

Technical Note TN2062

Guide to Creating Kiosks on Mac OS X

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Developers working in certain markets need to add kiosk features to their applications. That is the ability to lock the user into a certain application or disable certain functionality normally available in the operating system.

This technote shows several techniques for building kiosks or incorporating kiosk-like behavior into an application. This technote focuses on Mac OS X 10.2 and later because that system introduced key APIs to support kiosk development. The text describes which system versions are required for each technique.

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IMPORTANT:

The techniques discussed in this technote is intended only for developers who are working with a vertical market which requires kiosk behavior. These techniques should not be used by developers targeting the mass market of regular Mac OS X users.

Introduction

Developers working in vertical markets (for example Education) have been creating kiosks or adding kiosk behavior to their applications for quite some time. Specifically, this means the ability to lock the user into a certain application or disable certain operating system functionality normally available. Developers requiring kiosk behavior on computer systems have often been forced to use "jury-rigged" solutions which often were quite hard to maintain in the long term. With the advent of Mac OS X 10.2, creating kiosks and adding kiosk functionality to an existing application has become much easier to implement and support.

This technote will cover several techniques required by kiosk developers as well as answer commonly asked questions by developers of kiosk solutions.

Features of the SystemUIMode API

In Mac OS X 10.2 two important kiosk-related APIs were added to the system `SetSystemUIMode` and `GetSystemUIMode`. Overall the SystemUIMode API provides the following abilities:

- control Dock show/hide behavior

- control menu bar show/hide behavior
- control which Apple menu elements are active
- disable process switching through Command-Tab and Command-Shift-Tab keyboard equivalents
- disable Force Quit window available via Command-Option-Escape key equivalents or via the Apple menu
- disable the PowerKey window which is displayed when the Power button is pressed

Previous to Mac OS X 10.2 and the `SystemUIMode` API, getting much of this behavior on Mac OS X was not possible or was very difficult to accomplish.

The `SetSystemUIMode` API lets you specify the user interface mode for the calling application as well as additional user interface mode options for particular features you want to enable. The functions prototype is listed below as well as in `MacApplication.h` within the `HIToolbox` framework.

```
OSStatus SetSystemUIMode(
    SystemUIMode inMode,
    SystemUIOptions inOptions);
```

When controlling or disabling features of Mac OS X system using `SetSystemUIMode` the **requested behaviors are only in effect while the process which called `SetSystemUIMode` is frontmost**. That is, if another application becomes frontmost after `SetSystemUIMode` is called, the user interface mode requested will no longer be in effect. Also, if the application which called `SetSystemUIMode` does at some later time become frontmost again, the user interface mode previously established will come back into effect.

Available User Interface Modes

The table below outlines the user interface modes which you would pass as the `inMode` parameter to `SetSystemUIMode`. Each mode is given along with discussion of if its effect on the system.

<code>SystemUIMode</code>	Description
<code>kUIModeNormal</code>	This is the normal or default mode for all applications on Mac OS X. In this mode, all standard system UI elements are enabled and visible.
<code>kUIModeContentSuppressed</code>	In this mode, system user interface elements which cover the content area of the screen (the area other than the menubar) are hidden. However, these elements may automatically show themselves in response to mouse movements or other user activity. An example of this is the dock will be hidden in this mode but will automatically show itself when the mouse enters into the Dock's auto-show region.
<code>kUIModeContentHidden</code>	In this mode, system user interface elements which cover the content area of the screen are hidden. Unlike <code>kUIModeContentSuppressed</code> , in this mode user interface elements will not automatically show themselves.
<code>kUIModeAllHidden</code>	In this mode, all system user interface elements, including the menubar, are hidden. System user interface elements will not automatically show themselves in this mode.

IMPORTANT:

As of the publishing of this technote (Mac OS X 10.2.x) the `kUIModeContentHidden` and `kUIModeContentSuppressed` modes are not recognized by the Dock. This is due to a bug in Mac OS X (r. 2973242). The end result

is that, in modes `kUIModeContentHidden` and `kUIModeContentSuppressed`, the Dock operates the same as in the `kUIModeNormalMode`. This problem will be fixed in a future release of Mac OS X.

