If *protocolFamily* is `PF_INET` and *socketType* is negative or 0, the socket type defaults to `SOCK_STREAM`.

protocol
The protocol for the socket. If *protocolFamily* is `PF_INET` and *protocol* is negative or 0, the socket protocol defaults to `IPPROTO_TCP` if *socketType* is `SOCK_STREAM` or `IPPROTO_UDP` if *socketType* is `SOCK_DGRAM`.

callbackTypes
A bitwise-OR combination of the types of socket activity that should cause *callout* to be called. See [Callback Types](#) (page 517) for the possible activity values.

callout
The function to call when one of the activities indicated by *callbackTypes* occurs.

context

A structure holding contextual information for the CFSocket object. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be NULL.

Return Value

The new CFSocket object, or NULL if an error occurred. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CocoaEcho

CocoaHTTPServer

CocoaSOAP

Declared In

CFSocket.h

CFSocketCreateConnectedToSocketSignature

Creates a CFSocket object and opens a connection to a remote socket.

```
CFSocketRef CFSocketCreateConnectedToSocketSignature (
    CFAllocatorRef allocator,
    const CFSocketSignature *signature,
    CFOptionFlags callBackTypes,
    CFSocketCallback callout,
    const CFSocketContext *context,
    CFTimeInterval timeout
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

signature

A [CFSocketSignature](#) (page 517) identifying the communication protocol and address to which the CFSocket object should connect.

callBackTypes

A bitwise-OR combination of the types of socket activity that should cause *callout* to be called. See [Callback Types](#) (page 517) for the possible activity values.

callout

The function to call when one of the activities indicated by *callBackTypes* occurs.

context

A structure holding contextual information for the CFSocket object. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be NULL.

timeout

The time to wait for a connection to succeed. If a negative value is used, this function does not wait for the connection and instead lets the connection attempt happen in the background. If *callbackTypes* includes `kCFSocketConnectCallback`, you will receive a callback when the background connection succeeds or fails.

Return Value

The new CFSocket object, or NULL if an error occurred. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketCreateRunLoopSource

Creates a CFRunLoopSource object for a CFSocket object.

```
CFRunLoopSourceRef CFSocketCreateRunLoopSource (
    CFAllocatorRef allocator,
    CFSocketRef s,
    CFIndex order
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

s

The CFSocket object for which to create a run loop source.

order

A priority index indicating the order in which run loop sources are processed. When multiple run loop sources are firing in a single pass through the run loop, the sources are processed in increasing order of this parameter. If the run loop is set to process only one source per loop, only the highest priority source, the one with the lowest *order* value, is processed.

Return Value

The new CFRunLoopSource object for *s*. Ownership follows the Create Rule.

Discussion

The run loop source is not automatically added to a run loop. To add the source to a run loop, use [CFRunLoopAddSource](#) (page 445).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

CocoaEcho

CocoaHTTPServer

CocoaSOAP

DNSServiceMetaQuery

Declared In

CFSocket.h

CFSocketCreateWithNative

Creates a CFSocket object for a pre-existing native socket.

```
CFSocketRef CFSocketCreateWithNative (
    CFAllocatorRef allocator,
    CFSocketNativeHandle sock,
    CFOptionFlags callBackTypes,
    CFSocketCallBack callout,
    const CFSocketContext *context
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

sock

The native socket for which to create a CFSocket object.

callBackTypes

A bitwise-OR combination of the types of socket activity that should cause *callout* to be called. See [Callback Types](#) (page 517) for the possible activity values.

callout

The function to call when one of the activities indicated by *callBackTypes* occurs.

context

A structure holding contextual information for the CFSocket object. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be `NULL`.

Return Value

The new CFSocket object, or `NULL` if an error occurred. If a CFSocket object already exists for *sock*, the function returns the pre-existing object instead of creating a new object; the *context*, *callout*, and *callBackTypes* parameters are ignored in this case. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

DNSServiceMetaQuery

Declared In

CFSocket.h

CFSocketCreateWithSocketSignature

Creates a CFSocket object using information from a CFSocketSignature structure.

```
CFSocketRef CFSocketCreateWithSocketSignature (
    CFAllocatorRef allocator,
    const CFSocketSignature *signature,
    CFOptionFlags callbackTypes,
    CFSocketCallback callout,
    const CFSocketContext *context
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

signature

A [CFSocketSignature](#) (page 517) identifying the communication protocol and address with which to create the CFSocket object.

callbackTypes

A bitwise-OR combination of the types of socket activity that should cause *callout* to be called. See [Callback Types](#) (page 517) for the possible activity values.

callout

The function to call when one of the activities indicated by *callbackTypes* occurs.

context

A structure holding contextual information for the CFSocket object. The function copies the information out of the structure, so the memory pointed to by *context* does not need to persist beyond the function call. Can be `NULL`.

Return Value

The new CFSocket object, or `NULL` if an error occurred. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketDisableCallbacks

Disables the callback function of a CFSocket object for certain types of socket activity.

```
void CFSocketDisableCallbacks (
    CFSocketRef s,
    CFOptionFlags callbackTypes
);
```

Parameters*s*

The CFSocket object to modify.

callbackTypes

A bitwise-OR combination of CFSocket activity types that should not cause the callback function of *s* to be called. See [Callback Types](#) (page 517) for a list of callback types.

Discussion

If you no longer want certain types of callbacks that you requested when creating *s*, you can use this function to temporarily disable the callback. Use [CFSocketEnableCallbacks](#) (page 509) to reenable a callback type.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFSocket.h

CFSocketEnableCallbacks

Enables the callback function of a CFSocket object for certain types of socket activity.

```
void CFSocketEnableCallbacks (
    CFSocketRef s,
    CFOptionFlags callbackTypes
);
```

Parameters

s

The CFSocket object to modify.

callbackTypes

A bitwise-OR combination of CFSocket activity types that should cause the callback function of *s* to be called. See [Callback Types](#) (page 517) for a list of callback types.

Discussion

If a callback type is not automatically reenabled, you can use this function to enable the callback. A callback type that is not automatically reenabled still does not get reenabled after enabling it with this function; use [CFSocketSetSocketFlags](#) (page 514) to have the callback type reenabled automatically.

Be sure to enable only callback types that your CFSocket object actually possesses and has requested when creating the CFSocket object; the result of enabling other callback types is undefined.

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

CFLocalServer

Declared In

CFSocket.h

CFSocketGetContext

Returns the context information for a CFSocket object.

```
void CFSocketGetContext (
    CFSocketRef s,
    CFSocketContext *context
);
```

Parameters

s

The CFSocket object to examine.

context

A pointer to the structure into which the context information for *s* is to be copied. The information being returned is usually the same information you passed to [CFSocketCreate](#) (page 504), [CFSocketCreateConnectedToSocketSignature](#) (page 505), [CFSocketCreateWithNative](#) (page 507), or [CFSocketCreateWithSocketSignature](#) (page 507) when creating the CFSocket object. However, if [CFSocketCreateWithNative](#) (page 507) returned a cached CFSocket object instead of creating a new object, *context* is filled with information from the original CFSocket object instead of the information you passed to the function.

Discussion

The context version number for CFSocket is currently 0. Before calling this function, you need to initialize the *version* member of *context* to 0.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketGetNative

Returns the native socket associated with a CFSocket object.

```
CFSocketNativeHandle CFSocketGetNative (
    CFSocketRef s
);
```

Parameters

s

The CFSocket object to examine.

Return Value

The native socket associated with *s*. If *s* has been invalidated, returns -1, INVALID_SOCKET.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

CocoaEcho

CocoaHTTPServer

CocoaSOAP

Declared In

CFSocket.h

CFSocketGetSocketFlags

Returns flags that control certain behaviors of a CFSocket object.

```
CFOptionFlags CFSocketGetSocketFlags (
    CFSocketRef s
);
```

Parameters

s
The CFSocket to examine.

Return Value

A bitwise-OR combination of flags controlling the behavior of *s*. See [CFSocket Flags](#) (page 519) for the list of available flags.

Discussion

See [CFSocketSetSocketFlags](#) (page 514) for details on what the flags of a CFSocket mean.

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

DNSServiceMetaQuery

Declared In

CFSocket.h

CFSocketGetTypeID

Returns the type identifier for the CFSocket opaque type.

```
CTypeID CFSocketGetTypeID ();
```

Return Value

The type identifier for the CFSocket opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketInvalidate

Invalidates a CFSocket object, stopping it from sending or receiving any more messages.

```
void CFSocketInvalidate (
    CFSocketRef s
);
```

Parameters

s
The CFSocket object to invalidate.

Discussion

Invalidating a CFSocket object prevents the port from ever sending or receiving any more messages. The CFSocket object is not deallocated, though. The [CFSocketContext](#) (page 516) `info` information, which was provided when `s` was created, is released, if a release callback was specified in its context structure. Also, if a run loop source was created for `s`, the run loop source is invalidated, as well.

You should always invalidate a socket when you are done using it. If you have requested, using [CFSocketSetSocketFlags](#) (page 514), that the underlying socket not automatically close when invalidating the wrapping CFSocket object, you must invalidate the CFSocket object before closing the socket yourself.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFLocalServer

CocoaEcho

CocoaHTTPServer

CocoaSOAP

DNSServiceMetaQuery

Declared In

CFSocket.h

CFSocketIsValid

Returns a Boolean value that indicates whether a CFSocket object is valid and able to send or receive messages.

```
Boolean CFSocketIsValid (
    CFSocketRef s
);
```

Parameters

`s`

The CFSocket object to examine.

Return Value

`true` if `s` can be used for communication, otherwise `false`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketSendData

Sends data over a CFSocket object.


```

CFSocketError CFSocketSendData (
    CFSocketRef s,
    CFDataRef address,
    CFDataRef data,
    CFTimeInterval timeout
);

```

Parameters*s*

The CFSocket object to use.

address

The address, stored as a `struct sockaddr` in a CFData object, to which to send the contents of *data*. If NULL, the data are sent to the address to which *s* is already connected.

data

The data to send.

timeout

The time to wait for the data to be sent.

Return Value

An error code indicating success or failure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketSetAddress

Binds a local address to a CFSocket object.

```

CFSocketError CFSocketSetAddress (
    CFSocketRef s,
    CFDataRef address
);

```

Parameters*s*

The CFSocket object to modify.

address

A CFData object containing a `struct sockaddr` appropriate for the protocol family of *s*.

Return Value

An error code indicating success or failure.

Discussion

Once *s* is bound to *address*, depending on the socket's protocol, other processes and computers can connect to *s*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CocoaEcho

CocoaHTTPServer
CocoaSOAP

Declared In
CFSocket.h

CFSocketSetSocketFlags

Sets flags that control certain behaviors of a CFSocket object.

```
void CFSocketSetSocketFlags (
    CFSocketRef s,
    CFOptionFlags flags
);
```

Parameters

s

The CFSocket object to modify.

flags

A bitwise-OR combination of flags controlling the behavior of *s*. See [CFSocket Flags](#) (page 519) for the list of available flags.

Discussion

The *flags* argument controls whether callbacks of a given type are automatically reenabled after they are triggered, and whether the underlying native socket is closed when *s* is invalidated.

By default `kCFSocketReadCallBack`, `kCFSocketAcceptCallBack`, and `kCFSocketDataCallBack` callbacks are automatically reenabled, whereas `kCFSocketWriteCallBack` callbacks are not; `kCFSocketConnectCallBack` callbacks can only occur once, so they cannot be reenabled. Be careful about automatically re-enabling read and write callbacks, because this implies that the callbacks will be sent repeatedly if the socket remains readable or writable respectively. Be sure to set these flags only for callback types that your CFSocket object actually possesses; the result of setting them for other callback types is undefined.

By default the underlying native socket will be closed when *s* is invalidated, but it will not be if the `kCFSocketCloseOnInvalidate` flag is turned off. This can be useful when you want to destroy a CFSocket object but continue to use the underlying native socket. The CFSocket object must still be invalidated when it will no longer be used. Do not in either case close the underlying native socket without invalidating the CFSocket object.

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

DNSServiceMetaQuery

Declared In
CFSocket.h

Callbacks

CFSocketCallback

Callback invoked when certain types of activity takes place on a CFSocket object.

```
typedef void (*CFSocketCallback) (
    CFSocketRef s,
    CFSocketCallbackType callbackType,
    CFDataRef address,
    const void *data,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFSocketRef s,
    CFSocketCallbackType callbackType,
    CFDataRef address,
    const void *data,
    void *info
);
```

Parameters

s

The CFSocket object that experienced some activity.

callbackType

The type of activity detected.

address

A CFData object holding the contents of a `struct sockaddr` appropriate for the protocol family of *s*, identifying the remote address to which *s* is connected. This value is NULL except for `kCFSocketAcceptCallback` and `kCFSocketDataCallback` callbacks.

data

Data appropriate for the callback type. For a `kCFSocketConnectCallback` that failed in the background, it is a pointer to an `SInt32` error code; for a `kCFSocketAcceptCallback`, it is a pointer to a [CFSocketNativeHandle](#) (page 516); or for a `kCFSocketDataCallback`, it is a CFData object containing the incoming data. In all other cases, it is NULL.

info

The `info` member of the [CFSocketContext](#) (page 516) structure that was used when creating the CFSocket object.

Discussion

You specify this callback when you create the CFSocket object with [CFSocketCreate](#) (page 504), [CFSocketCreateConnectedToSocketSignature](#) (page 505), [CFSocketCreateWithNative](#) (page 507), or [CFSocketCreateWithSocketSignature](#) (page 507).

Availability

Available in Mac OS X v10.0 and later.

Declared In
CFSocket.h

Data Types

CFSocketContext

A structure that contains program-defined data and callbacks with which you can configure a CFSocket object's behavior.

```
struct CFSocketContext {
    CFIndex version;
    void *info;
    CFAllocatorRetainCallback retain;
    CFAllocatorReleaseCallback release;
    CFAllocatorCopyDescriptionCallback copyDescription;
};
typedef struct CFSocketContext CFSocketContext;
```

Fields

`version`

Version number of the structure. Must be 0.

`info`

An arbitrary pointer to program-defined data, which can be associated with the CFSocket object at creation time. This pointer is passed to all the callbacks defined in the context.

`retain`

A retain callback for your program-defined `info` pointer. Can be NULL.

`release`

A release callback for your program-defined `info` pointer. Can be NULL.

`copyDescription`

A copy description callback for your program-defined `info` pointer. Can be NULL.

Availability

Available in Mac OS X v10.0 and later.

Declared In
CFSocket.h

CFSocketNativeHandle

Type for the platform-specific native socket handle.

```
typedef int CFSocketNativeHandle;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In
CFSocket.h

CFSocketRef

A reference to a CFSocket object.

```
typedef struct __CFSocket *CFSocketRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketSignature

A structure that fully specifies the communication protocol and connection address of a CFSocket object.

```
struct CFSocketSignature {
    SInt32 protocolFamily;
    SInt32 socketType;
    SInt32 protocol;
    CFDataRef address;
};
typedef struct CFSocketSignature CFSocketSignature;
```

Fields

protocolFamily

The protocol family of the socket.

socketType

The socket type of the socket.

protocol

The protocol type of the socket.

address

A CFData object holding the contents of a struct sockaddr appropriate for the given protocol family, identifying the address of the socket.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

Constants

Callback Types

Types of socket activity that can cause the callback function of a CFSocket object to be called.

```
enum CFSocketCallbackType {
    kCFSocketNoCallback = 0,
    kCFSocketReadCallback = 1,
    kCFSocketAcceptCallback = 2,
    kCFSocketDataCallback = 3,
    kCFSocketConnectCallback = 4,
    kCFSocketWriteCallback = 8
};
typedef enum CFSocketCallbackType CFSocketCallbackType;
```

Constants**kCFSocketNoCallback****No callback should be made for any activity.****Available in Mac OS X v10.0 and later.****Declared in CFSocket.h.****kCFSocketReadCallback****The callback is called when data is available to be read or a new connection is waiting to be accepted. The data is not automatically read; the callback must read the data itself.****Available in Mac OS X v10.0 and later.****Declared in CFSocket.h.****kCFSocketAcceptCallback****New connections will be automatically accepted and the callback is called with the data argument being a pointer to a [CFSocketNativeHandle](#) (page 516) of the child socket. This callback is usable only with listening sockets.****Available in Mac OS X v10.0 and later.****Declared in CFSocket.h.****kCFSocketDataCallback****Incoming data will be read in chunks in the background and the callback is called with the data argument being a CFData object containing the read data.****Available in Mac OS X v10.0 and later.****Declared in CFSocket.h.****kCFSocketConnectCallback****If a connection attempt is made in the background by calling [CFSocketConnectToAddress](#) (page 502) or [CFSocketCreateConnectedToSocketSignature](#) (page 505) with a negative timeout value, this callback type is made when the connect finishes. In this case the data argument is either NULL or a pointer to an SInt32 error code, if the connect failed. This callback will never be sent more than once for a given socket.****Available in Mac OS X v10.0 and later.****Declared in CFSocket.h.****kCFSocketWriteCallback****The callback is called when the socket is writable. This callback type may be useful when large amounts of data are being sent rapidly over the socket and you want a notification when there is space in the kernel buffers for more data.****Available in Mac OS X v10.2 and later.****Declared in CFSocket.h.**

Discussion

The callback types for which a callback is made is determined when the CFSocket object is created, such as with [CFSocketCreate](#) (page 504), or later with [CFSocketEnableCallbacks](#) (page 509) and [CFSocketDisableCallbacks](#) (page 508).

The `kCFSocketReadCallback`, `kCFSocketAcceptCallback`, and `kCFSocketDataCallback` callbacks are mutually exclusive.

Version Notes

`kCFSocketWriteCallback` is available in Mac OS X v10.2 and later.

CFSocket Flags

Flags that can be set on a CFSocket object to control its behavior.

```
enum {
    kCFSocketAutomaticallyReenableReadCallback = 1,
    kCFSocketAutomaticallyReenableAcceptCallback = 2,
    kCFSocketAutomaticallyReenableDataCallback = 3,
    kCFSocketAutomaticallyReenableWriteCallback = 8,
    kCFSocketCloseOnInvalidate = 128
};
```

Constants

`kCFSocketAutomaticallyReenableReadCallback`

When enabled using [CFSocketSetSocketFlags](#) (page 514), the read callback is called every time the sockets has data to be read. When disabled, the read callback is called only once the next time data are available. The read callback is automatically reenabled by default.

Available in Mac OS X v10.2 and later.

Declared in `CFSocket.h`.

`kCFSocketAutomaticallyReenableAcceptCallback`

When enabled using [CFSocketSetSocketFlags](#) (page 514), the accept callback is called every time someone connects to your socket. When disabled, the accept callback is called only once the next time a new socket connection is accepted. The accept callback is automatically reenabled by default.

Available in Mac OS X v10.2 and later.

Declared in `CFSocket.h`.

`kCFSocketAutomaticallyReenableDataCallback`

When enabled using [CFSocketSetSocketFlags](#) (page 514), the data callback is called every time the socket has read some data. When disabled, the data callback is called only once the next time data are read. The data callback is automatically reenabled by default.

Available in Mac OS X v10.2 and later.

Declared in `CFSocket.h`.

`kCFSocketAutomaticallyReenableWriteCallback`

When enabled using [CFSocketSetSocketFlags](#) (page 514), the write callback is called every time more data can be written to the socket. When disabled, the write callback is called only the next time data can be written. The write callback is not automatically reenabled by default.

Available in Mac OS X v10.2 and later.

Declared in `CFSocket.h`.

`kCFSocketCloseOnInvalidate`

When enabled using `CFSocketSetSocketFlags` (page 514), the native socket associated with a `CFSocket` object is closed when the `CFSocket` object is invalidated. When disabled, the native socket remains open. This option is enabled by default.

Available in Mac OS X v10.2 and later.

Declared in `CFSocket.h`.

Discussion

The flags for a `CFSocket` object are set with `CFSocketSetSocketFlags` (page 514). To immediately enable or disable a callback, use `CFSocketEnableCallbacks` (page 509) and `CFSocketDisableCallbacks` (page 508).

Error Codes

Error codes for many `CFSocket` functions.

```
enum CFSocketError {
    kCFSocketSuccess = 0,
    kCFSocketError = -1,
    kCFSocketTimeout = -2
};
typedef enum CFSocketError CFSocketError;
```

Constants

`kCFSocketSuccess`

The socket operation succeeded.

Available in Mac OS X v10.0 and later.

Declared in `CFSocket.h`.

`kCFSocketError`

The socket operation failed.

Available in Mac OS X v10.0 and later.

Declared in `CFSocket.h`.

`kCFSocketTimeout`

The socket operation timed out.

Available in Mac OS X v10.0 and later.

Declared in `CFSocket.h`.

CFString Reference

Derived From:	CFPropertyList : CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFString.h CFBase.h
Companion guides	Property List Programming Topics for Core Foundation Strings Programming Guide for Core Foundation Data Formatting Guide for Core Foundation

Overview

CFString provides a suite of efficient string-manipulation and string-conversion functions. It offers seamless Unicode support and facilitates the sharing of data between Carbon and Cocoa programs. CFString is relevant for any Carbon application that uses strings. If your application supports (or is planning to support) Unicode, CFString is recommended. CFString creates immutable strings—use CFMutableString to create and manage a string that can be changed after it has been created.

CFString has two primitive functions, [CFStringGetLength](#) (page 561) and [CFStringGetCharacterAtIndex](#) (page 554), that provide the basis for all other functions in its interface. The [CFStringGetLength](#) function returns the total number (in terms of UTF-16 code pairs) of characters in the string. The [CFStringGetCharacterAtIndex](#) function gives access to each character in the string by index, with index values starting at 0.

CFString provides functions for finding and comparing strings. It also provides functions for reading numeric values from strings, for combining strings in various ways, and for converting a string to different forms (such as encoding and case changes). A number of functions, for example [CFStringFindWithOptions](#), allow you to specify a range over which to operate within a string. The specified range must not exceed the length of the string. Debugging options may help you to catch any errors that arise if a range does exceed a string's length.

Like other Core Foundation types, CFStrings can be hashed using the [CFHash](#) (page 638) function. Note, though, that hash values are not guaranteed to remain equal between releases of the operating system. In particular, hash values are different between Mac OS X v10.3 and v10.4. If you need to make a hash value persistent and consistent across different releases, you should use an alternate technique, such as SHA-1.

CFString is “toll-free bridged” with its Cocoa Foundation counterpart, NSString. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSString *` parameter, you can pass in a `CFStringRef`, and in a function where you see a `CFStringRef` parameter, you can pass in an NSString instance. This also applies to concrete subclasses of NSString. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a CFString

[CFSTR](#) (page 527)

Creates an immutable string from a constant compile-time string.

[CFStringCreateArrayBySeparatingStrings](#) (page 533)

Creates an array of CFString objects from a single CFString object.

[CFStringCreateByCombiningStrings](#) (page 535)

Creates a single string from the individual CFString objects that comprise the elements of an array.

[CFStringCreateCopy](#) (page 535)

Creates an immutable copy of a string.

[CFStringCreateFromExternalRepresentation](#) (page 537)

Creates a string from its “external representation.”

[CFStringCreateWithBytes](#) (page 538)

Creates a string from a buffer containing characters in a specified encoding.

[CFStringCreateWithBytesNoCopy](#) (page 539)

Creates a string from a buffer, containing characters in a specified encoding, that might serve as the backing store for the new string.

[CFStringCreateWithCharacters](#) (page 540)

Creates a string from a buffer of Unicode characters.

[CFStringCreateWithCharactersNoCopy](#) (page 541)

Creates a string from a buffer of Unicode characters that might serve as the backing store for the object.

[CFStringCreateWithCString](#) (page 542)

Creates an immutable string from a C string.

[CFStringCreateWithCStringNoCopy](#) (page 543)

Creates a CFString object from an external C string buffer that might serve as the backing store for the object.

[CFStringCreateWithFormat](#) (page 545)

Creates an immutable string from a formatted string and a variable number of arguments.

[CFStringCreateWithFormatAndArguments](#) (page 546)

Creates an immutable string from a formatted string and a variable number of arguments (specified in a parameter of type `va_list`).

[CFStringCreateWithPascalString](#) (page 546)

Creates an immutable CFString object from a Pascal string.

[CFStringCreateWithPascalStringNoCopy](#) (page 547)

Creates a CFString object from an external Pascal string buffer that might serve as the backing store for the object.

[CFStringCreateWithSubstring](#) (page 548)

Creates an immutable string from a segment (substring) of an existing string.

Searching Strings

[CFStringCreateArrayWithFindResults](#) (page 534)

Searches a string for multiple occurrences of a substring and creates an array of ranges identifying the locations of these substrings within the target string.

[CFStringFind](#) (page 549)

Searches for a substring within a string and, if it is found, yields the range of the substring within the object's characters.

[CFStringFindCharacterFromSet](#) (page 550)

Query the range of the first character contained in the specified character set.

[CFStringFindWithOptions](#) (page 551)

Searches for a substring within a range of the characters represented by a string and, if the substring is found, returns its range within the object's characters.

[CFStringFindWithOptionsAndLocale](#) (page 552)

Returns a Boolean value that indicates whether a given string was found in a given source string.

[CFStringGetLineBounds](#) (page 561)

Given a range of characters in a string, obtains the line bounds—that is, the indexes of the first character and the final characters of the lines containing the range.

Comparing Strings

[CFStringCompare](#) (page 527)

Compares one string with another string.

[CFStringCompareWithOptions](#) (page 528)

Compares a range of the characters in one string with that of another string.

[CFStringCompareWithOptionsAndLocale](#) (page 529)

Compares a range of the characters in one string with another string using a given locale.

[CFStringHasPrefix](#) (page 570)

Determines if the character data of a string begin with a specified sequence of characters.

[CFStringHasSuffix](#) (page 570)

Determines if a string ends with a specified sequence of characters.

Accessing Characters

[CFStringCreateExternalRepresentation](#) (page 536)

Creates an “external representation” of a CFString object, that is, a CFData object.

[CFStringGetBytes](#) (page 553)

Fetches a range of the characters from a string into a byte buffer after converting the characters to a specified encoding.

[CFStringGetCharacterAtIndex](#) (page 554)

Returns the Unicode character at a specified location in a string.

[CFStringGetCharacters](#) (page 556)

Copies a range of the Unicode characters from a string to a user-provided buffer.

[CFStringGetCharactersPtr](#) (page 556)

Quickly obtains a pointer to the contents of a string as a buffer of Unicode characters.

[CFStringGetCharacterFromInlineBuffer](#) (page 555)

Returns the Unicode character at a specific location in an in-line buffer.

[CFStringGetCString](#) (page 557)

Copies the character contents of a string to a local C string buffer after converting the characters to a given encoding.

[CFStringGetCStringPtr](#) (page 558)

Quickly obtains a pointer to a C-string buffer containing the characters of a string in a given encoding.

[CFStringGetLength](#) (page 561)

Returns the number (in terms of UTF-16 code pairs) of Unicode characters in a string.

[CFStringGetPascalString](#) (page 566)

Copies the character contents of a CFString object to a local Pascal string buffer after converting the characters to a requested encoding.

[CFStringGetPascalStringPtr](#) (page 567)

Quickly obtains a pointer to a Pascal buffer containing the characters of a string in a given encoding.

[CFStringGetRangeOfComposedCharactersAtIndex](#) (page 567)

Returns the range of the composed character sequence at a specified index.

[CFStringInitInlineBuffer](#) (page 571)

Initializes an in-line buffer to use for efficient access of a CFString object's characters.

Working With Encodings

[CFStringConvertEncodingToIANACharSetName](#) (page 530)

Returns the name of the IANA registry “charset” that is the closest mapping to a specified string encoding.

[CFStringConvertEncodingToNSStringEncoding](#) (page 530)

Returns the Cocoa encoding constant that maps most closely to a given Core Foundation encoding constant.

[CFStringConvertEncodingToWindowsCodepage](#) (page 531)

Returns the Windows codepage identifier that maps most closely to a given Core Foundation encoding constant.

[CFStringConvertIANACharSetNameToEncoding](#) (page 531)

Returns the Core Foundation encoding constant that is the closest mapping to a given IANA registry “charset” name.

[CFStringConvertNSStringEncodingToEncoding](#) (page 532)

Returns the Core Foundation encoding constant that is the closest mapping to a given Cocoa encoding.

[CFStringConvertWindowsCodepageToEncoding](#) (page 532)

Returns the Core Foundation encoding constant that is the closest mapping to a given Windows codepage identifier.

[CFStringGetFastestEncoding](#) (page 559)

Returns for a CFString object the character encoding that requires the least conversion time.

[CFStringGetListOfAvailableEncodings](#) (page 562)

Returns a pointer to a list of string encodings supported by the current system.

[CFStringGetMaximumSizeForEncoding](#) (page 563)

Returns the maximum number of bytes a string of a specified length (in Unicode characters) will take up if encoded in a specified encoding.

[CFStringGetMostCompatibleMacStringEncoding](#) (page 564)

Returns the most compatible Mac OS script value for the given input encoding.

[CFStringGetNameOfEncoding](#) (page 564)

Returns the canonical name of a specified string encoding.

[CFStringGetSmallestEncoding](#) (page 568)

Returns the smallest encoding on the current system for the character contents of a string.

[CFStringGetSystemEncoding](#) (page 568)

Returns the default encoding used by the operating system when it creates strings.

[CFStringIsEncodingAvailable](#) (page 571)

Determines whether a given Core Foundation string encoding is available on the current system.

Getting Numeric Values

[CFStringGetDoubleValue](#) (page 559)

Returns the primary `double` value represented by a string.

[CFStringGetIntValue](#) (page 560)

Returns the integer value represented by a string.

Getting String Properties

[CFShowStr](#) (page 526)

Prints the attributes of a string during debugging.

[CFStringGetTypeID](#) (page 569)

Returns the type identifier for the CFString opaque type.

String File System Representations

[CFStringCreateWithFileSystemRepresentation](#) (page 544)

Creates a CFString from a zero-terminated POSIX file system representation.

[CFStringGetFileSystemRepresentation](#) (page 560)

Extracts the contents of a string as a NULL-terminated 8-bit string appropriate for passing to POSIX APIs.

[CFStringGetMaximumSizeOfFileSystemRepresentation](#) (page 563)

Determines the upper bound on the number of bytes required to hold the file system representation of the string.

Getting Paragraph Bounds

[CFStringGetParagraphBounds](#) (page 565)

Given a range of characters in a string, obtains the paragraph bounds—that is, the indexes of the first character and the final characters of the paragraph(s) containing the range.

Functions

CFShowStr

Prints the attributes of a string during debugging.

```
void CFShowStr (
    CFStringRef str
);
```

Parameters

str

The string whose attributes you want to print.

Discussion

Use this function to learn about specific attributes of a CFString object during debugging. These attributes include the following:

- Length (in Unicode characters)
- Whether originally it was an 8-bit string and, if so, whether it was a C (HasNullByte) or Pascal (HasLengthByte) string
- Whether it is a mutable or an immutable object
- The allocator used to create it
- The memory address of the character contents and whether those contents are in-line

The information provided by this function is for debugging purposes only. The values of any of these attributes might change between different releases and on different platforms. Note in particular that this function does not show the contents of the string. If you want to display the contents of the string, use `CFShow`.

Special Considerations

You can use `CFShowStr` in one of two general ways. If your debugger supports function calls (such as `gdb` does), call `CFShowStr` in the debugger:

```
(gdb) call (void) CFShowStr(string)
Length 11
IsEightBit 1
HasLengthByte 1
HasNullByte 1
InlineContents 1
Allocator SystemDefault
Mutable 0
Contents 0x4e7c0
```

You can also incorporate calls to `CFShowStr` in a test version of your code to print descriptions of `CFString` objects to the console.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFString.h`

CFSTR

Creates an immutable string from a constant compile-time string.

```
CFStringRef CFSTR (  
    const char *cStr  
);
```

Parameters

cStr

A constant C string (that is, text enclosed in double-quotation marks) from which the string is to be created. The characters enclosed by the quotation marks must be ASCII characters, otherwise the behavior is undefined.

Return Value

An immutable string, or `NULL` if there was a problem creating the object. The returned object is a constant. You may retain and release it, similar to other immutable `CFString` objects, but are not required to do so—it will remain valid until the program terminates.

Discussion

The `CFSTR` macro is a convenient way to create `CFString` representations of constant compile-time strings.

A value returned by `CFSTR` has the following semantics:

- Values returned from `CFSTR` are not released by `CFString`—they are guaranteed to be valid until the program terminates.
- Values returned from `CFSTR` can be retained and released in a balanced fashion, like any other `CFString`, but you are not required to do so.

Non-ASCII characters (that is, character codes greater than 127) are not supported. If you use them, the result is undefined. Even if using them works for you in testing, it might not work if the user selects a different language preference.

Note that when using this macro as an initializer, you must compile using the flag `-fconstant-cfstrings` (see [Options Controlling C Dialect](#)).

CFStringCompare

Compares one string with another string.

```
CFComparisonResult CFStringCompare (
    CFStringRef theString1,
    CFStringRef theString2,
    CFOptionFlags compareOptions
);
```

Parameters*theString1*

The first string to use in the comparison.

theString2

The second string to use in the comparison.

*compareOptions*Flags that select different types of comparisons, such as localized comparison, case-insensitive comparison, and non-literal comparison. If you want the default comparison behavior, pass 0. See [“String Comparison Flags”](#) (page 574) for the available flags.**Return Value**A [CFComparisonResult](#) (page 764) value that indicates whether *theString1* is equal to, less than, or greater than *theString2*.**Discussion**You can affect how the comparison proceeds by specifying one or more option flags in *compareOptions*. Not all comparison options are currently implemented.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageBrowserView

ImageClient

MoreIsBetter

MoreOSL

NSLMiniBrowser

Declared In

CFString.h

CFStringCompareWithOptions

Compares a range of the characters in one string with that of another string.

```
CFComparisonResult CFStringCompareWithOptions (
    CFStringRef theString1,
    CFStringRef theString2,
    CFRange rangeToCompare,
    CFOptionFlags compareOptions
);
```

Parameters*theString1*

The first string to use in the comparison.

theString2

The second string to use in the comparison.

rangeToCompare

The range of characters in *theString1* to be used in the comparison to *theString2*. To use the whole string, pass the range `CFRangeMake(0, CFStringGetLength(theString1))` or use [CFStringCompare](#) (page 527). The specified range must not exceed the length of the string.

compareOptions

Flags that select different types of comparisons, such as localized comparison, case-insensitive comparison, and non-literal comparison. If you want the default comparison behavior, pass 0. See [“String Comparison Flags”](#) (page 574) for the available flags.

Return Value

A [CFComparisonResult](#) (page 764) value that indicates whether *theString1* is equal to, less than, or greater than *theString2*.

Discussion

You can affect how the comparison proceeds by specifying one or more option flags in *compareOptions*.

If you want to compare one entire string with another string, use the [CFStringCompare](#) (page 527) function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCompareWithOptionsAndLocale

Compares a range of the characters in one string with another string using a given locale.

```
CFComparisonResult CFStringCompareWithOptionsAndLocale (
    CFStringRef theString1,
    CFStringRef theString2,
    CFRange rangeToCompare,
    CFOptionFlags compareOptions,
    CFLocaleRef locale
);
```

Parameters*theString1*

The first string to use in the comparison.

theString2

The second string to use in the comparison. The full range of this string is used.

rangeToCompare

The range of characters in *theString1* to be used in the comparison to *theString2*. To use the whole string, pass the range `CFRangeMake(0, CFStringGetLength(theString1))`. The specified range must not exceed the bounds of the string.

compareOptions

Flags that select different types of comparisons, such as case-insensitive comparison and non-literal comparison. If you want the default comparison behavior, pass 0. See [“String Comparison Flags”](#) (page 574) for the available flags. `kCFCompareBackwards` and `kCFCompareAnchored` are not applicable.

locale

The locale to use for the comparison. `NULL` specifies the canonical locale (the return value from [CFLocaleGetSystem](#) (page 247)). The locale argument affects both equality and ordering algorithms. For example, in some locales, accented characters are ordered immediately after the base; other locales order them after “z”.

Return Value

A [CFComparisonResult](#) (page 764) value that indicates whether *theString1* is equal to, less than, or greater than *theString2*.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFString.h

CFStringConvertEncodingToIANACharSetName

Returns the name of the IANA registry “charset” that is the closest mapping to a specified string encoding.

```
CFStringRef CFStringConvertEncodingToIANACharSetName (
    CFStringEncoding encoding
);
```

Parameters*encoding*

The Core Foundation string encoding to use.

Return Value

The name of the IANA “charset” that is the closest mapping to *encoding*. Returns `NULL` if the encoding is not recognized.

Discussion

The [CFStringConvertIANACharSetNameToEncoding](#) (page 531) function is complementary to this function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringConvertEncodingToNSStringEncoding

Returns the Cocoa encoding constant that maps most closely to a given Core Foundation encoding constant.

```
UInt32 CFStringConvertEncodingToNSStringEncoding (
    CFStringEncoding encoding
);
```

Parameters*encoding*

The Core Foundation string encoding to use.

Return Value

The Cocoa encoding (of type `NSStringEncoding`) that is closest to the Core Foundation encoding *encoding*. The behavior is undefined if an invalid string encoding is passed.

Discussion

The [CFStringConvertNSStringEncodingToEncoding](#) (page 532) function is complementary to this function.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Quartz Composer WWDC 2005 TextEdit

TextEditPlus

Declared In

CFString.h

CFStringConvertEncodingToWindowsCodepage

Returns the Windows codepage identifier that maps most closely to a given Core Foundation encoding constant.

```
UInt32 CFStringConvertEncodingToWindowsCodepage (
    CFStringEncoding encoding
);
```

Parameters

encoding

The Core Foundation string encoding to use.

Return Value

The Windows codepage value that is closest to the Core Foundation encoding *encoding*. The behavior is undefined if an invalid string encoding is passed.

Discussion

The [CFStringConvertWindowsCodepageToEncoding](#) (page 532) function is complementary to this function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringConvertIANACharSetNameToEncoding

Returns the Core Foundation encoding constant that is the closest mapping to a given IANA registry “charset” name.

```
CFStringEncoding CFStringConvertIANACharSetNameToEncoding (
    CFStringRef theString
);
```

Parameters*IANAName*

The IANA “charset” name to use.

Return ValueThe Core Foundation string encoding that is closest to the IANA “charset” *IANAName*. Returns the [kCFStringEncodingInvalidId](#) (page 578) constant if the name is not recognized.**Discussion**The [CFStringConvertEncodingToIANACharSetName](#) (page 530) function is complementary to this function.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringConvertNSStringEncodingToEncoding

Returns the Core Foundation encoding constant that is the closest mapping to a given Cocoa encoding.

```
CFStringEncoding CFStringConvertNSStringEncodingToEncoding (
    UInt32 encoding
);
```

Parameters*encoding*The Cocoa string encoding (of type *NSStringEncoding*) to use.**Return Value**The Core Foundation string encoding that is closest to the Cocoa string encoding *encoding*. Returns the [kCFStringEncodingInvalidId](#) (page 578) constant if the mapping is not known.**Discussion**The [CFStringConvertEncodingToNSStringEncoding](#) (page 530) function is complementary to this function.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringConvertWindowsCodepageToEncoding

Returns the Core Foundation encoding constant that is the closest mapping to a given Windows codepage identifier.

```
CFStringEncoding CFStringConvertWindowsCodepageToEncoding (
    UInt32 codepage
);
```

Parameters*codepage*

The Windows codepage identifier to use.

Return Value

The Core Foundation string encoding that is closest to the Windows codepage identifier *codepage*. Returns the `kCFStringEncodingInvalidId` (page 578) constant if the mapping is not known.

Discussion

The `CFStringConvertEncodingToWindowsCodepage` (page 531) function is complementary to this function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCreateArrayBySeparatingStrings

Creates an array of CFString objects from a single CFString object.

```
CFArrayRef CFStringCreateArrayBySeparatingStrings (
    CFAllocatorRef alloc,
    CFStringRef theString,
    CFStringRef separatorString
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new CFArray object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theString

The string to be divided into substrings. The substrings should be separated by *separatorString*.

separatorString

A string containing the character or characters used to separate the substrings in *theString*.

Return Value

A new array that contains CFString objects that represent substrings of *theString*, or `NULL` if there was a problem creating the object. The order of elements in the array is identical to the order of the substrings in *theString*. If *separatorString* does not occur in *theString*, the result is an array containing *theString*. If *separatorString* is equal to *theString*, then the result is an array containing two empty strings. Ownership follows the Create Rule.

Discussion

This function provides a convenient way to convert units of data captured in a single string to a form (an array) suitable for iterative processing. One or more delimiter characters (or “separator string”) separates the substrings in the source string—these characters are frequently whitespace characters such as tabs and newlines (carriage returns). For example, you might have a file containing a localized list of place names with each name separated by a tab character. You could create a CFString object from this file and call this function on the string to obtain a CFArray object whose elements are these place names.

See also [CFStringCreateByCombiningStrings](#) (page 535).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

iTunesController

MoreIsBetter

MoreSCF

QISA

Declared In

CFString.h

CFStringCreateArrayWithFindResults

Searches a string for multiple occurrences of a substring and creates an array of ranges identifying the locations of these substrings within the target string.

```
CFArrayRef CFStringCreateArrayWithFindResults (
    CFAllocatorRef alloc,
    CFStringRef theString,
    CFStringRef stringToFind,
    CFRange rangeToSearch,
    CFOptionFlags compareOptions
);
```

Parameters

alloc

The allocator to use to allocate memory for the new CFArray object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

theString

The string in which to search for *stringToFind*.

stringToFind

The string to search for in *theString*.

rangeToSearch

The range of characters within *theString* to be searched. The specified range must not exceed the length of the string.

compareOptions

Flags that select different types of comparisons, such as localized comparison, case-insensitive comparison, and non-literal comparison. If you want the default comparison behavior, pass 0. See [“String Comparison Flags”](#) (page 574) for the available flags.

Return Value

An array that contains pointers to `CFRange` structures identifying the character locations of *stringToFind* in *theString*. Returns NULL, if no matching substring is found in the source object, or if there was a problem creating the array. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCreateByCombiningStrings

Creates a single string from the individual CFString objects that comprise the elements of an array.

```
CFStringRef CFStringCreateByCombiningStrings (
    CFAllocatorRef alloc,
    CFArrayRef theArray,
    CFStringRef separatorString
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theArray

An array of CFString objects to concatenate. This value should not be `NULL`.

separatorString

The string to insert between the substrings in the returned string. This value is commonly a whitespace character such as a tab or a newline (carriage return). If this value is not a valid CFString object, an assertion is raised.

Return Value

A string that contains a concatenation of the strings in *theArray* separated by *separatorString*. The order of the substrings in the string is identical to the order of the elements in *theArray*.

If *theArray* is empty, returns an empty CFString object; if *theArray* contains one CFString object, that object is returned (without the separator string). Returns `NULL` if there was a problem in creating the string. Ownership follows the Create Rule.

Discussion

See also [CFStringCreateArrayBySeparatingStrings](#) (page 533).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MyFirstJNIProject

Declared In

CFString.h

CFStringCreateCopy

Creates an immutable copy of a string.

```
CFStringRef CFStringCreateCopy (
    CFAllocatorRef alloc,
    CFStringRef theString
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theString

The string to copy.

Return Value

An immutable string whose contents are identical to *theString*. Returns `NULL` if there was a problem copying the object. Ownership follows the Create Rule.

Discussion

The resulting object has the same Unicode contents as the original object, but it is always immutable. It might also have different storage characteristics, and hence might reply differently to functions such as [CFStringGetCStringPtr](#) (page 558). Also, if the specified allocator and the allocator of the original object are the same, and the string is already immutable, this function may simply increment the retention count without making a true copy. However, the resulting object is a true immutable copy, except the operation was a lot more efficient.

You should use this function in situations where a string is or could be mutable, and you need to take a snapshot of its current value. For example, you might decide to pass a copy of a string to a function that stores its current value in a list for later use.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

HID Calibrator

HID Explorer

NSLMiniBrowser

QTMetaData

Declared In

CFString.h

CFStringCreateExternalRepresentation

Creates an “external representation” of a CFString object, that is, a CFData object.


```

CFDataRef CFStringCreateExternalRepresentation (
    CFAllocatorRef alloc,
    CFStringRef theString,
    CFStringEncoding encoding,
    UInt8 lossByte
);

```

Parameters*alloc*

The allocator to use to allocate memory for the new CFData object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

theString

The string to convert to an external representation.

encoding

The string encoding to use for the external representation.

lossByte

The character value to assign to characters that cannot be converted to the requested encoding. Pass `0` if you want conversion to stop at the first such error; if this happens, the function returns `NULL`.

Return Value

A CFData object that stores the characters of the CFString object as an “external representation.” Returns `NULL` if no loss byte was specified and the function could not convert the characters to the specified encoding. Ownership follows the Create Rule.

Discussion

In the CFData object form, the string can be written to disk as a file or be sent out over a network. If the encoding of the characters in the data object is Unicode, the function may insert a BOM (byte-order marker) to indicate endianness. However, representations created with encoding constants `kCFStringEncodingUTF16BE`, `kCFStringEncodingUTF16LE`, `kCFStringEncodingUTF32BE`, and `kCFStringEncodingUTF32LE` do not include a BOM because the byte order is explicitly indicated by the letters “BE” (big-endian) and “LE” (little-endian).

This function allows the specification of a “loss byte” to represent characters that cannot be converted to the requested encoding.

When you create an external representation from a CFMutableString object, it loses this mutability characteristic when it is converted back to a CFString object.

The [CFStringCreateFromExternalRepresentation](#) (page 537) function complements this function by creating a CFString object from an “external representation” CFData object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringCreateFromExternalRepresentation

Creates a string from its “external representation.”

```

CFStringRef CFStringCreateFromExternalRepresentation (
    CFAllocatorRef alloc,
    CFDataRef data,
    CFStringEncoding encoding
);

```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

data

The `CFData` object containing bytes that hold the characters in the specified encoding.

encoding

The encoding to use when interpreting the bytes in the `data` argument.

Return Value

An immutable string containing the characters from *data*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

In the `CFData` object form, the string can be written to disk as a file or be sent out over a network. If the encoding of the characters in the `data` object is Unicode, the function reads any BOM (byte order marker) and properly resolves endianness.

The [CFStringCreateExternalRepresentation](#) (page 536) function complements this function by creating an “external representation” `CFData` object from a string.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFString.h`

CFStringCreateWithBytes

Creates a string from a buffer containing characters in a specified encoding.

```

CFStringRef CFStringCreateWithBytes (
    CFAllocatorRef alloc,
    const UInt8 *bytes,
    CFIndex numBytes,
    CFStringEncoding encoding,
    Boolean isExternalRepresentation
);

```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

A buffer containing characters in the encoding specified by *encoding*. The buffer must *not* contain a length byte (as in Pascal buffers) or any terminating `NULL` character (as in C buffers).

numBytes

The number of bytes in *bytes*.

encoding

The string encoding of the characters in the buffer.

isExternalRepresentation

`true` if the characters in the byte buffer are in an “external representation” format—that is, whether the buffer contains a BOM (byte order marker). This is usually the case for bytes that are read in from a text file or received over the network. Otherwise, pass `false`.

Return Value

An immutable string, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function handles character data in an “external representation” format by interpreting any BOM (byte order marker) character and performing any necessary byte swapping.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonMDEF

ImageClient

MFSLives

MoreIsBetter

NSLMiniBrowser

Declared In

CFString.h

CFStringCreateWithBytesNoCopy

Creates a string from a buffer, containing characters in a specified encoding, that might serve as the backing store for the new string.

```
CFStringRef CFStringCreateWithBytesNoCopy (
    CFAllocatorRef alloc,
    const UInt8 *bytes,
    CFIndex numBytes,
    CFStringEncoding encoding,
    Boolean isExternalRepresentation,
    CFAllocatorRef contentsDeallocator
);
```

Parameters

alloc

The allocator to use to allocate memory for the new CFString object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

A buffer containing characters in the encoding specified by *encoding*. The buffer must *not* contain a length byte (as in Pascal buffers) or any terminating `NULL` character (as in C buffers).

numBytes

The number of bytes in *bytes*.

encoding

The character encoding of *bytes*.

isExternalRepresentation

`true` if the characters in the byte buffer are in an “external representation” format—that is, whether the buffer contains a BOM (byte order marker). This is usually the case for bytes that are read in from a text file or received over the network. Otherwise, pass `false`.

contentsDeallocator

The allocator to use to deallocate *bytes* when it is no longer needed. You can pass `NULL` or `kCFAllocatorDefault` to request the default allocator for this purpose. If the buffer does not need to be deallocated, or if you want to assume responsibility for deallocating the buffer (and not have the string deallocate it), pass `kCFAllocatorNull`.

Return Value

A new string whose contents are *bytes*. Ownership follows the Create Rule.

Discussion

This function takes an explicit length, and allows you to specify whether the data is an external format—that is, whether to pay attention to the BOM character (if any) and do byte swapping if necessary

Special Considerations

If an error occurs during the creation of the string, then *bytes* is not deallocated. In this case, the caller is responsible for freeing the buffer. This allows the caller to continue trying to create a string with the buffer, without having the buffer deallocated.

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFStringCreateWithBytes](#) (page 538)

[CFStringCreateWithCharactersNoCopy](#) (page 541)

[CFStringCreateWithCStringNoCopy](#) (page 543)

[CFStringCreateWithPascalStringNoCopy](#) (page 547)

Declared In

CFString.h

CFStringCreateWithCharacters

Creates a string from a buffer of Unicode characters.

```
CFStringRef CFStringCreateWithCharacters (
    CFAllocatorRef alloc,
    const UniChar *chars,
    CFIndex numChars
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

chars

The buffer of Unicode characters to copy into the new string.

numChars

The number of characters in the buffer pointed to by *chars*. Only this number of characters will be copied to internal storage.

Return Value

An immutable string containing *chars*, or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an immutable string from a client-supplied Unicode buffer. You must supply a count of the characters in the buffer. This function always copies the characters in the provided buffer into internal storage.

To save memory, this function might choose to store the characters internally in a 8-bit backing store. That is, just because a buffer of `UniChar` characters was used to initialize the object does not mean you will get back a non-NULL result from `CFStringGetCharactersPtr` (page 556).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Custom_HIView_Tutorial

MoreIsBetter

QISA

QTSetMovieAudioDevice

TypeServicesForUnicode

Declared In

CFString.h

CFStringCreateWithCharactersNoCopy

Creates a string from a buffer of Unicode characters that might serve as the backing store for the object.

```
CFStringRef CFStringCreateWithCharactersNoCopy (
    CFAllocatorRef alloc,
    const UniChar *chars,
    CFIndex numChars,
    CFAllocatorRef contentsDeallocator
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

chars

The Unicode buffer that has been allocated and initialized with Unicode characters.

numChars

The number of characters in the buffer pointed to by *chars*. Only this number of characters will be copied to internal storage.

contentsDeallocator

The allocator to use to deallocate the external buffer when it is no longer needed. You can pass `NULL` or `kCFAllocatorDefault` to request the default allocator for this purpose. If the buffer does not need to be deallocated, or if you want to assume responsibility for deallocating the buffer (and not have the string deallocate it), pass `kCFAllocatorNull`.

Return Value

An immutable string containing *chars*, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

Unless the situation warrants otherwise, the returned object does not copy the external buffer to internal storage but instead uses the buffer as its backing store. However, you should never count on the object using the external buffer since it could copy the buffer to internal storage or might even dump the buffer altogether and use alternative means for storing the characters.

The function includes a *contentsDeallocator* parameter with which to specify an allocator to use for deallocating the external buffer when the string is deallocated. If you want to assume responsibility for deallocating this memory, specify `kCFAllocatorNull` for this parameter.

If at creation time `CFString` decides it can't use the buffer, and there is a *contentsDeallocator*, it will use this allocator to free the buffer at that time.

Special Considerations

If an error occurs during the creation of the string, then *chars* is not deallocated. In this case, the caller is responsible for freeing the buffer. This allows the caller to continue trying to create a string with the buffer, without having the buffer deallocated.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFStringCreateWithCharacters](#) (page 540)

[CFStringCreateWithBytesNoCopy](#) (page 539)

[CFStringCreateWithCStringNoCopy](#) (page 543)

[CFStringCreateWithPascalStringNoCopy](#) (page 547)

Declared In

`CFString.h`

CFStringCreateWithCString

Creates an immutable string from a C string.

```
CFStringRef CFStringCreateWithCString (
    CFAllocatorRef alloc,
    const char *cStr,
    CFStringEncoding encoding
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

cStr

The NULL-terminated C string to be used to create the CFString object. The string must use an 8-bit encoding.

encoding

The encoding of the characters in the C string. The encoding must specify an 8-bit encoding.

