Carbon Accessibility Reference

User Experience > Accessibility

2006-02-07

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Carbon Accessibility Reference

Framework:	ApplicationServices/HIServices.h, Carbon/HIToolbox.h
Declared in	AXActionConstants.h AXAttributeConstants.h AXNotificationConstants.h AXRoleConstants.h AXValueConstants.h CarbonEvents.h HIAccessibility.h

Overview

This document describes the Carbon accessibility API. You use this API to make your Carbon application accessible to assistive applications and technologies, a process called access enabling.

Who Should Read This Document?

All Carbon application developers should read this document for information on specific functions and constants they may need to access-enable their applications. If you're unsure which parts of the Carbon accessibility API you need, or if you're new to accessibility in Mac OS X, be sure to read the documents listed in "See Also" (page 7).

Organization of This Document

This document contains API reference in the following sections:

- "Accessibility Object Functions" (page 8) documents the functions some Carbon applications use to create and manipulate accessibility objects.
- "Accessibility Constants" (page 15) documents accessibility Carbon events and the constants that define the accessibility event parameters, object attributes, and notifications.
- "Carbon Accessibility Result Codes" (page 56) describes some of the error codes returned by the Carbon accessibility implementation.

See Also

For more information on accessibility in general and access enabling Carbon applications in particular, you should read the following documents:

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- Getting Started With Accessibility
- Accessibility Overview
- Accessibility Programming Guidelines for Carbon

Functions

This section describes the functions some Carbon developers may need to use to access-enable their applications.

AXNotificationHIObjectNotify

Posts a notification for an accessibility object.

```
void AXNotificationHIObjectNotify (
   CFStringRef inNotification,
   HIObjectRef inHIObject,
   UInt64 inIdentifier
);
```

Parameters

inNotification

The string containing the name of the notification to broadcast.

inHIObject

The `HIObjectRef` portion of the accessibility object for which this notification applies.

inIdentifier

The 64-bit identifier portion of the accessibility object for which this notification applies.

Discussion

You use the `AXNotificationHIObjectNotify` function to broadcast changes in an accessibility object to assistive applications. For example, an accessibility object may want to broadcast that the window it represents has moved, or that an attribute value has changed. See "Notifications" (page 52) for a list of possible notification constants. Note that accessibility objects representing standard user interface elements automatically send out notifications. In general, you do not need to post your own notifications unless you implement custom user interface elements.

Availability

Available in Mac OS X version 10.2 and later.

Not available to 64-bit applications.

Declared In

`HIAccessibility.h`

AXUIElementCreateWithHIObjectAndIdentifier

Creates an accessibility object that represents a user interface element.

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```
AXUIElementRef AXUIElementCreateWithHIObjectAndIdentifier (
   HIObjectRef inHIObject,
   UInt64 inIdentifier
);
```

Parameters

inHIObject

A reference to the user interface element this accessibility object represents. You must pass one of the following reference types: `WindowRef`, `ControlRef`, `MenuRef`, or an `HIObjectRef`.

inIdentifier

A 64-bit identifier to uniquely identify the accessibility object within the user interface element. Pass `0` to indicate the base object identified by the `inHIObject` parameter.

Return Value
The newly created accessibility object.

Discussion
If the accessibility object represents part of the substructure of a user interface element, then you must assign it a unique, nonzero identifier value. If the accessibility object represents a complex user interface object as a whole, you must give it the identifier value `0`. For example, a segmented view containing five buttons can have six accessibility objects associated with it:

- The segmented view as a whole, identified by its control reference (`ControlRef`) and identifier value `0`.
- The five button elements, identified by the segmented view reference and identifiers `1` through `5`, respectively.

The accessibility object is a `CFTypeRef` object. You can use `CFEqual` to compare two accessibility objects. You must call `CFRelease` on the accessibility object when you no longer need it.

Availability
Available in Mac OS X version 10.2 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

AXUIElementGetHIObject

Gets the user interface element the given accessibility object represents.

```
HIObjectRef AXUIElementGetHIObject (
   AXUIElementRef inUIElement
);
```

Parameters

inHIAccObj

The accessibility object whose user interface element you want to get.

Return Value
A reference to the user interface element associated with the passed-in accessibility object (or `NULL` if `inHIAccObj` is not a valid accessibility object).

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Availability
Available in Mac OS X version 10.2 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

AXUIElementGetIdentifier

Gets the unique identifier associated with an accessibility object.

```
void AXUIElementGetIdentifier (
   AXUIElementRef inUIElement,
   UInt64 *outIdentifier
);
```

Parameters

`inHIAccObj`
The accessibility object whose identifier you want to get.

`outIdentifier`
A pointer to a 64-bit integer. On return, `outIdentifier` contains the accessibility object's identifier. If `inHIAccObj` is not a valid accessibility object, this function returns 0. Note that 0 is a valid identifier value, so you should not assume that `inHIAccObj` is invalid if you receive a 0 result.

Discussion
If you create your own accessibility objects to represent custom user interface elements or subviews, you can use the identifier this function returns to identify which accessibility object is being referenced.

Availability
Available in Mac OS X version 10.2 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

HICopyAccessibilityActionDescription

Returns the system-defined action description string for a standard action.

```
CFStringRef HICopyAccessibilityActionDescription (
   CFStringRef inAction
);
```

Parameters

`inAction`
The action for which you want the system-defined description. See "Actions" (page 50) for the action strings you can use.

Return Value
The system-defined description for the action. When you are finished with the CFString containing the description, you must use `CFRelease` to release it. If you pass in an unsupported action, the results are undefined.

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Discussion
The `HICopyAccessibilityActionDescription` function is a convenience function you can use to get the current, system-defined action description for a given action. If you create an accessibility object that supports an action, you must supply the action description. Using this function allows you to take advantage of any changes or enhancements Apple might make.

Availability
Available in Mac OS X version 10.4 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

HICopyAccessibilityRoleDescription

Returns the system-defined role description string for a standard role or role-subrole pair.

```
CFStringRef HICopyAccessibilityRoleDescription (
   CFStringRef inRole,
   CFStringRef inSubrole
);
```

Parameters

`inRole`

The role for which you want the system-defined description. See "Roles" (page 22) for the role strings you can use.

`inSubrole`

The subrole for which you want the system-defined description. See "Subroles" (page 28) for the subrole strings you can use. Pass `NULL` if your accessible object does not have a subrole.

Return Value
The system-defined description for the role or role-subrole pair. When you are finished with the CFString containing the description, you must use `CFRelease` to release it. If there is no system-defined role description associated with the role or role-subrole pair you pass in, this function returns `NULL`. If you pass in an unknown role or an unknown subrole, this function returns `NULL`.

Discussion
The `HICopyAccessibilityRoleDescription` function is a convenience function you can use if you have to provide the role description for an accessibility object you create. Instead of hard-coding a role description for an accessibility object, you should use this function to get the current, system-defined role description. This allows you to take advantage of any changes or enhancements Apple might make.

Availability
Available in Mac OS X version 10.4 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

HIObjectIsAccessibilityIgnored

Returns whether the given HIObject is marked as ignored for accessibility purposes.

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```
Boolean HIObjectIsAccessibilityIgnored (
   HIObjectRef inObject
);
```

Parameters

inObject

The object whose accessibility ignored state you wish to query.

Return Value

A Boolean value indicating whether the HIObject is ignored for accessibility purposes.

Availability

Available in Mac OS X version 10.2 and later.

Not available to 64-bit applications.

Declared In

HIAccessibility.h

HIObjectOverrideAccessibilityContainment

Allows you to override the accessibility objects an HIObject would usually supply as the values of its kAXParentAttribute, kAXWindowAttribute, and kAXTopLevelUIElementAttribute attributes.

```
OSStatus HIObjectOverrideAccessibilityContainment (
   HIObjectRef inHIObject,
   AXUIElementRef inDesiredParent,
   AXUIElementRef inDesiredWindow,
   AXUIElementRef inDesiredTopLevelUIElement
);
```

Parameters

inHIObject

The HIObjectRef whose parent attribute you want to override.

inDesiredParent

The AXUIElementRef that you want the given HIObject to return as the value of its kAXParentAttribute attribute. This function makes a copy of the AXUIElementRef and you must release the *inDesiredParent* parameter after you call this function. Passing NULL in this parameter indicates you do not want the HIObject to override the value of its kAXParentAttribute attribute.

inDesiredWindow

The AXUIElementRef that you want the given HIObject to return as the value of its kAXWindowAttribute attribute. This function makes a copy of the AXUIElementRef and you must release the *inDesiredWindow* parameter after you call this function. Passing NULL in this parameter indicates you do not want the HIObject to override the value of its kAXWindowAttribute attribute (if the value exists).

inDesiredTopLevelUIElement

The AXUIElementRef that you want the given HIObject to return as the value of its kAXTopLevelUIElementAttribute attribute. This function makes a copy of the AXUIElementRef and you must release the *inDesiredTopLevelUIElement* parameter after you call this function. Passing NULL in this parameter indicates you do not want the HIObject to override the value of its kAXTopLevelUIElementAttribute attribute (if the value exists).

Return Value

An OSStatus result code. If the HIObjectRef is invalid, this function returns paramErr.

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Discussion
This function allows you to change the parent that the given HIObject would usually supply to the accessibility hierarchy. For example, you might call this function on the menu of a pop-up control to ensure that the menu returns the pop-up control as its parent (rather than the application). Optionally, this function also allows you to change the window and top-level accessibility object the given HIObject would supply.

If the input HIObject is a standard toolbox object, such as an HIView or a menu, the input HIObject will not be included as an accessibility child of its normal parent. In all other cases, it is the client's responsibility to ensure that the input HIObject is not included as an accessibility child of its normal parent.

