

#WWDC19

Getting the Most Out of Simulator

Russ Bishop, Simulator and Devices Engineer

Tracy Popenhagen, Engineer Development Technologies

Katelyn Hicks, GPU Software Engineer

What is Simulator?

Burning questions and answers

Simulator from the Command Line

Metal in Simulator

What Is Simulator?



What Is Simulator?

What Is Simulator?

Kernel

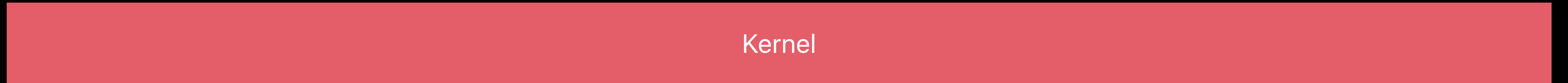
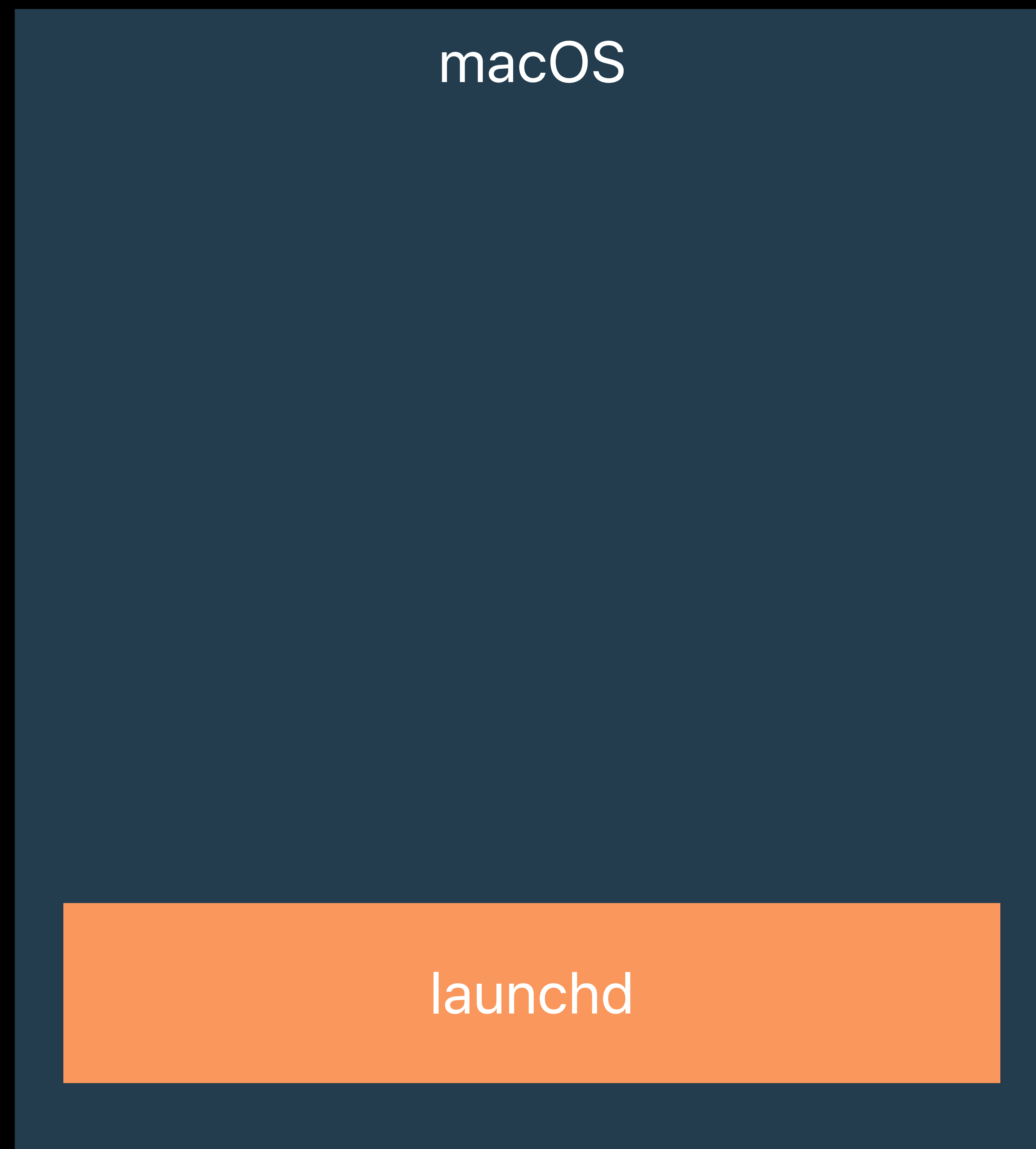
What Is Simulator?

macOS

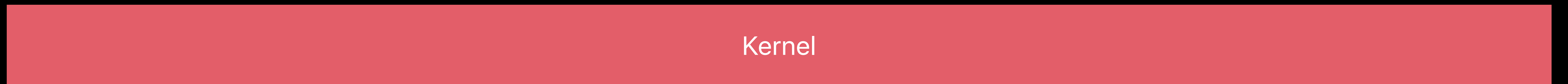
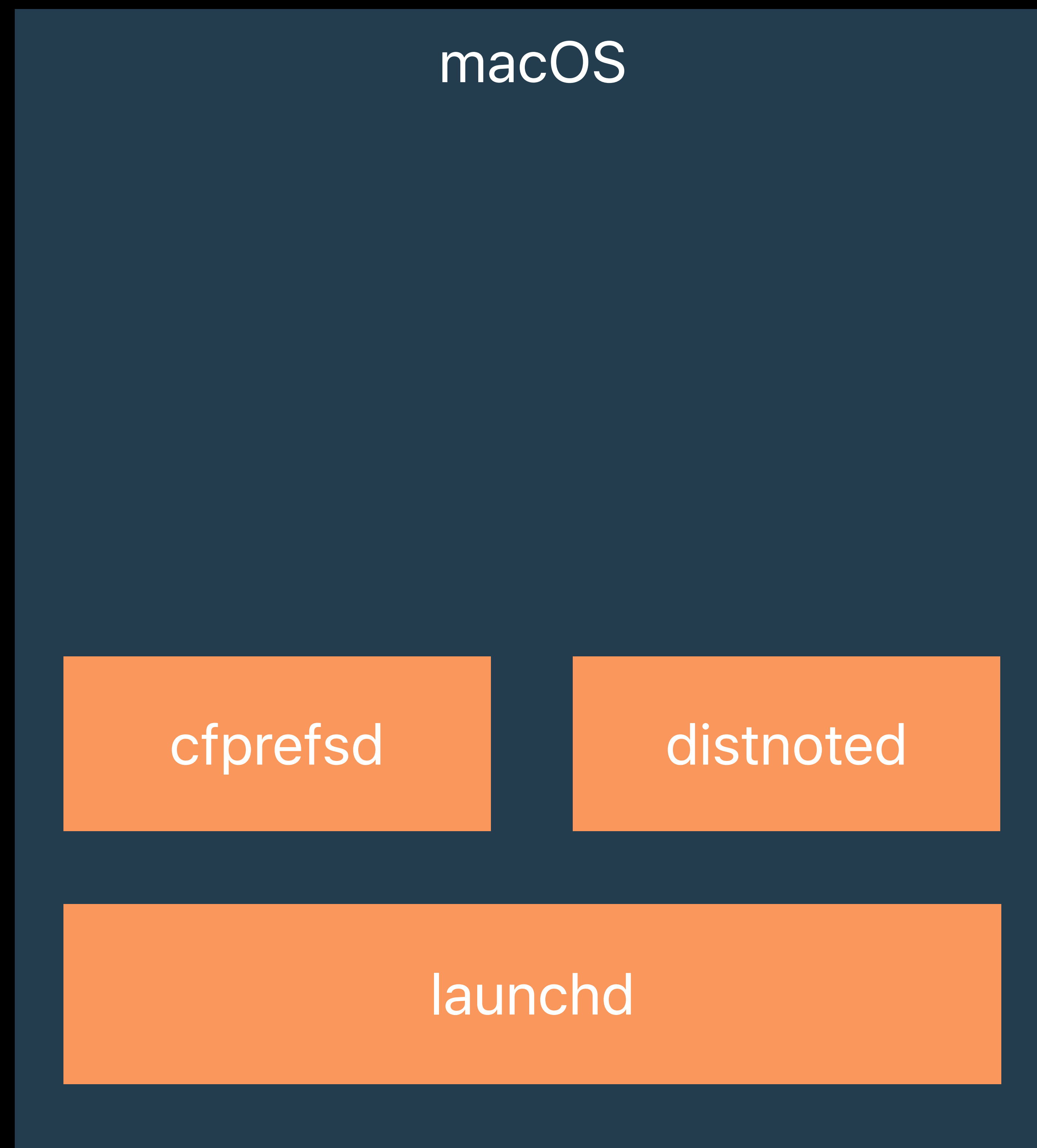
A diagram illustrating the layers of a simulator. It features a large dark blue rectangle on the left side, labeled 'macOS' at its top center. Below this rectangle is a horizontal pink bar that spans the width of the diagram, labeled 'Kernel' at its center. The background is black.

Kernel

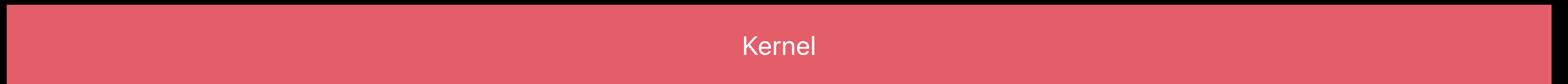
What Is Simulator?



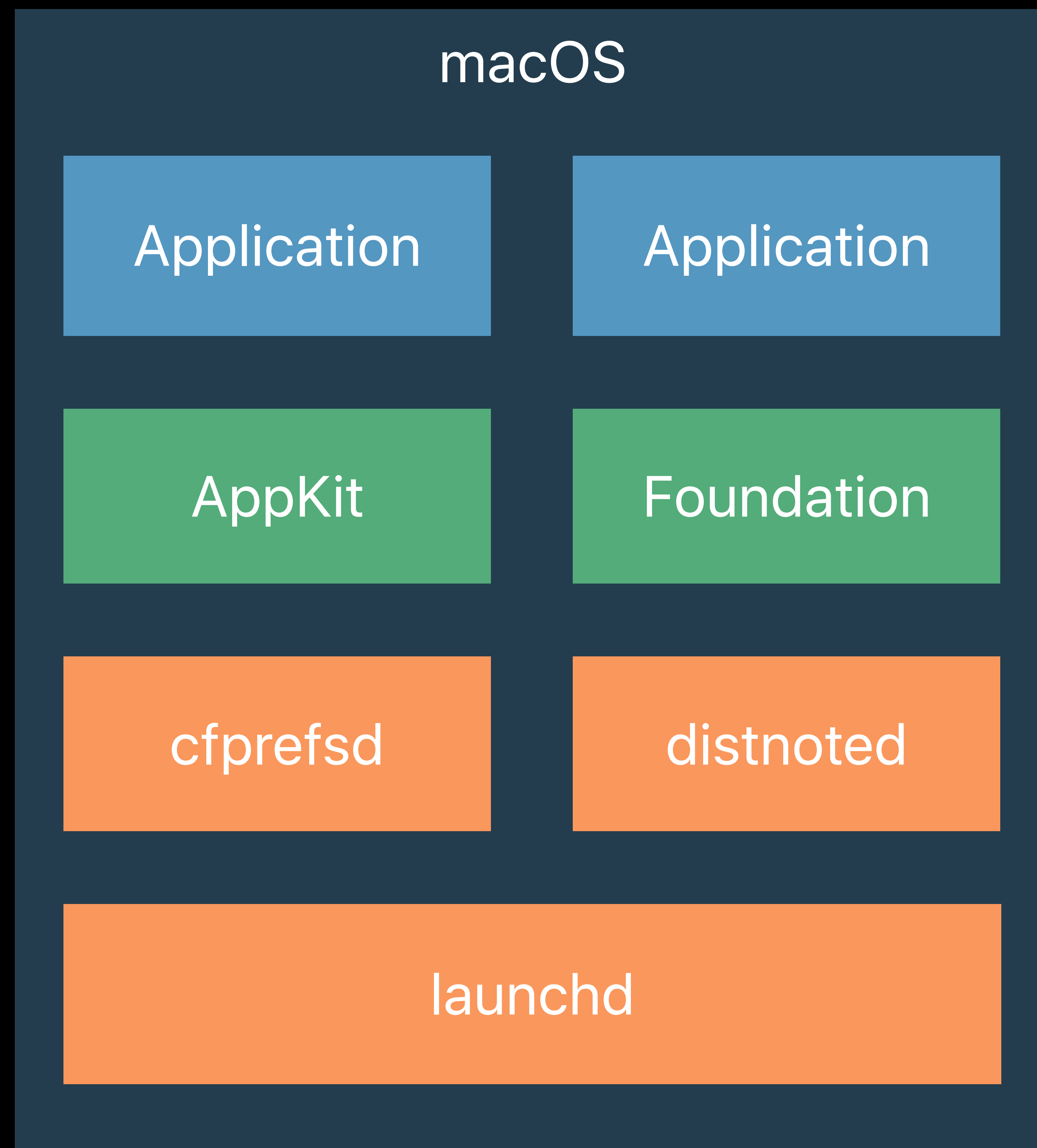
What Is Simulator?



What Is Simulator?



What Is Simulator?

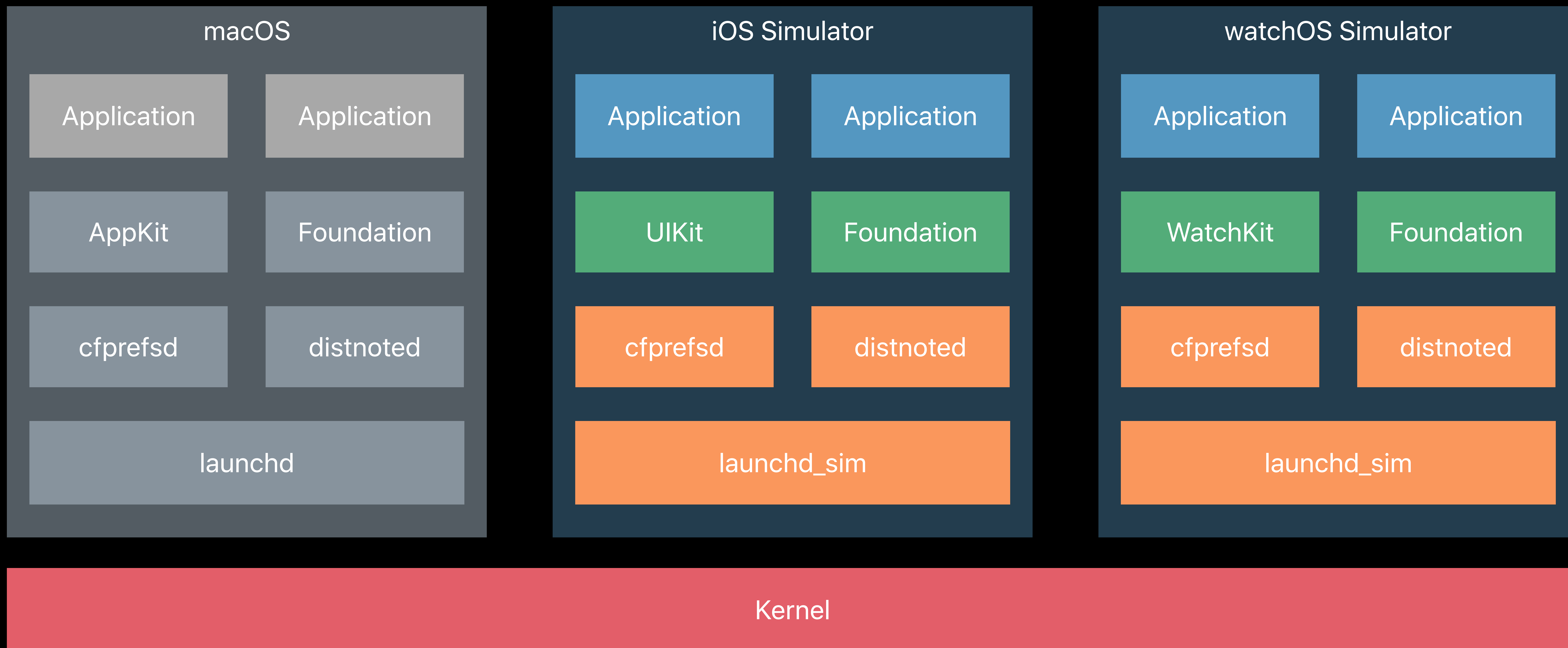


What Is Simulator?



Kernel

What Is Simulator?



What Is Simulator?

What Is Simulator?

The iOS, watchOS, or tvOS userspace running on the macOS kernel

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The iOS, watchOS, or tvOS userspace running on the macOS kernel

Separate launchd, separate daemons, separate darwin notifications, separate URL sessions, and separate mach bootstrap

What Is Simulator?

The iOS, watchOS, or tvOS userspace running on the macOS kernel

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- Same filesystem, separate \$HOME

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From libSystem up: built for iOS, watchOS, or tvOS

What Is Simulator?

The iOS, watchOS, or tvOS userspace running on the macOS kernel

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Uses iOS, watchOS, or tvOS ABI

What Is Simulator?