Available User Interface Options

Along with the user interface modes listed above, you can also specify `SystemUIOptions`. `SystemUIOptions` allow enabling or disabling of specific features while the user interface mode is in effect. The available `SystemUIOptions` are listed in the table below. Some `SystemUIOptions` are only valid for certain user interface modes as indicated. The constants given in the table below are what you would pass as the `inOptions` argument to `SetSystemUIMode` API. As mentioned earlier the `SystemUIMode` and `SystemUIOptions` specified are **only in effect while the process which called `SetSystemUIMode` is frontmost.**

SystemUIOption	Description	Valid SystemUIModes
<code>kUIOptionAutoShowMenuBar</code>	The menubar will automatically show itself when the user moves the mouse into the screen area that would ordinarily be occupied by the menubar.	<code>kUIModeAllHidden</code> .
<code>kUIOptionDisableAppleMenu</code>	Disables all items in the Apple menu.	All user interface modes.
<code>kUIOptionDisableProcessSwitch</code>	Disables process switching using Command-Tab and Command-Shift-Tab keyboard equivalents. Window rotation keys selected in the keyboard preference will also be disabled.	<code>kUIModeContentHidden</code> , <code>kUIModeContentSuppressed</code> , and <code>kUIModeAllHidden</code> .
<code>kUIOptionDisableForceQuit</code>	Disables the Force Quit window normally available via Command-Option-Escape keyboard equivalent or the Force Quit menu item in the Apple menu.	<code>kUIModeContentHidden</code> , <code>kUIModeContentSuppressed</code> , and <code>kUIModeAllHidden</code> .
<code>kUIOptionDisableSessionTerminate</code>	Disables the Power key window that comes up when the power key is pressed. Also disables Restart, Shut Down, and Log Out menu items in the Apple menu.	<code>kUIModeContentHidden</code> , <code>kUIModeContentSuppressed</code> , and <code>kUIModeAllHidden</code> .

Note If you attempt to use a user interface option which isn't valid with a particular user interface mode then the user interface option passed will be ignored.

In the case of where you want to use multiple `SystemUIOptions` together you can bitwise OR the `SystemUIOptions` constants. An example of calling the `SetSystemUIMode` with multiple `SystemUIOptions` is shown below. In the example the Dock and menu bar will be hidden. Also, Command-Tab and Command-Shift-Tab keyboard equivalents along with the Force Quit window will be disabled.

```
error = SetSystemUIMode(kUIModeAllHidden,
                       kUIOptionDisableAppleMenu
                       | kUIOptionDisableProcessSwitch
                       | kUIOptionDisableForceQuit);
```

Note you can have multiple `SystemUIOptions` as shown above but you can only have **one** `SystemUIMode` selected.

A demonstration application is available [UsingSystemUIMode](#) which demonstrates the abilities of the `SetSystemUIMode` API. A screen shot of the demonstration application is shown below. Select various `SystemUIModes` and `SystemUIOptions` to see how they affect your system. Note the application only works in OS X 10.2 and later.