If the desired `AXUIElementRef` parent represents an HIView, a menu, or a window, the input HIObject will be included automatically as an accessibility child of the specified parent. In all other cases, it is the client's responsibility to manually include the input HIObject as an accessibility child of the specified parent. To represent an HIView, a menu, or a window, an `AXUIElementRef` must contain the appropriate `HIObjectRef`, as well as an identifier value of 0.

Note that similar rules don't apply to the handling of the window and top-level element attributes, because those attributes don't represent two-way relationships.

Not every type of HIObject supports a containment override; currently, HIViews, menus, and windows support containment overrides.

Availability
Available in Mac OS X version 10.4 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

HIObjectSetAccessibilityIgnored

Marks an HIObject as ignored or unignored for accessibility purposes.

```
OSStatus HIObjectSetAccessibilityIgnored (
   HIObjectRef inObject,
   Boolean inIgnored
);
```

Parameters

inObject
The object whose accessibility ignored state you wish to change.

inIgnored
A Boolean value indicating whether to ignore the object (`TRUE`) or not (`FALSE`).

Return Value
An OSStatus signifying success or failure.

Discussion
An ignored HIObject is not shown to an assistive application that uses the accessibility APIs to examine the interface of your application. Your application's accessibility implementation should still report an ignored HIObject as usual. The Carbon accessibility implementation automatically hides ignored HIObjects from assistive applications.

Note: By default, an HIObject is *not* ignored.

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Availability
Available in Mac OS X version 10.2 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

HIObjectSetAuxiliaryAccessibilityAttribute

Associates an additional accessibility attribute with an accessibility object (a UIElement) that is used to represent a given HIObject or part thereof.

```
OSStatus HIObjectSetAuxiliaryAccessibilityAttribute (
   HIObjectRef inHIObject,
   UInt64 inIdentifier,
   CFStringRef inAttributeName,
   CFTypeRef inAttributeData
);
```

Parameters

inHIObject
The `HIObjectRef` portion of the object-identifier pair to which the attribute data is associated.

inIdentifier
The 64-bit identifier portion of the object-identifier pair to which the attribute data is associated. Pass 0 in this parameter when you want to associate the attribute data to the HIObject as a whole. You might do this if, for example, you want to give a description attribute to the object representing a button.

inAttributeName
A `CFStringRef` of the name of the attribute. This string is retained before it is added to the auxiliary attribute storage area.

inAttributeData
A `CFTypeRef` containing the data supplied for the attribute's value. This data is retained before it is added to the auxiliary attribute storage area; you may release this data after calling this function. If you pass `NULL` in this parameter, it indicates that the named auxiliary attribute should no longer be associated with the object-identifier pair and any named attribute data previously associated with the object-identifier pair will be released.

Return Value
An OSStatus result code. The function returns `noErr` if it was able to associate the attribute data with the HIObject. If the `HIObjectRef` is invalid, `paramErr` is returned.

Discussion
This function allows your application to provide the name of and data for an accessibility attribute you want to add to the UIElement that represents a given HIObject-identifier pair. Normally, accessibility attributes are only supplied dynamically through Carbon events, but this function allows you to supply them statically.

This function only allows you to associate attributes whose values never change. If you need to supply attribute whose values are determined dynamically or whose values are settable, you must install the necessary Carbon accessibility event handlers. See Accessibility Programming Guidelines for Carbon for more information about how this works.

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This function is particularly useful for supplying the values of the `kAXDescriptionAttribute`, `kAXTitleUIElementAttribute`, `kAXServesAsTitleForUIElementsAttribute`, `kAXLinkedUIElementsAttribute` attributes and other attributes whose values are specific to the layout and usage of your application.

The auxiliary attribute store (containing attribute values you supply using this function) is consulted during the HIObject's default handling of the Carbon accessibility attribute events. Therefore, any programmatic handling of a given accessibility attribute has the opportunity to override or block the consultation of the store. In general, if the toolbox or a Carbon event handler can provide the attribute value some other way, the store is not consulted.

Availability
Available in Mac OS X version 10.4 and later.
Not available to 64-bit applications.

Declared In
`HIAccessibility.h`

Constants

This section describes the constants that define accessibility events and aspects of accessibility objects. The accessibility event constants are defined in `CarbonEvents.h` in the Carbon framework. The accessibility object constants are defined in header files in the ApplicationServices framework.

Accessibility Events

Accessibility Event Constants

Define accessibility events (`kEventClassAccessibility`).

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```
enum
{
    kEventAccessibleGetChildAtPoint = 1,
    kEventAccessibleGetFocusedChild = 2,
    kEventAccessibleGetAllAttributeNames = 21,
    kEventAccessibleGetAllParameterizedAttributeNames = 25,
    kEventAccessibleGetNamedAttribute = 22,
    kEventAccessibleSetNamedAttribute = 23,
    kEventAccessibleIsNamedAttributeSettable = 24,
    kEventAccessibleGetAllActionNames = 41,
    kEventAccessiblePerformNamedAction = 42,
    kEventAccessibleGetNamedActionDescription = 44
};
```

Constants

`kEventAccessibleGetChildAtPoint`

A request sent by an assistive application to get the accessible child of the given accessibility object that contains the given point. The `kEventParamMouseLocation` parameter contains the location in global coordinates.

If you handle this event, you use the `kEventParamAccessibleChild` parameter to return an accessible first-order child of the accessibility object receiving the event. If there is no child at the given point, your handler should leave the `kEventParamAccessibleChild` parameter empty and return `noErr`. You must not set the `kEventParamAccessibleChild` parameter to a grandchild or more distant descendant of the accessible object receiving this event.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleGetFocusedChild`

A request sent by an assistive application to get the accessible child of the given accessibility object that is part of the focus chain.

If you handle this event, you set the `kEventParamAccessibleChild` parameter to a first-order, accessible child that is focused or is the ancestor of a focused object. If there is no child in the focus chain, your handler should leave the `kEventParamAccessibleChild` parameter empty and return `noErr`. You must not set the `kEventParamAccessibleChild` parameter to a grandchild or more distant descendant of the accessible object receiving this event.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleGetAllAttributeNames`

A request sent by an assistive application to get the names of all attributes the given accessibility object supports.

If you handle this event, you create a CFString object for the name of each non-parameterized attribute and add it to the mutable array in the `kEventParamAccessibleAttributeNames` parameter. If the accessibility object receiving the event supports parameterized attributes, you return them in the handler for the `kEventAccessibleGetAllParameterizedAttributeNames` event.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

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`kEventAccessibleGetAllParameterizedAttributeNames`

A request sent by an assistive application to get the names of all parameterized attributes the given accessibility object supports.

If you handle this event, you create a CFString object for the name of each parameterized attribute and add it to the mutable array in the `kEventParamAccessibleAttributeNames` parameter. You must not return any regular, non-parameterized attribute names with this event. Instead, return regular attribute names in the handler for the `kEventAccessibleGetAllAttributeNames` event.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.3 and later.

`kEventAccessibleGetNamedAttribute`

A request sent by an assistive application to get the value of the given attribute.

If you handle this event, you determine if the given accessibility object supports the attribute named in the `kEventParamAccessibleAttributeName` parameter. If it does, you return the attribute's value in the `kEventParamAccessibleAttributeValue` parameter. If the accessibility object does not support the attribute, return the `eventNotHandledErr` error. The type of the `kEventParamAccessibleAttributeValue` parameter varies with the type of the attribute's value.

This event may also include the optional `kEventParamAccessibleAttributeParameter` parameter that describes the parameters of a parameterized attribute. Note that parameterized attributes were introduced in Mac OS X version 10.3.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleSetNamedAttribute`

A request sent by an assistive application to set the value of the given attribute to the passed-in value.

If you handle this event, you determine if the given accessibility object supports the attribute named in the `kEventParamAccessibleAttributeName` parameter and if the attribute is settable. Then, you set the named attribute's value to the value supplied in the `kEventParamAccessibleAttributeValue` parameter. If you cannot handle this event (because, for example, the accessibility object does not support this attribute, the attribute is not settable, or the value is not appropriate), return the `eventNotHandledErr` error.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleIsNamedAttributeSettable`

A request sent by an assistive application to find out if the given attribute's value can be changed.

If you handle this event, you determine if the accessibility object supports the given attribute. If it does, you return a Boolean value in the `kEventParamAccessibleAttributeSettable` parameter that indicates whether the attribute's value can be changed.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleGetAllActionNames`

Sent by an assistive application to find out which actions the given accessibility object supports.

If you handle this event, you create a CFString object for the name of each action the given accessibility object supports and add it to the mutable array in the `kEventParamAccessibleActionNames` parameter.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

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`kEventAccessiblePerformNamedAction`

Sent by an assistive application when it wants the given accessibility object to perform the given action.

If you handle this event, you determine if the accessibility object supports the action named in the `kEventParamAccessibleActionName` parameter. If it does, you perform it.

In Mac OS X version 10.3 and later, this event includes the `kEventParamAccessibilityEventQueued` parameter, which indicates whether the event was queued. You check the value of this parameter before you perform an action that might result in a call to a routine that may not return immediately. If the event is queued, you can perform such an action without the possibility of causing an assistive application to receive a time-out error waiting for the action to complete. If the event is not queued, your handler can return the `eventDeferAccessibilityEventErr` to request that it be queued and sent to you later.

In versions of Mac OS X prior to 10.3, events are always directly dispatched and you should perform a requested action even if it might cause an assistive application to receive a time-out error.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

`kEventAccessibleGetNamedActionDescription`

Sent by an assistive application to get the human-intelligible name of the given action.

If you handle this event, you determine if the given accessibility object supports the given action. If it does, you return the value of the action's description property in the `kEventParamAccessibleActionDescription` parameter. To do this, you do not create a CFString object for the action description. Instead, you must modify the mutable string object in the `kEventParamAccessibleActionDescription` parameter to contain the action description.

Declared in `HIAccessibility.h`.

Available in Mac OS X version 10.2 and later.

Discussion

Table 1 (page 18) shows the parameters related to accessibility events.

Table 1 Parameter names and types for accessibility event kinds

Event kind	Parameter name	Parameter type
`kEventAccessible-GetChildAtPoint`	`kEventParamAccessibleObject`	`typeCFTypeRef` (an `AXUIElementRef`)
	`kEventParamAccessibleMouse-Location`	`typeHIPoint`
	`kEventParamAccessibleChild`	`typeCFTypeRef`
`kEventAccessible-GetFocusedChild`	`kEventParamAccessibleObject`	`typeCFTypeRef` (an `AXUIElementRef`)
	`kEventParamAccessibleChild`	`typeCFTypeRef`
`kEventAccessibleGet-AllAttributeNames`	`kEventParamAccessibleObject`	`typeCFTypeRef` (an `AXUIElementRef`)
	`kEventParamAccessibleAttribute-Names`	`typeCFMutableArrayRef`

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Event kind	Parameter name	Parameter type
kEventAccessibleGetAllParameterizedAttributeNames	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleAttributeNames	typeCFMutableArrayRef
kEventAccessibleGetNamedAttribute	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleAttributeName	typeCFStringRef
	kEventParamAccessibleAttributeParameter (Optional; introduced in Mac OS X version 10.3)	typeCFTypeRef
	kEventParamAccessibleAttributeValue	typeCFTypeRef (Varies with the type of the attribute value)
kEventAccessibleSetNamedAttribute	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleAttributeName	typeCFStringRef
	kEventParamAccessibleAttribuuteValue	typeCFTypeRef (Varies with the type of the attribute value)
kEventAccessibleIsNamedAttributeSettable	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleAttributeName	typeCFStringRef
	kEventParamAccessibleAttributeSettable	typeBoolean
kEventAccessibleGetAllActionNames	kEventParamAccessibleObject	typeCFTypeRef
	kEventParamAccessibleActionNames	typeCFMutableArrayRef
kEventAccessiblePerformNamedAction	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleActionName	typeCFStringRef
	kEventParamAccessibleEventQueued (Only in Mac OS X version 10.3 and later)	typeBoolean

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Event kind	Parameter name	Parameter type
kEventAccessible-GetNamedAction-Description	kEventParamAccessibleObject	typeCFTypeRef (an AXUIElementRef)
	kEventParamAccessibleActionName	typeCFStringRef
	kEventParamAccessibleAction-Description	typeCFMutableStringRef

Accessibility Event Parameters

Define parameters related to accessibility events.

