CarPlay App Programming Guide

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Developer

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Introduction

CarPlay is a smarter, safer way to use your iPhone in the car. CarPlay takes the things you want to do with your iPhone while driving and puts them right on your car's built-in display.

In addition to getting directions, making calls, sending and receiving messages, and listening to music, CarPlay supports the following types of apps.

- Audio
- Communication (messaging and calling)
- Driving task
- EV charging
- Fueling
- Navigation (turn-by-turn directions)
- Parking
- Quick food ordering

This guide describes how to create these types of CarPlay apps.

Note This guide does not cover CarPlay automaker apps (published by car manufacturers).

Overview

Users download CarPlay apps from the App Store and use them on iPhone like any other app. When an iPhone with a CarPlay app is connected to a CarPlay vehicle, the app icon appears on the CarPlay home screen. CarPlay apps are not separate apps—you add CarPlay support to an existing app.

CarPlay apps are designed to look and feel like your app on iPhone, but with UI elements that are similar to the built-in CarPlay apps.

Your app uses the CarPlay framework to present UI elements to the user. iOS manages the display of UI elements and handles the interface with the car. Your app does not need to manage the layout of UI elements for different screen resolutions, or support different input hardware such as touchscreens, knobs, or touch pads.

CarPlay apps must meet the basic requirements defined in the CarPlay Entitlement Addendum, and must follow the CarPlay App Guidelines.

For general design guidance, see Human Interface Guidelines for CarPlay Apps.

CarPlay app entitlements

All CarPlay apps require a CarPlay app entitlement that matches your app type.

To request a CarPlay app entitlement, go to http://developer.apple.com/carplay and provide information about your app, including the type of entitlement that you are requesting. You also need to agree to the CarPlay Entitlement Addendum.

Apple will review your request. If your app meets the criteria for a CarPlay app, Apple will assign a CarPlay app entitlement to your Apple Developer account and notify you.

CarPlay app guidelines

All CarPlay apps must adhere to the following guidelines.

Guidelines for all apps

1. Your CarPlay app must be designed primarily to provide the specified feature to a user (e.g. CarPlay audio apps must be designed primarily to provide audio playback services, CarPlay parking apps must be designed primarily to provide parking services, etc.).
2. Never instruct users to pick up their iPhone to perform a task. If there is an error condition, such as a required log in, you can let users know about the condition so they can take action when safe. However, user messages must not include wording that asks users to manipulate their iPhone.
3. All CarPlay user flows must be possible without interacting with iPhone.
4. All CarPlay user flows must be meaningful to use while driving. Don't include features in CarPlay that aren't related to the primary task (e.g. unrelated settings, maintenance features, etc.).
5. No gaming or social networking.
6. Never show the content of messages, texts, or emails on the CarPlay screen.
7. Use templates for their intended purpose, and only populate templates with the specified information types (e.g. a list template must be used to present a list for selection, album artwork in the now playing screen must be used to show an album cover, etc.).
8. All voice interaction must be handled using SiriKit (with the exception of CarPlay navigation apps, see below).

Additional guidelines for audio apps

1. Never show song lyrics on the CarPlay screen.
2. Text to speech systems (web readers, email readers, etc.) are not permitted.

Additional guidelines for communication (messaging and calling) apps

1. Communication apps must provide either short form text messaging features, VoIP calling features, or both.
2. Email is not considered short form text messaging and is not permitted.
3. Communication apps that provide text messaging features must support all 3 of the following SiriKit intents:
    - Send a message (`INSendMessageIntent`)
    - Request a list of messages (`INSearchForMessagesIntent`)
    - Modify the attributes of a message (`INSetMessageAttributeIntent`)
4. Communication apps that provide VoIP calling features must support CallKit, and all of the following SiriKit intents:
    - Start a call (`INStartCallIntent`)
    - Start an audio-only call (`INStartAudioCallIntent`) required for apps that support iOS 14 and earlier
    - Request a list of calls (`INSearchCallHistoryIntent`) required for apps that support iOS 14 and earlier

Additional guidelines for driving task apps

1. Driving task apps must enable tasks people *need* to do while driving. Tasks must actually *help* with the drive, not just be tasks that are done while driving.
2. Driving task apps must use the provided templates to display information and provide controls. Other kinds of CarPlay UI (e.g. custom maps, real-time video) are not possible.
3. Do not show CarPlay UI for tasks unrelated to driving (e.g. account setup, detailed settings).
4. Do not periodically refresh data items in the CarPlay UI more than once every 10 seconds (e.g. no real-time engine data).
5. Do not periodically refresh points of interest in the POI template more than once every 60 seconds.
6. Do not create POI (point of interest) apps that are focused on finding locations on a map. Driving tasks apps must be primarily designed to accomplish tasks and are not intended to be location finders (e.g. store finders).
7. Use cases outside of the vehicle environment are not permitted.

Additional guidelines for EV charging apps

1. EV charging apps must provide meaningful functionality relevant to driving (e.g. your app can't just be a list of EV chargers).
2. When showing locations on a map, do not expose locations other than EV chargers.

Additional guidelines for fueling apps

1. Fueling apps must provide meaningful functionality relevant to driving (e.g. your app can't just be a list of fueling stations).
2. When showing locations on a map, do not expose locations other than fueling stations.

Additional guidelines for parking apps

1. Parking apps must provide meaningful functionality relevant to driving (e.g. your app can't just be a list of parking locations).
2. When showing locations on a map, do not expose locations other than parking.

Additional guidelines for navigation (turn-by-turn directions) apps

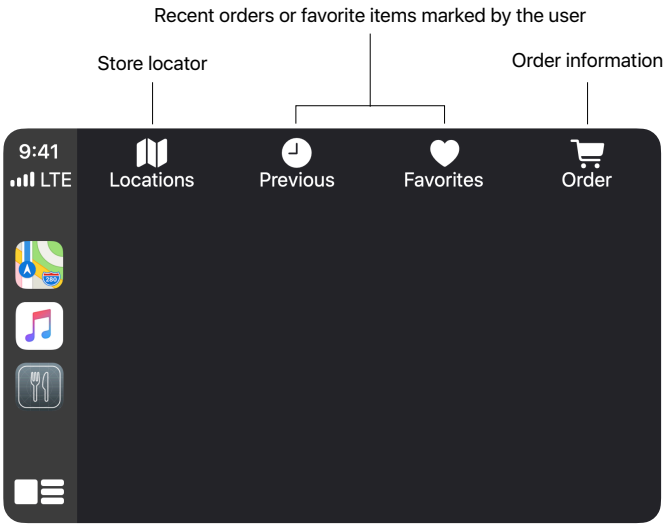
1. Navigation apps must provide turn-by-turn directions with upcoming maneuvers.
2. The base view must be used exclusively to draw a map. Do not draw windows, alerts, panels, overlays, or user interface elements in the base view. For example, don't draw lane guidance information in the base view. Instead, draw lane guidance information as a secondary maneuver using the provided template.
3. Use each provided template for its intended purpose. For example, maneuver images must represent a maneuver and cannot represent other content or user interface elements.
4. Provide a way to enter panning mode. If your app supports panning, you must include a button in the map template that allows the user to enter panning mode since drag gestures are not available in all vehicles. Drag gestures must only be used for panning the map.
5. Immediately terminate route guidance when requested. For example, if the user starts route guidance using the vehicle's built-in navigation system, your app delegate will receive a cancelation notification and must immediately stop route guidance.
6. Correctly handle audio. Voice prompts must work concurrently with the vehicle's audio system (such as the user listening to the car's FM radio) and your app should not needlessly activate audio sessions when there is no audio to play.
7. Ensure that your map is appropriate in each supported country.
8. Be open and responsive to feedback. Apple may contact you in the event that Apple or automakers have input to design or functionality.
9. Voice control must be limited to navigation features.