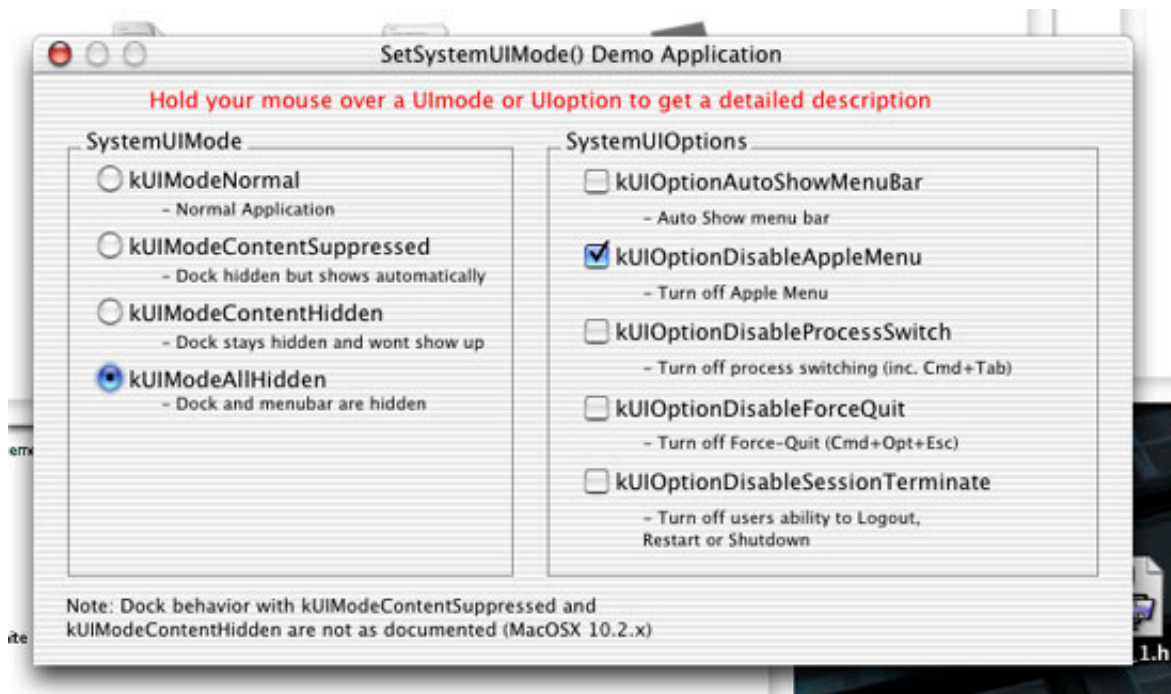


Figure 1. Screen shot of demo application

Using the `SetSystemUIMode` call various behaviors of the system can be disabled. A kiosk developer using a combination of `SystemUIModes` and `SystemUIOptions` should be able to obtain a configuration which suits their needs.

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Replacing the Finder

Since Mac OS X 10.0.x the system has supported the ability to launch programs other than Finder as the main system application upon login. This feature offers kiosk developers the ability of replacing the Finder application with another application. For example, a kiosk developer could launch their kiosk application as the main system application instead of Finder at login. Any application launched as the Finder application also gets the added benefit of being automatically relaunched if the application should quit unexpectedly (quit with a non-zero error code). The technique used to replace the Finder is discussed in detail in the [Replacing the Finder](#) section of [Inside Mac OS X: System Overview](#).

A installer can programatically replace the Finder by calling `system` and then the `defaults` command-line tool using the techniques [described in System Overview](#). More information on the `system` call can be found by typing "`man system`" into `Terminal`. Note you only have to set the Finder setting **once** and the preferences will be retained for the system even after a reboot.

An installer will be replacing the individual user's Finder setting if `defaults` is called under the logged in user. On the other hand, if `defaults` is called as root then the Finder setting for all users will be set. An individual user's Finder setting will override the setting for all users if both have been set.

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Enabling Open Firmware Password

The Open Firmware password is a security feature available on modern Macintosh systems. If you enable the Open Firmware password, the computer will execute a secure boot sequence. Specifically, enabling the Open Firmware password prevents users from starting up the computer from a volume other than the chosen as the startup disk (chosen in the Startup Disk preference panel within the System Preferences.) Also, enabling the Open Firmware Password prevents users from booting into single user mode using Command-S key combination at boot time.

There is currently no public programmatic solution to setting the Open Firmware password (r. 3075615). This means this setting can not be set by an installer. However, an administrator can enable the Open Firmware password using the "Open Firmware Password" application located at: <http://www.apple.com/downloads/macosx/apple/openfirmwarepassword.html>

IMPORTANT:

The Open Firmware Password will be reset if a user changes the amount of the physical memory in the machine and reboots. Systems which require Open Firmware Password level security need to be protected from users gaining physical access to the internals of the computer.