Return Value

An immutable string containing *cStr* (after stripping off the NULL terminating character), or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

A C string is a string of 8-bit characters terminated with an 8-bit NULL. Unichar and Unichar32 are not considered C strings.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFFTPSSample

DockBrowser

MoreIsBetter

NSLMiniBrowser

Quartz EB

Declared In

CFString.h

CFStringCreateWithCStringNoCopy

Creates a CFString object from an external C string buffer that might serve as the backing store for the object.

```
CFStringRef CFStringCreateWithCStringNoCopy (
    CFAllocatorRef alloc,
    const char *cStr,
    CFStringEncoding encoding,
    CFAllocatorRef contentsDeallocator
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

cStr

The NULL-terminated C string to be used to create the CFString object. The string must use an 8-bit encoding.

encoding

The encoding of the characters in the C string. The encoding must specify an 8-bit encoding.

contentsDeallocator

The CFAllocator object to use to deallocate the external string buffer when it is no longer needed. You can pass NULL or `kCFAllocatorDefault` to request the default allocator for this purpose. If the buffer does not need to be deallocated, or if you want to assume responsibility for deallocating the buffer (and not have the CFString object deallocate it), pass `kCFAllocatorNull`.

Return Value

An immutable string containing *cStr* (after stripping off the NULL terminating character), or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

A C string is a string of 8-bit characters terminated with an 8-bit NULL. Unichar and Unichar32 are not considered C strings.

Unless the situation warrants otherwise, the created object does not copy the external buffer to internal storage but instead uses the buffer as its backing store. However, you should never assume that the object is using the external buffer since the object might copy the buffer to internal storage or even dump the buffer altogether and store the characters in another way.

The function includes a *contentsDeallocator* parameter with which to specify an allocator to use for deallocating the external buffer when the CFString object is deallocated. If you want to assume responsibility for deallocating this memory, specify `kCFAllocatorNull` for this parameter.

If at creation time the CFString object decides it can't use the buffer, and the function specifies a *contentsDeallocator* allocator, it will use this allocator to free the buffer at that time.

Special Considerations

If an error occurs during the creation of the string, then *cStr* is not deallocated. In this case, the caller is responsible for freeing the buffer. This allows the caller to continue trying to create a string with the buffer, without having the buffer deallocated.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFStringCreateWithCString](#) (page 542)

[CFStringCreateWithBytesNoCopy](#) (page 539)

[CFStringCreateWithCharactersNoCopy](#) (page 541)

[CFStringCreateWithPascalStringNoCopy](#) (page 547)

Declared In

CFString.h

CFStringCreateWithFileSystemRepresentation

Creates a CFString from a zero-terminated POSIX file system representation.

```
CFStringRef CFStringCreateWithFileSystemRepresentation (
    CFAllocatorRef alloc,
    const char *buffer
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

buffer

The C string that you want to convert.

Return Value

A string that represents *buffer*. The result is `NULL` if there was a problem in creating the string (possible if the conversion fails due to bytes in the buffer not being a valid sequence of bytes for the appropriate character encoding). Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.4 and later.

Declared In

`CFString.h`

CFStringCreateWithFormat

Creates an immutable string from a formatted string and a variable number of arguments.

```
CFStringRef CFStringCreateWithFormat (
    CFAllocatorRef alloc,
    CFDictionaryRef formatOptions,
    CFStringRef format,
    ...
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatOptions

A `CFDictionary` object containing formatting options for the string (such as the thousand-separator character, which is dependent on locale). Currently, these options are an unimplemented feature.

format

The formatted string with `printf`-style specifiers. For information on supported specifiers, see [String Format Specifiers](#).

...

Variable list of the values to be inserted in *format*.

Return Value

An immutable string, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

[HID Calibrator](#)

[HID Explorer](#)

[HID Utilities Source](#)

[MoreIsBetter](#)

[QISA](#)

Declared In

`CFString.h`

CFStringCreateWithFormatAndArguments

Creates an immutable string from a formatted string and a variable number of arguments (specified in a parameter of type `va_list`).

```
CFStringRef CFStringCreateWithFormatAndArguments (
    CFAllocatorRef alloc,
    CFDictionaryRef formatOptions,
    CFStringRef format,
    va_list arguments
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

formatOptions

A `CFDictionary` object containing formatting options for the string (such as the thousand-separator character, which is dependent on locale). Currently, these options are an unimplemented feature.

format

The formatted string with `printf`-style specifiers. For information on supported specifiers, see [String Format Specifiers](#).

arguments

The variable argument list of values to be inserted into the formatted string contained in *format*.

Return Value

An immutable string, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

The programming interface for variable argument lists (`va_list`, `va_start`, `va_end`, and so forth) is declared in the standard C header file `stdarg.h`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFString.h`

CFStringCreateWithPascalString

Creates an immutable `CFString` object from a Pascal string.

```
CFStringRef CFStringCreateWithPascalString (
    CFAllocatorRef alloc,
    ConstStr255Param pStr,
    CFStringEncoding encoding
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

pStr

The Pascal string to be used to create the string.

encoding

The encoding of the characters in the Pascal string.

Return Value

An immutable string containing *pStr*, or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an immutable CFString objects from the character contents of a Pascal string (after stripping off the initial length byte).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AppearanceSampleUpdated

BasicInputMethod

Carbon Porting Tutorial

JustDraw

MoreIsBetter

Declared In

CFString.h

CFStringCreateWithPascalStringNoCopy

Creates a CFString object from an external Pascal string buffer that might serve as the backing store for the object.

```
CFStringRef CFStringCreateWithPascalStringNoCopy (
    CFAllocatorRef alloc,
    ConstStr255Param pStr,
    CFStringEncoding encoding,
    CFAllocatorRef contentsDeallocator
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

pStr

The Pascal string to be used to create the string.

encoding

The encoding of the characters in the Pascal string.

contentsDeallocator

The CFAllocator object to use to deallocate the external string buffer when it is no longer needed. Pass NULL or `kCFAllocatorDefault` to request the default allocator for this purpose. If the buffer does not need to be deallocated, or if you want to assume responsibility for deallocating the buffer (and not have the string deallocate it), pass `kCFAllocatorNull`.

Return Value

An immutable string containing *pStr*, or NULL if there was a problem creating the object. Ownership follows the Create Rule.

Discussion

This function creates an immutable CFString objects from the character contents of a Pascal string (after stripping off the initial length byte).

Unless the situation warrants otherwise, the created object does not copy the external buffer to internal storage but instead uses the buffer as its backing store. However, you should never assume that the object is using the external buffer since the object might copy the buffer to internal storage or even dump the buffer altogether and store the characters in another way.

The function includes a *contentsDeallocator* parameter with which to specify an allocator to use for deallocating the external buffer when the string is deallocated. If you want to assume responsibility for deallocating this memory, specify `kCFAllocatorNull` for this parameter.

If at creation time the string decides it can't use the buffer, and there is an allocator specified in the *contentsDeallocator* parameter, it will use this allocator to free the buffer at that time.

Special Considerations

If an error occurs during the creation of the string, then *pStr* is not deallocated. In this case, the caller is responsible for freeing the buffer. This allows the caller to continue trying to create a string with the buffer, without having the buffer deallocated.

Availability

Available in Mac OS X v10.0 and later.

See Also

[CFStringCreateWithPascalString](#) (page 546)

[CFStringCreateWithBytesNoCopy](#) (page 539)

[CFStringCreateWithCStringNoCopy](#) (page 543)

[CFStringCreateWithCharactersNoCopy](#) (page 541)

Declared In

CFString.h

CFStringCreateWithSubstring

Creates an immutable string from a segment (substring) of an existing string.

```
CFStringRef CFStringCreateWithSubstring (
    CFAllocatorRef alloc,
    CFStringRef str,
    CFRange range
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

str

The string from which to create the new string.

range

The range of characters in *str* to copy. The specified range must not exceed the length of the string.

Return Value

An immutable string, or `NULL` if there was a problem creating the object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools
 DockBrowser
 MoreIsBetter
 MoreSCF
 TypeServicesForUnicode

Declared In

CFString.h

CFStringFind

Searches for a substring within a string and, if it is found, yields the range of the substring within the object's characters.

```
CFRange CFStringFind (
    CFStringRef theString,
    CFStringRef stringToFind,
    CFOptionFlags compareOptions
);
```

Parameters

theString

The string in which to search for *stringToFind*.

stringToFind

The string to search for in *theString*.

compareOptions

Flags that select different types of comparisons, such as localized comparison, case-insensitive comparison, and non-literal comparison. If you want the default comparison behavior, pass 0. See [“String Comparison Flags”](#) (page 574) for the available flags.

Return Value

The range of the located substring within *theString*. If a match is not located, the returned `CFRange` structure will have a location of `kCFNotFound` (page 765) and a length of 0 (either of which is enough to indicate failure).

Discussion

This function is a convenience when you want to know if the entire range of characters represented by a string contains a particular substring. If you want to search only part of the characters of a string, use the [CFStringFindWithOptions](#) (page 551) function. Both of these functions return upon finding the first occurrence of the substring, so if you want to find out about multiple occurrences, call the [CFStringCreateArrayWithFindResults](#) (page 534) function.

Depending on the comparison-option flags specified, the length of the resulting range might be different than the length of the search string.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools

CIVideoDemoGL

TypeServicesForUnicode

Declared In

CFString.h

CFStringFindCharacterFromSet

Query the range of the first character contained in the specified character set.

```
Boolean CFStringFindCharacterFromSet (
    CFStringRef theString,
    CFCharacterSetRef theSet,
    CFRange rangeToSearch,
    CFOptionFlags searchOptions,
    CFRange *result
);
```

Parameters

theString

The string to search.

theSet

The character set against which the membership of characters is checked.

rangeToSearch

The range of characters within *theString* to search. If the range location or end point (defined by the location plus length minus 1) are outside the index space of the string (0 to $N-1$ inclusive, where N is the length of the string), the behavior is undefined. The specified range must not exceed the length of the string. If the range length is negative, the behavior is undefined. The range may be empty (length 0), in which case no search is performed.

searchOptions

The option flags to control the search behavior. The supported options are [kCFCompareBackwards](#) (page 574) and [kCFCompareAnchored](#) (page 574). If other option flags are specified, the behavior is undefined.

result

On return, a pointer to a CFRange structure (supplied by the caller) in which the search result is stored. Note that the length of this range could be more than 1 (if the character in question is a multi-byte character). If a pointer to an invalid structure is passed, the behavior is undefined.

Return Value

`true` if a character in the character set is found and *result* is filled, `false` otherwise.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFString.h

CFStringFindWithOptions

Searches for a substring within a range of the characters represented by a string and, if the substring is found, returns its range within the object's characters.

```
Boolean CFStringFindWithOptions (
    CFStringRef theString,
    CFStringRef stringToFind,
    CFRange rangeToSearch,
    CFOptionFlags searchOptions,
    CFRange *result
);
```

Parameters*theString*

The string in which to search for *stringToFind*.

stringToFind

The substring to search for in *theString*.

rangeToSearch

A range of the characters to search in *theString*. The specified range must not exceed the length of the string.

searchOptions

The option flags to control the search behavior. The supported options are [kCFCompareBackwards](#) (page 574), [kCFCompareAnchored](#) (page 574), [kCFCompareCaseInsensitive](#) (page 574), [kCFCompareNonLiteral](#) (page 574), and [kCFCompareLocalized](#) (page 575) (available in Mac OS X v10.0 and later). Uses the current user locale (the return value from [CFLocaleCopyCurrent](#) (page 240)) if [kCFCompareLocalized](#) is specified. If other option flags are specified, the behavior is undefined.

result

On return, if the function result is `true`, contains the starting location and length of the found substring. You may pass `NULL` if you only want to know if the substring exists in the larger string.

Return Value

`true` if the substring was found, `false` otherwise.

Discussion

This function allows you to search only part of the characters of a string for a substring. It returns the found range indirectly, in the final *result* parameter. If you want to know if the entire range of characters represented by a string contains a particular substring, you can use the convenience function [CFStringFind](#) (page 549). Both of these functions return upon finding the first occurrence of the substring, so if you want to find out about multiple occurrences, call the [CFStringCreateArrayWithFindResults](#) (page 534) function.

Depending on the comparison-option flags specified, the length of the resulting range might be different than the length of the search string.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser

MoreIsBetter

MoreOSL

MoreSCF

QISA

Declared In

CFString.h

CFStringFindWithOptionsAndLocale

Returns a Boolean value that indicates whether a given string was found in a given source string.

```
Boolean CFStringFindWithOptionsAndLocale (
    CFStringRef theString,
    CFStringRef stringToFind,
    CFRange rangeToSearch,
    CFOptionFlags searchOptions,
    CFLocaleRef locale,
    CFRange *result
);
```

Parameters*theString*The string in which to search for *stringToFind*.*stringToFind*The substring to search for in *theString*.*rangeToSearch*A range of the characters to search in *theString*. The specified range must not exceed the length of the string.*searchOptions*The option flags to control the search behavior. See “[String Comparison Flags](#)” (page 574) for possible values. [kCFCompareNumerically](#) (page 575) is ignored.*locale*The locale to use for the search comparison. NULL specifies the canonical locale (the return value from [CFLocaleGetSystem](#) (page 247)).

The locale argument affects the equality checking algorithm. For example, for the Turkish locale, case-insensitive compare matches “I” to “ı” (Unicode code point U+0131, Latin Small Dotless I), not the normal “i” character.

*result*On return, if the function result is `true` contains the starting location and length of the found substring. You may pass NULL if you only want to know if the *theString* contains *stringToFind*.**Return Value**`true` if the substring was found, `false` otherwise.**Discussion**If *stringToFind* is the empty string (zero length), nothing is found.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFString.h

CFStringGetBytes

Fetches a range of the characters from a string into a byte buffer after converting the characters to a specified encoding.

```
CFIndex CFStringGetBytes (
    CFStringRef theString,
    CFRange range,
    CFStringEncoding encoding,
    UInt8 lossByte,
    Boolean isExternalRepresentation,
    UInt8 *buffer,
    CFIndex maxBufLen,
    CFIndex *usedBufLen
);
```

Parameters

theString

The string upon which to operate.

range

The range of characters in *theString* to process. The specified range must not exceed the length of the string.

encoding

The string encoding of the characters to copy to the byte buffer. 8, 16, and 32-bit encodings are supported.

lossByte

A character (for example, '?') that should be substituted for characters that cannot be converted to the specified encoding. Pass 0 if you do not want lossy conversion to occur.

isExternalRepresentation

`true` if you want the result to be in an “external representation” format, otherwise `false`. In an “external representation” format, the result may contain a byte order marker (BOM) specifying endianness and this function might have to perform byte swapping.

buffer

The byte buffer into which the converted characters are written. The buffer can be allocated on the heap or stack. Pass `NULL` if you do not want conversion to take place but instead want to know if conversion will succeed (the function result is greater than 0) and, if so, how many bytes are required (*usedBufLen*).

maxBufLen

The size of *buffer* and the maximum number of bytes that can be written to it.

usedBufLen

On return, the number of converted bytes actually in *buffer*. You may pass `NULL` if you are not interested in this information.

Return Value

The number of characters converted.

Discussion

This function is the basic encoding-conversion function for CFString objects. As with the other functions that get the character contents of CFString objects, it allows conversion to a supported 8-bit encoding. Unlike most of those other functions, it also allows “lossy conversion.” The function permits the specification of a “loss byte” in a parameter; if a character cannot be converted this character is substituted and conversion proceeds. (With the other functions, conversion stops at the first error and the operation fails.)

Because this function takes a range and returns the number of characters converted, it can be called repeatedly with a small fixed size buffer and different ranges of the string to do the conversion incrementally.

This function also handles any necessary manipulation of character data in an “external representation” format. This format makes the data portable and persistent (disk-writable); in Unicode it often includes a BOM (byte order marker) that specifies the endianness of the data.

The [CFStringCreateExternalRepresentation](#) (page 536) function also handles external representations and performs lossy conversions. The complementary function [CFStringCreateWithBytes](#) (page 538) creates a string from the characters in a byte buffer.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

bulkerase

databurntest

MoreIsBetter

QISA

Declared In

CFString.h

CFStringGetCharacterAtIndex

Returns the Unicode character at a specified location in a string.

```
UniChar CFStringGetCharacterAtIndex (
    CFStringRef theString,
    CFIndex idx
);
```

Parameters

theString

The string from which the Unicode character is obtained.

idx

The position of the Unicode character in the CFString.

Return Value

A Unicode character.

Discussion

This function is typically called in a loop to fetch the Unicode characters of a string in sequence or to fetch a character at a known position (first or last, for example). Using it in a loop can be inefficient, especially with longer strings, so consider the [CFStringGetCharacters](#) (page 556) function or the in-line buffer functions ([CFStringInitInlineBuffer](#) (page 571) and [CFStringGetCharacterFromInlineBuffer](#) (page 555)) as alternatives.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AuthForAll

MFSLives

MoreSCF

Declared In

CFString.h

CFStringGetCharacterFromInlineBuffer

Returns the Unicode character at a specific location in an in-line buffer.

```
UniChar CFStringGetCharacterFromInlineBuffer (
    CFStringInlineBuffer *buf,
    CFIndex idx
);
```

Parameters

buf

The initialized [CFStringInlineBuffer](#) (page 573) structure in which the characters are stored. You should initialize the structure with the [CFStringInitInlineBuffer](#) (page 571) function.

idx

The location of a character in the in-line buffer *buf*. This index is relative to the range specified when *buf* was created.

Return Value

A Unicode character, or 0 if a location outside the original range is specified.

Discussion

This function accesses one of the characters of a string written to an in-line buffer. It is typically called from within a loop to access each character in the buffer in sequence. You should initialize the buffer with the [CFStringInitInlineBuffer](#) (page 571) function. The in-line buffer functions, along with the [CFStringInlineBuffer](#) (page 573) structure, give you fast access to the characters of a CFString object. The technique for in-line buffer access combines the convenience of one-at-a-time character access with the efficiency of bulk access.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetCharacters

Copies a range of the Unicode characters from a string to a user-provided buffer.

```
void CFStringGetCharacters (
    CFStringRef theString,
    CFRange range,
    UniChar *buffer
);
```

Parameters

theString

The string from which the characters are to be obtained.

range

The range of characters to copy. The specified range must not exceed the length of the string.

buffer

The `UniChar` buffer of length `range.length` that you have allocated on the stack or heap. On return, the buffer contains the requested Unicode characters.

Discussion

Use this function to obtain some or all of the Unicode characters represented by a `CFString` object. If this operation involves a large number of characters, the function call can be expensive in terms of memory. Instead you might want to consider using the in-line buffer functions [CFStringInitInlineBuffer](#) (page 571) and [CFStringGetCharacterFromInlineBuffer](#) (page 555) to extract the characters incrementally.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonQuartzDrawingWPrinting

Custom_HIView_Tutorial

HITextViewDemo

MoreIsBetter

QISA

Declared In

`CFString.h`

CFStringGetCharactersPtr

Quickly obtains a pointer to the contents of a string as a buffer of Unicode characters.

```
const UniChar * CFStringGetCharactersPtr (
    CFStringRef theString
);
```

Parameters

theString

The string whose contents you wish to access.

Return Value

A pointer to a buffer of Unicode character, or `NULL` if the internal storage of *theString* does not allow this to be returned efficiently.

Discussion

This function either returns the requested pointer immediately, with no memory allocations and no copying, or it returns `NULL`. If the latter is the result, call an alternative function such as [CFStringGetCharacters](#) (page 556) function to extract the characters.

Whether or not this function returns a valid pointer or `NULL` depends on many factors, all of which depend on how the string was created and its properties. In addition, the function result might change between different releases and on different platforms. So do not count on receiving a non-`NULL` result from this function under any circumstances (except when the object is created with [CFStringCreateMutableWithExternalCharactersNoCopy](#) (page 341)).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

TypeServicesForUnicode

Declared In

CFString.h

CFStringGetCString

Copies the character contents of a string to a local C string buffer after converting the characters to a given encoding.

```
Boolean CFStringGetCString (
    CFStringRef theString,
    char *buffer,
    CFIndex bufferSize,
    CFStringEncoding encoding
);
```

Parameters

theString

The string whose contents you wish to access.

buffer

The C string buffer into which to copy the string. The buffer must be at least *bufferSize* bytes in length. On return, the buffer contains the converted characters. If there is an error in conversion, the buffer contains only partial results.

bufferSize

The length of the local *buffer* in bytes (accounting for the NULL-terminator byte).

encoding

The string encoding to which the character contents of *theString* should be converted. The encoding must specify an 8-bit encoding.

Return Value

`true` upon success or `false` if the conversion fails or the provided buffer is too small.

Discussion

This function is useful when you need your own copy of a string's character data as a C string. You also typically call it as a "backup" when a prior call to the [CFStringGetCStringPtr](#) (page 558) function fails.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFHostSample

HID Calibrator

HID Config Save

HID Explorer

MoreIsBetter

Declared In

CFString.h

CFStringGetCStringPtr

Quickly obtains a pointer to a C-string buffer containing the characters of a string in a given encoding.

```
const char * CFStringGetCStringPtr (
    CFStringRef theString,
    CFStringEncoding encoding
);
```

Parameters

theString

The string whose contents you wish to access.

encoding

The string encoding to which the character contents of *theString* should be converted. The encoding must specify an 8-bit encoding.

Return Value

A pointer to a C string or NULL if the internal storage of *theString* does not allow this to be returned efficiently.

Discussion

This function either returns the requested pointer immediately, with no memory allocations and no copying, in constant time, or returns NULL. If the latter is the result, call an alternative function such as the [CFStringGetCString](#) (page 557) function to extract the characters.

Whether or not this function returns a valid pointer or NULL depends on many factors, all of which depend on how the string was created and its properties. In addition, the function result might change between different releases and on different platforms. So do not count on receiving a non-NULL result from this function under any circumstances.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

ColorMatching

ColorSyncDevices

ColorSyncDevices-Cocoa

InkSample

NSLMiniBrowser

Declared In

CFString.h

CFStringGetDoubleValue

Returns the primary `double` value represented by a string.

```
double CFStringGetDoubleValue (
    CFStringRef str
);
```

Parameters*str*

A string that represents a double value. The only allowed characters are the ASCII digit characters (ASCII 0x30 - 0x39), the plus sign (ASCII 0x2B), the minus sign (ASCII 0x2D), and the period character (ASCII 0x2E).

Return Value

The `double` value represented by *str*, or 0.0 if there is a scanning error (if the string contains disallowed characters or does not represent a double value).

Discussion

Consider the following example:

```
double val = CFStringGetDoubleValue(CFSTR("0.123"));
```

The variable `val` in this example would contain the value 0.123 after the function is called.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetFastestEncoding

Returns for a CFString object the character encoding that requires the least conversion time.

```
CFStringEncoding CFStringGetFastestEncoding (
    CFStringRef theString
);
```

Parameters*theString*

The string for which to determine the fastest encoding.

Return Value

The string encoding to which *theString* can be converted the fastest.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetFileSystemRepresentation

Extracts the contents of a string as a NULL-terminated 8-bit string appropriate for passing to POSIX APIs.

```
Boolean CFStringGetFileSystemRepresentation (
    CFStringRef string,
    char *buffer,
    CFIndex maxBufLen
);
```

Parameters

string

The string to convert.

buffer

The C string buffer into which to copy the string. The buffer must be at least *maxBufLen* bytes in length. On return, the buffer contains the converted characters.

maxBufLen

The maximum length of the buffer.

Return Value

true if the string is correctly converted; false if the conversion fails, or the results don't fit into the buffer.

Discussion

You can use [CFStringGetMaximumSizeOfFileSystemRepresentation](#) (page 563) if you want to make sure the buffer is of sufficient length.

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFString.h

CFStringGetIntValue

Returns the integer value represented by a string.

```
SInt32 CFStringGetIntValue (
    CFStringRef str
);
```

Parameters

str

A string that represents a signed integer value. The only allowed characters are the ASCII digit characters (ASCII 0x30 - 0x39), the plus sign (ASCII 0x2B), the minus sign (ASCII 0x2D), and the period character (ASCII 0x2E).

Return Value

The signed integer value represented by *str*. The result is 0 if there is a scanning error (if the string contains disallowed characters or does not represent an integer value) or INT_MAX or INT_MIN if there is an overflow error.

Discussion

Consider the following example:

```
SInt32 val = CFStringGetIntValue(CFSTR("-123"));
```


The variable `val` in this example would contain the value `-123` after the function is called.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetLength

Returns the number (in terms of UTF-16 code pairs) of Unicode characters in a string.

```
CFIndex CFStringGetLength (
    CFStringRef theString
);
```

Parameters

theString

The string to examine.

Return Value

The number (in terms of UTF-16 code pairs) of characters stored in *theString*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Custom_HIView_Tutorial

MoreIsBetter

MoreSCF

QISA

TypeServicesForUnicode

Declared In

CFString.h

CFStringGetLineBounds

Given a range of characters in a string, obtains the line bounds—that is, the indexes of the first character and the final characters of the lines containing the range.

```
void CFStringGetLineBounds (
    CFStringRef theString,
    CFRange range,
    CFIndex *lineBeginIndex,
    CFIndex *lineEndIndex,
    CFIndex *contentsEndIndex
);
```

Parameters

theString

The string containing the specified range of characters.

range

The range of characters to consider. The specified range must not exceed the length of the string.

lineBeginIndex

On return, the index of the first character of the containing line. Pass `NULL` if you do not want this result.

lineEndIndex

On return, the index of the first character of the line after the specified range. Pass `NULL` if you do not want this result.

contentsEndIndex

On return, the index of the last character of the containing line, excluding any line-separator characters. Pass `NULL` if you are not interested in this result.

Discussion

This function is a convenience function for determining the beginning and ending indexes of one or more lines in the given range of a string. It is useful, for example, when each line represents a “record” of some sort; you might search for some substring, but want to extract the record of which the substring is a part.

To determine line separation, the function looks for the standard line-separator characters: carriage returns (CR and CRLF), linefeeds (LF), and Unicode line and paragraph separators. The three final parameters of the function indirectly return, in order, the index of the first character that starts the line, the index of the first character of the next line (including end-of-line characters), and the index of the last character of the line (excluding end-of-line characters). Pass `NULL` for any of these parameters if you aren't interested in the result.

To determine the number of characters in the line:

- Subtract *lineBeginIndex* from *lineEndIndex* to find the number of characters in the line, including the line separators.
- Subtract *lineBeginIndex* from *contentsEndIndex* to find the number of characters in the line, excluding the line separators.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetListOfAvailableEncodings

Returns a pointer to a list of string encodings supported by the current system.

```
const CFStringEncoding * CFStringGetListOfAvailableEncodings (
    void
);
```

Return Value

A pointer to a `kCFStringEncodingInvalidId` (page 578)-terminated list of enum constants, each of type `CFStringEncoding` (page 572).

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Quartz Composer WWDC 2005 TextEdit
TextEditPlus

Declared In

CFString.h

CFStringGetMaximumSizeForEncoding

Returns the maximum number of bytes a string of a specified length (in Unicode characters) will take up if encoded in a specified encoding.

```
CFIndex CFStringGetMaximumSizeForEncoding (
    CFIndex length,
    CFStringEncoding encoding
);
```

Parameters

length

The number of Unicode characters to evaluate.

encoding

The string encoding for the number of characters specified by *length*.

Return Value

The maximum number of bytes that could be required to represent *length* number of Unicode characters with the string encoding *encoding*. The number of bytes that the encoding actually ends up requiring when converting any particular string could be less than this, but never more.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFHostSample
IOPrintSuperClasses
MoreIsBetter
simpleJavaLauncher

Declared In

CFString.h

CFStringGetMaximumSizeOfFileSystemRepresentation

Determines the upper bound on the number of bytes required to hold the file system representation of the string.

```
CFIndex CFStringGetMaximumSizeOfFileSystemRepresentation (
    CFStringRef string
);
```

Parameters

string

The string to convert.

Return Value

The upper bound on the number of bytes required to hold the file system representation of the string.

Discussion

The result is returned quickly as a rough approximation, and could be much larger than the actual space required. The result includes space for the zero termination. If you are allocating a buffer for long-term storage, you should reallocate it to be the right size after calling `CFStringGetFileSystemRepresentation` (page 560).

Availability

Available in Mac OS X v10.4 and later.

Declared In

CFString.h

CFStringGetMostCompatibleMacStringEncoding

Returns the most compatible Mac OS script value for the given input encoding.

```
CFStringEncoding CFStringGetMostCompatibleMacStringEncoding (
    CFStringEncoding encoding
);
```

Parameters

encoding

The encoding for which you wish to find a compatible Mac OS script value.

Return Value

The most compatible Mac OS script value for *encoding*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

Quartz Composer WWDC 2005 TextEdit
TextEditPlus

Declared In

CFString.h

CFStringGetNameOfEncoding

Returns the canonical name of a specified string encoding.

```
CFStringRef CFStringGetNameOfEncoding (
    CFStringEncoding encoding
);
```

Parameters

encoding

The string encoding to use.

Return Value

Name of *encoding*; non-localized. Ownership follows the Get Rule.

Discussion

This function returns the “canonical” name of the string encoding because the return value has to be the same no matter what localization is chosen. In other words, it can't change based on the International Preferences language panel setting. The canonical name is usually expressed in English.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetParagraphBounds

Given a range of characters in a string, obtains the paragraph bounds—that is, the indexes of the first character and the final characters of the paragraph(s) containing the range.

```
void CFStringGetParagraphBounds (
    CFStringRef string,
    CFRange range,
    CFIndex *parBeginIndex,
    CFIndex *parEndIndex,
    CFIndex *contentsEndIndex
);
```

Parameters

theString

The string containing the specified range of characters.

range

The range of characters to consider. The specified range must not exceed the length of the string.

parBeginIndex

On return, the index of the first character of the containing paragraph. Pass `NULL` if you do not want this result.

parEndIndex

On return, the index of the first character of the paragraph after the specified range. Pass `NULL` if you do not want this result.

contentsEndIndex

On return, the index of the last character of the containing paragraph, excluding any paragraph-separator characters. Pass `NULL` if you are not interested in this result.

Discussion

This function is the same as [CFStringGetLineBounds](#) (page 561)(), however it only looks for paragraphs (that is, it does not stop at Unicode `NextLine` or `LineSeparator` characters).

This function is a convenience function for determining the beginning and ending indexes of one or more paragraphs in the given range of a string. It is useful, for example, when each line represents a “record” of some sort; you might search for some substring, but want to extract the record of which the substring is a part.

To determine line separation, the function looks for the standard paragraph-separator characters: carriage returns (CR and CRLF), linefeeds (LF), and Unicode paragraph separators. The three final parameters of the function indirectly return, in order, the index of the first character that starts the line, the index of the first character of the next line (including end-of-line characters), and the index of the last character of the line (excluding end-of-line characters). Pass `NULL` for any of these parameters if you aren't interested in the result.

To determine the number of characters in the paragraph:

- Subtract *parBeginIndex* from *parEndIndex* to find the number of characters in the paragraph, including the paragraph separators.
- Subtract *parBeginIndex* from *contentsEndIndex* to find the number of characters in the paragraph, excluding the paragraph separators.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFString.h

CFStringGetPascalString

Copies the character contents of a CFString object to a local Pascal string buffer after converting the characters to a requested encoding.

```
Boolean CFStringGetPascalString (
    CFStringRef theString,
    StringPtr buffer,
    CFIndex bufferSize,
    CFStringEncoding encoding
);
```

Parameters

theString

The string to examine.

buffer

The Pascal string buffer into which to copy the *theString*. The buffer must be at least *bufferSize* bytes in length. On return, contains the converted characters. If there is an error in conversion, the buffer contains only partial results.

bufferSize

The length of the local *buffer* in bytes (accounting for the length byte).

encoding

The string encoding to which the character contents of *theString* should be converted.

Return Value

`true` if the operation succeeds or `false` if the conversion fails or the provided buffer is too small.

Discussion

This function is useful when you need your own copy of a CFString object's character data as a Pascal string. You can also call it as a “backup” operation when a prior call to the [CFStringGetPascalStringPtr](#) (page 567) function fails.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

GrabBag

MoreIsBetter

QISA

UIKitTimeCode

Declared In

CFString.h

CFStringGetPascalStringPtr

Quickly obtains a pointer to a Pascal buffer containing the characters of a string in a given encoding.

```
ConstStringPtr CFStringGetPascalStringPtr (
    CFStringRef theString,
    CFStringEncoding encoding
);
```

Parameters*theString*

The string to examine.

encoding

The string encoding to which the character contents of *theString* should be converted.

Return Value

A pointer to a Pascal string buffer or NULL if the internal storage of *theString* does not allow this to be returned efficiently.

Discussion

This function either returns the requested pointer immediately, with no memory allocations and no copying, in constant time, or returns NULL. If the latter is returned, call an alternative function such as the [CFStringGetPascalString](#) (page 566) function to extract the characters.

Whether or not this function returns a valid pointer or NULL depends on many factors, all of which depend on how the string was created and its properties. In addition, the function result might change between different releases and on different platforms. So do not count on receiving a non-NULL result from this function under any circumstances.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

GrabBag

Declared In

CFString.h

CFStringGetRangeOfComposedCharactersAtIndex

Returns the range of the composed character sequence at a specified index.

```

CFRange CFStringGetRangeOfComposedCharactersAtIndex (
    CFStringRef theString,
    CFIndex theIndex
);

```

Parameters*theString*

The string to examine.

theIndex

The index of the character contained in the composed character sequence. If the index is outside the range of the string (0 to N-1 inclusive, where N is the length of the string), the behavior is undefined.

Return Value

The range of the composed character sequence.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFString.h

CFStringGetSmallestEncoding

Returns the smallest encoding on the current system for the character contents of a string.

```

CFStringEncoding CFStringGetSmallestEncoding (
    CFStringRef theString
);

```

Parameters*theString*

The string for which to find the smallest encoding.

Return ValueThe string encoding that has the smallest representation of *theString*.**Discussion**

This function returns the supported encoding that requires the least space (in terms of bytes needed to represent one character) to represent the character contents of a string. This information is not always immediately available, so this function might need to compute it.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringGetSystemEncoding

Returns the default encoding used by the operating system when it creates strings.


```
CFStringEncoding CFStringGetSystemEncoding (
    void
);
```

Return Value

The default string encoding.

Discussion

This function returns the default text encoding used by the OS when it creates strings. In Mac OS X, this encoding is determined by the user's preferred language setting. The preferred language is the first language listed in the International pane of the System Preferences.

In most situations you will not want to use this function, however, because your primary interest will be your application's default text encoding. The application encoding is required when you create a `CFStringRef` from strings stored in Resource Manager resources, which typically use one of the Mac encodings such as `MacRoman` or `MacJapanese`.

To get your application's default text encoding, call the `GetApplicationTextEncoding Carbon` function.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

GLCarbon1ContextPbuffer

GLCarbonSharedPbuffer

HID Utilities Source

NSLMiniBrowser

QISA

Declared In

`CFString.h`

CFStringGetTypeID

Returns the type identifier for the `CFString` opaque type.

```
CTypeID CFStringGetTypeID (
    void
);
```

Return Value

The type identifier for the `CFString` opaque type.

Discussion

`CFMutableString` objects have the same type identifier as `CFString` objects.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DRDataBurnCarbonUI

DREraseCarbonUI

MoreIsBetter

MoreSCF

QISA

Declared In

CFString.h

CFStringHasPrefix

Determines if the character data of a string begin with a specified sequence of characters.

```
Boolean CFStringHasPrefix (
    CFStringRef theString,
    CFStringRef prefix
);
```

Parameters*theString*

The string to search.

prefix

The prefix to search for.

Return Value

true if *theString* begins with *prefix*, false if otherwise.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AppleScriptRunner

HID Calibrator

MoreIsBetter

MoreSCF

QISA

Declared In

CFString.h

CFStringHasSuffix

Determines if a string ends with a specified sequence of characters.

```
Boolean CFStringHasSuffix (
    CFStringRef theString,
    CFStringRef suffix
);
```

Parameters*theString*

The string to be evaluated.

suffix

The suffix to search for.

Return Value

true if *theString* ends with *suffix*, false otherwise.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Calibrator
 HID Config Save
 HID Explorer
 MoreIsBetter
 QISA

Declared In

CFString.h

CFStringInitInlineBuffer

Initializes an in-line buffer to use for efficient access of a CFString object's characters.

```
void CFStringInitInlineBuffer (
    CFStringRef str,
    CFStringInlineBuffer *buf,
    CFRange range
);
```

Parameters

str

The string to copy to the in-line buffer.

buf

The (uninitialized) [CFStringInlineBuffer](#) (page 573) structure to initialize. On return, an initialized structure that can be used in a [CFStringGetCharacterFromInlineBuffer](#) (page 555) function call. Typically this buffer is allocated on the stack.

range

The range of characters in *str* to copy to *buf*. The specified range must not exceed the length of the string.

Discussion

This function initializes an [CFStringInlineBuffer](#) (page 573) structure that can be used for accessing the characters of a string. Once the buffer is initialized you can call the [CFStringGetCharacterFromInlineBuffer](#) (page 555) function to access the characters in the buffer one at a time. The in-line buffer functions, along with the [CFStringInlineBuffer](#) (page 573) structure, give you fast access to the characters of a string. The technique for in-line buffer access combines the convenience of one-at-a-time character access with the efficiency of bulk access.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringIsEncodingAvailable

Determines whether a given Core Foundation string encoding is available on the current system.

```
Boolean CFStringIsEncodingAvailable (
    CFStringEncoding encoding
);
```

Parameters*encoding*

The Core Foundation string encoding to test.

Return Value

true if the encoding is available, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

Data Types

CFStringCompareFlags

A [CFOptionFlags](#) (page 763) type for specifying options for string comparison .

```
typedef CFOptionFlags CFStringCompareFlags;
```

Discussion

See [“String Comparison Flags”](#) (page 574) for values.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringEncoding

An integer type for constants used to specify supported string encodings in various CFString functions.

```
typedef UInt32 CFStringEncoding;
```

Discussion

This type is used to define the constants for the built-in encodings (see [“Built-in String Encodings”](#) (page 575) for a list) and for platform-dependent encodings (see [“External String Encodings”](#) (page 578)). If CFString does not recognize or support the string encoding of a particular string, CFString functions will identify the string’s encoding as [kCFStringEncodingInvalidId](#) (page 578).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFString.h

CFStringEncoding

Index type for constants used to specify external string encodings.

```
typedef CFIndex CFStringEncoding;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStringEncodingExt.h

CFStringInlineBuffer

Defines the buffer and related fields used for in-line buffer access of characters in CFString objects.

```
struct CFStringInlineBuffer {
    UniChar buffer[64];
    CFStringRef theString;
    const UniChar *directBuffer;
    CFRange rangeToBuffer;
    CFIndex bufferedRangeStart;
    CFIndex bufferedRangeEnd;
};
```

Discussion

This structure is used for in-line buffer access of characters contained by a CFString object. Use the [CFStringInitInlineBuffer](#) (page 571) function for initializing the fields of this structure; do not do it manually. Once the buffer is initialized, use the [CFStringGetCharacterFromInlineBuffer](#) (page 555) function to access characters from the buffer. Do not access the fields directly as they might change between releases.

The only reason this structure is not opaque is to allow the in-line functions to access its fields.

Declared In

CFString.h

CFStringRef

A reference to a CFString object.

```
typedef const struct __CFString *CFStringRef;
```

Discussion

The `CFStringRef` type refers to a CFString object, which “encapsulates” a Unicode string along with its length. CFString is an opaque type that defines the characteristics and behavior of CFString objects.

Values of type `CFStringRef` may refer to immutable or mutable strings, as `CFMutableString` objects respond to all functions intended for immutable CFString objects. Functions which accept `CFStringRef` values, and which need to hold on to the values immutably, should call [CFStringCreateCopy](#) (page 535) (instead of [CFRetain](#) (page 639)) to do so.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Constants

String Comparison Flags

Flags that specify how string comparisons are performed.

```
enum CFStringCompareFlags {
    kCFCompareCaseInsensitive = 1,
    kCFCompareBackwards = 4,
    kCFCompareAnchored = 8,
    kCFCompareNonliteral = 16,
    kCFCompareLocalized = 32,
    kCFCompareNumerically = 64,
    kCFCompareDiacriticInsensitive = 128,
    kCFCompareWidthInsensitive = 256,
    kCFCompareForcedOrdering = 512
};
```

Constants**kCFCompareCaseInsensitive**

Specifies that the comparison should ignore differences in case between alphabetical characters.

Available in Mac OS X v10.0 and later.

Declared in CFString.h.

kCFCompareBackwards

Specifies that the comparison should start at the last elements of the entities being compared (for example, strings or arrays).

Available in Mac OS X v10.0 and later.

Declared in CFString.h.

kCFCompareAnchored

Performs searching only on characters at the beginning or end of the range.

No match at the beginning or end means nothing is found, even if a matching sequence of characters occurs elsewhere in the string.

Available in Mac OS X v10.0 and later.

Declared in CFString.h.

kCFCompareNonliteral

Specifies that loose equivalence is acceptable, especially as pertains to diacritical marks.

For example, “ö” represented as two distinct characters (“o” and “umlaut”) is equivalent to “ö” represented by a single character (“o-umlaut”). Note that this is not the same as diacritic insensitivity.

Available in Mac OS X v10.0 and later.

Declared in CFString.h.

`kCFCompareLocalized`

Specifies that the comparison should take into account differences related to locale, such as the thousands separator character.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFCompareNumerically`

Specifies that represented numeric values should be used as the basis for comparison and not the actual character values.

For example, “version 2” is less than “version 2.5”.

This comparison does not work if `kCFCompareLocalized` is specified on systems before Mac OS X v10.3.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFCompareDiacriticInsensitive`

Specifies that the comparison should ignore diacritic markers.

For example, “ö” (“o-umlaut”) is equivalent to “o”.

Diacritic markers are designated as all non-spacing marks below U+0510.

Available in Mac OS X v10.5 and later.

Declared in `CFString.h`.

`kCFCompareWidthInsensitive`

Specifies that the comparison should ignore width differences.

For example, “a” is equivalent to UFF41.

Available in Mac OS X v10.5 and later.

Declared in `CFString.h`.

`kCFCompareForcedOrdering`

Specifies that the comparison is forced to return either `kCFCompareLessThan` or `kCFCompareGreaterThan` if the strings are equivalent but not strictly equal.

You use this option for stability when sorting (for example, with `kCFCompareCaseInsensitive` specified “aaa” is greater than “AAA”).

Available in Mac OS X v10.5 and later.

Declared in `CFString.h`.

Discussion

These constants are flags intended for use in the comparison-option parameters in comparison functions such as `CFStringCompare` (page 527). If you want to request multiple options, combine them with a bitwise-OR operation.

Declared In

`CFString.h`

Built-in String Encodings

Encodings that are built-in on all platforms on which Mac OS X runs.

```
enum CFStringBuiltInEncodings {
    kCFStringEncodingMacRoman = 0,
    kCFStringEncodingWindowsLatin1 = 0x0500,
    kCFStringEncodingISOLatin1 = 0x0201,
    kCFStringEncodingNextStepLatin = 0x0B01,
    kCFStringEncodingASCII = 0x0600,
    kCFStringEncodingUnicode = 0x0100,
    kCFStringEncodingUTF8 = 0x08000100,
    kCFStringEncodingNonLossyASCII = 0x0BFF,

    kCFStringEncodingUTF16 = 0x0100,
    kCFStringEncodingUTF16BE = 0x10000100,
    kCFStringEncodingUTF16LE = 0x14000100,
    kCFStringEncodingUTF32 = 0x0c000100,
    kCFStringEncodingUTF32BE = 0x18000100,
    kCFStringEncodingUTF32LE = 0x1c000100
};
typedef enum CFStringBuiltInEncodings CFStringBuiltInEncodings;
```

Constants

`kCFStringEncodingMacRoman`

An encoding constant that identifies the Mac Roman encoding.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingWindowsLatin1`

An encoding constant that identifies the Windows Latin 1 encoding (ANSI codepage 1252).

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingISOLatin1`

An encoding constant that identifies the ISO Latin 1 encoding (ISO 8859-1)

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingNextStepLatin`

An encoding constant that identifies the NextStep/OpenStep encoding.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingASCII`

An encoding constant that identifies the ASCII encoding (decimal values 0 through 127).

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingUnicode`

An encoding constant that identifies the Unicode encoding.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF8`

An encoding constant that identifies the UTF 8 encoding.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingNonLossyASCII`

An encoding constant that identifies non-lossy ASCII encoding.

Available in Mac OS X v10.0 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF16`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF16Format` encoding (alias of `kCFStringEncodingUnicode`).

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF16BE`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF16BEFormat` encoding. This constant specifies big-endian byte order.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF16LE`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF16LEFormat` encoding. This constant specifies little-endian byte order.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF32`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF32Format` encoding.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF32BE`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF32BEFormat` encoding. This constant specifies big-endian byte order.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

`kCFStringEncodingUTF32LE`

An encoding constant that identifies `kTextEncodingUnicodeDefault + kUnicodeUTF32LEFormat` encoding. This constant specifies little-endian byte order.

Available in Mac OS X v10.4 and later.

Declared in `CFString.h`.

Declared In

`CFString.h`

Invalid String Encoding Flag

Special value returned from functions to indicate a string encoding that is not supported or recognized by `CFString`.

```
#define kCFStringEncodingInvalidId (0xffffffffU)
```

Constants

`kCFStringEncodingInvalidId`

Used as a function result to identify an encoding that is not supported or recognized by CFString.

Available in Mac OS X v10.2 and later.

Declared in `CFString.h`.

Declared In

`CFString.h`

External String Encodings

`CFStringEncoding` constants for encodings that may be supported by CFString.

```

enum {
    kCFStringEncodingMacRoman = 0L,
    kCFStringEncodingMacJapanese = 1,
    kCFStringEncodingMacChineseTrad = 2,
    kCFStringEncodingMacKorean = 3,
    kCFStringEncodingMacArabic = 4,
    kCFStringEncodingMacHebrew = 5,
    kCFStringEncodingMacGreek = 6,
    kCFStringEncodingMacCyrillic = 7,
    kCFStringEncodingMacDevanagari = 9,
    kCFStringEncodingMacGurmukhi = 10,
    kCFStringEncodingMacGujarati = 11,
    kCFStringEncodingMacOriya = 12,
    kCFStringEncodingMacBengali = 13,
    kCFStringEncodingMacTamil = 14,
    kCFStringEncodingMacTelugu = 15,
    kCFStringEncodingMacKannada = 16,
    kCFStringEncodingMacMalayalam = 17,
    kCFStringEncodingMacSinhalese = 18,
    kCFStringEncodingMacBurmese = 19,
    kCFStringEncodingMacKhmer = 20,
    kCFStringEncodingMacThai = 21,
    kCFStringEncodingMacLaotian = 22,
    kCFStringEncodingMacGeorgian = 23,
    kCFStringEncodingMacArmenian = 24,
    kCFStringEncodingMacChineseSimp = 25,
    kCFStringEncodingMacTibetan = 26,
    kCFStringEncodingMacMongolian = 27,
    kCFStringEncodingMacEthiopic = 28,
    kCFStringEncodingMacCentralEurRoman = 29,
    kCFStringEncodingMacVietnamese = 30,
    kCFStringEncodingMacExtArabic = 31,
    kCFStringEncodingMacSymbol = 33,
    kCFStringEncodingMacDingbats = 34,
    kCFStringEncodingMacTurkish = 35,
    kCFStringEncodingMacCroatian = 36,
    kCFStringEncodingMacIcelandic = 37,
    kCFStringEncodingMacRomanian = 38,
    kCFStringEncodingMacCeltic = 39,
    kCFStringEncodingMacGaelic = 40,
    kCFStringEncodingMacFarsi = 0x8C,
    kCFStringEncodingMacUkrainian = 0x98,
    kCFStringEncodingMacInuit = 0xEC,
    kCFStringEncodingMacVT100 = 0xFC,
    kCFStringEncodingMacHFS = 0xFF,
    kCFStringEncodingISOLatin1 = 0x0201,
    kCFStringEncodingISOLatin2 = 0x0202,
    kCFStringEncodingISOLatin3 = 0x0203,
    kCFStringEncodingISOLatin4 = 0x0204,
    kCFStringEncodingISOLatinCyrillic = 0x0205,
    kCFStringEncodingISOLatinArabic = 0x0206,
    kCFStringEncodingISOLatinGreek = 0x0207,
    kCFStringEncodingISOLatinHebrew = 0x0208,
    kCFStringEncodingISOLatin5 = 0x0209,
    kCFStringEncodingISOLatin6 = 0x020A,
    kCFStringEncodingISOLatinThai = 0x020B,
    kCFStringEncodingISOLatin7 = 0x020D,
    kCFStringEncodingISOLatin8 = 0x020E,

```

```

kCFStringEncodingISOLatin9 = 0x020F,
kCFStringEncodingISOLatin10 = 0x0210,
kCFStringEncodingDOSLatinUS = 0x0400,
kCFStringEncodingDOSGreek = 0x0405,
kCFStringEncodingDOSBalticRim = 0x0406,
kCFStringEncodingDOSLatin1 = 0x0410,
kCFStringEncodingDOSGreek1 = 0x0411,
kCFStringEncodingDOSLatin2 = 0x0412,
kCFStringEncodingDOSCyrillic = 0x0413,
kCFStringEncodingDOSTurkish = 0x0414,
kCFStringEncodingDOSPortuguese = 0x0415,
kCFStringEncodingDOSIcelandic = 0x0416,
kCFStringEncodingDOSHebrew = 0x0417,
kCFStringEncodingDOSCanadianFrench = 0x0418,
kCFStringEncodingDOSArabic = 0x0419,
kCFStringEncodingDOSNordic = 0x041A,
kCFStringEncodingDOSRussian = 0x041B,
kCFStringEncodingDOSGreek2 = 0x041C,
kCFStringEncodingDOSThai = 0x041D,
kCFStringEncodingDOSJapanese = 0x0420,
kCFStringEncodingDOSChineseSimplif = 0x0421,
kCFStringEncodingDOSKorean = 0x0422,
kCFStringEncodingDOSChineseTrad = 0x0423,
kCFStringEncodingWindowsLatin1 = 0x0500,
kCFStringEncodingWindowsLatin2 = 0x0501,
kCFStringEncodingWindowsCyrillic = 0x0502,
kCFStringEncodingWindowsGreek = 0x0503,
kCFStringEncodingWindowsLatin5 = 0x0504,
kCFStringEncodingWindowsHebrew = 0x0505,
kCFStringEncodingWindowsArabic = 0x0506,
kCFStringEncodingWindowsBalticRim = 0x0507,
kCFStringEncodingWindowsVietnamese = 0x0508,
kCFStringEncodingWindowsKoreanJohab = 0x0510,
kCFStringEncodingASCII = 0x0600,
kCFStringEncodingANSEL = 0x0601,
kCFStringEncodingJIS_X0201_76 = 0x0620,
kCFStringEncodingJIS_X0208_83 = 0x0621,
kCFStringEncodingJIS_X0208_90 = 0x0622,
kCFStringEncodingJIS_X0212_90 = 0x0623,
kCFStringEncodingJIS_C6226_78 = 0x0624,
kCFStringEncodingShiftJIS_X0213_00 = 0x0628,
kCFStringEncodingShiftJIS_X0213_MenKuTen = 0x0629,
kCFStringEncodingGB_2312_80 = 0x0630,
kCFStringEncodingGBK_95 = 0x0631,
kCFStringEncodingGB_18030_2000 = 0x0632,
kCFStringEncodingKSC_5601_87 = 0x0640,
kCFStringEncodingKSC_5601_92_Johab = 0x0641,
kCFStringEncodingCNS_11643_92_P1 = 0x0651,
kCFStringEncodingCNS_11643_92_P2 = 0x0652,
kCFStringEncodingCNS_11643_92_P3 = 0x0653,
kCFStringEncodingISO_2022_JP = 0x0820,
kCFStringEncodingISO_2022_JP_2 = 0x0821,
kCFStringEncodingISO_2022_JP_1 = 0x0822,
kCFStringEncodingISO_2022_JP_3 = 0x0823,
kCFStringEncodingISO_2022_CN = 0x0830,
kCFStringEncodingISO_2022_CN_EXT = 0x0831,
kCFStringEncodingISO_2022_KR = 0x0840,
kCFStringEncodingEUC_JP = 0x0920,

```

```

kCFStringEncodingEUC_CN = 0x0930,
kCFStringEncodingEUC_TW = 0x0931,
kCFStringEncodingEUC_KR = 0x0940,
kCFStringEncodingShiftJIS = 0x0A01,
kCFStringEncodingKOI8_R = 0x0A02,
kCFStringEncodingBig5 = 0x0A03,
kCFStringEncodingMacRomanLatin1 = 0x0A04,
kCFStringEncodingHZ_GB_2312 = 0x0A05,
kCFStringEncodingBig5_HKSCS_1999 = 0x0A06,
kCFStringEncodingVISCII = 0x0A07,
kCFStringEncodingKOI8_U = 0x0A08,
kCFStringEncodingBig5_E = 0x0A09,
kCFStringEncodingNextStepLatin = 0x0B01,
kCFStringEncodingNextStepJapanese = 0x0B02,
kCFStringEncodingEBCDIC_US = 0x0C01,
kCFStringEncodingEBCDIC_CP037 = 0x0C02,
};

```

Constants

`kCFStringEncodingMacJapanese`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacChineseTrad`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacKorean`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacArabic`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacHebrew`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacGreek`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacCyrillic`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacDevanagari`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacGurmukhi`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

kCFStringEncodingMacGujarati

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacOriya

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacBengali

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacTamil

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacTelugu

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacKannada

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacMalayalam

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacSinhalese

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacBurmese

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacKhmer

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacThai

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacLaotian

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacGeorgian

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacArmenian

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacChineseSimp

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacTibetan

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacMongolian

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacEthiopic

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacCentralEurRoman

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacVietnamese

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacExtArabic

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacSymbol

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacDingbats

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacTurkish

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacCroatian

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

kCFStringEncodingMacIcelandic

Available in Mac OS X v10.0 and later.