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- Same filesystem, separate \$HOME

From libSystem up: built for iOS, watchOS, or tvOS

Uses iOS, watchOS, or tvOS ABI

Built natively for x86 (not an emulator)

Simulator Details

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Memory and CPU limits are not simulated

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Different core counts, different threading behaviors

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Application Sandbox is not enforced

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Simulates case-sensitive filesystem

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Memory and CPU limits are not simulated

Different core counts, different threading behaviors

Application Sandbox is not enforced

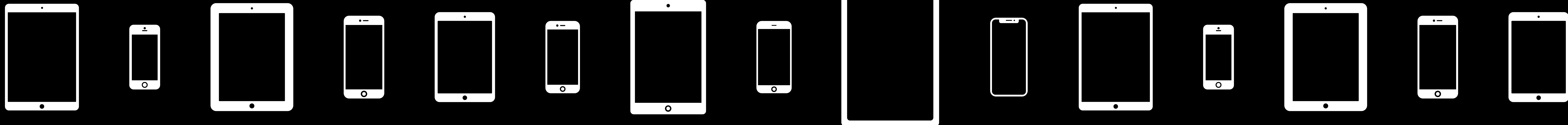
Simulates case-sensitive filesystem

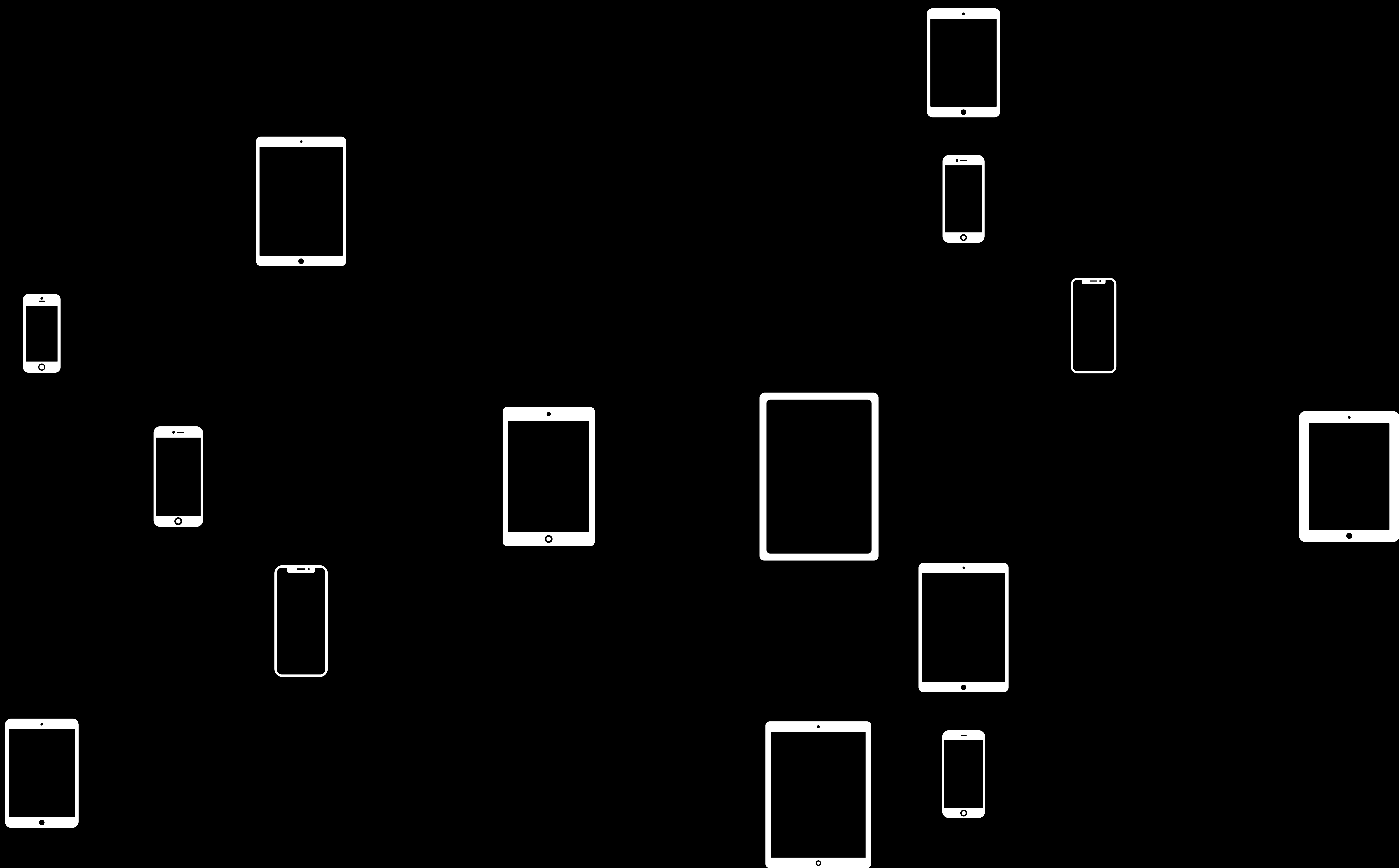
Thread Sanitizer supported

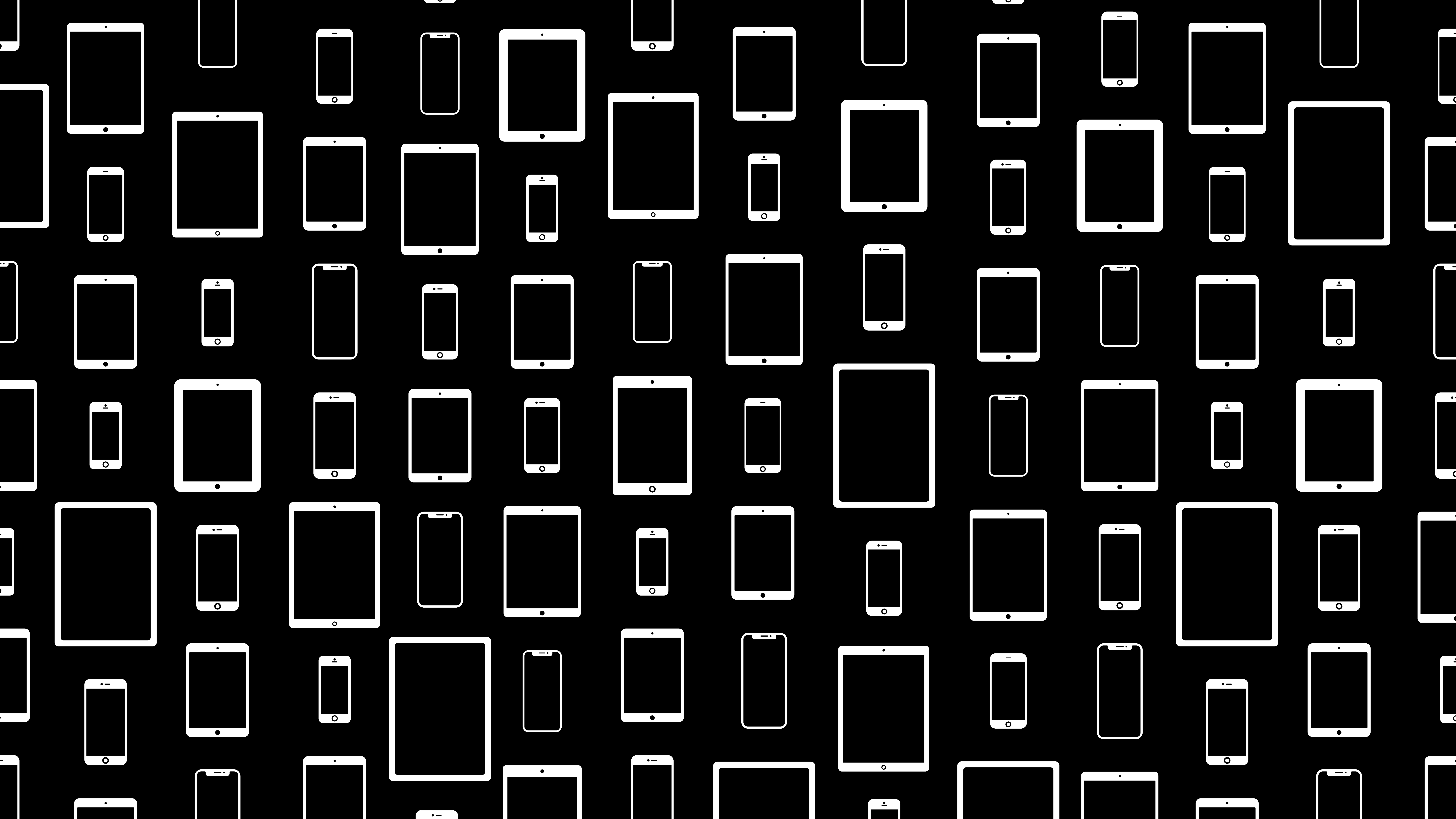
Burning Questions and Answers

Features that may have been hidden in plain sight

Tracy Popenhagen, Engineer Development Technologies

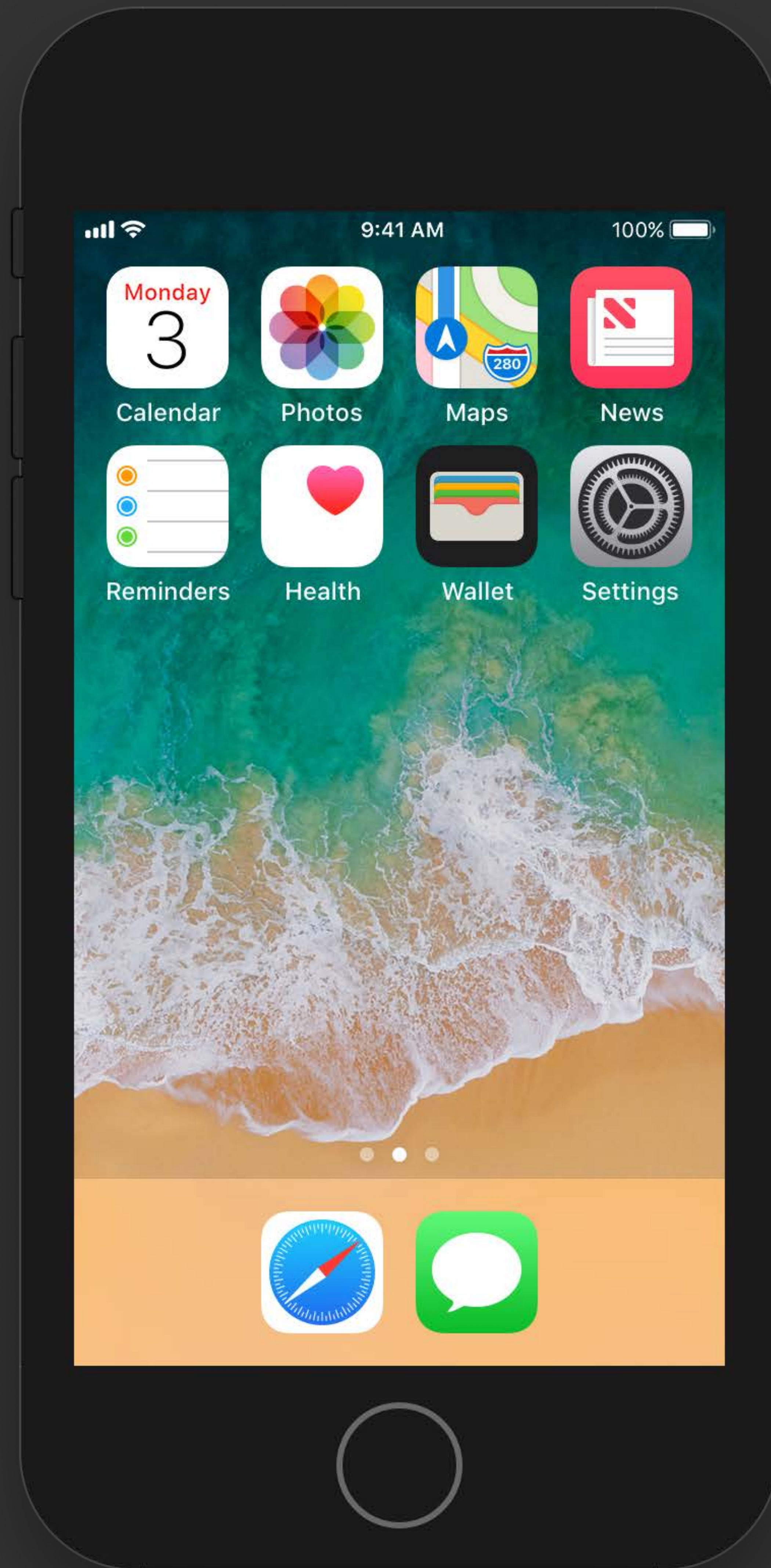








Testing to Older OS?

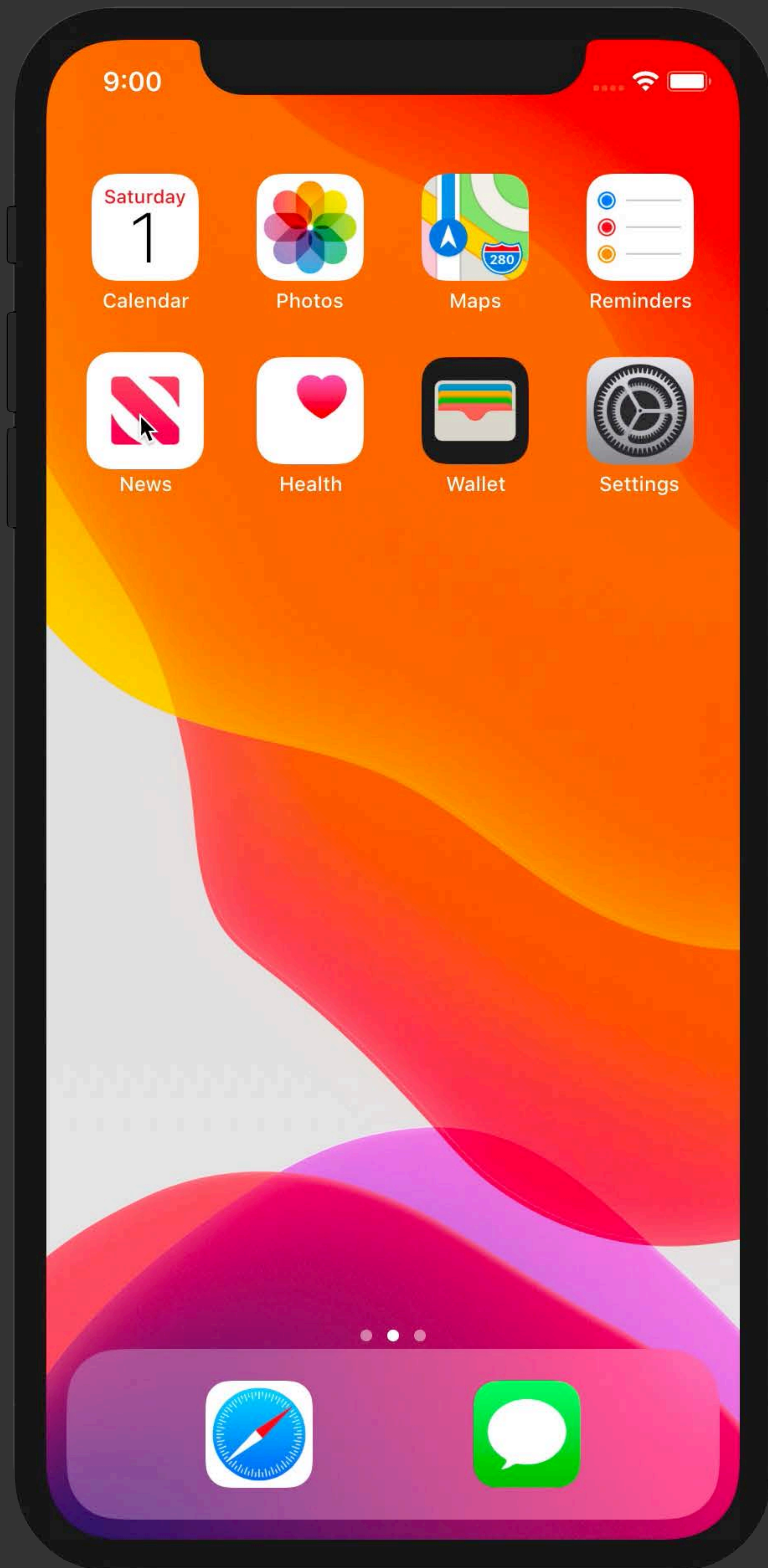


iPhone 5s — 11.0.1

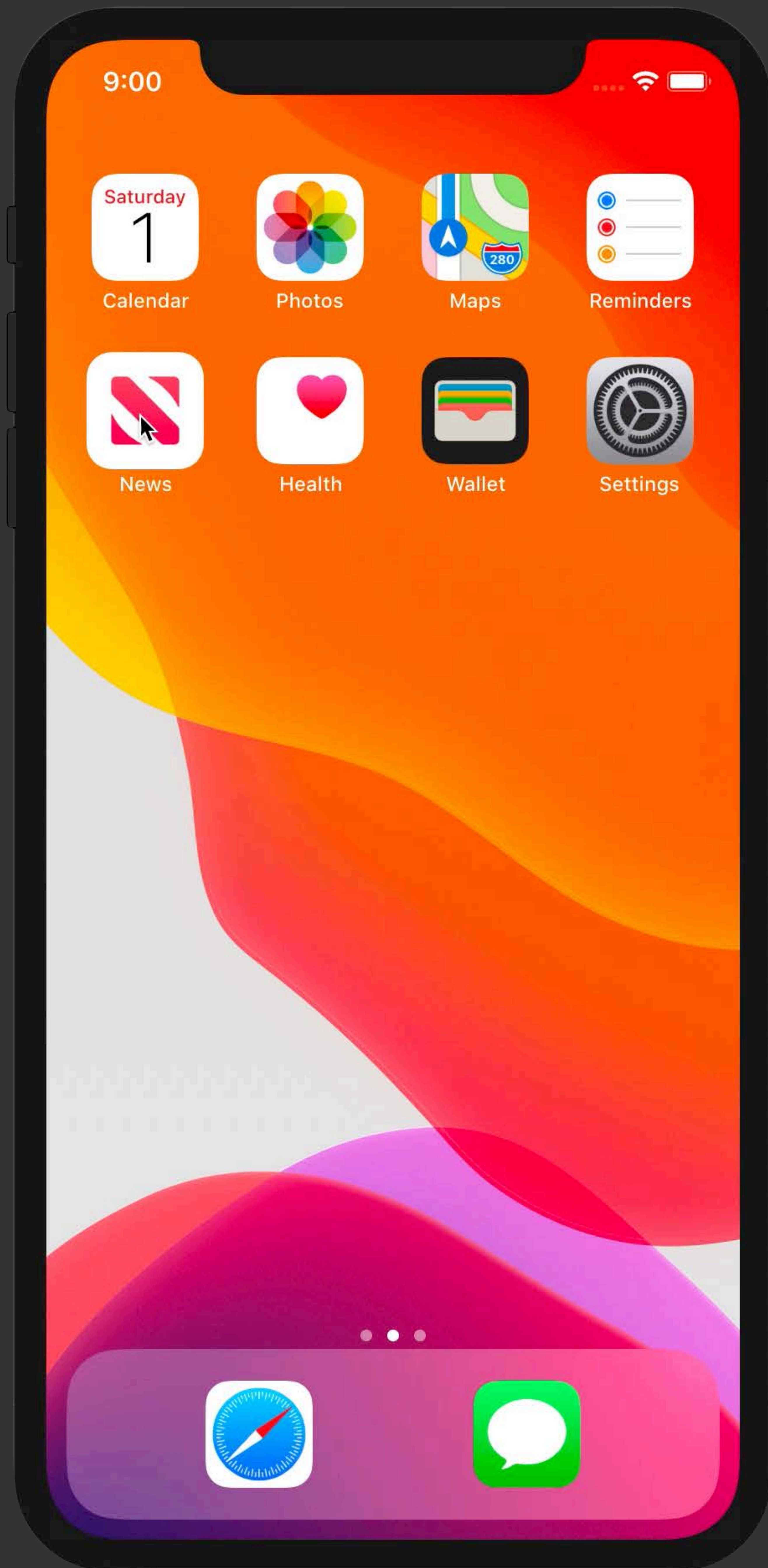
Can I zoom in on Simulator?