Additional guidelines for quick food ordering apps

1. Quick food ordering apps must be Quick Service Restaurant (QSR) apps designed primarily for driving-oriented food orders (e.g. drive thru, pick up) when in CarPlay and are not intended to be general retail apps (e.g. supermarkets, curbside pickup).
2. Quick food ordering apps must provide meaningful functionality relevant to driving (e.g. your app can't just be a list of store locations).
3. Simplified ordering only. Don't show a full menu. You can show a list of recent orders, or favorites limited to 12 items each.
4. When showing locations on a map, do not expose locations other than your Quick Service Restaurants.

   The following example shows how to structure a quick food ordering app in CarPlay. The app provides four tabs which allow the user select a store, view a list of recent orders or favorite items, and confirm order information. The icons and text may be customized.

   Locations, lists, and information screens are limited to 12 items. Quick food ordering user flows should be simple and limited to the most common tasks. Show only the most important and relevant information.



Tab bar in a quick food ordering app

Development environment

Xcode and an Apple Developer Program account are required to create apps for CarPlay.

Entitlements

Once you have received a CarPlay app entitlement, create a new Provisioning Profile that includes the CarPlay app capability.

1. Log in to your Apple Developer Account https://developer.apple.com/account/.
2. Select **Certificates, Identifiers & Profiles** and click **Identifiers** on the sidebar.
3. Select the App ID associated with your app, or create a new App ID.
4. Scroll down to **Additional Capabilities** near the bottom of the page.
5. Enable all necessary CarPlay App capabilities for your app.
6. Click Save on the top right.
7. Continue to **Provisioning Profiles** and create a new provisioning profile for your App ID.

For additional information, see **Manage identifiers** | **Enable app capabilities** in Developer Account Help.

https://help.apple.com/developer-account/

After you have created a new Provisioning Profile, import it into Xcode. Xcode and Simulator require a Provisioning Profile that supports CarPlay.

In Xcode, create an `Entitlements.plist` file in your project, if you don't have one already. Add your CarPlay app entitlement keys as a boolean key. The following example is for a CarPlay audio app that only supports the CarPlay framework.

```
<key>com.apple.developer.carplay-audio</key>
<true/>
```

In Xcode, under *Signing & Capabilities* turn off *Automatically manage signing*, and under *Build Settings* ensure that *Code Signing Entitlements* is set to the path of your `Entitlements.plist` file.

See Sample Code for project examples.

Use the entitlement keys that match your selected provisioning profile.

Entitlement	Key	Minimum version
CarPlay Audio App (CarPlay framework) App supports the CarPlay framework. Include both CarPlay audio app entitlements if your app supports the CarPlay framework and the Media Player framework.	`com.apple.developer.carplay-audio`	iOS 14
CarPlay Audio App (Media Player framework) **Deprecated.** App supports the Media Player framework. Include both CarPlay audio app entitlements if your app supports the CarPlay framework and the Media Player framework.	`com.apple.developer.playable-content`	
CarPlay Communication App App supports the CarPlay framework, and SiriKit intents for messaging or VoIP calling apps. May be combined with the optional CarPlay Messaging App and CarPlay VoIP Calling App entitlements to support iOS 13 and earlier.	`com.apple.developer.carplay-communication`	iOS 14
CarPlay Messaging App **Deprecated.** App relies solely on SiriKit and supports SiriKit intents to send, request, and modify messages. May be combined with the CarPlay Communication App entitlement, and the optional CarPlay VoIP Calling App entitlement to support iOS 13 and earlier.	`com.apple.developer.carplay-messaging`	
CarPlay VoIP Calling App **Deprecated.** App relies solely on SiriKit and CallKit, and supports SiriKit intents for starting calls and requesting a list of calls. May be combined with the CarPlay Communication App entitlement, and the optional CarPlay Messaging App entitlement to support iOS 13 and earlier.	`com.apple.developer.carplay-calling`	
CarPlay Driving Task App App supports the CarPlay framework.	`com.apple.developer.carplay-driving-task`	iOS 16
CarPlay EV Charging App App supports the CarPlay framework. May be combined with the CarPlay Fueling App entitlement.	`com.apple.developer.carplay-charging`	iOS 14
CarPlay Fueling App App supports the CarPlay framework. May be combined with the CarPlay EV Charging App entitlement.	`com.apple.developer.carplay-fueling`	iOS 16
CarPlay Navigation App App supports the CarPlay framework.	`com.apple.developer.carplay-maps`	iOS 12
CarPlay Parking App App supports the CarPlay framework.	`com.apple.developer.carplay-parking`	iOS 14
CarPlay Quick Food Ordering App App supports the CarPlay framework.	`com.apple.developer.carplay-quick-ordering`	iOS 14

Audio apps and backward compatibility

Audio apps can support the CarPlay framework, Media Player framework, or both. Be sure to include the correct entitlement(s) to match the framework(s) you support. On iOS 14 and later, the CarPlay framework will be used if your app supports both frameworks.

Starting with iOS 14, apps can use the CarPlay framework to present a customized user interface. Apps that use the CarPlay framework must include the `com.apple.developer.carplay-audio` entitlement.

If your app needs to work on iOS 13 and earlier, also support the Media Player framework (deprecated) and include the `com.apple.developer.playable-content` entitlement. Apps that only support the Media Player framework will still work on later versions of iOS, but without a customized user interface.

Communication (messaging and calling) apps and backward compatibility

Communication apps can support the CarPlay framework in addition to SiriKit and CallKit. Be sure to include the correct entitlement(s) to match the frameworks and features you support.

Starting with iOS 14, apps can use the CarPlay framework to present a customized user interface. Apps that use the CarPlay framework must include the `com.apple.developer.carplay-communication` entitlement.

If your app needs to work on iOS 13 and earlier, also include the `com.apple.developer.carplay-messaging` and/or `com.apple.developer.carplay-calling` entitlements to match your app features. Apps that don't support the CarPlay framework will still work on later versions of iOS, but without a customized user interface.

All communication apps must support required SiriKit intents, and CallKit (for calling apps). For a list of required SiriKit intents for communication apps, see CarPlay app guidelines.

Simulators

Apple provides two simulators to help you develop and test your CarPlay app. **Xcode Simulator** includes a CarPlay window that lets you quickly run and debug your CarPlay UI. **CarPlay Simulator** is a separate tool that simulates a complete car environment and requires you to install your app on iPhone.

You can also test your CarPlay app using a car or an aftermarket head unit with a power supply. If you are using an aftermarket head unit, it's recommended that you use one that supports wireless CarPlay. By using wireless CarPlay you can simultaneously connect iPhone to Xcode on your Mac using a cable.

Xcode Simulator is useful for fast build and test cycles for your CarPlay UI, but you should not rely exclusively on Xcode Simulator for all CarPlay app development. Here are some scenarios that require CarPlay Simulator or an actual CarPlay environment, and cannot be tested using Xcode Simulator.

- Testing while iPhone is locked. Most users interact with CarPlay while iPhone is locked so you need to ensure that your app works correctly even when iPhone is locked.
- Testing runtime scenarios such as launching your app, changing the foreground app in CarPlay or on iPhone, switching between CarPlay and the car's built-in UI, or connecting and disconnecting iPhone.
- Testing Siri features with your app.
- Testing scenarios where the car is playing audio. Remember that additional audio sources may be playing while CarPlay is active and your app must be a good audio citizen. For example, activating an audio session in your app has the side effect of immediately stopping the car's FM radio so you must only activate your audio session when you are ready to play audio.
- Testing your navigation app with instrument cluster displays.

Xcode Simulator

Xcode Simulator lets you quickly run and debug your CarPlay UI in a second window. The window acts as the car's display and allows you to interact with your CarPlay app in a similar manner to when you are connected to a CarPlay system.

To access CarPlay in Xcode Simulator, launch Simulator and select I/O, External Displays, and CarPlay to show the CarPlay screen.

CarPlay Simulator

CarPlay Simulator is a standalone Mac app that simulates a complete car environment. CarPlay Simulator is included in the **Additional Tools for Xcode** package which you can download from https://developer.apple.com/download/all/.