Declared in CFStringEncodingExt.h.

`kCFStringEncodingMacRomanian`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacCeltic`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacGaelic`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacFarsi`

Like MacArabic but uses Farsi digits

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacUkrainian`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacInuit`

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacVT100`

VT100102 font from Comm Toolbox: Latin-1 repertoire + box drawing etc

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingMacHFS`

Meta-value, should never appear in a table

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingISOLatin2`

ISO 8859-2

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingISOLatin3`

ISO 8859-3

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

`kCFStringEncodingISOLatin4`

ISO 8859-4

Available in Mac OS X v10.0 and later.

Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingISOLatinCyrillic`
ISO 8859-5
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatinArabic`
ISO 8859-6, =ASMO 708, =DOS CP 708
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatinGreek`
ISO 8859-7
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatinHebrew`
ISO 8859-8
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatin5`
ISO 8859-9
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatin6`
ISO 8859-10
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatinThai`
ISO 8859-11
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatin7`
ISO 8859-13
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatin8`
ISO 8859-14
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISOLatin9`
ISO 8859-15
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingISOLatin10`
ISO 8859-16
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSLatinUS`
code page 437
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSGreek`
code page 737 (formerly code page 437G)
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSBalticRim`
code page 775
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSLatin1`
code page 850, "Multilingual"
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSGreek1`
code page 851
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSLatin2`
code page 852, Slavic
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSCyrillic`
code page 855, IBM Cyrillic
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSTurkish`
code page 857, IBM Turkish
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSPortuguese`
code page 860
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingDOSIcelandic`
code page 861
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSHebrew`
code page 862
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSCanadianFrench`
code page 863
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSArabic`
code page 864
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSNordic`
code page 865
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSRussian`
code page 866
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSGreek2`
code page 869, IBM Modern Greek
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSThai`
code page 874, also for Windows
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSJapanese`
code page 932, also for Windows
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSChineseSimplif`
code page 936, also for Windows
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingDOSKorean`
code page 949, also for Windows; Unified Hangul Code
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingDOSChineseTrad`
code page 950, also for Windows
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsLatin2`
code page 1250, Central Europe
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsCyrillic`
code page 1251, Slavic Cyrillic
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsGreek`
code page 1253
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsLatin5`
code page 1254, Turkish
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsHebrew`
code page 1255
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsArabic`
code page 1256
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsBalticRim`
code page 1257
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingWindowsVietnamese`
code page 1258
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingWindowsKoreanJohab`
code page 1361, for Windows NT
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingANSEL`
ANSEL (ANSI Z39.47)
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingJIS_X0201_76`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingJIS_X0208_83`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingJIS_X0208_90`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingJIS_X0212_90`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingJIS_C6226_78`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingShiftJIS_X0213_00`
Shift-JIS format encoding of JIS X0213 planes 1 and 2
Available in Mac OS X v10.2 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingShiftJIS_X0213_MenKuTen`
JIS X0213 in plane-row-column notation
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingGB_2312_80`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingGBK_95`
annex to GB 13000-93; for Windows 95
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingGB_18030_2000`
Available in Mac OS X v10.2 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingKSC_5601_87`
same as KSC 5601-92 without Johab annex
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingKSC_5601_92_Johab`
KSC 5601-92 Johab annex
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingCNS_11643_92_P1`
CNS 11643-1992 plane 1
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingCNS_11643_92_P2`
CNS 11643-1992 plane 2
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingCNS_11643_92_P3`
CNS 11643-1992 plane 3 (was plane 14 in 1986 version)
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_JP`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_JP_2`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_JP_1`
RFC 2237
Available in Mac OS X v10.2 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_JP_3`
JIS X0213
Available in Mac OS X v10.2 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_CN`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingISO_2022_CN_EXT`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingISO_2022_KR`
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEUC_JP`
ISO 646, 1-byte katakana, JIS 208, JIS 212
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEUC_CN`
ISO 646, GB 2312-80
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEUC_TW`
ISO 646, CNS 11643-1992 Planes 1-16
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEUC_KR`
ISO 646, KS C 5601-1987
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingShiftJIS`
plain Shift-JIS
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingKOI8_R`
Russian internet standard
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingBig5`
Big-5 (has variants)
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingMacRomanLatin1`
Mac OS Roman permuted to align with ISO Latin-1
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingHZ_GB_2312`
HZ (RFC 1842, for Chinese mail & news)
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

- `kCFStringEncodingBig5_HKSCS_1999`
Big-5 with Hong Kong special char set supplement
Available in Mac OS X v10.2 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingVISCII`
RFC 1456, Vietnamese
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingKOI8_U`
RFC 2319, Ukrainian
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingBig5_E`
Taiwan Big-5E standard
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingNextStepJapanese`
NextStep Japanese encoding
Available in Mac OS X v10.4 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEBCDIC_US`
basic EBCDIC-US
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.
- `kCFStringEncodingEBCDIC_CP037`
code page 037, extended EBCDIC (Latin-1 set) for US,Canada...
Available in Mac OS X v10.0 and later.
Declared in `CFStringEncodingExt.h`.

Discussion

See the `CFStringEncodingExt.h` header file for the most current list of external string encodings and for more details.

Declared In

`CFStringEncodingExt.h`

CFStringTokenizer Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFStringTokenizer.h
Companion guide	Strings Programming Guide for Core Foundation

Overview

CFStringTokenizer allows you to tokenize strings into words, sentences or paragraphs in a language-neutral way. It supports languages such as Japanese and Chinese that do not delimit words by spaces, as well as de-compounding German compounds. You can obtain Latin transcription for tokens. It also provides language identification API.

You can use a CFStringTokenizer to break a string into tokens (sub-strings) on the basis of words, sentences, or paragraphs. When you create a tokenizer, you can supply options to further modify the tokenization—see [“Tokenization Modifiers”](#) (page 601).

In addition, with CFStringTokenizer:

- You can de-compound German compounds
- You can identify the language used in a string (using [CFStringTokenizerCopyBestStringLanguage](#) (page 596))
- You can obtain Latin transcription for tokens

To find a token that includes the character specified by character index and set it as the current token, you call [CFStringTokenizerGoToTokenAtIndex](#) (page 599). To advance to the next token and set it as the current token, you call [CFStringTokenizerAdvanceToNextToken](#) (page 595). To get the range of current token, you call [CFStringTokenizerGetCurrentTokenRange](#) (page 599). You can use [CFStringTokenizerCopyCurrentTokenAttribute](#) (page 596) to get the attribute of the current token. If the current token is a compound, you can call [CFStringTokenizerGetCurrentSubTokens](#) (page 598) to retrieve the subtokens or derived subtokens contained in the compound token. To guess the language of a string, you call [CFStringTokenizerCopyBestStringLanguage](#) (page 596).

CFStringTokenizer replaces the Language Analysis Manager (see [Language Analysis Manager Reference](#)). The Language Analysis Manager API provides access to one specific language engine at a time. For example you can create an analysis environment for Japanese tokenization, but it can't then be used to tokenize Chinese. Such API is good when you develop a language specific applications that handle a specific language such as input methods. It is not, however, convenient when you develop an internationalized applications which

handle text in language neutral way. Conceptually, `CFStringTokenizer` provides a higher level API that supports typical tasks of internationalized applications. With `CFStringTokenizer` you can tokenize a string without knowing the language.

The following Language Analysis Manager functionality is not available with `CFStringTokenizer`:

- Obtaining the part of speech for a token
- Obtaining alternative tokenization
- Kana-Kanji conversion

Functions by Task

Creating a Tokenizer

[CFStringTokenizerCreate](#) (page 597)
Returns a tokenizer for a given string.

Setting the String

[CFStringTokenizerSetString](#) (page 600)
Sets the string for a tokenizer.

Changing the Location

[CFStringTokenizerAdvanceToNextToken](#) (page 595)
Advances the tokenizer to the next token and sets that as the current token.

[CFStringTokenizerGoToTokenAtIndex](#) (page 599)
Finds a token that includes the character at a given index, and set it as the current token.

Getting Information About the Current Token

[CFStringTokenizerCopyCurrentTokenAttribute](#) (page 596)
Returns a given attribute of the current token.

[CFStringTokenizerGetCurrentTokenRange](#) (page 599)
Returns the range of the current token.

[CFStringTokenizerGetCurrentSubTokens](#) (page 598)
Retrieves the subtokens or derived subtokens contained in the compound token.

Identifying a Language

[CFStringTokenizerCopyBestStringLanguage](#) (page 596)

Guesses a language of a given string and returns the guess as a BCP 47 string.

Getting the CFStringTokenizer Type ID

[CFStringTokenizerGetTypeID](#) (page 599)

Returns the type ID for CFStringTokenizer.

Functions

CFStringTokenizerAdvanceToNextToken

Advances the tokenizer to the next token and sets that as the current token.

```
CFStringTokenizerTokenType CFStringTokenizerAdvanceToNextToken (
    CFStringTokenizerRef tokenizer
);
```

Parameters

tokenizer

A CFStringTokenizer object.

Return Value

The type of the token if the tokenizer succeeded in finding a token and setting it as current token. Returns `kCFStringTokenizerTokenNone` if the tokenizer failed to find a token. For possible values, see “[Token Types](#)” (page 603).

Discussion

If there is no preceding call to [CFStringTokenizerGoToTokenAtIndex](#) (page 599) or [CFStringTokenizerAdvanceToNextToken](#), the function finds the first token in the range specified by the [CFStringTokenizerCreate](#) (page 597). If there is a preceding, successful, call to [CFStringTokenizerGoToTokenAtIndex](#) (page 599) or [CFStringTokenizerAdvanceToNextToken](#) and there is a current token, proceeds to the next token. If a token is found, it is set as the current token and the function returns `true`; otherwise the current token is invalidated and the function returns `false`.

You can obtain the range and attribute of the token calling [CFStringTokenizerGetCurrentTokenRange](#) (page 599) and [CFStringTokenizerCopyCurrentTokenAttribute](#) (page 596). If the token is a compound (with type `kCFStringTokenizerTokenHasSubTokensMask` or `kCFStringTokenizerTokenHasDerivedSubTokensMask`), you can obtain its subtokens and (or) derived subtokens by calling [CFStringTokenizerGetCurrentSubTokens](#) (page 598).

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFStringTokenizerGoToTokenAtIndex](#) (page 599)

Declared In

CFStringTokenizer.h

CFStringTokenizerCopyBestStringLanguage

Guesses a language of a given string and returns the guess as a BCP 47 string.

```
CFStringRef CFStringTokenizerCopyBestStringLanguage (
    CFStringRef string,
    CFRange range
);
```

Parameters*string*

The string to test to identify the language.

range

The range of *string* to use for the test. If `NULL`, the first few hundred characters of the string are examined.

Return Value

A language in BCP 47 form, or `NULL` if the language in *string* could not be identified. Ownership follows the Create Rule.

Discussion

The result is not guaranteed to be accurate. Typically, the function requires 200-400 characters to reliably guess the language of a string.

CRStringTokenizer recognizes the following languages:

ar (Arabic), bg (Bulgarian), cs (Czech), da (Danish), de (German), el (Greek), en (English), es (Spanish), fi (Finnish), fr (French), he (Hebrew), hr (Croatian), hu (Hungarian), is (Icelandic), it (Italian), ja (Japanese), ko (Korean), nb (Norwegian Bokmål), nl (Dutch), pl (Polish), pt (Portuguese), ro (Romanian), ru (Russian), sk (Slovak), sv (Swedish), th (Thai), tr (Turkish), uk (Ukrainian), zh-Hans (Simplified Chinese), zh-Hant (Traditional Chinese).

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerCopyCurrentTokenAttribute

Returns a given attribute of the current token.

```
CTypeRef CFStringTokenizerCopyCurrentTokenAttribute (
    CFStringTokenizerRef tokenizer,
    CFOptionFlags attribute
);
```

Parameters*tokenizer*

A CFStringTokenizer object.

attribute

The token attribute to obtain. The value must be `kCFStringTokenizerAttributeLatinTranscription`, or `kCFStringTokenizerAttributeLanguage`.

Return Value

The attribute specified by *attribute* of the current token, or `NULL` if the current token does not have the specified attribute or there is no current token. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

`CFStringTokenizer.h`

CFStringTokenizerCreate

Returns a tokenizer for a given string.

```
CFStringTokenizerRef CFStringTokenizerCreate (
    CFAllocatorRef alloc,
    CFStringRef string,
    CFRange range,
    CFOptionFlags options,
    CFLocaleRef locale
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

string

The string to tokenize.

range

The range of the characters in *string* to tokenize.

options

A tokenization unit option that specifies how *string* should be tokenized. The options can be modified by adding unit modifier options to tell the tokenizer to prepare specified attributes when it tokenizes *string*.

For possible values, see [“Tokenization Modifiers”](#) (page 601).

locale

A locale that specifies language- or region-specific behavior for the tokenization. You can pass `NULL` to use the default system locale, although this is typically not recommended—instead use [`CFLocaleCopyCurrent`](#) (page 240) to specify the locale of the current user.

For more information, see [“Tokenization Modifiers”](#) (page 601).

Return Value

A tokenizer to analyze the range *range* of *string* for the given locale and options. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerGetCurrentSubTokens

Retrieves the subtokens or derived subtokens contained in the compound token.

```
CFIndex CFStringTokenizerGetCurrentSubTokens (
    CFStringTokenizerRef tokenizer,
    CFRange *ranges,
    CFIndex maxRangeLength,
    CFMutableArrayRef derivedSubTokens
);
```

Parameters*tokenizer*

A CFStringTokenizer object.

tokenizer

Upon return, an array of CFRanges containing the ranges of subtokens. The ranges are relative to the string specified to CFStringTokenizerCreate. This parameter can be NULL.

maxRangeLength

The maximum number of ranges to return.

derivedSubTokens

A CFMutableArray to which the derived subtokens are to be added. This parameter can be NULL.

Return Value

The number of ranges returned.

Discussion

If *token type* is `kCFStringTokenizerTokenNone`, the *ranges* array and *derivedSubTokens* array are untouched and the return value is 0.

If *token type* is `kCFStringTokenizerTokenNormal`, the *ranges* array has one item filled in with the entire range of the token (if *maxRangeLength* \geq 1) and a string taken from the entire token range is added to the *derivedSubTokens* array and the return value is 1.

If *token type* is `kCFStringTokenizerTokenHasSubTokensMask` or `kCFStringTokenizerTokenHasDerivedSubTokensMask`, the *ranges* array is filled in with as many items as there are subtokens (up to a limit of *maxRangeLength*).

The *derivedSubTokens* array will have sub tokens added even when the sub token is a substring of the token. If *token type* is `kCFStringTokenizerTokenHasSubTokensMask`, the ordinary non-derived subtokens are added to the *derivedSubTokens* array.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerGetCurrentTokenRange

Returns the range of the current token.

```
CFRange CFStringTokenizerGetCurrentTokenRange (
    CFStringTokenizerRef tokenizer
);
```

Parameters

tokenizer

A CFStringTokenizer object.

Return Value

The range of the current token, or {kCFNotFound, 0} if there is no current token.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerGetTypeID

Returns the type ID for CFStringTokenizer.

```
CFTypeID CFStringTokenizerGetTypeID (
    void
);
```

Return Value

The type ID for CFStringTokenizer.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerGoToTokenAtIndex

Finds a token that includes the character at a given index, and set it as the current token.

```
CFStringTokenizerTokenType CFStringTokenizerGoToTokenAtIndex (
    CFStringTokenizerRef tokenizer,
    CFIndex index
);
```

Parameters

tokenizer

A CFStringTokenizer object.

index

The index of a character in the string for *tokenizer*.

Return Value

The type of the token if the tokenizer succeeded in finding a token and setting it as the current token. Returns `kCFStringTokenizerTokenNone` if the tokenizer failed to find a token. For possible values, see “[Token Types](#)” (page 603).

Discussion

You can obtain the range and attribute of the token calling [CFStringTokenizerGetCurrentTokenRange](#) (page 599) and [CFStringTokenizerCopyCurrentTokenAttribute](#) (page 596). If the token is a compound (with type `kCFStringTokenizerTokenHasSubTokensMask` or `kCFStringTokenizerTokenHasDerivedSubTokensMask`), you can obtain its subtokens and (or) derived subtokens by calling [CFStringTokenizerGetCurrentSubTokens](#) (page 598).

Availability

Available in Mac OS X v10.5 and later.

See Also

[CFStringTokenizerAdvanceToNextToken](#) (page 595)

Declared In

`CFStringTokenizer.h`

CFStringTokenizerSetString

Sets the string for a tokenizer.

```
void CFStringTokenizerSetString (
    CFStringTokenizerRef tokenizer,
    CFStringRef string,
    CFRange range
);
```

Parameters

tokenizer

A tokenizer.

string

The string for the tokenizer to tokenize.

range

The range of string to tokenize. The range of characters within the string to be tokenized. The specified range must not exceed the length of the string.

Availability

Available in Mac OS X v10.5 and later.

Declared In

`CFStringTokenizer.h`

Data Types

CFStringTokenizerRef

A reference to a CFStringTokenizer object.

```
typedef struct __CFStringTokenizer * CFStringTokenizerRef;
```

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

CFStringTokenizerTokenType

Token types returned by [CFStringTokenizerGoToTokenAtIndex](#) (page 599) and [CFStringTokenizerAdvanceToNextToken](#) (page 595).

```
typedef CFOptionFlags CFStringTokenizerTokenType;
```

Discussion

For possible values, see [“Token Types”](#) (page 603).

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStringTokenizer.h

Constants

Tokenization Modifiers

Tokenization options are used with [CFStringTokenizerCreate](#) (page 597) to specify how the string should be tokenized

```
enum {
    kCFStringTokenizerUnitWord          = 0,
    kCFStringTokenizerUnitSentence     = 1,
    kCFStringTokenizerUnitParagraph    = 2,
    kCFStringTokenizerUnitLineBreak    = 3,
    kCFStringTokenizerUnitWordBoundary = 4,
    kCFStringTokenizerAttributeLatinTranscription = 1L << 16,
    kCFStringTokenizerAttributeLanguage   = 1L << 17
};
```

Constants

`kCFStringTokenizerUnitWord`

Specifies that a string should be tokenized by word. The *locale* parameter of [CFStringTokenizerCreate](#) (page 597) is ignored.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerUnitSentence`

Specifies that a string should be tokenized by sentence. The *locale* parameter of [CFStringTokenizerCreate](#) (page 597) is ignored.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerUnitParagraph`

Specifies that a string should be tokenized by paragraph. The *locale* parameter of [CFStringTokenizerCreate](#) (page 597) is ignored.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerUnitLineBreak`

Specifies that a string should be tokenized by line break. The *locale* parameter of [CFStringTokenizerCreate](#) (page 597) is ignored.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerUnitWordBoundary`

Specifies that a string should be tokenized by locale-sensitive word boundary.

You can use this constant in double-click range detection and whole word search. It is locale-sensitive. If the locale is `en_US_POSIX`, a colon (U+003A) is treated as a word separator. If the *locale* parameter of [CFStringTokenizerCreate](#) (page 597) is `NULL`, the locale from the global `AppleTextBreakLocale` preference is used if it is available; otherwise the locale defaults to the first locale in `AppleLanguages`.

`kCFStringTokenizerUnitWordBoundary` also returns space between words as a token.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerAttributeLatinTranscription`

Used with `kCFStringTokenizerUnitWord`, tells the tokenizer to prepare the Latin transcription when it tokenizes the string.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerAttributeLanguage`

Tells the tokenizer to prepare the language (specified as an RFC 3066bis string) when it tokenizes the string.

Used with [kCFStringTokenizerUnitSentence](#) (page 602) or [kCFStringTokenizerUnitParagraph](#) (page 602).

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

Discussion

You use the tokenization unit options with [CFStringTokenizerCreate](#) (page 597) to specify how a string should be tokenized.

You use the modifiers together with a tokenization unit to modify the way the string is tokenized.

You use the attribute specifiers to tell the tokenizer to prepare the specified attribute when it tokenizes the given string. You can retrieve the attribute value by calling [CFStringTokenizerCopyCurrentTokenAttribute](#) (page 596) with one of the attribute options.

The locale sensitivity of the tokenization unit options may change in a future release.

Declared In

`CFStringTokenizer.h`

Token Types

Token types returned by [CFStringTokenizerGoToTokenAtIndex](#) (page 599) and [CFStringTokenizerAdvanceToNextToken](#) (page 595).

```
enum {
    kCFStringTokenizerTokenNone           = 0,
    kCFStringTokenizerTokenNormal        = 1,
    kCFStringTokenizerTokenHasSubTokensMask = 1L << 1,
    kCFStringTokenizerTokenHasDerivedSubTokensMask = 1L << 2,
    kCFStringTokenizerTokenHasNumbersMask = 1L << 3,
    kCFStringTokenizerTokenHasNonLettersMask = 1L << 4,
    kCFStringTokenizerTokenIsCJWordMask = 1L << 5
};
```

Constants

`kCFStringTokenizerTokenNone`

Has no token.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenNormal`

Has a normal token.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenHasSubTokensMask`

Compound token which may contain subtokens but with no derived subtokens.

You can obtain subtokens by calling `CFStringTokenizerGetCurrentSubTokens` (page 598).

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenHasDerivedSubTokensMask`

Compound token which may contain derived subtokens.

You can obtain subtokens and derived subtokens by calling `CFStringTokenizerGetCurrentSubTokens` (page 598).

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenHasNumbersMask`

Appears to contain a number.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenHasNonLettersMask`

Contains punctuation, symbols, and so on.

Given the way Unicode word break works, this means it is a standalone punctuation or symbol character, or a string of such.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

`kCFStringTokenizerTokenIsCJWordMask`

Contains kana and/or ideographs.

Available in Mac OS X v10.5 and later.

Declared in `CFStringTokenizer.h`.

Discussion

See http://www.unicode.org/reports/tr29/#Word_Boundaries for a detailed description of word boundaries.

Declared In

`CFStringTokenizer.h`

CFTimeZone Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CTimeZone.h CFDate.h
Companion guide	Dates and Times Programming Guide for Core Foundation

Overview

CFTimeZone defines the behavior of time zone objects. Time zone objects represent geopolitical regions. Consequently, these objects have names for these regions. Time zone objects also represent a temporal offset, either plus or minus, from Greenwich Mean Time (GMT) and an abbreviation (such as PST for Pacific Standard Time).

CFTimeZone provides several functions to create time zone objects: [CFTimeZoneCreateWithName](#) (page 610) and [CFTimeZoneCreateWithTimeIntervalFromGMT](#) (page 611). CFTimeZone also permits you to set the default time zone within your application using the [CFTimeZoneSetDefault](#) (page 615) function. You can access this default time zone at any time with the [CFTimeZoneCopyDefault](#) (page 608) function.

CFTimeZone is “toll-free bridged” with its Cocoa Foundation counterpart, NSTimeZone. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSTimeZone *` parameter, you can pass in a `CFTimeZoneRef`, and in a function where you see a `CFTimeZoneRef` parameter, you can pass in an `NSTimeZone` instance. This fact also applies to concrete subclasses of `NSTimeZone`. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Time Zone

[CFTimeZoneCreateWithName](#) (page 610)

Returns the time zone object identified by a given name or abbreviation.

[CFTimeZoneCreateWithTimeIntervalFromGMT](#) (page 611)

Returns a time zone object for the specified time interval offset from Greenwich Mean Time (GMT).

[CFTimeZoneCreate](#) (page 609)

Creates a time zone with a given name and data.

System and Default Time Zones and Information

[CFTimeZoneCopyAbbreviationDictionary](#) (page 607)

Returns a dictionary holding the mappings of time zone abbreviations to time zone names.

[CFTimeZoneCopyAbbreviation](#) (page 607)

Returns the abbreviation of a time zone at a specified date.

[CFTimeZoneCopyDefault](#) (page 608)

Returns the default time zone set for your application.

[CFTimeZoneCopySystem](#) (page 609)

Returns the time zone currently used by the system.

[CFTimeZoneSetDefault](#) (page 615)

Sets the default time zone for your application the given time zone.

[CFTimeZoneCopyKnownNames](#) (page 608)

Returns an array of strings containing the names of all the time zones known to the system.

[CFTimeZoneResetSystem](#) (page 614)

Clears the previously determined system time zone, if any.

[CFTimeZoneSetAbbreviationDictionary](#) (page 615)

Sets the abbreviation dictionary to a given dictionary.

Getting Information About Time Zones

[CFTimeZoneGetName](#) (page 612)

Returns the geopolitical region name that identifies a given time zone.

[CFTimeZoneCopyLocalizedName](#) (page 608)

Returns the localized name of a given time zone.

[CFTimeZoneGetSecondsFromGMT](#) (page 613)

Returns the difference in seconds between the receiver and Greenwich Mean Time (GMT) at the specified date.

[CFTimeZoneGetData](#) (page 611)

Returns the data that stores the information used by a time zone.

Getting Daylight Savings Time Information

[CFTimeZoneIsDaylightSavingTime](#) (page 614)

Returns whether or not a time zone is in daylight savings time at a specified date.

[CFTimeZoneGetDaylightSavingTimeOffset](#) (page 612)

Returns the daylight saving time offset for a time zone at a given time.

[CFTimeZoneGetNextDaylightSavingTimeTransition](#) (page 612)

Returns the time in a given time zone of the next daylight saving time transition after a given time.

Getting the CTimeZone Type ID

[CTimeZoneGetTypeID](#) (page 613)

Returns the type identifier for the CTimeZone opaque type.

Functions

CTimeZoneCopyAbbreviation

Returns the abbreviation of a time zone at a specified date.

```
CFStringRef CTimeZoneCopyAbbreviation (
    CTimeZoneRef tz,
    CFAbsoluteTime at
);
```

Parameters

tz

The time zone to use.

at

The absolute time at which to obtain the abbreviation.

Return Value

A string containing the time zone abbreviation of *at*. Ownership follows the Create Rule.

Discussion

Note that the abbreviation may be different at different dates. For example, during daylight savings time the US/Eastern time zone has an abbreviation of "EDT." At other times, its abbreviation is "EST."

Availability

Available in Mac OS X v10.0 and later.

Declared In

CTimeZone.h

CTimeZoneCopyAbbreviationDictionary

Returns a dictionary holding the mappings of time zone abbreviations to time zone names.

```
CFDictionaryRef CTimeZoneCopyAbbreviationDictionary (
    void
);
```

Return Value

A dictionary containing the mappings of time zone abbreviations to time zone names. Ownership follows the Create Rule.

Discussion

More than one time zone may have the same abbreviation. For example, US/Pacific and Canada/Pacific both use the abbreviation "PST." In these cases this function chooses a single name to map the abbreviation to.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneCopyDefault

Returns the default time zone set for your application.

```
CFTimeZoneRef CFTimeZoneCopyDefault (
    void
);
```

Return Value

A time zone representing the default time zone set for your application, or the system time zone if no default is set. Ownership follows the Create Rule.

Discussion

If no default time zone is set, this function simply returns the result of the [CFTimeZoneCopySystem](#) (page 609) function.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MFSLives

Declared In

CFTimeZone.h

CFTimeZoneCopyKnownNames

Returns an array of strings containing the names of all the time zones known to the system.

```
CFArrayRef CFTimeZoneCopyKnownNames (
    void
);
```

Return Value

An array containing CFString objects representing all the known time zone names. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneCopyLocalizedName

Returns the localized name of a given time zone.


```
CFStringRef CFTimeZoneCopyLocalizedName (
    CFTimeZoneRef tz,
    CFTimeZoneNameStyle style,
    CFLocaleRef locale
);
```

Parameters*tz*

The time zone to analyze.

style

The style for the returned name.

locale

The locale for which to localize the returned name.

Return ValueThe name of *tz* localized for *locale*. Ownership follows the Create Rule.**Availability**

Available in Mac OS X v10.5 and later.

Declared In

CFTimeZone.h

CFTimeZoneCopySystem

Returns the time zone currently used by the system.

```
CFTimeZoneRef CFTimeZoneCopySystem (
    void
);
```

Return Value

A time zone representing the time zone currently used by the system, or the GMT time zone if the current zone cannot be determined. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CalendarView

SampleDS

Declared In

CFTimeZone.h

CFTimeZoneCreate

Creates a time zone with a given name and data.

```
CFTimeZoneRef CFTimeZoneCreate (
    CFAllocatorRef allocator,
    CFStringRef name,
    CFDataRef data
);
```

Parameters*allocator*

The allocator object to use to allocate memory for the new time zone. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

name

The name of the time zone to create.

data

The data to use to initialize the time zone. The contents of the data should be the same as that found within the time-zone files located at `/usr/share/zoneinfo`.

Return Value

A time zone corresponding to *name* and *data*. Ownership follows the Create Rule.

Discussion

You typically do not call this function directly. Use the [CFTimeZoneCreateWithName](#) (page 610) function to obtain a time zone given its name.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFTimeZone.h`

CFTimeZoneCreateWithName

Returns the time zone object identified by a given name or abbreviation.

```
CFTimeZoneRef CFTimeZoneCreateWithName (
    CFAllocatorRef allocator,
    CFStringRef name,
    Boolean tryAbbrev
);
```

Parameters*allocator*

The allocator object to use to allocate memory for the new time zone. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

name

The name or abbreviation of the time zone to obtain. The name may be in any of the formats understood by the system, for example "EST", "Etc/GMT-2", "America/Argentina/Buenos_Aires", "Europe/Monaco", "US/Pacific", or "posixrules". For a complete list of system names, you can see the output of [CFTimeZoneCopyKnownNames](#) (page 608).

tryAbbrev

If `false`, assumes *name* is not an abbreviation and searches the time zone information directory for a matching name. If `true`, tries to resolve *name* using the abbreviation dictionary first before searching the information dictionary.

Return Value

A time zone corresponding to *name*, or NULL if no match was found. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CSTimeZone.h

CSTimeZoneCreateWithTimeIntervalFromGMT

Returns a time zone object for the specified time interval offset from Greenwich Mean Time (GMT).

```
CSTimeZoneRef CSTimeZoneCreateWithTimeIntervalFromGMT (
    CFAllocatorRef allocator,
    CSTimeInterval ti
);
```

Parameters

allocator

The allocator object to use to allocate memory for the new time zone. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

ti

The offset, from GMT, of the new time zone.

Return Value

A new time zone whose offset from GMT is given by the interval *ti*. The name of the new time zone is GMT +/- the offset, in hours and minutes. Time zones created with this function never have daylight savings, and the offset is constant no matter what the date. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CSTimeZone.h

CSTimeZoneGetData

Returns the data that stores the information used by a time zone.

```
CFDataRef CSTimeZoneGetData (
    CSTimeZoneRef tz
);
```

Parameters

tz

The time zone to analyze.

Return Value

The data used to store *tz*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneGetDaylightSavingTimeOffset

Returns the daylight saving time offset for a time zone at a given time.

```
CTimeInterval CFTimeZoneGetDaylightSavingTimeOffset (
    CFTimeZoneRef tz,
    CFAbsoluteTime at
);
```

Parameters*tz*

The time zone to analyze.

*at*The time in *tz* to test for daylight saving time offset.**Return Value**The daylight saving time offset for *tz* at *at*.**Availability**

Available in Mac OS X v10.5 and later.

Declared In

CFTimeZone.h

CFTimeZoneGetName

Returns the geopolitical region name that identifies a given time zone.

```
CFStringRef CFTimeZoneGetName (
    CFTimeZoneRef tz
);
```

Parameters*tz*

The time zone to analyze.

Return ValueA string containing the geopolitical region name that identifies *tz*. Ownership follows the Get Rule.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneGetNextDaylightSavingTimeTransition

Returns the time in a given time zone of the next daylight saving time transition after a given time.

```
CFAbsoluteTime CTimeZoneGetNextDaylightSavingTimeTransition (
    CTimeZoneRef tz,
    CFAbsoluteTime at
);
```

Parameters

tz
The time zone to analyze.

at
A time in *tz*.

Return Value

The time in *tz* of the next daylight saving time transition after *at*.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CTimeZone.h

CTimeZoneGetSecondsFromGMT

Returns the difference in seconds between the receiver and Greenwich Mean Time (GMT) at the specified date.

```
CFTimeInterval CTimeZoneGetSecondsFromGMT (
    CTimeZoneRef tz,
    CFAbsoluteTime at
);
```

Parameters

tz
The time zone to analyze.

at
The date at which the interval is to be computed.

Return Value

The difference in seconds between *tz* and GMT at the specified date, *at*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MFSLives

Declared In

CTimeZone.h

CTimeZoneGetTypeID

Returns the type identifier for the CTimeZone opaque type.

```
CTypeID CTimeZoneGetTypeID (
    void
);
```

Return Value

The type identifier for the CTimeZone opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CTimeZone.h

CTimeZonesDaylightSavingTime

Returns whether or not a time zone is in daylight savings time at a specified date.

```
Boolean CTimeZoneIsDaylightSavingTime (
    CTimeZoneRef tz,
    CFAbsoluteTime at
);
```

Parameters

tz

The time zone to analyze.

at

The date in *tz* to test for daylight savings.

Return Value

true if *tz* is in daylight savings time at *at*, otherwise false.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CTimeZone.h

CTimeZoneResetSystem

Clears the previously determined system time zone, if any.

```
void CTimeZoneResetSystem (
    void
);
```

Discussion

This function also resets the default time zone if it is the same as the system time zone.

Subsequent calls to [CTimeZoneCopySystem](#) (page 609) will attempt to re-determine the system time zone.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneSetAbbreviationDictionary

Sets the abbreviation dictionary to a given dictionary.

```
void CFTimeZoneSetAbbreviationDictionary (
    CFDictionaryRef dict
);
```

Parameters*dict*

A dictionary containing key-value pairs for looking up time zone names given their abbreviations. The keys should be CFString objects containing the abbreviations; the values should be CFString objects containing their corresponding geopolitical region names.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

CFTimeZoneSetDefault

Sets the default time zone for your application the given time zone.

```
void CFTimeZoneSetDefault (
    CFTimeZoneRef tz
);
```

Parameters*tz*

The time zone to use as default.

Discussion

There can be only one default time zone, so by setting a new default time zone, you lose the previous one.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTimeZone.h

Data Types

CFTimeZoneNameStyle

Index type for constants used to specify styles of time zone names.

```
typedef CFIndex CFTimeZoneNameStyle;
```

Discussion

For values, see [“Time Zone Name Styles”](#) (page 616).

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFTimeZone.h

CFTimeZoneRef

A reference to a CFTimeZone object.

```
typedef const struct __CFTimeZone *CFTimeZoneRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

Constants

Notification Name

Name of the notification posted when the time zone changes.

```
const CFStringRef kCFTimeZoneSystemTimeZoneDidChangeNotification;
```

Constants

```
kCFTimeZoneSystemTimeZoneDidChangeNotification
```

Name of the notification posted when the system time zone changes.

The object of the notification is the previous system time zone object. This notification carries no user info.

Keep in mind that there is no order in how notifications are delivered to observers; frameworks or other parts of your code may also be observing this notification to take their own actions, and these may not have occurred by the time you receive the notification.

Available in Mac OS X v10.5 and later.

Declared in CFTimeZone.h.

Declared In

CFTimeZone.h

Time Zone Name Styles

Constants to specify styles for time zone names.


```
enum {
    kCFTimeZoneNameStyleStandard,
    kCFTimeZoneNameStyleShortStandard,
    kCFTimeZoneNameStyleDaylightSaving,
    kCFTimeZoneNameStyleShortDaylightSaving
};
```

Constants

`kCFTimeZoneNameStyleStandard`

Specifies the standard name style for a time zone.

Available in Mac OS X v10.5 and later.

Declared in `CFTimeZone.h`.

`kCFTimeZoneNameStyleShortStandard`

Specifies the short standard name style for a time zone.

Available in Mac OS X v10.5 and later.

Declared in `CFTimeZone.h`.

`kCFTimeZoneNameStyleDaylightSaving`

Specifies the daylight saving name style for a time zone.

Available in Mac OS X v10.5 and later.

Declared in `CFTimeZone.h`.

`kCFTimeZoneNameStyleShortDaylightSaving`

Specifies the short daylight saving name style for a time zone.

Available in Mac OS X v10.5 and later.

Declared in `CFTimeZone.h`.

Discussion

These constants are used with the function `CFTimeZoneCopyLocalizedName` (page 608).

Declared In

`CFTimeZone.h`

CFTree Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFTree.h
Companion guide	Collections Programming Topics for Core Foundation

Overview

You use CFTree to create tree structures that represent hierarchical organizations of information. In such structures, each tree node has exactly one parent tree (except for the root tree, which has no parent) and can have multiple children. Each CFTree object in the structure has a context associated with it; this context includes some program-defined data as well as callbacks that operate on that data. The program-defined data is often used as the basis for determining where CFTree objects fit within the structure. All CFTree objects are mutable.

You create a CFTree object using the [CFTreeCreate](#) (page 622) function. This function takes an allocator and pointer to a [CFTreeGetContext](#) (page 624) structure as parameters. The [CFTreeContext](#) (page 632) structure contains the program-defined data and callbacks needed to describe, retain, and release that data. If you do not implement these callbacks, your program-defined data will not be retained or released when trees are added and removed from a parent.

Each CFTree object has a parent and list of children, all of which may be NULL. CFTree provides functions for adding and removing tree objects from the tree structure. Use the [CFTreeAppendChild](#) (page 621), [CFTreeInsertSibling](#) (page 626), or [CFTreePrependChild](#) (page 627) functions to add trees to a tree structure, and the [CFTreeRemove](#) (page 627) or [CFTreeRemoveAllChildren](#) (page 628) functions to remove trees.

For the purposes of memory management, CFTree can be thought of as a collection. Typically the only object that retains a child tree is its parent. Usually, therefore, when you remove a child tree from a tree, the child tree is destroyed. If you want to use a child tree after you remove it from its parent, you should retain the child tree first, prior to removing it.

Releasing a tree releases its child trees, and all of their child trees (recursively). Note also that the final release of a tree (when its retain count decreases to zero) causes all of its child trees, and all of their child trees (recursively), to be destroyed, regardless of their retain counts. Releasing a child that is still in a tree is therefore a programming error, and may cause your application to crash.

You can use any of the get functions (functions containing the word “Get”) to obtain the parent, children, or attributes of a tree. For example, use [CFTreeGetChildAtIndex](#) (page 623) to obtain a child of a tree at a specified location. In common with other Core Foundation “Get” functions, these functions do not retain the tree that is returned. If you are making other modifications to the tree, you should either retain or make a deep copy of the child tree returned.

You can apply a function to all children of a tree using the [CFTreeApplyFunctionToChildren](#) (page 622) function, and sort children of a tree using the [CFTreeSortChildren](#) (page 629) function.

Functions by Task

Creating Trees

[CFTreeCreate](#) (page 622)
Creates a new CFTree object.

Modifying a Tree

[CFTreeAppendChild](#) (page 621)
Adds a new child to a tree as the last in its list of children.

[CFTreeInsertSibling](#) (page 626)
Inserts a new sibling after a given tree.

[CFTreeRemoveAllChildren](#) (page 628)
Removes all the children of a tree.

[CFTreePrependChild](#) (page 627)
Adds a new child to the specified tree as the first in its list of children.

[CFTreeRemove](#) (page 627)
Removes a tree from its parent.

[CFTreeSetContext](#) (page 628)
Replaces the context of a tree by releasing the old information pointer and retaining the new one.

Sorting a Tree

[CFTreeSortChildren](#) (page 629)
Sorts the immediate children of a tree using a specified comparator function.

Examining a Tree

[CFTreeFindRoot](#) (page 623)
Returns the root tree of a given tree.

[CFTreeGetChildAtIndex](#) (page 623)
Returns the child of a tree at the specified index.

[CFTreeGetChildCount](#) (page 624)
Returns the number of children in a tree.

[CFTreeGetChildren](#) (page 624)
Fills a buffer with children from the tree.

[CFTreeGetContext](#) (page 624)

Returns the context of the specified tree.

[CFTreeGetFirstChild](#) (page 625)

Returns the first child of a tree.

[CFTreeGetNextSibling](#) (page 625)

Returns the next sibling, adjacent to a given tree, in the parent's children list.

[CFTreeGetParent](#) (page 626)

Returns the parent of a given tree.

Performing an Operation on Tree Elements

[CFTreeApplyFunctionToChildren](#) (page 622)

Calls a function once for each immediate child of a tree.

Getting the Tree Type ID

[CFTreeGetTypeID](#) (page 626)

Returns the type identifier of the CFTree opaque type.

Functions

CFTreeAppendChild

Adds a new child to a tree as the last in its list of children.

```
void CFTreeAppendChild (
    CFTreeRef tree,
    CFTreeRef newChild
);
```

Parameters

tree

The tree to which to add *newChild*.

newChild

The child tree to add to *tree*. If this parameter is a tree which is already a child of any other tree, the behavior is undefined.

Discussion

When a child tree is added to another tree, the child tree is retained by its new parent.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeApplyFunctionToChildren

Calls a function once for each immediate child of a tree.

```
void CFTreeApplyFunctionToChildren (
    CFTreeRef tree,
    CFTreeApplierFunction applier,
    void *context
);
```

Parameters

tree

The tree to operate upon.

applier

The callback function to call once for each child in *tree*. The function must be able to apply to all the values in the tree.

context

A pointer-sized program-defined value that is passed to the applier function, but is otherwise unused by this function.

Discussion

Note that the applier only operates one level deep—it does not operate on descendants further removed than the immediate children of a tree. If the tree is mutable, it is unsafe for the applied function to change the contents of the tree.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeCreate

Creates a new CFTree object.

```
CFTreeRef CFTreeCreate (
    CFAllocatorRef allocator,
    const CFTreeContext *context
);
```

Parameters

allocator

The allocator to use to allocate memory for the new tree. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

context

The [CFTreeContext](#) (page 632) structure to be copied and used as the context of the new tree. The information pointer will be retained by the tree if a retain function is provided. If this value is not a valid C pointer to a `CFTreeContext` structure-sized block of storage, the result is undefined. If the version number of the storage is not a valid `CFTreeContext` version number, the result is undefined.

Return Value

A new CFTree object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeFindRoot

Returns the root tree of a given tree.

```
CFTreeRef CFTreeFindRoot (
    CFTreeRef tree
);
```

Parameters

tree

The tree to examine.

Return Value

The root of *tree* where root is defined as a tree without a parent. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetChildAtIndex

Returns the child of a tree at the specified index.

```
CFTreeRef CFTreeGetChildAtIndex (
    CFTreeRef tree,
    CFIndex idx
);
```

Parameters

tree

The tree to examine.

idx

The index of the child obtain. The value must be less than the number of children in *tree*.

Return Value

The child tree at *idx*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetChildCount

Returns the number of children in a tree.

```
CFIndex CFTreeGetChildCount (
    CFTreeRef tree
);
```

Parameters

tree

The tree to examine.

Return Value

The number of children in *tree*.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetChildren

Fills a buffer with children from the tree.

```
void CFTreeGetChildren (
    CFTreeRef tree,
    CFTreeRef *children
);
```

Parameters

tree

The tree to examine.

children

The C array of pointer-sized values to be filled with the children from *tree*. This value must be a valid pointer to a C array of at least the size of the number of children in *tree*. Use the [CFTreeGetChildCount](#) (page 624) function to obtain the number of children in *tree*. You are responsible for retaining and releasing the returned objects as needed.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetContext

Returns the context of the specified tree.


```
void CFTreeGetContext (
    CFTreeRef tree,
    CFTreeContext *context
);
```

Parameters*tree*

The tree to examine.

context

The [CFTreeContext](#) (page 632) structure to be filled in with the context of the specified tree. This value must be a valid C pointer to a `CFTreeContext` structure-sized block of storage. If the version number of the storage is not a valid `CFTreeContext` structure version number, the result is undefined.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetFirstChild

Returns the first child of a tree.

```
CFTreeRef CFTreeGetFirstChild (
    CFTreeRef tree
);
```

Parameters*tree*

The tree to examine.

Return ValueThe first child of *tree*. Ownership follows the Get Rule.**Availability**

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetNextSibling

Returns the next sibling, adjacent to a given tree, in the parent's children list.

```
CFTreeRef CFTreeGetNextSibling (
    CFTreeRef tree
);
```

Parameters*tree*

The tree to examine.

Return Value

The next sibling, adjacent to *tree*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetParent

Returns the parent of a given tree.

```
CFTreeRef CFTreeGetParent (
    CFTreeRef tree
);
```

Parameters

tree

The tree to examine.

Return Value

The parent of *tree*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeGetTypeID

Returns the type identifier of the CFTree opaque type.

```
CTypeID CFTreeGetTypeID (
    void
);
```

Return Value

The type identifier of the CFTree opaque type.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeInsertSibling

Inserts a new sibling after a given tree.

```
void CFTreeInsertSibling (
    CFTreeRef tree,
    CFTreeRef newSibling
);
```

Parameters*tree*

The tree after which to insert *newSibling*. *tree* must have a parent.

newSibling

The sibling to add. *newSibling* must not have a parent.

Discussion

When a child tree is added to another tree, the child tree is retained by its new parent.

If you want to manipulate an existing tree structure, since *newSibling* must not have a parent you need to remove a tree from its parent in order to move it to a new position. If you do this, you should retain the tree before you actually remove it from its parent (see [CFTreeRemove](#) (page 627)).

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreePrependChild

Adds a new child to the specified tree as the first in its list of children.

```
void CFTreePrependChild (
    CFTreeRef tree,
    CFTreeRef newChild
);
```

Parameters*tree*

The tree to which to add *newChild*.

newChild

The child tree to add to *tree*. This value must not be a child of another tree.

Discussion

When a child tree is added to another tree, the child tree is retained by its new parent.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeRemove

Removes a tree from its parent.

```
void CFTreeRemove (
    CFTreeRef tree
);
```

Parameters*tree*

The tree to remove from its parent.

Discussion

When a child tree is removed from its parent, the parent releases it. If you want to use the child after you have removed it, you should ensure you retain it before removing it from its parent.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeRemoveAllChildren

Removes all the children of a tree.

```
void CFTreeRemoveAllChildren (
    CFTreeRef tree
);
```

Parameters*tree*

The tree to modify.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeSetContext

Replaces the context of a tree by releasing the old information pointer and retaining the new one.

```
void CFTreeSetContext (
    CFTreeRef tree,
    const CFTreeContext *context
);
```

Parameters*tree*

The tree to modify.

context

The [CFTreeContext](#) (page 632) structure to be copied and used as the context of the new tree. The information pointer will be retained by the tree if a retain function is provided. If this value is not a valid C pointer to a `CFTreeContext` structure-sized block of storage, the result is undefined. If the version number of the storage is not a valid `CFTreeContext` version number, the result is undefined.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFTree.h`

CFTreeSortChildren

Sorts the immediate children of a tree using a specified comparator function.

```
void CFTreeSortChildren (
    CFTreeRef tree,
    CFComparatorFunction comparator,
    void *context
);
```

Parameters

tree

The tree to sort.

comparator

The function with a comparator function type signature which is used in the sort operation to compare children of the tree. The children of the tree are sorted from least to greatest according to this function.

context

A pointer-sized program-defined value that is passed to the comparator function, but is otherwise unused by this function.

Discussion

Note that the comparator only operates one level deep and does not operate on descendants further removed than the immediate children of a tree node.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFTree.h`

Callbacks

CFTreeApplierFunction

Type of the callback function used by the `CFTree apply` function.

```
typedef void (*CFTreeApplierFunction) (
    const void *value,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *value,
    void *context
);
```

Parameters

value

The current child of a tree that is being iterated.

context

The program-defined context parameter that was passed to the applier function.

Discussion

This callback is used by the `CFTreeApplyFunctionToChildren` (page 622) applier function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeCopyDescriptionCallback

Callback function used to provide a description of the program-defined information pointer.

```
typedef CFStringRef (*CFTreeCopyDescriptionCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *info
);
```

Parameters

info

The program-supplied information pointer provided in a `CFTreeContext` (page 632) structure.

Return Value

A textual description of *info*. The caller is responsible for releasing this object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeReleaseCallback

Callback function used to release a previously retained program-defined information pointer.

```
typedef void (*CFTreeReleaseCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *info
);
```

Parameters

info

The program-supplied information pointer provided in a [CFTreeContext](#) (page 632) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeRetainCallback

Callback function used to retain a program-defined information pointer.

```
typedef const void *(*CFTreeRetainCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    const void *info
);
```

Parameters

info

The program-supplied information pointer provided in a [CFTreeContext](#) (page 632) structure.

Return Value

The value to use whenever the information pointer is retained, which is usually the *info* parameter passed to this callback, but may be a different value if a different value should be used.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

Data Types

CFTreeContext

Structure containing program-defined data and callbacks for a CFTree object.

```
struct CFTreeContext {
    CFIndex version;
    void *info;
    CFTreeRetainCallBack retain;
    CFTreeReleaseCallBack release;
    CFTreeCopyDescriptionCallBack copyDescription;
};
typedef struct CFTreeContext CFTreeContext;
```

Fields

`version`

The version number of the structure type being passed in as a parameter to a CFTree creation function. This structure is version 0.

`info`

A C pointer to a program-defined block of data, referred to as the information pointer.

`retain`

The callback used to retain the `info` field. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. This value may be `NULL`.

`release`

The callback used to release a previously retained `info` field. If this parameter is not a pointer to a function of the correct prototype, the behavior is undefined. This value may be `NULL`.

`copyDescription`

The callback used to provide a description of the `info` field.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CFTreeRef

A reference to a CFTree object.

```
typedef struct __CFTree *CFTreeRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFTree.h

CType Reference

Derived From:	None
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBase.h CFString.h
Companion guides	Core Foundation Design Concepts Memory Management Programming Guide for Core Foundation

Overview

All other Core Foundation opaque types derive from CType. The functions, callbacks, data types, and constants defined for CType can be used by any derived opaque type. Hence, CType functions are referred to as “polymorphic functions.” You use CType functions to retain and release objects, to compare and inspect objects, get descriptions of objects and opaque types, and to get object allocators.

Functions by Task

Memory Management

[CFGetAllocator](#) (page 636)

Returns the allocator used to allocate a Core Foundation object.

[CFGetRetainCount](#) (page 636)

Returns the reference count of a Core Foundation object.

[CFMakeCollectable](#) (page 638)

Makes a newly-allocated Core Foundation object eligible for garbage collection.

[CFRelease](#) (page 639)

Releases a Core Foundation object.

[CFRetain](#) (page 639)

Retains a Core Foundation object.

Determining Equality

[CFEqual](#) (page 635)

Determines whether two Core Foundation objects are considered equal.

Hashing

[CFHash](#) (page 638)

Returns a code that can be used to identify an object in a hashing structure.

Miscellaneous Functions

[CFCopyDescription](#) (page 634)

Returns a textual description of a Core Foundation object.

[CFCopyTypeIDDescription](#) (page 635)

Returns a textual description of a Core Foundation type, as identified by its type ID, which can be used when debugging.

[CFGetTypeID](#) (page 637)

Returns the unique identifier of an opaque type to which a Core Foundation object belongs.

[CFShow](#) (page 640)

Prints a description of a Core Foundation object to stderr.

Functions

CFCopyDescription

Returns a textual description of a Core Foundation object.

```
CFStringRef CFCopyDescription (
    CTypeRef cf
);
```

Parameters

cf

The CType object (a generic reference of type [CTypeRef](#) (page 642)) from which to derive a description.

Return Value

A string that contains a description of *cf*. Ownership follows the Create Rule.

Discussion

The nature of the description differs by object. For example, a description of a CFArray object would include descriptions of each of the elements in the collection.

You can use this function for debugging Core Foundation objects in your code. Note, however, that the description for a given object may be different in different releases of the operating system. Do *not* create dependencies in your code on the content or format of the information returned by this function.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPrefsDumper

FSFileOperation

MoreIsBetter

MoreSCF

Declared In

CFBase.h

CFCopyTypeIDDescription

Returns a textual description of a Core Foundation type, as identified by its type ID, which can be used when debugging.

```
CFStringRef CFCopyTypeIDDescription (
    CTypeID type_id
);
```

Parameters

theType

An integer of type [CTypeID](#) (page 641) that uniquely identifies a Core Foundation opaque type.

Return Value

A string containing a type description. Ownership follows the Create Rule.

Discussion

You can use this function for debugging Core Foundation objects in your code. Note, however, that the description for a given object may be different in different releases of the operating system. Do *not* create dependencies in your code on the content or format of the information returned by this function.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

MoreSCF

Declared In

CFBase.h

CFEqual

Determines whether two Core Foundation objects are considered equal.

```
Boolean CFEqual (
    CTypeRef cf1,
    CTypeRef cf2
);
```

Parameters

cf1

A CType object to compare to *cf2*.

cf2

A CType object to compare to *cf1*.

Return Value

true if *cf1* and *cf2* are of the same type and considered equal, otherwise false.

Discussion

Equality is something specific to each Core Foundation opaque type. For example, two CFNumber objects are equal if the numeric values they represent are equal. Two CFString objects are equal if they represent identical sequences of characters, regardless of encoding.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

bulkerase

databurntest

MoreIsBetter

MoreSCF

QISA

Declared In

CFBase.h

CFGetAllocator

Returns the allocator used to allocate a Core Foundation object.