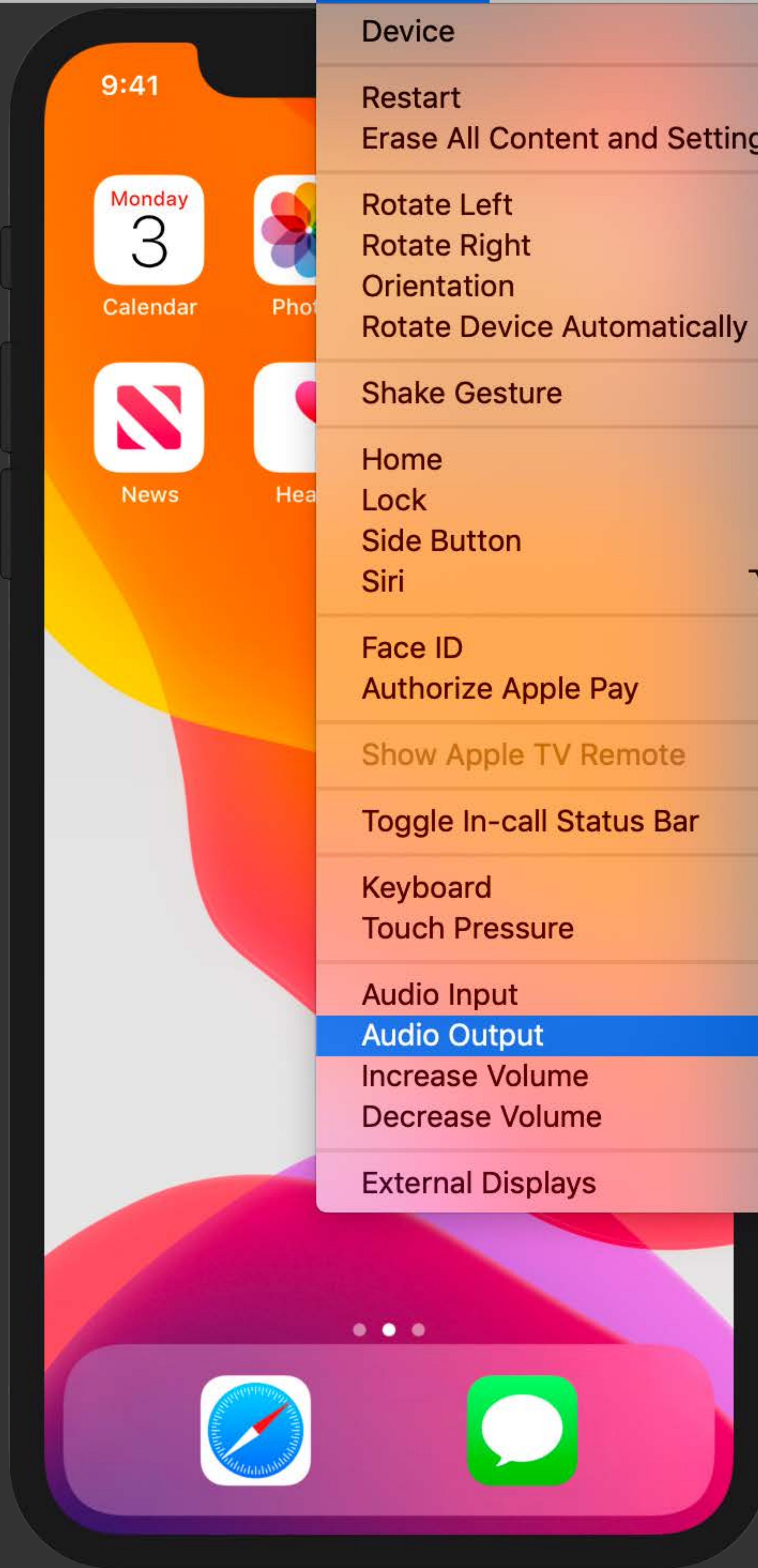


iPhone XR — 13.0



iPhone XR — 13.0

Can I change which audio device
Simulator uses for input and output?



- Device ▶
- Restart
- Erase All Content and Settings...
- Rotate Left ⌘←
- Rotate Right ⌘→
- Orientation ▶
- Rotate Device Automatically
- Shake Gesture ^⌘Z
- Home ⌘H
- Lock ⌘L
- Side Button ⌘B
- Siri ⌘H
- Face ID ▶
- Authorize Apple Pay ⌘A
- Show Apple TV Remote ⌘R
- Toggle In-call Status Bar ⌘Y
- Keyboard ▶
- Touch Pressure ▶
- Audio Input ▶
- Audio Output ▶**
- Increase Volume ⌘↑
- Decrease Volume ⌘↓
- External Displays ▶

- System (Internal Speakers)
- ✓ Tracy Dear's AirPods
- Internal Speakers




Does iCloud work in Simulator?

Settings


 **Tracy Popenhagen**
Apple ID, iCloud, iTunes & App St...

 Bluetooth Unavailable

 General

 Accessibility

 Privacy


 Passwords & Accounts


 Maps


 Safari

 News

 Shortcuts

 Siri & Search

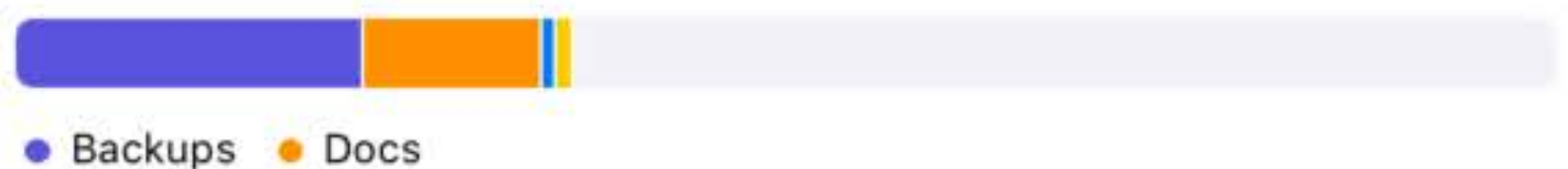
 Photos

 Game Center

 Developer

STORAGE

iCloud 1.8 GB of 5 GB Used



Manage Storage >

APPS USING ICLOUD

 Photos On >

 Contacts

 Calendars

 Reminders

 Messages

 Safari

 News

 Home

 Game Center

 Siri

 iCloud Backup On >

 iCloud Drive

Look Me Up >

9:33 PM Sat Jun 1 100%

June 2019

Day Week **Month** Year

Sun Mon Tue Wed Thu Fri Sat

2	3	4	5	6	7	8
	WWDC	Eid al-Fitr				
9	10	11	12	13	14	15
					Flag Day	David Taylor's 21st Birthday
16	17	18	19	20	21	22
Father's Day			Juneteenth			John Appleseed's 39th Bi...
23	24	25	26	27	28	29
30						

Today Calendars Inbox

9:33 PM Sat Jun 1 100%

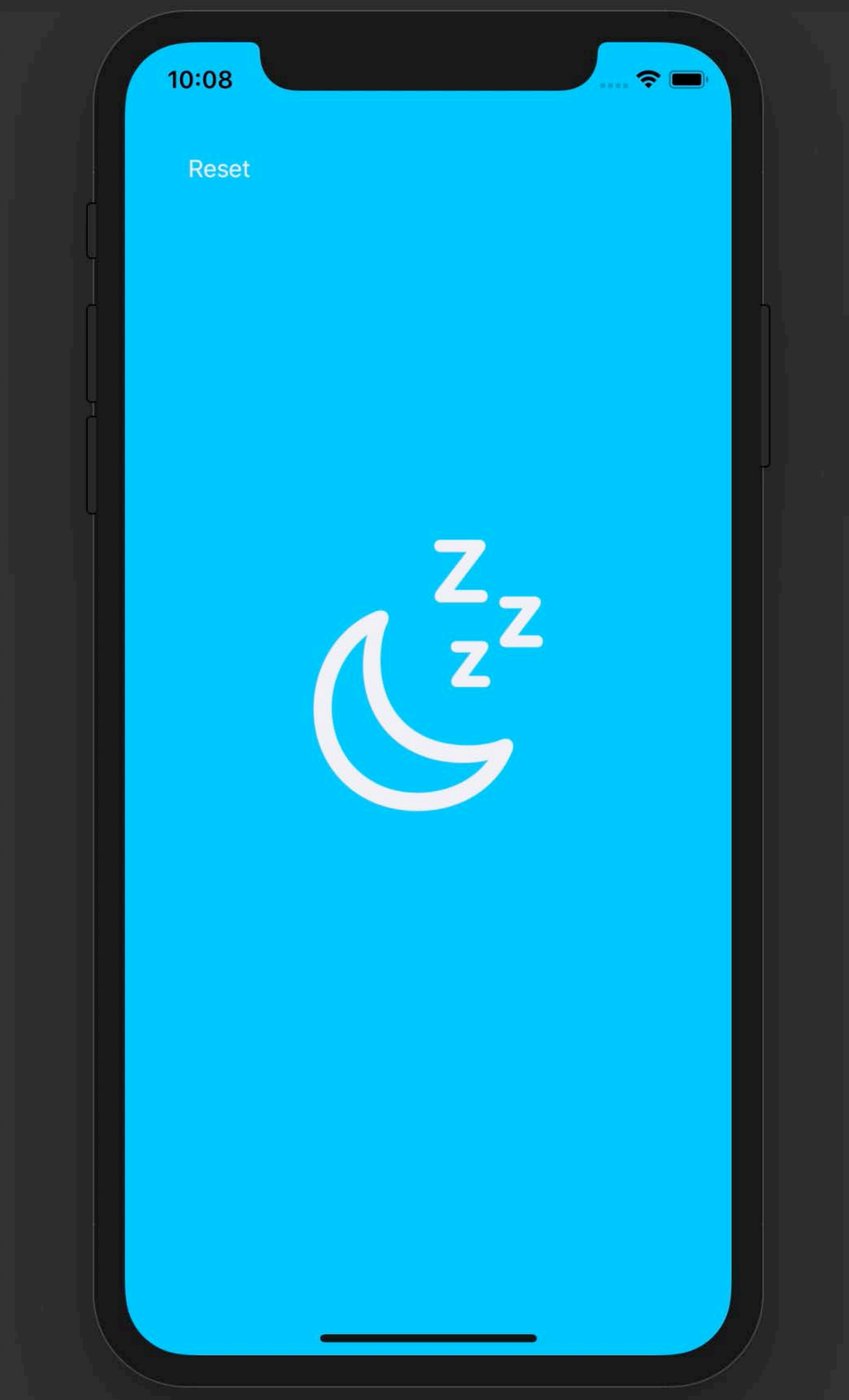
June 2019

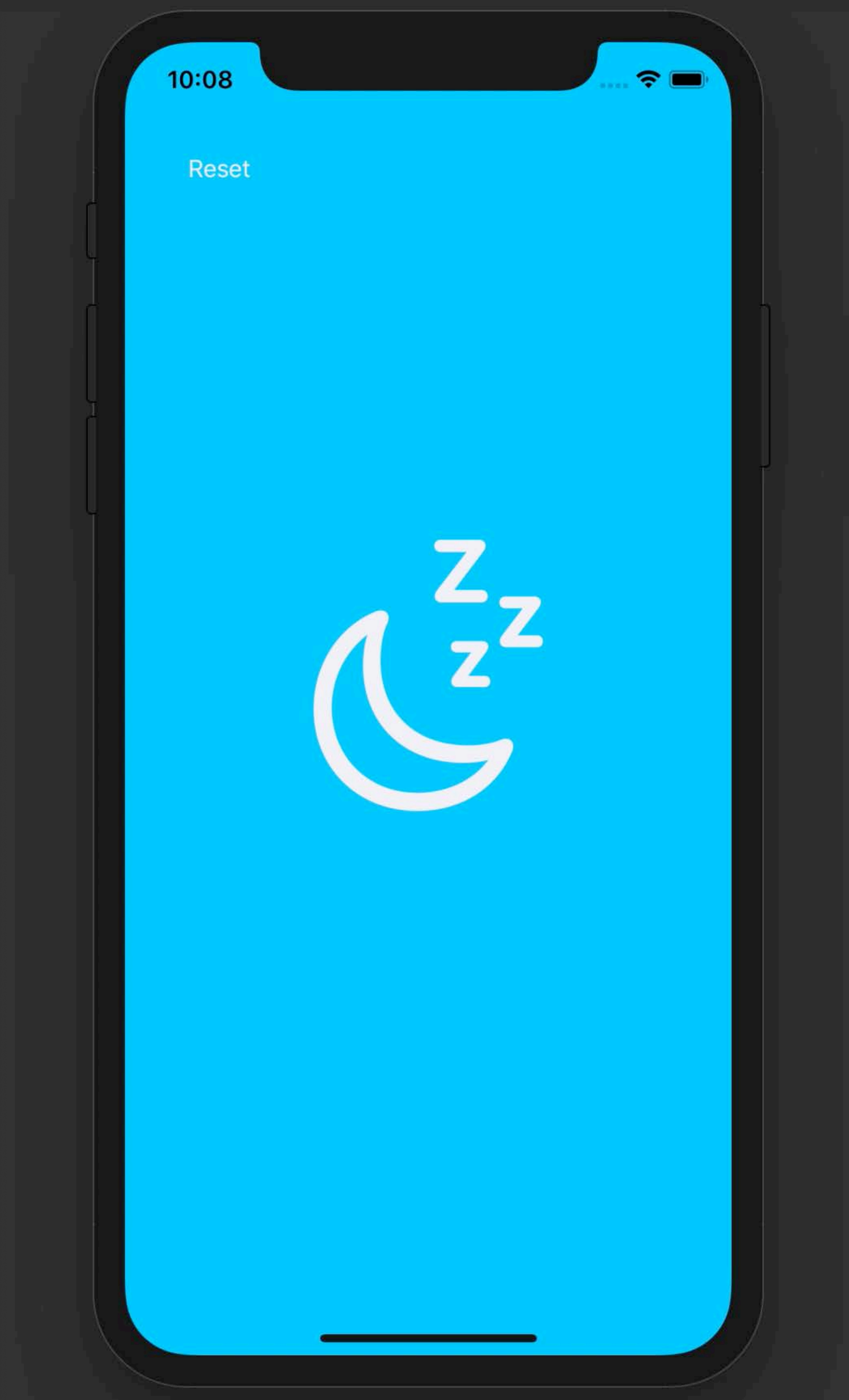
Day Week **Month** Year 🔍 +

Sun	Mon	Tue	Wed	Thu	Fri	Sat
2	3	4	5	6	7	8
	WWDC	Eid al-Fitr				
9	10	11	12	13	14	15
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16	17	18	19	20	21	22
Father's Day			Juneteenth			John Appleseed's 39th Bi...
23	24	25	26	27	28	29
30						

Today Calendars Inbox

Can I use Shake Gestures?





How do I get other simulators
to show as deployment targets?



Welcome to Xcode

Version 11.0 beta (11M336w)



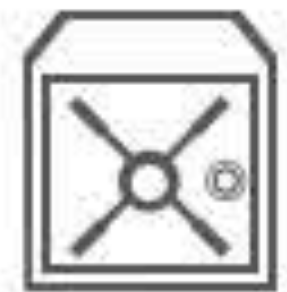
Get started with a playground

Explore new ideas quickly and easily.



Create a new Xcode project

Create an app for iPhone, iPad, Mac, Apple Watch, or Apple TV.



Clone an existing project

Start working on something from a Git repository.