Using CarPlay Simulator

Locate **CarPlay Simulator** in the **Hardware** folder, run it, and connect iPhone using a Lightning to USB cable. CarPlay starts on iPhone just the same as if you had it connected to a real car.

CarPlay Simulator

Testing navigation apps in Xcode Simulator and CarPlay Simulator

If you are developing a navigation app, it's important to try different display configurations to ensure your map drawing code works correctly. Note that CarPlay supports both landscape and portrait displays and can scale from 2x at low resolutions to 3x at high resolutions. Here are some recommended screen sizes to test.

	Width and Height	Scale
Minimum (smallest possible CarPlay screen)	748px x 456px	2.0
Standard (default resolution typical of many CarPlay screens)	800px x 480px	2.0
High resolution (typical of larger CarPlay screens)	1920px x 720px	3.0
Portrait (example of a vertical CarPlay screen)	900px x 1200px	3.0

In CarPlay Simulator, simply click **Configure** to change the display configuration.

In Xcode Simulator, first enable extra options by entering the following command in Terminal before launching Xcode Simulator.

```
defaults write com.apple.iphonesimulator CarPlayExtraOptions -bool YES
```

If your app is composed only of templates, you can still try different screen configurations to see what your UI will look like in different cars, but the system will generally ensure that everything works correctly.

Templates

CarPlay apps are built from a fixed set of UI templates that iOS renders on the CarPlay screen.

CarPlay apps are responsible for selecting which template to show on the screen (the controller), and providing data to be shown inside the template (the model). iOS is responsible for rendering the information in CarPlay (the view).

CarPlay supports general purpose templates such as alerts, lists, and tab bars. It also supports templates designed for specific features such as contacts, maps, and a now playing screen.

Each CarPlay app type supports specific templates and this is governed by the app entitlement. For example, an audio app may only use alert, grid, list, tab bar, and now playing templates. Attempting to use an unsupported template triggers an exception at runtime.

	Audio	Communication	Navigation	Driving task, EV charging, fueling, parking, and quick food ordering
Action Sheet		●	●	●
Alert	●	●	●	●
Grid	●	●	●	●
List	●	●	●	●
Tab bar	●	●	●	●
Information		●	●	●
Point of Interest				●
Now Playing	●			
Contact		●	●	
Map			●	
Search			●	
Voice control			●	

There is a limit to the number of templates (depth of hierarchy) that you can push onto the screen. Most apps are limited to a depth of 5 templates. Fueling apps are further limited to 3 templates, and driving task and quick food ordering apps are limited 2 templates. These include the root template.

Action sheet

An action sheet is a specific style of alert that appears in response to a control or action, and presents a set of two or more choices related to the current context. Use action sheets to let people initiate tasks, or to request confirmation before performing a potentially destructive operation. The action sheet template can be used in communication, EV charging, navigation, parking, and quick food ordering apps.

Action sheet

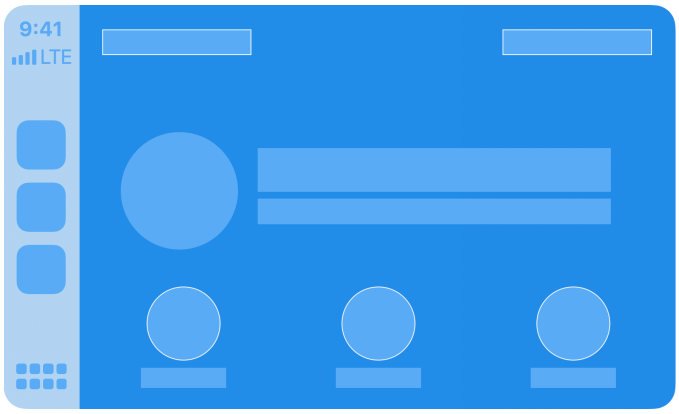
Alert

Alerts convey important information related to the state of your app. An alert consists of a title and one or more buttons. You can provide titles of varying lengths and let CarPlay choose the title that best fits the available screen space. If underlying conditions permit, alerts can be dismissed programatically. The alert template can be used by all apps.

Alert

Contact

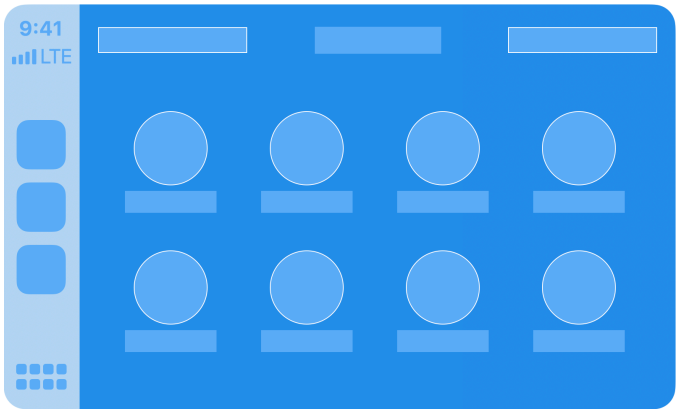
Contacts allow you to present information about a person or business. A contact consists of an image, title, subtitle, and action buttons. Use action buttons to let users perform tasks related to the current contact, such as making a phone call or sending a message. The contact template can be used in communication and navigation apps.



Contact

Grid

A grid is a specific style of menu that presents up to eight choices represented by an icon and a title. Use the grid template to let people select from a fixed list of items. The grid also includes a navigation bar with a title, leading buttons, and trailing buttons which can be shown as icons or text. The grid template can be used by all apps.



Grid

Information

An information screen is a specific style of list that presents a limited number of static labels with optional footer buttons. Labels can appear in a single column or in two columns. Starting in iOS 16, the information template can also include leading and trailing navigation bar buttons.

Use the information template to show important information. For example, an EV charging app may display information about a charging station such as availability, while a quick food ordering app may display an order summary such as pick-up location and time.

Since the number of labels is limited, show only the most important summary information needed to complete a task.

The information template can be used by communication, EV charging, parking, navigation, and quick food ordering apps.

Information

List

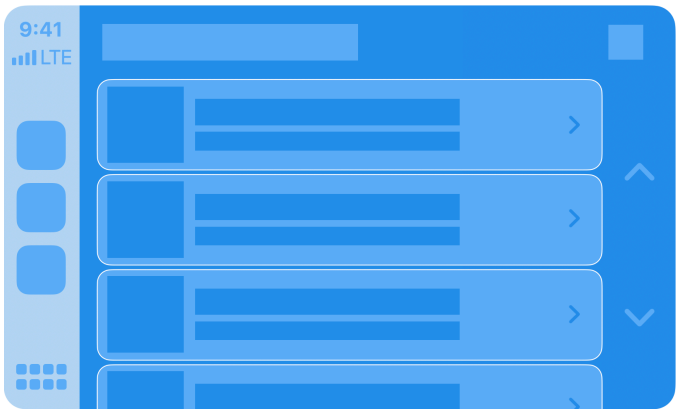
A list presents data as a scrolling, single-column table of rows that can be divided into sections. Lists are ideal for text-based content, and can be used as a means of navigation for hierarchical information.

Each item in a list can include attributes such as an icon, title, subtitle, disclosure indicator, progress indicator, playback status, or read status. Use a general list item if you just need to show an icon with text, or choose a specific list item such as the image row list item which is useful in audio apps, or the messages list item which is useful in communication apps.

Some cars dynamically limit lists to 12 items. You can check for the maximum number of items, but you always need to be prepared to handle the case where only 12 items are shown.

If your app supports SiriKit, you can add an “Ask Siri ...” item that appears in the list.

Lists can be used by all apps.



List

List with an image row list item

Now playing

The now playing screen presents information about the currently playing audio, such as title, artist, elapsed time, and album artwork. It also lets people control your app using playback control buttons.