```
enum
{
    kEventParamAccessibleObject = 'aojb',
    kEventParamAccessibleChild = 'achl',
    kEventParamAccessibleAttributeName = 'atnm',
    kEventParamAccessibleAttributeNames = 'atns',
    kEventParamAccessibleAttributeValue = 'atvl',
    kEventParamAccessibleAttributeSettable = 'atst',
    kEventParamAccessibleAttributeParameter = 'atpa',
    kEventParamAccessibleActionName = 'acnm',
    kEventParamAccessibleActionNames = 'acns',
    kEventParamAccessibleActionDescription = 'acds',
    kEventParamAccessibleEventQueued = 'aequ'
};
```

Constants

`kEventParamAccessibleObject`

Specifies an accessibility object. The parameter type is `typeCFTypeRef`, and the data must be of type `AXUIElementRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleChild`

Specifies the child accessibility object. The parameter type is `typeCFTypeRef`, and the data must be of type `AXUIElementRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleAttributeName`

Specifies an attribute name. The parameter type is `typeCFStringRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

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`kEventParamAccessibleAttributeNames`
Specifies an array of attribute names (each of type `CFStringRef`). The parameter type is `typeCFMutableArrayRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleAttributeValue`
Specifies the value of an attribute. The parameter type varies according to the attribute. However, this value must be one of the flat data types, such as point, rectangle, integer, float, or any CFType, and must be able to be packaged in a CFPropertyList. In particular, the data should not be a pointer, because you cannot be sure how long an assistive application will retain the value, or in what way it will interpret the value.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleAttributeSettable`
Specifies whether an attribute is settable. The parameter type is `typeBoolean`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleAttributeParameter`
Specifies the parameters of a parameterized attribute. The parameter type is `typeCFTypeRef`.

Available in Mac OS X v10.3 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleActionName`
Specifies an action name. The parameter type is `typeCFStringRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleActionNames`
Specifies an array of action names (each of type `CFStringRef`) . The parameter type is `typeCFMutableArrayRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleActionDescription`
Specifes the description of an action. The parameter type is `typeCFMutableStringRef`.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

`kEventParamAccessibleEventQueued`
Specifies whether the event has been queued. The parameter type is `typeBoolean`.

Accessibility Event Class

Defines the event class for accessibility events.

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```
enum
{
    kEventClassAccessibility = 'acce',
};
```

Constants

`kEventClassAccessibility`

Pass this value for the event class when registering for accessibility events.

Available in Mac OS X v10.2 and later.

Declared in `CarbonEvents.h`.

Accessibility Object Constants

Roles

Define the values an accessibility object's role attribute can have.

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```
#define kAXApplicationRole  CFSTR("AXApplication")
#define kAXSystemWideRole   CFSTR("AXSystemWide")
#define kAXWindowRole       CFSTR("AXWindow")
#define kAXSheetRole        CFSTR("AXSheet")
#define kAXDrawerRole       CFSTR("AXDrawer")
#define kAXGrowAreaRole     CFSTR("AXGrowArea")
#define kAXImageRole        CFSTR("AXImage")
#define kAXUnknownRole      CFSTR("AXUnknown")
#define kAXButtonRole       CFSTR("AXButton")
#define kAXRadioButtonRole  CFSTR("AXRadioButton")
#define kAXCheckBoxRole     CFSTR("AXCheckBox")
#define kAXPopUpButtonRole  CFSTR("AXPopUpButton")
#define kAXMenuButtonRole   CFSTR("AXMenuButton")
#define kAXTabGroupRole     CFSTR("AXTabGroup")
#define kAXTableRole        CFSTR("AXTable")
#define kAXColumnRole       CFSTR("AXColumn")
#define kAXRowRole          CFSTR("AXRow")
#define kAXOutlineRole      CFSTR("AXOutline")
#define kAXBrowserRole      CFSTR("AXBrowser")
#define kAXScrollAreaRole   CFSTR("AXScrollArea")
#define kAXScrollBarRole    CFSTR("AXScrollBar")
#define kAXRadioGroupRole   CFSTR("AXRadioGroup")
#define kAXListRole         CFSTR("AXList")
#define kAXGroupRole        CFSTR("AXGroup")
#define kAXValueIndicatorRole CFSTR ("AXValueIndicator")
#define kAXComboBoxRole     CFSTR("AXComboBox")
#define kAXSliderRole       CFSTR("AXSlider")
#define kAXIncrementorRole  CFSTR("AXIncrementor")
#define kAXBusyIndicatorRole CFSTR ("AXBusyIndicator")
#define kAXProgressIndicatorRole  CFSTR("AXProgressIndicator")
#define kAXRelevanceIndicatorRole CFSTR("AXRelevanceIndicator")
#define kAXToolbarRole      CFSTR("AXToolbar")
#define kAXDisclosureTriangleRole CFSTR("AXDisclosureTriangle")
#define kAXTextFieldRole CFSTR("AXTextField")
#definekAXTextAreaRole      CFSTR("AXTextArea")
#define kAXStaticTextRole   CFSTR("AXStaticText")
#define kAXMenuBarRole      CFSTR("AXMenuBar")
#define kAXMenuBarItemRole  CFSTR("AXMenuBarItem")
#define kAXMenuRole         CFSTR("AXMenu")
#define kAXMenuItemRole     CFSTR("AXMenuItem")
#define kAXSplitGroupRole   CFSTR("AXSplitGroup")
#define kAXSplitterRole     CFSTR("AXSplitter")
#define kAXColorWellRole    CFSTR("AXColorWell")
#define kAXTimeFieldRole    CFSTR("AXTimeField")
#define kAXDateFieldRole    CFSTR("AXDateField")
#define kAXHelpTagRole      CFSTR("AXHelpTag")
#define kAXMatteRole        CFSTR("AXMatteRole")
#define kAXDockItemRole     CFSTR("AXDockItem")
```

Constants

`kAXApplicationRole`

An application.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

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`kAXSystemWideRole`
The system-wide accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXWindowRole`
A window.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXSheetRole`
A sheet.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXDrawerRole`
A drawer.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXGrowAreaRole`
A grow control.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXImageRole`
An image.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXUnknownRole`
Generic role value for an unknown accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXButtonRole`
A button.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXRadioButtonRole`
A radio button.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXCheckBoxRole`
A check box.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

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`kAXPopUpButtonRole`
A pop-up button.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXMenuButtonRole`
A menu button.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXTabGroupRole`
A tab view.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXTableRole`
A table.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXColumnRole`
A column.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXRowRole`
A row.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXOutlineRole`
An accessibility object that displays row-based, hierarchically structured data, such as the list view in a Finder window.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXBrowserRole`
An accessibility object that displays column-based, hierarchically structured data, such as the column view in a Finder window.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXScrollAreaRole`
An accessibility object that displays data managed by scrolling controls.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXScrollBarRole`
A scroll bar control.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

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`kAXRadioGroupRole`
A set of radio buttons.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXListRole`
A list view.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXGroupRole`
A group box. This role can also be used to group other views without any visual indication of the grouping.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXValueIndicatorRole`
A control that indicates the value of an accessibility object, such as the scroller of a scroll bar control

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXComboBoxRole`
A combo box control.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXSliderRole`
A slider control.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXIncrementorRole`
A stepper control (also known as the “little arrows”).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXBusyIndicatorRole`
An asynchronous progress indicator.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXProgressIndicatorRole`
A determinate or indeterminate progress indicator.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXRelevanceIndicatorRole`
A relevance indicator.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

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`kAXToolbarRole`
A toolbar.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXDisclosureTriangleRole`
A disclosure triangle control.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXTextFieldRole`
A text field.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXTextAreaRole`
The editable text area in a control or window.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXStaticTextRole`
A string of static text displayed in a window that is not part of any control.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXMenuBarRole`
A menu bar.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXMenuBarItemRole`
A menu bar item.
Available in Mac OS X v10.3 and later.
Declared in `AXRoleConstants.h`.

`kAXMenuRole`
A menu.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXMenuItemRole`
A menu item.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

`kAXSplitGroupRole`
A split view.
Available in Mac OS X v10.2 and later.
Declared in `AXRoleConstants.h`.

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`kAXSplitterRole`
A splitter bar control.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXColorWellRole`
A color well.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXTimeFieldRole`
A field that displays time.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXDateFieldRole`
A field that displays dates.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXHelpTagRole`
A help tag.

Available in Mac OS X v10.4 and later.

Declared in `AXRoleConstants.h`.

`kAXMatteRole`
The outer view that represents the entire contents, including the view through the matte hole, the contents hidden by the matte frame, and the resizing and repositioning controls. An example of an object with a matte role is the iChat icon scaling window.

Available in Mac OS X v10.4 and later.

Declared in `AXRoleConstants.h`.

`kAXDockItemRole`
An icon that represents an item in the Dock.

Available in Mac OS X v10.4 and later.

Declared in `AXRoleConstants.h`.

Discussion
The value of the role attribute describes what the object is, not what it does. See the "Roles and Associated Attributes" appendix in Accessibility Overview for more information on which attributes are associated with each role.

Subroles

Define the values for an accessibility object's subrole attribute.

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```
#define kAXCloseButtonSubrole       CFSTR("AXCloseButton")
#define kAXMinimizeButtonSubrole    CFSTR("AXMinimizeButton")
#define kAXZoomButtonSubrole        CFSTR("AXZoomButton")
#define kAXToolbarButtonSubrole     CFSTR("AXToolbarButton")
#define kAXSecureTextFieldSubrole   CFSTR("AXSecureTextField")
#define kAXTableRowSubrole          CFSTR("AXTableRow")
#define kAXOutlineRowSubrole        CFSTR("AXOutlineRow")
#define kAXUnknownSubrole           CFSTR("AXUnknown")
#define kAXStandardWindowSubrole    CFSTR("AXStandardWindow")
#define kAXDialogSubrole            CFSTR("AXDialog")
#define kAXSystemDialogSubrole      CFSTR("AXSystemDialog")
#define kAXFloatingWindowSubrole    CFSTR("AXFloatingWindow")
#define kAXSystemFloatingWindowSubrole CFSTR("AXSystemFloatingWindow")
#define kAXIncrementArrowSubrole    CFSTR("AXIncrementArrow")
#define kAXDecrementArrowSubrole    CFSTR("AXDecrementArrow")
#define kAXIncrementPageSubrole     CFSTR("AXIncrementPage")
#define kAXDecrementPageSubrole     CFSTR("AXDecrementPage")
#define kAXSortButtonSubrole        CFSTR("AXSortButton")
#define kAXSearchFieldSubrole       CFSTR("AXSearchField")
#define kAXApplicationDockItemSubrole CFSTR("AXApplicationDockItem")
#define kAXDocumentDockItemSubrole  CFSTR("AXDocumentDockItem")
#define kAXFolderDockItemSubrole    CFSTR("AXFolderDockItem")
#define kAXMinimizedWindowDockItemSubrole CFSTR("AXMinimizedWindowDockItem")
#define kAXURLDockItemSubrole       CFSTR("AXURLDockItem")
#define kAXDockExtraDockItemSubrole CFSTR("AXDockExtraDockItem")
#define kAXTrashDockItemSubrole     CFSTR("AXTrashDockItem")
#define kAXProcessSwitcherListSubrole CFSTR("AXProcessSwitcherList")
```