```
CFAllocatorRef CFGetAllocator (
    CTypeRef cf
);
```

Parameters

cf

The CType object to examine.

Return Value

The allocator used to allocate memory for *cf*.

Discussion

When you are creating a Core Foundation object sometimes you want to ensure that the block of memory allocated for the object is from the same allocator used for another object. One way to do this is to reuse the allocator assigned to an existing Core Foundation object when you call a “creation” function.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFGetRetainCount

Returns the reference count of a Core Foundation object.

```
CFIndex CFGetRetainCount (
    CTypeRef cf
);
```

Parameters*cf*

The CType object to examine.

Return Value

A number representing the reference count of *cf*.

Discussion

You increment the reference count using the [CFRetain](#) (page 639) function, and decrement the reference count using the [CFRelease](#) (page 639) function.

This function may be useful for debugging memory leaks. You normally do not use this function, otherwise.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AuthForAll

BSDLLCTest

MoreIsBetter

MoreSCF

QISA

Declared In

CFBase.h

CFGetTypeID

Returns the unique identifier of an opaque type to which a Core Foundation object belongs.

```
CTypeID CFGetTypeID (
    CTypeRef cf
);
```

Parameters*cf*

The CType object to examine.

Return Value

A value of type [CTypeID](#) (page 641) that identifies the opaque type of *cf*.

Discussion

This function returns a value that uniquely identifies the opaque type of any Core Foundation object. You can compare this value with the known [CTypeID](#) (page 641) identifier obtained with a “GetTypeID” function specific to a type, for example [CFDateGetTypeID](#) (page 181). These values might change from release to release or platform to platform.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest
 CFFTPSample
 MoreIsBetter
 MoreSCF
 QISA

Declared In

CFBase.h

CFHash

Returns a code that can be used to identify an object in a hashing structure.

```
CFHashCode CFHash (
    CTypeRef cf
);
```

Parameters

cf
 A CType object to examine.

Return Value

An integer of type [CFHashCode](#) (page 641) that represents a hashing value for *cf*.

Discussion

Two objects that are equal (as determined by the [CFEqual](#) (page 635) function) have the same hashing value. However, the converse is not true: two objects with the same hashing value might not be equal. That is, hashing values are not necessarily unique.

The hashing value for an object might change from release to release or from platform to platform.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFMakeCollectable

Makes a newly-allocated Core Foundation object eligible for garbage collection.

```
CTypeRef CFMakeCollectable (
    CTypeRef cf
);
```

Parameters

cf
 A CType object to make collectable. This value must not be NULL.

Return Value

cf.

Discussion

For more details, see *Garbage Collection Programming Guide*.

Special Considerations

If *cf* is NULL, this will cause a runtime error and your application will crash.

Availability

Available in Mac OS X v10.4 and later.

Related Sample Code

AutomatorHandsOn

Declared In

CFBase.h

CFRelease

Releases a Core Foundation object.

```
void CFRelease (  
    CTypeRef cf  
);
```

Parameters

cf

A CType object to release. This value must not be NULL.

Discussion

If the retain count of *cf* becomes zero the memory allocated to the object is deallocated and the object is destroyed. If you create, copy, or explicitly retain (see the [CFRetain](#) (page 639) function) a Core Foundation object, you are responsible for releasing it when you no longer need it (see *Memory Management Programming Guide for Core Foundation*).

Special Considerations

If *cf* is NULL, this will cause a runtime error and your application will crash.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

HID Explorer

ImageClient

SeeMyFriends

TypeServicesForUnicode

Declared In

CFBase.h

CFRetain

Retains a Core Foundation object.

```
CTypeRef CFRetain (
    CTypeRef cf
);
```

Parameters*cf*

The CType object to retain. This value must not be NULL

Return Value

The input value, *cf*.

Discussion

You should retain a Core Foundation object when you receive it from elsewhere (that is, you did not create or copy it) and you want it to persist. If you retain a Core Foundation object you are responsible for releasing it (see *Memory Management Programming Guide for Core Foundation*).

Special Considerations

If *cf* is NULL, this will cause a runtime error and your application will crash.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

audioburntest

databurntest

MoreIsBetter

MoreSCF

QISA

Declared In

CFBase.h

CFShow

Prints a description of a Core Foundation object to stderr.

```
void CFShow (
    CTypeRef obj
);
```

Parameters*obj*

A Core Foundation object derived from CType. If *obj* is not a Core Foundation object, an assertion is raised.

Discussion

The output is printed to the standard I/O standard error (stderr).

This function is useful as a debugging aid for Core Foundation objects. Because these objects are based on opaque types, it is difficult to examine their contents directly. However, the opaque types implement `description` function callbacks that return descriptions of their objects. This function invokes these callbacks.

Special Considerations

You can use `CFSHOW` in one of two general ways. If your debugger supports function calls (such as `gdb` does), call `CFSHOW` in the debugger:

```
(gdb) call (void) CFSHOW(string)
Hello World
```

You can also incorporate calls to `CFSHOW` in a test version of your code to print out "snapshots" of Core Foundation objects to the console.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

`FSFileOperation`

`MoreIsBetter`

`MoreSCF`

`ProfileSystem`

`QISA`

Declared In

`CFString.h`

Data Types

CFHashCode

A type for hash codes returned by the `CFHash` function.

```
typedef unsigned long CFHashCode;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFBase.h`

CTypeID

A type for unique, constant integer values that identify particular Core Foundation opaque types.

```
typedef unsigned long CTypeID;
```

Discussion

Defines a type identifier in Core Foundation. A type ID is an integer that identifies the opaque type to which a Core Foundation object "belongs." You use type IDs in various contexts, such as when you are operating on heterogeneous collections. Core Foundation provides programmatic interfaces for obtaining and evaluating type IDs.

Because the value for a type ID can change from release to release, your code should not rely on stored or hard-coded type IDs nor should it hard-code any observed properties of a type ID (such as, for example, it being a small integer).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CTypeRef

An untyped "generic" reference to any Core Foundation object.

```
typedef const void * CTypeRef;
```

Discussion

The `CTypeRef` type is the base type defined in Core Foundation. It is used as the type and return value in several polymorphic functions. It is a generic object reference that acts as a placeholder for other true Core Foundation objects.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFURL Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFURL.h

Overview

CFURL provides facilities for creating, parsing, and dereferencing URL strings. CFURL is useful to applications that need to use URLs to access resources, including local files.

A CFURL object is composed of two parts—a base URL, which can be `NULL`, and a string that is resolved relative to the base URL. A CFURL object whose string is fully resolved without a base URL is considered absolute; all others are considered relative.

CFURL fails to create an object if the string passed is not well-formed (that is, if it does not comply with RFC 2396). Examples of cases that will not succeed are strings containing space characters and high-bit characters. If a function fails to create a CFURL object, it returns `NULL`, which you must be prepared to handle. If you create CFURL objects using file system paths, you should use the [CFURLCreateFromFileSystemRepresentation](#) (page 659) and [CFURLCreateFromFileSystemRepresentationRelativeToBase](#) (page 660) functions, which handle the subtle differences between URL paths and file system paths.

For functions that read and write data from a URL, see *Core Foundation URL Access Utilities Reference*

CFURL is “toll-free bridged” with its Cocoa Foundation counterpart, NSURL. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. In other words, in a method where you see an `NSURL *` parameter, you can pass in a `CFURLRef`, and in a function where you see a `CFURLRef` parameter, you can pass in an NSURL instance. This also applies to concrete subclasses of NSURL. See *Integrating Carbon and Cocoa in Your Application* for more information on toll-free bridging.

Functions by Task

Creating a CFURL

[CFURLCopyAbsoluteURL](#) (page 646)

Creates a new CFURL object by resolving the relative portion of a URL against its base.

- [CFURLCreateAbsoluteURLWithBytes](#) (page 655)
Creates a new `CFURL` object by resolving the relative portion of a URL, specified as bytes, against its given base URL.
- [CFURLCreateCopyAppendingPathComponent](#) (page 656)
Creates a copy of a given URL and appends a path component.
- [CFURLCreateCopyAppendingPathExtension](#) (page 657)
Creates a copy of a given URL and appends a path extension.
- [CFURLCreateCopyDeletingLastPathComponent](#) (page 657)
Creates a copy of a given URL with the last path component deleted.
- [CFURLCreateCopyDeletingPathExtension](#) (page 658)
Creates a copy of a given URL with its last path extension removed.
- [CFURLCreateFromFileSystemRepresentation](#) (page 659)
Creates a new `CFURL` object for a file system entity using the native representation.
- [CFURLCreateFromFileSystemRepresentationRelativeToBase](#) (page 660)
Creates a `CFURL` object from a native character string path relative to a base URL.
- [CFURLCreateFromFSRef](#) (page 661)
Creates a URL from a given directory or file.
- [CFURLCreateWithBytes](#) (page 664)
Creates a `CFURL` object using a given character bytes.
- [CFURLCreateWithFilePath](#) (page 665)
Creates a `CFURL` object using a local file system path string.
- [CFURLCreateWithFilePathRelativeToBase](#) (page 666)
Creates a `CFURL` object using a local file system path string relative to a base URL.
- [CFURLCreateWithString](#) (page 667)
Creates a `CFURL` object using a given `CFString` object.

Accessing the Parts of a URL

- [CFURLCanBeDecomposed](#) (page 646)
Determines if the given URL conforms to RFC 1808 and therefore can be decomposed.
- [CFURLCopyFilePath](#) (page 647)
Returns the path portion of a given URL.
- [CFURLCopyFragment](#) (page 647)
Returns the fragment from a given URL.
- [CFURLCopyHostName](#) (page 648)
Returns the host name of a given URL.
- [CFURLCopyLastPathComponent](#) (page 649)
Returns the last path component of a given URL.
- [CFURLCopyNetLocation](#) (page 649)
Returns the net location portion of a given URL.
- [CFURLCopyParameterString](#) (page 650)
Returns the parameter string from a given URL.
- [CFURLCopyPassword](#) (page 650)
Returns the password of a given URL.

- [CFURLCopyPath](#) (page 651)
Returns the path portion of a given URL.
- [CFURLCopyPathExtension](#) (page 652)
Returns the path extension of a given URL.
- [CFURLCopyQueryString](#) (page 652)
Returns the query string of a given URL.
- [CFURLCopyResourceSpecifier](#) (page 653)
Returns any additional resource specifiers after the path.
- [CFURLCopyScheme](#) (page 653)
Returns the scheme portion of a given URL.
- [CFURLCopyStrictPath](#) (page 654)
Returns the path portion of a given URL.
- [CFURLCopyUserName](#) (page 654)
Returns the user name from a given URL.
- [CFURLGetPortNumber](#) (page 671)
Returns the port number from a given URL.
- [CFURLHasDirectoryPath](#) (page 672)
Determines if a given URL's path represents a directory.

Converting URLs to Other Representations

- [CFURLCreateData](#) (page 658)
Creates a `CFData` object containing the content of a given URL.
- [CFURLCreateStringByAddingPercentEscapes](#) (page 661)
Creates a copy of a string, replacing certain characters with the equivalent percent escape sequence based on the specified encoding.
- [CFURLCreateStringByReplacingPercentEscapes](#) (page 663)
Creates a new string by replacing any percent escape sequences with their character equivalent.
- [CFURLCreateStringByReplacingPercentEscapesUsingEncoding](#) (page 663)
Creates a new string by replacing any percent escape sequences with their character equivalent.
- [CFURLGetFileSystemRepresentation](#) (page 669)
Fills a buffer with the file system's native string representation of a given URL's path.
- [CFURLGetFSRef](#) (page 670)
Converts a given URL to a file or directory object.
- [CFURLGetString](#) (page 671)
Returns the URL as a `CFString` object.

Getting URL Properties

- [CFURLGetBaseURL](#) (page 668)
Returns the base URL of a given URL if it exists.
- [CFURLGetBytes](#) (page 669)
Returns by reference the byte representation of a URL object.

[CFURLGetByteRangeForComponent](#) (page 668)

Returns the range of the specified component in the bytes of a URL.

[CFURLGetTypeID](#) (page 672)

Returns the type identifier for the `CFURL` opaque type.

Functions

CFURLCanBeDecomposed

Determines if the given URL conforms to RFC 1808 and therefore can be decomposed.

```
Boolean CFURLCanBeDecomposed (
    CFURLRef anURL
);
```

Parameters

anURL

The `CFURL` object to test.

Return Value

`true` if *anURL* conforms to RFC 1808, `false` otherwise.

Discussion

If a `CFURL` object can be decomposed, you can retrieve separately each of the four components (scheme, net location, path, and resource specifier), as well as the base URL.

Relative URLs are permitted to have only paths (or a variety of other configurations); these are considered decomposable if their base URL is decomposable. If no base URL is present, they are considered decomposable.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFURL.h`

CFURLCopyAbsoluteURL

Creates a new `CFURL` object by resolving the relative portion of a URL against its base.

```
CFURLRef CFURLCopyAbsoluteURL (
    CFURLRef relativeURL
);
```

Parameters

relativeURL

The `CFURL` object to resolve.

Return Value

A new `CFURL` object, or `NULL` if *relativeURL* cannot be made absolute. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

Declared In

CFURL.h

CFURLCopyFilePath

Returns the path portion of a given URL.

```
CFStringRef CFURLCopyFilePath (
    CFURLRef anURL,
    CFURLPathStyle pathStyle
);
```

Parameters

anURL

The CFURL object whose path you want to obtain.

pathStyle

The operating system path style to be used to create the path. See [Path Style](#) (page 675) for a list of possible values.

Return Value

The URL's path in the format specified by *pathStyle*. Ownership follows the Create Rule.

Discussion

This function returns the URL's path as a file system path for a given path style.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioBurn

MoreAppleEvents

MoreIsBetter

RecordAudioToFile

SeeMyFriends

Declared In

CFURL.h

CFURLCopyFragment

Returns the fragment from a given URL.

```
CFStringRef CFURLCopyFragment (
    CFURLRef anURL,
    CFStringRef charactersToLeaveEscaped
);
```

Parameters*anURL*

The CFURL object whose fragment you want to obtain.

charactersToLeaveEscaped

Characters whose percent escape sequences, such as %20 for a space character, you want to leave intact. Pass NULL to specify that no percent escapes be replaced, or the empty string (CFSTR(" ")) to specify that all be replaced.

Return Value

The fragment, or NULL if no fragment exists. Ownership follows the Create Rule.

Discussion

A fragment is the text following a "#". These are generally used to indicate locations within a single file. This function removes all percent escape sequences except those for characters specified in *charactersToLeaveEscaped*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyHostName

Returns the host name of a given URL.

```
CFStringRef CFURLCopyHostName (
    CFURLRef anURL
);
```

Parameters*anURL*

The CFURL object to examine.

Return Value

The host name of *anURL*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

Declared In

CFURL.h

CFURLCopyLastPathComponent

Returns the last path component of a given URL.

```
CFStringRef CFURLCopyLastPathComponent (
    CFURLRef url
);
```

Parameters

url

The CFURL object to examine.

Return Value

The last path component of *url*. Ownership follows the Create Rule.

Discussion

Note that if there is no last path component, this function returns an empty string. In the code sample shown in Listing 48-1, `lastPathComponent` is an empty string.

Listing 48-1 Code sample illustrating `CFURLCopyLastPathComponent`

```
CFStringRef urlString = CFSTR("http://www.apple.com");
CFURLRef url = CFURLCreateWithString(NULL, urlString, NULL);
CFStringRef lastPathComponent = CFURLCopyLastPathComponent (url);
```

If `urlString` were created with `CFSTR("http://www.apple.com/")`, then `lastPathComponent` would be a CFString object containing the character `"/"`.

See also [CFURLCopyPathExtension](#) (page 652).

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFFTPSample

HITextViewDemo

QTCarbonShell

RecentItems

SampleCMPlugIn

Declared In

CFURL.h

CFURLCopyNetLocation

Returns the net location portion of a given URL.

```
CFStringRef CFURLCopyNetLocation (
    CFURLRef anURL
);
```

Parameters

anURL

The CFURL object to examine.

Return Value

The net location of *anURL*, or `NULL` if the URL cannot be decomposed (doesn't conform to RFC 1808). Ownership follows the Create Rule.

Discussion

The URL net location is the portion of the URL that identifies the network address of the resource. It includes the optional username and password, as well as the target machine's IP address or host name.

This function leaves any percent escape sequences intact.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyParameterString

Returns the parameter string from a given URL.

```
CFStringRef CFURLCopyParameterString (
    CFURLRef anURL,
    CFStringRef charactersToLeaveEscaped
);
```

Parameters

anURL

The `CFURL` object to examine.

charactersToLeaveEscaped

Characters whose percent escape sequences, such as `%20` for a space character, you want to leave intact. Pass `NULL` to specify that no percent escapes be replaced, or the empty string (`CFSTR(" ")`) to specify that all be replaced.

Return Value

The parameter string (as defined in RFC 1738), or `NULL` if no parameter string exists. Ownership follows the Create Rule.

Discussion

This function removes all percent escape sequences except those for characters specified in *charactersToLeaveEscaped*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyPassword

Returns the password of a given URL.

```
CFStringRef CFURLCopyPassword (
    CFURLRef anURL
);
```

Parameters*anURL*

The CFURL object to examine.

Return Value

The password, or NULL if no password exists. In some cases, this function may also return the empty string (CFSTR("")) if no password exists. You should consider NULL and the empty string to be equivalent. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyPath

Returns the path portion of a given URL.

```
CFStringRef CFURLCopyPath (
    CFURLRef anURL
);
```

Parameters*anURL*

The CFURL object to examine.

Return Value

The path of *anURL*, or NULL if the URL cannot be decomposed (doesn't conform to RFC 1808). Ownership follows the Create Rule.

Discussion

This function does not resolve the URL against its base and replaces all percent escape sequences. This function's return value includes any leading slash (giving the path the normal POSIX appearance), if present. If this behavior is not appropriate, use [CFURLCopyStrictPath](#) (page 654) whose return value omits any leading slash. You may also want to use the function [CFURLCopyFilePath](#) (page 647), which returns the URL's path as a file system path for the given path style. If the path is to be passed to file system calls, you may also want to use the function [CFURLGetFileSystemRepresentation](#) (page 669), which returns a C string.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

iTunesController

SampleDS

Declared In

CFURL.h

CFURLCopyPathExtension

Returns the path extension of a given URL.

```
CFStringRef CFURLCopyPathExtension (
    CFURLRef url
);
```

Parameters*url*

The CFURL object to examine.

Return ValueThe path extension of *url*, or NULL if no extension exists. Ownership follows the Create Rule.**Discussion**

The path extension is the portion of the last path component which follows the final period, if there is one. For example, for `http://www.apple.com/developer/macosx.today.html`, the extension is `html`, and for `http://www.apple.com/developer`, there is no path extension.

See also [CFURLCopyLastPathComponent](#) (page 649).**Availability**

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyQueryString

Returns the query string of a given URL.

```
CFStringRef CFURLCopyQueryString (
    CFURLRef anURL,
    CFStringRef charactersToLeaveEscaped
);
```

Parameters*anURL*

The CFURL object to examine.

charactersToLeaveEscaped

Characters whose percent escape sequences, such as `%20` for a space character, you want to leave intact. Pass NULL to specify that no percent escapes be replaced, or the empty string (`CFSTR("")`) to specify that all be replaced.

Return Value

The query string, or NULL if no parameter string exists. Ownership follows the Create Rule.

Discussion

This function removes all percent escape sequences except those for characters specified in *charactersToLeaveEscaped*.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyResourceSpecifier

Returns any additional resource specifiers after the path.

```
CFStringRef CFURLCopyResourceSpecifier (
    CFURLRef anURL
);
```

Parameters

anURL

The CFURL object to examine.

Return Value

The resource specifiers. Ownership follows the Create Rule.

Discussion

This function leaves any percent escape sequences intact. For decomposable URLs, this function returns everything after the path. For URLs that cannot be decomposed, this function returns everything except the scheme itself.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyScheme

Returns the scheme portion of a given URL.

```
CFStringRef CFURLCopyScheme (
    CFURLRef anURL
);
```

Parameters

anURL

The CFURL object to examine.

Return Value

The scheme of *anURL*. Ownership follows the Create Rule.

Discussion

The URL scheme is the portion of the URL specifying the transport type. For example `http`, `ftp`, and `rtsp` are schemes. This function leaves any percent escape sequences intact.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

Declared In

CFURL.h

CFURLCopyStrictPath

Returns the path portion of a given URL.

```
CFStringRef CFURLCopyStrictPath (
    CFURLRef anURL,
    Boolean *isAbsolute
);
```

Parameters

anURL

The CFURL object to examine.

isAbsolute

On return, indicates whether the path of *anURL* is absolute.

Return Value

The path of *anURL*, or NULL if the URL cannot be decomposed (doesn't conform to RFC 1808). Ownership follows the Create Rule.

Discussion

This function does not resolve the URL against its base and replaces all percent escape sequences. This function's return value does not include a leading slash and uses *isAbsolute* to report whether the URL's path is absolute. If this behavior is not appropriate, use the [CFURLCopyPath](#) (page 651) function whose return value includes the leading slash (giving the path the normal POSIX appearance). You may also want to use the [CFURLCopyFilePath](#) (page 647) function, which returns the URL's path as a file system path for the given path style. If the path is to be passed to file system calls, you may also want to use the function [CFURLGetFileSystemRepresentation](#) (page 669), which returns a C string.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCopyUserName

Returns the user name from a given URL.

```
CFStringRef CFURLCopyUserName (
    CFURLRef anURL
);
```

Parameters*anURL*

The CFURL object to examine.

Return Value

The user name, or NULL if no user name exists. In some cases, this function may also return the empty string (CFSTR("")) if no username exists. You should consider NULL and the empty string to be equivalent.

Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCreateAbsoluteURLWithBytes

Creates a new CFURL object by resolving the relative portion of a URL, specified as bytes, against its given base URL.

```
CFURLRef CFURLCreateAbsoluteURLWithBytes (
    CFAllocatorRef alloc,
    const UInt8 *relativeURLBytes,
    CFIndex length,
    CFStringEncoding encoding,
    CFURLRef baseURL,
    Boolean useCompatibilityMode
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new CFURL object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

relativeURLBytes

The character bytes that represent a relative URL to convert into a CFURL object.

*length*The number of bytes in *relativeURLBytes*.*encoding*The string encoding of the *relativeURLBytes* string. This encoding is also used to interpret percent escape sequences.*baseURL*The URL to which *relativeURLBytes* is relative.*useCompatibilityMode*If true, the rules historically used on the web are used to resolve the string specified by the *relativeURLBytes* parameter against *baseURL*. These rules are generally listed in the RFC as optional or alternate interpretations. Otherwise, the strict rules from the RFC are used.

Return Value

A new `CFURL` object, or `NULL` if *relativeURLBytes* cannot be made absolute. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFURL.h`

CFURLCreateCopyAppendingPathComponent

Creates a copy of a given URL and appends a path component.

```
CFURLRef CFURLCreateCopyAppendingPathComponent (
    CFAllocatorRef allocator,
    CFURLRef url,
    CFStringRef pathComponent,
    Boolean isDirectory
);
```

Parameters

allocator

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

url

The `CFURL` object to which to append a path component.

pathComponent

The path component to append to *url*.

isDirectory

A Boolean value that specifies whether the string is treated as a directory path when resolving against relative path components. Pass `true` if the new component indicates a directory, `false` otherwise.

Return Value

A copy of *url* appended with *pathComponent*. Ownership follows the Create Rule.

Discussion

The *isDirectory* argument specifies whether or not the new path component points to a file or a to directory. Note that the URL syntax for a directory and for a file at otherwise the same location are slightly different—directory URLs must end in `"/`. If you have the URL `http://www.apple.com/foo/` and you append the path component `bar`, then if *isDirectory* is YES then the resulting URL is `http://www.apple.com/foo/bar/`, whereas if *isDirectory* is NO then the resulting URL is `http://www.apple.com/foo/bar`. This difference is particularly important if you resolve another URL against this new URL. `file.html` relative to `http://www.apple.com/foo/bar` is `http://www.apple.com/foo/file.html`, whereas `file.html` relative to `http://www.apple.com/foo/bar/` is `http://www.apple.com/foo/bar/file.html`.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

MoreIsBetter

PDEProject
 QISA
 SpellingChecker CarbonCocoa Bundled
 SpellingChecker-CarbonCocoa

Declared In
 CFURL.h

CFURLCreateCopyAppendingPathExtension

Creates a copy of a given URL and appends a path extension.

```
CFURLRef CFURLCreateCopyAppendingPathExtension (
    CFAllocatorRef allocator,
    CFURLRef url,
    CFStringRef extension
);
```

Parameters

allocator

The allocator to use to allocate memory for the new CFURL object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

url

The CFURL object to which to append a path extension.

extension

The extension to append to *url*.

Return Value

A copy of *url* appended with *extension*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In
 CFURL.h

CFURLCreateCopyDeletingLastPathComponent

Creates a copy of a given URL with the last path component deleted.

```
CFURLRef CFURLCreateCopyDeletingLastPathComponent (
    CFAllocatorRef allocator,
    CFURLRef url
);
```

Parameters

allocator

The allocator to use to allocate memory for the new CFURL object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

url

The CFURL object whose last path component you want to delete.

Return Value

A copy of *url* with the last path component deleted. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Utilities Source

ImageClient

Declared In

CFURL.h

CFURLCreateCopyDeletingPathExtension

Creates a copy of a given URL with its last path extension removed.

```
CFURLRef CFURLCreateCopyDeletingPathExtension (
    CFAllocatorRef allocator,
    CFURLRef url
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new CFURL object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

url

The CFURL object whose path extension you want to delete.

Return Value

A copy of *url* with its last path extension removed. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCreateData

Creates a CFData object containing the content of a given URL.

```
CFDataRef CFURLCreateData (
    CFAllocatorRef allocator,
    CFURLRef url,
    CFStringEncoding encoding,
    Boolean escapeWhitespace
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFData` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

url

The URL to convert into a `CFData` object.

encoding

The string encoding to use when converting *url* into a `CFData` object.

escapeWhitespace

`true` if you want to escape whitespace characters in the URL, `false` otherwise.

Return Value

A new `CFData` object containing the content of *url*. Ownership follows the Create Rule.

Discussion

This function escapes any character that is not 7-bit ASCII with the byte-code for the given encoding. If *escapeWhitespace* is `true`, whitespace characters (' ', '\t', '\r', '\n') will be escaped as well. This is desirable if you want to embed the URL into a larger text stream like HTML.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLCreateFromFileSystemRepresentation

Creates a new `CFURL` object for a file system entity using the native representation.

```
CFURLRef CFURLCreateFromFileSystemRepresentation (
    CFAllocatorRef allocator,
    const UInt8 *buffer,
    CFIndex bufLen,
    Boolean isDirectory
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

buffer

The character bytes to convert into a `CFURL` object. This should be the path as you would use in POSIX function calls.

bufLen

The number of bytes in the buffer.

isDirectory

A Boolean value that specifies whether the string is treated as a directory path when resolving against relative path components—`true` if the pathname indicates a directory, `false` otherwise.

Return Value

A new CFURL object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools

CFFTPSample

CFPrefTopScores

MemoryBasedBundle

MoreIsBetter

Declared In

CFURL.h

CFURLCreateFromFileSystemRepresentationRelativeToBase

Creates a CFURL object from a native character string path relative to a base URL.

```
CFURLRef CFURLCreateFromFileSystemRepresentationRelativeToBase (
    CFAllocatorRef allocator,
    const UInt8 *buffer,
    CFIndex bufLen,
    Boolean isDirectory,
    CFURLRef baseURL
);
```

Parameters

allocator

The allocator to use to allocate memory for the new CFURL object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

buffer

The character bytes to convert into a CFURL object. This should be the path as you would use in POSIX function calls.

bufLen

The number of bytes in the buffer.

isDirectory

A Boolean value that specifies whether the string is treated as a directory path when resolving against relative path components. Pass `true` if the pathname indicates a directory, `false` otherwise.

baseURL

The URL against which to resolve the path.

Return Value

A new CFURL object. Ownership follows the Create Rule.

Discussion

This function takes a path name in the form of a native character string, resolves it against a base URL, and returns a new `CFURL` object containing the result.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFURL.h`

CFURLCreateFromFSRef

Creates a URL from a given directory or file.

```
CFURLRef CFURLCreateFromFSRef (
    CFAllocatorRef allocator,
    const struct FSRef *fsRef
);
```

Parameters

allocator

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

fsRef

The file or directory representing the URL.

Return Value

A new `CFURL` object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

`BSDLLCTest`

`CarbonSketch`

`QTCarbonShell`

Declared In

`CFURL.h`

CFURLCreateStringByAddingPercentEscapes

Creates a copy of a string, replacing certain characters with the equivalent percent escape sequence based on the specified encoding.

```

CFStringRef CFURLCreateStringByAddingPercentEscapes (
    CFAllocatorRef allocator,
    CFStringRef originalString,
    CFStringRef charactersToLeaveUnescaped,
    CFStringRef legalURLCharactersToBeEscaped,
    CFStringEncoding encoding
);

```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFString` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

originalString

The `CFString` object to copy.

charactersToLeaveUnescaped

Characters whose percent escape sequences you want to leave intact. Pass `NULL` to specify that all escape sequences be replaced.

legalURLCharactersToBeEscaped

Legal characters to be escaped. Pass `NULL` to specify that no legal characters be replaced.

encoding

The encoding to use for the translation. If you are uncertain of the correct encoding, you should use UTF-8, which is the encoding designated by RFC 2396 as the correct encoding for use in URLs.

Return Value

A copy of *originalString* replacing certain characters. If it does not need to be modified (no percent escape sequences are missing), this function may merely return *originalString* with its reference count incremented. Ownership follows the Create Rule.

Discussion

The characters escaped are all characters that are not legal URL characters (based on RFC 2396), plus any characters in *legalURLCharactersToBeEscaped*, less any characters in *charactersToLeaveUnescaped*. To simply correct any non-URL characters in an otherwise correct URL string, pass `NULL` for the *allocator*, *charactersToLeaveUnescaped*, and *legalURLCharactersToBeEscaped* parameters, and `kCFStringEncodingUTF8` as the *encoding* parameter.

It may be difficult to use this function to "clean up" unescaped or partially escaped URL strings where sequences are unpredictable and you cannot specify *charactersToLeaveUnescaped*. Instead, you can "pre-process" a URL string using [CFURLCreateStringByReplacingPercentEscapesUsingEncoding](#) (page 663) then add the escape characters using [CFURLCreateStringByAddingPercentEscapes](#) (page 661), as shown in the following code fragment.

```

CFStringRef originalURLString =
CFSTR("http://online.store.com/storefront/?request=get-document&doi=10.1175%2F1520-0426(2005)014%3C1157:00A0SS%3E2.0.CO%3B2");
CFStringRef preprocessedString =
    CFURLCreateStringByReplacingPercentEscapesUsingEncoding(kCFAllocatorDefault,
        originalURLString, CFSTR(""), kCFStringEncodingUTF8);
CFStringRef urlString =
    CFURLCreateStringByAddingPercentEscapes(kCFAllocatorDefault,
        preprocessedString, NULL, NULL, kCFStringEncodingUTF8);
url = CFURLCreateWithString(kCFAllocatorDefault, urlString, NULL);

```

Availability

Available in CarbonLib v1.3 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFNetworkHTTPDownload

Declared In

CFURL.h

CFURLCreateStringByReplacingPercentEscapes

Creates a new string by replacing any percent escape sequences with their character equivalent.

```
CFStringRef CFURLCreateStringByReplacingPercentEscapes (
    CFAllocatorRef allocator,
    CFStringRef originalString,
    CFStringRef charactersToLeaveEscaped
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFString` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

originalString

The `CFString` object to be copied and modified.

charactersToLeaveEscaped

Characters whose percent escape sequences, such as `%20` for a space character, you want to leave intact. Pass `NULL` to specify that no percent escapes be replaced, or the empty string (`CFSTR(" ")`) to specify that all be replaced.

Return Value

A new `CFString` object, or `NULL` if the percent escapes cannot be converted to characters, assuming UTF-8 encoding. If no characters need to be replaced, this function returns the original string with its reference count incremented. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFNetworkHTTPDownload

Declared In

CFURL.h

CFURLCreateStringByReplacingPercentEscapesUsingEncoding

Creates a new string by replacing any percent escape sequences with their character equivalent.

```
CFStringRef CFURLCreateStringByReplacingPercentEscapesUsingEncoding (
    CFAllocatorRef allocator,
    CFStringRef origString,
    CFStringRef charsToLeaveEscaped,
    CFStringEncoding encoding
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFString` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

originalString

The `CFString` object to be copied and modified.

charactersToLeaveEscaped

Characters whose percent escape sequences, such as `%20` for a space character, you want to leave intact. Pass `NULL` to specify that no percent escapes be replaced, or the empty string (`CFSTR(" ")`) to specify that all be replaced.

encoding

Specifies the encoding to use when interpreting percent escapes.

Return Value

A new `CFString` object, or `NULL` if the percent escapes cannot be converted to characters, assuming the encoding given by *encoding*. If no characters need to be replaced, this function returns the original string with its reference count incremented. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.3 and later.

Declared In

`CFURL.h`

CFURLCreateWithBytes

Creates a `CFURL` object using a given character bytes.

```
CFURLRef CFURLCreateWithBytes (
    CFAllocatorRef allocator,
    const UInt8 *URLBytes,
    CFIndex length,
    CFStringEncoding encoding,
    CFURLRef baseURL
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

URLBytes

The character bytes to convert into a `CFURL` object.

length

The number of bytes in *URLBytes*.

encoding

The string encoding of the `URLBytes` string. This encoding is also used to interpret percent escape sequences.

baseURL

The URL to which `URLBytes` is relative. Pass `NULL` if `URLBytes` contains an absolute URL or if you want to create a relative URL. If `URLBytes` contains an absolute URL, this parameter is ignored.

Return Value

A new `CFURL` object. Ownership follows the Create Rule.

Discussion

The specified string encoding will be used both to interpret `URLBytes`, and to interpret any percent-escapes within the string.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CarbonCocoa_PictureCursor

DisplayURL

ImageBrowserView

RecentItems

Declared In

`CFURL.h`

CFURLCreateWithFilePath

Creates a `CFURL` object using a local file system path string.

```
CFURLRef CFURLCreateWithFilePath (
    CFAllocatorRef allocator,
    CFStringRef filePath,
    CFURLPathStyle pathStyle,
    Boolean isDirectory
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

filePath

The path string to convert to a `CFURL` object.

pathStyle

The operating system path style used in `filePath`. See [Path Style](#) (page 675) for a list of possible values.

isDirectory

A Boolean value that specifies whether `filePath` is treated as a directory path when resolving against relative path components. Pass `true` if the pathname indicates a directory, `false` otherwise.

Return Value

A new CFURL object. Ownership follows the Create Rule.

Discussion

If *filePath* is not absolute, the resulting URL will be considered relative to the current working directory (evaluated when this function is being invoked).

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageBrowserView

Quartz EB

SimpleUserClient

TexturePerformanceDemo

TextureRange

Declared In

CFURL.h

CFURLCreateWithFileSystemPathRelativeToBase

Creates a CFURL object using a local file system path string relative to a base URL.

```
CFURLRef CFURLCreateWithFileSystemPathRelativeToBase (
    CFAllocatorRef allocator,
    CFStringRef filePath,
    CFURLPathStyle pathStyle,
    Boolean isDirectory,
    CFURLRef baseURL
);
```

Parameters

allocator

The allocator to use to allocate memory for the new CFURL object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

filePath

The path string to convert to a CFURL object.

pathStyle

The operating system path style used in the *filePath* string. See [Path Style](#) (page 675) for a list of possible values.

isDirectory

A Boolean value that specifies whether *filePath* is treated as a directory path when resolving against relative path components. Pass `true` if the pathname indicates a directory, `false` otherwise.

baseURL

The base URL against which to resolve the *filePath*.

Return Value

A new CFURL object. Ownership follows the Create Rule.

Discussion

This function takes a path name in the form of a `CFString` object, resolves it against a base URL, and returns a new `CFURL` object containing the result.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

Aperture Image Resizer

Declared In

`CFURL.h`

CFURLCreateWithString

Creates a `CFURL` object using a given `CFString` object.

```
CFURLRef CFURLCreateWithString (
    CFAllocatorRef allocator,
    CFStringRef urlString,
    CFURLRef baseURL
);
```

Parameters

allocator

The allocator to use to allocate memory for the new `CFURL` object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

URLString

The `CFString` object containing the URL string.

baseURL

The URL to which `URLString` is relative. Pass `NULL` if `URLString` contains an absolute URL or if you want to create a relative URL. If `URLString` contains an absolute URL, `baseURL` is ignored.

Return Value

A new `CFURL` object. Ownership follows the Create Rule.

Discussion

Any escape sequences in `URLString` will be interpreted using UTF-8.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AuthForAll

CFFTPSample

ComboBoxPrefs

DockBrowser

LocalServer

Declared In

`CFURL.h`

CFURLGetBaseURL

Returns the base URL of a given URL if it exists.

```

CFURLRef CFURLGetBaseURL (
    CFURLRef anURL
);

```

Parameters

anURL

The CFURL object to examine.

Return Value

A CFURL object representing the base URL of *anURL*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLGetByteRangeForComponent

Returns the range of the specified component in the bytes of a URL.

```

CFRange CFURLGetByteRangeForComponent (
    CFURLRef url,
    CFURLComponentType component,
    CFRange *rangeIncludingSeparators
);

```

Parameters

anURL

The URL containing *component*.

component

The type of component in *anURL* whose range you want to obtain. See [Component Type](#) (page 673) for possible values.

rangeIncludingSeparators

Specifies the range of *component* including the sequences that separate component from the previous and next components. If there is no previous or next components, this function will match the range of the component itself. If *anURL* does not contain *component*, *rangeIncludingSeparators* is set to the location where the component would be inserted.

Return Value

The range of bytes for *component* in the buffer returned by the [CFURLGetBytes](#) (page 669) function. If *anURL* does not contain *component*, the first part of the returned range is set to [kCFNotFound](#) (page 765).

Discussion

This function is intended to be used in conjunction with the [CFURLGetBytes](#) (page 669) function, since the range returned is only applicable to the bytes returned by [CFURLGetBytes](#) (page 669).

Availability

Available in Mac OS X v10.3 and later.

Related Sample Code

DisplayURL

Declared In

CFURL.h

CFURLGetBytes

Returns by reference the byte representation of a URL object.

```
CFIndex CFURLGetBytes (
    CFURLRef url,
    UInt8 *buffer,
    CFIndex bufferLength
);
```

Parameters*anURL*

The URL object to convert to a byte representation.

buffer

The buffer where you want the bytes to be placed. If the buffer is of insufficient size, returns -1 and no bytes are placed in buffer. If NULL the needed length is computed and returned. The returned bytes are the original bytes from which the URL was created. If the URL was created from a string, the bytes are the bytes of the string encoded via UTF-8.

*bufferLength*The number of bytes in *buffer*.**Return Value**Returns the number of bytes in *buffer* that were filled. If the buffer is of insufficient size, returns -1.**Availability**

Available in Mac OS X v10.3 and later.

Related Sample Code

DisplayURL

Declared In

CFURL.h

CFURLGetFileSystemRepresentation

Fills a buffer with the file system's native string representation of a given URL's path.

```
Boolean CFURLGetFileSystemRepresentation (
    CFURLRef url,
    Boolean resolveAgainstBase,
    UInt8 *buffer,
    CFIndex maxBufLen
);
```

Parameters*url*

The CFURL object whose native file system representation you want to obtain.

resolveAgainstBase

Pass `true` to return an absolute path name.

buffer

A pointer to a character buffer. On return, the buffer holds the native file system's representation of *url*. The buffer is null-terminated. This parameter must be at least *maxBufLen* in size for the file system in question to avoid failures for insufficiently large buffers.

maxBufLen

The maximum number of characters that can be written to *buffer*.

Return Value

`true` if successful, `false` if an error occurred.

Discussion

No more than *maxBufLen* bytes are written to *buffer*. If *url* requires more than *maxBufLen* bytes to represent itself, including the terminating null byte, this function returns `false`. To avoid this possible failure, you should pass a buffer with size of at least the maximum path length for the file system in question.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

CFPrefTopScores

EmbeddedAppleScripts

MoreIsBetter

QISA

Declared In

CFURL.h

CFURLGetFSRef

Converts a given URL to a file or directory object.

```
Boolean CFURLGetFSRef (
    CFURLRef url,
    struct FSRef *fsRef
);
```

Parameters

url

The CFURL object to convert to a file or directory object.

fsRef

Upon return, contains the file or directory object representing *url*.

Return Value

`true` if the conversion was successful, otherwise `false`.

Special Considerations

The function cannot create an FSRef object if the path specified by *url* contains an alias. The function can, however, traverse symbolic links.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

CFURLGetPortNumber

Returns the port number from a given URL.

```
SInt32 CFURLGetPortNumber (
    CFURLRef anURL
);
```

Parameters

anURL

The CFURL object to examine.

Return Value

The port number of *anURL*, or -1 if no port number exists.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

ImageClient

Declared In

CFURL.h

CFURLGetString

Returns the URL as a CFString object.

```
CFStringRef CFURLGetString (
    CFURLRef anURL
);
```

Parameters

anURL

The CFURL object to convert into a CFString object.

Return Value

A string representation of *anURL*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AlbumToSlideshow

LoginItemsAE

QISA

Declared In

CFURL.h

CFURLGetTypeID

Returns the type identifier for the CFURL opaque type.

```
CFTypeID CFURLGetTypeID (
    void
);
```

Return Value

The type identifier for the CFURL opaque type.

Availability

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

LoginItemsAE

Declared In

CFURL.h

CFURLHasDirectoryPath

Determines if a given URL's path represents a directory.

```
Boolean CFURLHasDirectoryPath (
    CFURLRef anURL
);
```

Parameters*anURL*

The CFURL object to examine.

Return Value*true* if *anURL* represents a directory, *false* otherwise.**Availability**

Available in CarbonLib v1.0 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CFFTPSample

ImageClient

MoreAppleEvents

MoreIsBetter

QISA

Declared In

CFURL.h

Data Types

CFURLRef

A reference to a CFURL object.

```
typedef const struct __CFURL *CFURLRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFURL.h

Constants

Component Type

The types of components in a URL.

```
typedef enum {
    kCFURLComponentScheme = 1,
    kCFURLComponentNetLocation = 2,
    kCFURLComponentPath = 3,
    kCFURLComponentResourceSpecifier = 4,
    kCFURLComponentUser = 5,
    kCFURLComponentPassword = 6,
    kCFURLComponentUserInfo = 7,
    kCFURLComponentHost = 8,
    kCFURLComponentPort = 9,
    kCFURLComponentParameterString = 10,
    kCFURLComponentQuery = 11,
    kCFURLComponentFragment = 12
} CFURLComponentType;
typedef enum CFURLPathStyle CFURLPathStyle;
```

Constants

kCFURLComponentScheme

The URL's scheme.

Available in Mac OS X v10.3 and later.

Declared in CFURL.h.

kCFURLComponentNetLocation

The URL's network location.

Available in Mac OS X v10.3 and later.

Declared in CFURL.h.

- `kCFURLComponentPath`
The URL's path component.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentResourceSpecifier`
The URL's resource specifier.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentUser`
The URL's user.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentPassword`
The user's password.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentUserInfo`
The user's information.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentHost`
The URL's host.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentPort`
The URL's port.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentParameterString`
The URL's parameter string.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentQuery`
The URL's query.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.
- `kCFURLComponentFragment`
The URL's fragment.
Available in Mac OS X v10.3 and later.
Declared in `CFURL.h`.

Discussion

These constants are used by the [CFURLGetByteRangeForComponent](#) (page 668) function.

Availability

Available in Mac OS X v10.3 and later.

Path Style

Options you can use to determine how CFURL functions parse a file system path name.

```
enum CFURLPathStyle {
    kCFURLPOSIXPathStyle = 0,
    kCFURLHFSPathStyle = 1,
    kCFURLWindowsPathStyle = 2
};
typedef enum CFURLPathStyle CFURLPathStyle;
```

Constants

`kCFURLPOSIXPathStyle`

Indicates a POSIX style path name. Components are slash delimited. A leading slash indicates an absolute path; a trailing slash is not significant.

Available in Mac OS X v10.0 and later.

Declared in `CFURL.h`.

`kCFURLHFSPathStyle`

Indicates a HFS style path name. Components are colon delimited. A leading colon indicates a relative path, otherwise the first path component denotes the volume.

Available in Mac OS X v10.0 and later.

Declared in `CFURL.h`.

`kCFURLWindowsPathStyle`

Indicates a Windows style path name.

Available in Mac OS X v10.0 and later.

Declared in `CFURL.h`.

CFUserNotification Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFUserNotification.h
Companion guide	Notification Programming Topics for Cocoa

Overview

A `CFUserNotification` object presents a simple dialog on the screen and optionally receives feedback from the user. The contents of the dialog can include a header, a message, an icon, text fields, a pop-up button, radio buttons or checkboxes, and up to three ordinary buttons. Use `CFUserNotification` in processes that do not otherwise have user interfaces, but may need occasional interaction with the user.

You create a user notification with the `CFUserNotificationCreate` (page 678) function. You pass in a dictionary whose keys describe the items to place into the dialog. (See "[Dialog Description Keys](#)" (page 689) for the list of keys.) A set of flags passed to the function determines, among other things, whether secure text fields are used (such as for password fields), whether radio buttons or checkboxes are used, and which of these buttons are checked by default. You can also specify a timeout for the dialog, in which case the dialog cancels itself if the user does not respond in the allotted time period.

A user notification displays its dialog as soon as it is created. If any reply is required, it may be awaited in one of two ways: either synchronously, using `CFUserNotificationReceiveResponse` (page 684), or asynchronously, using a run loop source created with `CFUserNotificationCreateRunLoopSource` (page 679). `CFUserNotificationReceiveResponse` (page 684) has a timeout parameter that determines how long it will block (zero meaning indefinitely) and it may be called as many times as necessary until a response arrives. If a user notification has not yet received a response, it may be updated with new information or it may be cancelled. User notifications may not be reused.

`CFUserNotification` provides two convenience functions, `CFUserNotificationDisplayNotice` (page 681) and `CFUserNotificationDisplayAlert` (page 680), to display very basic dialogs that either require no response from the user or require only a single button to be pressed, respectively.

Functions

CFUserNotificationCancel

Cancels a user notification dialog.

```

SInt32 CFUserNotificationCancel (
    CFUserNotificationRef userNotification
);

```

Parameters

userNotification

The user notification to cancel.

Return Value

0 if the cancel was successful; a non-0 value otherwise.

Discussion

You must cancel a user notification if you want to remove its dialog from the screen before the user dismisses it. It is not sufficient to just release the object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationCheckBoxChecked

Returns a flag used to set or test a checkbox's state.

```

CFOptionFlags CFUserNotificationCheckBoxChecked (
    CFIndex i
);

```

Parameters

idx

The index of the checkbox to set or test. The index corresponds to the order in which the checkbox titles are listed in the [kCFUserNotificationCheckBoxTitlesKey](#) (page 691) array of the user notification's description dictionary. *idx* must be in the range 0 to 7.

Return Value

A flag that can be used either to set the state of a checkbox when creating a user notification with [CFUserNotificationCreate](#) (page 678) or to test a checkbox's state returned in a user notification's response flags, such as from [CFUserNotificationReceiveResponse](#) (page 684), when the notification dialog is dismissed.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationCreate

Creates a CFUserNotification object and displays its notification dialog on screen.

```
CFUserNotificationRef CFUserNotificationCreate (
    CFAllocatorRef allocator,
    CFTimeInterval timeout,
    CFOptionFlags flags,
    SInt32 *error,
    CFDictionaryRef dictionary
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

timeout

The time to wait before the notification dialog dismisses itself if the user does not respond. If 0, the notification never times out.

flags

A set of flags describing the type of notification to display. These flags specify an alert level for the notification (see [Alert Levels](#) (page 687)), determine whether radio buttons or checkboxes are to be used (see [Button Flags](#) (page 689)), specify which, if any, of these buttons are checked by default (see [CFUserNotificationCheckBoxChecked](#) (page 678)), specify whether any of the text fields are to be secure text fields (see [CFUserNotificationSecureTextField](#) (page 685)), and determine which element of a pop-up menu, if present, should be selected by default (see [CFUserNotificationPopUpSelection](#) (page 684)). Combine these flags together by performing a bitwise-OR operation with all the individual flags.

error

On return contains an integer error code. If 0, the user notification was successfully created and displayed.

dictionary

A description of the elements to display in the notification dialog. The possible keys are listed in ["Dialog Description Keys"](#) (page 689). The dictionary must contain a value for the key [kCFUserNotificationAlertHeaderKey](#) (page 690), but the other keys are optional.

Return Value

The new `CFUserNotification` object. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFUserNotification.h`

CFUserNotificationCreateRunLoopSource

Creates a run loop source for a user notification.

```
CFRunLoopSourceRef CFUserNotificationCreateRunLoopSource (
    CFAllocatorRef allocator,
    CFUserNotificationRef userNotification,
    CFUserNotificationCallback callout,
    CFIndex order
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

userNotification

The user notification to use.

callout

The callback function to invoke when the user notification dialog is dismissed.

order

A priority index indicating the order in which run loop sources are processed. User notifications currently ignore this parameter. Pass 0 for this value.

Return Value

The new `CFRunLoopSource` object. Ownership follows the Create Rule.

Discussion

A run loop source needs to be added to a run loop before it can fire and call its callback function. To add the source to a run loop, use [CFRunLoopAddSource](#) (page 445).

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFUserNotification.h`

CFUserNotificationDisplayAlert

Displays a user notification dialog and waits for a user response.

```
SInt32 CFUserNotificationDisplayAlert (
    CFTimeInterval timeout,
    CFOptionFlags flags,
    CFURLRef iconURL,
    CFURLRef soundURL,
    CFURLRef localizationURL,
    CFStringRef alertHeader,
    CFStringRef alertMessage,
    CFStringRef defaultButtonTitle,
    CFStringRef alternateButtonTitle,
    CFStringRef otherButtonTitle,
    CFOptionFlags *responseFlags
);
```

Parameters*timeout*

The amount of time to wait for the user to dismiss the notification dialog before the dialog dismisses itself. Pass 0 to have the dialog never time out.

flags

A set of flags describing the type of notification dialog to display. The value is normally just the alert level from [Alert Levels](#) (page 687). If you don't want a default button displayed, perform a bitwise-OR operation with the alert level and the constant `kCFUserNotificationNoDefaultButtonFlag` (page 689).

iconURL

A file URL pointing to the icon to display in the dialog. If `NULL`, a default icon is used based on the notification's alert level specified in *flags*.

soundURL

Not used.

localizationURL

A file URL pointing to a bundle that contains localized versions of the strings displayed in the dialog. Can be `NULL`.

alertHeader

The title of the notification dialog. Cannot be `NULL`.

alertMessage

The message string to display in the dialog. Can be `NULL`.

defaultButtonTitle

The title of the default button. If `NULL`, the string `OK` is used.

alternateButtonTitle

The title of an optional alternate button. Can be `NULL`.

otherButtonTitle

The title of an optional third button. Can be `NULL`.

responseFlags

On return, contains flags identifying how the notification was dismissed. See [Response Codes](#) (page 688) for details.

Return Value

0 if the cancel was successful; a non-0 value otherwise.

Discussion

This function blocks the current thread's execution until the dialog is dismissed, either by the user or by timing out.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFUserNotification.h`

CFUserNotificationDisplayNotice

Displays a user notification dialog that does not need a user response.

```

SInt32 CFUserNotificationDisplayNotice (
    CFTimeInterval timeout,
    CFOptionFlags flags,
    CFURLRef iconURL,
    CFURLRef soundURL,
    CFURLRef localizationURL,
    CFStringRef alertHeader,
    CFStringRef alertMessage,
    CFStringRef defaultButtonTitle
);

```

Parameters*timeout*

The amount of time to wait for the user to dismiss the notification dialog before the dialog dismisses itself. Pass 0 to have the dialog never time out.

flags

A set of flags describing the type of notification dialog to display. The value is normally just the alert level from [Alert Levels](#) (page 687). If you don't want a default button displayed, perform a bitwise-OR operation with the alert level and the constant `kCFUserNotificationNoDefaultButtonFlag` (page 689).

iconURL

A file URL pointing to the icon to display in the dialog. If NULL, a default icon is used based on the notification's alert level specified in *flags*.

soundURL

Not used.

localizationURL

A file URL pointing to a bundle that contains localized versions of the strings displayed in the dialog. Can be NULL.

alertHeader

The title of the notification dialog. Cannot be NULL.

alertMessage

The message string to display in the dialog. Can be NULL.

defaultButtonTitle

The title of the default button. If NULL, the string OK is used.

Return Value

0 if the cancel was successful; a non-0 value otherwise.

Discussion

This function returns immediately. It does not wait for a user response after displaying the dialog.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

X11CallCarbonAndCocoa

Declared In

CFUserNotification.h

CFUserNotificationGetResponseDictionary

Returns the dictionary containing all the text field values from a dismissed notification dialog.

```
CFDictionaryRef CFUserNotificationGetResponseDictionary (
    CFUserNotificationRef userNotification
);
```

Parameters

userNotification

The user notification to use.

Return Value

A dictionary holding the values of all the text fields in *userNotification* when it was dismissed. The values are in an array stored with the key `kCFUserNotificationTextFieldValuesKey` (page 691). Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationGetResponseValue

Extracts the values of the text fields from a dismissed notification dialog.