The now playing screen is customizable and you should adapt it to your needs. For example, you can provide a link to upcoming tracks, the playback control buttons can be customized with your own icons, and the elapsed time indicator can be configured for fixed-length audio or for open ended audio such as a live stream.

The now playing template is special because users can directly access it from the CarPlay home screen or through the now playing button in your app's navigation bar. You must be prepared to populate the now playing template at all times.

Only the list template may be pushed on top of the now playing template. For example, if your app enables the "Playing Next" button in the now playing template, you can respond by showing a list template containing the upcoming playback queue.

The now playing template can be used in audio apps.

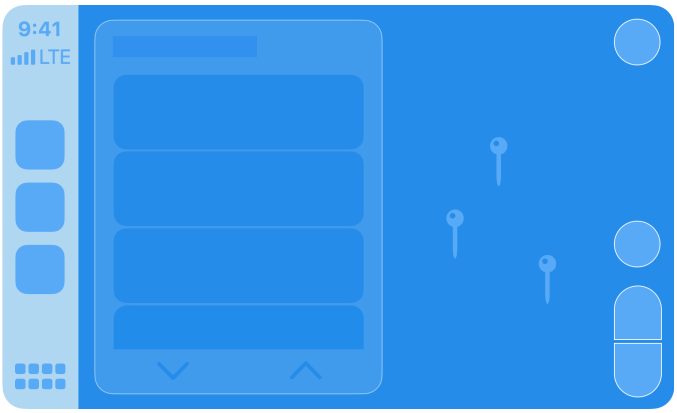
Now playing

Point of interest

A point of interest screen lets the user browse nearby locations on a map and choose one for further action.

The point of interest template includes a map provided by the MapKit framework, and an overlay containing a list of up to 12 locations with customizable pin images. Starting in iOS 16, you may optionally provide a larger pin image for the currently selected location. The list of locations should be limited to those that are most relevant or nearby.

The point of interest template can be used by EV charging, parking, and quick food ordering apps.



Point of interest

Tab bar

The tab bar is a versatile container for other templates, where each template occupies one tab in the tab bar. People can use the tab bar to rapidly switch between different templates.

Use the `CPTabBarTemplate maximumTabCount` method to determine the maximum number of tabs that can be displayed. In current versions of iOS, the tab bar allows up to 4 tabs for audio apps and up to 5 tabs for all other app types, although this may change in the future.

The tab bar template can be used by all apps.

Tab bar

Assets

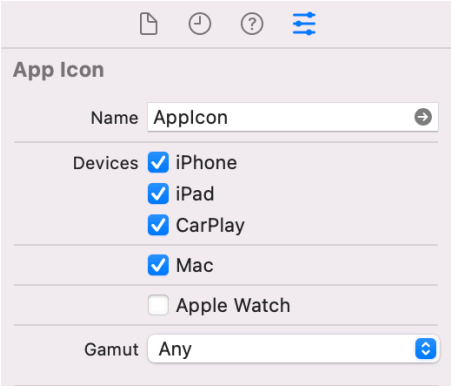
Prepare CarPlay assets for your app icon and images used in templates such as icons and buttons. Note that CarPlay supports multiple scales and both light and dark interfaces so you should take this into account when creating assets. Create versions that are suitable for 2x and 3x scale factors, and for light and dark styles.

If you are creating assets programmatically, use `UIImageAsset` to combine `UIImage` instances into single image with both light and dark trait collections.

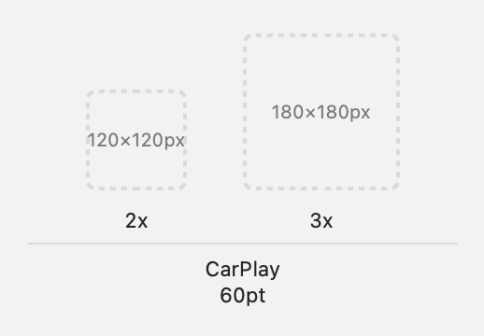
Use CarPlay Simulator to test your app and see how it appears under different conditions.

Your app icon in CarPlay should look similar to your app icon displayed on iPhone.

For example, to configure your app icon, turn on CarPlay assets in Xcode and populate the CarPlay image wells.



Turn on CarPlay app icon assets



CarPlay app icon 2x and 3x image wells

Use the following size guidance when creating images.

	Maximum size in points	Maximum size in pixels (3x)	Maximum size in pixels (2x)
CarPlay app icon	60pt x 60pt	180px x 180px	120px x 120px
Contact action button	50pt x 50pt	150px x 150px	100px x 100px
Grid icon	40pt x 40pt	120px x 120px	80px x 80px
Now playing action button	20pt x 20pt	60px x 60px	40px x 40px
Tab bar icon	24pt x 24pt	72px x 72px	48px x 48px

If you need to know the CarPlay screen scale, use the trait collection `carTraitCollection` to obtain the display scale. Don't use other parameters in the `carTraitCollection` and be sure to get the scale for the car's screen (not the scale for the iPhone screen).

Build a CarPlay app

Startup

All CarPlay apps must adopt scenes and declare a CarPlay scene to use the CarPlay framework. You can declare a scene dynamically, or you can include an application scene manifest in your `Info.plist` file. The following is an example of an application scene manifest that declares a CarPlay scene. You can add this to the top level of your app's `Info.plist` file.

```
<key>UIApplicationSceneManifest</key>
<dict>
   <key>UISceneConfigurations</key>
    <dict>
        <!-- Declare device scene -->
        <key>UIWindowSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>UIWindowScene</string>
                <key>UISceneConfigurationName</key>
                <string>Phone</string>
                <key>UISceneDelegateClassName</key>
                <string>MyAppWindowSceneDelegate</string>
            </dict>
        </array>
        <!-- Declare CarPlay scene -->
        <key>CPTemplateApplicationSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>CPTemplateApplicationScene</string>
                <key>UISceneConfigurationName</key>
                <string>MyApp-Car</string>
                <key>UISceneDelegateClassName</key>
                <string>MyApp.CarPlaySceneDelegate</string>
            </dict>
        </array>
    </dict>
</dict>
```

In the above example, the app declares 2 scenes—one for the iPhone screen, and one for the CarPlay screen.

The name of the class that serves as the scene delegate is defined in the manifest by `UISceneDelegateClassName`. Your delegate must conform to `CPTemplateApplicationSceneDelegate`. Listen for the `didConnect` and `didDisconnect` methods to know when your app has been launched on the CarPlay screen. Remember, your app may be launched only on the CarPlay screen.

When your app is launched, you will receive a `CPInterfaceController` that manages all the templates on the CarPlay screen. Hold onto the controller since you'll need it to manage templates, such as showing a now playing screen or an alert.

On launch, you must also specify a root template. In the example below, the app specifies a CPListTemplate as the root template.

```
import CarPlay

class CarPlaySceneDelegate: UIResponder, CPTemplateApplicationSceneDelegate {
    var interfaceController: CPInterfaceController?

    // CarPlay connected

    func templateApplicationScene(_ templateApplicationScene: CPTemplateApplicationScene,
                                  didConnect interfaceController: CPInterfaceController) {
        self.interfaceController = interfaceController
        let listTemplate: CPListTemplate = ...
        interfaceController.setRootTemplate(listTemplate, animated: true)
    }

    // CarPlay disconnected

    func templateApplicationScene(_ templateApplicationScene: CPTemplateApplicationScene,
                                  didDisconnect interfaceController: CPInterfaceController) {
        self.interfaceController = nil
    }
}
```

Create a list template

The following example shows how to create a list containing a single list item with a title and a subtitle.