- Minimize ⌘M
- Zoom
- Tile Window to Left of Screen
- Tile Window to Right of Screen
- Rename Tab... ⌘⇧T
- Show Previous Tab ⌘⇧←
- Show Next Tab ⌘⇧→
- Move Tab to New Window
- Merge All Windows
- Developer Documentation ⌘⇧0
- Welcome to Xcode ⌘⇧1
- Devices and Simulators ⌘⇧2**
- Organizer ⌘⇧O
- Show Touch Bar ⌘⇧8
- Bring All to Front

No R

Open another project...



Welcome to Xcode

Version 11.0 beta (11M336w)



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- Devices and Simulators ⌘⇧2**
- Organizer ⌘⇧O
- Show Touch Bar ⌘⇧8
- Bring All to Front


Device


 iPhone


Build Only Device


 Generic iOS Device

iOS Simulators


 iPad Air (3rd generation)

 iPad Pro (9.7-inch)


 iPad Pro (11-inch)


 iPad Pro (12.9-inch) (3rd generation)

 iPhone 8

 iPhone 8 Plus

 iPhone Xs

✓  iPhone Xs Max

 iPhone XR

Add Additional Simulators...

Connected

AppleTV

iPhone

iPad


Devices | **Simulators**

iPhone

iOS 13.0 (17A5492t)
Model: iPhone XR
Capacity: 113.94 GB (108.81 GB available)
Serial Number: C7CX600KKWR6
Identifier: 00008020-00...0D993600013A

Show as run destination
 Connect via network

Take Screenshot
View Device Logs
Open Console



PAIRED WATCHES

Name	Model	watchOS	Identifier
Apple Watch	Apple Watch Series 3 (GPS +...)	6.0 (17R5491t)	7f168a1dd04078...

INSTALLED APPS

Name	Version	Identifier
No apps installed		





+ - | ⚙️

DEVICE CONDITIONS

+ Filter

Devices Simulators

Connected

-  AppleTV 
-  iPhone
-  iPad

+

iPhone


iOS 13.0 (17A5492t)
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Apple Watch	Apple Watch Series 3 (GPS +...)	6.0 (17R5491t)	7f168a1dd04078...

INSTALLED APPS

Name	Version	Identifier
No apps installed		

+ - 

DEVICE CONDITIONS



Devices

Simulators

iOS

iPad Air (3rd gener...

iPad Pro (9.7-inch)

iPad Pro (11-inch)

iPad Pro (12.9-inch...)

iPhone 8

iPhone 8 Plus

iPhone Xs

iPhone Xs Max

iPhone XR

tvOS

Apple TV

Apple TV 4K

Apple TV 4K (at 10...



Filter

iPhone Xs Max

iOS 13.0 (17A5492t)

Model: iPhone Xs Max

Identifier: 4004E59C-C2...20EC8CE70192

Show as run destination



PAIRED WATCHES

Name	Model	watchOS	Identifier
Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...

+ -



Devices

Simulators

iOS

iPad Air (3rd gener...

iPad Pro (9.7-inch)

iPad Pro (11-inch)

iPad Pro (12.9-inch...

iPhone 8

iPhone 8 Plus

iPhone Xs

iPhone Xs Max

iPhone XR

tvOS

Apple TV

Apple TV 4K

Apple TV 4K (at 10...



Filter

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iOS 13.0 (17A5492t)

Model: iPhone Xs Max

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Show as run destination



PAIRED WATCHES

Name	Model	watchOS	Identifier
Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...

+ -

Devices Simulators

ios

- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-)
- iPad Pro (12.9)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)

+ Filter

Create a new simulator:

Simulator Name:

Device Type: iPhone Xr


OS Version: iOS 13.0

Paired Apple Watch

Cancel Previous Create

Identifier

987D919A-46F2...



Devices Simulators

iOS

- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-)
- iPad Pro (12.9)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)

+ Filter

Create a new simulator:

Simulator Name:

Device Type: iPhone XR


OS Version: iOS 13.0

Paired Apple Watch

Cancel Previous Create

Identifier

987D919A-46F2...



Create a new simulator:

Cancel

Simulator Name

Device Type

OS Version

- iPad Pro (9.7-inch)
- iPad Pro (12.9-inch)
- iPad (5th generation)
- iPad Pro (12.9-inch) (2nd generation)
- iPad Pro (10.5-inch)
- iPad (6th generation)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch) (3rd generation)
- ✓ iPad mini (5th generation)
- iPad Air (3rd generation)
- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)
- Apple Watch - 38mm
- Apple Watch - 42mm
- Apple Watch Series 2 - 38mm
- Apple Watch Series 2 - 42mm
- Apple Watch Series 3 - 38mm
- Apple Watch Series 3 - 42mm
- Apple Watch Series 4 - 40mm
- Apple Watch Series 4 - 44mm

ios

- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-
- iPad Pro (12.
- iPhone 8
- iPhone 8 Plu
- iPhone Xs
- iPhone Xs M
- iPhone XR

tvOS


- Apple TV
- Apple TV 4K
- Apple TV 4K (at 10...

+ Filter

Identifier

987D919A-46F2...

Create



Create a new simulator:

Simulator Name

Device Type

OS Version

Cancel

Create

Identifier

987D919A-46F2...

ios


- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-)
- iPad Pro (12.9)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 10...)

+ Filter

- iPad Pro (9.7-inch)
- iPad Pro (12.9-inch)
- iPad (5th generation)
- iPad Pro (12.9-inch) (2nd generation)
- iPad Pro (10.5-inch)
- iPad (6th generation)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch) (3rd generation)
- ✓ iPad mini (5th generation)
- iPad Air (3rd generation)
- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)
- Apple Watch - 38mm
- Apple Watch - 42mm
- Apple Watch Series 2 - 38mm
- Apple Watch Series 2 - 42mm
- Apple Watch Series 3 - 38mm
- Apple Watch Series 3 - 42mm
- Apple Watch Series 4 - 40mm
- Apple Watch Series 4 - 44mm



Devices Simulators

ios

- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-)
- iPad Pro (12.9)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)

+ Filter

Create a new simulator:

Simulator Name:


Device Type: iPad mini (5th generation)

OS Version: iOS 13.0

Cancel Previous Create

Identifier

987D919A-46F2...



Devices Simulators

iOS

- iPad Air (3rd)
- iPad Pro (9.7)
- iPad Pro (11-)
- iPad Pro (12.9)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)

+ Filter

Create a new simulator:

Simulator Name:


Device Type:

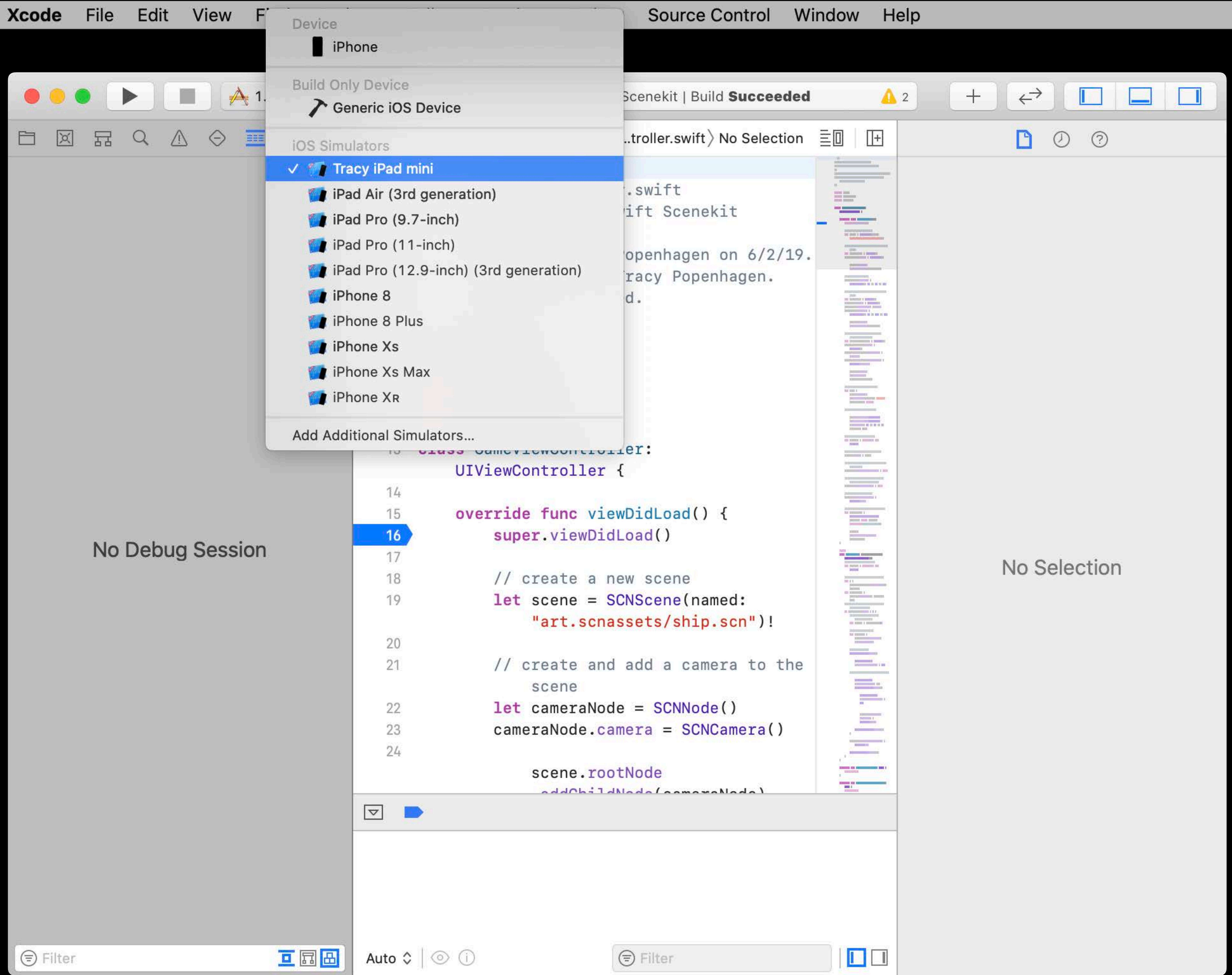
OS Version:

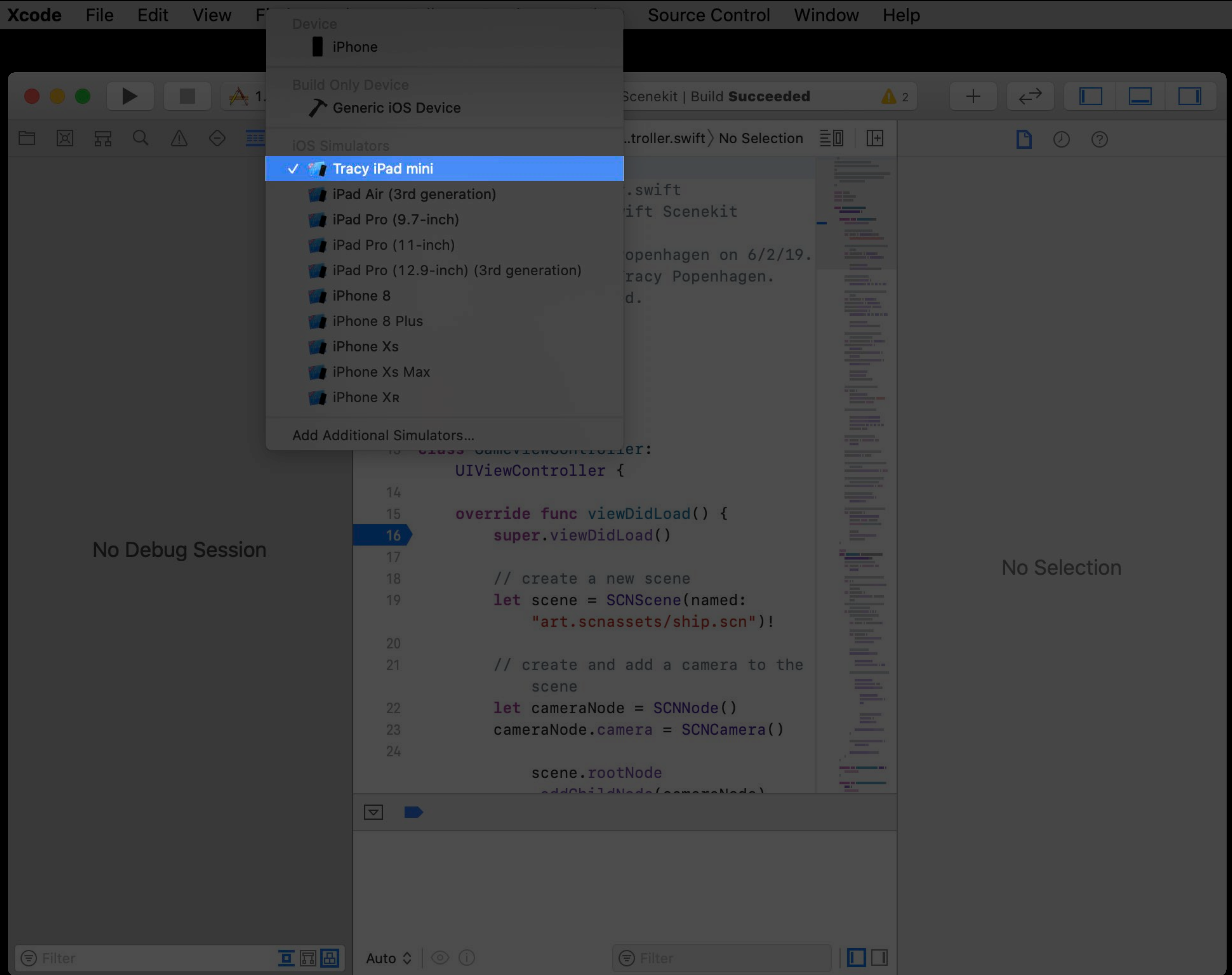
Cancel Previous **Create**

Identifier

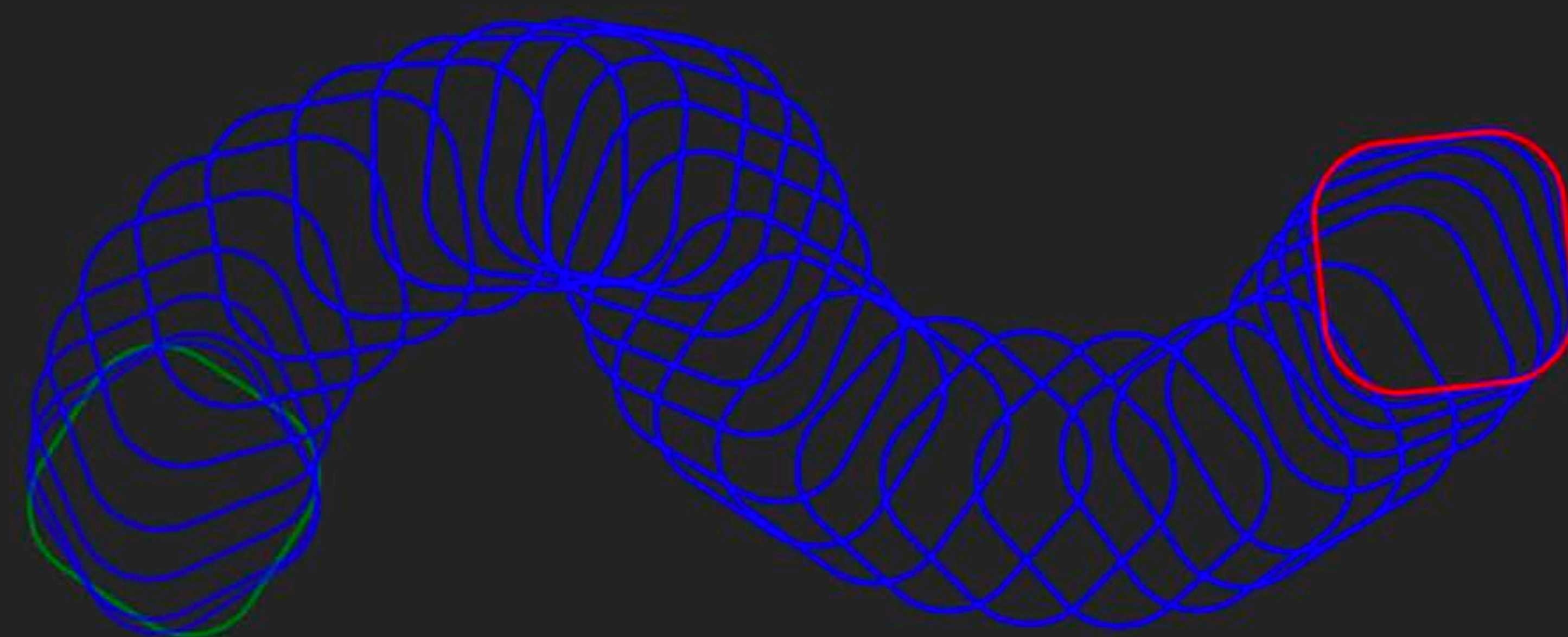
987D919A-46F2...







Hello, World!



nodes:33 60.0 fps



Devices

Simulators

iOS

- Tracy iPad mini
- iPad Air (3rd gener...)
- iPad Pro (9.7-inch)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch...)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max**
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K



Filter

iPhone Xs Max

iOS 13.0 (17A5492t)

Model: iPhone Xs Max

Identifier: 4004E59C-C2...20EC8CE70192

Show as run destination



PAIRED WATCHES

Name	Model	watchOS	Identifier
Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...