```
CFStringRef CFUserNotificationGetResponseValue (
    CFUserNotificationRef userNotification,
    CFStringRef key,
    CFIndex idx
);
```

Parameters

userNotification

The user notification to use.

key

The dictionary key identifying the text fields to use. Currently, only `kCFUserNotificationTextFieldValuesKey` (page 691) is supported.

idx

The index of the text field value to return. The index corresponds to the order in which text fields are listed in the `kCFUserNotificationTextFieldTitlesKey` (page 691) array in the user notification's description dictionary.

Return Value

The value of the text field identified by *key* and *idx*. Ownership follows the Get Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationGetTypeID

Returns the type identifier for the `CFUserNotification` opaque type.

```
CFTypeID CFUserNotificationGetTypeID (
    void
);
```

Return Value

The type identifier for the `CFUserNotification` opaque type.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFUserNotification.h`

CFUserNotificationPopUpSelection

Returns a flag used to set the selected element of a pop-up menu.

```
CFOptionFlags CFUserNotificationPopUpSelection (
    CFIndex n
);
```

Parameters

idx

The index of the pop-up menu element to select. The index corresponds to the order in which the pop-up menu elements are listed in the `kCFUserNotificationPopUpTitlesKey` (page 691) array of the user notification's description dictionary. *idx* must be in the range 0 to 255.

Return Value

A flag that can be used to set the selected element of a pop-up menu when creating a user notification with `CFUserNotificationCreate` (page 678).

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFUserNotification.h`

CFUserNotificationReceiveResponse

Waits for the user to respond to a notification or for the notification to time out.

```
SInt32 CFUserNotificationReceiveResponse (
    CFUserNotificationRef userNotification,
    CFTimeInterval timeout,
    CFOptionFlags *responseFlags
);
```

Parameters

userNotification

The user notification to use.

timeout

The amount of time to wait for the user to respond to *userNotification* or for the notification to time out. If neither happens before *timeout* passes, this function returns a non-0 value. If *timeout* is 0, the function blocks until the user notification is dismissed.

responseFlags

On return, contains flags identifying how the notification was dismissed, the state of any checkboxes, and the selected element of the pop-up menu. Bits 0-1 of the value hold an identifier for the button pressed by the user (see [Response Codes](#) (page 688)). Extract the identifier by performing a bitwise-AND operation with 0x3. Bits 8-15 of *responseFlags* hold the state of up to 8 checkboxes or radio buttons, if present. Extract the flags by performing bitwise-AND operations with the return value of [CFUserNotificationCheckBoxChecked](#) (page 678). Bits 24-31 hold the index number of the element selected in a pop-up menu, if present. Extract the index by performing a 24-bit right shift: `responseFlags >> 24`.

Return Value

0 if the cancel was successful; a non-0 value otherwise.

Discussion

Use this function to poll a user notification for a user response. You can call it any number of times on the same user notification.

To avoid polling and blocking your thread's execution, you can create a run loop source for the user notification with [CFUserNotificationCreateRunLoopSource](#) (page 679). You will then receive a callback when the dialog is dismissed.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationSecureTextField

Returns a flag used to set the secure state of a text field.

```
CFOptionFlags CFUserNotificationSecureTextField (
    CFIndex i
);
```

Parameters*idx*

The index of the text field to make secure. The index corresponds to the order in which the text fields are listed in the [kCFUserNotificationTextFieldTitlesKey](#) (page 691) array of the user notification's description dictionary. *idx* must be in the range 0 to 7.

Return Value

A flag that can be used to set the secure state of a text field when creating a user notification with [CFUserNotificationCreate](#) (page 678).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

CFUserNotificationUpdate

Updates a displayed user notification dialog with new user interface information.

```

SInt32 CFUserNotificationUpdate (
    CFUserNotificationRef userNotification,
    CTimeInterval timeout,
    CFOptionFlags flags,
    CFDictionaryRef dictionary
);

```

Parameters

userNotification

The user notification to update.

timeout

The new timeout value for the dialog.

flags

A set of flags describing the type of notification to display. See [CFUserNotificationCreate](#) (page 678) for details.

dictionary

A description of the elements to display in the notification dialog. The possible keys are listed in ["Dialog Description Keys"](#) (page 689).

Return Value

0 if the cancel was successful; a non-0 value otherwise.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

Callbacks

CFUserNotificationCallback

Callback invoked when an asynchronous user notification dialog is dismissed.

```

typedef void (*CFUserNotificationCallback) (
    CFUserNotificationRef userNotification,
    CFOptionFlags responseFlags
);

```

If you name your function `MyCallback`, you would declare it like this:

```

void MyCallback (
    CFUserNotificationRef userNotification,
    CFOptionFlags responseFlags
);

```

Parameters*userNotification*

The user notification that was dismissed.

responseFlags

On return, contains flags identifying how the notification was dismissed, the state of any checkboxes, and the selected item of the pop-up menu. See [CFUserNotificationReceiveResponse](#) (page 684) for details.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

Data Types

CFUserNotificationRef

A reference to a user notification object.

```
typedef struct __CFUserNotification *CFUserNotificationRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUserNotification.h

Constants

Alert Levels

Flags identifying the seriousness of a user notification.

```
enum {
    kCFUserNotificationStopAlertLevel = 0,
    kCFUserNotificationNoteAlertLevel = 1,
    kCFUserNotificationCautionAlertLevel = 2,
    kCFUserNotificationPlainAlertLevel = 3
};
```

Constants

`kCFUserNotificationStopAlertLevel`

The notification is very serious.

A stop icon is displayed by default.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationNoteAlertLevel`

The notification is not very serious.

A note icon is displayed by default.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationCautionAlertLevel`

The notification is somewhat serious.

A caution icon is displayed by default.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationPlainAlertLevel`

The notification is not serious.

An information icon is displayed by default.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

Discussion

If you specify an icon to display in the dialog, this icon overrides the default icon used for each alert level.

Response Codes

Response codes identifying the button that was pressed to dismiss a notification dialog.

```
enum {
    kCFUserNotificationDefaultResponse = 0,
    kCFUserNotificationAlternateResponse = 1,
    kCFUserNotificationOtherResponse = 2,
    kCFUserNotificationCancelResponse = 3
};
```

Constants

`kCFUserNotificationDefaultResponse`

The default button was pressed.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationAlternateResponse`

The alternate button was pressed.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationOtherResponse`

The third button was pressed.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationCancelResponse`

No button was pressed and the notification timed out.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

Discussion

To extract this value from the response flags of a dismissed notification (such as returned by [CFUserNotificationReceiveResponse](#) (page 684)), you must perform a bitwise-AND operation between the returned response flags and `0x3` before comparing the value to these constants.

Button Flags

Flags that alter the display of buttons in a user notification dialog.

```
enum {
    kCFUserNotificationNoDefaultButtonFlag = (1 << 5),
    kCFUserNotificationUseRadioButtonsFlag = (1 << 6)
};
```

Constants

`kCFUserNotificationNoDefaultButtonFlag`

Displays the dialog without the default, alternate, or other buttons.

The dialog remains on screen until it times out or you cancel it with [CFUserNotificationCancel](#) (page 677). If you provide a title for the default button in the user notification's description dictionary, this flag is ignored and buttons show up normally.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationUseRadioButtonsFlag`

Creates a group of radio buttons instead of checkboxes for the elements in the [kCFUserNotificationCheckBoxTitlesKey](#) (page 691) array in the user notification's description dictionary.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

Discussion

You specify these flags when you create the user notification with [CFUserNotificationCreate](#) (page 678).

Dialog Description Keys

Keys used in a user notification's description dictionary, which describes the contents of the notification dialog to display.

```

const CFStringRef kCFUserNotificationIconURLKey;
const CFStringRef kCFUserNotificationSoundURLKey;
const CFStringRef kCFUserNotificationLocalizationURLKey;
const CFStringRef kCFUserNotificationAlertHeaderKey;
const CFStringRef kCFUserNotificationAlertMessageKey;
const CFStringRef kCFUserNotificationDefaultButtonTitleKey;
const CFStringRef kCFUserNotificationAlternateButtonTitleKey;
const CFStringRef kCFUserNotificationOtherButtonTitleKey;
const CFStringRef kCFUserNotificationProgressIndicatorValueKey;
const CFStringRef kCFUserNotificationPopUpTitlesKey;
const CFStringRef kCFUserNotificationTextFieldTitlesKey;
const CFStringRef kCFUserNotificationCheckBoxTitlesKey;
const CFStringRef kCFUserNotificationTextFieldValuesKey;
const CFStringRef kCFUserNotificationPopUpSelectionKey

```

Constants

`kCFUserNotificationIconURLKey`

A file URL pointing to the icon to display in the dialog.

If absent, a default icon based on the alert level is used.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationSoundURLKey`

Not used.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationLocalizationURLKey`

A file URL pointing to a bundle that contains localized versions of the strings displayed in the dialog.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationAlertHeaderKey`

The title of the notification dialog.

This key is required.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationAlertMessageKey`

The message string to display in the dialog.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationDefaultButtonTitleKey`

The title of the default button.

If absent and the dialog is not being created with the

[kCFUserNotificationNoDefaultButtonFlag](#) (page 689) flag, a default button title of OK is used.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationAlternateButtonTitleKey`

The title of an optional alternate button.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationOtherButtonTitleKey`

The title of an optional third button.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationProgressIndicatorValueKey`

Not used.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationPopUpTitlesKey`

The list of strings to display in a pop-up menu.

The array cannot have more than 256 elements.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationTextFieldTitlesKey`

The list of titles for all the text fields to display.

If only one text field is to be displayed, you can pass its title string directly without putting it into an array first.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationCheckBoxTitlesKey`

The list of titles for all the checkboxes or radio buttons to display.

The array cannot have more than 8 elements. If only one checkbox is to be displayed, you can pass its title string directly without putting it into an array first.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationTextFieldValuesKey`

The list of values to put into the text fields. If only one text field is to be displayed, you can pass its value string directly without putting it into an array first.

Available in Mac OS X v10.0 and later.

Declared in `CFUserNotification.h`.

`kCFUserNotificationPopUpSelectionKey`

The item that was selected from a pop-up menu.

Available in Mac OS X v10.3 and later.

Declared in `CFUserNotification.h`.

Discussion

When creating the user notification with `CFUserNotificationCreate` (page 678), the description dictionary must have a value for `kCFUserNotificationAlertHeaderKey` (page 690). All other keys are optional.

The button title keys must be given in right-to-left order—you therefore must use the `kCFUserNotificationDefaultButtonTitleKey` constant for the rightmost button even if it is conceptually not a "default" button (for example, if you want a single "Cancel" button that should not have color, should not pulse, and should not have return for a key equivalent). If, however, you set the `kCFUserNotificationNoDefaultButtonFlag`, the rightmost button does not behave as a default button (although it will still be the "default" button in the sense of using `kCFUserNotificationDefaultButtonTitleKey` and `kCFUserNotificationDefaultResponse`). The following code fragment shows how you can create a notification that contains a single "Cancel" button that does not behave as a default button.

```
const void* keys[] = {kCFUserNotificationAlertHeaderKey,
                    kCFUserNotificationProgressIndicatorValueKey,
                    kCFUserNotificationDefaultButtonTitleKey};
const void* values[] = {CFSTR("Progress"),
                       kCFBooleanTrue,
                       CFSTR("Cancel")};
CFDictionaryRef parameters = CFDictionaryCreate(0, keys, values,
        sizeof(keys)/sizeof(*keys), &kCFTypeDictionaryKeyCallBacks,
        &kCFTypeDictionaryValueCallBacks);
SInt32 err = 0;
CFUserNotificationCreate(kCFAllocatorDefault, 0,
        kCFUserNotificationPlainAlertLevel |
        kCFUserNotificationNoDefaultButtonFlag,
        &err, parameters);
```

If you set the `kCFUserNotificationNoDefaultButtonFlag` flag and do not specify a value for `kCFUserNotificationDefaultButtonTitleKey`, the notification will have no buttons.

CFUUID Reference

Derived From:	CFType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFUUID.h
Companion guide	Plug-ins

Overview

CFUUID objects are used by plug-ins to uniquely identify types, interfaces, and factories. When creating a new type, host developers must generate UUIDs to identify the type as well as its interfaces and factories.

UUIDs (Universally Unique Identifiers), also known as GUIDs (Globally Unique Identifiers) or IIDs (Interface Identifiers), are 128-bit values guaranteed to be unique. A UUID is made unique over both space and time by combining a value unique to the computer on which it was generated—usually the Ethernet hardware address—and a value representing the number of 100-nanosecond intervals since October 15, 1582 at 00:00:00.

The standard format for UUIDs represented in ASCII is a string punctuated by hyphens, for example 68753A44-4D6F-1226-9C60-0050E4C00067. The hex representation looks, as you might expect, like a list of numerical values preceded by 0x. For example, 0xD7, 0x36, 0x95, 0x0A, 0x4D, 0x6E, 0x12, 0x26, 0x80, 0x3A, 0x00, 0x50, 0xE4, 0xC0, 0x00, 0x67. To use a UUID, you simply create it and then copy the resulting strings into your header and C language source files. Because a UUID is expressed simply as an array of bytes, there are no endianness considerations for different platforms.

You can create a CFUUID object, and thereby generate a UUID, using any one of the `CFUUIDCreate...` functions. Use the `CFUUIDGetConstantUUIDWithBytes` (page 698) function if you want to declare a UUID constant in a `#define` statement. You can get the raw bytes of an existing CFUUID object using the `CFUUIDGetUUIDBytes` (page 700) function.

Functions by Task

Creating CFUUID Objects

`CFUUIDCreate` (page 694)

Creates a Universally Unique Identifier (UUID) object.

`CFUUIDCreateFromString` (page 695)

Creates a CFUUID object for a specified string.

- [CFUUIDCreateFromUUIDBytes](#) (page 695)
Creates a CFUUID object from raw UUID bytes.
- [CFUUIDCreateWithBytes](#) (page 697)
Creates a CFUUID object from raw UUID bytes.

Getting Information About CFUUID Objects

- [CFUUIDCreateString](#) (page 696)
Returns the string representation of a specified CFUUID object.
- [CFUUIDGetConstantUUIDWithBytes](#) (page 698)
Returns a CFUUID object from raw UUID bytes.
- [CFUUIDGetUUIDBytes](#) (page 700)
Returns the value of a UUID object as raw bytes.

Getting the CFUUID Type Identifier

- [CFUUIDGetTypeID](#) (page 700)
Returns the type identifier for all CFUUID objects.

Functions

CFUUIDCreate

Creates a Universally Unique Identifier (UUID) object.

```
CFUUIDRef CFUUIDCreate (
    CFAllocatorRef alloc
);
```

Parameters

alloc

The allocator to use to allocate memory for the new CFUUID object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

Return Value

A new CFUUID object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AutomatorHandsOn

People

StickiesExample

Declared In

CFUUID.h

CFUUIDCreateFromString

Creates a CFUUID object for a specified string.

```
CFUUIDRef CFUUIDCreateFromString (
    CFAllocatorRef alloc,
    CFStringRef uuidStr
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new CFUUID object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

uuidStr

A string containing a UUID. The standard format for UUIDs represented in ASCII is a string punctuated by hyphens, for example `68753A44-4D6F-1226-9C60-0050E4C00067`.

Return Value

A new CFUUID object, or if a CFUUID object of the same value already exists, the existing instance with its reference count incremented. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CoreRecipes

iSpend

PDEProject

Spotlight

SpotlightFortunes

Declared In

CFUUID.h

CFUUIDCreateFromUUIDBytes

Creates a CFUUID object from raw UUID bytes.

```
CFUUIDRef CFUUIDCreateFromUUIDBytes (
    CFAllocatorRef alloc,
    CFUUIDBytes bytes
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new CFUUID object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bytes

Raw UUID bytes to use to create the CFUUID object.

Return Value

A new CFUUID object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

CoreRecipes

iSpend

SampleCMPlugIn

Spotlight

SpotlightFortunes

Declared In

CFUUID.h

CFUUIDCreateString

Returns the string representation of a specified CFUUID object.

```
CFStringRef CFUUIDCreateString (
    CFAllocatorRef alloc,
    CFUUIDRef uuid
);
```

Parameters

alloc

The allocator to use to allocate memory for the new string. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

uuid

The CFUUID object whose string representation to obtain.

Return Value

The string representation of *uuid*. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

AutomatorHandsOn

IdentitySample

PDEProject

People

StickiesExample

Declared In

CFUUID.h

CFUUIDCreateWithBytes

Creates a CFUUID object from raw UUID bytes.

```
CFUUIDRef CFUUIDCreateWithBytes (
    CFAllocatorRef alloc,
    UInt8 byte0,
    UInt8 byte1,
    UInt8 byte2,
    UInt8 byte3,
    UInt8 byte4,
    UInt8 byte5,
    UInt8 byte6,
    UInt8 byte7,
    UInt8 byte8,
    UInt8 byte9,
    UInt8 byte10,
    UInt8 byte11,
    UInt8 byte12,
    UInt8 byte13,
    UInt8 byte14,
    UInt8 byte15
);
```

Parameters

alloc

The allocator to use to allocate memory for the new CFUUID object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

byte0

Raw byte number 0.

byte1

Raw byte number 1.

byte2

Raw byte number 2.

byte3

Raw byte number 3.

byte4

Raw byte number 4.

byte5

Raw byte number 5.

byte6

Raw byte number 6.

byte7

Raw byte number 7.

byte8

Raw byte number 8.

byte9

Raw byte number 9.

byte10

Raw byte number 10.

byte11

Raw byte number 11.

byte12

Raw byte number 12.

byte13

Raw byte number 13.

byte14

Raw byte number 14.

byte15

Raw byte number 15.

Return Value

A new CFUUID object, or, if a CFUUID object of the same value already exists, the existing instance with its reference count incremented. Ownership follows the Create Rule.

Discussion

.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFUUID.h

CFUUIDGetConstantUUIDWithBytes

Returns a CFUUID object from raw UUID bytes.

```
CFUUIDRef CFUUIDGetConstantUUIDWithBytes (
    CFAllocatorRef alloc,
    UInt8 byte0,
    UInt8 byte1,
    UInt8 byte2,
    UInt8 byte3,
    UInt8 byte4,
    UInt8 byte5,
    UInt8 byte6,
    UInt8 byte7,
    UInt8 byte8,
    UInt8 byte9,
    UInt8 byte10,
    UInt8 byte11,
    UInt8 byte12,
    UInt8 byte13,
    UInt8 byte14,
    UInt8 byte15
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new CFUUID object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

<i>byte0</i>	Raw byte number 0.
<i>byte1</i>	Raw byte number 1.
<i>byte2</i>	Raw byte number 2.
<i>byte3</i>	Raw byte number 3.
<i>byte4</i>	Raw byte number 4.
<i>byte5</i>	Raw byte number 5.
<i>byte6</i>	Raw byte number 6.
<i>byte7</i>	Raw byte number 7.
<i>byte8</i>	Raw byte number 8.
<i>byte9</i>	Raw byte number 9.
<i>byte10</i>	Raw byte number 10.
<i>byte11</i>	Raw byte number 11.
<i>byte12</i>	Raw byte number 12.
<i>byte13</i>	Raw byte number 13.
<i>byte14</i>	Raw byte number 14.
<i>byte15</i>	Raw byte number 15.

Return Value

A CFUUID object. Ownership follows the Get Rule.

Discussion

This function can be used in headers to declare a UUID constant with `#define`.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFUUID.h

CFUUIDGetTypeID

Returns the type identifier for all CFUUID objects.

```
CTypeID CFUUIDGetTypeID (
    void
);
```

Return Value

The type identifier for the CFUUID opaque type.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFUUID.h

CFUUIDGetUUIDBytes

Returns the value of a UUID object as raw bytes.

```
CFUUIDBytes CFUUIDGetUUIDBytes (
    CFUUIDRef uuid
);
```

Parameters

uuid

The CFUUID object to examine.

Return Value

The value of *uuid* represented as raw bytes.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Related Sample Code

BasicPlugIn

SCSIOldAndNew

simpleAVC

USBPrivateDataSample

Declared In

CFUUID.h

Data Types

CFUUIDBytes

A 128-bit struct that represents a UUID as raw bytes.

```
typedef struct {
    UInt8 byte0;
    UInt8 byte1;
    UInt8 byte2;
    UInt8 byte3;
    UInt8 byte4;
    UInt8 byte5;
    UInt8 byte6;
    UInt8 byte7;
    UInt8 byte8;
    UInt8 byte9;
    UInt8 byte10;
    UInt8 byte11;
    UInt8 byte12;
    UInt8 byte13;
    UInt8 byte14;
    UInt8 byte15;
} CFUUIDBytes;
```

Fields

byte0

The first byte.

byte1

The second byte.

byte2

The third byte.

byte3

The fourth byte.

byte4

The fifth byte.

byte5

The sixth byte.

byte6

The seventh byte.

byte7

The eighth byte.

byte8

The ninth byte.

byte9

The tenth byte.

byte10

The eleventh byte.

byte11

The twelfth byte.

byte12

The thirteenth byte.

byte13

The fourteenth byte.

byte14

The fifteenth byte.

byte15

The sixteenth byte.

Discussion

This structure can be obtained from a CFUUID object using the [CFUUIDGetUUIDBytes](#) (page 700) function. This structure is can be passed to functions that expect a raw UUID.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUUID.h

CFUUIDRef

A reference to a CFUUID object.

```
typedef const struct __CFUUID *CFUUIDRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFUUID.h

CFWriteStream Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFStream.h

Overview

`CFWriteStream` provides an interface for writing a byte stream either synchronously or asynchronously. You can create streams that write bytes to a block of memory, a file, or a generic socket. All streams need to be opened, using [CFWriteStreamOpen](#) (page 710), before writing.

Use `CFReadStream` for reading byte streams, and for the functions, such as [CFStreamCreatePairWithSocketToHost](#) (page 825), that create socket streams).

`CFWriteStream` is “toll-free bridged” with its Cocoa Foundation counterpart, `NSOutputStream`. This means that the Core Foundation type is interchangeable in function or method calls with the bridged Foundation object. Therefore, in a method where you see an `NSOutputStream *` parameter, you can pass in a `CFWriteStreamRef`, and in a function where you see a `CFWriteStreamRef` parameter, you can pass in an `NSOutputStream` instance. Note, however, that you may have either a delegate or callbacks but not both. See [Interchangeable Data Types](#) for more information on toll-free bridging.

Functions by Task

Creating a Write Stream

- [CFWriteStreamCreateWithAllocatedBuffers](#) (page 706)
Creates a writable stream for a growable block of memory.
- [CFWriteStreamCreateWithBuffer](#) (page 707)
Creates a writable stream for a fixed-size block of memory.
- [CFWriteStreamCreateWithFile](#) (page 708)
Creates a writable stream for a file.

Opening and Closing a Stream

- [CFWriteStreamClose](#) (page 705)
Closes a writable stream.

[CFWriteStreamOpen](#) (page 710)
Opens a stream for writing.

Writing to a Stream

[CFWriteStreamWrite](#) (page 713)
Writes data to a writable stream.

Scheduling a Write Stream

[CFWriteStreamScheduleWithRunLoop](#) (page 710)
Schedules a stream into a run loop.

[CFWriteStreamUnscheduleFromRunLoop](#) (page 713)
Removes a stream from a particular run loop.

Examining Stream Properties

[CFWriteStreamCanAcceptBytes](#) (page 705)
Returns whether a writable stream can accept new data without blocking.

[CFWriteStreamCopyProperty](#) (page 706)
Returns the value of a property for a stream.

[CFWriteStreamCopyError](#) (page 705)
Returns the error associated with a stream.

[CFWriteStreamGetError](#) (page 708)
Returns the error status of a stream. (**Deprecated.** Use [CFWriteStreamCopyError](#) (page 705) instead.)

[CFWriteStreamGetStatus](#) (page 709)
Returns the current state of a stream.

Setting Stream Properties

[CFWriteStreamSetClient](#) (page 711)
Assigns a client to a stream, which receives callbacks when certain events occur.

[CFWriteStreamSetProperty](#) (page 712)
Sets the value of a property for a stream.

Getting the CFWriteStream Type ID

[CFWriteStreamGetTypeID](#) (page 709)
Returns the type identifier of all CFWriteStream objects.

Functions

CFWriteStreamCanAcceptBytes

Returns whether a writable stream can accept new data without blocking.

```
Boolean CFWriteStreamCanAcceptBytes (  
    CFWriteStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

`true` if data can be written to *stream* without blocking, `false` otherwise. If *stream* cannot tell if data can be written without actually trying to write the data, this function returns `true`.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFWriteStreamClose

Closes a writable stream.

```
void CFWriteStreamClose (  
    CFWriteStreamRef stream  
);
```

Parameters

stream

The stream to close.

Discussion

This function terminates the flow of bytes and releases any system resources required by the stream. The stream is removed from any run loops in which it was scheduled. Once closed, the stream cannot be reopened.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamCopyError

Returns the error associated with a stream.

```
CFErrorRef CFWriteStreamCopyError (
    CFReadStreamRef stream
);
```

Parameters

stream

The stream to examine.

Return Value

A CFError object that describes the current problem with stream, or NULL if there is no error. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStream.h

CFWriteStreamCopyProperty

Returns the value of a property for a stream.

```
CTypeRef CFWriteStreamCopyProperty (
    CFWriteStreamRef stream,
    CFStringRef propertyName
);
```

Parameters

stream

The stream to examine.

propertyName

The name of the stream property to obtain. The available properties for standard Core Foundation streams are listed in [“Stream Properties.”](#) (page 832)

Return Value

The value of the property *propertyName*. Ownership follows the Create Rule.

Discussion

Each type of stream can define a set of properties that either describe or configure individual streams. A property can be any interesting information about a stream. Examples include the headers from an HTTP transmission, the expected number of bytes, file permission information, and so on. Use [CFWriteStreamSetProperty](#) (page 712) to modify the value of a property, although some properties are read-only.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFWriteStreamCreateWithAllocatedBuffers

Creates a writable stream for a growable block of memory.

```
CFWriteStreamRef CFWriteStreamCreateWithAllocatedBuffers (
    CFAllocatorRef alloc,
    CFAllocatorRef bufferAllocator
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

bufferAllocator

The allocator to use to allocate memory for the stream's memory buffers. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

Return Value

A new write stream. Ownership follows the Create Rule.

Discussion

New buffers are allocated using *bufferAllocator* as bytes are written to the stream. At any point, you can recover the bytes thus far written by asking for the property `kCFStreamPropertyDataWritten` with [CFWriteStreamCopyProperty](#) (page 706).

You must open the stream, using [CFWriteStreamOpen](#) (page 710), before writing to it.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFWriteStreamCreateWithBuffer

Creates a writable stream for a fixed-size block of memory.

```
CFWriteStreamRef CFWriteStreamCreateWithBuffer (
    CFAllocatorRef alloc,
    UInt8 *buffer,
    CFIndex bufferCapacity
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

buffer

The memory buffer into which to write data. This buffer must exist for the lifetime of the stream.

bufferCapacity

The size of *buffer* and the maximum number of bytes that can be written.

Return Value

A new write stream, or `NULL` on failure. Ownership follows the Create Rule.

Discussion

When *buffer* is filled after writing *bufferCapacity* bytes, the stream is exhausted and its status becomes [kCFStreamStatusAtEnd](#) (page 828).

You must open the stream, using [CFWriteStreamOpen](#) (page 710), before writing to it.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFWriteStreamCreateWithFile

Creates a writable stream for a file.

```
CFWriteStreamRef CFWriteStreamCreateWithFile (
    CFAllocatorRef alloc,
    CFURLRef fileURL
);
```

Parameters

alloc

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

fileURL

The URL of the file to which to write. The URL must use a file scheme.

Return Value

The new write stream, or `NULL` on failure. Ownership follows the Create Rule.

Discussion

The stream overwrites an existing file unless you set the `kCFStreamPropertyAppendToFile` to `kCFBooleanTrue` with [CFWriteStreamSetProperty](#) (page 712), in which case the stream appends data to the file.

You must open the stream, using [CFWriteStreamOpen](#) (page 710), before writing to it.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamGetError

Returns the error status of a stream. (**Deprecated.** Use [CFWriteStreamCopyError](#) (page 705) instead.)

```
CFStreamError CFWriteStreamGetError (  
    CFWriteStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

The error status of *stream* returned in a `CFStreamError` structure.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSSample

Declared In

CFStream.h

CFWriteStreamGetStatus

Returns the current state of a stream.

```
CFStreamStatus CFWriteStreamGetStatus (  
    CFWriteStreamRef stream  
);
```

Parameters

stream

The stream to examine.

Return Value

The current state of *stream*. See [CFStreamStatus](#) (page 827) for the list of possible states.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFWriteStreamGetTypeID

Returns the type identifier of all `CFWriteStream` objects.

```
CTypeID CFWriteStreamGetTypeID (  
    void  
);
```

Return Value

The type identifier for the `CFWriteStream` opaque type.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamOpen

Opens a stream for writing.

```
Boolean CFWriteStreamOpen (
    CFWriteStreamRef stream
);
```

Parameters*stream*

The stream to open.

Return Value

true if *stream* was successfully opened, false otherwise. If *stream* is not in the [kCFStreamStatusNotOpen](#) (page 828) state, this function returns false.

Discussion

Opening a stream causes it to reserve all the system resources it requires. If the stream can open in the background without blocking, this function always returns true. To learn when a background open operation completes, you can either schedule the stream into a run loop with [CFWriteStreamScheduleWithRunLoop](#) (page 710) and wait for the stream's client (set with [CFWriteStreamSetClient](#) (page 711)) to be notified or you can poll the stream using [CFWriteStreamGetStatus](#) (page 709), waiting for a status of [kCFStreamStatusOpen](#) (page 828) or [kCFStreamStatusError](#) (page 828).

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamScheduleWithRunLoop

Schedules a stream into a run loop.

```
void CFWriteStreamScheduleWithRunLoop (
    CFWriteStreamRef stream,
    CFRunLoopRef runLoop,
    CFStringRef runLoopMode
);
```

Parameters*stream*

The stream to schedule.

runLoop

The run loop in which to schedule *stream*.

runLoopMode

The run loop mode of *runLoop* in which to schedule *stream*.

Discussion

After scheduling *stream* into a run loop, its client (set with [CFWriteStreamSetClient](#) (page 711)) is notified when various events happen with the stream, such as when it finishes opening, when it can accept new bytes, and when an error occurs. A stream can be scheduled into multiple run loops and run loop modes. Use [CFWriteStreamUnscheduleFromRunLoop](#) (page 713) to later remove *stream* from the run loop.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamSetClient

Assigns a client to a stream, which receives callbacks when certain events occur.

```
Boolean CFWriteStreamSetClient (
    CFWriteStreamRef stream,
    CFOptionFlags streamEvents,
    CFWriteStreamClientCallback clientCB,
    CFStreamClientContext *clientContext
);
```

Parameters

stream

The stream to modify.

streamEvents

The set of events for which the client should receive callbacks. The events are listed in [CFStreamEventType](#) (page 831). If you pass [kCFStreamEventNone](#) (page 831), the current client for *stream* is removed.

clientCB

The client callback function to call when one of the events requested in *streamEvents* occurs. If NULL, the current client for *stream* is removed.

clientContext

A structure holding contextual information for the stream client. The function copies the information out of the structure, so the memory pointed to by *clientContext* does not need to persist beyond the function call. If NULL, the current client for *stream* is removed.

Return Value

true if the stream supports asynchronous notification, false otherwise.

Discussion

To avoid polling and blocking, you can register a client to hear about interesting events that occur on a stream. Only one client per stream is allowed; registering a new client replaces the previous one.

Once you have set a client, you need to schedule the stream in a run loop using [CFWriteStreamScheduleWithRunLoop](#) (page 710) so that the client can receive the asynchronous notifications. You can schedule each stream in multiple run loops (for example, if you are using a thread pool). It is the caller's responsibility to ensure that at least one of the scheduled run loops is being run, otherwise the callback cannot be called.

Although all Core Foundation streams currently support asynchronous notification, future stream types may not. If a stream does not support asynchronous notification, this function returns `false`. Typically, such streams never block for device I/O (for example, a stream writing to memory) and don't benefit from asynchronous notification.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSSample

Declared In

CFStream.h

CFWriteStreamSetProperty

Sets the value of a property for a stream.

```
Boolean CFWriteStreamSetProperty (
    CFWriteStreamRef stream,
    CFStringRef propertyName,
    CTypeRef propertyValue
);
```

Parameters

stream

The stream to modify.

propertyName

The name of the property to set. The available properties for standard Core Foundation streams are listed in ["Stream Properties."](#) (page 832)

propertyValue

The value to which to set the property *propertyName* for *stream*. The allowed data type of the value depends on the property being set.

Return Value

`true` if *stream* recognizes and accepts the given property-value pair, `false` otherwise.

Discussion

Each type of stream can define a set of properties that either describe or configure individual streams. A property can be any interesting information about a stream. Examples include the headers from an HTTP transmission, the expected number of bytes, file permission information, and so on. Properties that can be set configure the behavior of the stream and may be modifiable only at particular times, such as before the stream has been opened. (In fact, you should assume that you can set properties only before opening the stream, unless otherwise noted.) To read the value of a property use [CFWriteStreamCopyProperty](#) (page 706), although some properties are write-only.

Availability

Available in Mac OS X v10.2 and later.

Related Sample Code

CFFTPSample

CocoaEcho

CocoaHTTPServer

CocoaSOAP

Declared In

CFStream.h

CFWriteStreamUnscheduleFromRunLoop

Removes a stream from a particular run loop.

```
void CFWriteStreamUnscheduleFromRunLoop (
    CFWriteStreamRef stream,
    CFRunLoopRef runLoop,
    CFStringRef runLoopMode
);
```

Parameters*stream*

The stream to remove.

*runLoop*The run loop from which to remove *stream*.*runLoopMode*The run loop mode of *runLoop* from which to remove *stream*.**Availability**

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

CFWriteStreamWrite

Writes data to a writable stream.

```
CFIndex CFWriteStreamWrite (
    CFWriteStreamRef stream,
    const UInt8 *buffer,
    CFIndex bufferLength
);
```

Parameters*stream*

The stream to which to write.

buffer

The buffer holding the data to write.

bufferLength

The number of bytes from *buffer* to write.

Return Value

The number of bytes successfully written, 0 if the stream has been filled to capacity (for fixed-length streams), or -1 if either the stream is not open or an error occurs.

Discussion

If *stream* is in the process of opening, this function waits until it has completed. If the stream is not full, this call blocks until at least one byte is written; it does not block until all the bytes in *buffer* is written. To avoid blocking, call this function only if [CFWriteStreamCanAcceptBytes](#) (page 705) returns `true` or after the stream's client (set with [CFWriteStreamSetClient](#) (page 711)) is notified of a [kCFStreamEventCanAcceptBytes](#) (page 831) event.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CFFTPSample

Declared In

CFStream.h

Callbacks

CFWriteStreamClientCallback

Callback invoked when certain types of activity takes place on a writable stream.

```
typedef void (*CFWriteStreamClientCallback) (
    CFWriteStreamRef stream,
    CFStreamEventType eventType,
    void *clientCallbackInfo
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFWriteStreamRef stream,
    CFStreamEventType eventType,
    void *clientCallbackInfo
);
```

Parameters

stream

The stream that experienced the event *eventType*.

eventType

The event that caused the callback to be called. The possible events are listed in [“Stream Events.”](#) (page 831).

clientCallbackInfo

The `info` member of the [CFStreamClientContext](#) (page 827) structure that was used when setting the client for *stream*.

Discussion

This callback is called only for the events requested when setting the client with [CFWriteStreamSetClient](#) (page 711).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStream.h

Data Types

CFWriteStreamRef

A reference to a writable stream object.

```
typedef struct __CFWriteStream *CFWriteStreamRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFStream.h

CFXMLNode Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFXMLNode.h
Companion guide	XML Programming Topics for Core Foundation

Overview

A `CFXMLNode` object describes an individual XML construct—like a tag, or a comment, or a string of character data. `CFXMLNode` is intended to be used with the `CFXMLParser` and `CFXMLTree` opaque types.

Each `CFXMLNode` object contains three main pieces of information—the node's type, the data string, and a pointer to an additional information data structure. A `CFXMLNode` object's type is one of the enumerations described in [Node Type Code](#) (page 728). The data string is always a `CFString` object; the meaning of the string is dependent on the node's type. The format of the additional data is also dependent on the node's type; in general, there is a custom structure for each type that requires additional data. See [Node Type Code](#) (page 728) for the mapping from a node type to meaning of the data string, and structure of the additional information. Note that these structures are versioned and may change as the parser changes. The current version can always be identified by the `kCFXMLNodeCurrentVersion` (page 728) constant; earlier versions can be identified and used by passing earlier values for the version number (although the older structures would have been removed from the header).

You create a `CFXMLNode` object using one of the create or copy functions. Use the [CFXMLNodeGetTypeCode](#) (page 720), [CFXMLNodeGetString](#) (page 719), and [CFXMLNodeGetInfoPtr](#) (page 719) functions to get the node type, data string, and additional information respectively. Use the [CFXMLNodeGetVersion](#) (page 720) function to get a node's version number.

Functions

CFXMLNodeCreate

Creates a new `CFXMLNode`.

```
CFXMLNodeRef CFXMLNodeCreate (
    CFAllocatorRef alloc,
    CFXMLNodeTypeCode xmlType,
    CFStringRef dataString,
    const void *additionalInfoPtr,
    CFIndex version
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

xmlType

Type identifier code for the XML structure you want this node to describe.

dataString

The XML data.

additionalInfoPtr

A pointer to a structure containing additional information about the XML data.

version

The version number of the CFXMLNode object you want to create. Pass one of the pre-defined constants, typically `kCFXMLNodeCurrentVersion` (page 728).

Return Value

A new CFXMLNode object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeCreateCopy

Creates a copy of a CFXMLNode object.

```
CFXMLNodeRef CFXMLNodeCreateCopy (
    CFAllocatorRef alloc,
    CFXMLNodeRef origNode
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

origNode

The node to copy. Do not pass `NULL`.

Return Value

A new CFXMLNode object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeGetInfoPtr

Returns the additional information pointer of a CFXMLNode object.

```
const void * CFXMLNodeGetInfoPtr (  
    CFXMLNodeRef node  
);
```

Parameters

node

The CFXMLNode object to examine.

Return Value

A pointer to a structure containing additional information. The CFXMLNode version together with the node's type determines the expected structure. See [Node Type Code](#) (page 728) for information about the possible structures returned. If the returned value is a Core Foundation object, ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeGetString

Returns the data string from a CFXMLNode.

```
CFStringRef CFXMLNodeGetString (  
    CFXMLNodeRef node  
);
```

Parameters

node

The CFXMLNode object to examine.

Return Value

The data string from *node*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeGetTypeCode

Returns the XML structure type code for a CFXMLNode object.

```
CFXMLNodeTypeCode CFXMLNodeGetTypeCode (
    CFXMLNodeRef node
);
```

Parameters

node

The CFXMLNode object to examine.

Return Value

The type code for *node*.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeGetTypeID

Returns the type identifier code for the CFXMLNode opaque type.

```
CTypeID CFXMLNodeGetTypeID (
    void
);
```

Return Value

The type identifier for the CFXMLNode opaque type.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeGetVersion

Returns the version number for a CFXMLNode object.

```
CFIndex CFXMLNodeGetVersion (
    CFXMLNodeRef node
);
```

Parameters

node

The CFXMLNode object to examine.

Return Value

The version number of *node*.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

Data Types

CFXMLAttributeDeclarationInfo

Contains information about an element attribute definition.

```
struct CFXMLAttributeDeclarationInfo {
    CFStringRef attributeName;
    CFStringRef typeString;
    CFStringRef defaultString;
};
typedef struct CFXMLAttributeDeclarationInfo CFXMLAttributeDeclarationInfo;
```

Fields

attributeName

The name of the attribute.

typeString

Describes the declaration of a single attribute.

defaultString

The attribute's default value.

Discussion

This structure is part of the definition of the [CFXMLAttributeListDeclarationInfo](#) (page 721) structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLAttributeListDeclarationInfo

Contains a list of the attributes associated with an element.

```
struct CFXMLAttributeListDeclarationInfo {
    CFIndex numberOfAttributes;
    CFXMLAttributeDeclarationInfo *attributes;
};
typedef struct CFXMLAttributeListDeclarationInfo CFXMLAttributeListDeclarationInfo;
```

Fields

numberOfAttributes

The number of attributes in the array.

attributes

A C array of attributes.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters an attribute declaration in the DTD. Use the `CFXMLNodeGetInfoPtr` (page 719) function to obtain the pointer to this structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLDocumentInfo

Contains the source URL and text encoding information for the XML document.

```
struct CFXMLDocumentInfo {
    CFURLRef sourceURL;
    CFStringEncoding encoding;
};
typedef struct CFXMLDocumentInfo CFXMLDocumentInfo;
```

Fields

sourceURL

The source URL of the XML document.

encoding

The text encoding of the XML document.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters the XML declaration. Use the `CFXMLNodeGetInfoPtr` (page 719) function to obtain the pointer.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLDocumentTypeInfo

Contains the external ID of the DTD.

```
struct CFXMLDocumentTypeInfo {
    CFXMLExternalID externalID;
};
typedef struct CFXMLDocumentTypeInfo CFXMLDocumentTypeInfo;
```

Fields

externalID

The external ID of the DTD.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters the beginning of the DTD. Use the [CFXMLNodeGetInfoPtr](#) (page 719) function to obtain a pointer to this structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLElementInfo

Contains a list of element attributes packaged as `CFDictionary` key/value pairs.

```
struct CFXMLElementInfo {
    CFDictionaryRef attributes;
    CFArrayRef attributeOrder;
    Boolean isEmpty;
};
typedef struct CFXMLElementInfo CFXMLElementInfo;
```

Fields

`attributes`

The dictionary of attribute values.

`attributeOrder`

An array specifying the order in which the attributes appeared in the XML document.

`isEmpty`

A flag indicating whether the element was expressed in closed form.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters an element containing attributes. Use the [CFXMLNodeGetInfoPtr](#) (page 719) function to obtain the pointer.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLElementTypeDeclarationInfo

Contains a description of the element type.

```
struct CFXMLElementTypeDeclarationInfo {
    CFStringRef contentDescription;
};
typedef struct CFXMLElementTypeDeclarationInfo CFXMLElementTypeDeclarationInfo;
```

Fields

`contentDescription`

A textual description of the element type.

Discussion

A pointer to this structure is included in the `CFXMLNode` passed to your application when the parser encounters an element type declaration. Use the `CFXMLNodeGetInfoPtr` (page 719) function to obtain a pointer to this structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLEntityInfo

Contains information describing an XML entity.

```
struct CFXMLEntityInfo {
    CFXMLEntityTypeCode entityType;
    CFStringRef replacementText;
    CFXMLExternalID entityID;
    CFStringRef notationName;
};
typedef struct CFXMLEntityInfo CFXMLEntityInfo;
```

Fields

`entityType`

The entity type code.

`replacementText`

NULL if `entityType` is external or unparsed, otherwise the text that the entity should be replaced with.

`entityID`

`entityID.systemID` will be NULL if `entityType` is internal.

`notationName`

NULL if `entityType` is parsed.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters an entity declaration. Use the `CFXMLNodeGetInfoPtr` (page 719) function to obtain a pointer to this structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLEntityReferenceInfo

Contains information describing an XML entity reference.

```
struct CFXMLEntityReferenceInfo {
    CFXMLEntityTypeCode entityType;
};
typedef struct CFXMLEntityReferenceInfo CFXMLEntityReferenceInfo;
```

Fields

entityType

The entity type code.

Discussion

A pointer to this structure is included in the `CFXMLNode` object passed to your application when the parser encounters an entity reference. Use the [CFXMLNodeGetInfoPtr](#) (page 719) function to obtain the pointer.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLExternalID

Contains the system and public IDs for an external entity reference.

```
struct CFXMLExternalID {
    CFURLRef systemID;
    CFStringRef publicID;
};
typedef struct CFXMLExternalID CFXMLExternalID;
```

Fields

systemID

The systemID URL.

publicID

The publicID string.

Discussion

This structure is part of the definition of the [CFXMLDocumentTypeInfo](#) (page 722), [CFXMLNotationInfo](#) (page 726), and [CFXMLEntityInfo](#) (page 724) structures.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNodeRef

A reference to a `CFXMLNode` object.

```
typedef const struct __CFXMLNode *CFXMLNodeRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLNotationInfo

Contains the external ID of the notation.

```
struct CFXMLNotationInfo {
    CFXMLExternalID externalID;
};
typedef struct CFXMLNotationInfo CFXMLNotationInfo;
```

Fields

externalID

The external ID of the notation.

Discussion

A pointer to this structure is included in the CFXMLNode object passed to your application when the parser encounters a notation element. Use the [CFXMLNodeGetInfoPtr](#) (page 719) function to obtain a pointer to this structure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

CFXMLProcessingInstructionInfo

Contains the text of the processing instruction.

```
struct CFXMLProcessingInstructionInfo {
    CFStringRef dataString;
};
typedef struct CFXMLProcessingInstructionInfo CFXMLProcessingInstructionInfo;
```

Fields

dataString

The text of the processing instruction.

Discussion

A pointer to this structure is included in the CFXMLNode object passed to your application when the parser encounters a processing instruction. Use the [CFXMLNodeGetInfoPtr](#) (page 719) function to obtain the pointer.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

Constants

Entity Type Code

The entity type identification codes that the parser uses to describe XML entities.

```
enum CFXMLEntityTypeCode {
    kCFXMLEntityTypeParameter = 0,
    kCFXMLEntityTypeParsedInternal = 1,
    kCFXMLEntityTypeParsedExternal = 2,
    kCFXMLEntityTypeUnparsed = 3,
    kCFXMLEntityTypeCharacter = 4
};
typedef enum CFXMLEntityTypeCode CFXMLEntityTypeCode;
```

Constants

`kCFXMLEntityTypeParameter`

Implies a parsed, internal entity.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLEntityTypeParsedInternal`

Indicates a parsed, internal entity.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLEntityTypeParsedExternal`

Indicates a parsed, external entity.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLEntityTypeUnparsed`

Indicates an unparsed entity.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLEntityTypeCharacter`

Indicates a character entity type.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

Discussion

These codes are used with the [CFXMLEntityInfo](#) (page 724) and [CFXMLEntityReferenceInfo](#) (page 724) structures.

Node Current Version

The version of a `CFXMLNode` object.

```
enum {
    kCFXMLNodeCurrentVersion = 1
};
```

Constants

kCFXMLNodeCurrentVersion
 The current version of CFXMLNode objects.
 Available in Mac OS X v10.0 and later.
 Declared in CFXMLNode.h.

Node Type Code

The various XML data type identification codes that the parser uses to describe XML structures.

```
enum CFXMLNodeTypeCode {
    kCFXMLNodeTypeDocument = 1,
    kCFXMLNodeTypeElement = 2,
    kCFXMLNodeTypeAttribute = 3,
    kCFXMLNodeTypeProcessingInstruction = 4,
    kCFXMLNodeTypeComment = 5,
    kCFXMLNodeTypeText = 6,
    kCFXMLNodeTypeCDATASection = 7,
    kCFXMLNodeTypeDocumentFragment = 8,
    kCFXMLNodeTypeEntity = 9,
    kCFXMLNodeTypeEntityReference = 10,
    kCFXMLNodeTypeDocumentType = 11,
    kCFXMLNodeTypeWhitespace = 12,
    kCFXMLNodeTypeNotation = 13,
    kCFXMLNodeTypeElementTypeDeclaration = 14,
    kCFXMLNodeTypeAttributeListDeclaration = 15
};
typedef enum CFXMLNodeTypeCode CFXMLNodeTypeCode;
```

Constants

kCFXMLNodeTypeDocument
 Indicates a document where the data string is NULL and the additional information is a pointer to a [CFXMLDocumentInfo](#) (page 722) structure.
 Available in Mac OS X v10.0 and later.
 Declared in CFXMLNode.h.

kCFXMLNodeTypeElement
 Indicates an element where the data string is the name of the tag and the additional information is a pointer to a [CFXMLElementInfo](#) (page 723) structure.
 Available in Mac OS X v10.0 and later.
 Declared in CFXMLNode.h.

kCFXMLNodeTypeAttribute
 Currently not used.
 Available in Mac OS X v10.0 and later.
 Declared in CFXMLNode.h.

`kCFXMLNodeTypeProcessingInstruction`

Indicates a processing instruction where the data string is the name of the target and the additional information is a pointer to a [CFXMLProcessingInstructionInfo](#) (page 726) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeComment`

Indicates a comment section where the data string is the text of the comment and the additional information is `NULL`.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeText`

Indicates a text section where the data string is the text's contents and the additional information is `NULL`.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeCDATASection`

Indicates a CDATA section where the data string is the text of the CDATA and the additional information is `NULL`.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeDocumentFragment`

Currently not used.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeEntity`

Indicates an entity where the data string is the name of the entity and the additional information is a pointer to a [CFXMLEntityInfo](#) (page 724) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeEntityReference`

Indicates an entity reference where the data string is the name of the referenced entity and the additional information is a pointer to a [CFXMLEntityReferenceInfo](#) (page 724) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeDocumentType`

Indicates a document type where the data string is the name given to the top-level element and the additional information is a pointer to a [CFXMLDocumentTypeInfo](#) (page 722) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeWhitespace`

Indicates white space where the data string is the text of the white space and the additional information is `NULL`.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeNotation`

Indicates a notation where the data string is the notation name and the additional information is a pointer to a `CFXMLNotationInfo` (page 726) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeElementTypeDeclaration`

Indicates an element type declaration where the data string is the tag name and the additional information is a pointer to a `CFXMLElementTypeDeclarationInfo` (page 723) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

`kCFXMLNodeTypeAttributeListDeclaration`

Indicates an attribute list declaration where the data string is the tag name and the additional information is a pointer to a `CFXMLAttributeListDeclarationInfo` (page 721) structure.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLNode.h`.

Discussion

When the parser encounters a new XML structure, its data type and contents are placed in a `CFXMLNode` object.

CFXMLParser Reference

Derived From:	CType
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFXMLParser.h
Companion guide	XML Programming Topics for Core Foundation

Overview

CFXMLParser provides an XML parser you can use to find and extract data in XML documents. You can use a high-level interface to load an XML document into a Core Foundation collection object. A low-level callback-based interface allows you to perform any action you wish on an XML structured type when it is detected by the parser. This opaque type is relevant for applications that need information about an XML document's structure or content.

Functions

CFXMLParserAbort

Causes a parser to abort with the given error code and description.

```
void CFXMLParserAbort (
    CFXMLParserRef parser,
    CFXMLParserStatusCode errorCode,
    CFStringRef errorDescription
);
```

Parameters

parser

The parser to abort.

errorCode

The error code to return to the parser.

errorDescription

The error description string to return to the parser. This value may not be NULL.

Discussion

This function cannot be called asynchronously. In other words, it must be called from within a parser callback function.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserCopyErrorDescription

Returns the user-readable description of the current error condition.

```
CFStringRef CFXMLParserCopyErrorDescription (
    CFXMLParserRef parser
);
```

Parameters

parser

The XML parser to examine.

Return Value

A user-readable description of the current error condition, or NULL if no error occurred. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserCreate

Creates a new XML parser for the specified XML data.

```
CFXMLParserRef CFXMLParserCreate (
    CFAllocatorRef allocator,
    CFDataRef xmlData,
    CFURLRef dataSource,
    CFOptionFlags parseOptions,
    CFIndex versionOfNodes,
    CFXMLParserCallbacks *callbacks,
    CFXMLParserContext *context
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or `kCFAllocatorDefault` to use the current default allocator.

xmlData

The XML data to parse. Do not pass NULL.

dataSource

The URL from which the XML data was obtained. The URL is used to resolve any relative references found in XML Data. Pass `NULL` if a valid URL is unavailable.

parseOptions

Flags which control how the XML data will be parsed. See [Parsing Options](#) (page 748) for the list of available options.

versionOfNodes

Determines which version of `CFXMLNode` objects are produced by the parser.

callbacks

Callbacks called by the parser as the XML is processed. The callbacks are called as each XML tag is encountered, when an external entity needs to be resolved, and when an error occurs. See [CFXMLParserCallbacks](#) (page 744) and the individual callbacks for more details. Do not pass `NULL`.

context

Determines what, if any, information pointer is passed to the callbacks as the parse progresses; *context* may be `NULL`.

Return Value

The newly created parser. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserCreateWithDataFromURL

Creates a new XML parser for the specified XML data at the specified URL.

```
CFXMLParserRef CFXMLParserCreateWithDataFromURL (
    CFAllocatorRef allocator,
    CFURLRef dataSource,
    CFOptionFlags parseOptions,
    CFIndex versionOfNodes,
    CFXMLParserCallbacks *callbacks,
    CFXMLParserContext *context
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

dataSource

The URL from which to load the XML data. The URL is used to resolve any relative references found in XML Data. It must be a valid `CFURL` object; `NULL` is an unacceptable value.

parseOptions

Flags which control how the XML data will be parsed. See [Parsing Options](#) (page 748) for the list of available options.

versionOfNodes

Determines which version of `CFXMLNode` objects are produced by the parser.

callbacks

Callbacks called by the parser as the XML is processed. The callbacks are called as each XML tag is encountered, when an external entity needs to be resolved, and when an error occurs. See [CFXMLParserCallbacks](#) (page 744) and the individual callbacks for more details. Do not pass NULL.

context

Determines what, if any, information pointer is passed to the callbacks as the parse progresses; may be NULL.