Constants

`kAXCloseButtonSubrole`

A close button (that is, the red button in a window's title bar that closes the window).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXMinimizeButtonSubrole`

A minimize button (that is, the yellow button in a window's title bar that minimizes the window into the Dock).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXZoomButtonSubrole`

A zoom button (that is, the green button in a window's title bar that adjusts the window's size).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXToolbarButtonSubrole`

A toolbar button (that is, the button in a window's title bar that hides and reveals the toolbar).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXSecureTextFieldSubrole`

A text field intended to contain sensitive data and that displays the user's input as a series of bullets.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

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`kAXTableRowSubrole`
A row in a table.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXOutlineRowSubrole`
A row in an outline view (see `kAXOutlineRole` for a description of an outline view).

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXUnknownSubrole`
A subrole for an unknown type of window. A window should include a subrole to further define its type. If your window does not conform to an existing subrole, you can use the unknown subrole. Alternatively, you can return the `eventNotHandledErr` error when your window is asked for its subrole.

Available in Mac OS X v10.2 and later.

Declared in `AXRoleConstants.h`.

`kAXStandardWindowSubrole`
A standard window that includes a title bar (that is, not an inspector window or a sheet).

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXDialogSubrole`
A dialog window, such as an alert.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXSystemDialogSubrole`
A system-generated dialog window that floats on the top layer, regardless of which application is frontmost. Use this subrole only when a dialog or alert applies to the system as a whole, such as a shutdown dialog.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXFloatingWindowSubrole`
A utility window.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXSystemFloatingWindowSubrole`
A system-generated utility window.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

`kAXIncrementArrowSubrole`
The up arrow of a scroll bar.

Available in Mac OS X v10.3 and later.

Declared in `AXRoleConstants.h`.

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`kAXDecrementArrowSubrole`
The down arrow of a scroll bar.
Available in Mac OS X v10.3 and later.
Declared in `AXRoleConstants.h`.

`kAXIncrementPageSubrole`
The increment area in the scroll track of a scroll bar.
Available in Mac OS X v10.3 and later.
Declared in `AXRoleConstants.h`.

`kAXDecrementPageSubrole`
The decrement area in the scroll track of a scroll bar.
Available in Mac OS X v10.3 and later.
Declared in `AXRoleConstants.h`.

`kAXSortButtonSubrole`
A column heading button in a list or column view.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXSearchFieldSubrole`
A search field.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXApplicationDockItemSubrole`
An icon in the Dock that represents an application.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXDocumentDockItemSubrole`
An icon in the Dock that represents a document.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXFolderDockItemSubrole`
An icon in the Dock that represents a folder.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXMinimizedWindowDockItemSubrole`
An icon in the Dock that represents a minimized window.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

`kAXURLDockItemSubrole`
An icon in the Dock that represents a URL.
Available in Mac OS X v10.4 and later.
Declared in `AXRoleConstants.h`.

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`kAXDockExtraDockItemSubrole`
: An icon in the Dock that represents a Dock Extra.

  Available in Mac OS X v10.4 and later.

  Declared in `AXRoleConstants.h`.

`kAXTrashDockItemSubrole`
: The icon in the Dock that represents the Trash.

  Available in Mac OS X v10.4 and later.

  Declared in `AXRoleConstants.h`.

`kAXProcessSwitcherListSubrole`
: The display of running applications (processes) that appears when a user presses Command-Tab.

  Available in Mac OS X v10.4 and later.

  Declared in `AXRoleConstants.h`.

Discussion
A subrole provides a more specific description of an accessibility object's role. If an accessibility object is of a well-defined subtype, it can include the subrole attribute to provide additional information to an assistive application.

Attributes

Define the attributes available for accessibility objects.

```
//General attributes
#define kAXRoleAttribute                    CFSTR("AXRole")
#define kAXSubroleAttribute                 CFSTR("AXSubrole")
#define kAXRoleDescriptionAttribute         CFSTR("AXRoleDescription")
#define kAXHelpAttribute                    CFSTR("AXHelp")
#define kAXTitleAttribute                   CFSTR("AXTitle")
#define kAXValueAttribute                   CFSTR("AXValue")
#define kAXMinValueAttribute                CFSTR("AXMinValue")
#define kAXMaxValueAttribute                CFSTR("AXMaxValue")
#define kAXValueIncrementAttribute          CFSTR("AXValueIncrement")
#define kAXAllowedValuesAttribute           CFSTR("AXAllowedValues")
#define kAXEnabledAttribute                 CFSTR("AXEnabled")
#define kAXFocusedAttribute                 CFSTR("AXFocused")
#define kAXParentAttribute                  CFSTR("AXParent")
#define kAXChildrenAttribute                CFSTR("AXChildren")
#define kAXSelectedChildrenAttribute        CFSTR("AXSelectedChildren")
#define kAXVisibleChildrenAttribute         CFSTR("AXVisibleChildren")
#define kAXWindowAttribute                  CFSTR("AXWindow")
#define kAXTopLevelUIElementAttribute       CFSTR("AXTopLevelUIElement")
#define kAXPositionAttribute                CFSTR("AXPosition")
#define kAXSizeAttribute                    CFSTR("AXSize")
#define kAXOrientationAttribute             CFSTR("AXOrientation")
#define kAXDescriptionAttribute             CFSTR("AXDescription")
```