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Top 20 Commonly asked Kiosk questions

1) How do I disable Force Quit?

This can be accomplished using the `SetSystemUIMode` call with the `kUIOptionDisableForceQuit` `SystemUIOption` set. This technique is described in more detail in the [SystemUIMode section of this technote](#). A code snippet below also demonstrates the technique:

```
error = SetSystemUIMode(
    kUIModeContentHidden,
    kUIOptionDisableForceQuit);
```

Note disabling Force Quit using `SetSystemUIMode` will only disable Force Quit so long as the calling application is frontmost. There is an alternative to disabling the Force Quit completely. An application can also avoid showing up in the Force Quit window using techniques described in ["How do I prevent my application from being Force Quit?"](#)

2) How do I disable/suppress the Dock?

The dock can be disabled/suppressed using the `SetSystemUIMode` API. By selecting specific user interface modes a developer can control exactly how the Dock is disabled. Please consult the [SystemUIMode section of this technote](#) for more details. If a developer just wants the Dock completely suppressed while still showing the menubar they can use the code snippet shown below.

```
error = SetSystemUIMode(kUIModeAllHidden, NULL);
ShowMenuBar(); //shows the menu bar.
```

Note disabling the Dock using this technique will only disable the Dock long as the calling application is frontmost.

3) How do I disable the Command-Tab or Command-Shift-Tab process switching keyboard equivalents?

These keyboard equivalents can be disabled using the `SetSystemUIMode` call with the `kUIOptionDisableProcessSwitch` `SystemUIMode` set. This technique was described in more detail in the [SystemUIMode section of this technote](#). A code snippet below also demonstrates the technique.

```
error = SetSystemUIMode(
    kUIModeContentHidden,
    kUIOptionDisableProcessSwitch);
```

Note disabling process switching keyboard equivalents using `SetSystemUIMode` will only disable the keyboard equivalents so long as the calling application is frontmost.

4) How do I disable the Apple menu (or certain portions of it)?

One can disable the entire Apple menu using the `SetSystemUIMode` call with the `kUIOptionDisableAppleMenu` `SystemUIMode` set. This technique was described in more detail in the [SystemUIMode section of this technote](#). Note

disabling the Apple menu using this technique will only disable the Apple menu so long as the calling application is frontmost. A code snippet below also demonstrates this technique.

```
error = SetSystemUIMode(kUIModeNormal, kUIOptionDisableAppleMenu);
```

The above technique disables the entire Apple menu. For disabling more specific portions of the Apple menu please consult the [SystemUIMode section of this technote](#).

5) How do I prevent my application from being Force Quit?

One can use the technique described section ["How do I disable Force Quit?"](#) to completely disable Force Quit. This will prevent Force Quit from activating so long as the calling application is frontmost. There is another alternative available if one isn't capturing the display using the CGDisplayCapture APIs described in [How to Create a Full-Screen Context](#). The alternative is to not have an application show up in the Force Quit menu at all. Thus, when a user invokes the Force Quit menu the application will not show up in the list. This can be done by adding the `LSUIElement` key to the application's Info.plist. The precise setting required to enable this is `LSUIElement = 1` (string) as illustrated in the PropertyListEditor screen shot below.