Return Value

The newly created parser. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetCallbacks

Returns the callbacks associated with an XML parser when it was created.

```
void CFXMLParserGetCallbacks (
    CFXMLParserRef parser,
    CFXMLParserCallbacks *callbacks
);
```

Parameters

parser

The XML parser to examine.

callbacks

On return, contains the callbacks for *parser*.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetContext

Returns the context for an XML parser.

```
void CFXMLParserGetContext (
    CFXMLParserRef parser,
    CFXMLParserContext *context
);
```

Parameters

parser

The XML parser to examine.

context

On return, a pointer to the context structure for *parser*.

Discussion

If you set a context for the parser, it will be passed to you as a parameter in each of the parser callback functions. The context data structure is application defined and associated with a parser using one of the `CFXMLParserCreate...` functions.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserGetDocument

Returns the top-most object returned by the create XML structure callback.

```
void *CFXMLParserGetDocument (
    CFXMLParserRef parser
);
```

Parameters

parser

The XML parser to examine.

Return Value

The top-most object returned by the `createXMLStructure` field in the [CFXMLParserCallbacks](#) (page 744) structure. If the returned value is a Core Foundation object, ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserGetLineNumber

Returns the line number of the current parse location.

```
CFIndex CFXMLParserGetLineNumber (
    CFXMLParserRef parser
);
```

Parameters

parser

The XML parser to examine.

Return Value

The line number of the current location.

Discussion

This function is typically used in conjunction with the [CFXMLParserHandleErrorCallback](#) (page 741) function so that error location information can be reported.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetLocation

Returns the character index of the current parse location.

```
CFIndex CFXMLParserGetLocation (  
    CFXMLParserRef parser  
);
```

Parameters

parser

The XML parser to examine.

Return Value

The character index of the current parse location.

Discussion

This function is typically used in conjunction with the [CFXMLParserHandleErrorCallback](#) (page 741) function so that error location information can be reported.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetSourceURL

Returns the URL for the XML data being parsed.

```
CFURLRef CFXMLParserGetSourceURL (  
    CFXMLParserRef parser  
);
```

Parameters

parser

The XML parser to examine.

Return Value

The URL for the XML document being parsed. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetStatusCode

Returns a numeric code indicating the current status of the parser.

```
CFXMLParserStatusCode CFXMLParserGetStatusCode (
    CFXMLParserRef parser
);
```

Parameters

parser

The XML parser to examine.

Return Value

A status code indicating the current parser. See [Parser Status Codes](#) (page 746) for a list of possible status codes.

Discussion

If an error has occurred, the code for the last error is returned. If no error has occurred, a status code is returned.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserGetTypeID

Returns the type identifier for the CFXMLParser opaque type.

```
CTypeID CFXMLParserGetTypeID ();
```

Return Value

The type identifier for the CFXMLParser opaque type.

Availability

Available in CarbonLib v1.3 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserParse

Begins a parse of the XML data that was associated with the parser when it was created.

```
Boolean CFXMLParserParse (
    CFXMLParserRef parser
);
```

Parameters*parser*

The XML parser to start.

Return Value

true if the parse was successful, false otherwise.

Discussion

Upon success, use the [CFXMLParserGetDocument](#) (page 735) function to get the product of the parse. Upon failure, use the [CFXMLParserGetContext](#) (page 734) or [CFXMLParserCopyErrorDescription](#) (page 732) functions to get information about the error. It is an error to call the [CFXMLParserParse](#) (page 737) function while a parse is already underway.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

Callbacks

CFXMLParserAddChildCallback

Callback function invoked by the parser to notify your application of parent/child relationships between XML structures.

```
typedef void (*CFXMLParserAddChildCallback) (
    CFXMLParserRef parser,
    void *parent,
    void *child,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFXMLParserRef parser,
    void *parent,
    void *child,
    void *info
);
```

Parameters*parser*

The CFXMLParser object making the callback.

parent

The program-defined value representing the XML element to whom *child* is being added. This value was returned by the [CFXMLParserCreateXMLStructureCallback](#) (page 740) callback when this element's open tag was detected.

child

The program-defined value representing the XML element that is being added to *parent*. This value was returned by the [CFXMLParserCreateXMLStructureCallback](#) (page 740) callback when this element's open tag was detected.

info

The program-defined context data you specified in the [CFXMLParserContext](#) (page 745) structure when creating the parser.

Discussion

If the [CFXMLParserCreateXMLStructureCallback](#) (page 740) function returns `NULL` for a given structure, that structure is omitted entirely, and this callback will *not* be called for either a `NULL` child or parent.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserCopyDescriptionCallback

Callback function invoked by the parser when handling the information pointer.

```
typedef CFStringRef (*CFXMLParserCopyDescriptionCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFStringRef MyCallback (
    const void *info
);
```

Parameters*info*

The program-defined context data you specified in the [CFXMLParserContext](#) (page 745) structure when creating the parser.

Return Value

A textual description of *info*. The caller is responsible for releasing this object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserCreateXMLStructureCallback

Callback function invoked when the parser encounters an XML open tag.

```
typedef void (*CFXMLParserCreateXMLStructureCallback) (
    CFXMLParserRef parser,
    CFXMLNodeRef nodeDesc,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void *MyCallback (
    CFXMLParserRef parser,
    CFXMLNodeRef nodeDesc,
    void *info
);
```

Parameters

parser

The `CFXMLParser` object making the callback.

nodeDesc

The `CFXMLNode` object that represents the XML structure encountered.

info

The program-defined context data you specified in the `CFXMLParserContext` (page 745) structure when creating the parser.

Return Value

A program-defined value representing the new XML element or `NULL` to indicate that the given structure should be skipped. This value is passed to the other callbacks.

Discussion

If `NULL` is returned for a given structure, only minimal parsing is done for that structure (enough to correctly determine its end, and to extract any data necessary for the remainder of the parse, such as Entity definitions). This callback (or any of the tree-creation callbacks) will not be called for any children of the skipped structure. The only exception is that the top-most element will always be reported even if `NULL` was returned for the document as a whole. For performance reasons, the node passed to this callback cannot be safely retained by the client; the node as a whole must be copied (using the `CFXMLNodeCreateCopy` (page 718) function), or its contents must be extracted and copied. You are required to implement this callback for the parser to operate.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserEndXMLStructureCallback

Callback function invoked by the parser to notify your application that an XML structure (and all its children) have been completely parsed.

```
typedef void (*CFXMLParserEndXMLStructureCallback) (
    CFXMLParserRef parser,
    void *xmlType,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    CFXMLParserRef parser,
    void *xmlType,
    void *info
);
```

Parameters

parser

The `CFXMLParser` object making the callback.

xmlType

The program-defined value representing the XML element whose end tag has been detected. This value was returned by the `CFXMLParserCreateXMLStructureCallback` (page 740) callback.

info

The program-defined context data you specified in the `CFXMLParserContext` (page 745) structure when creating the parser.

Discussion

As elements are encountered, this callback is called first, then the `CFXMLParserAddChildCallback` (page 738) callback to add the new structure to its parent, then the `CFXMLParserAddChildCallback` (page 738) callback (potentially several times) to add the new structure's children to it, and then finally the `CFXMLParserEndXMLStructureCallback` (page 740) callback to show that the structure has been fully parsed. This callback is optional.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserHandleErrorCallback

Callback function invoked by the parser to notify your application that an error has occurred.

```
typedef Boolean (*CFXMLParserHandleErrorCallback) (
    CFXMLParserRef parser,
    CFXMLParserStatusCode error,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
Boolean MyCallback (
    CFXMLParserRef parser,
    CFXMLParserStatusCode error,
    void *info
);
```

```
);
```

Parameters

parser

A CFXMLParser object making the callback.

error

A status code describing the error.

info

The program-defined context data you specified in the [CFXMLParserContext](#) (page 745) structure when creating the parser.

Return Value

`true` if the parser should continue parsing the XML, `false` if the parser should stop.

Discussion

If this callback is not defined, the parser will silently attempt to recover. Otherwise, this callback may return `false` to force the parser to stop. If this callback returns `true`, the parser will attempt to recover (fatal errors will still cause the parse to abort immediately). This callback is optional.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserReleaseCallback

Callback function invoked by the parser when it wants to release a reference to the information pointer.

```
typedef void (*CFXMLParserReleaseCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
void MyCallback (
    const void *info
);
```

Parameters

info

The program-defined context data you specified in the [CFXMLParserContext](#) (page 745) structure when creating the parser.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserResolveExternalEntityCallback

Callback function invoked by the parser to notify your application that an external entity has been referenced.

```
typedef CFDataRef (*CFXMLParserResolveExternalEntityCallback) (
    CFXMLParserRef parser,
    CFXMLExternalID *extID,
    void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFDataRef MyCallback (
    CFXMLParserRef parser,
    CFXMLExternalID *extID,
    void *info
);
```

Parameters

parser

The `CFXMLParser` object making the callback.

extID

The identifier for the external entity.

info

The program-defined context data you specified in the `CFXMLParserContext` (page 745) structure when creating the parser.

Return Value

The external entity or `NULL` if it should not be resolved.

Discussion

If this callback is not defined, the parser uses its internal routines to try and resolve the entity. Otherwise, if this callback returns `NULL`, a place holder for the external entity is inserted into the tree. In this manner, the parser's client can prevent any external network or file accesses. This callback is optional.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLParserRetainCallback

Callback function invoked by the parser when it needs another reference to the information pointer.

```
typedef const void *(*CFXMLParserRetainCallback) (
    const void *info
);
```

If you name your function `MyCallback`, you would declare it like this:

```
const void *MyCallback (
    const void *info
);
```

Parameters*info*

The program-defined context data you specified in the [CFXMLParserContext](#) (page 745) structure when creating the parser.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

Data Types

CFXMLParserCallbacks

Contains version information and function pointers to callbacks needed when parsing XML.

```
struct CFXMLParserCallbacks {
    CFIndex version;
    CFXMLParserCreateXMLStructureCallback createXMLStructure;
    CFXMLParserAddChildCallback addChild;
    CFXMLParserEndXMLStructureCallback endXMLStructure;
    CFXMLParserResolveExternalEntityCallback resolveExternalEntity;
    CFXMLParserHandleErrorCallback handleError;
};
typedef struct CFXMLParserCallbacks CFXMLParserCallbacks;
```

Fields*version*

Version number. Must be 0.

createXMLStructure

Called when an XML structure is created.

addChild

Called when a child is added.

endXMLStructure

Called when an XML structure has ended.

resolveExternalEntity

Called when an external entity needs to be resolved.

handleError

Called when a parse error needs to be handled.

Discussion

This structure is passed to one of the `CFXMLParserCreate...` functions. Only the `createXMLStructure`, `addChild`, and `endXMLStructure` fields are required. Set the others to NULL if you don't wish to implement them.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserContext

Contains version information and function pointers to callbacks used when handling a program-defined context.

```
struct CFXMLParserContext {
    CFIndex version;
    void *info;
    CFXMLParserRetainCallback retain;
    CFXMLParserReleaseCallback release;
    CFXMLParserCopyDescriptionCallback copyDescription;
};
typedef struct CFXMLParserContext CFXMLParserContext;
```

Fields

version

Version number of this structure. Must be 0.

info

An arbitrary program-defined value passed to all the callbacks in this structure and in the [CFXMLParserCallbacks](#) (page 744) structure.

retain

A retain callback for your program-defined context data. Optional.

release

A release callback for your program-defined context data. Optional.

copyDescription

A copy description callback for your program-defined context data. Optional.

Discussion

You can associate a context with a parser when the parser is created. The context can be anything you wish and will be passed as a parameter to all of the XML parser callbacks.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLParserRef

A reference to an XML parser object.

```
typedef struct __CFXMLParser *CFXMLParserRef;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

Constants

Parser Status Codes

The various status and error flags that can be returned by the parser.

```
enum CFXMLParserStatusCode {
    kCFXMLStatusParseNotBegun = -2,
    kCFXMLStatusParseInProgress = -1,
    kCFXMLStatusParseSuccessful = 0,
    kCFXMLErrorUnexpectedEOF = 1,
    kCFXMLErrorUnknownEncoding = 2,
    kCFXMLErrorEncodingConversionFailure = 3,
    kCFXMLErrorMalformedProcessingInstruction = 4,
    kCFXMLErrorMalformedDTD = 5,
    kCFXMLErrorMalformedName = 6,
    kCFXMLErrorMalformedCDSect = 7,
    kCFXMLErrorMalformedCloseTag = 8,
    kCFXMLErrorMalformedStartTag = 9,
    kCFXMLErrorMalformedDocument = 10,
    kCFXMLErrorElementlessDocument = 11,
    kCFXMLErrorMalformedComment = 12,
    kCFXMLErrorMalformedCharacterReference = 13,
    kCFXMLErrorMalformedParsedCharacterData = 14,
    kCFXMLErrorNoData = 15
};
typedef enum CFXMLParserStatusCode CFXMLParserStatusCode;
```

Constants

`kCFXMLStatusParseNotBegun`

Indicates the parser has not begun.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLStatusParseInProgress`

Indicates the parser is in progress.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLStatusParseSuccessful`

Indicates the parser was successful.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLErrorUnexpectedEOF`

Indicates an unexpected EOF occurred.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLErrorUnknownEncoding`

Indicates an unknown encoding error.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

- `kCFXMLErrorEncodingConversionFailure`
Indicates an encoding conversion error.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedProcessingInstruction`
Indicates a malformed processing instruction.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedDTD`
Indicates a malformed DTD.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedName`
Indicates a malformed name.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedCDSect`
Indicates a malformed CDATA section.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedCloseTag`
Indicates a malformed close tag.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedStartTag`
Indicates a malformed start tag.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedDocument`
Indicates a malformed document.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorElementlessDocument`
Indicates a document containing no elements.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.
- `kCFXMLErrorMalformedComment`
Indicates a malformed comment.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserMalformedCharacterReference`
Indicates a malformed character reference.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserMalformedParsedCharacterData`
Indicates malformed character data.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserNoData`
Indicates a no data error.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

Discussion

Parser status is determined by calling the [CFXMLParserGetStatusCode](#) (page 737) function. The parser reports errors to your application by invoking the [CFXMLParserHandleErrorCallback](#) (page 741) function.

Parsing Options

Options you can use to control the parser's treatment of an XML document.

```
enum CFXMLParserOptions {
    kCFXMLParserValidateDocument = (1 << 0),
    kCFXMLParserSkipMetaData = (1 << 1),
    kCFXMLParserReplacePhysicalEntities = (1 << 2),
    kCFXMLParserSkipWhitespace = (1 << 3),
    kCFXMLParserResolveExternalEntities = (1 << 4),
    kCFXMLParserAddImpliedAttributes = (1 << 5),
    kCFXMLParserAllOptions = 0x00FFFFFF,
    kCFXMLParserNoOptions = 0
};
typedef enum CFXMLParserOptions CFXMLParserOptions;
```

Constants

`kCFXMLParserValidateDocument`
Validates the document against its grammar from the DTD, reporting any errors. Currently not supported.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserSkipMetaData`
Silently skip over metadata constructs (the DTD and comments).
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserReplacePhysicalEntities`
Replaces declared entities like `<`. Note that other than the 5 predefined entities (`lt`, `gt`, `quot`, `amp`, `apos`), these must be defined in the DTD. Currently not supported.
Available in Mac OS X v10.0 and later.
Declared in `CFXMLParser.h`.

`kCFXMLParserSkipWhitespace`

Skip over all whitespace that does not abut non-whitespace character data. In other words, given “<foo> <bar> blah </bar></foo>,” the whitespace between foo’s open tag and bar’s open tag would be suppressed, but the whitespace around `blah` would be preserved.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLParserResolveExternalEntities`

Resolves all external entities.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLParserAddImpliedAttributes`

Where the DTD specifies implied attribute-value pairs for a particular element, add those pairs to any occurrences of the element in the element tree. Currently not supported.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLParserAllOptions`

Makes the parser do the most work, returning only the pure element tree.

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

`kCFXMLParserNoOptions`

Leaves the XML as “intact” as possible (reports all structures; performs no replacements).

Available in Mac OS X v10.0 and later.

Declared in `CFXMLParser.h`.

Discussion

These are the various options you use to configure the parser. An option flag of 0 (`kCFXMLParserNoOptions` (page 749)) leaves the XML as “intact” as possible (reports all structures; performs no replacements). Hence, to make the parser do the most work, returning only the pure element tree, set the option flag to `kCFXMLParserAllOptions` (page 749).

CFXMLTree Reference

Derived From:	<i>CFTree Reference</i> : <i>CType Reference</i>
Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFXMLParser.h CFXMLNode.h
Companion guide	XML Programming Topics for Core Foundation

Overview

A CFXMLTree object is simply a CFTree object whose context data is known to be a CFXMLNode object. CFXMLTree is derived from CFTree—you can pass CFXMLTree objects in all the CFTree functions. As such, a CFXMLTree object can be used to represent an entire XML document; the CFTree object provides the tree structure of the document, while the CFXMLNode objects identify and describe the nodes of the tree. An XML document can be parsed to a CFXMLTree object, and a CFXMLTree object can generate the data for the equivalent XML document. This opaque type is expected to be used in conjunction with CFXMLParser and CFXMLNode objects.

Functions

CFXMLCreateStringByEscapingEntities

Given a CFString object containing XML source with unescaped entities, returns a string with specified XML entities escaped.

```
CFStringRef CFXMLCreateStringByEscapingEntities(
    CFAllocatorRef allocator,
    CFStringRef string,
    CFDictionaryRef entitiesDictionary,
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

string

Any CFString object that may contain XML source. This function translates any substring that is mapped to an entity in *entitiesDictionary* to the specified entity.

entitiesDictionary

Specifies the entities to be replaced. Dictionary keys should be the entity names (for example, “para” for ¶), and the values should be CFString objects containing the expansion. Pass `NULL` to indicate no entities other than the standard five.

Return Value

A CFString object derived from *string* with substrings identified in *entitiesDictionary* escaped to their corresponding entities. Ownership follows the Create Rule.

Discussion

The standard five predefined entities are automatically supported.

As an example of using this function, say you apply this function to string “Refer to ¶ 5 of the contract” with a key of “para” mapped to “¶” in *entitiesDictionary*. The resulting string is “Refer to ¶ 5 of the contract”.

Note: Currently, only the standard predefined entities are supported; passing `NULL` for *entitiesDictionary* is sufficient.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFXMLParser.h

CFXMLCreateStringByUnescapingEntities

Given a CFString object containing XML source with escaped entities, returns a string with specified XML entities unescaped.

```
CFStringRef CFXMLCreateStringByUnescapingEntities(
    CFAllocatorRef allocator,
    CFStringRef string,
    CFDictionaryRef entitiesDictionary,
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

string

Any CFString object that may contain XML source. This function translates any entity that is mapped to a substring in *entitiesDictionary* to the specified substring.

entitiesDictionary

Specifies the entities to be replaced. Dictionary keys should be the entity names (for example, “para” for ¶), and the values should be CFString objects containing the expansion. Pass `NULL` to indicate no entities other than the standard five.

Return Value

A CFString object derived from *string* with entities identified in *entitiesDictionary* unescaped to their corresponding substrings. Ownership follows the Create Rule.

Discussion

The standard five predefined entities are automatically supported.

As an example of using this function, say you apply this function to string “Refer to ¶ 5 of the contract” with a key of “para” mapped to “¶” in *entitiesDictionary*. The resulting string is “Refer to ¶ 5 of the contract”.

Note: Currently, only the standard predefined entities are supported; passing `NULL` for *entitiesDictionary* is sufficient.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFXMLParser.h

CFXMLTreeCreateFromData

Parses the given XML data and returns the resulting CFXMLTree object.

```
CFXMLTreeRef CFXMLTreeCreateFromData (
    CFAllocatorRef allocator,
    CFDataRef xmlData,
    CFURLRef dataSource,
    CFOptionFlags parseOptions,
    CFIndex versionOfNodes
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

xmlData

The XML data you wish to parse.

dataSource

The URL from which the XML data was obtained. The URL is used to resolve any relative references found in *xmlData*. Pass `NULL` if a valid URL is unavailable.

parseOptions

Flags which control how the XML data will be parsed. See [Parsing Options](#) (page 748) for the list of available options.

versionOfNodes

Determines which version of CFXMLNode objects are produced by the parser.

Return Value

A new CFXMLTree object containing the data from the specified XML document. Ownership follows the Create Rule.

Discussion

This function represents the high-level interface to the XML parser. This single function creates a parser for the specified XML data using the specified options. The parser creates and returns a CFXMLTree object that you can examine and modify with the CFTree functions or obtain the node using the [CFXMLTreeGetNode](#) (page 757) function and examine its attributes using CFXMLNode functions.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLTreeCreateFromDataWithError

Parses the given XML data and returns the resulting CFXMLTree object and any error information.

```
CFXMLTreeRef CFXMLTreeCreateFromDataWithError (
    CFAllocatorRef allocator,
    CFDataRef xmlData,
    CFURLRef dataSource,
    CFOptionFlags parseOptions,
    CFIndex versionOfNodes
    CFDictionaryRef *errorDict
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass NULL or kCFAllocatorDefault to use the current default allocator.

xmlData

The XML data you wish to parse.

dataSource

The URL from which the XML data was obtained. The URL is used to resolve any relative references found in *xmlData*. Pass NULL if a valid URL is unavailable.

parseOptions

Flags which control how the XML data will be parsed. See [Parsing Options](#) (page 748) for the list of available options.

versionOfNodes

Determines which version of CFXMLNode objects are produced by the parser. The current version is 1.

errorDict

Upon return, if an error occurs contains a CFDictionary object that describes the error. If no errors occur, this parameter is not changed. Pass NULL if you don't want error information. See ["Error Dictionary Keys"](#) (page 757) for a description of the key-value pairs in this dictionary. Ownership follows the Create Rule.

Return Value

A new CFXMLTree object containing the data from the specified XML document. Ownership follows the Create Rule.

Discussion

Use this function instead of [CFXMLTreeCreateFromData](#) (page 753) if you need access to XML parsing errors.

Availability

Available in Mac OS X v10.3 and later.

Declared In

CFXMLParser.h

CFXMLTreeCreateWithDataFromURL

Creates a new CFXMLTree object by loading the data to be parsed directly from a data source.

```
CFXMLTreeRef CFXMLTreeCreateWithDataFromURL (
    CFAllocatorRef allocator,
    CFURLRef dataSource,
    CFOptionFlags parseOptions,
    CFIndex versionOfNodes
);
```

Parameters

allocator

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

dataSource

The URL from which the XML data is obtained. The URL is used to resolve any relative references found in XML Data. Pass `NULL` if a valid URL is unavailable.

parseOptions

Flags which control how the XML data will be parsed. See [Parsing Options](#) (page 748) for the list of available options.

versionOfNodes

Determines which version of CFXMLNode objects are produced by the parser.

Return Value

A new CFXMLTree object containing the data from the specified XML data source. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLParser.h

CFXMLTreeCreateWithNode

Creates a childless, parentless CFXMLTree object node for a CFXMLNode object.

```
CFXMLTreeRef CFXMLTreeCreateWithNode (
    CFAllocatorRef allocator,
    CFXMLNodeRef node
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

node

The `CFXMLNode` object to use when creating the new `CFXMLTree` object.

Return Value

A `CFXMLTree` object. Ownership follows the Create Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLNode.h`

CFXMLTreeCreateXMLData

Generates an XML document from a `CFXMLTree` object which is ready to be written to permanent storage.

```
CFDataRef CFXMLTreeCreateXMLData (
    CFAllocatorRef allocator,
    CFXMLTreeRef xmlTree
);
```

Parameters*allocator*

The allocator to use to allocate memory for the new object. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

xmlTree

The `CFXMLTree` object you wish to convert to an XML document.

Return Value

The XML data. Ownership follows the Create Rule.

Discussion

This function will *not* regenerate entity references replaced at the parse time (except those required for syntactic correctness). If you need this you must manually walk the tree and re-insert any entity references that should appear in the final output file.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

`CFXMLParser.h`

CFXMLTreeGetNode

Returns the node of a CFXMLTree object.

```
CFXMLNodeRef CFXMLTreeGetNode (
    CFXMLTreeRef xmlTree
);
```

Parameters

xmlTree

The CFXMLTree object whose node you wish to obtain.

Return Value

The node of *xmlTree*. Ownership follows the Get Rule.

Availability

Available in CarbonLib v1.1 and later.

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

Data Types

CFXMLTreeRef

A reference to a CFXMLTree object.

```
typedef CFTreeRef CFXMLTreeRef;
```

Discussion

When using the high-level parser API, XML data is parsed to a special CFTree object which is simply a CFXMLTree object with known contexts and callbacks. The nodes of a CFXMLTree may be queried using the basic CFTree functions (to report on the structure of the tree itself), or via the functions here (to report on the XML contents of the nodes).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFXMLNode.h

Constants

Error Dictionary Keys

The keys used in an error dictionary returned by some functions to provide more information about XML parse errors.

```
const CFStringRef kCFXMLTreeErrorDescription;  
const CFStringRef kCFXMLTreeErrorLineNumber;  
const CFStringRef kCFXMLTreeErrorLocation;  
const CFStringRef kCFXMLTreeErrorStatusCode;
```

Constants

`kCFXMLTreeErrorDescription`

Dictionary key whose value is a CFString containing a readable description of the error.

Available in Mac OS X v10.3 and later.

Declared in `CFXMLParser.h`.

`kCFXMLTreeErrorLineNumber`

Dictionary key whose value is a CFNumber containing the line number where the error was detected. This may not be the line number where the actual XML error is located.

Available in Mac OS X v10.3 and later.

Declared in `CFXMLParser.h`.

`kCFXMLTreeErrorLocation`

Dictionary key whose value is a CFNumber containing the byte location where the error was detected.

Available in Mac OS X v10.3 and later.

Declared in `CFXMLParser.h`.

`kCFXMLTreeErrorStatusCode`

Dictionary key whose value is a CFNumber containing the error status code. See *CFXMLParser Reference* for possible status code values.

Available in Mac OS X v10.3 and later.

Declared in `CFXMLParser.h`.

Discussion

These keys are used in the error dictionary returned by the `CFXMLTreeCreateFromDataWithError` (page 754) function.

Availability

Available in Mac OS X v10.3 and later.

Managers

Base Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFBase.h
Companion guide	Core Foundation Design Concepts

Overview

Core Foundation defines a number of miscellaneous symbols that are either used by many different opaque types, such as [CFIndex](#) (page 763), or apply to Core Foundation as a whole, such as [kCFCoreFoundationVersionNumber](#) (page 765). These symbols are collected together and documented here.

Functions

CFRangeMake

Declares and initializes a `CFRange` structure.

```
CFRange CFRangeMake (
    CFIndex loc,
    CFIndex len
);
```

Parameters

loc

The starting location of the range.

len

The length of the range.

Return Value

An initialized structure of type [CFRange](#) (page 764).

Discussion

This is an in-line convenience function for creating initialized [CFRange](#) (page 764) structures.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

BSDLLCTest

HID Calibrator
 HID Config Save
 HID Explorer
 QTCarbonShell

Declared In
 CFBase.h

Callbacks

CFComparatorFunction

Callback function that compares two values. You provide a pointer to this callback in certain Core Foundation sorting functions.

```
typedef CFComparisonResult (*CFComparatorFunction) (
    const void *val1,
    const void *val2,
    void *context
);
```

If you name your function `MyCallback`, you would declare it like this:

```
CFComparisonResult MyCallback (
    const void *val1,
    const void *val2,
    void *context
);
```

Parameters

val1

The first value to compare.

val2

The second value to compare.

context

An untyped pointer to the context of the evaluation.

The meaning of this value and its use are defined by each comparator function. This value is usually passed to a sort function, such as [CFArraySortValues](#) (page 285), which then passes it, unchanged, to the comparator function.

Return Value

A `CFComparisonResult` value that indicates whether the *val1* is equal to, less than, or greater than *val2*. See [“Comparison Results”](#) (page 764) for a list of possible values.

Discussion

If you need to sort the elements in a collection using special criteria, you can implement a comparator function with the signature defined by this prototype. You pass a pointer to this function in one of the “sort” functions, such as `CFArray`'s [CFArraySortValues](#) (page 285).

You can also pass pointers to standard Core Foundation comparator functions such as [CFStringCompare](#) (page 527) and [CFDateCompare](#) (page 179).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Data Types

CFIndex

An integer type used throughout Core Foundation in several programmatic roles: as an array index and for count, size, and length parameters and return values.

```
typedef SInt32 CFIndex;
```

Discussion

Core Foundation types as `CFIndex` all parameters and return values that might grow over time as the processor's address size changes. On architectures where pointer sizes are a different size (say, 64 bits) `CFIndex` might be declared to be also 64 bits, independent of the size of `int`.

If you type your own variables that interact with Core Foundation as `CFIndex`, your code will have a higher degree of source compatibility in the future.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFOptionFlags

A bitfield used for passing special allocation and other requests into Core Foundation functions.

```
typedef UInt32 CFOptionFlags;
```

Discussion

The flag bits are specific to particular opaque types and functions in Core Foundation.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

CFRange

A structure representing a range of sequential items in a container, such as characters in a buffer or elements in a collection.

```
struct CFRange {
    CFIndex location;
    CFIndex length;
};
typedef struct CFRange CFRange;
```

Fields

location

An integer representing the starting location of the range.

length

An integer representing the number of items in the range.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFBase.h

Constants

Comparison Results

Constants returned by comparison functions, indicating whether a value is equal to, less than, or greater than another value.

```
enum CFComparisonResult {
    kCFCompareLessThan = -1,
    kCFCompareEqualTo = 0,
    kCFCompareGreaterThan = 1
};
typedef enum CFComparisonResult CFComparisonResult;
```

Constants

kCFCompareLessThan

Returned by a comparison function if the first value is less than the second value.

Available in Mac OS X v10.0 and later.

Declared in CFBase.h.

kCFCompareEqualTo

Returned by a comparison function if the first value is equal to the second value.

Available in Mac OS X v10.0 and later.

Declared in CFBase.h.

kCFCompareGreaterThan

Returned by a comparison function if the first value is greater than the second value.

Available in Mac OS X v10.0 and later.

Declared in CFBase.h.

Declared In

CFBase.h

Value Not Found

Special value returned when a Core Foundation function cannot locate a requested value.

```
enum {  
    kCFNotFound = -1  
};
```

Constants

kCFNotFound

A constant that indicates that a search operation did not succeed in locating the target value.

Available in Mac OS X v10.0 and later.

Declared in CFBase.h.

Declared In

CFBase.h

Current Framework Version Number

Current version number of the Core Foundation framework.

```
double kCFCoreFoundationVersionNumber;
```

Constants

kCFCoreFoundationVersionNumber

The current version of the Core Foundation framework. Compare this value to the values in [“Framework Version Numbers”](#) (page 765). Although this variable was added to the CFBase.h header file in Mac OS X v10.1, it was available and can be used in Mac OS X v10.0.

Available in Mac OS X v10.1 and later.

Declared in CFBase.h.

Declared In

CFBase.h

Framework Version Numbers

Version numbers of the Core Foundation framework.

```

#define kCFCoreFoundationVersionNumber10_0 196.4
#define kCFCoreFoundationVersionNumber10_0_3 196.5
#define kCFCoreFoundationVersionNumber10_1 226.0
#define kCFCoreFoundationVersionNumber10_1_2 227.2
#define kCFCoreFoundationVersionNumber10_1_4 227.3
#define kCFCoreFoundationVersionNumber10_2 263.0
#define kCFCoreFoundationVersionNumber10_2_1 263.10
#define kCFCoreFoundationVersionNumber10_2_2 263.10
#define kCFCoreFoundationVersionNumber10_2_3 263.30
#define kCFCoreFoundationVersionNumber10_2_4 263.30
#define kCFCoreFoundationVersionNumber10_2_5 263.50
#define kCFCoreFoundationVersionNumber10_2_6 263.50
#define kCFCoreFoundationVersionNumber10_2_7 263.50
#define kCFCoreFoundationVersionNumber10_2_8 263.50
#define kCFCoreFoundationVersionNumber10_3 299.00
#define kCFCoreFoundationVersionNumber10_3_1 299.00
#define kCFCoreFoundationVersionNumber10_3_2 299.00
#define kCFCoreFoundationVersionNumber10_3_3 299.30
#define kCFCoreFoundationVersionNumber10_3_4 299.31
#define kCFCoreFoundationVersionNumber10_3_5 299.31
#define kCFCoreFoundationVersionNumber10_3_6 299.32
#define kCFCoreFoundationVersionNumber10_3_7 299.33
#define kCFCoreFoundationVersionNumber10_3_8 299.33
#define kCFCoreFoundationVersionNumber10_3_9 299.35
#define kCFCoreFoundationVersionNumber10_4 368.00
#define kCFCoreFoundationVersionNumber10_4_1 368.10
#define kCFCoreFoundationVersionNumber10_4_2 368.11
#define kCFCoreFoundationVersionNumber10_4_3 368.18
#define kCFCoreFoundationVersionNumber10_4_4_Intel 368.26
#define kCFCoreFoundationVersionNumber10_4_4_PowerPC 368.25
#define kCFCoreFoundationVersionNumber10_4_5_Intel 368.26
#define kCFCoreFoundationVersionNumber10_4_5_PowerPC 368.25
#define kCFCoreFoundationVersionNumber10_4_6_Intel 368.26
#define kCFCoreFoundationVersionNumber10_4_6_PowerPC 368.25
#define kCFCoreFoundationVersionNumber10_4_7 368.27

```

Constants

`kCFCoreFoundationVersionNumber10_0`

The Core Foundation framework version in Mac OS X version 10.0.

Available in Mac OS X v10.1 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_0_3`

The Core Foundation framework version in Mac OS X version 10.0.3.

Available in Mac OS X v10.1 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_1`

The Core Foundation framework version in Mac OS X version 10.1.

Available in Mac OS X v10.2 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_1_2`

The Core Foundation framework version in Mac OS X version 10.1.2.

Available in Mac OS X v10.3 and later.

Declared in `CFBase.h`.

- `kCFCoreFoundationVersionNumber10_1_4`
The Core Foundation framework version in Mac OS X version 10.14.
Available in Mac OS X v10.3 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2`
The Core Foundation framework version in Mac OS X version 10.2.
Available in Mac OS X v10.3 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_1`
The Core Foundation framework version in Mac OS X version 10.2.1.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_2`
The Core Foundation framework version in Mac OS X version 10.2.2.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_3`
The Core Foundation framework version in Mac OS X version 10.2.3.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_4`
The Core Foundation framework version in Mac OS X version 10.2.4.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_5`
The Core Foundation framework version in Mac OS X version 10.2.5.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_6`
The Core Foundation framework version in Mac OS X version 10.2.6.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_7`
The Core Foundation framework version in Mac OS X version 10.2.7.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.
- `kCFCoreFoundationVersionNumber10_2_8`
The Core Foundation framework version in Mac OS X version 10.2.8.
Available in Mac OS X v10.5 and later.
Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3`

The Core Foundation framework version in Mac OS X version 10.3.

Available in Mac OS X v10.4 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_1`

The Core Foundation framework version in Mac OS X version 10.3.1.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_2`

The Core Foundation framework version in Mac OS X version 10.3.2.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_3`

The Core Foundation framework version in Mac OS X version 10.3.3.

Available in Mac OS X v10.4 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_4`

The Core Foundation framework version in Mac OS X version 10.3.4.

Available in Mac OS X v10.4 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_5`

The Core Foundation framework version in Mac OS X version 10.3.5.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_6`

The Core Foundation framework version in Mac OS X version 10.3.6.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_7`

The Core Foundation framework version in Mac OS X version 10.3.7.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_8`

The Core Foundation framework version in Mac OS X version 10.3.8.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_3_9`

The Core Foundation framework version in Mac OS X version 10.3.9.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4`

The Core Foundation framework version in Mac OS X version 10.4.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_1`

The Core Foundation framework version in Mac OS X version 10.4.1.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_2`

The Core Foundation framework version in Mac OS X version 10.4.2.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_3`

The Core Foundation framework version in Mac OS X version 10.4.3.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_4_Intel`

The Core Foundation framework version in Mac OS X version 10.4.4 on Intel-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_4_PowerPC`

The Core Foundation framework version in Mac OS X version 10.4.4 on PowerPC-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_5_Intel`

The Core Foundation framework version in Mac OS X version 10.4.5 on Intel-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_5_PowerPC`

The Core Foundation framework version in Mac OS X version 10.4.5 on PowerPC-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_6_Intel`

The Core Foundation framework version in Mac OS X version 10.4.6 on Intel-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_6_PowerPC`

The Core Foundation framework version in Mac OS X version 10.4.6 on PowerPC-based Macintosh computers.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

`kCFCoreFoundationVersionNumber10_4_7`

The Core Foundation framework version in Mac OS X version 10.4.7.

Available in Mac OS X v10.5 and later.

Declared in `CFBase.h`.

Discussion

Compare these values to the value of the `kCFCoreFoundationVersionNumber` (page 765) variable to identify on which version of the Core Foundation framework your code is executing.

Declared In

`CFBase.h`

Byte-Order Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFByteOrder.h
Companion guide	Memory Management Programming Guide for Core Foundation

Overview

When handling binary data transmitted or shared across platforms, you need be concerned with how each platform stores numerical values. A platform stores values either in big-endian or little-endian format. On big-endian machines, such as PowerPC machines, values are stored with the most-significant bytes first in memory; on little-endian machines, such as Pentium machines, values are stored with the least-significant bytes first. A multibyte value transmitted to a platform with a different format will be misinterpreted if it is not converted properly by one of the computers.

You identify the native format of the current platform using the [CFByteOrderGetCurrent](#) (page 771) function. Use functions such as [CFSwapInt32BigToHost](#) (page 777) and [CFConvertFloat32HostToSwapped](#) (page 772) to convert values between different byte order formats.

Functions

CFByteOrderGetCurrent

Returns the byte order of the current computer.

```
CFByteOrder CFByteOrderGetCurrent (
    void
);
```

Return Value

The byte order of the current computer. See “[Byte Order Flags](#)” (page 782) for the list of possible return values.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertDoubleHostToSwapped

Converts a 64-bit double from the host's native byte order to a platform-independent format.

```
CFSwappedFloat64 CFConvertDoubleHostToSwapped (
    double arg
);
```

Parameters

arg

The real value to convert.

Return Value

A structure holding the real value in a canonical byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertDoubleSwappedToHost

Converts a 64-bit double from a platform-independent format to the host's native byte order.

```
double CFConvertDoubleSwappedToHost (
    CFSwappedFloat64 arg
);
```

Parameters

arg

A structure holding the real value to convert.

Return Value

The real value in the host's native format.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloat32HostToSwapped

Converts a 32-bit float from the host's native byte order to a platform-independent format.

```
CFSwappedFloat32 CFConvertFloat32HostToSwapped (
    Float32 arg
);
```

Parameters

arg

The real value to convert.

Return Value

A structure holding the real value in a canonical byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloat32SwappedToHost

Converts a 32-bit float from a platform-independent format to the host's native byte order.

```
Float32 CFConvertFloat32SwappedToHost (  
    CFSwappedFloat32 arg  
);
```

Parameters

arg

A structure holding the real value to convert.

Return Value

The real value in the host's native format.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloat64HostToSwapped

Converts a 64-bit float from the host's native byte order to a platform-independent format.

```
CFSwappedFloat64 CFConvertFloat64HostToSwapped (  
    Float64 arg  
);
```

Parameters

arg

The real value to convert.

Return Value

A structure holding the real value in a canonical byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloat64SwappedToHost

Converts a 64-bit float from a platform-independent format to the host's native byte order.

```
Float64 CFConvertFloat64SwappedToHost (
    CFSwappedFloat64 arg
);
```

Parameters*arg*

A structure holding the real value to convert.

Return Value

The real value in the host's native format.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloatHostToSwapped

Converts a 32-bit float from the host's native byte order to a platform-independent format.

```
CFSwappedFloat32 CFConvertFloatHostToSwapped (
    float arg
);
```

Parameters*arg*

The real value to convert.

Return Value

A structure holding the real value in a canonical byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFConvertFloatSwappedToHost

Converts a 32-bit float from a platform-independent format to the host's native byte order.

```
float CFConvertFloatSwappedToHost (
    CFSwappedFloat32 arg
);
```

Parameters*arg*

A structure holding the real value to convert.

Return Value

The real value in the host's native format.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt16

Swaps the bytes of a 16-bit integer.

```
uint16_t CFSwapInt16 (  
    uint16_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt16BigToHost

Converts a 16-bit integer from big-endian format to the host's native byte order.

```
uint16_t CFSwapInt16BigToHost (  
    uint16_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt16HostToBig

Converts a 16-bit integer from the host's native byte order to big-endian format.

```
uint16_t CFSwapInt16HostToBig (  
    uint16_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt16HostToLittle

Converts a 16-bit integer from the host's native byte order to little-endian format.

```
uint16_t CFSwapInt16HostToLittle (  
    uint16_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt16LittleToHost

Converts a 16-bit integer from little-endian format to the host's native byte order.

```
uint16_t CFSwapInt16LittleToHost (  
    uint16_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt32

Swaps the bytes of a 32-bit integer.

```
uint32_t CFSwapInt32 (  
    uint32_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt32BigToHost

Converts a 32-bit integer from big-endian format to the host's native byte order.

```
uint32_t CFSwapInt32BigToHost (  
    uint32_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools

TabsShowcase

Declared In

CFByteOrder.h

CFSwapInt32HostToBig

Converts a 32-bit integer from the host's native byte order to big-endian format.

```
uint32_t CFSwapInt32HostToBig (  
    uint32_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools

HIFleetingControls

RecordAudioToFile

TabsShowcase

Declared In

CFByteOrder.h

CFSwapInt32HostToLittle

Converts a 32-bit integer from the host's native byte order to little-endian format.

```
uint32_t CFSwapInt32HostToLittle (  
    uint32_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt32LittleToHost

Converts a 32-bit integer from little-endian format to the host's native byte order.

```
uint32_t CFSwapInt32LittleToHost (  
    uint32_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt64

Swaps the bytes of a 64-bit integer.

```
uint64_t CFSwapInt64 (  
    uint64_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt64BigToHost

Converts a 64-bit integer from big-endian format to the host's native byte order.

```
uint64_t CFSwapInt64BigToHost (  
    uint64_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt64HostToBig

Converts a 64-bit integer from the host's native byte order to big-endian format.

```
uint64_t CFSwapInt64HostToBig (  
    uint64_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is big-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt64HostToLittle

Converts a 64-bit integer from the host's native byte order to little-endian format.

```
uint64_t CFSwapInt64HostToLittle (  
    uint64_t arg  
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwapInt64LittleToHost

Converts a 64-bit integer from little-endian format to the host's native byte order.

```
uint64_t CFSwapInt64LittleToHost (
    uint64_t arg
);
```

Parameters*arg*

The integer whose bytes should be swapped.

Return Value

The integer with its bytes swapped. If the host is little-endian, this function returns *arg* unchanged.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

Data Types

CFSwappedFloat32

Structure holding a 32-bit float value in a platform-independent byte order.

```
struct CFSwappedFloat32 {
    uint32_t v;
};
typedef struct CFSwappedFloat32 CFSwappedFloat32;
```

Fields*v*

A 32-bit float value stored with a platform-independent byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFByteOrder.h

CFSwappedFloat64

Structure holding a 64-bit float value in a platform-independent byte order.

```
struct CFSwappedFloat64 {
    uint64_t v;
};
typedef struct CFSwappedFloat64 CFSwappedFloat64;
```

Fields*v*

A 64-bit float value stored with a platform-independent byte order.

Availability

Available in Mac OS X v10.0 and later.

Declared In
CFByteOrder.h

Constants

Byte Order Flags

Flags that identify byte order.

```
enum __CFByteOrder {
    CFByteOrderUnknown,
    CFByteOrderLittleEndian,
    CFByteOrderBigEndian
};
typedef enum __CFByteOrder CFByteOrder;
```

Constants

CFByteOrderUnknown

The byte order is unknown.

Available in Mac OS X v10.0 and later.

Declared in CFByteOrder.h.

CFByteOrderLittleEndian

Multi-byte values are stored with the least-significant bytes stored first. Pentium CPUs are little endian.

Available in Mac OS X v10.0 and later.

Declared in CFByteOrder.h.

CFByteOrderBigEndian

Multi-byte values are stored with the most-significant bytes stored first. PowerPC CPUs are big endian.

Available in Mac OS X v10.0 and later.

Declared in CFByteOrder.h.

Core Foundation URL Access Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFURLAccess.h

Overview

Core Foundation URL Access Utilities give you convenient system-independent methods of creating, reading, updating, or deleting a URL resource.

Given a CFURL object that holds either a file or http URL, you can read the resource's data with the [CFURLCreateDataAndPropertiesFromResource](#) (page 783) function. You can write data to the URL resource, possibly creating a new file, with the [CFURLWriteDataAndPropertiesToResource](#) (page 786) function. Finally, you can destroy, or delete, the resource pointed to by the URL with the [CFURLDestroyResource](#) (page 785) function.

Functions

CFURLCreateDataAndPropertiesFromResource

Loads the data and properties referred to by a given URL.

```
Boolean CFURLCreateDataAndPropertiesFromResource (
    CFAllocatorRef alloc,
    CFURLRef url,
    CFDataRef *resourceData,
    CFDictionaryRef *properties,
    CFArrayRef desiredProperties,
    SInt32 *errorCode
);
```

Parameters

allocator

The allocator to use to allocate memory for the new CFData and CFDictionary objects returned in *resourceData* and *properties*. Pass NULL or kCFAllocatorDefault to use the current default allocator.

url

The URL referring to the data and/or properties you wish to load.

resourceData

On return, contains a CFData object containing the data referred to by *url*. Ownership follows the Create Rule.

properties

On return, a pointer to a `CFDictionary` object containing the resource properties referred to by *url*. Ownership follows the Create Rule.

desiredProperties

A list of the properties you wish to obtain and return in *properties*. See “File URL Properties” (page 788) and “HTTP URL Properties” (page 789) for the list of available properties.

errorCode

0 if successful, otherwise an error code indicating the nature of the problem. See “Error Codes” (page 787) for a list of possible error codes.

Return Value

true if successful, false otherwise.

Discussion

If you are interested in loading only the resource data or the resource's properties, pass `NULL` for the one you don't want. If *properties* is non-`NULL` and *desiredProperties* is `NULL` then all properties are fetched. Note that as much work as possible is done even if `false` is returned. For instance, if one property is not available, the others are fetched anyway. This function is intended for convenience, not performance.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

HID Calibrator

HID Utilities Source

MoreIsBetter

QISA

SeeMyFriends

Declared In

`CFURLAccess.h`

CFURLCreatePropertyFromResource

Returns a given property specified by a given URL and property string.

```
CTypeRef CFURLCreatePropertyFromResource (
    CFAllocatorRef alloc,
    CFURLRef url,
    CFStringRef property,
    SInt32 *errorCode
);
```

Parameters

allocator

The allocator to use to allocate memory for the new `CType` object for the requested property. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

url

The `CFURL` object referring to the resource whose properties are loaded.

property

The name of the property you wish to load. Pass one of the provided string constants indicating the property. See [“File URL Properties”](#) (page 788) and [“HTTP URL Properties”](#) (page 789) for the list of available properties.

errorCode

On return, 0 if successful, otherwise an error code indicating the nature of the problem. See [“Error Codes”](#) (page 787) for a list of possible error codes.

Return Value

If successful, the requested property as a `CFType` object, `NULL` otherwise. Ownership follows the Create Rule.

Discussion

This is a convenience function for retrieving individual property values which calls through to [`CFURLCreateDataAndPropertiesFromResource`](#) (page 783).

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFURLAccess.h`

CFURLDestroyResource

Destroys a resource indicated by a given URL.

```
Boolean CFURLDestroyResource (
    CFURLRef url,
    SInt32 *errorCode
);
```

Parameters*url*

The `CFURL` object of the resource to destroy.

errorCode

On return, 0 if successful, otherwise an error code indicating the nature of the problem. See [“Error Codes”](#) (page 787) for a list of possible error codes.

Return Value

`true` if successful, `false` otherwise.

Discussion

If *url* uses an `http` scheme, an `http DELETE` request is sent to the resource. If *url* uses a file scheme, then:

- if the reference is a file, the file is deleted;
- if the reference is a directory and the directory is empty, the directory is deleted;
- if the reference is a directory and the directory is not empty, the function returns `false` and *errorCode* contains `kCFURLUnknownError`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFURLAccess.h`

CFURLWriteDataAndPropertiesToResource

Writes the given data and properties to a given URL.

```
Boolean CFURLWriteDataAndPropertiesToResource (
    CFURLRef url,
    CFDataRef dataToWrite,
    CFDictionaryRef propertiesToWrite,
    SInt32 *errorCode
);
```

Parameters

url

The resource to write.

dataToWrite

The data to write. Pass NULL to write only properties.

propertiesToWrite

The properties to write. Pass NULL to write only data. See “File URL Properties” (page 788) and “HTTP URL Properties” (page 789) for the list of available properties.

errorCode

Upon return, 0 if successful, otherwise contains an error code indicating the nature of the problem. See “Error Codes” (page 787) for a list of possible error codes.

Return Value

true if successful, false otherwise.

Discussion

Properties not present in *propertiesToWrite* are left unchanged, hence if *propertiesToWrite* is NULL or empty, the URL's properties are not changed at all.

If *url* uses a file scheme and it references a file, the contents of *dataToWrite* are written to the referenced file, overwriting any preexisting data, and the file's properties are modified according to *propertiesToWrite*. If the file does not exist, but all intermediate directories along the path do already exist, the file is created (otherwise it is not).

If *url* uses a file scheme and it references a directory (the last path character is "/"), the contents of *dataToWrite* are ignored, but if the parameter value is not NULL—and all intermediate directories along the path do already exist—a new directory is created (otherwise it is not).

If *url* uses an http scheme, an http PUT request is sent to the resource with *propertiesToWrite* as the header fields and *dataToWrite* as the data.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPrefTopScores

ImageBrowserView

MoreIsBetter

SeeMyFriends

Declared In

CFURLAccess.h

Constants

Error Codes

CFURL error codes.

```
enum CFURLError {
    kCFURLUnknownError = -10,
    kCFURLUnknownSchemeError = -11,
    kCFURLResourceNotFoundError = -12,
    kCFURLResourceAccessViolationError = -13,
    kCFURLRemoteHostUnavailableError = -14,
    kCFURLImproperArgumentsError = -15,
    kCFURLUnknownPropertyKeyError = -16,
    kCFURLPropertyKeyUnavailableError = -17,
    kCFURLTimeoutError = -18
};
typedef enum CFURLError CFURLError;
```

Constants

`kCFURLUnknownError`

Indicates an unknown error.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLUnknownSchemeError`

Indicates that the scheme is not recognized.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLResourceNotFoundError`

Indicates a resource was not found.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLResourceAccessViolationError`

Indicates an error in accessing a resource.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLRemoteHostUnavailableError`

Indicates a remote host is unavailable.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLImproperArgumentsError`

Indicates one or more arguments are improper.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLUnknownPropertyKeyError`

Indicates a property key is unknown.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLPropertyKeyUnavailableError`

Indicates a property key was unavailable.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLTimeoutError`

Indicates a timeout.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

Availability

Available in Mac OS X version 10.0 and later.

Declared In

`CFURLAccess.h`

File URL Properties

Properties for file URL resources.

```
const CFStringRef kCFURLFileExists;
const CFStringRef kCFURLFileDirectoryContents;
const CFStringRef kCFURLFileLength;
const CFStringRef kCFURLFileLastModificationTime;
const CFStringRef kCFURLFilePOSIXMode;
const CFStringRef kCFURLFileOwnerID;
```

Constants

`kCFURLFileExists`

A `CFBoolean` object indicating whether the file referred to by a URL exists.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLFileDirectoryContents`

A `CFArray` object holding `CFURL` objects for the contents of a directory referred to by a URL.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLFileLength`

A `CFNumber` object holding the file's length in bytes.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLFileLastModificationTime`

A `CFDate` object holding the file's modification time.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLFilePOSIXMode`

A `CFNumber` holding the file's POSIX mode as given in `/usr/include/sys/stat.h`.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLFileOwnerID`

A `CFNumber` holding the file owner's UID.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

Availability

Available in Mac OS X version 10.0 and later.

Declared In

`CFURLAccess.h`

HTTP URL Properties

Properties for HTTP URL resources.

```
const CFStringRef kCFURLHTTPStatusCode;
const CFStringRef kCFURLHTTPStatusLine;
```

Constants

`kCFURLHTTPStatusCode`

A `CFNumber` object holding the status code of an HTTP request.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

`kCFURLHTTPStatusLine`

A `CFString` object holding the status line of an HTTP request.

Available in Mac OS X v10.0 and later.

Declared in `CFURLAccess.h`.

Discussion

In addition to the above properties, each field within an HTTP request or response header is itself a property. You can specify a header field by using the field name as the property name.

Availability

Available in Mac OS X version 10.0 and later.

Declared In

`CFURLAccess.h`

Preferences Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFPreferences.h
Companion guide	Preferences Programming Topics for Core Foundation

Overview

Core Foundation provides a simple, standard way to manage user (and application) preferences. Core Foundation stores preferences as key-value pairs that are assigned a scope using a combination of user name, application ID, and host (computer) names. This makes it possible to save and retrieve preferences that apply to different classes of users. Core Foundation preferences is useful to all applications that support user preferences. Note that modification of some preferences domains (those not belonging to the “Current User”) requires Admin privileges—see *Authorization Services Programming Guide* for information on how to gain suitable privileges.