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```
// Text-specific attributes
#define kAXSelectedTextAttribute            CFSTR("AXSelectedText")
#define kAXVisibleCharacterRangeAttribute CFSTR("AXVisibleCharacterRange")
#define kAXSelectedTextRangeAttribute       CFSTR("AXSelectedTextRange")
#define kAXNumberOfCharactersAttribute      CFSTR("AXNumberOfCharacters")
#define kAXSharedTextUIElementsAttribute    CFSTR("AXSharedTextUIElements")
#define kAXSharedCharacterRangeAttribute    CFSTR("AXSharedCharacterRange")

// Window-specific attributes
#define kAXMainAttribute                    CFSTR("AXMain")
#define kAXMinimizedAttribute               CFSTR("AXMinimized")
#define kAXCloseButtonAttribute             CFSTR("AXCloseButton")
#define kAXZoomButtonAttribute              CFSTR("AXZoomButton")
#define kAXMinimizeButtonAttribute          CFSTR("AXMinimizeButton")
#define kAXToolbarButtonAttribute           CFSTR("AXToolbarButton")
#define kAXGrowAreaAttribute                CFSTR("AXGrowArea")
#define kAXProxyAttribute                   CFSTR("AXProxy")
#define kAXModalAttribute                   CFSTR("AXModal")
#define kAXDefaultButtonAttribute           CFSTR("AXDefaultButton")
#define kAXCancelButtonAttribute            CFSTR("AXCancelButton")

// Menu-specific attributes
#define kAXMenuItemCmdCharAttribute         CFSTR("AXMenuItemCmdChar")
#define kAXMenuItemCmdVirtualKeyAttribute
                                  CFSTR("AXMenuItemCmdVirtualKey")
#define kAXMenuItemCmdGlyphAttribute        CFSTR("AXMenuItemCmdGlyph")
#define kAXMenuItemCmdModifiersAttribute
                                     CFSTR("AXMenuItemCmdModifiers")
#define kAXMenuItemMarkCharAttribute    CFSTR("AXMenuItemMarkChar")
#define kAXMenuItemPrimaryUIElementAttribute CFSTR("AXMenuItemPrimaryUIElement")

// Application-specific attributes
#define kAXMenuBarAttribute                     CFSTR("AXMenuBar")
#define kAXWindowsAttribute                     CFSTR("AXWindows")
#define kAXFrontmostAttribute                   CFSTR("AXFrontmost")
#define kAXHiddenAttribute                      CFSTR("AXHidden")
#define kAXMainWindowAttribute                  CFSTR("AXMainWindow")
#define kAXFocusedWindowAttribute               CFSTR("AXFocusedWindow")
#define kAXFocusedUIElementAttribute        CFSTR("AXFocusedUIElement")
```


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```
// Miscellaneous attributes
#define kAXHeaderAttribute                  CFSTR("AXHeader")
#define kAXEditedAttribute                  CFSTR("AXEdited")
#define kAXValueWrapsAttribute              CFSTR("AXValueWraps")
#define kAXTabsAttribute                    CFSTR("AXTabs")
#define kAXTitleUIElementAttribute          CFSTR("AXTitleUIElement")
#define kAXHorizontalScrollBarAttribute     CFSTR("AXHorizontalScrollBar")
#define kAXVerticalScrollBarAttribute       CFSTR("AXVerticalScrollBar")
#define kAXOverflowButtonAttribute          CFSTR("AXOverflowButton")
#define kAXFilenameAttribute                CFSTR("AXFilename")
#define kAXExpandedAttribute                CFSTR("AXExpanded")
#define kAXSelectedAttribute                CFSTR("AXSelected")
#define kAXSplittersAttribute               CFSTR("AXSplitters")
#define kAXNextContentsAttribute            CFSTR("AXNextContents")
#define kAXDocumentAttribute                CFSTR("AXDocument")
#define kAXDecrementButtonAttribute         CFSTR("AXDecrementButton")
#define kAXIncrementButtonAttribute         CFSTR("AXIncrementButton")
#define kAXPreviousContentsAttribute        CFSTR("AXPreviousContents")
#define kAXContentsAttribute                CFSTR("AXContents")
#define kAXIncrementorAttribute             CFSTR("AXIncrementor")
#define kAXHourFieldAttribute               CFSTR("AXHourField")
#define kAXMinuteFieldAttribute             CFSTR("AXMinuteField")
#define kAXSecondFieldAttribute             CFSTR("AXSecondField")
#define kAXAMPMFieldAttribute               CFSTR("AXAMPMField")
#define kAXDayFieldAttribute                CFSTR("AXDayField")
#define kAXMonthFieldAttribute              CFSTR("AXMonthField")
#define kAXYearFieldAttribute               CFSTR("AXYearField")
#define kAXColumnTitleAttribute             CFSTR("AXColumnTitles")
#define kAXURLAttribute                     CFSTR("AXURL")
#define kAXLabelUIElementsAttribute         CFSTR("AXLabelUIElements")
#define kAXLabelValueAttribute              CFSTR("AXLabelValue")
#define kAXShownMenuUIElementAttribute      CFSTR("AXShownMenuUIElement")
#define kAXServesAsTitleForUIElementsAttribute
CFSTR("AXServesAsTitleForUIElements")
#define kAXLinkedUIElementsAttribute CFSTR("AXLinkedUIElements")

// Table and outline view attributes
#define kAXRowsAttribute                    CFSTR("AXRows")
#define kAXVisibleRowsAttribute             CFSTR("AXVisibleRows")
#define kAXSelectedRowsAttribute            CFSTR("AXSelectedRows")
#define kAXColumnsAttribute                 CFSTR("AXColumns")
#define kAXVisibleColumnsAttribute          CFSTR("AXVisibleColumns")
#define kAXSelectedColumnsAttribute         CFSTR("AXSelectedColumns")
#define kAXSortDirectionAttribute           CFSTR("AXSortDirection")
#define kAXColumnHeaderUIElementsAttribute CFSTR("AXColumnHeaderUIElements")
#define kAXIndexAttribute                   CFSTR("AXIndex")
#define kAXDisclosingAttribute              CFSTR("AXDisclosing")
#define kAXDisclosedRowsAttribute           CFSTR("AXDisclosedRows")
#define kAXDisclosedByRowAttribute          CFSTR("AXDisclosedByRow")

// Matte attributes
#define kAXMatteHoleAttribute               CFSTR("AXMatteHole")
#define kAXMatteContentUIElementAttribute CFSTR("AXMatteContentUIElement")


// Dock attributes
#define kAXIsApplicationRunningAttribute CFSTR("AXIsApplicationRunning")
```


