



Certified iPhone Apps Developer
Sample Material
VS-1049

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1. IOS INTRODUCTION

iOS (formerly iPhone OS) is a mobile operating system created and developed by Apple Inc. exclusively for its hardware. It is the operating system that presently powers many of the company's mobile devices, including the iPhone, iPad, and iPod Touch. It is the second most popular mobile operating system globally after Android.

Originally unveiled in 2007 for the iPhone, iOS has been extended to support other Apple devices such as the iPod Touch (September 2007) and the iPad (January 2010). As of January 2017, Apple's App Store contains more than 2.2 million iOS applications, 1 million of which are native for iPads. These mobile apps have collectively been downloaded more than 130 billion times.

The iOS user interface is based upon direct manipulation, using multi-touch gestures. Interface control elements consist of sliders, switches, and buttons. Interaction with the OS includes gestures such as swipe, tap, pinch, and reverse pinch, all of which have specific definitions within the context of the iOS operating system and its multi-touch interface. Internal accelerometers are used by some applications to respond to shaking the device (one common result is the undo command) or rotating it in three dimensions (one common result is switching between portrait and landscape mode). Apple has been significantly praised for incorporating thorough accessibility functions into iOS, enabling users with vision and hearing disabilities to properly use its products.

Major versions of iOS are released annually. The current version, iOS 11, was released on September 19, 2017. It is available for all iOS devices with 64-bit processors; the iPhone 5S and later iPhone models, the iPad (2017), the iPad Air and later iPad Air models, all iPad Pro models, the iPad Mini 2 and later iPad Mini models, and the sixth-generation iPod Touch.

1.1. iOS Basics

iOS is a mobile operating system, developed by Apple Inc. for iPhone, iPad, and iPod Touch. Updates for iOS are released through the iTunes software, and, since iOS 5, via over-the-air software updates. With the announcement of iOS 5.0 on June 6, 2011, a USB connection to iTunes was no longer needed to activate iOS devices; data synchronization can happen automatically and wirelessly through Apple's iCloud service. Major new iOS releases are announced yearly during the Apple Worldwide Developers Conference (WWDC), and are usually released in September of the same year, usually coinciding with the release of new iPhone models. The current stable release, iOS 11.2.5, was released on January 23, 2018.

June 2007 saw the official first version release of what eventually became iOS - concurrently with the first iPhone. iOS did not have an official name until the official release of the iPhone software development kit (iPhone SDK) on March 6, 2008. Before then, Apple marketing simply stated that iPhone ran a version of Mac OS X made specifically for iPhone. When iOS was introduced, it was named iPhone OS. It was officially renamed iOS on June 7, 2010 with the announcement and introduction of iPad. The introduction of iPad, and the existence of iPod Touch, meant the iPhone was no longer the only device to run the mobile operating system. iOS 4 was the first major iOS release that reflected the name change. Apple licensed the "iOS" trademark from Cisco Systems.

Apple concurrently provides the same version of iOS for the comparable model of iPhone and iPod Touch, usually devices released in the same calendar year. iPhone users receive all software updates for free, while iPod Touch users paid for the 2.0 and 3.0 major software updates. As of iOS 4.0, Apple no longer charges money for iPod Touch updates.

As of 2017, two versions of iOS were never released. iPhone OS 1.2, which after the first beta was replaced by a 2.0 version number; the second beta was named 2.0 beta 2 instead of 1.2 beta 2. The other was iOS 4.2, replaced with 4.2.1 due to a Wi-Fi bug in 4.2 beta 3, causing Apple to release 2 golden masters (4.2 GM and 4.2.1 GM). One version of iOS was pulled back by Apple after being released. iOS 8.0.1 was pulled back by Apple because cellular service and Touch ID were disabled on iPhone 6 and iPhone 6 Plus.