Unlike some other Core Foundation types, CFPreferences is not toll-free bridged to its corresponding Cocoa Foundation framework class (NSUserDefaults).

Functions by Task

Several functions return a preference value as a Core Foundation property list object. You can use the function [CFGetTypeID](#) (page 637) to determine the value’s type. For more information about property lists, see *Property List Programming Topics for Core Foundation*.

Getting Preference Values

[CFPreferencesCopyAppValue](#) (page 795)

Obtains a preference value for the specified key and application.

[CFPreferencesCopyKeyList](#) (page 796)

Constructs and returns the list of all keys set in the specified domain.

[CFPreferencesCopyMultiple](#) (page 796)

Returns a dictionary containing preference values for multiple keys.

[CFPreferencesCopyValue](#) (page 797)

Returns a preference value for a given domain.

[CFPreferencesGetAppBooleanValue](#) (page 798)

Convenience function that directly obtains a boolean preference value for the specified key.

[CPreferencesGetAppIntegerValue](#) (page 799)

Convenience function that directly obtains an integer preference value for the specified key.

Setting Preference Values

[CPreferencesSetAppValue](#) (page 800)

Adds, modifies, or removes a preference.

[CPreferencesSetMultiple](#) (page 801)

Convenience function that allows you to set and remove multiple preference values.

[CPreferencesSetValue](#) (page 801)

Adds, modifies, or removes a preference value for the specified domain.

Synchronizing Preferences

[CPreferencesAppSynchronize](#) (page 793)

Writes to permanent storage all pending changes to the preference data for the application, and reads the latest preference data from permanent storage.

[CPreferencesSynchronize](#) (page 802)

For the specified domain, writes all pending changes to preference data to permanent storage, and reads latest preference data from permanent storage.

Adding and Removing Suite Preferences

[CPreferencesAddSuitePreferencesToApp](#) (page 792)

Adds suite preferences to an application's preference search chain.

[CPreferencesRemoveSuitePreferencesFromApp](#) (page 799)

Removes suite preferences from an application's search chain.

Miscellaneous Functions

[CPreferencesAppValueIsForced](#) (page 794)

Determines whether or not a given key has been imposed on the user.

[CPreferencesCopyApplicationList](#) (page 794)

Constructs and returns the list of all applications that have preferences in the scope of the specified user and host.

Functions

CPreferencesAddSuitePreferencesToApp

Adds suite preferences to an application's preference search chain.


```
void CFPreferencesAddSuitePreferencesToApp (
    CFStringRef applicationID,
    CFStringRef suiteID
);
```

Parameters*applicationID*

The ID of the application to which to add suite preferences, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass `NULL` or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

suiteID

The ID of the application suite preferences to add. Takes the form of a Java package name, `com.foosoft`.

Discussion

Suite preferences allow you to maintain a set of preferences that are common to all applications in the suite. When a suite is added to an application's search chain, all of the domains pertaining to that suite are inserted into the chain. Suite preferences are added between the "Current Application" domains and the "Any Application" domains. If you add multiple suite preferences to one application, the order of the suites in the search chain is non-deterministic. You can override a suite preference for a given application by defining the same preference key in the application specific preferences.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFPreferences.h`

CFPreferencesAppSynchronize

Writes to permanent storage all pending changes to the preference data for the application, and reads the latest preference data from permanent storage.

```
Boolean CFPreferencesAppSynchronize (
    CFStringRef applicationID
);
```

Parameters*applicationID*

The ID of the application whose preferences to write to storage, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass `NULL` or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

Return Value

`true` if synchronization was successful, otherwise `false`.

Discussion

Calling the function [CFPreferencesSetAppValue](#) (page 800) is not in itself sufficient for storing preferences. The `CFPreferencesAppSynchronize` function writes to permanent storage all pending preference changes for the application. Typically you would call this function after multiple calls to [CFPreferencesSetAppValue](#) (page 800). Conversely, preference data is cached after it is first read. Changes made externally are not automatically incorporated. The `CFPreferencesAppSynchronize` function reads the latest preferences from permanent storage.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

ComboBoxPrefs

DTSCarbonShell

HID Config Save

QTCarbonShell

RecentItems

Declared In

CFPreferences.h

CFPreferencesAppValueIsForced

Determines whether or not a given key has been imposed on the user.

```
Boolean CFPreferencesAppValueIsForced (
    CFStringRef key,
    CFStringRef applicationID
);
```

Parameters

key

The key you are querying.

applicationID

The application's ID, typically `kCFPreferencesCurrentApplication` (page 804). Do not pass `NULL` or `kCFPreferencesAnyApplication` (page 804). Takes the form of a Java package name, `com.fooSoft`.

Return Value

`true` if value of the key cannot be changed by the user, otherwise `false`.

Discussion

In cases where machines and/or users are under some kind of management, you should use this function to determine whether or not to disable UI elements corresponding to those preference keys.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFPreferences.h

CFPreferencesCopyApplicationList

Constructs and returns the list of all applications that have preferences in the scope of the specified user and host.

```
CFArrayRef CFPreferencesCopyApplicationList (
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*userName*

[kCFPreferencesCurrentUser](#) (page 804) to search the current-user domain, otherwise [kCFPreferencesAnyUser](#) (page 804) to search the any-user domain.

hostName

[kCFPreferencesCurrentHost](#) (page 804) to search the current-host domain, otherwise [kCFPreferencesAnyHost](#) (page 804) to search the any-host domain.

Return Value

The list of application IDs. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPrefsDumper

Declared In

CFPreferences.h

CFPreferencesCopyAppValue

Obtains a preference value for the specified key and application.

```
CFPropertyListRef CFPreferencesCopyAppValue (
    CFStringRef key,
    CFStringRef applicationID
);
```

Parameters*key*

The preference key whose value to obtain.

applicationID

The identifier of the application whose preferences to search, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass `NULL` or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

Return Value

The preference data for the specified key and application. If no value was located, returns `NULL`. Ownership follows the Create Rule.

Discussion

Note that values returned from this function are immutable, even if you have recently set the value using a mutable object.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

ComboBoxPrefs

DockBrowser

DTSCarbonShell

GrabBag

QTCarbonShell

Declared In

CFPreferences.h

CFPreferencesCopyKeyList

Constructs and returns the list of all keys set in the specified domain.

```
CFArrayRef CFPreferencesCopyKeyList (
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*applicationID*

The ID of the application whose preferences to search. Takes the form of a Java package name, `com.foosoft`.

userName

[kCFPreferencesCurrentUser](#) (page 804) to search the current-user domain, otherwise [kCFPreferencesAnyUser](#) (page 804) to search the any-user domain.

hostName

[kCFPreferencesCurrentHost](#) (page 804) to search the current-host domain, otherwise [kCFPreferencesAnyHost](#) (page 804) to search the any-host domain.

Return Value

The list of keys. Ownership follows the Create Rule.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPreferences.h

CFPreferencesCopyMultiple

Returns a dictionary containing preference values for multiple keys.

```
CFDictionaryRef CFPreferencesCopyMultiple (
    CFArrayRef keysToFetch,
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*keysToFetch*

An array of preference keys the values of which to obtain.

applicationID

The ID of the application whose preferences are searched. Takes the form of a Java package name, such as `com.foosoft`.

userName

[kCFPreferencesCurrentUser](#) (page 804) to search the current-user domain, otherwise [kCFPreferencesAnyUser](#) (page 804) to search the any-user domain.

hostName

[kCFPreferencesCurrentHost](#) (page 804) to search the current-host domain, otherwise [kCFPreferencesAnyHost](#) (page 804) to search the any-host domain.

Return Value

A dictionary containing the preference values for the keys specified by *keysToFetch* for the specified domain. If no values were located, returns an empty dictionary. Ownership follows the Create Rule.

Discussion

Note that values returned from this function are immutable, even if you have recently set the value using a mutable object.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CFPrefsDumper

Declared In

CFPreferences.h

CFPreferencesCopyValue

Returns a preference value for a given domain.

```
CFPropertyListRef CFPreferencesCopyValue (
    CFStringRef key,
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*key*

Preferences key for the value to obtain.

applicationID

The ID of the application whose preferences are searched. Takes the form of a Java package name, such as `com.foosoft`.

userName

`kCFPreferencesCurrentUser` (page 804) if to search the current-user domain, otherwise `kCFPreferencesAnyUser` (page 804) to search the any-user domain.

hostName

`kCFPreferencesCurrentHost` (page 804) if to search the current-host domain, otherwise `kCFPreferencesAnyHost` (page 804) to search the any-host domain.

Return Value

The preference data for the specified domain. If the no value was located, returns `NULL`. Ownership follows the Create Rule.

Discussion

This function is the primitive get mechanism for the higher level preference function `CFPreferencesCopyAppValue` (page 795). Unlike the high-level function, `CFPreferencesCopyValue` (page 797) searches only the exact domain specified. Do not use this function directly unless you have a need. All arguments must be non-`NULL`. Do not use arbitrary user and host names, instead pass the pre-defined domain qualifier constants.

Note that values returned from this function are immutable, even if you have recently set the value using a mutable object.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFPreferences.h`

CFPreferencesGetAppBooleanValue

Convenience function that directly obtains a boolean preference value for the specified key.

```
Boolean CFPreferencesGetAppBooleanValue (
    CFStringRef key,
    CFStringRef applicationID,
    Boolean *keyExistsAndIsValidFormat
);
```

Parameters

key

The preference key whose value to obtain. The key must specify a preference whose value is of type `Boolean`.

applicationID

The identifier of the application whose preferences are searched, typically `kCFPreferencesCurrentApplication` (page 804). Do not pass `NULL` or `kCFPreferencesAnyApplication` (page 804). Takes the form of a Java package name, such as `com.foosoft`.

keyExistsAndIsValidFormat

On return, `true` if the preference value for the specified key was located and found to be of type `Boolean`, otherwise `false`.

Return Value

The preference data for the specified key and application, or if no value was located, `false`.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DTSCarbonShell

QTCarbonShell

RecentItems

Declared In

CFPreferences.h

CFPreferencesGetAppIntegerValue

Convenience function that directly obtains an integer preference value for the specified key.

```
CFIndex CFPreferencesGetAppIntegerValue (
    CFStringRef key,
    CFStringRef applicationID,
    Boolean *keyExistsAndHasValidFormat
);
```

Parameters

key

The preference key whose value you wish to obtain. The key must specify a preference whose value is of type `int`.

applicationID

The identifier of the application whose preferences you wish to search, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass `NULL` or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

keyExistsAndHasValidFormat

On return, indicates whether the preference value for the specified key was located and found to be of type `int`.

Return Value

The preference data for the specified key and application. If no value was located, `0` is returned.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPreferences.h

CFPreferencesRemoveSuitePreferencesFromApp

Removes suite preferences from an application's search chain.

```
void CFPreferencesRemoveSuitePreferencesFromApp (
    CFStringRef applicationID,
    CFStringRef suiteID
);
```

Parameters*applicationID*

The ID of the application from which to remove suite preferences, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass NULL or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

suiteID

The ID of the application suite preferences to remove. Takes the form of a Java package name, `com.foosoft`.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPreferences.h

CFPreferencesSetAppValue

Adds, modifies, or removes a preference.

```
void CFPreferencesSetAppValue (
    CFStringRef key,
    CFPropertyListRef value,
    CFStringRef applicationID
);
```

Parameters*key*

The preference key whose value you wish to set.

value

The value to set for the specified *key* and application. Pass NULL to remove the specified key from the application's preferences.

applicationID

The ID of the application whose preferences you wish to create or modify, typically [kCFPreferencesCurrentApplication](#) (page 804). Do not pass NULL or [kCFPreferencesAnyApplication](#) (page 804). Takes the form of a Java package name, `com.foosoft`.

Discussion

New preference values are stored in the standard application preference location, `~/Library/Preferences/`. When called with [kCFPreferencesCurrentApplication](#) (page 804), modifications are performed in the preference domain "Current User, Current Application, Any Host." If you need to create preferences in some other domain, use the low-level function [CFPreferencesSetValue](#) (page 801).

You must call the [CFPreferencesAppSynchronize](#) (page 793) function in order for your changes to be saved to permanent storage.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

DockBrowser
 DTSCarbonShell
 GrabBag
 QTCarbonShell
 RecentItems

Declared In

CFPreferences.h

CFPreferencesSetMultiple

Convenience function that allows you to set and remove multiple preference values.

```
void CFPreferencesSetMultiple (
    CFDictionaryRef keysToSet,
    CFArrayRef keysToRemove,
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters

keysToSet

A dictionary containing the key/value pairs for the preferences to set.

keysToRemove

An array containing a list of keys to remove.

applicationID

The ID of the application whose preferences you wish to modify. Takes the form of a Java package name, `com.foosoft`.

userName

[kCFPreferencesCurrentUser](#) (page 804) to modify the current user's preferences, otherwise [kCFPreferencesAnyUser](#) (page 804) to modify the preferences of all users.

hostName

[kCFPreferencesCurrentHost](#) (page 804) to modify the preferences of the current host, otherwise [kCFPreferencesAnyHost](#) (page 804) to modify the preferences of all hosts.

Discussion

Behavior is undefined if a key is in both *keysToSet* and *keysToRemove*

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFPreferences.h

CFPreferencesSetValue

Adds, modifies, or removes a preference value for the specified domain.

```
void CFPreferencesSetValue (
    CFStringRef key,
    CFPropertyListRef value,
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*key*

Preferences key for the value you wish to set.

*value*The value to set for *key* and application. Pass `NULL` to remove *key* from the domain.*applicationID*The ID of the application whose preferences you wish to modify. Takes the form of a Java package name, `com.foosoft`.*userName*`kCFPreferencesCurrentUser` (page 804) to modify the current user's preferences, otherwise `kCFPreferencesAnyUser` (page 804) to modify the preferences of all users.*hostName*`kCFPreferencesCurrentHost` (page 804) to modify the preferences of the current host, otherwise `kCFPreferencesAnyHost` (page 804) to modify the preferences of all hosts.**Discussion**

This function is the primitive set mechanism for the higher level preference function `CFPreferencesSetAppValue` (page 800). Only the exact domain specified is modified. Do not use this function directly unless you have a specific need. All arguments except *value* must be non-NULL. Do not use arbitrary user and host names, instead pass the pre-defined constants.

You must call the `CFPreferencesSynchronize` (page 802) function in order for your changes to be saved to permanent storage. Note that you can only save preferences for "Any User" if you have Admin privileges.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code`CFPrefTopScores`**Declared In**`CFPreferences.h`**CFPreferencesSynchronize**

For the specified domain, writes all pending changes to preference data to permanent storage, and reads latest preference data from permanent storage.

```
Boolean CFPreferencesSynchronize (
    CFStringRef applicationID,
    CFStringRef userName,
    CFStringRef hostName
);
```

Parameters*applicationID*

The ID of the application whose preferences you wish to modify. Takes the form of a Java package name, `com.foosoft`.

userName

[kCFPreferencesCurrentUser](#) (page 804) to modify the current user's preferences, otherwise [kCFPreferencesAnyUser](#) (page 804) to modify the preferences of all users.

hostName

[kCFPreferencesCurrentHost](#) (page 804) to search the current-host domain, otherwise [kCFPreferencesAnyHost](#) (page 804) to search the any-host domain.

Return Value

`true` if synchronization was successful, `false` if an error occurred.

Discussion

This function is the primitive synchronize mechanism for the higher level preference function [CFPreferencesAppSynchronize](#) (page 793); it writes updated preferences to permanent storage, and reads the latest preferences from permanent storage. Only the exact domain specified is modified. Note that to modify “Any User” preferences requires Admin privileges—see *Authorization Services Programming Guide*.

Do not use this function directly unless you have a specific need. All arguments must be non- `NULL`. Do not use arbitrary user and host names, instead pass the pre-defined constants.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

[CFPrefTopScores](#)

Declared In

[CFPreferences.h](#)

Constants

Application, Host, and User Keys

Keys used to specify the common preference domains.

```
const CFStringRef kCFPreferencesAnyApplication;  
const CFStringRef kCFPreferencesAnyHost;  
const CFStringRef kCFPreferencesAnyUser;  
const CFStringRef kCFPreferencesCurrentApplication;  
const CFStringRef kCFPreferencesCurrentHost;  
const CFStringRef kCFPreferencesCurrentUser;
```

Constants

`kCFPreferencesAnyApplication`

Indicates a preference that applies to any application.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

`kCFPreferencesAnyHost`

Indicates a preference that applies to any host.

This domain is currently unsupported.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

`kCFPreferencesAnyUser`

Indicates a preference that applies to any user.

This domain is currently unsupported.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

`kCFPreferencesCurrentApplication`

Indicates a preference that applies only to the current application.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

`kCFPreferencesCurrentHost`

Indicates a preference that applies only to the current host.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

`kCFPreferencesCurrentUser`

Indicates a preference that applies only to the current user.

Available in Mac OS X v10.0 and later.

Declared in `CFPreferences.h`.

Socket Name Server Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFSocket.h

Overview

Name server functionality is currently inoperable in Mac OS X.

Functions

CFSocketCopyRegisteredSocketSignature

Returns a socket signature registered with a CFSocket name server.

```
CFSocketError CFSocketCopyRegisteredSocketSignature (
    const CFSocketSignature *nameServerSignature,
    CFTimeInterval timeout,
    CFStringRef name,
    CFSocketSignature *signature,
    CFDataRef *nameServerAddress
);
```

Parameters

nameServerSignature

The socket signature for the name server. If NULL, this function contacts the default server, which is assumed to be a local process using TCP/IP to listen on the port number returned from [CFSocketGetDefaultNameRegistryPortNumber](#) (page 807). If *nameServerSignature* is incomplete, the missing values are replaced with the default server's values, if appropriate.

timeout

The time to wait for the server to accept a connection and to reply to the registration request.

name

The name of the registered socket signature to retrieve.

signature

A pointer to a CFSocketSignature structure into which the retrieved socket signature is copied.

nameServerAddress

A pointer to a CFData object into which the name server's address is copied. Pass NULL if you do not want the server's address.

Return Value

An error code indicating success or failure.

Discussion

Once you have the socket signature, you can open a connection to that socket with [CFSocketCreateConnectedToSocketSignature](#) (page 505).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketCopyRegisteredValue

Returns a value registered with a CFSocket name server.

```
CFSocketError CFSocketCopyRegisteredValue (
    const CFSocketSignature *nameServerSignature,
    CFTimeInterval timeout,
    CFStringRef name,
    CFPropertyListRef *value,
    CFDataRef *nameServerAddress
);
```

Parameters

nameServerSignature

The socket signature for the name server. If NULL, this function contacts the default server, which is assumed to be a local process using TCP/IP to listen on the port number returned from [CFSocketGetDefaultNameRegistryPortNumber](#) (page 807). If *nameServerSignature* is incomplete, the missing values are replaced with the default server's values, if appropriate.

timeout

The time to wait for the server to accept a connection and to reply to the registration request.

name

The name of the registered value to return.

value

A pointer to the property list object into which the retrieved value should be copied.

nameServerAddress

A pointer to a CFData object into which the name server's address is copied. Pass NULL if you do not want the server's address.

Return Value

An error code indicating success or failure.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketGetDefaultNameRegistryPortNumber

Returns the default port number with which to connect to a CFSocket name server.

```
UInt16 CFSocketGetDefaultNameRegistryPortNumber (
    void
);
```

Return Value

The default port number with which to connect to a CFSocket name server.

Discussion

If you do not provide a name server signature or leave out the socket address in the signature when calling one of the name registry functions, such as [CFSocketRegisterSocketSignature](#) (page 807), the returned port number is used for the connection.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketRegisterSocketSignature

Registers a socket signature with a CFSocket name server.

```
CFSocketError CFSocketRegisterSocketSignature (
    const CFSocketSignature *nameServerSignature,
    CFTimeInterval timeout,
    CFStringRef name,
    const CFSocketSignature *signature
);
```

Parameters

nameServerSignature

The socket signature for the name server. If NULL, this function contacts the default server, which is assumed to be a local process using TCP/IP to listen on the port number returned from [CFSocketGetDefaultNameRegistryPortNumber](#) (page 807). If *nameServerSignature* is incomplete, the missing values are replaced with the default server's values, if appropriate.

timeout

The time to wait for the server to accept a connection and to reply to the registration request.

name

The name with which to register *signature*.

signature

The socket signature to register.

Return Value

An error code indicating success or failure.

Discussion

Once a socket signature is registered, other processes can retrieve it with [CFSocketCopyRegisteredSocketSignature](#) (page 805) and then open a connection to your socket using [CFSocketCreateConnectedToSocketSignature](#) (page 505).

To remove a registered socket signature from the name server, use [CFSocketUnregister](#) (page 809).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketRegisterValue

Registers a property-list value with a CFSocket name server.

```
CFSocketError CFSocketRegisterValue (
    const CFSocketSignature *nameServerSignature,
    CFTimeInterval timeout,
    CFStringRef name,
    CFPropertyListRef value
);
```

Parameters

nameServerSignature

The socket signature for the name server. If `NULL`, this function contacts the default server, which is assumed to be a local process using TCP/IP to listen on the port number returned from [CFSocketGetDefaultNameRegistryPortNumber](#) (page 807). If *nameServerSignature* is incomplete, the missing values are replaced with the default server's values, if appropriate.

timeout

The time to wait for the server to accept a connection and to reply to the registration request.

name

The name with which to register *value*.

value

The property-list value to register.

Return Value

An error code indicating success or failure.

Discussion

To remove a registered value from the name server, use [CFSocketUnregister](#) (page 809).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketSetDefaultNameRegistryPortNumber

Sets the default port number with which to connect to a CFSocket name server.


```
void CFSocketSetDefaultNameRegistryPortNumber (
    UInt16 port
);
```

Parameters*port*

The port number to use to connect to the CFSocket name server.

Discussion

If you do not provide a name server signature or leave out the socket address in the signature when calling one of the name registry functions, such as [CFSocketRegisterSocketSignature](#) (page 807), *port* will be used for the connection.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

CFSocketUnregister

Unregisters a value or socket signature with a CFSocket name server.

```
CFSocketError CFSocketUnregister (
    const CFSocketSignature *nameServerSignature,
    CFTimeInterval timeout,
    CFStringRef name
);
```

Parameters*nameServerSignature*

The socket signature for the name server. If NULL, this function contacts the default server, which is assumed to be a local process using TCP/IP to listen on the port number returned from [CFSocketGetDefaultNameRegistryPortNumber](#) (page 807). If *nameServerSignature* is incomplete, the missing values are replaced with the default server's values, if appropriate.

timeout

The time to wait for the server to accept a connection and to reply to the registration request.

name

The name of the property-list value or socket signature to unregister.

Return Value

An error code indicating success or failure.

Discussion

The value being unregistered was previously registered with [CFSocketRegisterValue](#) (page 808) or [CFSocketRegisterSocketSignature](#) (page 807).

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFSocket.h

Constants

CFSocket Name Server Keys

Not used.

```
const CFStringRef kCFSocketCommandKey;
const CFStringRef kCFSocketNameKey;
const CFStringRef kCFSocketValueKey;
const CFStringRef kCFSocketResultKey;
const CFStringRef kCFSocketErrorKey;
const CFStringRef kCFSocketRegisterCommand;
const CFStringRef kCFSocketRetrieveCommand;
```

Constants

kCFSocketCommandKey

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketNameKey

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketValueKey

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketResultKey

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketErrorKey

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketRegisterCommand

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

kCFSocketRetrieveCommand

Not used.

Available in Mac OS X v10.0 and later.

Declared in CFSocket.h.

Declared In

CFSocket.h

Time Utilities Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CFDate.h
Companion guide	Dates and Times Programming Guide for Core Foundation

Overview

Core Foundation measures time in units of seconds. The base data type is the [CFTimeInterval](#) (page 818), which measures the difference in seconds between two times. Fixed times, or dates, are defined by the [CFAbsoluteTime](#) (page 817) data type, which measures the time interval between a particular date and the absolute reference date of Jan 1 2001 00:00:00 GMT.

The [CFGregorianCalendar](#) (page 817) structure represents absolute times in terms of the Gregorian calendar. Functions such as [CFAbsoluteTimeGetGregorianCalendar](#) (page 814) use a [CFTimeZone](#) object to obtain the local time in a particular time zone.

The [CFDate](#) opaque type wraps an absolute time into a [CType](#)-base object, allowing you to put time objects into collections and property lists and to be handled by other object-oriented parts of Core Foundation.

Functions

CFAbsoluteTimeAddGregorianUnits

Adds a time interval, expressed as Gregorian units, to a given absolute time.

```
CFAbsoluteTime CFAbsoluteTimeAddGregorianUnits (
    CFAbsoluteTime at,
    CFTimeZoneRef tz,
    CFGregorianCalendarUnits units
);
```

Parameters

at

The absolute time to which the interval is added.

tz

The time zone to use for time correction. Pass `NULL` for GMT.

units

The time interval to add to *at*.

Return Value

An absolute time value equal to the sum of *at* and *units*.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CalendarView

Declared In

CFDate.h

CFAbsoluteTimeGetCurrent

Returns the current system absolute time.

```
CFAbsoluteTime CFAbsoluteTimeGetCurrent ();
```

Return Value

The current absolute time.

Discussion

Absolute time is measured in seconds relative to the absolute reference date of Jan 1 2001 00:00:00 GMT. A positive value represents a date after the reference date, a negative value represents a date before it. For example, the absolute time `-32940326` is equivalent to December 16th, 1999 at 17:54:34. Repeated calls to this function do not guarantee monotonically increasing results. The system time may decrease due to synchronization with external time references or due to an explicit user change of the clock.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

AudioQueueTools

ColorSyncDevices

NSGLImage

OpenGL Screensaver

Worm

Declared In

CFDate.h

CFAbsoluteTimeGetDayOfWeek

Returns an integer representing the day of the week indicated by the specified absolute time.

```
SInt32 CFAbsoluteTimeGetDayOfWeek (
    CFAbsoluteTime at,
    CFTimeZoneRef tz
);
```

Parameters

at

The absolute time to convert.

tz

The time zone to use for time correction. Pass `NULL` for GMT.

Return Value

An integer (1-7) representing the day of the week specified by *at*. Per ISO-8601, Monday is represented by 1, Tuesday by 2, and so on.

Availability

Available in Mac OS X v10.0 and later.

Related Sample Code

CalendarView

Declared In

CFDate.h

CFAbsoluteTimeGetDayOfYear

Returns an integer representing the day of the year indicated by the specified absolute time.

```
SInt32 CFAbsoluteTimeGetDayOfYear (
    CFAbsoluteTime at,
    CFTimeZoneRef tz
);
```

Parameters*at*

The absolute time to convert.

tz

The time zone to use for time correction. Pass `NULL` for GMT.

Return Value

An integer (1-366) representing the day of the year specified by *at*.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFAbsoluteTimeGetDifferenceAsGregorianUnits

Computes the time difference between two specified absolute times and returns the result as an interval in Gregorian units.

```

CFGregorianUnits CFAbsoluteTimeGetDifferenceAsGregorianUnits (
    CFAbsoluteTime at1,
    CFAbsoluteTime at2,
    CFTimeZoneRef tz,
    CFOptionFlags unitFlags
);

```

Parameters*at1*

An absolute time.

at2

An absolute time.

tz

The time zone to use for time correction. Pass NULL for GMT.

*unitFlags*A mask that specifies which Gregorian unit fields to use when converting the absolute time difference into a Gregorian interval. See [Gregorian Unit Flags](#) (page 818) for a list of values from which to construct the mask.**Return Value**The difference between the specified absolute times (as $at1 - at2$ —if *at1* is earlier than *at2*, the result is negative) expressed in the units specified by *unitFlags*.**Discussion**

The temporal difference is expressed as accurately as possible, given the units specified. For example, if you asked for the number of months and hours between 2:30pm on April 8 2005 and 5:45pm September 9 2005, the result would be 5 months and 27 hours.

The following example prints the number of hours and minutes between the current time (now) and the reference date (1 January 2001 00:00:00 GMT).

```

CFAbsoluteTime now = CFAbsoluteTimeGetCurrent ();

CFGregorianUnits units = CFAbsoluteTimeGetDifferenceAsGregorianUnits
    (now, 0, NULL, (kCFGregorianUnitsHours | kCFGregorianUnitsMinutes));

CFStringRef output = CFStringCreateWithFormat
    (NULL, 0, CFSTR("hours: %d; minutes: %d"), units.hours, units.minutes);
CFShow(output);

```

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFAbsoluteTimeGetGregorianDate

Converts an absolute time value into a Gregorian date.

```

CFGregorianCalendar CFAbsoluteTimeGetGregorianCalendar (
    CFbsoluteTime at,
    CFTimeZoneRef tz
);

```

Parameters*at*

The absolute time value to convert.

*tz*The time zone to use for time correction. Pass `NULL` for GMT.**Return Value**The Gregorian date equivalent for *at*.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

CalendarView

SampleDS

Declared In

CFDate.h

CFbsoluteTimeGetWeekOfYear

Returns an integer representing the week of the year indicated by the specified absolute time.

```

SInt32 CFbsoluteTimeGetWeekOfYear (
    CFbsoluteTime at,
    CFTimeZoneRef tz
);

```

Parameters*at*

The absolute time to convert.

*tz*The time zone to use for time correction. Pass `NULL` for GMT.**Return Value**An integer (1-53) representing the week of the year specified by *at*. The numbering follows the ISO 8601 definition of week.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFGregorianCalendarGetAbsoluteTime

Converts a Gregorian date value into an absolute time value.

```

CFAbsoluteTime CFGregorianCalendarGetAbsoluteTime (
    CFGregorianCalendar gdate,
    CFTimeZoneRef tz
);

```

Parameters*gdate*

The Gregorian date to convert.

*tz*The time zone to use for time correction. Pass `NULL` for GMT.**Return Value**The absolute time equivalent of *gdate*.**Availability**

Available in Mac OS X v10.0 and later.

Related Sample Code

CalendarView

Declared In

CFDate.h

CFGregorianCalendarIsValid

Checks the specified fields of a CFGregorianCalendar structure for valid values.

```

Boolean CFGregorianCalendarIsValid (
    CFGregorianCalendar gdate,
    CFOptionFlags unitFlags
);

```

Parameters*gdate*

The CFGregorianCalendar structure whose fields to validate.

*unitFlags*A mask that specifies which Gregorian unit fields to validate. See [Gregorian Unit Flags](#) (page 818) for a list of values from which to construct the mask.**Return Value**`true` if the specified fields are valid, otherwise `false`.**Availability**

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

Data Types

CFAbsoluteTime

Type used to represent a specific point in time relative to the absolute reference date of 1 Jan 2001 00:00:00 GMT.

```
typedef CTimeInterval CFAbsoluteTime;
```

Discussion

Absolute time is measured by the number of seconds between the reference date and the specified date. Negative values indicate dates/times before the reference date. Positive values indicate dates/times after the reference date.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFGregorianCalendar

Structure used to represent a point in time using the Gregorian calendar.

```
struct CFGregorianCalendar {
    SInt32 year;
    SInt8 month;
    SInt8 day;
    SInt8 hour;
    SInt8 minute;
    double second;
};
typedef struct CFGregorianCalendar CFGregorianCalendar;
```

Discussion

CFGregorianCalendar is implemented using the smallest data type appropriate for the range of possible values. For example, there are only 12 months in the Gregorian year, so there is no need to use an integer type larger than 8 bits. To represent a time interval in Gregorian units, use a [CFGregorianCalendarUnits](#) (page 817).

The month and day units are 1-based: the index for January is 1, and the index for the first day of the month is 1.

Availability

Available in Mac OS X v10.0 and later.

Declared In

CFDate.h

CFGregorianCalendarUnits

Structure used to represent a time interval in Gregorian units.

```
struct CFGregorianUnits {
    SInt32 years;
    SInt32 months;
    SInt32 days;
    SInt32 hours;
    SInt32 minutes;
    double seconds;
};
typedef struct CFGregorianUnits CFGregorianUnits;
```

Discussion

A `CFGregorianUnits` is used to represent arbitrary time *intervals* (to represent a point in time using Gregorian units, use a [CFGregorianDate](#) (page 817)). Each field can take values up to the maximum possible for its data type. Negative values are also valid.

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFDate.h`

CTimeInterval

Type used to represent elapsed time in seconds.

```
typedef double CFTimeInterval;
```

Availability

Available in Mac OS X v10.0 and later.

Declared In

`CFDate.h`

Constants

CFGregorianUnitFlags

These option flags are used as a mask to indicate a specific set of fields in the `CFGregorianDate` or `CFGregorianUnits` structures.

```
enum CFGregorianUnitFlags {
    kCFGregorianUnitsYears = (1 << 0),
    kCFGregorianUnitsMonths = (1 << 1),
    kCFGregorianUnitsDays = (1 << 2),
    kCFGregorianUnitsHours = (1 << 3),
    kCFGregorianUnitsMinutes = (1 << 4),
    kCFGregorianUnitsSeconds = (1 << 5),
    kCFGregorianAllUnits = 0x00FFFFFF
};
typedef enum CFGregorianUnitFlags CFGregorianUnitFlags;
```

Constants

`kCFGregorianUnitsYears`

Specifies the year field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianUnitsMonths`

Specifies the month field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianUnitsDays`

Specifies the day field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianUnitsHours`

Specifies the hours field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianUnitsMinutes`

Specifies the minutes field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianUnitsSeconds`

Specifies the seconds field.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFGregorianAllUnits`

Specifies all fields.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

Discussion

These flags are used with functions such as [CFGregorianDateIsValid](#) (page 816) and [CFAbsoluteTimeGetDifferenceAsGregorianUnits](#) (page 813) which operate on a `CFGregorianDate` or `CFGregorianUnits` structure. For more details, see the discussion of those functions.

Declared In

`CFDate.h`

Predefined Time Interval Values

Time intervals between the absolute reference date and certain other dates.

```
const CTimeInterval kCFAbsoluteTimeIntervalSince1970;  
const CTimeInterval kCFAbsoluteTimeIntervalSince1904;
```

Constants

`kCFAbsoluteTimeIntervalSince1970`

The time interval between 1 January 1970 and the reference date 1 January 2001 00:00:00 GMT.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

`kCFAbsoluteTimeIntervalSince1904`

The time interval between 1 January 1904 and the reference date 1 January 2001 00:00:00 GMT.

Available in Mac OS X v10.0 and later.

Declared in `CFDate.h`.

Other References

CFStream Reference

Framework:	CoreFoundation/CoreFoundation.h
Declared in	CoreFoundation/CFStream.h
Companion guides	Getting Started with Networking CFNetwork Programming Guide

Overview

This document describes the generic `CFStream` functions, data types, and constants. See also [CFReadStreamRef](#) (page 439) and [CFWriteStreamRef](#) (page 715) for functions and constants specific to read and write streams respectively.

Functions

CFStreamCreateBoundPair

Creates a pair of read and write streams.

```
void CFStreamCreateBoundPair (
    CFAllocatorRef alloc,
    CFReadStreamRef *readStream,
    CFWriteStreamRef *writeStream,
    CFIndex transferBufferSize
);
```

Parameters

alloc

The allocator to use to allocate memory for the new objects. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

readStream

Upon return, a readable stream. Ownership follows the Create Rule.

writeStream

Upon return, a writable. Ownership follows the Create Rule.

transferBufferSize

The size of the buffer to use to transfer data from *readStream* to *writeStream*.

Availability

Available in Mac OS X v10.5 and later.

Declared In

CFStream.h

CFStreamCreatePairWithPeerSocketSignature

Creates readable and writable streams connected to a socket.

```
void CFStreamCreatePairWithPeerSocketSignature (
    CFAllocatorRef alloc,
    const CFSocketSignature *signature,
    CFReadStreamRef *readStream,
    CFWriteStreamRef *writeStream
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new objects. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

signature

A `CFSocketSignature` structure identifying the communication protocol and address to which the socket streams should connect.

readStream

On return, a readable stream connected to the socket address in *signature*. If you pass `NULL`, this function will not create a readable stream. Ownership follows the Create Rule.

writeStream

On return, a writable stream connected to the socket address in *signature*. If you pass `NULL`, this function will not create a writable stream. Ownership follows the Create Rule.

Discussion

The streams do not open a connection to the socket until one of the streams is opened.

Most properties are shared by both streams. Setting the property for one stream automatically sets the property for the other.

Availability

Available in Mac OS X v10.2 and later.

Declared In

CFStream.h

CFStreamCreatePairWithSocket

Creates readable and writable streams connected to a socket.


```
void CFStreamCreatePairWithSocket (
    CFAllocatorRef alloc,
    CFSocketNativeHandle sock,
    CFReadStreamRef *readStream,
    CFWriteStreamRef *writeStream
);
```

Parameters*alloc*

The allocator to use to allocate memory for the new objects. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

sock

The pre-existing (and already connected) socket which the socket streams should use.

readStream

Upon return, a readable stream connected to the socket address in *signature*. If you pass `NULL`, this function will not create a readable stream. Ownership follows the Create Rule.

writeStream

Upon return, a writable stream connected to the socket address in *signature*. If you pass `NULL`, this function will not create a writable stream. Ownership follows the Create Rule.

Discussion

Most properties are shared by both streams. Setting the property for one stream automatically sets the property for the other.

Availability

Available in Mac OS X v10.1 and later.

Related Sample Code

CocoaEcho

CocoaHTTPServer

CocoaSOAP

Declared In

CFStream.h

CFStreamCreatePairWithSocketToHost

Creates readable and writable streams connected to a TCP/IP port of a particular host.

```
void CFStreamCreatePairWithSocketToHost (
    CFAllocatorRef alloc,
    CFStringRef host,
    UInt32 port,
    CFReadStreamRef *readStream,
    CFWriteStreamRef *writeStream
);
```

Parameters*alloc*

The allocator to use to allocate memory for the `CFReadStream` and `CFWriteStream` objects. Pass `NULL` or `kCFAllocatorDefault` to use the current default allocator.

host

The host name to which the socket streams should connect. The host can be specified using an IPv4 or IPv6 address or a fully qualified DNS host name.

port

The TCP port number to which the socket streams should connect.

readStream

Upon return, a readable stream connected to the socket address in *port*. If you pass `NULL`, this function will not create a readable stream. Ownership follows the Create Rule.

writeStream

Upon return, a writable stream connected to the socket address in *port*. If you pass `NULL`, this function will not create a writable stream. Ownership follows the Create Rule.

Discussion

The streams do not open a connection to the specified host until one of the streams is opened.

Most properties are shared by both streams. Setting the property for one stream automatically sets the property for the other.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

Data Types

CFStreamError

The structure returned by [CFReadStreamGetError](#) (page 432) and [CFWriteStreamGetError](#) (page 708). **(Deprecated.** Use [CFReadStreamCopyError](#) (page 429) and [CFWriteStreamCopyError](#) (page 705) instead.)

```
typedef struct {
    CFStreamErrorDomain domain;
    SInt32 error;
} CFStreamError;
```

Fields

domain

The error domain that should be used to interpret the error. See [CFStream Error Domain Constants](#) (page 829) for possible values.

error

The error code.

Availability

Available in Mac OS X v10.1 and later.

Declared In

CFStream.h

CFStreamClientContext

A structure provided when an application registers itself to receive stream-related events.

```
struct CFStreamClientContext {
    CFIndex version;
    void *info;
    void *(*retain)(void *info);
    void (*release)(void *info);
    CFStringRef (*copyDescription)(void *info);
} CFStreamClientContext;
```

Fields

version

An integer of type `CFIndex`. Currently the only valid value is zero.

info

A pointer to allocated memory containing user-defined data that will be valid for as long as the client is registered with the stream. You may assign `NULL` if your callback function doesn't want to receive user-defined data.

retain

A pointer to a function callback that retains the data pointed to by the `info` field. You may set this function pointer to `NULL`.

release

A pointer to a function callback that releases the data pointed to by the `info` field. You may set this function pointer to `NULL` but doing so might result in memory leaks.

copyDescription

A pointer to a function callback that provides a description of the data pointed to by the `info` field. In implementing this function, return a reference to a `CFString` object that describes your allocator, particularly some characteristics of your user-defined data. You may set this function pointer to `NULL`, in which case Core Foundation will provide a rudimentary description.

Declared In

CoreFoundation/CFStream.h

Constants

CFStream Status Constants

Constants that describe the status of a stream.

```
typedef enum {
    kCFStreamStatusNotOpen = 0,
    kCFStreamStatusOpening,
    kCFStreamStatusOpen,
    kCFStreamStatusReading,
    kCFStreamStatusWriting,
    kCFStreamStatusAtEnd,
    kCFStreamStatusClosed,
    kCFStreamStatusError
} CFStreamStatus;
```

Constants

`kCFStreamStatusNotOpen`

The stream is not open for reading or writing.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusOpening`

The stream is being opened for reading or for writing.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusOpen`

The stream is open.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusReading`

The stream is being read from.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusWriting`

The stream is being written to.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusAtEnd`

There is no more data to read, or no more data can be written.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusClosed`

The stream is closed.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamStatusError`

An error occurred on the stream.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

Discussion

The `CFStreamStatus` enumeration defines constants that describe the status of a stream. These values are returned by `CFReadStreamGetStatus` (page 433) and `CFWriteStreamGetStatus` (page 709).

Declared In

CoreFoundation/CFStream.h

CFStream Error Domain Constants

Defines constants for values returned in the domain field of the `CFStreamError` structure. **(Deprecated.)** These constants are returned by `CFReadStreamGetError` (page 432) and `CFWriteStreamGetError` (page 708); use `CFReadStreamCopyError` (page 429) and `CFWriteStreamCopyError` (page 705) instead.)

```
typedef enum {
    kCFStreamErrorDomainCustom = -1,
    kCFStreamErrorDomainPOSIX = 1,
    kCFStreamErrorDomainMacOSStatus,
} CFStreamErrorDomain;
```

Constants

`kCFStreamErrorDomainCustom`

The error code is a custom error code.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamErrorDomainPOSIX`

The error code is an error code defined in `errno.h`.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamErrorDomainMacOSStatus`

The error is an `OSStatus` value defined in `MacErrors.h`.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

Discussion

These constants indicate how the error code in the `error` field in the `CFStreamError` (page 826) structure should be interpreted.

Declared In

CoreFoundation/CFStream.h

CFStream Error Domain Constants (CFHost)

Defines constants for values returned in the domain field of the `CFStreamError` structure.

```

const SInt32 kCFStreamErrorDomainNetDB;
const SInt32 kCFStreamErrorDomainNetServices;
const SInt32 kCFStreamErrorDomainMach;
const SInt32 kCFStreamErrorDomainFTP;
const SInt32 kCFStreamErrorDomainHTTP;
const int kCFStreamErrorDomainSOCKS;
const SInt32 kCFStreamErrorDomainSystemConfiguration;
const int kCFStreamErrorDomainSSL;

```

Constants

`kCFStreamErrorDomainNetDB`

The error code is an error code defined in `netdb.h`.

Available in Mac OS X v10.3 and later.

Declared in `CFHost.h`.

`kCFStreamErrorDomainNetServices`

The error code is a `CFNetService` error code. For details, see the `CFNetService` Error Constants enumeration.

Available in Mac OS X v10.2 and later.

Declared in `CFNetServices.h`.

`kCFStreamErrorDomainMach`

The error code is a Mach error code defined in `mach/error.h`.

Available in Mac OS X v10.2 and later.

Declared in `CFNetServices.h`.

`kCFStreamErrorDomainFTP`

The error code is an FTP error code.

Available in Mac OS X v10.3 and later.

Declared in `CFFTPStream.h`.

`kCFStreamErrorDomainHTTP`

The error code is an HTTP error code.

Available in Mac OS X v10.1 and later.

Declared in `CFHTTPStream.h`.

`kCFStreamErrorDomainSOCKS`

The error code is a SOCKS proxy error.

Available in Mac OS X v10.2 and later.

Declared in `CFSocketStream.h`.

`kCFStreamErrorDomainSystemConfiguration`

The error code is a system configuration error code as defined in `System/ConfigurationSystemConfiguration.h`.

Available in Mac OS X v10.3 and later.

Declared in `CFHost.h`.

`kCFStreamErrorDomainSSL`

The error code is an SSL error code as defined in `Security/SecureTransport.h`.

Available in Mac OS X v10.1 and later.

Declared in `CFSocketStream.h`.

Discussion

These constants indicate how the error code in the `error` field in the `CFStreamError` (page 826) structure should be interpreted.

Availability

Available in Mac OS X version 10.0 and later.

Declared In

`CFNetwork.framework/CFHost.h`

CFStream Event Type Constants

Defines constants for stream-related events.

```
typedef enum {
    kCFStreamEventNone = 0,
    kCFStreamEventOpenCompleted = 1,
    kCFStreamEventHasBytesAvailable = 2,
    kCFStreamEventCanAcceptBytes = 4,
    kCFStreamEventErrorOccurred = 8,
    kCFStreamEventEndEncountered = 16
} CFStreamEventType;
```

Constants

`kCFStreamEventNone`

No event has occurred.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamEventOpenCompleted`

The open has completed successfully.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamEventHasBytesAvailable`

The stream has bytes to be read.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamEventCanAcceptBytes`

The stream can accept bytes for writing.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamEventErrorOccurred`

An error has occurred on the stream.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamEventEndEncountered`

The end of the stream has been reached.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

Discussion

This enumeration defines constants for stream-related events.

Availability

Available in Mac OS X version 10.0 and later.

Declared In

CoreFoundation/CFStream.h

Stream Properties

Stream property names that can be set or copied.