When the user selects a list item, your list item handler will be called. You should take appropriate action here, such as starting audio playback in the case of an audio app. If you initiate asynchronous work and don't immediately call the completion block, CarPlay will display a spinner to let the user know that your app is busy. When you're ready to continue, you must call the completion block to tell CarPlay to remove the spinner.

```
import CarPlay

let item = CPListItem(text: “My title", detailText: “My subtitle")
item.listItemHandler = { item, completion, [weak self] in

    // Start playback asynchronously…

    self.interfaceController.pushTemplate(CPNowPlayingTemplate.shared(), animated: true)
    completion()
}

let section = CPListSection(items: [item])
let listTemplate = CPListTemplate(title: "Albums", sections: [section])
self.interfaceController.pushTemplate(listTemplate, animated: true)
```

Create a now playing template

The now playing template is a shared instance so you need to obtain it and configure its properties.

Do this when the interface controller connects to your app because iOS can display the shared now playing template on your behalf. For example, when the user taps the “Now Playing” button on the CarPlay home screen or in your app’s navigation bar, iOS will immediately present the shared now playing template.

This example shows an app configuring the playback rate button on the now playing template.

```
import CarPlay

class CarPlaySceneDelegate: UIResponder, CPTemplateApplicationSceneDelegate {

    func templateApplicationScene(_ templateApplicationScene: CPTemplateApplicationScene,
                                  didConnect interfaceController: CPInterfaceController) {

        let nowPlayingTemplate = CPNowPlayingTemplate.shared()

        let rateButton = CPNowPlayingPlaybackRateButton() {
            // Change the playback rate!
        }
        nowPlayingTemplate.updateNowPlayingButtons([rateButton])
    }
}
```

Play audio

If your app plays audio, ensure that it works well with audio sources in the car.

Activate your audio session the moment you are ready to play audio. When you activate your audio session, other audio sources in the car will stop. For example, if a user is listening to the car's FM radio, they won't expect the FM radio to stop when they launch your app. The FM radio should continue to play until they explicitly choose another audio stream using your app. Don't activate your audio session at the time your app launches. Instead, wait until you actually need to play audio.

Work while iPhone is locked

CarPlay is frequently used while iPhone is in a locked state. Test your app throughly to ensure it works as expected when iPhone is locked.

You won't be able to access any of the following when launched or running while iPhone is locked.

- Files saved with `NSFileProtectionComplete` or `NSFileProtectionCompleteUnlessOpen`.
- Keychain items with a `kSecAttrAccessible` attribute of `kSecAttrAccessibleWhenPasscodeSetThisDeviceOnly`, `kSecAttrAccessibleWhenUnlocked` or `kSecAttrAccessibleWhenUnlockedThisDeviceOnly`.

Launch other apps

If your app launches other apps in CarPlay, such as to get directions or make a phone call, use the `CPTemplateApplicationScene open(_:options:completionHandler:)` method to launch the other app using a URL to ensure it launches on the CarPlay screen.

Build a CarPlay navigation app

The following section describes how to create a CarPlay navigation app.

CarPlay navigation apps have additional UI elements and capabilities that are different from other CarPlay app types. Skip this section if you are not creating a navigation app.

Additional templates for navigation apps

CarPlay navigation apps use additional templates to display map information, a keyboard, and voice control feedback.

Base View

All CarPlay navigation apps start with a base view. The base view is where you draw your map. Create the base view and attach it to the provided window when CarPlay starts.

The base view must be used exclusively to draw a map, and cannot be used to draw alerts, overlays, or other UI elements. All UI elements that appear on the screen, including the navigation bar and map buttons, must be implemented using the provided templates. Your app won't receive direct tap or drag events in the base view.

You will be required to draw your map on a variety of screens with different aspect ratios, resolutions, and in light or dark mode. Get the current mode using `contentStyle` in your CarPlay template application scene and receive `contentStyleDidChange` notifications in your scene delegate. You must also consider the safe area (the portion of the map not obscured by buttons). See Simulator for more information on testing with different display configurations, including testing light and dark mode.

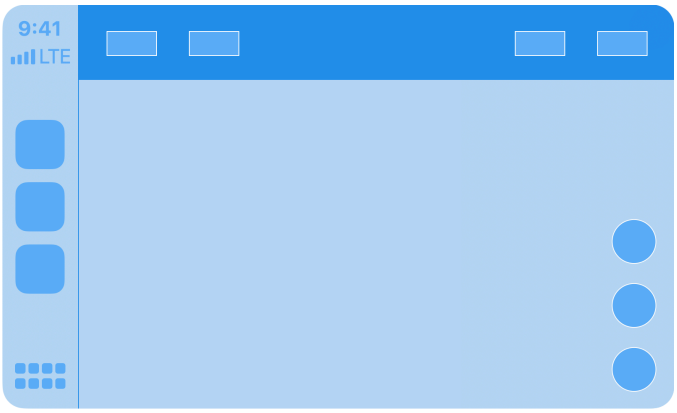
Base view

Map

The map template is a control layer that appears as an overlay over the base view and allows users to manipulate the map. It consists of a navigation bar and map buttons drawn as individual overlays. By default, the navigation bar appears when the user interacts with the app, and disappears after a period of inactivity. You can customize this behavior, including whether to hide the map buttons.

The navigation bar includes up to two leading buttons and two trailing buttons that can be specified with icons or text.

You can also specify up to four map buttons which are shown as icons. Use the map buttons to provide zooming and panning features. Although many cars support panning through direct manipulation of the car's touchscreen, there are cars that only support panning through knob or touch pad events. CarPlay supports these cars with a "panning mode." If your app supports any panning features, you must allocate one of the map buttons to be a pan button that allows the user to enter panning mode, and you must respond to the panning functions in `CPMapTemplate`.

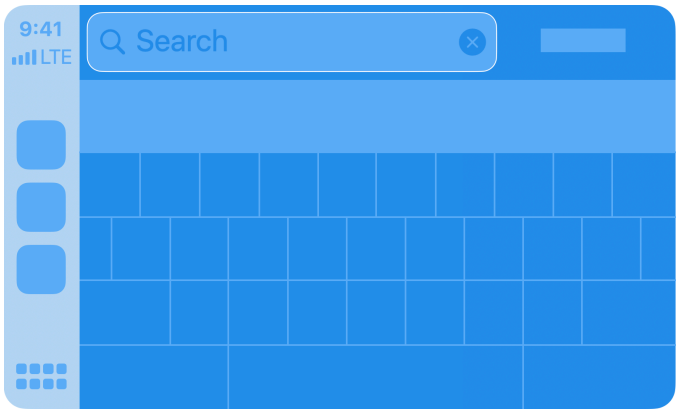


Map

Search

The search template displays a text entry field, a list of search results, and a keyboard. Your app parses the text by responding to `updatedSearchText` and updating the list of search results with an array of `CPListItem` elements. You must also take action when the user selects an item from the list by responding to `selectedResult`.

Note that many cars limit when the keyboard may be shown. See keyboard and list restrictions for details.



Search

Voice control

The voice control template allows you to provide visual feedback during a voice control session. CarPlay navigation apps can provide a voice control feature, but it must be restricted to navigation functions. In addition, navigation apps must display the voice control template whenever a voice control audio session is active.

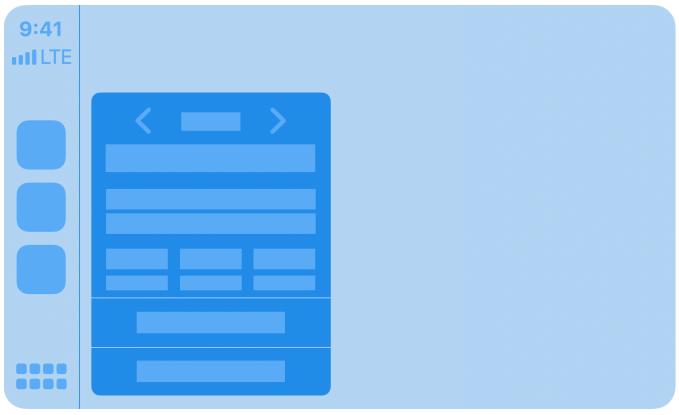
The voice control template can be used in navigation apps. Other CarPlay apps must use SiriKit or Siri Shortcuts to provide voice control features.