1.2. iOS Version History

iPhone OS 1

Apple announced iPhone OS 1 at the iPhone keynote on January 9, 2007, and it was released to the public alongside the original iPhone on June 29, 2007. No official name was given on its initial release; Apple marketing literature simply stated the iPhone runs a version of Apple's desktop operating system, OS X. The release of iPhone OS 1.1 brought support for the iPod touch (1st generation). iPhone OS 1.1.5 is the final version of iPhone OS 1. Support of iPhone OS 1 ended in 2010.

iPhone OS 2

Apple announced iPhone OS 2, at the iPhone software roadmap keynote in March, 2008, and it was released to the public on July 11, 2008 alongside the iPhone 3G. Apple did not drop support for any devices with this release. iPhone OS 2 was compatible with all iOS devices released up to that time. The release of iPhone OS 2.1.1 brought support for the iPod touch (2nd generation). iPhone OS 2.2.1 is the final version of iPhone OS 2. Support of iPhone OS 2 ended in 2011.

iPhone OS 3

Apple announced iPhone OS 3 in March, 2009, and it was released to the public on June 17, 2009 alongside the iPhone 3GS. Apple did not drop support for any devices with this release. iPhone OS 3 was compatible with all iOS devices released up to that time, but not all features were available on the original iPhone. The final release supported on the original iPhone and iPod Touch is iPhone OS 3.1.3. The first iPad was introduced along with iOS 3.2. Support of iPhone OS 3 ended in 2012.

iOS 4

Apple announced iOS 4 in March, 2010 and it was released to the public on June 21, 2010 alongside the iPhone 4. With this release, Apple dropped support for the original iPhone and iPod touch, the first time they had done this. All other devices from the iPhone 3G onwards and the iPod touch (2nd generation) onward are supported. However, iOS 4 has limited support for the iPhone 3G and iPod Touch (2nd generation), as they lack of multitasking capabilities and the ability to set a home screen wallpaper. It is also the first major iOS release that iPod Touch users did not have to pay for. The release of iOS 4.2.1 brought compatibility to the original iPad and is

the final supported release on the iPhone 3G and iPod touch (2nd generation) due to major performance issues. The release of iOS 4.3 brought iPad 2 compatibility. Support of iOS 4 ended in 2013.

iOS 5

Apple announced iOS 5 on June 6, 2011 at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on October 12, 2011 alongside the iPhone 4s. Apple did not drop support for any devices with this release, as this had already been done with the release of iOS 4.3 seven months earlier. Therefore, iOS 5 was released for the iPhone 3GS onwards, iPod Touch (3rd generation) onwards, and both iPad, models. The release of iOS 5.1 brought support for the iPad (3rd generation). iOS 5.1.1 is the final release supported for the iPad (1st generation) and iPod Touch (3rd generation). Support of iOS 5 ended in 2014.

iOS 6

Apple announced iOS 6 on June 11, 2012 at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 19, 2012 alongside the iPhone 5, iPod Touch (5th generation), and iPad (4th generation). With this release, Apple dropped support for the iPod Touch (3rd generation), and the iPad (1st generation). All other devices from the iPhone 3GS onwards; the iPod Touch (4th generation) onwards; the iPad 2 onwards; and the iPad mini (1st generation) are supported. However, iOS 6 has limited support on the iPhone 3GS, iPad 2, and iPod Touch (4th generation). iOS 6.1.6 is the final release supported for the iPhone 3GS and iPod Touch (4th generation). Support of iOS 6 ended in 2015.

iOS 7

Apple announced iOS 7 on June 10, 2013 at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 18, 2013 alongside the iPhone 5C and iPhone 5S. With this release, Apple dropped support for the iPhone 3GS (due to hardware limitations) and the iPod Touch (4th generation) (due to performance issues). All other devices from the iPhone 4 onwards, iPod Touch (5th generation) onwards, the iPad 2 onwards, and the iPad Mini (1st generation) onwards are supported. However, iOS 7 has limited support on the iPad 2 and the iPhone 4 since they do not support Siri. The release of iOS 7.0.3 brought support for the iPad Air and iPad mini 2. iOS 7.1.2 is the final release on the iPhone 4. Support of iOS 7 ended in 2016.