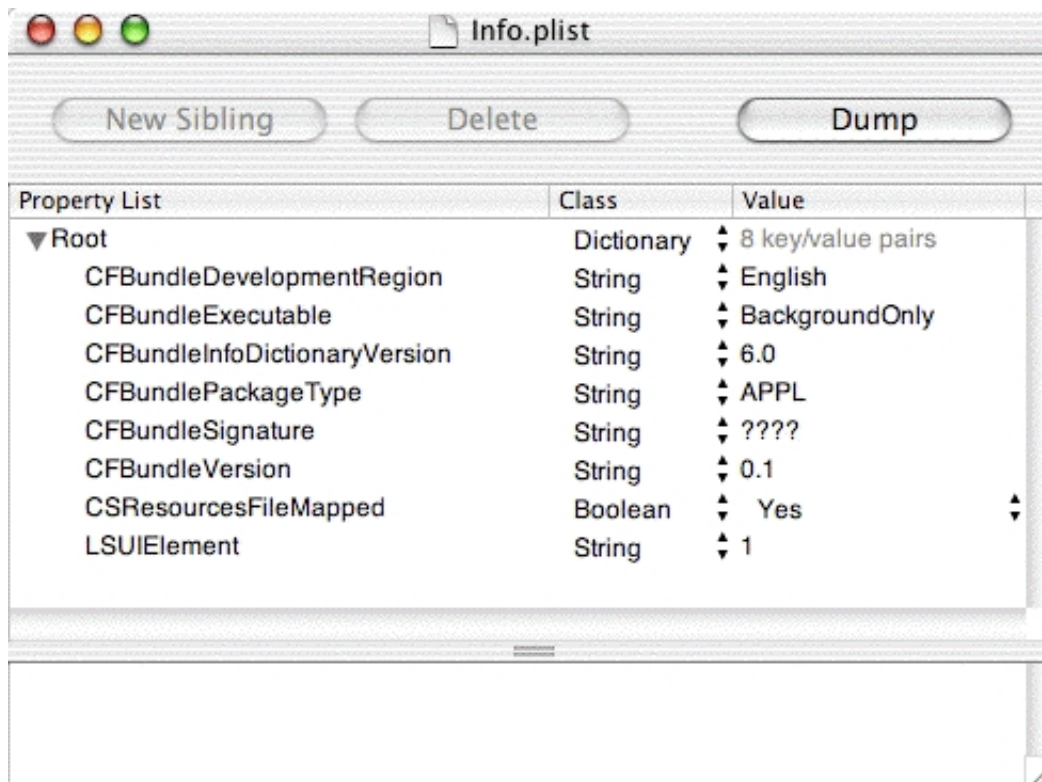


Figure 2. Info.plist for an application which won't show up in the Force Quit menu.

IMPORTANT:

An application using the `LSUIElement` property in its Info.plist should **not** use the [SetSystemUIMode API](#). Also, setting the `LSUIElement` property prevents the application from showing up in the Dock.

6) How do I disable single user mode (Command-S on boot)?

The most effective way to disable single user mode is by enabling the Open Firmware Password of the system. This can be done using the technique described in the [Enabling Open Firmware Password](#) section of this technote.

7) How do I disable the Eject Key?

There is currently no supported way to disable the Eject Key. You can however, prevent any new inserted media from being mounted. See the section: ["How do I prevent new media \(e.g. CDs, DVDs, iPods, USB/Firewire hard drives, etc.\) from becoming mounted?"](#) for more details

8) How do I prevent users from booting off alternative media (bootable CDs, external hard drives, etc.)?

You can prevent booting from other system disks by enabling the Open Firmware Password of the system. This can be done using the technique described in the [Enabling Open Firmware password](#) section of this technote.

9) How do I prevent new media (CDs, DVDs, iPods, USB/Firewire hard drives, etc.) from becoming mounted?

There is currently no public programmatic solution to this problem (r. 2824118). For the present time administrators can disable new media from becoming active using the Mac Manager application located at: <http://www.info.apple.com/usen/mm/>

10) How do I disable Command-Control-Power (force reboot)?

There is currently no supported way to disable this keyboard equivalent. Also, the technique of preventing normal reboot discussed in ["How do I disable Command-Control-Eject \(normal reboot\)?"](#) does not work for preventing a force reboot. Though, a developer can secure the computer during a boot process using the techniques discussed in: ["How do I prevent users from booting off alternative media?"](#) and ["How do I disable single user mode?"](#)

11) How do I make my application full screen so it takes over the screen?

A commonly used technique is to use the CGDisplay Capture routines as described in [How to Create a Full-Screen Context](#) in the OpenGL documentation. A simpler solution is to edit the main window of the kiosk application's GUI so it fills the screen. This way as long as other elements of the operating system have been disabled the application will remain frontmost. Note if you wish to have movable windows you may want to disable desktop switching using the technique described in: ["How do I prevent users from clicking on the desktop to switch out of my application?"](#)

12) How do I prevent users from clicking on the desktop to switch out of my application?