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```
// System-wide attributes
#define kAXFocusedApplicationAttribute      CFSTR("AXFocusedApplication")
```

Constants

`kAXRoleAttribute`

The role, or type, of this accessibility object (for example, `AXButton`). This string is for identification purposes only and does not need to be localized. All accessibility objects must include this attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSubroleAttribute`

The subrole of this accessibility object (for example, `AXCloseButton`). The subrole provides additional information about the accessibility object to an assistive application. This string is for identification purposes only and does not need to be localized. This attribute is necessary only for an accessibility object whose `AXRole` attribute does not adequately describe its meaning.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXRoleDescriptionAttribute`

A localized string describing the role (for example, "button"). This string must be readable by (or speakable to) the user. All accessibility objects must include this attribute. To get the system-defined role description string for a given role, use the `HICopyAccessibilityRoleDescription` (page 11) function.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXHelpAttribute`

A localized string containing help text for this accessibility object. An accessibility object that provides help information should include this attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXTitleAttribute`

The title associated with this accessibility object. A title is text that the object displays as part of its visual interface, such as the text "OK" on an OK button. This string must be localizable and human-intelligible. This attribute is required for all accessibility objects that display a string in their visual interfaces.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXValueAttribute`

The value associated with this accessibility object (for example, a scroller value). The value of an accessibility object is user-modifiable and represents the setting of the associated user interface element, such as the contents of an editable text field or the position of a scroller. This attribute is required if an accessibility object's value state conveys information to the user or if the user can define the value of the object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXMinValueAttribute`

The minimum value this accessibility object can display (for example, the minimum value of a scroller control). This attribute is used only in conjunction with the `AXValue` attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMaxValueAttribute`

The maximum value this accessibility object can display (for example, the maximum value of a scroller control). This attribute is used only in conjunction with the `AXValue` attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXValueIncrementAttribute`

The amount an accessibility object's value changes as the result of a single action (for example, how far a scroller travels with one mouse click). This attribute is used only in conjunction with the `AXValue` attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXAllowedValuesAttribute`

An array of the allowed values for an accessibility object. This attribute indicates the subset of values to which an accessibility object can be set. For example, a slider control displays a large range of values, but the accessibility object representing the slider can be set to only a few specific values within that range. This attribute is used only in conjunction with the `AXValue` attribute.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXEnabledAttribute`

Indicates whether the user can interact with the accessibility object. For example, the `AXEnabled` attribute of a disabled button is `false`. This attribute is required for accessibility objects that represent views, menus, and menu items. This attribute is not required for accessibility objects that represent windows.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXFocusedAttribute`

Indicates whether the accessibility object currently has the keyboard focus. Note that you can set the value of the `AXFocused` attribute to `true` to accept keyboard focus. This attribute is required for all accessibility objects representing elements that can receive keyboard focus.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXParentAttribute`

This accessibility object's parent object in the accessibility hierarchy. This attribute is required for all accessibility objects except the application-level accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXChildrenAttribute`

An array of the first-order accessibility objects contained by this accessibility object. An accessibility object may be a member of only one `AXChildren` array. This attribute is required for all accessibility objects that contain accessible child objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedChildrenAttribute`

An array of selected first-order accessibility objects contained by this accessibility object. For example, the selected subelements of a list view are contained in the `AXSelectedChildren` array of the list view's accessibility object. The members of the `AXSelectedChildren` array are a subset of the members of this accessibility object's `AXChildren` array. This attribute is required for accessibility objects that contain selectable child objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXVisibleChildrenAttribute`

An array of first-order accessibility objects contained by this accessibility object that are visible to a sighted user. For example, a list view's `AXVisibleChildren` array would contain the list's subelements that are currently scrolled into view. The members of the `AXVisibleChildren` array are a subset of the members of this accessibility object's `AXChildren` array. This attribute is recommended for accessibility objects whose child objects can be scrolled out of view or otherwise obscured.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXWindowAttribute`

The window element that contains this accessibility object. An accessibility object that is contained in a window includes this attribute so an assistive application easily can find the window without having to step through all intervening objects in the accessibility hierarchy. Note that the value of the `AXWindow` attribute must be an accessibility object that represents a window, not a sheet or drawer. For a similar attribute that is less restrictive, see `kAXTopLevelUIElementAttribute`. The `AXWindow` attribute is required for all accessibility elements whose parent or more distant ancestor represents a window.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXPositionAttribute`

The global screen coordinates of the top-left corner of this accessibility object. Note that the coordinates `0,0` represent the top-left corner of the screen that displays the menu bar. All accessibility objects that have a screen position (in other words, are visible on the screen) should include this attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXTopLevelUIElementAttribute`

The window, sheet, or drawer element that contains this accessibility object. An accessibility object that is contained in a window, sheet, or drawer includes this attribute so an assistive application easily can find that element without having to step through all intervening objects in the accessibility hierarchy. This attribute is required for all accessibility objects whose parent or more distant ancestor represents a window, drawer, or sheet.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

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`kAXSizeAttribute`

The vertical and horizontal dimensions of this accessibility object. This attribute is required for all accessibility objects that are visible on the screen.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXOrientationAttribute`

Indicates whether this accessibility object is displayed or interacted with in a vertical or a horizontal manner. The interpretation of an element, such as a slider, can change depending on whether it is oriented vertically or horizontally. Using the value of this attribute, an assistive application can communicate this information to the user. This attribute is required for any accessibility object, such as a scroller or slider, whose semantic meaning varies with the object's orientation.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXDescriptionAttribute`

The purpose of this accessibility object. The description string must be localizable and human-intelligible and it must be all lower case and include no punctuation. The string should briefly describe this accessibility object's purpose, without including the object's role description. This attribute is required for all accessibility objects that do not provide enough descriptive information in the title attribute.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedTextAttribute`

The currently selected text within this accessibility object. This attribute is required for all accessibility objects that represent editable text elements.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedTextRangeAttribute`

Indicates the range of characters (not bytes) that defines the currently selected text within this accessibility object. This attribute is required for all accessibility objects that represent editable text elements.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXVisibleCharacterRangeAttribute`

Indicates the range of characters (not bytes) that are scrolled into view within this accessibility object. This attribute is required only for accessibility objects that represent an editable text area (objects of role `AXTextArea`), not for any other text-related accessibility objects.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXNumberOfCharactersAttribute`

The total number of characters (not bytes) in the editable text element represented by this accessibility object. This attribute is required for all accessibility objects that represent editable text elements.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

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`kAXSharedTextUIElementsAttribute`

An array of accessibility objects with which the text of this accessibility object is shared. In a multi-column document, for example, each column may be represented by a separate accessibility object. However, the text in the document may flow from one column to the other. You get the value of this attribute if you need to know with which accessibility object this accessibility object shares its text. This attribute is recommended for sets of accessibility objects that share text in a single window. (See `kAXSharedCharacterRange` for a related attribute.)

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXSharedCharacterRangeAttribute`

The portion of shared text this accessibility object currently displays. In a multi-column document, for example, each column may be represented by a separate accessibility object. However, the text in the document may flow from one column to the other. Get the value of this attribute if you need to know the specific range of characters this accessibility object currently displays. This attribute is recommended for sets of accessibility objects that share text in a single window. (See `kAXSharedTextUIElementsAttribute` for a related attribute.)

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXMainAttribute`

Indicates whether the window represented by this accessibility object is the main application window. Note that a window can be main even though it does not have keyboard focus. This attribute is recommended for all accessibility objects that represent windows.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMinimizedAttribute`

Indicates whether the window represented by this accessibility object is currently minimized in the Dock. This attribute is recommended for all accessibility objects that represent windows that can be minimized.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXCloseButtonAttribute`

The close button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's close button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a close button.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXZoomButtonAttribute`

The zoom button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's zoom button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a zoom button.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXMinimizeButtonAttribute`

The minimize button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's minimize button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a minimize button.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXToolbarButtonAttribute`

The toolbar button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's toolbar button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a toolbar button.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXGrowAreaAttribute`

The grow area of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's grow area, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a grow area.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXProxyAttribute`

The document proxy of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's document proxy, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that display a document proxy.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXModalAttribute`

Indicates whether the window represented by this accessibility object is modal. This attribute is recommended for all accessibility objects that represent windows.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXDefaultButtonAttribute`

The default button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's default button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a default button.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

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`kAXCancelButtonAttribute`

The cancel button of the window represented by this accessibility object. An accessibility object includes this attribute to help an assistive application easily find a window's cancel button, without having to traverse the accessibility hierarchy. This attribute is recommended for all accessibility objects that represent windows that contain a cancel button.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemCmdCharAttribute`

The primary key in the keyboard shortcut for the command represented by this accessibility object. For example, "O" is the primary key in the keyboard shortcut for the Open command.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemCmdVirtualKeyAttribute`

The key code associated with the physical key in the keyboard shortcut for the command represented by this accessibility object. For example, Return and Enter are different physical keys that can produce the same character. If an assistive application needs to be able to distinguish between them, it can view the virtual key codes.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemCmdGlyphAttribute`

The glyph displayed for a physical key in the keyboard shortcut for the command represented by this accessibility object, if it is different from the visible result of pressing the key. The Delete key, for example, produces an invisible character, but it is associated with a visible glyph.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemCmdModifiersAttribute`

An integer mask that represents the modifier keys held down in the keyboard shortcut for the command represented by this accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemMarkCharAttribute`

The symbol displayed to the left of the menu item represented by this accessibility object. For example, in the Window menu, a checkmark appears next to the active document's name. For more information on the standard symbols that can appear next to menu items, see *Apple Human Interface Guidelines*.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMenuItemPrimaryUIElementAttribute`

The accessibility object representing the primary menu item in a group of dynamic menu items. Dynamic menu item are commands that change when the user presses a modifier key, such as Minimize Window and Minimize All Windows. Within each group, each dynamic menu item's accessibility object includes this attribute and in each case the attribute's value is the accessibility object representing the primary menu item.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

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`kAXMenuBarAttribute`

The accessibility object representing the menu bar of this application. The application-level accessibility object includes this attribute to help an assistive application easily find the menu bar. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXWindowsAttribute`

An array of accessibility objects representing this application's windows. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXFrontmostAttribute`

Indicates whether the application represented by this accessibility object is active. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXHiddenAttribute`

Indicates whether the application represented by this accessibility object is hidden. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMainWindowAttribute`

The accessibility object representing this application's main window. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXFocusedWindowAttribute`

The accessibility object that represents the currently focused window of this application. This attribute is recommended for all application-level accessibility objects.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXFocusedUIElemenAttribute`

The accessibility object that represents the currently focused user interface element in this application. This attribute is recommended for all application-level accessibility objects.

`kAXHeaderAttribute`

The accessibility object representing the header element of this accessibility object. For example, a table or an outline view can have a header element that displays column or row headers. An accessibility object includes this attribute to help an assistive application easily find embedded header information. This attribute is recommended for all accessibility objects that represent elements that display header information.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXEditedAttribute`

Indicates whether the user interface element represented by this accessibility object has been edited. For example, a document window indicates it has been edited by displaying a black dot in its close button. This attribute is recommended for all accessibility objects that represent editable user interface elements.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXTitleUIElementAttribute`

An accessibility object that represents a static text title associated with another accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXValueWrapsAttribute`

Indicates whether the value displayed in the user interface element represented by this accessibility object wraps around.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXTabsAttribute`

An array of accessibility objects representing the tabs this accessibility object displays. An accessibility object includes this attribute to help an assistive application easily distinguish a tab view's tabs from its other children. This attribute is recommended for all accessibility objects that represent tab views.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXHorizontalScrollBarAttribute`

The horizontal scroll bar displayed by the user interface element this accessibility object represents. This is a convenience attribute an assistive application can use easily to find the scroll bar without traversing the accessibility hierarchy. This attribute is recommended for all accessibility objects that display a horizontal scroll bar.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXVerticalScrollBarAttribute`

The vertical scroll bar displayed by the user interface element this accessibility object represents. This is a convenience attribute an assistive application can use easily to find the scroll bar without traversing the accessibility hierarchy. This attribute is recommended for all accessibility objects that display a vertical scroll bar.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXOverflowButtonAttribute`

Identifies which child of an accessibility object representing a toolbar is the overflow button (if any). This attribute is optional.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXFilenameAttribute`

The filename associated with this accessibility object. This attribute is optional.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXExpandedAttribute`

Indicates whether the menu displayed by the combo box or pop-up menu represented by this accessibility object is currently expanded. This attribute is recommended for all accessibility objects that display a pop-up menu.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedAttribute`

Indicates whether the row or column element represented by this accessibility object is selected. This attribute is recommended for all accessibility objects that represent selectable rows or columns.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSplittersAttribute`

An array of views and splitter bar elements displayed by the split view represented by this accessibility object. This is a convenience attribute that helps an assistive application easily find these elements.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXNextContentsAttribute`

The group of accessibility objects representing the elements on one side of a splitter bar. (Which side of the splitter bar is considered "next" is determined by the value of the splitter bar's orientation attribute.) This attribute is recommended for an accessibility object that represents the splitter bar in a split view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXPreviousContentsAttribute`

The group of accessibility objects representing the elements on one side of a splitter bar. (Which side of the splitter bar is considered "previous" is determined by the value of the splitter bar's orientation attribute.) This attribute is recommended for an accessibility object that represents the splitter bar in a split view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXDocumentAttribute`

The URL of the open document represented by this accessibility object. This attribute represents the URL as a string object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXIncrementButtonAttribute`

The increment element associated with the user interface object this accessibility object represents. This attribute can be used to provide convenient access to the increment area of a custom user interface object. To refer to the increment button associated with a date or time field, see `kAXIncrementorAttribute`.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXDecrementButtonAttribute`

The decrement element associated with the user interface object this accessibility object represents. This attribute can be used to provide convenient access to the decrement area of a custom user interface object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXContentsAttribute`

Content-containing accessibility objects that are children of this accessibility object. For example, a tab view contains children that represent both the tab controls and the content displayed for each tab. The accessibility object representing a tab view can include only the content-display children in its `AXContents` attribute to help an assistive application provide more targeted information to the user. This attribute is recommended for any accessibility object whose children represent both content and control elements.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXIncrementorAttribute`

The incrementor of a time or date field represented by this accessibility object. This attribute is required for accessibility objects that represent time or date field elements that display an incrementor.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXHourFieldAttribute`

The hour field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display hours.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXMinuteFieldAttribute`

The minute field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display minutes.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXSecondFieldAttribute`

The second field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display seconds.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXAMPMFieldAttribute`

The AM/PM field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display AM/PM settings.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXDayFieldAttribute`

The day field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display days.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

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`kAXMonthFieldAttribute`

The month field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display months.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXYearFieldAttribute`

The year field of a time field represented by this accessibility object. This attribute is required for accessibility objects that represent time fields that display years.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXColumnTitleAttribute`

The title of the column element represented by this accessibility object. Note that, because column titles are sometimes the children of a separate header element, the value of this attribute can refer to an element that is not a child of the column accessibility object.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXURLAttribute`

The URL that describes the location of the document or application represented by this accessibility object.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXLabelUIElementsAttribute`

An array of accessibility objects representing the labels displayed near the control represented by this accessibility object. For example, a slider control might display labels that indicate the range of values the slider can represent. Because these labels are not displayed as part of the slider's visual interface, an assistive application does not know they are associated with the slider. By including accessibility objects representing the labels in this attribute, you make this association explicit.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXLabelValueAttribute`

The value of the label represented by this accessibility object. This attribute is required for all accessibility objects that represent labels.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXShownMenuUIElementAttribute`

An array of accessibility objects that represent the contextual or Dock menus provided by this accessibility object.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

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`kAXServesAsTitleForUIElementsAttribute`

An array of accessibility objects for which this accessibility object serves as the title. For example, a piece of static text can serve as a title for one or more user interface elements. Because this static text string is not displayed as part of any user interface element's visual interface, an assistive application does not know the title is associated with user interface elements. By including this attribute in the accessibility object representing the title, you specify the accessibility objects with which this title is associated.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXLinkedUIElementsAttribute`

An array of accessibility objects with which this accessibility object is related. For example, the contents of a list item can be displayed in another pane or window. The list item and the separately displayed contents are related, but this relationship may not be apparent to an assistive application. To make such a relationship explicit, you include this attribute in the accessibility objects representing the related user interface elements.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXRowsAttribute`

An array of the accessibility objects representing the rows in this table or outline view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXVisibleRowsAttribute`

An array of the accessibility objects representing the currently visible rows in this table or outline view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedRowsAttribute`

An array of the accessibility objects representing the currently selected rows in this table or outline view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXColumnsAttribute`

An array of the accessibility objects representing the columns in this browser view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXVisibleColumnsAttribute`

An array of the accessibility objects representing the currently visible columns in this browser view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXSelectedColumnsAttribute`

An array of the accessibility objects representing the currently selected columns in this browser view.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

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`kAXSortDirectionAttribute`
The sort direction of this accessibility object's contents. For example, a list view's contents may be sorted in ascending or descending order.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXColumnHeaderUIElementsAttribute`
An array of accessibility objects representing the column headers of this table or browser view.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXIndexAttribute`
The index of the row or column represented by this accessibility object.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXDisclosingAttribute`
Indicates whether a row in an outline view represented by this accessibility object has an open or closed disclosure triangle. `true` indicates an open disclosure triangle; `false` indicates a closed disclosure triangle.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXDisclosedRowsAttribute`
An array of accessibility objects representing the disclosed rows of this user interface element.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXDisclosedByRowAttribute`
The accessibility object representing the disclosing row.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXMatteHoleAttribute`
The accessibility object that represents the area available to the user through the matte hole.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXMatteContentUIElementAttribute`
The accessibility object clipped by the matte.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

`kAXIsApplicationRunningAttribute`
Indicates if the application represented by the Dock icon this accessibility object represents is currently running.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

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`kAXFocusedApplicationAttribute`

Indicates the application element that is currently accepting keyboard input. This attribute is supported by the system-wide accessibility object to help an assistive application quickly determine the application that is accepting keyboard input. After the assistive application gets the accessibility object representing this application, it can send a message to the application asking for its focused accessibility object.

Available in Mac OS X v10.2 and later.

Declared in `AXAttributeConstants.h`.

`kAXInsertionPointLineNumberAttribute`

The line number of the insertion point in the text associated with this accessibility object.

Available in Mac OS X v10.4 and later.

Declared in `AXAttributeConstants.h`.

Discussion
See the "Roles and Associated Attributes" appendix in Accessibility Overview for more information on which attributes are associated with a specific role.

Parameterized Attributes

Define the parameterized attributes an accessibility object can have.