iOS 8

Apple announced iOS 8 on June 2, 2014, at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 17, 2014 alongside the iPhone 6 and iPhone 6 Plus. With this release, Apple dropped support for only one device, the iPhone 4. All other devices from the iPhone 4S onwards, iPod Touch (5th generation) onwards, the iPad 2 onwards, and the iPad Mini (1st generation) onwards are supported. However, iOS 8 has limited support on the iPad 2, iPhone 4S, and the iPod Touch (5th generation), and Apple received widespread complaints of extremely poor/slow performance from owners of these devices. The release of iOS 8.1 brought support for the iPad Air 2 and iPad mini 3, and the release of iOS 8.4 brought support for the iPod touch (6th generation). iOS 8.3 was also the first version of iOS to have public beta testing be available. The final version of iOS 8 is iOS 8.4.1. Support for iOS 8 ended in 2017.

iOS 9

Apple announced iOS 9 on June 8, 2015, at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 16, 2015 alongside the iPhone 6S, iPhone 6S Plus and iPad mini 4. With this release, Apple did not drop support for any iOS devices. Therefore, iOS 9 was supported on the iPhone 4S onwards, iPod Touch (5th generation) onwards, the iPad 2 onwards, and the iPad Mini (1st generation) onwards. This release made the iPad 2 the first iOS device to support six major releases of iOS, supporting iOS 4 to 9. However, iOS 9 has limited support on the iPhone 4S, iPad 2, iPad (3rd generation), iPad Mini (1st generation), and iPod Touch (5th generation). Despite Apple's promise of better performance on these devices, there were still widespread complaints that the issue had not been fixed. iOS 9.3.5 is the final release on the iPhone 4S, iPad 2, iPad (3rd generation), iPod Touch (5th generation) and iPad Mini (1st generation)

iOS 10

Apple announced iOS 10 on June 13, 2016, at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 13, 2016 alongside the iPhone 7 and 7 Plus. With this release, Apple dropped support for devices using an A5 or A5X processor: the iPhone 4S, iPad 2, iPad (3rd generation), iPad Mini (1st generation) and iPod Touch (5th generation). All other devices from the iPhone 5 onwards, iPod touch (6th generation) onwards, iPad (4th generation) onwards, and the iPad mini 2 onwards are supported. However, iOS 10 has limited support on the iPhone 5, iPhone 5C, and iPad (4th generation), because those devices have 32-bit processors. The release of iOS 10.2.1 brought support for the iPad (5th generation), and iOS 10.3.2 brought support for the iPad Pro (10.5-inch) and the iPad Pro (12.9-inch, 2nd generation). iOS 10.3.3 is the final supported release for the iPhone 5, iPhone 5C, and iPad (4th generation) and last iOS version to run on 32-bit processors.

iOS 11

Apple announced iOS 11 on June 5, 2017, at its annual Apple Worldwide Developers Conference (WWDC) event, and it was released to the public on September 19, 2017 alongside the iPhone 8 and 8 Plus. With this release, Apple dropped support for the 32-bit iPhone 5, iPhone 5C, and the iPad (4th generation), making iOS a 64-bit only OS that only runs 64-bit apps. All other devices from the iPhone 5s onwards, iPod touch (6th generation) onwards, iPad Air onwards, and iPad mini 2 onwards are supported. However, iOS 11 has limited support on devices with an A7 processor: the iPhone 5S, iPad Mini 2, iPad Mini 3, and iPad Air.

1.3. iOS Features

Home screen

The home screen, rendered by SpringBoard, displays application icons and a dock at the bottom where users can pin their most frequently used apps. The home screen appears whenever the user unlocks the device or presses the physical "Home" button whilst in another app. Before iOS 4 on the iPhone 3GS (or later), the screen's background could be customized only through jailbreaking, but can now be changed out-of-the-box. The screen has a status bar across the top to display data, such as time, battery level, and signal strength. The rest of the screen is devoted to the current application. When a passcode is set and a user switches on the device, the passcode must be entered at the Lock Screen before access to the Home screen is granted.