+ -



Devices

Simulators

iOS

- Tracy iPad mini
- iPad Air (3rd gener...)
- iPad Pro (9.7-inch)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch...)
- iPhone 8
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- iPhone Xs
- iPhone Xs Max**
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K



Filter

iPhone Xs Max

iOS 13.0 (17A5492t)

Model: iPhone Xs Max

Identifier: 4004E59C-C2...20EC8CE70192

Show as run destination



PAIRED WATCHES

Name	Model	watchOS	Identifier
Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...
+ —			

Devices Simulators

ios

- Tracy iPad m
- iPad Air (3rd
- iPad Pro (9.7
- iPad Pro (11-
- iPad Pro (12.
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max**
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K

+ Filter

Pair an Apple Watch simulator with iPhone Xs Max:

Paired Simulator Name:


Device Type:

OS Version:

Cancel Previous **Pair**

Identifier

987D919A-46F2...



Devices Simulators

ios

- Tracy iPad m
- iPad Air (3rd
- iPad Pro (9.7
- iPad Pro (11-
- iPad Pro (12.
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max**
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K

+ Filter

Pair an Apple Watch simulator with iPhone Xs Max:

Paired Simulator Name:


Device Type:

OS Version:

Cancel Previous **Pair**

Identifier

987D919A-46F2...



Devices Simulators

iOS

- Tracy iPad mini
- iPad Air (3rd gener...)
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- iPhone XR

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+ Filter

iPhone Xs Max

iOS 13.0 (17A5492t) Show as run destination

Model: iPhone Xs Max
Identifier: 4004E59C-C2...20EC8CE70192



PAIRED WATCHES

Name	Model	watchOS	Identifier
<input type="radio"/> Apple Watch Series 2 - 38mm	Apple Watch Series 2 - 38...	6.0 (17R5491t)	8D26B652-A78...
<input checked="" type="radio"/> Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...

+ -

Devices Simulators

iOS

- Tracy iPad mini
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PAIRED WATCHES

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<input checked="" type="radio"/> Apple Watch Series 4 - 44mm	Apple Watch Series 4 - 44...	6.0 (17R5491t)	987D919A-46F2...

+ -

Components

General Accounts Behaviors Navigation Fonts & Colors Text Editing Key Bindings Source Control Components Locations Server & Bots

Simulators

Simulator	Size
⬇ iOS 12.1 Simulator	2.49 GB
⬇ iOS 12.0 Simulator	2.4 GB
⬇ iOS 11.4 Simulator	2.14 GB
⬇ iOS 11.3 Simulator	2.14 GB
⬇ iOS 11.2 Simulator	2.11 GB
⬇ iOS 11.1 Simulator	2.1 GB
⬇ iOS 11.0 Simulator	2.09 GB
⬇ iOS 10.3.1 Simulator	1.98 GB
⬇ iOS 10.2 Simulator	1.93 GB
⬇ iOS 10.1 Simulator	1.9 GB
⬇ iOS 10.0 Simulator	1.89 GB
⬇ iOS 9.3 Simulator	1.53 GB
⬇ iOS 9.2 Simulator	1.49 GB


Check for and install simulator updates automatically

Check and Install Now

Components

General Accounts Behaviors Navigation Fonts & Colors Text Editing Key Bindings Source Control Components Locations Server & Bots

Simulators

Simulator	Size
⬇️ iOS 12.1 Simulator	2.49 GB
⬇️ iOS 12.0 Simulator	2.4 GB
⬇️ iOS 11.4 Simulator	2.14 GB
⬇️ iOS 11.3 Simulator	2.14 GB
⬇️ iOS 11.2 Simulator	2.11 GB
⬇️ iOS 11.1 Simulator	2.1 GB
🌀 iOS 11.0 Simulator 	2.09 GB
⬇️ iOS 10.3.1 Simulator	1.98 GB
⬇️ iOS 10.2 Simulator	1.93 GB
⬇️ iOS 10.1 Simulator	1.9 GB
⬇️ iOS 10.0 Simulator	1.89 GB
⬇️ iOS 9.3 Simulator	1.53 GB
⬇️ iOS 9.2 Simulator	1.49 GB

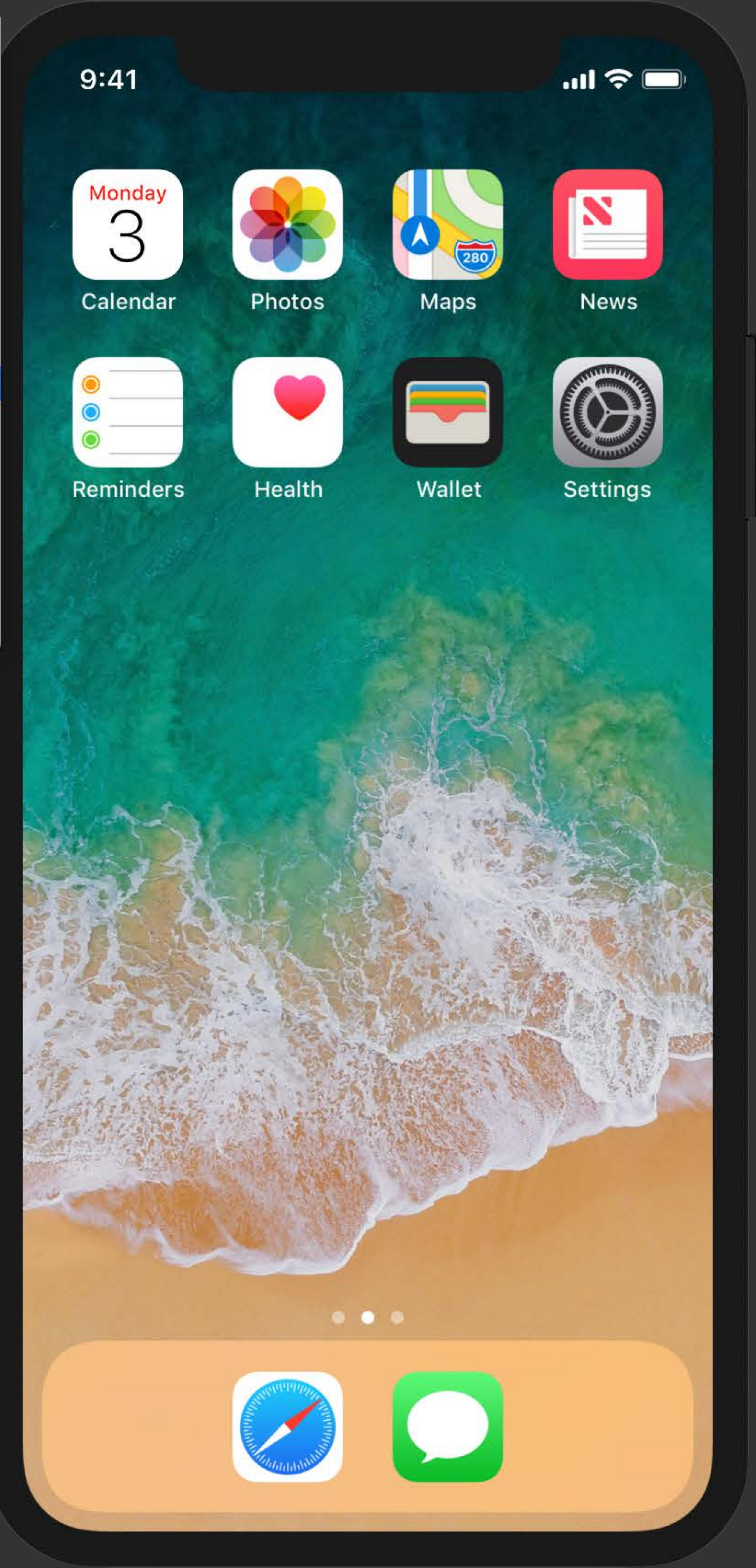
Check for and install simulator updates automatically

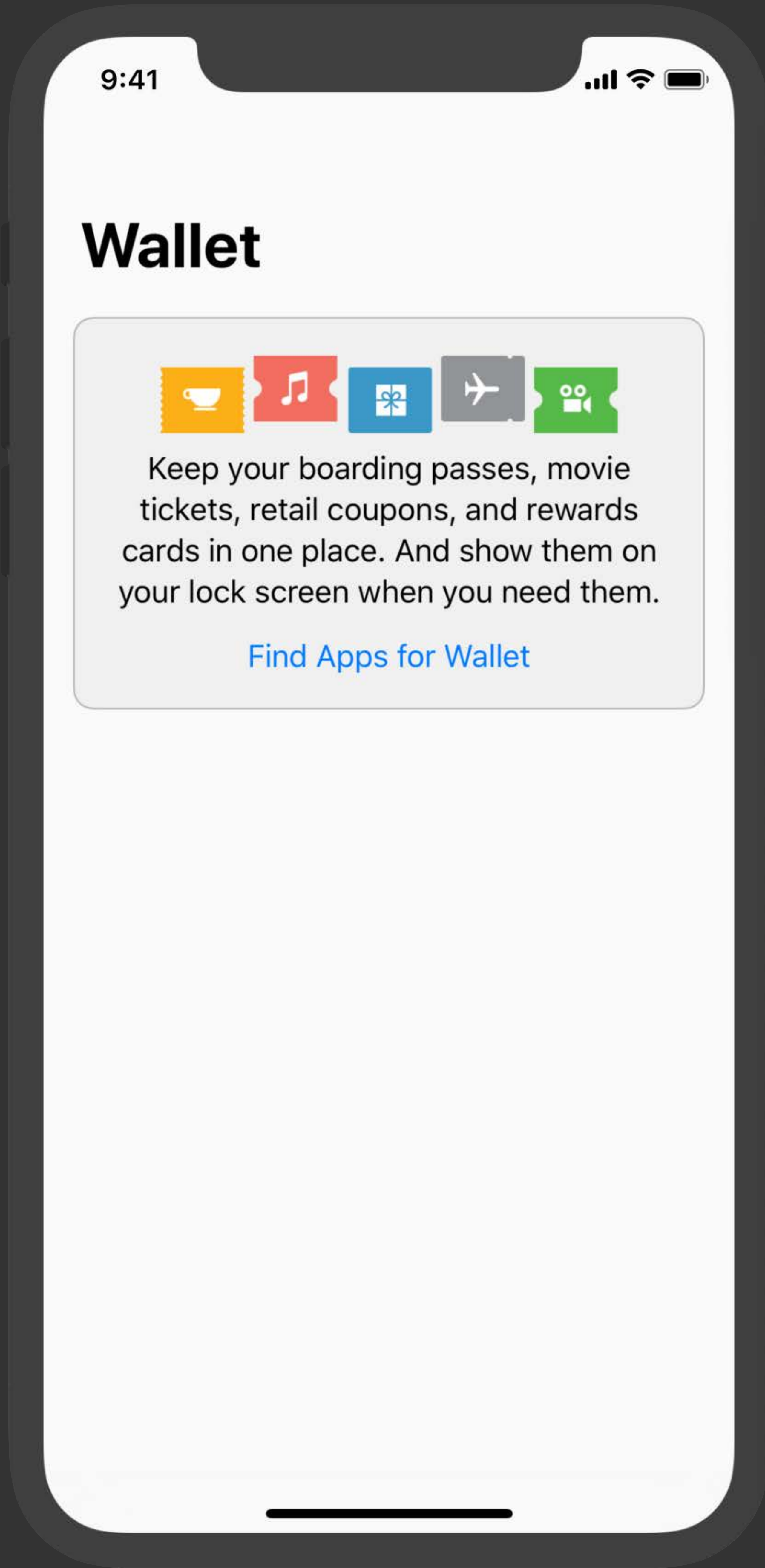
Check and Install Now

- Device ▶
- Restart
- Erase All Content and Settings...
- Rotate Left ⌘←
- Rotate Right ⌘→
- Orientation ▶
- Rotate Device Automatically
- Shake Gesture ^⌘Z
- Home ⌘⇧H
- Lock ⌘L
- Side Button ⌘⇧B
- Siri ⌘⇧⌘H
- Face ID ▶
- Authorize Apple Pay ⌘⇧⌘A
- Show Apple TV Remote ⌘⇧R
- Toggle In-call Status Bar ⌘Y
- Keyboard ▶
- Touch Pressure ▶
- Audio Input ▶
- Audio Output ▶
- Increase Volume ⌘↑
- Decrease Volume ⌘↓
- External Displays ▶

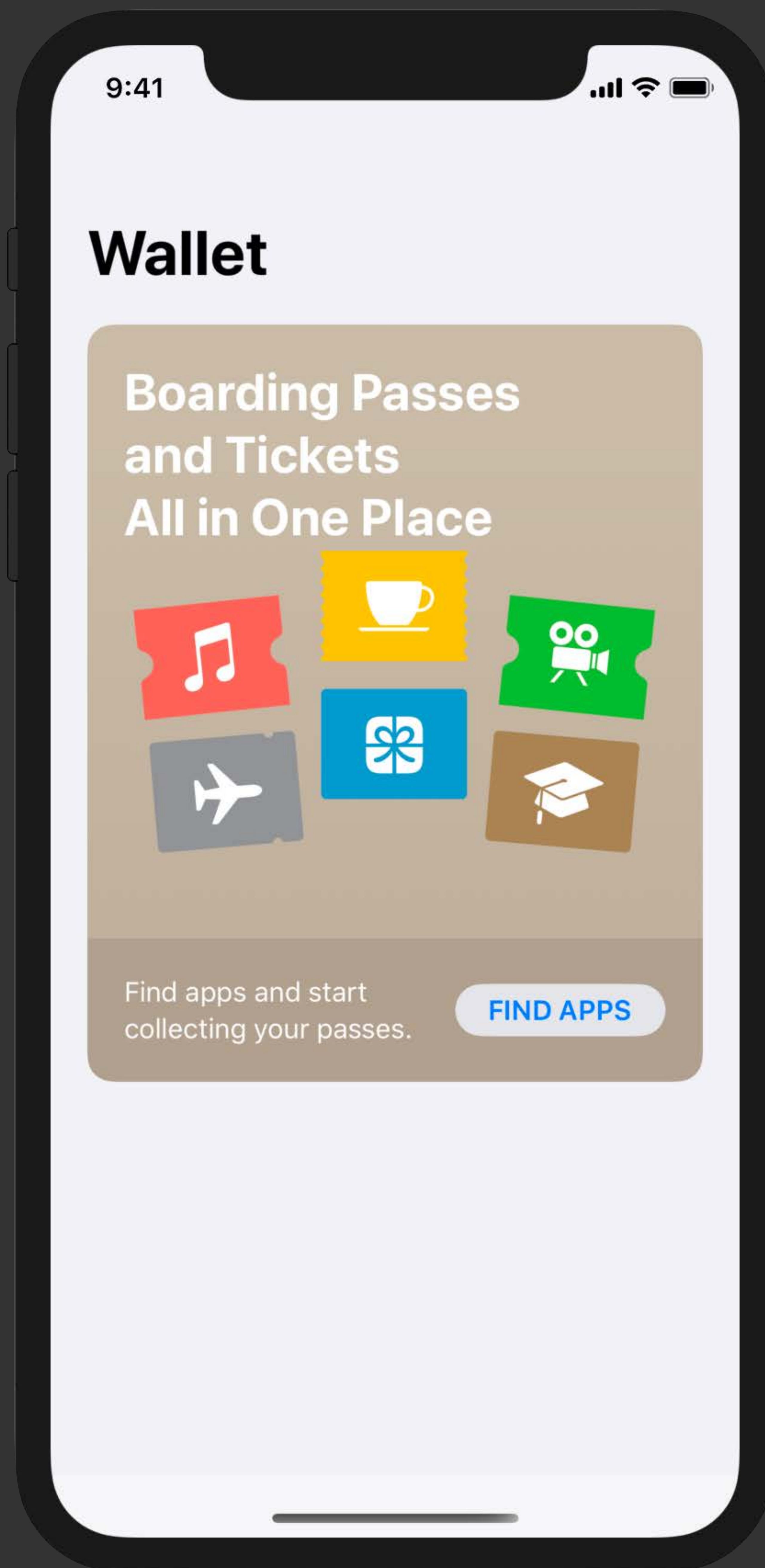
- iOS 11.0 ▶
- iOS 13.0 ▶
- tvOS 13.0 ▶
- watchOS 6.0 ▶
- Manage Devices...

- iPhone 5s
- iPhone 6
- iPhone 6 Plus
- iPhone 6s
- iPhone 6s Plus
- iPhone 7
- iPhone 7 Plus
- iPhone 8
- iPhone 8 Plus
- iPhone SE
- ✓ iPhone X
- iPad Air
- iPad Air 2
- iPad Pro (9.7-inch)
- iPad Pro (12.9-inch)
- iPad (5th generation)
- iPad Pro (12.9-inch) (2nd generation)
- iPad Pro (10.5-inch)





iPhone X — 11.0.1



iPhone X — 13.0

Devices Simulators

iOS

- iPad Air (3rd generati...)
- iPad Pro (9.7-inch)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch) (...)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)


+ Filter

iPad Air (3rd generation)

iOS 13.0 (17A5492t) Show as run destination

Model: iPad Air (3rd generation)

Identifier: D89E4A13-9E...A40E45FFA8E



PAIRED WATCHES

Name	Model	watchOS	Identifier
This simulator does not support paired watches.			

Devices Simulators

iOS

- iPad Air (3rd generati...)
- iPad Pro (9.7-inch)
- iPad Pro (11-inch)
- iPad Pro (12.9-inch) (...)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)


+

Filter

iPad Air (3rd generation)

iOS 13.0 (17A5492t) Show as run destination

Model: iPad Air (3rd generation)
Identifier: D89E4A13-9E...A40E45FFA8E



PAIRED WATCHES

Name	Model	watchOS	Identifier
This simulator does not support paired watches.			

Devices

Simulators

iOS

-  iPad Air (3rd generati...
-  iPad Pro (9.7-inch)
-  iPad Pro (11-inch)
-  iPad Pro (12.9-inch) (...)
-  iPhone 8
-  iPhone 8 Plus
-  iPhone Xs
-  iPhone Xs Max
-  iPhone XR

tvOS

-  Apple TV
-  Apple TV 4K
-  Apple TV 4K (at 1080p)



Filter



Are you sure you want to delete 'iPad Air (3rd generation)'?