```
// Text-suite parameterized attributes
#define kAXLineForIndexParameterizedAttribute CFSTR("AXLineForIndex")
#define kAXRangeForLineParameterizedAttribute          CFSTR("AXRangeForLine")
#define kAXStringForRangeParameterizedAttribute         CFSTR("AXStringForRange")
#define kAXRangeForPositionParameterizedAttribute CFSTR("AXRangeForPosition")
#define kAXRangeForIndexParameterizedAttribute CFSTR("AXRangeForIndex")
#define kAXBoundsForRangeParameterizedAttribute CFSTR("AXBoundsForRange")
#define kAXRTFForRangeParameterizedAttribute CFSTR("AXRTFForRange")
#define kAXAttributedStringForRangeParameterizedAttribute
CFSTR("AXAttributedStringForRange")
#define kAXStyleRangeForIndexParameterizedAttribute CFSTR("AXStyleRangeForIndex")
#define kAXInsertionPointLineNumberAttribute CFSTR("AXInsertionPointLineNumber")
```

Constants

`kAXLineForIndexParameterizedAttribute`

Given an indexed character, the line number of the text associated with this accessibility object that contains the character.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXRangeForLineParameterizedAttribute`

Given a line number, the range of characters of the text associated with this accessibility object that contains the line number.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

`kAXStringForRangeParameterizedAttribute`

A substring of the text associated with this accessibility object that is specified by the given character range.

Available in Mac OS X v10.3 and later.

Declared in `AXAttributeConstants.h`.

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`kAXRangeForPositionParameterizedAttribute`
: The composed character range in the text associated with this accessibility object that is specified by the given screen coordinates. This parameterized attribute returns the complete range of characters (including surrogate pairs of multi-byte glyphs) at the given screen coordinates.

  Available in Mac OS X v10.3 and later.

  Declared in `AXAttributeConstants.h`.

`kAXRangeForIndexParameterizedAttribute`
: The composed character range in the text associated with this accessibility object that is specified by the given index value. This parameterized attribute returns the complete range of characters (including surrogate pairs of multi-byte glyphs) at the given index.

  Available in Mac OS X v10.3 and later.

  Declared in `AXAttributeConstants.h`.

`kAXBoundsForRangeParameterizedAttribute`
: The bounding rectangle of the text associated with this accessibility object that is specified by the given range. This is the bounding rectangle a sighted user would see on the display screen, in pixels.

  Available in Mac OS X v10.3 and later.

  Declared in `AXAttributeConstants.h`.

`kAXRTFForRangeParameterizedAttribute`
: The RTF representation of the text associated with this accessibility object that is specified by the given range.

  Available in Mac OS X v10.3 and later.

  Declared in `AXAttributeConstants.h`.

`kAXAttributedStringForRangeParameterizedAttribute`
: The CFAttributedStringType representation of the text associated with this accessibility object that is specified by the given range.

  Available in Mac OS X v10.4 and later.

  Declared in `AXAttributeConstants.h`.

`kAXStyleRangeForIndexParameterizedAttribute`
: Given a character index, the range of text associated with this accessibility object over which the style in effect at that character index applies.

  Available in Mac OS X v10.3 and later.

  Declared in `AXAttributeConstants.h`.

Discussion
Parameterized attributes allow you to pass in additional values to get more specific information about the text associated with an accessibility object.

Availability
Available in Mac OS X version 10.3 and later.

Actions

Define the actions an accessibility object can perform.

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```
// Accessibility actions.
#define kAXPressAction          CFSTR("AXPress")
#define kAXIncrementAction      CFSTR("AXIncrement")
#define kAXDecrementAction      CFSTR("AXDecrement")
#define kAXConfirmAction        CFSTR("AXConfirm")
#define kAXCancelAction         CFSTR("AXCancel")
#define kAXRaiseAction          CFSTR("AXRaise")
#define kAXShowMenuAction       CFSTR("AXShowMenu")
```

Constants

`kAXPressAction`

Simulates a single click, such as on a button.

Available in Mac OS X v10.2 and later.

Declared in `AXActionConstants.h`.

`kAXIncrementAction`

Increments the value of the accessibility object. The amount the value is incremented by is determined by the value of the `kAXValueIncrementAttribute` attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXActionConstants.h`.