One technique is to not allow users access to the desktop at all. This can be achieved by making a full screen application. Techniques to create a full screen application are described in ["How do I make my application full screen so it takes over the screen?"](#)

If one needs to disable "desktop switching" this can be accomplished by disabling the Finder since the Finder provides the "desktop switching" services along with any hard drives which show up on the desktop. One technique of disabling the

Finder is to replace the Finder using the technique described in the ["Replacing The Finder"](#) section of this technote. Another method of disabling the Finder is to send it a `kAEQuitApplication` Apple event. The below code demonstrates how to quit the Finder using an Apple event.

Listing 2. Programmatically quitting Finder using an Apple Event.

```
OSErr QuitFinder()
{
    int kFinderProcessSignature = 'MACS';
    OSErr          anErr = paramErr;
    AppleEvent      tAppleEvent = {typeNull,nil};
    AppleEvent      tReply;
    AEBuildError    tAEBuildError;

    anErr = AEBuildAppleEvent(
        kCoreEventClass, kAEQuitApplication,
        typeApplSignature, &kFinderProcessSignature,
        sizeof(OSType), kAutoGenerateReturnID,
        kAnyTransactionID, &tAppleEvent,
        &tAEBuildError, "");

    if (noErr == anErr)
    {
        anErr = AESend( &tAppleEvent, &tReply, kAENoReply |
                        kAENeverInteract, kAENormalPriority,
                        kNoTimeout, nil, nil );

        (void) AEDisposeDesc(&tAppleEvent);
    }
    return anErr;
}

int main(int argc, char *argv[])
{
    OSErr error = QuitFinder();

    if (error != noErr)
        {printf("Finder quit successfully!\n");}
    else
        {printf("Finder wouldn't quit!\n");}

    return 0;
}
```

The above code is also available via the downloadable [QuitFinder sample](#)

13) How do I disable Command-H (Hide) and Command-Q (Quit)?

These keyboard equivalents sometimes catch kiosk developers new to Mac OS X. The method to remove these keyboard equivalents differs based on if a developer is using Carbon or Cocoa. Complete descriptions of how to override these keyboard equivalents are listed below.

Disabling behavior in Carbon:

Within Carbon one method of disabling the keyboard equivalents is to delete the menu items providing the keyboard equivalents. That is deleting the Quit and Hide menu items completely will disable the keyboard equivalents. Deleting these menu items programmatically can be done by first locating the menu items using `GetIndMenuItemWithCommandID`

passing `kHICCommandHide` or `kHICCommandQuit` as the `inCommandID` argument. Once located a menu item can be removed by calling `DeleteMenuItem`. An alternative to removing the menu item completely is to simply remove the keyboard equivalent while still retaining the menu item. This can be accomplished by calling `SetItemCmd` passing zero for the `cmdChar` argument, once you have already located the appropriate menu item with `GetIndMenuItemWithCommandID`. A code snippet below demonstrates both techniques.

```
//Completely remove the Quit menu item
error = GetIndMenuItemWithCommandID(
    NULL, kHICCommandQuit, 1,
    &applicationMenu, &outIndex);
DeleteMenuItem(applicationMenu, outIndex);

//Disable Command-H keyboard equivalent on the Hide menu
error = GetIndMenuItemWithCommandID(
    NULL, kHICCommandHide, 1,
    &applicationMenu, &outIndex);
SetItemCmd(applicationMenu, outIndex, 0);
```

Disabling behavior in Cocoa:

Within Cocoa, a developer can simply edit their program's nib file to remove the Command-Q and Command-H keyboard equivalents from the Quit and Hide menu items. Another alternative available is to simply remove the Quit and Hide menu items from the program.

Another technique available to both Carbon and Cocoa is to assign another menu item with a Command-H keyboard equivalent. If a program has another menu item with a Command-H keyboard equivalent, then that menu item will override the default application hiding behavior of Command-H. Note this only works for Command-H (hide) and not Command-Q (quit).