All of the installed content and settings in this simulator will also be deleted.

Cancel

Delete



PAIRED WATCHES

Name	Model	watchOS	Identifier
------	-------	---------	------------

This simulator does not support paired watches.

Devices Simulators

ios

- iPad Air (3rd generation)
- iPad Pro (12.9-inch) (3rd generation)
- iPad Pro (11-inch) (3rd generation)
- iPad Pro (10.5-inch) (3rd generation)
- iPhone 8
- iPhone 8 Plus
- iPhone Xs
- iPhone Xs Max
- iPhone XR

tvOS

- Apple TV
- Apple TV 4K
- Apple TV 4K (at 1080p)

generation)

generation)

3-9E...A40E45FFA8E

Show as run destination

BETA

Copy Name

Copy Identifier

Rename

Delete

Show Provisioning Profiles...

Devices and Simulators Window Help

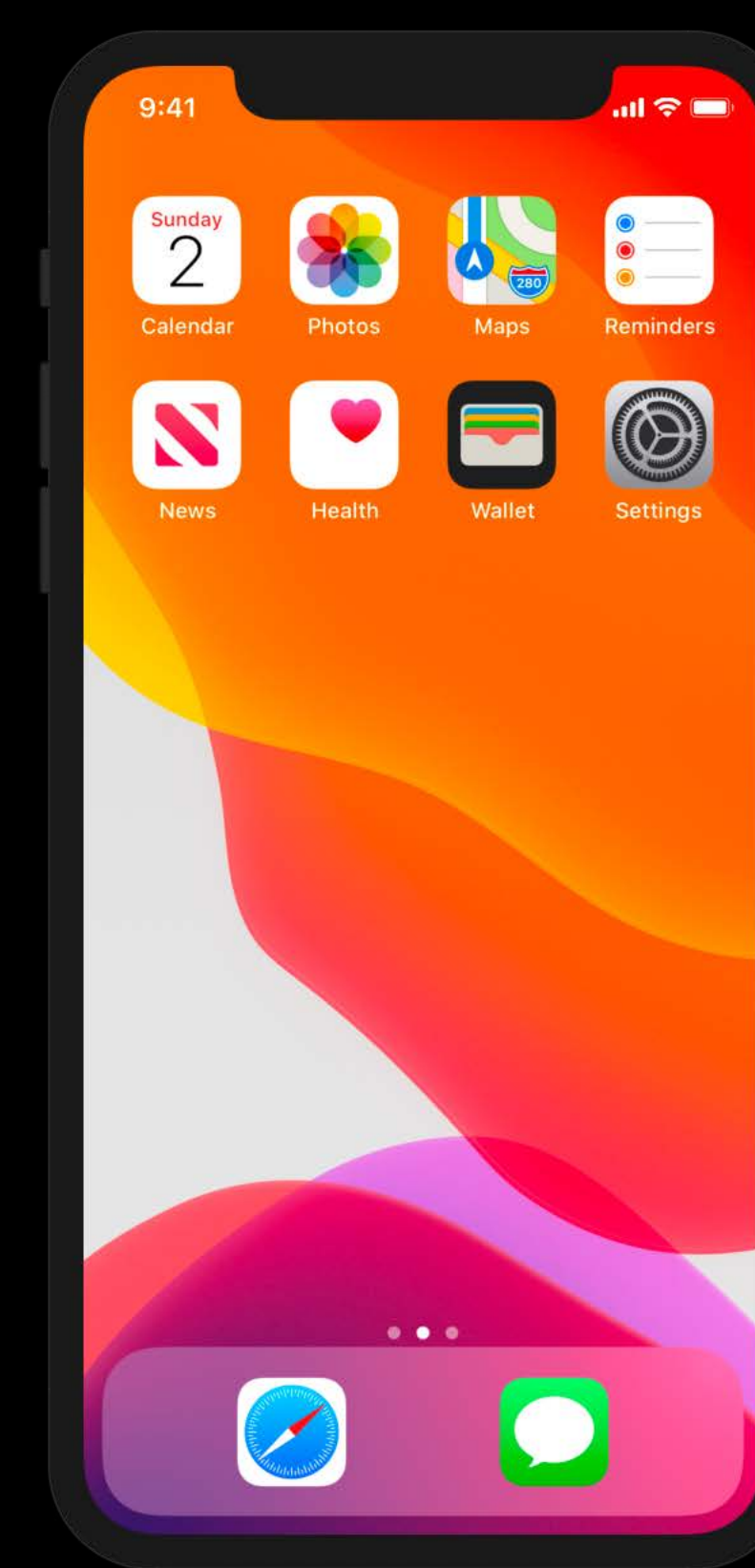
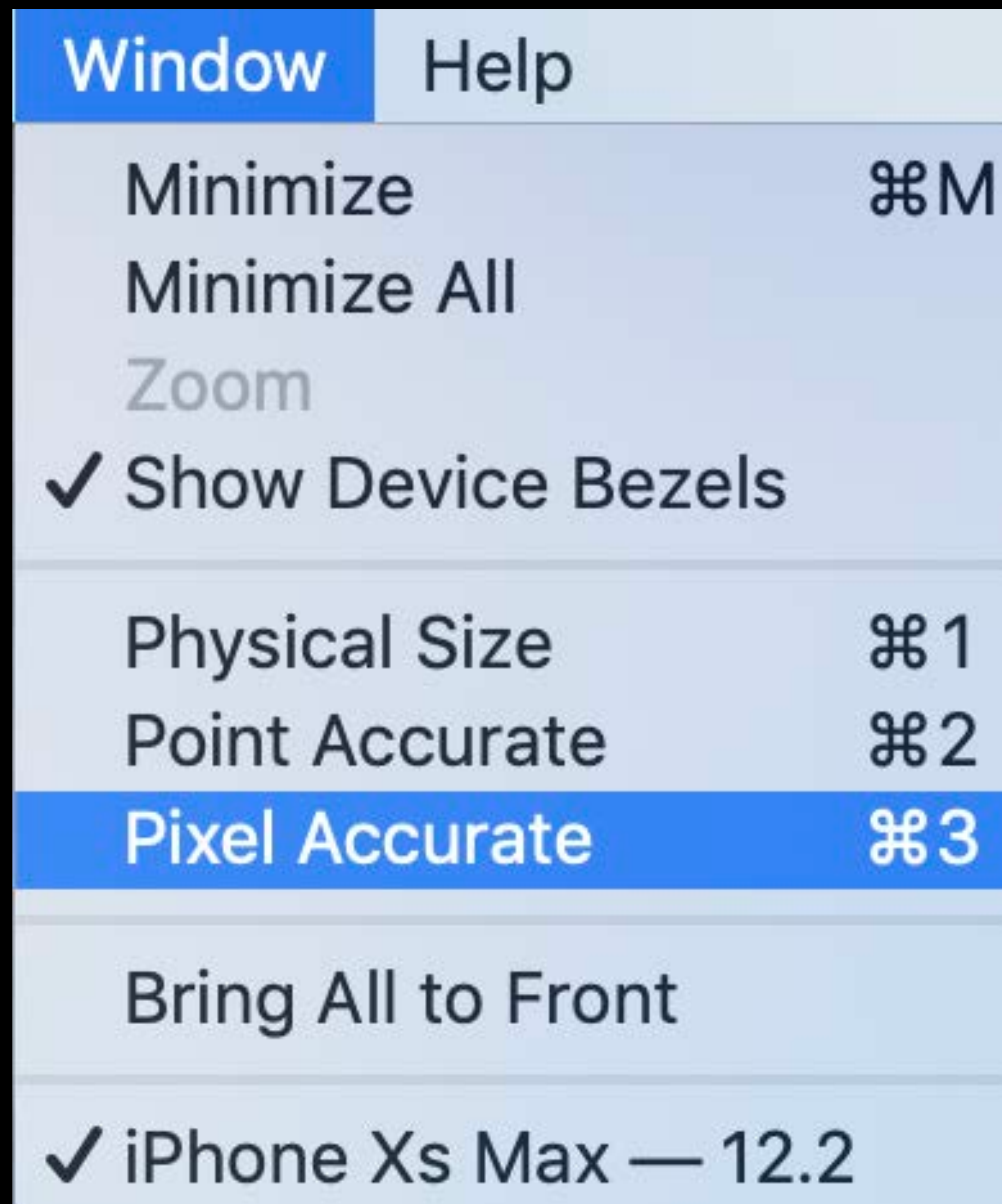
PAIRED WATCHES

Name	Model	watchOS	Identifier
This simulator does not support paired watches.			

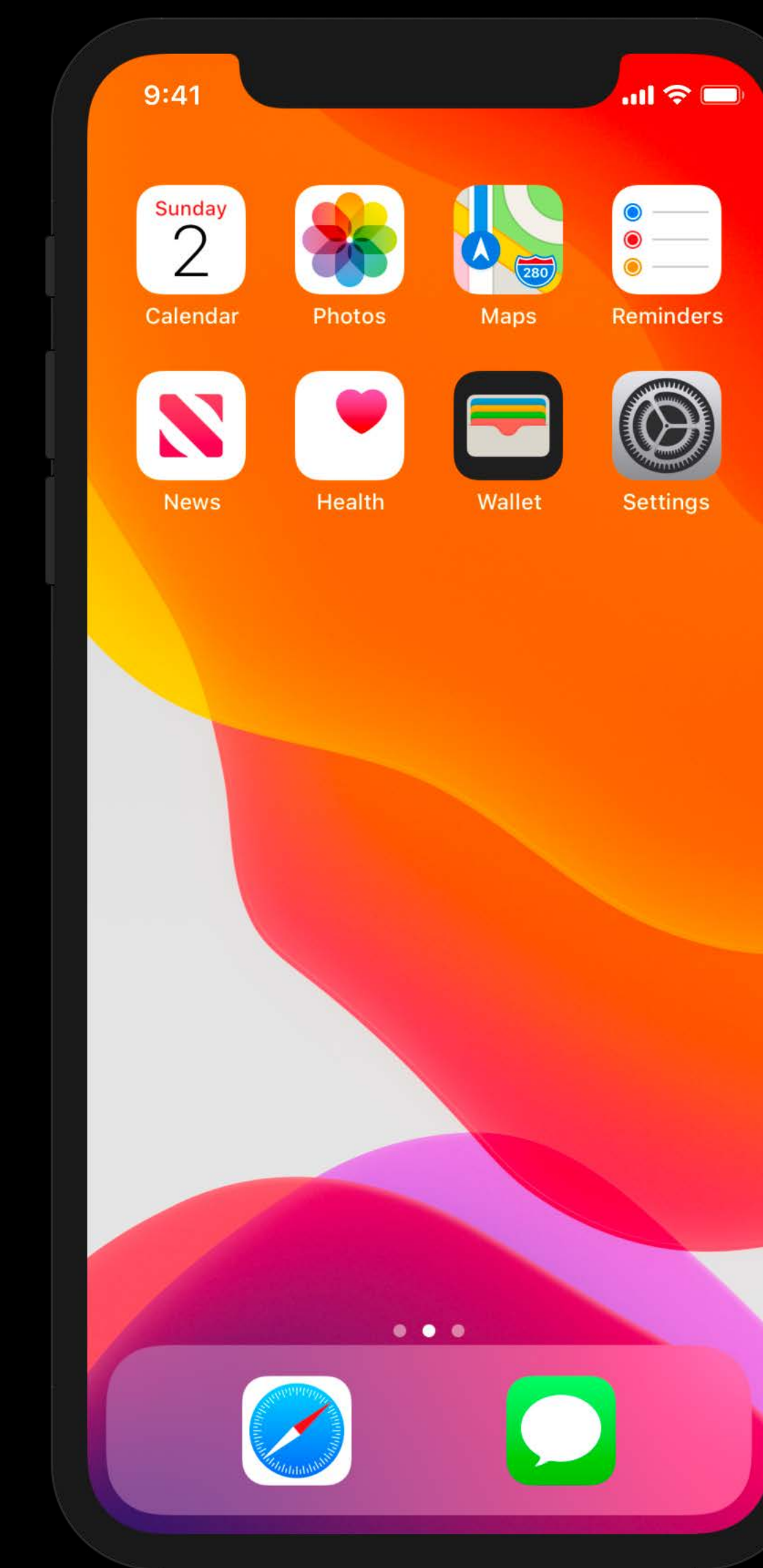
+ Filter

Simulators are overtaking my screen.
Can I make them smaller?