```
const CFStringRef kCFStreamPropertyAppendToFile;
const CFStringRef kCFStreamPropertyFileCurrentOffset;
const CFStringRef kCFStreamPropertyDataWritten;
const CFStringRef kCFStreamPropertySocketNativeHandle;
const CFStringRef kCFStreamPropertySocketRemoteHostName;
const CFStringRef kCFStreamPropertySocketRemotePortNumber;
```

Constants

`kCFStreamPropertyDataWritten`

Value is a `CFData` object that contains all the bytes written to a writable memory stream. You cannot modify this value.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamPropertyAppendToFile`

Value is a `CFBoolean` value that indicates whether to append the written data to a file, if it already exists, rather than to replace its contents.

You must set this value before opening the writable file stream. The default value is `kCFBooleanFalse`, indicating that the stream should replace any pre-existing file. You cannot read this value.

Declared in `CFStream.h`.

Available in Mac OS X version 10.2 and later.

`kCFStreamPropertyFileCurrentOffset`

Value is a `CFNumber` object containing the current file offset.

Available in Mac OS X v10.3 and later.

Declared in `CFStream.h`.

`kCFStreamPropertySocketNativeHandle`

Value is a `CFData` object that contains the native handle for a socket stream—of type [CFSocketNativeHandle](#) (page 516)—to which the socket stream is connected.

This property is only available for socket streams. You cannot modify this value. You can read this value at any time.

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamPropertySocketRemoteHostName`

Value is a `CFString` object containing the name of the host to which the socket stream is connected or `NULL` if unknown.

You cannot modify this value. You can read this value at any time.]

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

`kCFStreamPropertySocketRemotePortNumber`

Value is a `CFNumber` object containing the remote port number to which the socket stream is connected or `NULL` if unknown.

You cannot modify this value. You can read this value at any time.]

Available in Mac OS X v10.1 and later.

Declared in `CFStream.h`.

Discussion

Use [CFReadStreamCopyProperty](#) (page 430) or [CFWriteStreamCopyProperty](#) (page 706) to read the property values. Use [CFReadStreamSetProperty](#) (page 437) or [CFWriteStreamSetProperty](#) (page 712) to set the property values.

Availability

Available in Mac OS X v10.2 and later.

Declared In

`CoreFoundation/CFStream.h`

10.5 Symbol Changes

This article lists the symbols added to `CoreFoundation.framework` in Mac OS X v10.5.

C Symbols

All of the header files with new symbols are listed alphabetically, with their new symbols described.

CFBase.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>CF_EXTERN_C_BEGIN</code>	
<code>CF_EXTERN_C_END</code>	
<code>kCFCoreFoundationVersionNumber10_1_1</code>	
<code>kCFCoreFoundationVersionNumber10_1_3</code>	
<code>kCFCoreFoundationVersionNumber10_2_1</code>	The Core Foundation framework version in Mac OS X version 10.2.1.
<code>kCFCoreFoundationVersionNumber10_2_2</code>	The Core Foundation framework version in Mac OS X version 10.2.2.
<code>kCFCoreFoundationVersionNumber10_2_3</code>	The Core Foundation framework version in Mac OS X version 10.2.3.
<code>kCFCoreFoundationVersionNumber10_2_4</code>	The Core Foundation framework version in Mac OS X version 10.2.4.
<code>kCFCoreFoundationVersionNumber10_2_5</code>	The Core Foundation framework version in Mac OS X version 10.2.5.
<code>kCFCoreFoundationVersionNumber10_2_6</code>	The Core Foundation framework version in Mac OS X version 10.2.6.
<code>kCFCoreFoundationVersionNumber10_2_7</code>	The Core Foundation framework version in Mac OS X version 10.2.7.

10.5 Symbol Changes

kCFCoreFoundationVersionNumber10_2_8	The Core Foundation framework version in Mac OS X version 10.2.8.
kCFCoreFoundationVersionNumber10_3_1	The Core Foundation framework version in Mac OS X version 10.3.1.
kCFCoreFoundationVersionNumber10_3_2	The Core Foundation framework version in Mac OS X version 10.3.2.
kCFCoreFoundationVersionNumber10_3_5	The Core Foundation framework version in Mac OS X version 10.3.5.
kCFCoreFoundationVersionNumber10_3_6	The Core Foundation framework version in Mac OS X version 10.3.6.
kCFCoreFoundationVersionNumber10_3_7	The Core Foundation framework version in Mac OS X version 10.3.7.
kCFCoreFoundationVersionNumber10_3_8	The Core Foundation framework version in Mac OS X version 10.3.8.
kCFCoreFoundationVersionNumber10_3_9	The Core Foundation framework version in Mac OS X version 10.3.9.
kCFCoreFoundationVersionNumber10_4	The Core Foundation framework version in Mac OS X version 10.4.
kCFCoreFoundationVersionNumber10_4_1	The Core Foundation framework version in Mac OS X version 10.4.1.
kCFCoreFoundationVersionNumber10_4_10	
kCFCoreFoundationVersionNumber10_4_11	
kCFCoreFoundationVersionNumber10_4_2	The Core Foundation framework version in Mac OS X version 10.4.2.
kCFCoreFoundationVersionNumber10_4_3	The Core Foundation framework version in Mac OS X version 10.4.3.
kCFCoreFoundationVersionNumber10_4_4_Intel	The Core Foundation framework version in Mac OS X version 10.4.4 on Intel-based Macintosh computers.
kCFCoreFoundationVersionNumber10_4_4_PowerPC	The Core Foundation framework version in Mac OS X version 10.4.4 on PowerPC-based Macintosh computers.
kCFCoreFoundationVersionNumber10_4_5_Intel	The Core Foundation framework version in Mac OS X version 10.4.5 on Intel-based Macintosh computers.
kCFCoreFoundationVersionNumber10_4_5_PowerPC	The Core Foundation framework version in Mac OS X version 10.4.5 on PowerPC-based Macintosh computers.

<code>kCFCoreFoundationVersionNumber10_4_6_Intel</code>	The Core Foundation framework version in Mac OS X version 10.4.6 on Intel-based Macintosh computers.
<code>kCFCoreFoundationVersionNumber10_4_6_PowerPC</code>	The Core Foundation framework version in Mac OS X version 10.4.6 on PowerPC-based Macintosh computers.
<code>kCFCoreFoundationVersionNumber10_4_7</code>	The Core Foundation framework version in Mac OS X version 10.4.7.
<code>kCFCoreFoundationVersionNumber10_4_8</code>	
<code>kCFCoreFoundationVersionNumber10_4_9</code>	

CFBundle.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFBundleCopyExecutableArchitectures (page 108)	Returns an array of CFNumbers representing the architectures a given bundle provides.
CFBundleCopyExecutableArchitecturesForURL (page 109)	Returns an array of CFNumbers representing the architectures a given URL provides.
CFBundleLoadExecutableAndReturnError (page 132)	Returns a Boolean value that indicates whether a given bundle is loaded, attempting to load it if necessary.
CFBundlePreflightExecutable (page 134)	Returns a Boolean value that indicates whether a given bundle is loaded or appears to be loadable.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFBundleRefNum (page 138)	Type that identifies a distinct reference number for a resource map.
<code>kCFBundleExecutableArchitectureI386</code>	Specifies the 32-bit Intel architecture.
<code>kCFBundleExecutableArchitecturePPC</code>	Specifies the 32-bit PowerPC architecture.
<code>kCFBundleExecutableArchitecturePPC64</code>	Specifies the 64-bit PowerPC architecture.
<code>kCFBundleExecutableArchitectureX86_64</code>	Specifies the 64-bit Intel architecture.

CFByteOrder.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CF_USE_OSBYTEORDER_H

CFCalendar.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCalendarGetTimeRangeOfUnit (page 153)	Returns by reference the start time and duration of a given calendar unit that contains a given absolute time.
--	--

CFCharacterSet.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFCharacterSetNewline	Newline character set (U000A ~ U000D, U0085, U2028, and U2029).
------------------------	---

CFDateFormatter.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFDateFormatterGregorianStartDate	Specifies the Gregorian start date property, a CFDate object.
kCFDateFormatterLongEraSymbols	Specifies the long era symbols property, a CFArray of CFString objects.

<code>kCFDateFormatterQuarterSymbols</code>	Specifies the quarter symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterShortQuarterSymbols</code>	Specifies the short quarter symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterShortStandaloneMonthSymbols</code>	Specifies the short standalone month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterShortStandaloneQuarterSymbols</code>	Specifies the short standalone quarter symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterShortStandaloneWeekdaySymbols</code>	Specifies the short standalone weekday symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterStandaloneMonthSymbols</code>	Specifies the standalone month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterStandaloneQuarterSymbols</code>	Specifies the standalone quarter symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterStandaloneWeekdaySymbols</code>	Specifies the standalone weekday symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterVeryShortMonthSymbols</code>	Specifies the very short month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterVeryShortStandaloneMonthSymbols</code>	Specifies the very short standalone month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterVeryShortStandaloneWeekdaySymbols</code>	Specifies the very short standalone weekday symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterVeryShortWeekdaySymbols</code>	Specifies the very short weekday symbols property, a CFArray of CFString objects.

CFError.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFErrorCopyDescription (page 218)	Returns a human-presentable description for a given error.
CFErrorCopyFailureReason (page 219)	Returns a human-presentable failure reason for a given error.
CFErrorCopyRecoverySuggestion (page 220)	Returns a human presentable recovery suggestion for a given error.
CFErrorCopyUserInfo (page 220)	Returns the user info dictionary for a given CFError.
CFErrorCreate (page 221)	Creates a new CFError object.
CFErrorCreateWithUserInfoKeysAndValues (page 221)	Creates a new CFError object using given keys and values to create the user info dictionary.
CFErrorGetCode (page 222)	Returns the error code for a given CFError.
CFErrorGetDomain (page 223)	Returns the error domain for a given CFError.
CFErrorGetTypeID (page 223)	Returns the type identifier for the CFError opaque type.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFErrorRef (page 224)	A reference to a CFError object.
kCFErrorDescriptionKey (page 225)	Key to identify the description in the userInfo dictionary.
<code>kCFErrorDomainCocoa</code>	A constant that specified the Cocoa domain.
<code>kCFErrorDomainMach</code>	A constant that specified the Mach domain.
<code>kCFErrorDomainOSStatus</code>	A constant that specified the OS domain.
<code>kCFErrorDomainPOSIX</code>	A constant that specified the POSIX domain.
kCFErrorLocalizedDescriptionKey (page 225)	Key to identify the end user-presentable description in the userInfo dictionary.
kCFErrorLocalizedFailureReasonKey (page 225)	Key to identify the end user-presentable failure reason in the userInfo dictionary.
kCFErrorLocalizedRecoverySuggestionKey (page 225)	Key to identify the end user-presentable recovery suggestion in the userInfo dictionary.
<code>kCFErrorUnderlyingErrorKey</code>	Key to identify the underlying error in the userInfo dictionary.

CFFileDescriptor.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFFileDescriptorCreate (page 229)	Creates a new CFFileDescriptor.
CFFileDescriptorCreateRunLoopSource (page 230)	Creates a new runloop source for a given CFFileDescriptor.
CFFileDescriptorDisableCallbacks (page 230)	Disables callbacks for a given CFFileDescriptor.
CFFileDescriptorEnableCallbacks (page 231)	Enables callbacks for a given CFFileDescriptor.
CFFileDescriptorGetContext (page 231)	Gets the context for a given CFFileDescriptor.
CFFileDescriptorGetNativeDescriptor (page 232)	Returns the native file descriptor for a given CFFileDescriptor.
CFFileDescriptorGetTypeID (page 232)	Returns the type identifier for the CFFileDescriptor opaque type.
CFFileDescriptorInvalidate (page 232)	Invalidates the native file descriptor for a given CFFileDescriptor.
CFFileDescriptorIsValid (page 233)	Returns a Boolean value that indicates whether the native file descriptor for a given CFFileDescriptor is valid.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFFileDescriptorCallback	
CFFileDescriptorContext (page 234)	Defines a structure for the context of a CFFileDescriptor.
CFFileDescriptorNativeDescriptor (page 233)	Defines a type for the native file descriptor.
CFFileDescriptorRef (page 234)	A reference to an CFFileDescriptor object.
kCFFileDescriptorReadCallback	Identifies the read callback.
kCFFileDescriptorWriteCallback	Identifies the write callback.

CFLocale.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFLocaleCopyCommonISOCurrencyCodes (page 239)	Returns an array of strings that represents ISO currency codes for currencies in common use.
CFLocaleCopyPreferredLanguages (page 242)	Returns the array of canonicalized locale IDs that the user prefers.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFLocaleCurrentLocaleDidChangeNotification</code>	Identifier for the notification sent if the current locale changes.
--	---

CFNumber.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFNumberCGFloatType (page 379)	CGFloat value.
kCFNumberNSIntegerType (page 379)	NSInteger value.

CFNumberFormatter.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFNumberFormatterCurrencyGroupingSeparator</code>	Specifies the grouping symbol to use when placing a currency value within a string, a CFString object.
--	--

<code>kCFNumberFormatterIsLenient</code>	Specifies whether the formatter is lenient, a <code>CFBoolean</code> object.
<code>kCFNumberFormatterMaxSignificantDigits</code>	Specifies the maximum number of significant digits to use, a <code>CFNumber</code> object.
<code>kCFNumberFormatterMinSignificantDigits</code>	Specifies the minimum number of significant digits to use, a <code>CFNumber</code> object.
<code>kCFNumberFormatterUseSignificantDigits</code>	Specifies the whether the formatter uses significant digits, a <code>CFBoolean</code> object.

CFRunLoop.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFRunLoopGetMain (page 450)	Returns the main <code>CFRunLoop</code> object.
---	---

CFStream.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFReadStreamCopyError (page 429)	Returns the error associated with a stream.
CFStreamCreateBoundPair (page 823)	Creates a pair of read and write streams.
CFWriteStreamCopyError (page 705)	Returns the error associated with a stream.

CFString.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringCompareWithOptionsAndLocale (page 529)	Compares a range of the characters in one string with another string using a given locale.
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CFStringCreateWithBytesNoCopy (page 539)	Creates a string from a buffer, containing characters in a specified encoding, that might serve as the backing store for the new string.
CFStringFindWithOptionsAndLocale (page 552)	Returns a Boolean value that indicates whether a given string was found in a given source string.
CFStringFold (page 344)	Folds a given string into the form specified by optional flags.
CFStringGetParagraphBounds (page 565)	Given a range of characters in a string, obtains the paragraph bounds—that is, the indexes of the first character and the final characters of the paragraph(s) containing the range.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFCompareDiacriticInsensitive</code>	Specifies that the comparison should ignore diacritic markers.
<code>kCFCompareForcedOrdering</code>	Specifies that the comparison is forced to return either <code>kCFCompareLessThan</code> or <code>kCFCompareGreaterThan</code> if the strings are equivalent but not strictly equal.
<code>kCFCompareWidthInsensitive</code>	Specifies that the comparison should ignore width differences.
kCFStringTransformStripDiacritics (page 355)	The identifier of a transform to remove diacritic markings.

CFStringEncodingExt.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFStringEncodingShiftJIS_X0213</code>	
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CFStringTokenizer.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringTokenizerAdvanceToNextToken (page 595)	Advances the tokenizer to the next token and sets that as the current token.
CFStringTokenizerCopyBestStringLanguage (page 596)	Guesses a language of a given string and returns the guess as a BCP 47 string.
CFStringTokenizerCopyCurrentTokenAttribute (page 596)	Returns a given attribute of the current token.
CFStringTokenizerCreate (page 597)	Returns a tokenizer for a given string.
CFStringTokenizerGetCurrentSubTokens (page 598)	Retrieves the subtokens or derived subtokens contained in the compound token.
CFStringTokenizerGetCurrentTokenRange (page 599)	Returns the range of the current token.
CFStringTokenizerGetTypeID (page 599)	Returns the type ID for CFStringTokenizer.
CFStringTokenizerGoToTokenAtIndex (page 599)	Finds a token that includes the character at a given index, and set it as the current token.
CFStringTokenizerSetString (page 600)	Sets the string for a tokenizer.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringTokenizerRef (page 601)	A reference to a CFStringTokenizer object.
CFStringTokenizerTokenType (page 601)	Token types returned by CFStringTokenizerGoToTokenAtIndex and CFStringTokenizerAdvanceToNextToken .
<code>kCFStringTokenizerAttributeLanguage</code>	Tells the tokenizer to prepare the language (specified as an RFC 3066bis string) when it tokenizes the string.
<code>kCFStringTokenizerAttributeLatinTranscription</code>	Used with <code>kCFStringTokenizerUnitWord</code> , tells the tokenizer to prepare the Latin transcription when it tokenizes the string.
<code>kCFStringTokenizerTokenHasDerivedSubTokensMask</code>	Compound token which may contain derived subtokens.
<code>kCFStringTokenizerTokenHasNumbersMask</code>	Appears to contain a number.
<code>kCFStringTokenizerTokenHasNonLettersMask</code>	Contains punctuation, symbols, and so on.
<code>kCFStringTokenizerTokenHasSubTokensMask</code>	Compound token which may contain subtokens but with no derived subtokens.

<code>kCFStringTokenizerTokenIsCJWordMask</code>	Contains kana and/or ideographs.
<code>kCFStringTokenizerTokenNone</code>	Has no token.
<code>kCFStringTokenizerTokenNormal</code>	Has a normal token.
<code>kCFStringTokenizerUnitLineBreak</code>	Specifies that a string should be tokenized by line break. The locale parameter of <code>CFStringTokenizerCreate</code> is ignored.
kCFStringTokenizerUnitParagraph (page 602)	Specifies that a string should be tokenized by paragraph. The locale parameter of <code>CFStringTokenizerCreate</code> is ignored.
kCFStringTokenizerUnitSentence (page 602)	Specifies that a string should be tokenized by sentence. The locale parameter of <code>CFStringTokenizerCreate</code> is ignored.
<code>kCFStringTokenizerUnitWord</code>	Specifies that a string should be tokenized by word. The locale parameter of <code>CFStringTokenizerCreate</code> is ignored.
<code>kCFStringTokenizerUnitWordBoundary</code>	Specifies that a string should be tokenized by locale-sensitive word boundary.

CFTimeZone.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFTimeZoneCopyLocalizedName (page 608)	Returns the localized name of a given time zone.
CFTimeZoneGetDaylightSavingTimeOffset (page 612)	Returns the daylight saving time offset for a time zone at a given time.
CFTimeZoneGetNextDaylightSavingTimeTransition (page 612)	Returns the time in a given time zone of the next daylight saving time transition after a given time.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFTimeZoneNameStyle (page 615)	Index type for constants used to specify styles of time zone names.
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10.5 Symbol Changes

<code>kCFTimeZoneNameStyleDaylightSaving</code>	Specifies the daylight saving name style for a time zone.
<code>kCFTimeZoneNameStyleShortDaylightSaving</code>	Specifies the short daylight saving name style for a time zone.
<code>kCFTimeZoneNameStyleShortStandard</code>	Specifies the short standard name style for a time zone.
<code>kCFTimeZoneNameStyleStandard</code>	Specifies the standard name style for a time zone.
<code>kCFTimeZoneSystemTimeZoneDidChangeNotification</code>	Name of the notification posted when the system time zone changes.

10.4 Symbol Changes

This article lists the symbols added to `CoreFoundation.framework` in Mac OS X v10.4.

C Symbols

All of the header files with new symbols are listed alphabetically, with their new symbols described.

CFAttributedString.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFAttributedStringBeginEditing (page 289)	Defers internal consistency-checking and coalescing for a mutable attributed string.
CFAttributedStringCreate (page 55)	Creates an attributed string with specified string and attributes.
CFAttributedStringCreateCopy (page 55)	Creates an immutable copy of an attributed string.
CFAttributedStringCreateMutable (page 289)	Creates a mutable attributed string.
CFAttributedStringCreateMutableCopy (page 290)	Creates a mutable copy of an attributed string.
CFAttributedStringCreateWithSubstring (page 56)	Creates a sub-attributed string from the specified range.
CFAttributedStringEndEditing (page 290)	Re-enables internal consistency-checking and coalescing for a mutable attributed string.
CFAttributedStringGetAttribute (page 57)	Returns the value of a given attribute of an attributed string at a specified location.
CFAttributedStringGetAttribute-AndLongestEffectiveRange (page 57)	Returns the value of a given attribute of an attributed string at a specified location.
CFAttributedStringGetAttributes (page 58)	Returns the attributes of an attributed string at a specified location.

CFAttributedStringGetAttributes-AndLongestEffectiveRange (page 59)	Returns the attributes of an attributed string at a specified location.
CFAttributedStringGetLength (page 59)	Returns the length of the attributed string in characters.
CFAttributedStringGetMutableString (page 291)	Gets as a mutable string the string for an attributed string.
CFAttributedStringGetString (page 60)	Returns the string for an attributed string.
CFAttributedStringGetTypeID (page 60)	Returns the type identifier for the CFAttributedString opaque type.
CFAttributedStringRemoveAttribute (page 291)	Removes the value of a single attribute over a specified range.
CFAttributedStringReplaceAttributedString (page 292)	Replaces the attributed substring over a range with another attributed string.
CFAttributedStringReplaceString (page 292)	Modifies the string of an attributed string.
CFAttributedStringSetAttribute (page 293)	Sets the value of a single attribute over the specified range.
CFAttributedStringSetAttributes (page 294)	Sets the value of attributes of a mutable attributed string over a specified range.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFAttributedStringRef (page 61)	A reference to a CFAttributedString object.
CFMutableAttributedStringRef (page 294)	A reference to a CFMutableAttributedString object.

CFBase.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFMakeCollectable (page 638)	Makes a newly-allocated Core Foundation object eligible for garbage collection.
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Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFAllocatorMallocZone</code>	This allocator explicitly uses the default malloc zone, returned by <code>malloc_default_zone()</code> .
<code>kCFCoreFoundationVersionNumber10_3</code>	The Core Foundation framework version in Mac OS X version 10.3.
<code>kCFCoreFoundationVersionNumber10_3_3</code>	The Core Foundation framework version in Mac OS X version 10.3.3.
<code>kCFCoreFoundationVersionNumber10_3_4</code>	The Core Foundation framework version in Mac OS X version 10.3.4.

CFCalendar.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCalendarAddComponents (page 144)	Computes the absolute time when specified components are added to a given absolute time.
CFCalendarComposeAbsoluteTime (page 145)	Computes the absolute time from components in a description string.
CFCalendarCopyCurrent (page 146)	Returns a copy of the logical calendar for the current user.
CFCalendarCopyLocale (page 146)	Returns a locale object for a specified calendar.
CFCalendarCopyTimeZone (page 147)	Returns a time zone object for a specified calendar.
CFCalendarCreateWithIdentifier (page 147)	Returns a calendar object for the calendar identified by a calendar identifier.
CFCalendarDecomposeAbsoluteTime (page 148)	Computes the components which are indicated by the <code>componentDesc</code> description string for the given absolute time.
CFCalendarGetComponentDifference (page 149)	Computes the difference between the two absolute times, in terms of specified calendrical components.
CFCalendarGetFirstWeekday (page 150)	Returns the index of first weekday for a specified calendar.
CFCalendarGetIdentifier (page 150)	Returns the given calendar's identifier.

CFCalendarGetMaximumRangeOfUnit (page 150)	Returns the maximum range limits of the values that a specified unit can take on in a given calendar.
CFCalendarGetMinimumDaysInFirstWeek (page 151)	Returns the minimum number of days in the first week of a specified calendar.
CFCalendarGetMinimumRangeOfUnit (page 151)	Returns the minimum range limits of the values that a specified unit can take on in a given calendar.
CFCalendarGetOrdinalityOfUnit (page 152)	Returns the ordinal number of a calendrical unit within a larger unit at a specified absolute time.
CFCalendarGetRangeOfUnit (page 153)	Returns the range of values that one unit can take on within a larger unit during which a specific absolute time occurs.
CFCalendarGetTypeID (page 154)	Returns the type identifier for the CFCalendar opaque type.
CFCalendarSetFirstWeekday (page 154)	Sets the first weekday for a calendar.
CFCalendarSetLocale (page 155)	Sets the locale for a calendar.
CFCalendarSetMinimumDaysInFirstWeek (page 155)	Sets the minimum number of days in the first week of a specified calendar.
CFCalendarSetTimeZone (page 155)	Sets the time zone for a calendar.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCalendarRef (page 156)	A reference to a CFCalendar object.
CFCalendarUnit (page 156)	CFCalendarUnit constants are used to specify calendrical units, such as day or month, in various calendar calculations.
kCFCalendarComponentsWrap (page 158)	Specifies that the components specified for calendar components should be incremented and wrap around to zero/one on overflow, but should not cause higher units to be incremented.
kCFCalendarUnitDay	Specifies the day unit.
kCFCalendarUnitEra	Specifies the era unit.
kCFCalendarUnitHour	Specifies the hour unit.
kCFCalendarUnitMinute	Specifies the minute unit.
kCFCalendarUnitMonth	Specifies the month unit.
kCFCalendarUnitSecond	Specifies the second unit.

<code>kCFCalendarUnitWeek</code>	Specifies the week unit.
<code>kCFCalendarUnitWeekday</code>	Specifies the weekday unit.
<code>kCFCalendarUnitWeekdayOrdinal</code>	Specifies the ordinal weekday unit.
<code>kCFCalendarUnitYear</code>	Specifies the year unit.

CFDateFormatter.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFDateFormatterAMSymbol</code>	Specifies the AM symbol property, a CFString object.
<code>kCFDateFormatterCalendar</code>	Specifies the calendar property, a CFCalendar object.
<code>kCFDateFormatterDefaultDate</code>	Specifies the default date property, a CFDate object.
<code>kCFDateFormatterEraSymbols</code>	Specifies the era symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterMonthSymbols</code>	Specifies the month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterPMSymbol</code>	Specifies the PM symbol property, a CFString object.
<code>kCFDateFormatterShortMonthSymbols</code>	Specifies the short month symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterShortWeekdaySymbols</code>	Specifies the short weekday symbols property, a CFArray of CFString objects.
<code>kCFDateFormatterTwoDigitStartDate</code>	Specifies the property representing the date from which two-digit years start, a CFDate object.
<code>kCFDateFormatterWeekdaySymbols</code>	Specifies the weekday symbols property, a CFArray of CFString objects.

CFLocale.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFLocaleCopyAvailableLocaleIdentifiers (page 239)	Returns an array of CFString objects that represents all locales for which locale data is available.
CFLocaleCopyDisplayNameForPropertyValue (page 240)	Returns the display name for the given value.
CFLocaleCopyISOCountryCodes (page 241)	Returns an array of CFString objects that represents all known legal ISO country codes.
CFLocaleCopyISOCurrencyCodes (page 241)	Returns an array of CFString objects that represents all known legal ISO currency codes.
CFLocaleCopyISOLanguageCodes (page 242)	Returns an array of CFString objects that represents all known legal ISO language codes.
CFLocaleCreateCanonicalLanguage- IdentifierFromString (page 243)	Returns a canonical language identifier by mapping an arbitrary locale identification string to the canonical identifier
CFLocaleCreateComponentsFromLocaleIdentifier (page 245)	Returns a dictionary containing the result from parsing a locale ID consisting of language, script, country, variant, and keyword/value pairs.
CFLocaleCreateLocaleIdentifierFromComponents (page 246)	Returns a locale identifier consisting of language, script, country, variant, and keyword/value pairs derived from a dictionary containing the source information.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFBuddhistCalendar	Specifies the Buddhist calendar.
kCFChineseCalendar	Specifies the Chinese calendar.
kCFHebrewCalendar	Specifies the Hebrew calendar.
kCFIslamicCalendar	Specifies the Islamic calendar.
kCFIslamicCivilCalendar	Specifies the Islamic Civil calendar.
kCFJapaneseCalendar	Specifies the Japanese calendar.
kCFLocaleCalendar	Specifies the locale calendar.
kCFLocaleCalendarIdentifier	Specifies the locale calendar identifier.
kCFLocaleCollationIdentifier	Specifies the locale collation identifier.

<code>kCFLocaleCountryCode</code>	Specifies the locale country code.
<code>kCFLocaleExemplarCharacterSet</code>	Specifies the locale character set.
<code>kCFLocaleIdentifier</code>	Specifies locale identifier.
<code>kCFLocaleLanguageCode</code>	Specifies the locale language code.
<code>kCFLocaleScriptCode</code>	Specifies the locale script code.
<code>kCFLocaleUsesMetricSystem</code>	Specifies the whether the locale uses the metric system.
<code>kCFLocaleVariantCode</code>	Specifies the locale variant code.

CFNotificationCenter.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNotificationCenterGetDarwinNotificationCenter (page 360)	Returns the application's Darwin notification center.
CFNotificationCenterGetLocalCenter (page 361)	Returns the application's local notification center.

CFNumberFormatter.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFNumberFormatterInternationalCurrencySymbol</code>	Specifies the international currency symbol to use when placing a formatted number within a string, a CFString object.
<code>kCFNumberFormatterMultiplier</code>	Specifies the multiplier to use when placing a formatted number within a string, a CFNumber object.
<code>kCFNumberFormatterNegativePrefix</code>	Specifies the minus sign prefix symbol to use when placing a formatted number within a string, a CFString object.

<code>kCFNumberFormatterNegativeSuffix</code>	Specifies the minus sign suffix symbol to use when placing a formatted number within a string, a <code>CFString</code> object.
<code>kCFNumberFormatterPerMillSymbol</code>	Specifies the per mill (1/1000) symbol to use when placing a formatted number within a string, a <code>CFString</code> object.
<code>kCFNumberFormatterPositivePrefix</code>	Specifies the plus sign prefix symbol to use when placing a formatted number within a string, a <code>CFString</code> object.
<code>kCFNumberFormatterPositiveSuffix</code>	Specifies the plus sign suffix symbol to use when placing a formatted number within a string, a <code>CFString</code> object.
<code>kCFNumberFormatterSpellOutStyle</code>	Specifies a spelled out format.

CFString.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringCreateWithFileSystemRepresentation (page 544)	Creates a <code>CFString</code> from a zero-terminated POSIX file system representation.
CFStringGetFileSystemRepresentation (page 560)	Extracts the contents of a string as a NULL-terminated 8-bit string appropriate for passing to POSIX APIs.
CFStringGetMaximumSizeOfFileSystemRepresentation (page 563)	Determines the upper bound on the number of bytes required to hold the file system representation of the string.
CFStringTransform (page 350)	Perform in-place transliteration on a mutable string.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFStringEncodingUTF16</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault + kUnicodeUTF16Format</code> encoding (alias of <code>kCFStringEncodingUnicode</code>).
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<code>kCFStringEncodingUTF16BE</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault</code> + <code>kUnicodeUTF16BEFormat</code> encoding. This constant specifies big-endian byte order.
<code>kCFStringEncodingUTF16LE</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault</code> + <code>kUnicodeUTF16LEFormat</code> encoding. This constant specifies little-endian byte order.
<code>kCFStringEncodingUTF32</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault</code> + <code>kUnicodeUTF32Format</code> encoding.
<code>kCFStringEncodingUTF32BE</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault</code> + <code>kUnicodeUTF32BEFormat</code> encoding. This constant specifies big-endian byte order.
<code>kCFStringEncodingUTF32LE</code>	An encoding constant that identifies <code>kTextEncodingUnicodeDefault</code> + <code>kUnicodeUTF32LEFormat</code> encoding. This constant specifies little-endian byte order.
kCFStringTransformFullwidthHalfwidth (page 354)	The identifier of a reversible transform to convert full-width characters to their half-width equivalents.
kCFStringTransformHiraganaKatakana (page 354)	The identifier of a reversible transform to transliterate text to Katakana from Hiragana.
kCFStringTransformLatinArabic (page 355)	The identifier of a reversible transform to transliterate text to Arabic from Latin.
kCFStringTransformLatinCyrillic (page 355)	The identifier of a reversible transform to transliterate text to Cyrillic from Latin.
kCFStringTransformLatinGreek (page 355)	The identifier of a reversible transform to transliterate text to Greek from Latin.
kCFStringTransformLatinHangul (page 355)	The identifier of a reversible transform to transliterate text to Hangul from Latin.
kCFStringTransformLatinHebrew (page 355)	The identifier of a reversible transform to transliterate text to Hebrew from Latin.
kCFStringTransformLatinHiragana (page 354)	The identifier of a reversible transform to transliterate text to Hiragana from Latin.
kCFStringTransformLatinKatakana (page 354)	The identifier of a reversible transform to transliterate text to Katakana from Latin.
kCFStringTransformLatinThai (page 355)	The identifier of a reversible transform to transliterate text to Thai from Latin.

kCFStringTransformMandarinLatin (page 354)	The identifier of a reversible transform to transliterate text to Latin from ideographs interpreted as Mandarin Chinese.
kCFStringTransformStripCombiningMarks (page 354)	The identifier of a transform to strip combining marks (accents or diacritics).
kCFStringTransformToLatin (page 354)	The identifier of a transform to transliterate all text possible to Latin script. Ideographs are transliterated as Mandarin Chinese.
kCFStringTransformToUnicodeName (page 355)	The identifier of a reversible transform to transliterate characters other than printable ASCII (minus braces) to their Unicode character name in braces.
kCFStringTransformToXMLHex (page 355)	The identifier of a reversible transform to transliterate characters other than printable ASCII to XML/HTML numeric entities.

CFStringEncodingExt.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFStringEncodingANSEL</code>	ANSEL (ANSI Z39.47)
<code>kCFStringEncodingBig5_E</code>	Taiwan Big-5E standard
<code>kCFStringEncodingISOLatin10</code>	ISO 8859-16
<code>kCFStringEncodingKOI8_U</code>	RFC 2319, Ukrainian
<code>kCFStringEncodingNextStepJapanese</code>	NextStep Japanese encoding
<code>kCFStringEncodingShiftJIS_X0213_MenKuTen</code>	JIS X0213 in plane-row-column notation
<code>kCFStringEncodingVISCII</code>	RFC 1456, Vietnamese

10.3 Symbol Changes

This article lists the symbols added to `CoreFoundation.framework` in Mac OS X v10.3.

C Symbols

All of the header files with new symbols are listed alphabetically, with their new symbols described.

CFBase.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFCoreFoundationVersionNumber10_1_2</code>	The Core Foundation framework version in Mac OS X version 10.1.2.
<code>kCFCoreFoundationVersionNumber10_1_4</code>	The Core Foundation framework version in Mac OS X version 10.1.4.
<code>kCFCoreFoundationVersionNumber10_2</code>	The Core Foundation framework version in Mac OS X version 10.2.

CFCharacterSet.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCharacterSetCreateCopy (page 161)	Creates a new character set with the values from a given character set.
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Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFCharacterSetSymbol</code>	Symbol character set (Unicode General Category S*).
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CFDateFormatter.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFDateFormatterCopyProperty (page 184)	Returns a copy of a date formatter's value for a given key.
CFDateFormatterCreate (page 185)	Creates a new CFDateFormatter object, localized to the given locale, which will format dates to the given date and time styles.
CFDateFormatterCreateDateFromString (page 186)	Returns a date object representing a given string.
CFDateFormatterCreateStringWithAbsoluteTime (page 187)	Returns a string representation of the given absolute time using the specified date formatter.
CFDateFormatterCreateStringWithDate (page 187)	Returns a string representation of the given date using the specified date formatter.
CFDateFormatterGetAbsoluteTimeFromString (page 188)	Returns an absolute time object representing a given string.
CFDateFormatterGetDateStyle (page 189)	Returns the date style used to create the given date formatter object.
CFDateFormatterGetFormat (page 189)	Returns a format string for the given date formatter object.
CFDateFormatterGetLocale (page 189)	Returns the locale object used to create the given date formatter object.
CFDateFormatterGetTimeStyle (page 190)	Returns the time style used to create the given date formatter object.
CFDateFormatterGetTypeID (page 190)	Returns the type identifier for CFDateFormatter.
CFDateFormatterSetFormat (page 190)	Sets the format string of the given date formatter to the specified value.
CFDateFormatterSetProperty (page 191)	Sets a date formatter property using a key-value pair.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFDateFormatterRef (page 192)	A reference to a CFDateFormatter object.
CFDateFormatterStyle (page 192)	Data type for predefined date and time format styles.
kCFDateFormatterCalendarName (page 195)	Specifies the calendar name, a CFString object.
<code>kCFDateFormatterDefaultFormat</code>	The original format string for the formatter (given the date & time style and locale specified at creation).
<code>kCFDateFormatterFullStyle</code>	Specifies a full style with complete details, such as “Tuesday, April 12, 1952 AD” or “3:30:42pm PST”.
kCFDateFormatterIsLenient (page 194)	Specifies the lenient property, a CFBoolean object where a true value indicates that the parsing of strings into date or absolute time values will be fuzzy.
<code>kCFDateFormatterLongStyle</code>	Specifies a long style, typically with full text, such as “November 23, 1937” or “3:30:32pm”.
<code>kCFDateFormatterMediumStyle</code>	Specifies a medium style, typically with abbreviated text, such as “Nov 23, 1937”.
<code>kCFDateFormatterNoStyle</code>	Specifies no output.
<code>kCFDateFormatterShortStyle</code>	Specifies a short style, typically numeric only, such as “11/23/37” or “3:30pm”.
<code>kCFDateFormatterTimeZone</code>	Specifies the time zone property, a CFTimeZone object.
kCFGregorianCalendar (page 197)	The name of the calendar currently supported by the <code>kCFDateFormatterCalendarName</code> property.

CFLocale.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFLocaleCopyCurrent (page 240)	Returns a copy of the logical locale for the current user.
CFLocaleCreate (page 242)	Creates a locale for the given arbitrary locale identifier.

CFLocaleCreateCanonicalLocaleIdentifier-FromScriptManagerCodes (page 243)	Returns a canonical locale identifier from given language and region codes.
CFLocaleCreateCanonicalLocaleIdentifierFromString (page 244)	Returns a canonical locale identifier by mapping an arbitrary locale identification string to the canonical identifier.
CFLocaleCreateCopy (page 245)	Returns a copy of a locale.
CFLocaleGetIdentifier (page 246)	Returns the given locale's identifier.
CFLocaleGetSystem (page 247)	Returns the root, canonical locale.
CFLocaleGetTypeID (page 247)	Returns the type identifier for the CFLocale opaque type.
CFLocaleGetValue (page 247)	Returns the corresponding value for the given key of a locale's key-value pair.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFLocaleRef (page 248)	A reference to a CFLocale object.
kCFLocaleCurrencyCode	Specifies the locale currency code.
kCFLocaleCurrencySymbol	Specifies the currency symbol.
kCFLocaleDecimalSeparator	Specifies the decimal point string.
kCFLocaleGroupingSeparator	Specifies the separator string between groups of digits.
kCFLocaleMeasurementSystem (page 249)	Specifies the measurement system used.

CFNotificationCenter.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNotificationCenterPostNotificationWithOptions (page 362)	Posts a notification for an object using specified options.
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Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFNotificationDeliverImmediately</code>	Delivers the notification immediately.
<code>kCFNotificationPostToAllSessions</code>	Delivers the notification to all sessions.

CFNumberFormatter.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNumberFormatterCopyProperty (page 382)	Returns a copy of a number formatter's value for a given key.
CFNumberFormatterCreate (page 383)	Creates a new CFNumberFormatter object, localized to the given locale, which will format numbers to the given style.
CFNumberFormatterCreateNumberFromString (page 383)	Returns a number object representing a given string.
CFNumberFormatterCreateStringWithNumber (page 384)	Returns a string representation of the given number using the specified number formatter.
CFNumberFormatterCreateStringWithValue (page 385)	Returns a string representation of the given number or value using the specified number formatter.
CFNumberFormatterGetDecimalInfoForCurrencyCode (page 385)	Returns the number of fraction digits that should be displayed, and the rounding increment, for a given currency.
CFNumberFormatterGetFormat (page 386)	Returns a format string for the given number formatter object.
CFNumberFormatterGetLocale (page 387)	Returns the locale object used to create the given number formatter object.
CFNumberFormatterGetStyle (page 387)	Returns the number style used to create the given number formatter object.
CFNumberFormatterGetTypeID (page 387)	Returns the type identifier for the CFNumberFormatter opaque type.

CFNumberFormatterGetValueFromString (page 388)	Returns a number or value representing a given string.
CFNumberFormatterSetFormat (page 388)	Sets the format string of a number formatter.
CFNumberFormatterSetProperty (page 389)	Sets a number formatter property using a key-value pair.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNumberFormatterOptionFlags (page 389)	Type for constants specifying how numbers should be parsed.
CFNumberFormatterPadPosition (page 390)	Type for constants specifying how numbers should be padded.
CFNumberFormatterRef (page 390)	A reference to a CFNumberFormatter object.
CFNumberFormatterRoundingMode (page 397)	These constants are used to specify how numbers should be rounded.
CFNumberFormatterStyle (page 390)	Type for constants specifying a formatter style.
<code>kCFNumberFormatterAlwaysShowDecimalSeparator</code>	Specifies if the result of converting a value to a string should always contain the decimal separator, even if the number is an integer.
kCFNumberFormatterCurrencyCode (page 392)	Specifies the currency code, a CFString object.
<code>kCFNumberFormatterCurrencyDecimalSeparator</code>	Specifies the currency decimal separator, a CFString object.
<code>kCFNumberFormatterCurrencyStyle</code>	Specifies a currency style format.
<code>kCFNumberFormatterCurrencySymbol</code>	Specifies the symbol for the currency, a CFString object.
<code>kCFNumberFormatterDecimalSeparator</code>	Specifies the decimal separator, a CFString object.
<code>kCFNumberFormatterDecimalStyle</code>	Specifies a decimal style format.
<code>kCFNumberFormatterDefaultFormat</code>	The original format string for the formatter (given the date and time style and locale specified at creation), a CFString object.
<code>kCFNumberFormatterExponentSymbol</code>	Specifies the exponent symbol (“E” or “e”) in the scientific notation of numbers (for example, as in 1.0e+56), a CFString object.

<code>kCFNumberFormatterFormatWidth</code>	Specifies the width of a formatted number within a string that is either left justified or right justified based on the value of <code>kCFNumberFormatterPaddingPosition</code> , a <code>CFNumber</code> object.
<code>kCFNumberFormatterGroupingSeparator</code>	Specifies the grouping separator, a <code>CFString</code> object.
<code>kCFNumberFormatterGroupingSize</code>	Specifies how often the “thousands” or grouping separator appears, as in “10,000,000”; a <code>CFNumber</code> object.
<code>kCFNumberFormatterInfinitySymbol</code>	Specifies the string that is used to represent the symbol for infinity, a <code>CFString</code> object.
<code>kCFNumberFormatterMaxFractionDigits</code>	Specifies the maximum number of digits after a decimal point, a <code>CFNumber</code> object.
<code>kCFNumberFormatterMaxIntegerDigits</code>	Specifies the maximum number of integer digits before a decimal point, a <code>CFNumber</code> object.
<code>kCFNumberFormatterMinFractionDigits</code>	Specifies the minimum number of digits after a decimal point, a <code>CFNumber</code> object.
<code>kCFNumberFormatterMinIntegerDigits</code>	Specifies the minimum number of integer digits before a decimal point, a <code>CFNumber</code> object.
<code>kCFNumberFormatterMinusSign</code>	Specifies the symbol for the minus sign, a <code>CFString</code> object.
<code>kCFNumberFormatterNaNSymbol</code>	Specifies the string that is used to represent NaN (“not a number”) when values are converted to strings, a <code>CFString</code> object.
<code>kCFNumberFormatterNoStyle</code>	Specifies no style.
<code>kCFNumberFormatterPadAfterPrefix</code>	Specifies the number of padding characters after the prefix.
<code>kCFNumberFormatterPadAfterSuffix</code>	Specifies the number of padding characters after the suffix.
<code>kCFNumberFormatterPadBeforePrefix</code>	Specifies the number of padding characters before the prefix.
<code>kCFNumberFormatterPadBeforeSuffix</code>	Specifies the number of padding characters before the suffix.
<code>kCFNumberFormatterPaddingCharacter</code>	Specifies the padding character to use when placing a formatted number within a string, a <code>CFString</code> object.

<code>kCFNumberFormatterPaddingPosition</code> (page 395)	Specifies the position of a formatted number within a string, a <code>CFNumber</code> object.
<code>kCFNumberFormatterParseIntegersOnly</code> (page 397)	Specifies that only integers should be parsed.
<code>kCFNumberFormatterPercentStyle</code>	Specifies a percent style format.
<code>kCFNumberFormatterPercentSymbol</code>	Specifies the string that is used to represent the percent symbol, a <code>CFString</code> object.
<code>kCFNumberFormatterPlusSign</code>	Specifies the symbol for the plus sign, a <code>CFString</code> object.
<code>kCFNumberFormatterRoundCeiling</code>	Round up to next larger number with the proper number of fraction digits.
<code>kCFNumberFormatterRoundDown</code>	Round down to next larger number with the proper number of fraction digits.
<code>kCFNumberFormatterRoundFloor</code>	Round down to next larger number with the proper number of fraction digits.
<code>kCFNumberFormatterRoundHalfDown</code>	Round down when a 5 follows putative last digit.
<code>kCFNumberFormatterRoundHalfEven</code>	Round the last digit, when followed by a 5, toward an even digit (.25 -> .2, .35 -> .4)
<code>kCFNumberFormatterRoundHalfUp</code>	Round up when a 5 follows putative last digit.
<code>kCFNumberFormatterRoundingIncrement</code>	Specifies a positive rounding increment, or 0.0 to disable rounding, a <code>CFNumber</code> object.
<code>kCFNumberFormatterRoundingMode</code>	Specifies how the last digit is rounded, as when 3.1415926535... is rounded to three decimal places, as in 3.142, a <code>CFNumber</code> object. See "Rounding Modes" for possible values.
<code>kCFNumberFormatterRoundUp</code>	Round up to next larger number with the proper number of fraction digits.
<code>kCFNumberFormatterScientificStyle</code>	Specifies a scientific style format.
<code>kCFNumberFormatterSecondaryGroupingSize</code>	Specifies how often the secondary grouping separator appears, a <code>CFNumber</code> object. See Unicode Technical Standard #35 for more information.
<code>kCFNumberFormatterUseGroupingSeparator</code>	Specifies if the grouping separator should be used, a <code>CFBoolean</code> object.
<code>kCFNumberFormatterZeroSymbol</code>	Specifies the string that is used to represent zero, a <code>CFString</code> object.

CFStream.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFStreamPropertyFileCurrentOffset (page 832)	Value is a CFNumber object containing the current file offset.
---	--

CFURL.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFURLCreateAbsoluteURLWithBytes (page 655)	Creates a new CFURL object by resolving the relative portion of a URL, specified as bytes, against its given base URL.
CFURLCreateStringByReplacingPercentEscapesUsingEncoding (page 663)	Creates a new string by replacing any percent escape sequences with their character equivalent.
CFURLGetByteRangeForComponent (page 668)	Returns the range of the specified component in the bytes of a URL.
CFURLGetBytes (page 669)	Returns by reference the byte representation of a URL object.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFURLComponentType (page 673)	The types of components in a URL.
kCFURLComponentFragment	The URL's fragment.
kCFURLComponentHost	The URL's host.
kCFURLComponentNetLocation	The URL's network location.
kCFURLComponentParameterString	The URL's parameter string.
kCFURLComponentPassword	The user's password.
kCFURLComponentPath	The URL's path component.

<code>kCFURLComponentPort</code>	The URL's port.
<code>kCFURLComponentQuery</code>	The URL's query.
<code>kCFURLComponentResourceSpecifier</code>	The URL's resource specifier.
<code>kCFURLComponentScheme</code>	The URL's scheme.
<code>kCFURLComponentUser</code>	The URL's user.
<code>kCFURLComponentUserInfo</code>	The user's information.

CFUserNotification.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFUserNotificationPopUpSelectionKey</code>	The item that was selected from a pop-up menu.
---	--

CFXMLParser.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFXMLCreateStringByEscapingEntities (page 751)	Given a CFString object containing XML source with unescaped entities, returns a string with specified XML entities escaped.
CFXMLCreateStringByUnescapingEntities (page 752)	Given a CFString object containing XML source with escaped entities, returns a string with specified XML entities unescaped.
CFXMLTreeCreateFromDataWithError (page 754)	Parses the given XML data and returns the resulting CFXMLTree object and any error information.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFXMLTreeErrorDescription (page 758)	Dictionary key whose value is a CFString containing a readable description of the error.
---	--

kCFXMLTreeErrorLineNumber (page 758)	Dictionary key whose value is a CFNumber containing the line number where the error was detected. This may not be the line number where the actual XML error is located.
kCFXMLTreeErrorLocation (page 758)	Dictionary key whose value is a CFNumber containing the byte location where the error was detected.
kCFXMLTreeErrorStatusCode (page 758)	Dictionary key whose value is a CFNumber containing the error status code. See CFXMLParser Reference for possible status code values.

10.2 Symbol Changes

This article lists the symbols added to `CoreFoundation.framework` in Mac OS X v10.2.

C Symbols

All of the header files with new symbols are listed alphabetically, with their new symbols described.

CFBase.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNullGetTypeID (page 369)	Returns the type identifier for the CFNull opaque type.
--	---

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFNullRef (page 370)	A reference to a CFNull object.
<code>kCFCoreFoundationVersionNumber10_1</code>	The Core Foundation framework version in Mac OS X version 10.1.
kCFNull (page 370)	The singleton CFNull object.
<code>NS_NEW_API</code>	

CFBundle.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFBundleCopyInfoDictionaryForURL (page 110)	Returns the information dictionary for a given URL location.
CFBundleCopyLocalizationsForPreferences (page 111)	Given an array of possible localizations and preferred locations, returns the one or more of them that CFBundle would use, without reference to the current application context.
CFBundleCopyLocalizationsForURL (page 112)	Returns an array containing the localizations for a bundle or executable at a particular location.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCopyLocalizedStringWithDefaultValue (page 137)	Returns a localized version of a localization string.
kCFBundleLocalizationsKey (page 140)	Allows an unbundled application that handles localization itself to specify which localizations it has available.

CFCharacterSet.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFCharacterSetCreateInvertedSet (page 161)	Creates a new immutable character set that is the invert of the specified character set.
CFCharacterSetHasMemberInPlane (page 164)	Reports whether or not a character set contains at least one member character in the specified plane.
CFCharacterSetIsLongCharacterMember (page 165)	Reports whether or not a given UTF-32 character is in a character set.
CFCharacterSetIsSupersetOfSet (page 166)	Reports whether or not a character set is a superset of another set.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFCharacterSetCapitalizedLetter</code>	Titlecase character set (Unicode General Category Lt).
---	--

CFPreferences.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFPreferencesAppValueIsForced (page 794)	Determines whether or not a given key has been imposed on the user.
--	---

CFPropertyList.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFPropertyListCreateFromStream (page 421)	Creates a property list using data from a stream.
CFPropertyListIsValid (page 423)	Determines if a property list is valid.
CFPropertyListWriteToStream (page 424)	Writes the bytes of a property list serialization out to a stream.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFPropertyListFormat (page 425)	Specifies the format of a property list.
<code>kCFPropertyListBinaryFormat_v1_0</code>	Binary format version 1.0.
<code>kCFPropertyListOpenStepFormat</code>	OpenStep format (use of this format is discouraged).
<code>kCFPropertyListXMLFormat_v1_0</code>	XML format version 1.0.

CFSocket.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFSocketDisableCallbacks (page 508)	Disables the callback function of a CFSocket object for certain types of socket activity.
CFSocketEnableCallbacks (page 509)	Enables the callback function of a CFSocket object for certain types of socket activity.
CFSocketGetSocketFlags (page 510)	Returns flags that control certain behaviors of a CFSocket object.
CFSocketSetSocketFlags (page 514)	Sets flags that control certain behaviors of a CFSocket object.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

<code>kCFSocketAutomaticallyReenableAcceptCallback</code>	When enabled using <code>CFSocketSetSocketFlags</code> , the accept callback is called every time someone connects to your socket.
<code>kCFSocketAutomaticallyReenableDataCallback</code>	When enabled using <code>CFSocketSetSocketFlags</code> , the data callback is called every time the socket has read some data.
<code>kCFSocketAutomaticallyReenableReadCallback</code>	When enabled using <code>CFSocketSetSocketFlags</code> , the read callback is called every time the sockets has data to be read.
<code>kCFSocketAutomaticallyReenableWriteCallback</code>	When enabled using <code>CFSocketSetSocketFlags</code> , the write callback is called every time more data can be written to the socket.
<code>kCFSocketCloseOnInvalidate</code>	When enabled using <code>CFSocketSetSocketFlags</code> , the native socket associated with a CFSocket object is closed when the CFSocket object is invalidated. When disabled, the native socket remains open. This option is enabled by default.

kCFSocketWriteCallback	The callback is called when the socket is writable. This callback type may be useful when large amounts of data are being sent rapidly over the socket and you want a notification when there is space in the kernel buffers for more data.
------------------------	---

CFStream.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFReadStreamSetProperty (page 437)	Sets the value of a property for a stream.
CFStreamCreatePairWithPeerSocketSignature (page 824)	Creates readable and writable streams connected to a socket.
CFWriteStreamSetProperty (page 712)	Sets the value of a property for a stream.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFStreamPropertyAppendToFile (page 832)	Value is a CFBoolean value that indicates whether to append the written data to a file, if it already exists, rather than to replace its contents.
--	--

CFString.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringFindAndReplace (page 343)	Replaces all occurrences of a substring within a given range.
CFStringFindCharacterFromSet (page 550)	Query the range of the first character contained in the specified character set.
CFStringGetRangeOfComposedCharactersAtIndex (page 567)	Returns the range of the composed character sequence at a specified index.

CFStringNormalize (page 346)	Normalizes the string into the specified form as described in Unicode Technical Report #15.
--	---

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFStringNormalizationForm (page 353)	Unicode normalization forms as described in Unicode Technical Report #15.
kCFStringEncodingInvalidId (page 578)	Used as a function result to identify an encoding that is not supported or recognized by CFString.
kCFStringNormalizationFormC (page 353)	Canonical decomposition followed by canonical composition.
kCFStringNormalizationFormD (page 353)	Canonical decomposition.
kCFStringNormalizationFormKC (page 353)	Compatibility decomposition followed by canonical composition.
kCFStringNormalizationFormKD (page 353)	Compatibility decomposition.

CFStringEncodingExt.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFStringEncodingBig5_HKSCS_1999	Big-5 with Hong Kong special char set supplement
kCFStringEncodingGB_18030_2000	
kCFStringEncodingISO_2022_JP_1	RFC 2237
kCFStringEncodingISO_2022_JP_3	JIS X0213
kCFStringEncodingShiftJIS_X0213_00	Shift-JIS format encoding of JIS X0213 planes 1 and 2

10.1 Symbol Changes

This article lists the symbols added to `CoreFoundation.framework` in Mac OS X v10.1.

C Symbols

All of the header files with new symbols are listed alphabetically, with their new symbols described.

CFBase.h

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

kCFCoreFoundationVersionNumber (page 765)	The current version of the Core Foundation framework.
<code>kCFCoreFoundationVersionNumber10_0</code>	The Core Foundation framework version in Mac OS X version 10.0.
<code>kCFCoreFoundationVersionNumber10_0_3</code>	The Core Foundation framework version in Mac OS X version 10.0.3.
<code>TYPE_BOOL</code>	

CFStream.h

Functions

All of the new functions in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFReadStreamClose (page 429)	Closes a readable stream.
CFReadStreamCopyProperty (page 430)	Returns the value of a property for a stream.
CFReadStreamCreateWithBytesNoCopy (page 430)	Creates a readable stream for a block of memory.

CFReadStreamCreateWithFile (page 431)	Creates a readable stream for a file.
CFReadStreamGetBuffer (page 431)	Returns a pointer to a stream's internal buffer of unread data, if possible.
CFReadStreamGetError (page 432)	Returns the error status of a stream.
CFReadStreamGetStatus (page 433)	Returns the current state of a stream.
CFReadStreamGetTypeID (page 433)	Returns the type identifier the CFReadStream opaque type.
CFReadStreamHasBytesAvailable (page 433)	Returns a Boolean value that indicates whether a readable stream has data that can be read without blocking.
CFReadStreamOpen (page 434)	Opens a stream for reading.
CFReadStreamRead (page 434)	Reads data from a readable stream.
CFReadStreamScheduleWithRunLoop (page 435)	Schedules a stream into a run loop.
CFReadStreamSetClient (page 436)	Assigns a client to a stream, which receives callbacks when certain events occur.
CFReadStreamUnscheduleFromRunLoop (page 438)	Removes a read stream from a given run loop.
CFStreamCreatePairWithSocket (page 824)	Creates readable and writable streams connected to a socket.
CFStreamCreatePairWithSocketToHost (page 825)	Creates readable and writable streams connected to a TCP/IP port of a particular host.
CFWriteStreamCanAcceptBytes (page 705)	Returns whether a writable stream can accept new data without blocking.
CFWriteStreamClose (page 705)	Closes a writable stream.
CFWriteStreamCopyProperty (page 706)	Returns the value of a property for a stream.
CFWriteStreamCreateWithAllocatedBuffers (page 706)	Creates a writable stream for a growable block of memory.
CFWriteStreamCreateWithBuffer (page 707)	Creates a writable stream for a fixed-size block of memory.
CFWriteStreamCreateWithFile (page 708)	Creates a writable stream for a file.
CFWriteStreamGetError (page 708)	Returns the error status of a stream.
CFWriteStreamGetStatus (page 709)	Returns the current state of a stream.
CFWriteStreamGetTypeID (page 709)	Returns the type identifier of all CFWriteStream objects.

CFWriteStreamOpen (page 710)	Opens a stream for writing.
CFWriteStreamScheduleWithRunLoop (page 710)	Schedules a stream into a run loop.
CFWriteStreamSetClient (page 711)	Assigns a client to a stream, which receives callbacks when certain events occur.
CFWriteStreamUnscheduleFromRunLoop (page 713)	Removes a stream from a particular run loop.
CFWriteStreamWrite (page 713)	Writes data to a writable stream.

Data Types & Constants

All of the new data types and constants in this header file are listed alphabetically, with links to documentation and abstracts, if available.

CFReadStreamClientCallback (page 438)	Callback invoked when certain types of activity takes place on a readable stream.
CFReadStreamRef (page 439)	A reference to a readable stream object.
CFStreamClientContext (page 440)	A structure that contains program-defined data and callbacks with which you can configure a stream's client behavior.
CFStreamError (page 826)	The structure returned by CFReadStreamGetError and CFWriteStreamGetError .
CFStreamErrorDomain (page 829)	Defines constants for values returned in the domain field of the CFStreamError structure.
CFStreamEventType (page 831)	Defines constants for stream-related events.
CFStreamStatus (page 827)	Constants that describe the status of a stream.
CFWriteStreamClientCallback (page 714)	Callback invoked when certain types of activity takes place on a writable stream.
CFWriteStreamRef (page 715)	A reference to a writable stream object.
kCFStreamErrorDomainCustom (page 829)	The error code is a custom error code.
kCFStreamErrorDomainMacOSStatus (page 829)	The error is an OSStatus value defined in MacErrors.h .
kCFStreamErrorDomainPOSIX (page 829)	The error code is an error code defined in errno.h .
kCFStreamEventCanAcceptBytes (page 831)	The stream can accept bytes for writing.
kCFStreamEventEndEncountered (page 831)	The end of the stream has been reached.
kCFStreamEventErrorOccurred (page 831)	An error has occurred on the stream.

kCFStreamEventHasBytesAvailable (page 831)	The stream has bytes to be read.
kCFStreamEventNone (page 831)	No event has occurred.
kCFStreamEventOpenCompleted (page 831)	The open has completed successfully.
kCFStreamPropertyDataWritten (page 832)	Value is a CFData object that contains all the bytes written to a writable memory stream. You cannot modify this value.
kCFStreamPropertySocketNativeHandle (page 832)	Value is a CFData object that contains the native handle for a socket stream—of type <code>CFSocketNativeHandle</code> —to which the socket stream is connected.
kCFStreamPropertySocketRemoteHostName (page 833)	Value is a CFString object containing the name of the host to which the socket stream is connected or NULL if unknown.
kCFStreamPropertySocketRemotePortNumber (page 833)	Value is a CFNumber object containing the remote port number to which the socket stream is connected or NULL if unknown.
kCFStreamStatusAtEnd (page 828)	There is no more data to read, or no more data can be written.
kCFStreamStatusClosed (page 828)	The stream is closed.
kCFStreamStatusError (page 828)	An error occurred on the stream.
kCFStreamStatusNotOpen (page 828)	The stream is not open for reading or writing.
kCFStreamStatusOpen (page 828)	The stream is open.
kCFStreamStatusOpening (page 828)	The stream is being opened for reading or for writing.
kCFStreamStatusReading (page 828)	The stream is being read from.
kCFStreamStatusWriting (page 828)	The stream is being written to.

Document Revision History

This table describes the changes to *Core Foundation Framework Reference*.

Date	Notes
2007-10-31	Updated for Mac OS X v10.5. Added link to CFFileDescriptor reference.
2007-01-07	Includes new API for Leopard.
2006-05-23	First publication of this content as a collection of previously published documents.

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