Voice control

Panels

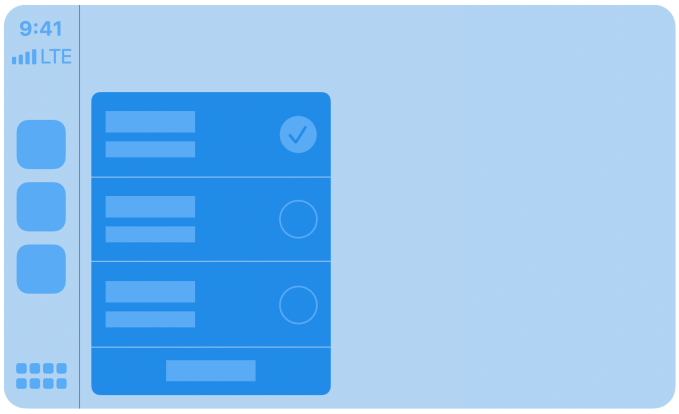
CarPlay navigation apps use panels to overlay information on the map. This includes trip previews, route selection, route guidance, and navigation alerts. You don't create panels directly. Instead, use the provided APIs to trigger them.

Trip preview panel. Display up to 12 potential destinations and select one. The trip preview panel is usually the result of a destination search. When users preview a trip, show a visual representation of that trip in your base view.



Trip preview

Route choice panel. Display potential routes for a trip and select one. Each route should have clear descriptions so the user can choose their preferred route. For example, a summary and optional description for a route could be "Via I-280 South" and "Traffic is light." When users preview a route, show a visual representation of that route in your base view.

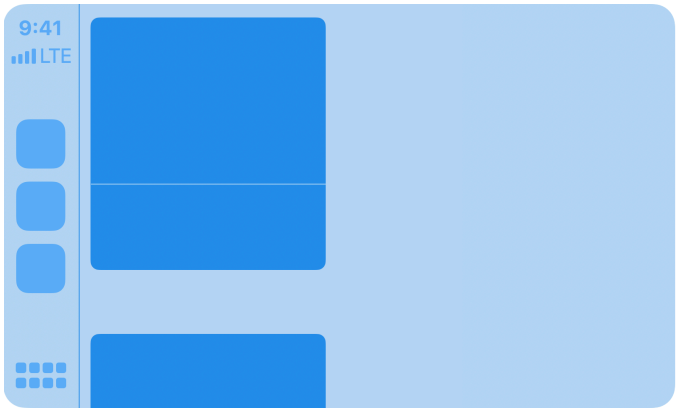


Route choice

Guidance and trip estimate panels. Displays upcoming maneuvers and trip estimates.

Maneuvers are normally shown one at a time, but in cases where maneuvers appear in rapid succession, two maneuvers may be shown. The second maneuver may be repurposed to show lane guidance or a junction image for the first maneuver.

In addition to providing upcoming maneuvers, you should continuously update overall trip estimates.



Guidance and trip estimate

Each maneuver can include a symbol, instruction text, estimated remaining distance, and time.

You may optionally specify multiple variants for your images and instruction text so they appear differently in your app and the CarPlay Dashboard. This includes maneuver symbols, junction images, notification symbols, instruction text and notification text. To specify something different, use the dashboard variants of the properties—for example, by default `symbolImage` defines what appears in your app and the CarPlay Dashboard, but if you also specify a `dashboardSymbolImage` property, then it will be used in the CarPlay Dashboard.

Use the following guide when preparing maneuver symbol assets. Be sure to provide variants for light and dark interfaces.

	Maximum size in points	Maximum size in pixels (3x)	Maximum size in pixels (2x)
First maneuver symbol (symbol and instruction on one line)	50pt x 50pt	150px x 150px	100px x 100px
First maneuver symbol (symbol and instruction on two lines)	120pt x 50pt	360px x 150px	240px x 100px
Second maneuver symbol (symbol and instructions)	18pt x 18pt	54px x 54px	36px x 36px
Second symbol (symbol only)	120pt x 18pt	360px x 54px	240px x 36px
CarPlay Dashboard junction image	140pt x 100pt	420px x 300px	280px x 200px

Navigation alert panel. Display important, real time feedback and optionally give the user a chance to make a decision that will affect the current route. For example, you should show an alert if there is unexpected traffic ahead and you are recommending that the user take an alternate route. Navigation alerts result in a notification if your app is running in the background.

Navigation alerts can consist of an image, title, subtitle, duration for which the alert is visible before it's automatically dismissed, and up to 2 action buttons. For example, the action buttons could provide options to either maintain the current route, or take an alternate route. Starting in iOS 16 you can specify a navigation alert with longer subtitle text (previously it was limited to 3 lines), no action buttons (in which case the alert will have a simple close button), or action buttons with custom colors.

Navigation alert

Startup

CarPlay navigation apps can declare two CarPlay scenes, one for the main app window in CarPlay, and one for the CarPlay Dashboard. If you are using a scene manifest, extend it with information about the CarPlay Dashboard scene. See Dashboard scene manifest for details.

Provide delegates for the CarPlay scene and the CarPlay Dashboard scene. Listen for the `didConnect` and `didDisconnect` methods to know when your app has been launched in each scene. In the main app window, your `CPTemplateApplicationSceneDelegate` will be called using the `didConnect` and `didDisconnect` methods that receive an interface controller and a window. `CPInterfaceController` and a `CPWindow` object.

For the main app view, retain references to both the interface controller and the map content window for the duration of the CarPlay session.

```
self.interfaceController = interfaceController
self.carWindow = window
```

Next, create a new view controller and assign it to the window's root view controller. Use the view controller to manage your map content as the base view in the window.

```
let rootViewController = MyRootViewController()
window.rootViewController = rootViewController
```

Finally, create a map template and assign it as the root template.

```
let rootTemplate: CPMapTemplate = createRootTemplate()
self.interfaceController?.setRootTemplate(rootTemplate, animated:
false)
```

Create a default set of navigation bar buttons and map buttons and assign them to the root map template. Specify navigation bar buttons by setting up the `leadingNavigationBarButtons` and `trailingNavigationBarButtons` arrays. Specify map buttons by setting up the `mapButtons` array.

If your CarPlay navigation app supports panning, one of the buttons you create must be a pan button that lets the user enter panning mode. The pan button is essential in vehicles that don't support panning via the touch screen.

You can update the navigation bar buttons and map buttons dynamically based on the state of the app. For example, during active route guidance, you may choose to replace the default navigation bar buttons with an option to end route guidance.

Route guidance

All CarPlay navigation apps have a standard flow for selecting a destination and providing route guidance.

Select destination. All route guidance starts with the user selecting a destination, whether that is the result of an on-screen search, voice command, or picking a category or destination from a list.

Preview. When a destination is selected, the user is shown a preview of the trip. At the same time, your map in the base view typically shows a visual representation of the trip. The preview also supports disambiguation when there are multiple matching destinations. For example, if the user chooses to navigate to a nearby park, the preview may show up to 12 nearby parks to choose from.

Choose route and start guidance. Once the user has confirmed the destination, they may start route guidance. If there are multiple possible routes, you may present the routes as options for the user to choose from.

Show trip information and upcoming maneuvers. When the user starts route guidance, show real time information including upcoming maneuvers, and travel estimates (distance and time remaining) for the trip.

End guidance. Route guidance continues until the user arrives at the destination, or chooses to end route guidance.

Select destination

Use `CPInterfaceController` to present templates that allow the user to specify a destination. To present a new template, use `pushTemplate` with a supported `CPTemplate` class such as `CPGridTemplate`, `CPListTemplate`, `CPSearchTemplate`, or `CPVoiceControlTemplate`.

When the user selects an item or cancels the selection, your delegate will be called with information about the action that was taken.