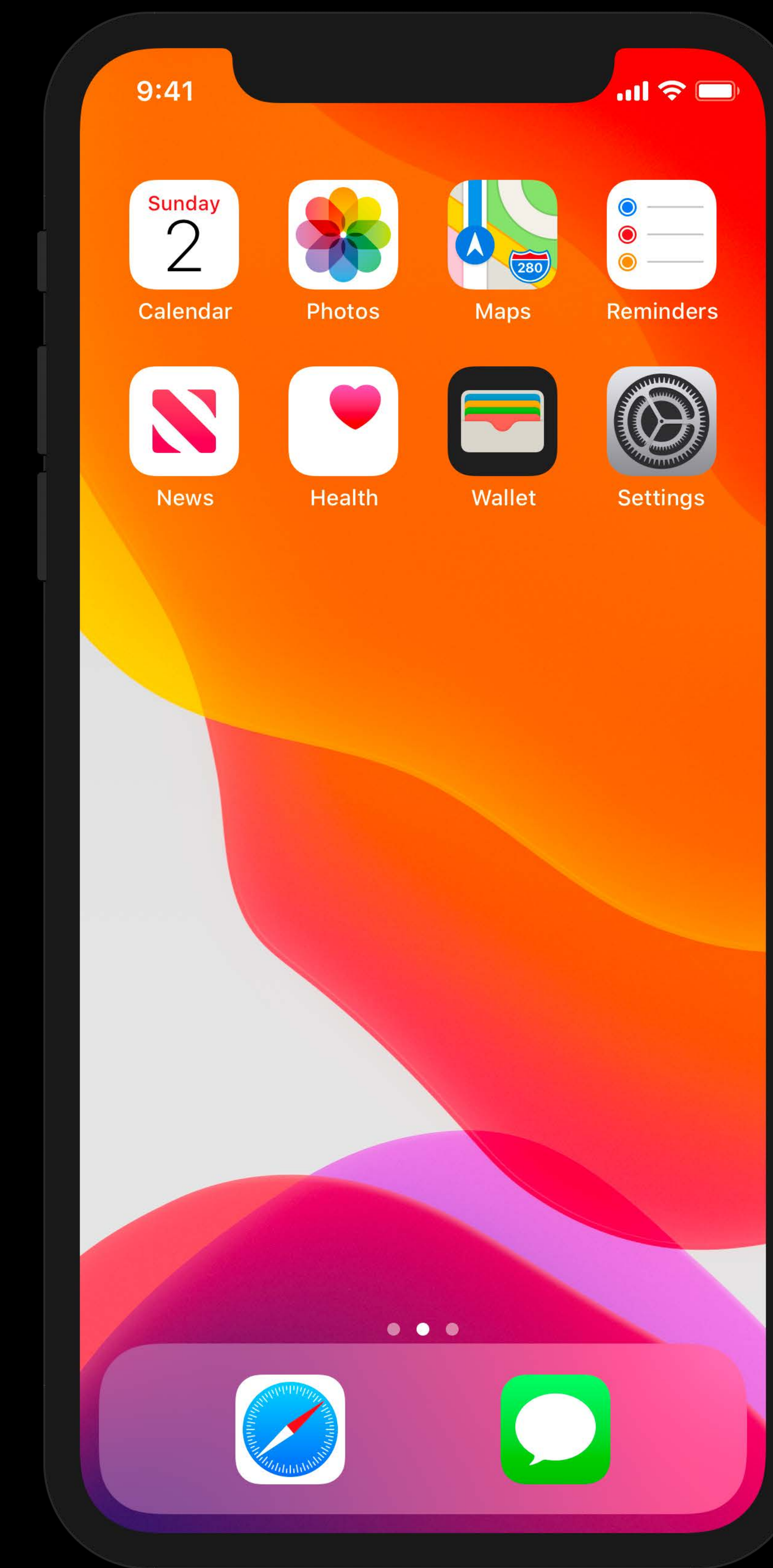
Window Menu of the Simulator



Physical size
of device



1 UIKit point =
1 AppKit point



1 Pixel =
1 Pixel

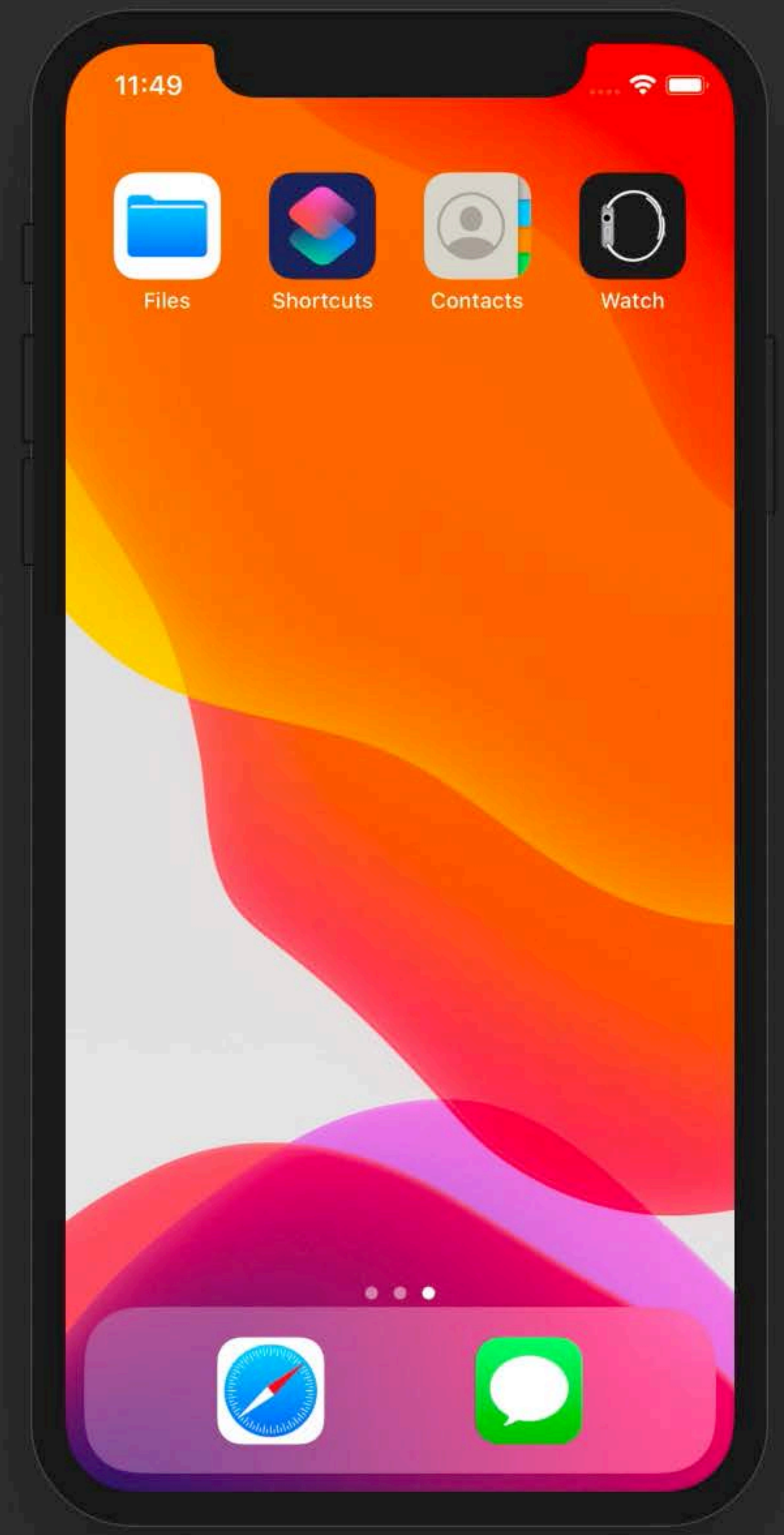


Apple Watch Series 4 - 44mm — 6.0

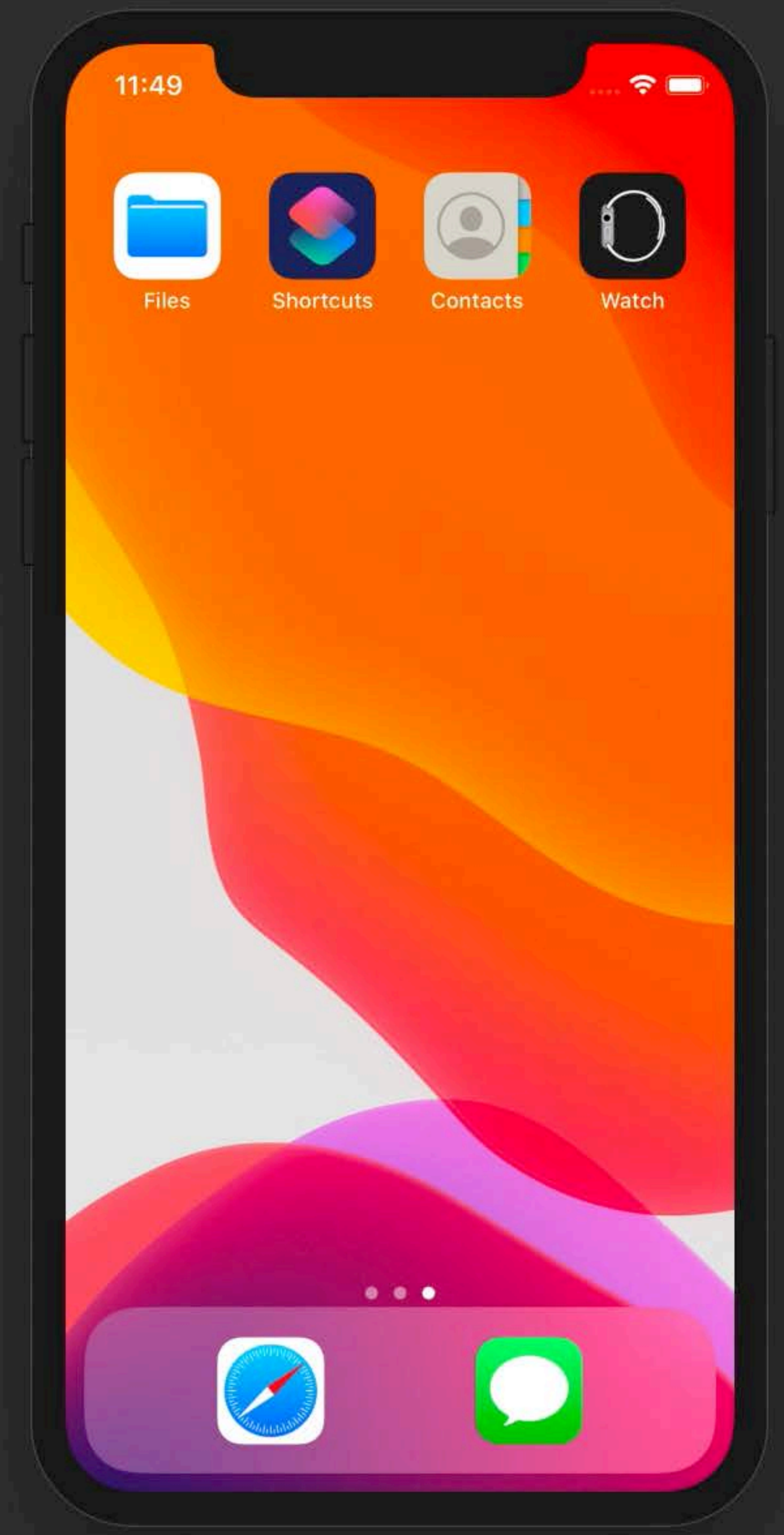


Apple Watch Series 4 - 44mm — 6.0

Can Simulator help me
debug UI animations?



iPhone Xs — 13.0



iPhone Xs — 13.0

Is Siri available in Simulator?



Apple Watch Series 4 - 44mm — 6.0



Apple Watch Series 4 - 44mm — 6.0

How do I control my tvOS Simulator?



+  Mt 60fps

◆ 3 45.55K

Apple TV 4K (at 1080p) — 13.0



+  Mt 60fps


◆ 3 45.55K

Apple TV 4K (at 1080p) — 13.0



Bluetooth

Search






Bluetooth: On

Turn Bluetooth Off

Now discoverable as
"Tracy's iMac"

Devices

- CAB's Trackpad
Connected 
- Magic Keyboard
Connected 
- BigRedButton
Connected


 dc-2b-2a-db-7c-b1 [Connect](#)

Show Bluetooth in menu bar [Advanced...](#) [?](#)



Bluetooth

Search






Bluetooth: On

Turn Bluetooth Off

Now discoverable as
"Tracy's iMac"

Devices

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Connected 
- Magic Keyboard
Connected 
- BigRedButton
Connected

 dc-2b-2a-db-7c-b1 [Connect](#)

Show Bluetooth in menu bar [Advanced...](#) [?](#)

Keyboard for Simple Navigation

Left/right arrows

Return and esc



Apple TV 4K — 13.0

Can I use Xcode 10.2.1 with
iOS 13.0 Simulators?

Xcode 10.x Running with New Simulator.app

If you have Xcode 10.2.1 on the same machine as Xcode 11-Beta

- Launch Xcode 11-Beta and then boot an iOS Simulator
- Leave Simulator.app open while closing Xcode 11-Beta
- Launch Xcode 10.2.1
- Build/run to Simulator

iPhone... (12.2) Finished running spritekit on iPhone Xs

spritekit

- spritekit
 - AppDelegate.swift
 - GameScene.sks
 - Actions.sks
 - GameScene.swift
 - GameViewController.swift
 - Main.storyboard
 - Assets.xcassets

```
1 //
2 // GameViewController.swift
3 // spritekit
4 //
5 // Created by Tracy Popenhagen on 6/2/19.
6 // Copyright © 2019 Tracy Popenhagen. All rights reserved.
7 //
8
9 import UIKit
10 import SpriteKit
```

Identity and Type

Name: GameViewController.swift

Type: Default - Swift Source

Location: Relative to Group

GameViewController.swift

Full Path: /Users/tracypopenhagen/My Testing/spritekit/spritekit/GameViewController.swift

On Demand Resource Tags

Only resources are taggable

Target Membership

spritekit

Text Settings

Text Encoding: No Explicit Encoding

Line Endings: No Explicit Line Endings

Indent Using: Spaces

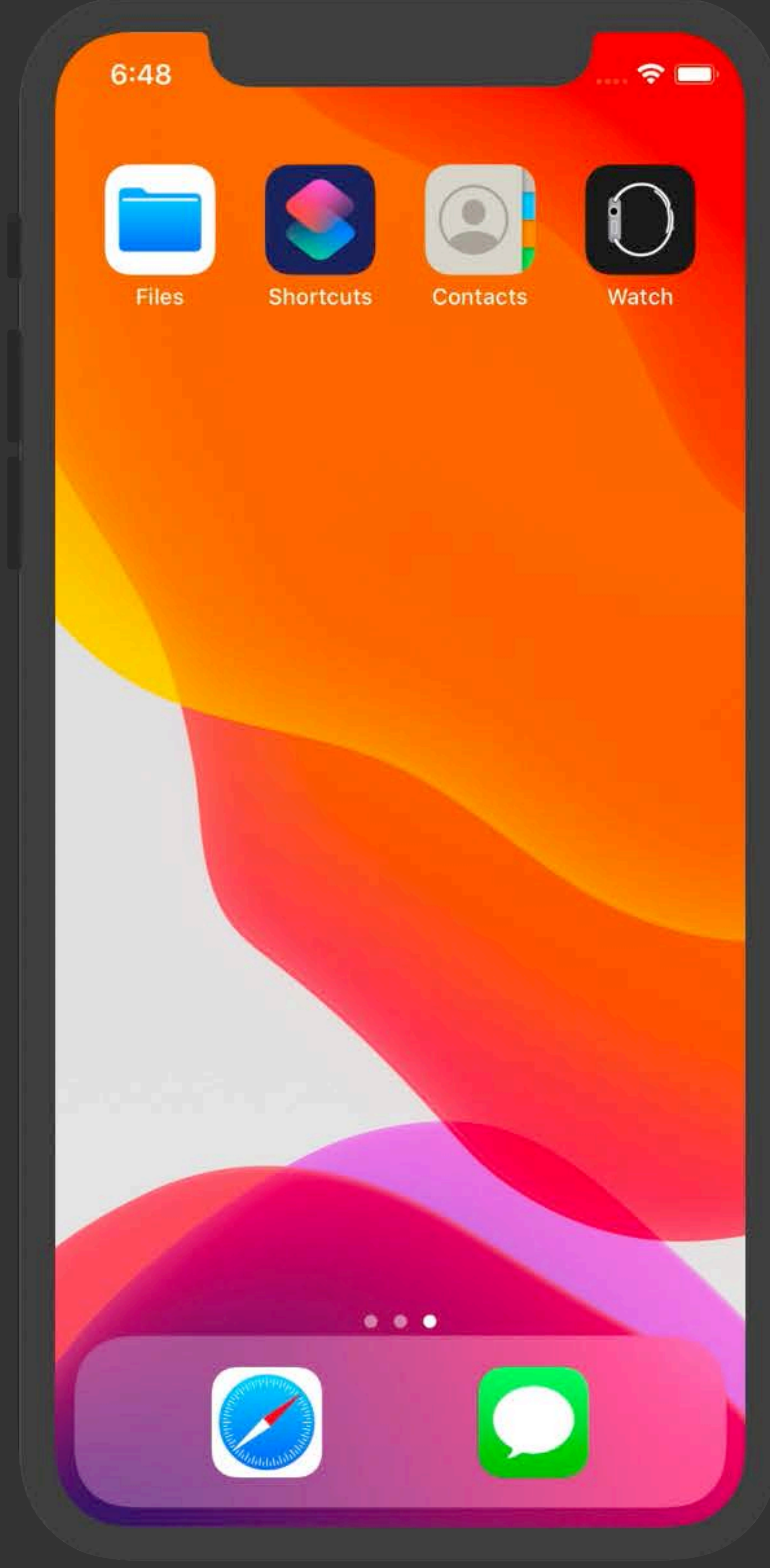
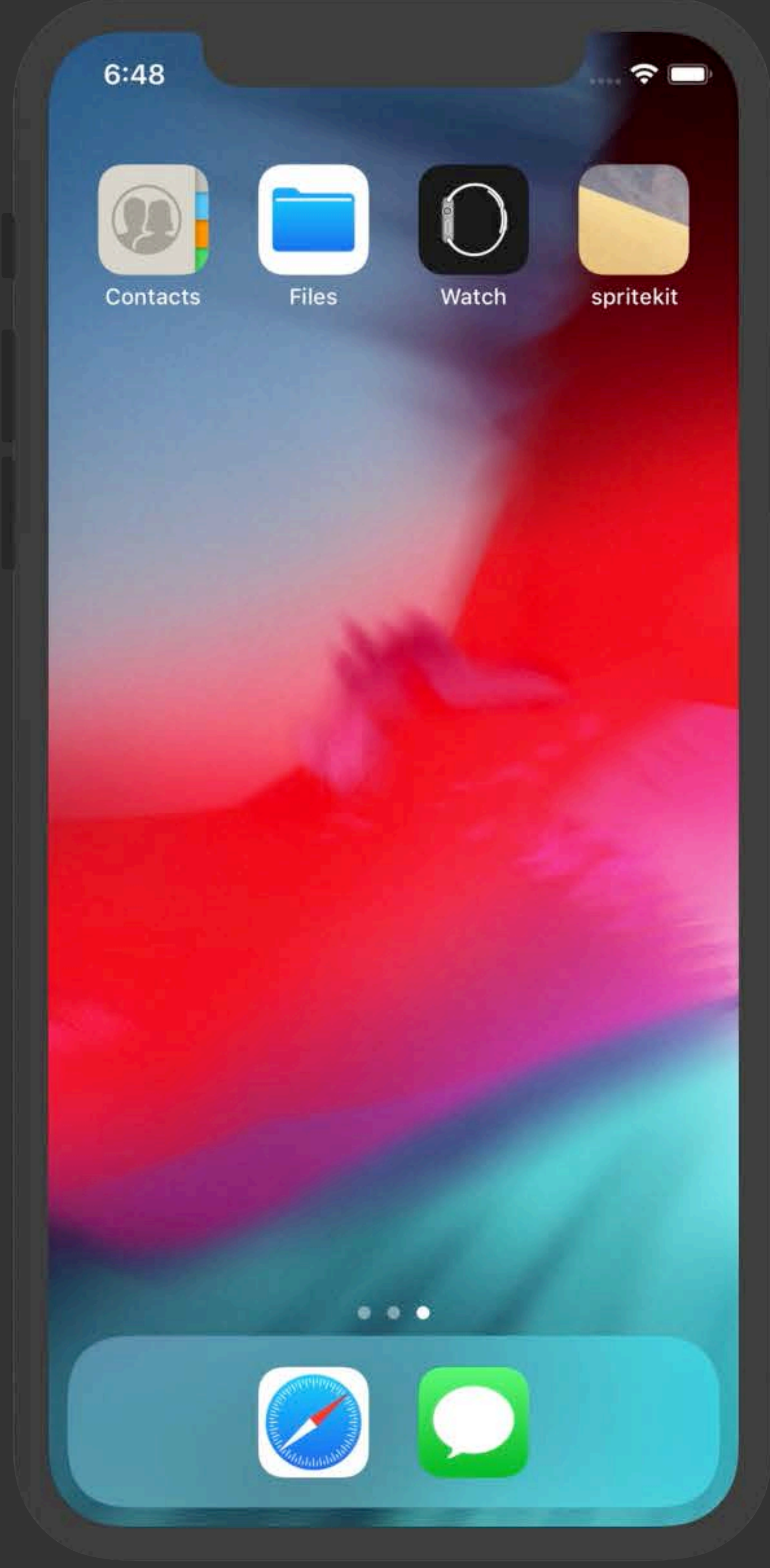
Widths: Tab 4 Indent 4