In iPhone OS 3, Spotlight was introduced, allowing users to search media, apps, emails, contacts, messages, reminders, calendar events, and similar content. In iOS 7 and later, Spotlight is accessed by pulling down anywhere on the home screen (except for the top and bottom edges that open Notification Center and Control Center). In iOS 9, there are two ways to access Spotlight. As with iOS 7 and 8, pulling down on any home screen will show Spotlight. However, it can also be accessed as it was in iOS 3 - 6. This gives a Spotlight endowed with Siri suggestions, which include app suggestions, contact suggestions and news. In iOS 10, Spotlight is at the top of the now-dedicated "Today" panel.

Since iOS 3.2, users are able to set a background image for the Home screen. This feature is only available on third-generation devices—iPhone 3GS, third-generation iPod touch (iOS 4.0 or newer), all iPad models (since iOS 3.2)—or newer.

Researchers found that users organize icons on their home screens based on usage-frequency and relatedness of the applications, as well as for reasons of usability and aesthetics.

System font

iOS originally used Helvetica as the system font. Apple switched to Helvetica Neue exclusively for the iPhone 4 and its Retina Display, and retained Helvetica as the system font for older iPhone devices on iOS 4. With iOS 7, Apple announced that they would change the system font to Helvetica Neue Light, a decision that sparked criticism for inappropriate usage of a light, thin typeface for low-resolution mobile screens. Apple eventually chose Helvetica Neue instead. The release of iOS 7 also introduced the ability to scale text or apply other forms of text accessibility changes through Settings. With iOS 9, Apple changed the font to San Francisco, an Apple-designed font aimed at maximum legibility and font consistency across its product lineup.

Folders

iOS 4 introduced folders, which can be created by dragging an application on top of another, and from then on, more items can be added to the folder using the same procedure. A title for the folder is automatically selected by the category of applications inside, but the name can also be edited by the user. When apps inside folders receive notification badges, the individual numbers of notifications are added up and the total number is displayed as a notification badge on the folder itself. Originally, folders on an iPhone could include up to 12 apps, while folders on iPad could include 20. With increasing display sizes on newer iPhone hardware, iOS 7 updated the folders with pages similar to the home screen layout, allowing for a significant expansion of folder functionality. Each page of a folder can contain up to nine apps, and there can be 15 pages in total, allowing for a total of 135 apps in a single folder. In iOS 9, Apple updated folder sizes for iPad hardware, allowing for 16 apps per page, still at 15 pages maximum, increasing the total to 240 apps.

Notification Center

Before iOS 5, notifications were delivered in a modal window and couldn't be viewed after being dismissed. In iOS 5, Apple introduced Notification Center, which allows users to view a history of notifications. The user can tap a notification to open its corresponding app, or clear it. Notifications are now delivered in banners that appear briefly at the top of the screen. If a user taps a received notification, the application that sent the notification will be opened. Users can also

choose to view notifications in modal alert windows by adjusting the application's notification settings. Introduced with iOS 8, widgets are now accessible through the Notification Center, defined by 3rd parties.

When an app sends a notification while closed, a red badge appears on its icon. This badge tells the user, at a glance, how many notifications that app has sent. Opening the app clears the badge.

Accessibility

iOS offers various accessibility features to help users with vision and hearing disabilities. One major feature, VoiceOver, provides a voice reading information on the screen, including contextual buttons, icons, links and other user interface elements, and allows the user to navigate the operating system through gestures. Any apps with default controls and developed with a UIKit framework gets VoiceOver functionality built in. One example includes holding up the iPhone to take a photo, with VoiceOver describing the photo scenery. As part of a "Made for iPhone" program, introduced with the release of iOS 7 in 2013, Apple has developed technology to use Bluetooth and a special technology protocol to let compatible third-party equipment connect with iPhones and iPads for streaming audio directly to a user's ears. Additional customization available for Made for iPhone products include battery tracking and adjustable sound settings for different environments. Apple made further efforts for accessibility for the release of iOS 10 in 2016, adding a new pronunciation editor to VoiceOver, adding a Magnifier setting to enlarge objects through the device's camera, software TTY support for deaf people to make phone calls from the iPhone, and giving tutorials and guidelines for third-party developers to incorporate proper accessibility functions into their apps.