You may present multiple templates in succession to support hierarchical selection. For example, you can show a list template that includes list items which lead to additional sublists when selected. Be sure to set `showsDisclosureIndicator` to `true` for list items that support hierarchical browsing, and push a new list template when the list item is selected. Hierarchical selections must never exceed five levels of depth.

Preview

After the user has selected a destination and you are ready to show trip previews, use `CPMapTemplate showTripPreviews` to provide an array of up to 12 `CPTrip` objects.

Each `CPTrip` object represents a journey consisting of an origin, a destination, up to 3 route choices, and estimates for remaining time and distance.

Use `CPRouteChoice` to define each route choice. Your descriptions for each route are provided as arrays of variable length strings in descending order of length (longest string first). CarPlay will display the longest string that fits in the available space on the screen.

For each `CPTrip`, be sure to provide travel estimates using `CPMapTemplate updateEstimates:` and update the estimates if the remaining time or distance change.

You may also customize the names of the start, overview, and additional routes buttons shown in the trip preview panel.

Choose route and start guidance

When the user selects a different route to preview, the delegate `selectedPreviewFor:` will be called. Respond by updating your map base view.

If the user decides to start a trip, the delegate `startedTrip:` will be called. Respond by starting route guidance. At this time, use `CPMapTemplate hideTripPreviews` to dismiss the trip preview panel.

```
mapTemplate.hideTripPreviews()
```

Next use `CPMapTemplate startNavigationSession` to start a navigation session for the selected trip and obtain a `CPNavigationSession` object that represents the active navigation session.

```
let session = mapTemplate.startNavigationSession(for: trip)
```

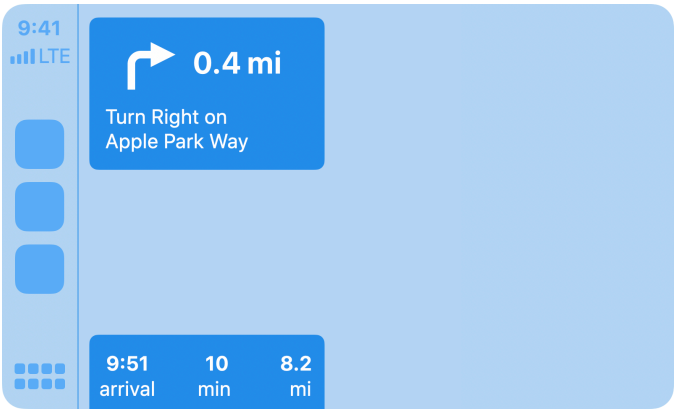
While you are calculating initial maneuvers, set the navigation session pause state to `CPTripPauseReasonLoading` so that CarPlay can display the correct state.

```
session.pauseTrip(for: .CPTripPauseReasonLoading)
```

At this time, update the navigation bar buttons and map buttons to provide appropriate actions for the user to manage their route.

Show trip information and upcoming maneuvers

During turn by turn guidance, show route guidance information by updating `upcomingManeuvers` with information on upcoming turns. Each `CPManeuver` represents a single maneuver and may include a symbol, an instruction, and estimates for remaining time and distance.



Show a maneuver in the route guidance panel

Symbol. If the maneuver has an associated symbol, such as a turn right arrow, provide an image using `symbolSet`. The symbol will be shown in the route guidance card and any related notifications. You must provide two image variants using `CPImageSet`—one is used for rendering the symbol on light backgrounds, the other is used for rendering the symbol on dark backgrounds.

Instruction. Provide an instruction using `instructionVariants` which is an array of strings. Use the array to provide variants of different lengths so that CarPlay can display the instruction that best fits in the available space on the screen. For example, if the maneuver requires you to turn right on the street named "Solar Circle" you may choose to provide 3 instruction variants "Turn Right on Solar Circle," "Turn Right on Solar Cir.", and "Turn Right". CarPlay will display the instruction with the longest string length that fits in the available space. The array of instructions must be provided in descending order of length (longest string first). You may optionally provide `attributedInstructionVariants` to include embedded images in the instruction. This is useful if you need to display special symbols, such as a highway symbol, as part of the instruction. Note that other text attributes including text size and fonts will be ignored. If you provide `attributedInstructionVariants`, always provide text-only `instructionVariants` since CarPlay vehicles may not always support attributed strings.

Maintain at least one upcoming turn in the `maneuvers` array at all times. In cases where there are two maneuvers in quick succession, provide a second maneuver which may be shown on the screen simultaneously.

If you provide a second maneuver, you can customize its appearance by specifying a symbol style. In `CPMapTemplateDelegate`, return a `CPManeuverDisplayStyle` for the maneuver when requested. The display style only applies to the second maneuver.

If your app provides lane guidance information, you must use the second maneuver to show lane guidance. Create a second maneuver containing `symbolSet` with dark and light images that occupy the full width of the guidance panel (maximum size 120pt x 18pt), provide an empty array for `instructionVariants`, and in the `CPMapTemplateDelegate`, return a symbol style of `CPManeuverDisplayStyleSymbolOnly` for the maneuver.

Show a maneuver with lane guidance information

Your app is responsible for continuously updating estimates for remaining time and distance for each maneuver, and for the overall trip. Use `CPNavigationSession updateEstimates:` to update estimates for each maneuver, and `CPMapTemplate updateEstimates` to update overall estimates for the trip. Only update the values when significant changes occur, such as when the number of remaining minutes changes.

If you need to display an alert related to the map or navigation, create a `CPNavigationAlert` and use `CPMapTemplate present` to show it. Navigation alerts can be configured to automatically disappear after a fixed interval. They may also be shown as a notification, even when your app is not in the foreground.

For each maneuver and navigation alert, specify whether it should be shown as a CarPlay notification when your app is running in the background. Respond to the `shouldShowNotificationFor` delegate call to specify the maneuver or navigation alert

behavior. In the case of a maneuver, you can optionally include updating travel estimates as part of the notification.

In addition to the route guidance panel, maneuvers may also be shown in notifications, or sent to vehicles that support the display of CarPlay metadata in their instrument cluster or heads up display.

End guidance

When route guidance is paused, canceled, or finished, call the appropriate method in `CPNavigationSession`.

In some cases, CarPlay route guidance may be canceled by the system. For example, if the car's native navigation system starts route guidance, CarPlay route guidance automatically terminates. In this case, your delegate will receive `mapTemplateDidCancelNavigation` and you should end route guidance immediately.

Keyboard and list restrictions

Some cars limit keyboard use and the lengths of lists while driving. iOS automatically disables the keyboard and reduces list lengths when the car indicates it should do so. However, if your app needs to adjust other user interface elements in response to these changes, you can receive notifications when the limits change. For example, you may want to disable a keyboard icon or adjust list items when list lengths are shorter. Use `CPSessionConfiguration` to observe `limitedUserInterfaces`.

Voice prompts

Voice prompts are essential for a route guidance experience, but you must ensure that your app is a good audio citizen and works well with other audio sources on iPhone and in the car.

Audio session configuration

CarPlay navigation apps must use the following audio session configuration when playing voice prompts for upcoming maneuvers.

1. Set the audio session category to `AVAudioSessionCategoryPlayback`.
2. Set the audio session mode to `AVAudioSessionModeVoicePrompt`.
3. Set the audio session category options to `AVAudioSessionCategoryOptionInterruptSpokenAudioAndMixWithOthers` and `AVAudioSessionCategoryOptionDuckOthers`.

Voice prompts are played over a separate audio channel and mixed with audio sources in the car, including the car's own audio sources such as FM radio.

`AVAudioSessionCategoryOptionInterruptSpokenAudioAndMixWithOthers` allows voice prompts to pause certain apps with spoken audio (such as podcasts or audio books) and mix with other apps such as music.

`AVAudioSessionCategoryOptionDuckOthers` allows voice prompts to duck (lower the volume) for other apps such as music while your audio is played.