`kAXDecrementAction`

Decrements the value of the accessibility object. The amount the value is decremented by is determined by the value of the `kAXValueIncrementAttribute` attribute.

Available in Mac OS X v10.2 and later.

Declared in `AXActionConstants.h`.

`kAXConfirmAction`

Simulates pressing the Return key.

Available in Mac OS X v10.2 and later.

Declared in `AXActionConstants.h`.

`kAXCancelAction`

Simulates pressing a Cancel button.

Available in Mac OS X v10.2 and later.

Declared in `AXActionConstants.h`.

`kAXRaiseAction`

Causes a window to become as frontmost as is allowed by the containing application's circumstances. Note that an application's floating windows (such as inspector windows) might remain above a window that performs the raise action.

Available in Mac OS X v10.3 and later.

Declared in `AXActionConstants.h`.

`kAXShowMenuAction`

Simulates the opening of a contextual menu in the element represented by this accessibility object. This action can also be used to simulate the display of a menu that is preassociated with an element, such as the menu that displays when a user clicks Safari's back button slowly.

Available in Mac OS X v10.4 and later.

Declared in `AXActionConstants.h`.

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Notifications

Define the notifications that can be broadcast by an accessibility object.

```
// Focus notifications
#define kAXMainWindowChangedNotification CFSTR("AXMainWindowChanged")
#define kAXFocusedWindowChangedNotification CFSTR("AXFocusedWindowChanged")
#define kAXFocusedUIElementChangedNotification
CFSTR("AXFocusedUIElementChanged")

// Application notifications
#define kAXApplicationActivatedNotification CFSTR("AXApplicationActivated")
#define kAXApplicationDeactivatedNotification CFSTR("AXApplicationDeactivated")
#define kAXApplicationHiddenNotification CFSTR("AXApplicationHidden")
#define kAXApplicationShownNotification CFSTR("AXApplicationShown")

// Window notifications
#define kAXWindowCreatedNotification    CFSTR("AXWindowCreated")
#define kAXWindowMovedNotification      CFSTR("AXWindowMoved")
#define kAXWindowResizedNotification    CFSTR("AXWindowResized")
#define kAXWindowMiniaturizedNotification CFSTR("AXWindowMiniaturized")
#define kAXWindowDeminiaturizedNotification CFSTR("AXWindowDeminiaturized")

// New drawer, sheet, and help tag notifications
#define kAXDrawerCreatedNotification    CFSTR("AXDrawerCreated")
#define kAXSheetCreatedNotification     CFSTR("AXSheetCreated")
#define kAXHelpTagCreatedNotification   CFSTR("AXHelpTagCreated")

// Element notifications
#define kAXValueChangedNotification     CFSTR("AXValueChanged")
#define kAXUIElementDestroyedNotification       CFSTR("AXUIElementDestroyed")

// Menu notifications
#define kAXMenuOpenedNotification       CFSTR("AXMenuOpened")
#define kAXMenuClosedNotification       CFSTR("AXMenuClosed")
#define kAXMenuItemSelectedNotification CFSTR("AXMenuItemSelected")

// Table and outline view notifications
#define kAXRowCountChangedNotification  CFSTR("AXRowCountChanged")

// Miscellaneous notifications
#define kAXSelectedChildrenChangedNotification
CFSTR("AXSelectedChildrenChanged")
#define kAXResizedNotification          CFSTR("AXResized")
#define kAXMovedNotification            CFSTR("AXMoved")
#define kAXCreatedNotification          CFSTR("AXCreated")
```

Constants

`kAXMainWindowChangedNotification`

The main window has changed.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXFocusedWindowChangedNotification`

The focused window has changed.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

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`kAXFocusedUIElementChangedNotification`
The focused accessibility object has changed.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXApplicationActivatedNotification`
The application was activated (that is, brought to front).

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXApplicationDeactivatedNotification`
The application was deactivated.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXApplicationHiddenNotification`
The application was hidden.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXApplicationShownNotification`
The application was shown (that is, a hidden application is now visible).

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXWindowCreatedNotification`
A window was created. Carbon automatically sends this notification when window is created, as long as the window is implemented using Carbon window mechanisms.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXWindowMovedNotification`
The window was moved (this notification is sent at the end of the window-move operation, not during it).

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXWindowResizedNotification`
The window was resized (this notification is sent at the end of the window-resize operation, not during it).

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXWindowMiniaturizedNotification`
The application was minimized (that is, moved into the Dock).

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXWindowDeminiaturizedNotification`
The window was moved out of the Dock.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

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`kAXDrawerCreatedNotification`
A drawer was created (that is, a drawer now extends from this window).

Available in Mac OS X v10.3 and later.

Declared in `AXNotificationConstants.h`.

`kAXSheetCreatedNotification`
A sheet was created (that is, a modal dialog now extends from this window).

Available in Mac OS X v10.3 and later.

Declared in `AXNotificationConstants.h`.

`kAXHelpTagCreatedNotification`
A help tag is now visible for this accessibility object.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

`kAXValueChangedNotification`
The value of an accessibility object's value attribute was changed.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXUIElementDestroyedNotification`
An accessibility object was disposed of.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXMenuOpenedNotification`
A menu was opened.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXMenuClosedNotification`
A menu was closed.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXMenuItemSelectedNotification`
A menu item was selected.

Available in Mac OS X v10.2 and later.

Declared in `AXNotificationConstants.h`.

`kAXRowCountChangedNotification`
The number of rows in this table was changed.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

`kAXSelectedChildrenChangedNotification`
A different subset of this accessibility object's children were selected.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

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`kAXResizedNotification`
The window has changed size.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

`kAXMovedNotification`
The position of this accessibility object was changed.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

`kAXCreatedNotification`
An accessibility object was created.

Available in Mac OS X v10.4 and later.

Declared in `AXNotificationConstants.h`.

Orientations and Sort Directions

Define the values for the orientation and sort-direction attributes of some accessibility objects.

```
// Orientations
#define kAXHorizontalOrientationValue CFSTR("AXHorizontalOrientation")
#define kAXVerticalOrientationValue CFSTR("AXVerticalOrientation")
#define kAXUnknownOrientationValue  CFSTR("AXUnknownOrientation")

// Sort directions
#define kAXAscendingSortDirectionValue CFSTR("AXAscendingSortDirection")
#define kAXDescendingSortDirectionValue CFSTR("AXDescendingSortDirection")
#define kAXUnknownSortDirectionValue CFSTR("AXUnknownSortDirection")
```

Constants

`kAXHorizontalOrientationValue`
This object is oriented horizontally.

Available in Mac OS X v10.2 and later.

Declared in `AXValueConstants.h`.

`kAXVerticalOrientationValue`
This object is oriented vertically.

Available in Mac OS X v10.2 and later.

Declared in `AXValueConstants.h`.

`kAXUnknownOrientationValue`
The orientation of this object is unknown.

Available in Mac OS X v10.4 and later.

Declared in `AXValueConstants.h`.

`kAXAscendingSortDirectionValue`
This object's contents are sorted in ascending order.

Available in Mac OS X v10.4 and later.

Declared in `AXValueConstants.h`.

`AXDescendingSortDirection`
This object's contents are sorted in descending order.

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`kAXUnknownSortDirectionValue`

The sort order of this object is unknown.

Available in Mac OS X v10.4 and later.

Declared in `AXValueConstants.h`.

Discussion

See `kAXOrientationAttribute` and `kAXSortDirectionAttribute` for more information on the attributes for which you can use these values.

Result Codes

The result codes returned by the Carbon accessibility implementation are listed below. Other result codes defined in `AXError.h` are of use only to assistive applications.

Result Code	Value	Description
`kAXErrorIllegalArgument`	-25201	The value received in this event is an invalid value for this attribute. This also applies for invalid parameters in parameterized attributes. Available in Mac OS X v10.2 and later.
`kAXErrorInvalidUIElement`	-25202	The accessibility object received in this event is invalid. Available in Mac OS X v10.2 and later.
`kAXErrorInvalidUIElementObserver`	-25203	The observer for the accessibility object received in this event is invalid. Available in Mac OS X v10.2 and later.
`kAXErrorCannotComplete`	-25204	A fundamental error has occurred, such as a failure to allocate memory during processing. Available in Mac OS X v10.2 and later.
`kAXErrorAttributeUnsupported`	-25205	The referenced attribute is not supported. Alternatively, you can return the `eventNotHandledErr` error. Available in Mac OS X v10.2 and later.
`kAXErrorActionUnsupported`	-25206	The referenced action is not supported. Alternatively, you can return the `eventNotHandledErr` error. Available in Mac OS X v10.2 and later.
`kAXErrorAPIDisabled`	-25211	Assistive applications are not enabled in System Preferences. Available in Mac OS X v10.2 and later.

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Result Code	Value	Description
`kAXErrorParameterizedAttributeUnsupported`	-25213	The parameterized attribute is not supported. Alternatively, you can return the `eventNotHandledErr` error. Available in Mac OS X v10.3 and later.

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Document Revision History

This table describes the changes to *Carbon Accessibility Reference*.

Date	Notes
2006-02-07	Fixed minor errors.
2005-04-29	Added descriptions of new and updated functions and constants.
	Added descriptions for the `HIObjectIsAccessibilityIgnored` (page 11), `HIObjectSetAccessibilityIgnored` (page 13), `HIObjectSetAuxiliaryAccessibilityAttribute` (page 14), and `HIObjectOverrideAccessibilityContainment` (page 12) functions. Updated descriptions of the `kAXWindowMovedNotification`, `kAXWindowResizedNotification`, and `kAXValueChangedNotification` notifications.
	New document that describes the C API for making applications accessible. Some content was previously in "Making Carbon Applications Accessible to Users With Disabilities."

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