In 2012, Liat Kornowski from The Atlantic wrote that "the iPhone has turned out to be one of the most revolutionary developments since the invention of Braille", and in 2016, Steven Aquino of TechCrunch described Apple as "leading the way in assistive technology", with Sarah Herrlinger, Senior Manager for Global Accessibility Policy and Initiatives at Apple, stating that "We see accessibility as a basic human right. Building into the core of our products supports a vision of an inclusive world where opportunity and access to information are barrier-free, empowering individuals with disabilities to achieve their goals".

Multitasking

Multitasking for iOS was first released in June 2010 along with the release of iOS 4. Only certain devices—iPhone 4, iPhone 3GS, and iPod Touch 3rd generation—were able to multitask. The iPad did not get multitasking until iOS 4.2.1 in November. Currently, multitasking is supported on iPhone 3GS+, iPod Touch 3rd generation+, and all iPad models.

Implementation of multitasking in iOS has been criticized for its approach, which limits the work that applications in the background can perform to a limited function set and requires application developers to add explicit support for it.

Before iOS 4, multitasking was limited to a selection of the applications Apple included on the device. Users could, however "jailbreak" their device in order to unofficially multitask. Starting with iOS 4, on third-generation and newer iOS devices, multitasking is supported through seven background APIs:

- ✓ Background audio - application continues to run in the background as long as it is playing audio or video content
- ✓ Voice over IP - application is suspended when a phone call is not in progress
- ✓ Background location - application is notified of location changes
- ✓ Push notifications
- ✓ Local notifications - application schedules local notifications to be delivered at a predetermined time
- ✓ Task completion - application asks the system for extra time to complete a given task
- ✓ Fast app switching - application does not execute any code and may be removed from memory at any time

In iOS 5, three new background APIs were introduced:

- ✓ Newsstand - application can download content in the background to be ready for the user
- ✓ External Accessory - application communicates with an external accessory and shares data at regular intervals
- ✓ Bluetooth Accessory - application communicates with a bluetooth accessory and shares data at regular intervals

In iOS 7, Apple introduced a new multitasking feature, providing all apps with the ability to perform background updates. This feature prefers to update the user's most frequently used apps and prefers to use WiFi networks over a cellular network, without markedly reducing the device's battery life.

Switching Applications

In iOS 4.0 to iOS 6.x, double-clicking the home button activates the application switcher. A scrollable dock-like interface appears from the bottom, moving the contents of the screen up. Choosing an icon switches to an application. To the far left are icons which function as music controls, a rotation lock, and on iOS 4.2 and above, a volume controller.

With the introduction of iOS 7, double clicking the home button also activates the application switcher. However, unlike previous versions it displays screenshots of open applications on top of the icon and horizontal scrolling allows for browsing through previous apps, and it is possible to close applications by dragging them up, similar to how WebOS handled multiple cards.

With the introduction of iOS 9, the application switcher received a significant visual change; whilst still retaining the card metaphor introduced in iOS 7, the application icon is smaller, and appears above the screenshot (which is now larger, due to the removal of "Recent and Favorite Contacts"), and each application "card" overlaps the other, forming a rolodex effect as the user scrolls. Now, instead of the home screen appearing at the leftmost of the application switcher, it appears rightmost. In iOS 11, the application switcher receives a major redesign. In the iPad, the Control Center and app switcher are combined. The app switcher in the iPad can also be accessed by swiping up from the bottom. In the iPhone, the app switcher cannot be accessed if there are no apps in the RAM.

Ending tasks

In iOS 4.0 to iOS 6.x, briefly holding the icons in the application switcher makes them "jiggle" (similarly to the homescreen) and allows the user to force quit the applications by tapping the red minus circle that appears at the corner of the app's icon. Clearing applications from multitasking stayed the same from iOS 4.0 through 6.1.6, the last version of iOS 6.

As of iOS 7, the process has become faster and easier. In iOS 7, instead of holding the icons to close them, they are closed by simply swiping them upwards off the screen. Up to three apps can be cleared at a time compared to one in versions up to iOS 6.1.6.

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Contact us at:

V-Skills

011-473 44 723 or info@vskills.in

www.vskills.in