Activate and deactivate the audio session

Keep your audio session deactivated until you are ready to play a voice prompt. Call `setActive` with YES only when a voice prompt is ready to play. You may keep the audio session active for short durations if you know that multiple audio prompts are going to be played in rapid succession. However, while your `AVAudioSession` is active, music apps will remain ducked, and apps with spoken audio will remain paused. Don't hold on to the active state for more than few seconds if audio prompts are not playing.

When you are done playing a voice prompt, call `setActive` with NO to allow other audio to resume.

Prompt style

In some cases it doesn't make sense to play a voice prompt. For example, the user may be on a phone call or in the middle of using Siri.

Just before playing each voice prompt, check the audio session's `promptStyle`. If necessary, it will return a hint to alter the type of prompt you should play in response to other system audio.

Prompt style	Action
`None`	Don't play any sound
`Short`	Play a tone
`Normal`	Play a full spoken prompt

Maps in the CarPlay Dashboard and instrument cluster displays

People using your navigation app want to see important information, even when your app is not the foreground app in CarPlay.

Support for CarPlay Dashboard. Starting with iOS 13.4, you can add support for CarPlay Dashboard. Display your map, upcoming maneuvers, and dashboard buttons so they are available at a glance inside CarPlay Dashboard.

Support for instrument cluster displays. Starting with iOS 15.4, you can add support for instrument cluster displays in supported vehicles. Display your map and upcoming maneuvers, so they are visible at a glance in the car's instrument cluster display.

It's easy to support both CarPlay Dashboard and instrument cluster displays since they work in similar ways.

`CPTemplateApplicationDashboardScene` and `CPTemplateApplicationInstrumentClusterScene` are new UIScene subclasses that CarPlay creates when it determines that your app should appear in CarPlay Dashboard or the instrument cluster.

`CPDashboardController` and `CPDashboardButton` let you manage the CarPlay Dashboard and the buttons that appear inside it. `CPInstrumentClusterController` lets you manage instrument cluster displays.

Indicate support for the CarPlay dashboard and instrument cluster

In your application scene manifest, set `CPSupportsDashboardNavigationScene` and `CPSupportsInstrumentClusterNavigationScene` to true and provide corresponding keys for your scenes and delegates. See "Application scene manifest example" below.

Create scene delegates

Define delegates for CarPlay Dashboard and instrument cluster scenes just like you would for the main template application scene. These delegates conform to `CPTemplateApplicationDashboardSceneDelegate` and `CPTemplateApplicationInstrumentClusterSceneDelegate` and will be called with instances of `CPDashboardController` or `CPInstrumentClusterController`.

Draw your content

Use the provided windows to draw map content for display in the CarPlay Dashboard or instrument cluster.

When drawing maps in the instrument cluster, you must follow these guidelines:

- Draw a minimal version of your map with minimal clutter
- Show a detailed view of the upcoming route, not an overview
- Ensure the current heading is facing up (the top of the screen)

Also, as with all maps rendered in CarPlay, be sure to observe safe areas, and light and dark mode settings (similar to your base view, use the `contentMode` in `CPTemplateApplicationDashboardScene` or `CPTemplateApplicationInstrumentClusterScene`).

When navigation begins in your app using `CPMapTemplate` and `CPNavigationSession`, CarPlay automatically displays maneuver information.

For the CarPlay Dashboard, you can also provide two instances of `CPDashboardButton` to `CPDashboardController`. These buttons appear in the guidance card area when your app is not actively navigating. People can interact with your app through the dashboard buttons as well as within your main app interface.

For instrument cluster displays, some cars may allow users to zoom the map in and out. It's your responsibility to respond to these events in your delegate. Similarly, if your app includes a compass or speed limit, the corresponding delegates will tell your app whether it's appropriate to draw them or not. Depending on the shape of the car's instrument cluster, your view area may be partially obscured by other elements in the car. Override `viewSafeAreaInsetsDidChange` on your view controller to know when the safe area changes, and use the `safeAreaLayoutGuide` on your cluster view to ensure that important content in the area of the view is always visible.

Application scene manifest example

The following is an example of an application scene manifest that supports both the CarPlay Dashboard and instrument cluster displays.

```
<key>UIApplicationSceneManifest</key>
<dict>
    <!-- Indicate support for CarPlay dashboard -->
    <key>CPSupportsDashboardNavigationScene</key>
    <true/>
    <!-- Indicate support for instrument cluster displays -->
    <key>CPSupportsInstrumentClusterNavigationScene</key>
    <true/>
    <!-- Indicate support for multiple scenes -->
    <key>UIApplicationSupportsMultipleScenes</key>
    <true/>
    <key>UISceneConfigurations</key>
    <dict>
        <!-- For device scenes -->
        <key>UIWindowSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>UIWindowScene</string>
                <key>UISceneConfigurationName</key>
                <string>Phone</string>
                <key>UISceneDelegateClassName</key>
                <string>MyAppWindowSceneDelegate</string>
            </dict>
        </array>
        <!-- For the main CarPlay scene -->
        <key>CPTemplateApplicationSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>CPTemplateApplicationScene</string>
                <key>UISceneConfigurationName</key>
                <string>CarPlay</string>
                <key>UISceneDelegateClassName</key>
                <string>MyAppCarPlaySceneDelegate</string>
            </dict>
```

```
        </array>
        <!-- For the CarPlay Dashboard scene -->
        <key>CPTemplateApplicationDashboardSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>CPTemplateApplicationDashboardScene</string>
                <key>UISceneConfigurationName</key>
                <string>CarPlay-Dashboard</string>
                <key>UISceneDelegateClassName</key>
                <string>MyAppCarPlayDashboardSceneDelegate</string>
            </dict>
        </array>
        <!-- For the CarPlay instrument cluster scene -->
        <key>CPTemplateApplicationInstrumentClusterSceneSessionRoleApplication</key>
        <array>
            <dict>
                <key>UISceneClassName</key>
                <string>CPTemplateApplicationInstrumentClusterScene</string>
                <key>UISceneConfigurationName</key>
                <string>CarPlay-Instrument-Cluster</string>
                <key>UISceneDelegateClassName</key>
                <string>MyAppCarPlayInstrumentClusterSceneDelegate</string>
            </dict>
        </array>
    </dict>
</dict>
```

Testing maps in instrument cluster displays

Use CarPlay Simulator to test your map in instrument cluster displays.

Simply click **Configure** | **Cluster Display**, turn on **Instrument Cluster Display enabled** and specify scale factor, screen size, safe area, and safe area sizes. Here are some recommended configurations to test.

	Scale Factor	Size	Safe Area Origin	Safe Area Size
Minimum	3x	300 x 200	0, 0	300 x 200
Basic	2x	640 x 480	0, 0	640 x 480
Widescreen (wide safe area)	3x	1920 x 720	420, 0	1080 x 720
Widescreen (small safe area)	2x	1920 x 720	640, 120	640 x 480

Sample code

The following sample code is available to help you get started developing your CarPlay app.

Integrating CarPlay with your music app

CarPlay Music is a sample music app that demonstrates how to display a custom UI from a CarPlay–enabled vehicle. CarPlay Music integrates with the CarPlay framework by implementing the CPNowPlayingTemplate and CPListTemplate. This sample's iOS app component provides a logging interface to help you understand the life cycle of a CarPlay app, as well as a music controller.

Download

Integrating CarPlay with your navigation app

Coastal Roads is a sample navigation app that demonstrates how to display a custom map and navigation instructions in a CarPlay–enabled vehicle. Coastal Roads integrates with the CarPlay framework by implementing the map and additional CPTemplate subclasses, such as CPGridTemplate and CPListTemplate. This sample's iOS app component provides a logging interface to help you understand the life cycle of a CarPlay app.

Download

Publish your CarPlay app

When you are ready to publish your CarPlay app on the App Store, follow the same process as for any iOS app and use App Store Connect to submit your app.

Ensure that your app follows the CarPlay App Guidelines.

Apple Inc.
One Apple Park Way
Cupertino, CA 95014
408-996-1010