14) How do I disable the window that pops up when Power key or the Control-Eject keyboard equivalent is pressed?

This can be accomplished using the `SetSystemUIMode` call with the `kUIOptionDisableSessionTerminate` `SystemUIOption` set. This technique was described in more detail in the [SystemUIMode section of this technote](#). A code snippet below also demonstrates the technique:

```
error = SetSystemUIMode(kUIModeContentHidden,
    kUIOptionDisableSessionTerminate);
```

Note that disabling the Power key window using `SetSystemUIMode` will only disable this keyboard equivalent as long as the calling application is frontmost.

15) How do I disable Command-Option-Eject (sleep)?

A kiosk developer can disable system sleep using the I/O Kit APIs. This can be done by calling `IOCancelPowerChange` after receiving a power change notification for system sleep. This technique is illustrated in more detail at: [Receiving Notification of Power Events](#) in the I/O Kit documentation. Note this technique does not work in "demand power change" situations such as when the lid of a laptop computer is closed.

16) How do I disable Command-Control-Option-Eject (normal shutdown)?

There is currently no supported way to disable this keyboard equivalent. However, a kiosk developer can prevent the reboot from occurring by returning `userCanceledErr` to the `kAEQuitApplication` Apple event. This technique is discussed in ["How do I disable Command-Control-Eject \(normal reboot\)?"](#)

17) How do I disable Command-Control-Eject (normal reboot)?

There is currently no supported way to disable this keyboard equivalent. However, a kiosk developer can prevent the reboot from occurring by registering for the `kAEQuitApplication` Apple Event and returning `userCanceledErr` to the event. The technique is shown in the [PreventLogoutRestartShutdown](#) downloadable and in the following code snippet.

Listing 3. Programmatically preventing Logout/Restart/Shutdown.

```
OSErr QuitAppleEventHandler( const AppleEvent *appleEvt,
                           AppleEvent* reply, UInt32 refcon )
{
    //returning userCanceledErr to cancel logout
    return userCanceledErr;
}

int main(int argc, char *argv[])
{
    OSErr    err;

    //Installing quit event handler
    err = AEInstallEventHandler( kCoreEventClass,
                                kAEQuitApplication, NewAEEEventHandlerUPP(
                                    (AEEEventHandlerProcPtr)QuitAppleEventHandler),
                                0, false );

    if (err != noErr)
        ExitToShell();

    EventLoop();

    return 0;
}
```

Note when you disable logout/restart/shutdown using this technique a dialog will be presented to the user indicating your application cancelled the operation. This technique is also described in [Terminating Processes](#) in System Overview.

18) How do I disable the screen capture keys: Command-Shift-3 and Command-Shift-4?

There is currently no supported way to disable these keyboard equivalents. (r. 3085384)

19) How do I disable the video brightness keys available on some keyboards?

There is currently no supported way to disable these keys.

20) How do I disable the sound volume keys available on some keyboards?

There is currently no supported way to disable these keys.

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Summary

Creating kiosks or adding kiosk-like behavior to an application has historically been very difficult. However, with the new features available on Mac OS X this process has become much simpler. One final note: If your kiosk **requires** behavior which is not covered in any of the above sections of this technote (or is currently listed as unsupported) let us know by sending an email to dts@apple.com.

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References

[Mac OS X System Overview](#) Contains a high level overview of Mac OS X. This is a good starting point with developing for Mac OS X.

[QA 1123: Getting List of All Processes on Mac OS X](#) contains information on getting a "snapshot" of the BSD process list

[TN 2050: Observing Process Lifetimes Without Polling](#) contains information and code on getting notifications when a process launches or terminates.

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Downloadables



Acrobat version of this Note (500K)

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Demonstration Application for SetSystemUIMode API. (56K)

[Download](#)



Sample demonstrating quitting Finder. (8K)

[Download](#)



Sample demonstrating how to programmatically prevent logout. (8K)

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