Wrap lines

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Acknowledgments License Agreement

```
22 scene.scaleMode = .aspectFill
23
24 // Present the scene
25 view.presentScene(scene)
26 }
27
```



iPhone... (12.2) Finished running spritekit on iPhone Xs

spritekit

- spritekit
 - AppDelegate.swift
 - GameScene.sks
 - Actions.sks
 - GameScene.swift
 - GameViewController.swift
 - Main.storyboard
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Target Membership

spritekit

Text Settings

Text Encoding: No Explicit Encoding

Line Endings: No Explicit Line Endings

Indent Using: Spaces

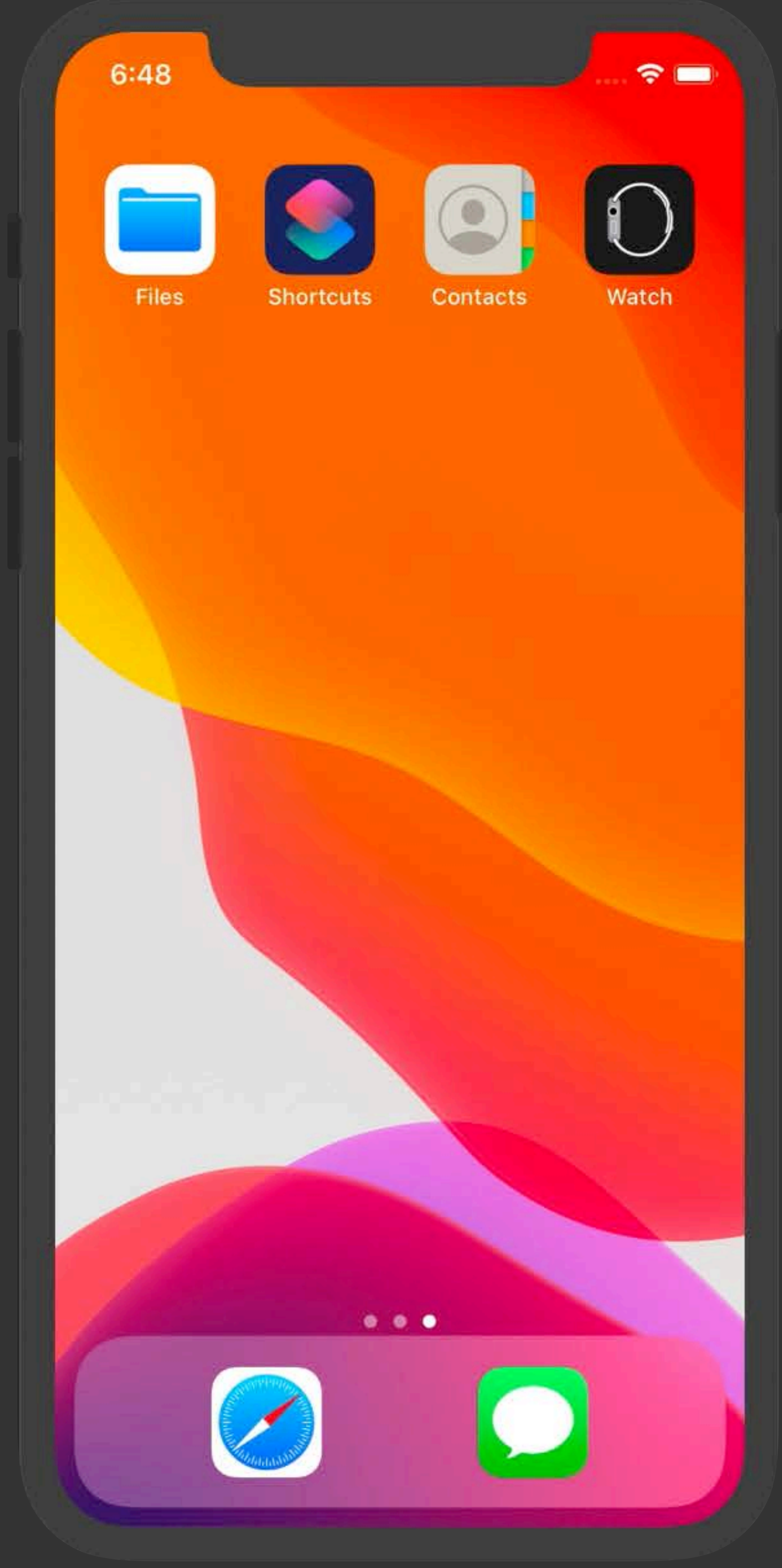
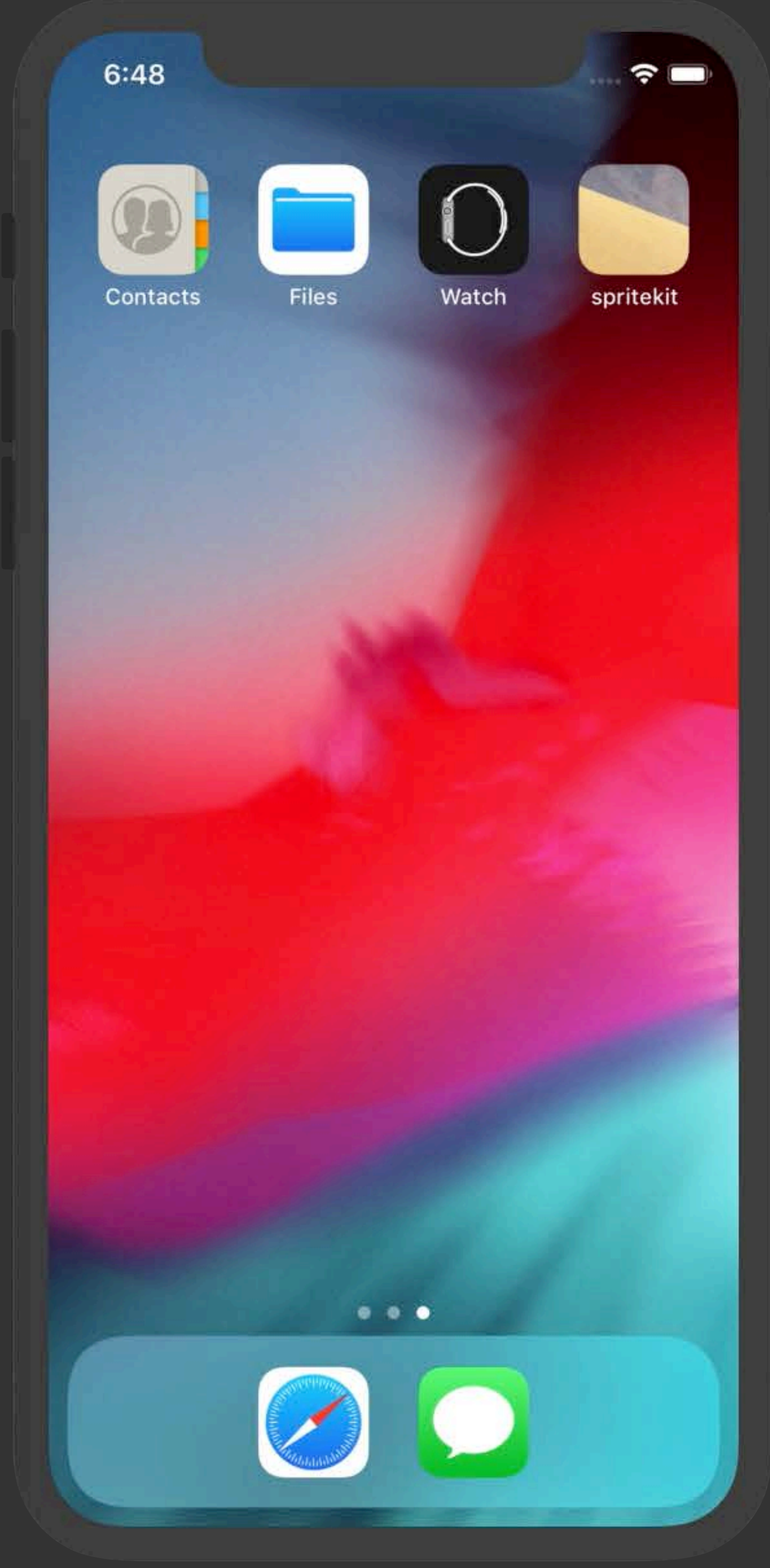
Widths: Tab 4, Indent 4

Wrap lines

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Acknowledgments License Agreement

```
22 scene.scaleMode = .aspectFill
23
24 // Present the scene
25 view.presentScene(scene)
26 }
27
```



Can I copy content to Simulator?

Content Available with Drag and Drop

App bundles

Locations

Photo/image files

Video files

URLs

Shak...ster > iPhone Xs Finished running ShakeMemoryTester on iPhone Xs

Shak...r.swift > No Selection

ShakeMemoryTester

- ShakeMemoryTester
 - AppDelegate.swift
 - ShakeMemoryV...Controller.swift M
 - Main.storyboard M
 - Assets.xcassets M
 - LaunchScreen.storyboard M
 - Info.plist
- Products
 - ShakeMemoryTester.app

```
1 //
2 // ShakeMemoryViewController.swift
3 // ShakeMemoryTester
4 //
5 // Created by Jason Yao on 5/30/19.
6 // Copyright © 2019 Tracy. All rights
  reserved.
7 //
8
9 import UIKit
10
11 class ShakeMemoryViewController:
  UIViewController {
12     @IBOutlet weak var resultImageView:
  UIImageView!
13     @IBOutlet weak var resultLabel:
  UILabel!
14
15     var originalImage : UIImage?
16
17     override func viewDidLoad() {
18         super.viewDidLoad()
19         // Do any additional setup after
```

Identity and Type

Name ShakeMemoryViewController.swift

Type Default - Swift Source

Location Relative to Group

ShakeMemoryViewController.swift

Full Path /Users/tracypopenhagen/Desktop/ShakeMemoryTester/ShakeMemoryTester/ShakeMemoryViewController.swift

On Demand Resource Tags

Only resources are taggable

Target Membership

- ShakeMemoryTester

Text Settings

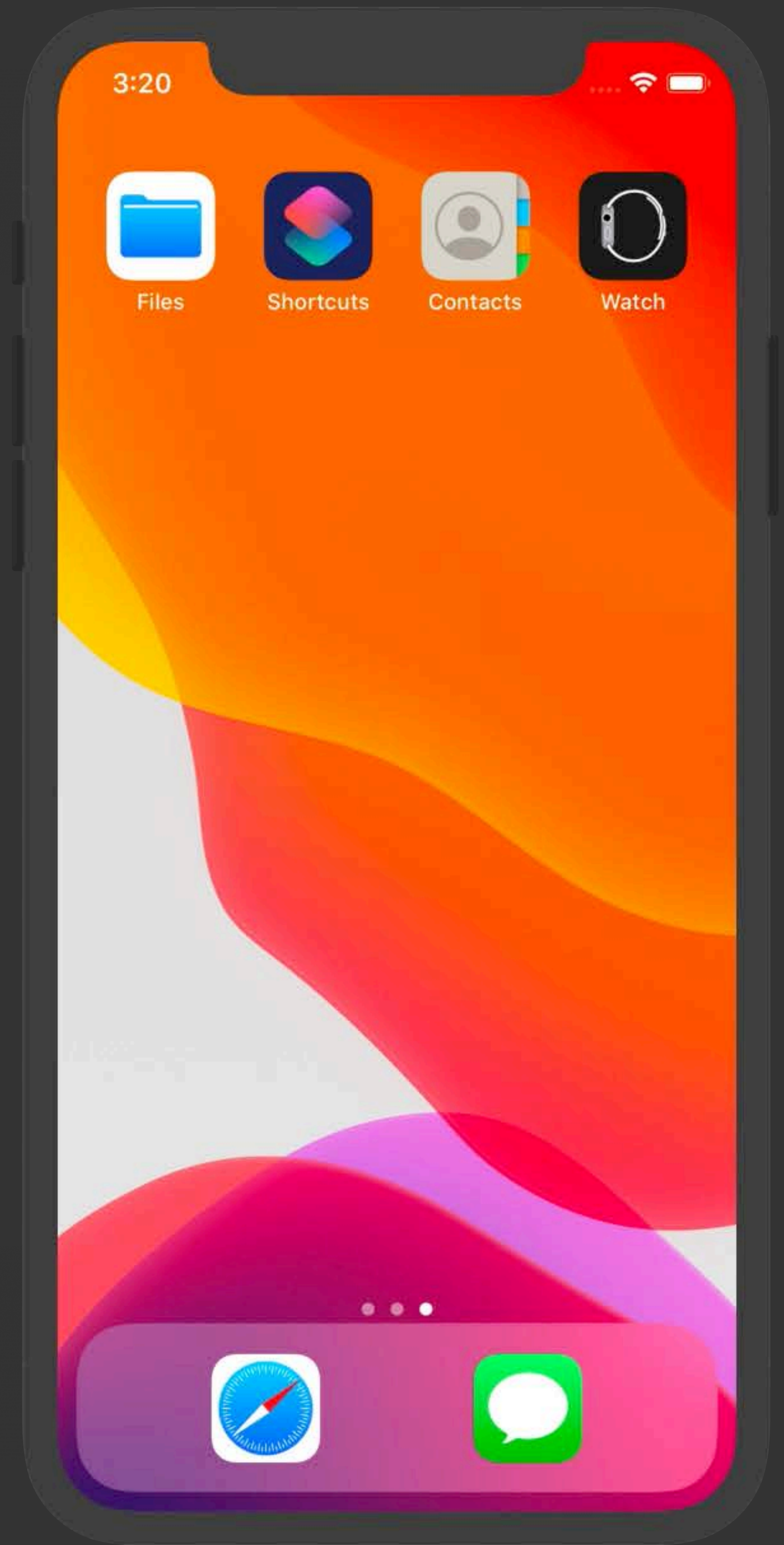
Text Encoding No Explicit Encoding

Line Endings No Explicit Line Endings

Indent Using Spaces

Widths Tab 4 Indent 4

Wrap lines



Shak...ster > iPhone Xs Finished running ShakeMemoryTester on iPhone Xs

Shak...r.swift > No Selection

ShakeMemoryTester

- ShakeMemoryTester
 - AppDelegate.swift
 - ShakeMemoryV...Controller.swift M
 - Main.storyboard M
 - Assets.xcassets M
 - LaunchScreen.storyboard M
 - Info.plist
- Products
 - ShakeMemoryTester.app

```
1 //
2 // ShakeMemoryViewController.swift
3 // ShakeMemoryTester
4 //
5 // Created by Jason Yao on 5/30/19.
6 // Copyright © 2019 Tracy. All rights
  reserved.
7 //
8
9 import UIKit
10
11 class ShakeMemoryViewController:
  UIViewController {
12     @IBOutlet weak var resultImageView:
  UIImageView!
13     @IBOutlet weak var resultLabel:
  UILabel!
14
15     var originalImage : UIImage?
16
17     override func viewDidLoad() {
18         super.viewDidLoad()
19         // Do any additional setup after
```

Identity and Type

Name ShakeMemoryViewController.swift

Type Default - Swift Source

Location Relative to Group

ShakeMemoryViewController.swift

Full Path /Users/tracypopenhagen/Desktop/ShakeMemoryTester/ShakeMemoryTester/ShakeMemoryViewController.swift

On Demand Resource Tags

Only resources are taggable

Target Membership

- ShakeMemoryTester

Text Settings

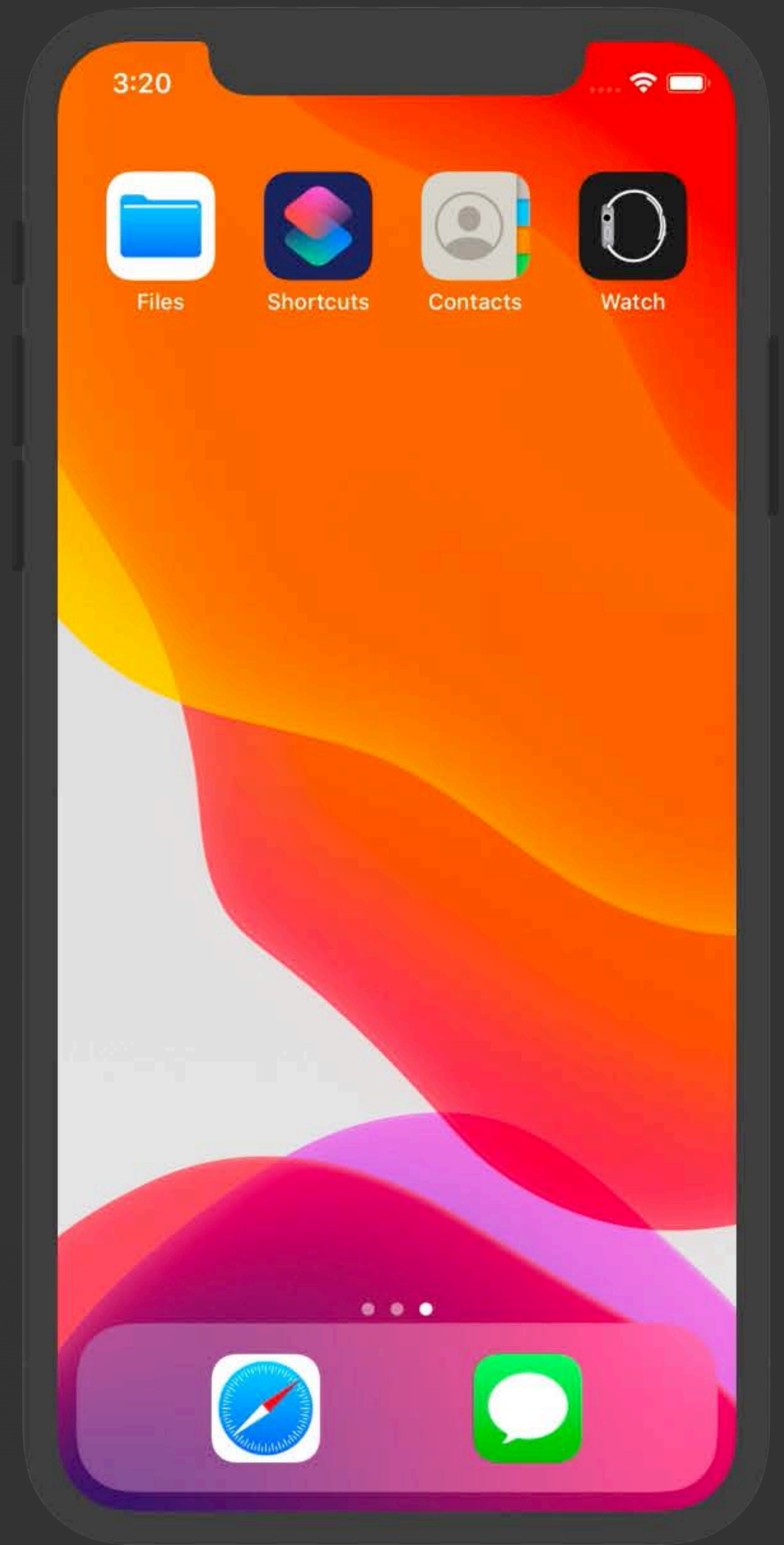
Text Encoding No Explicit Encoding

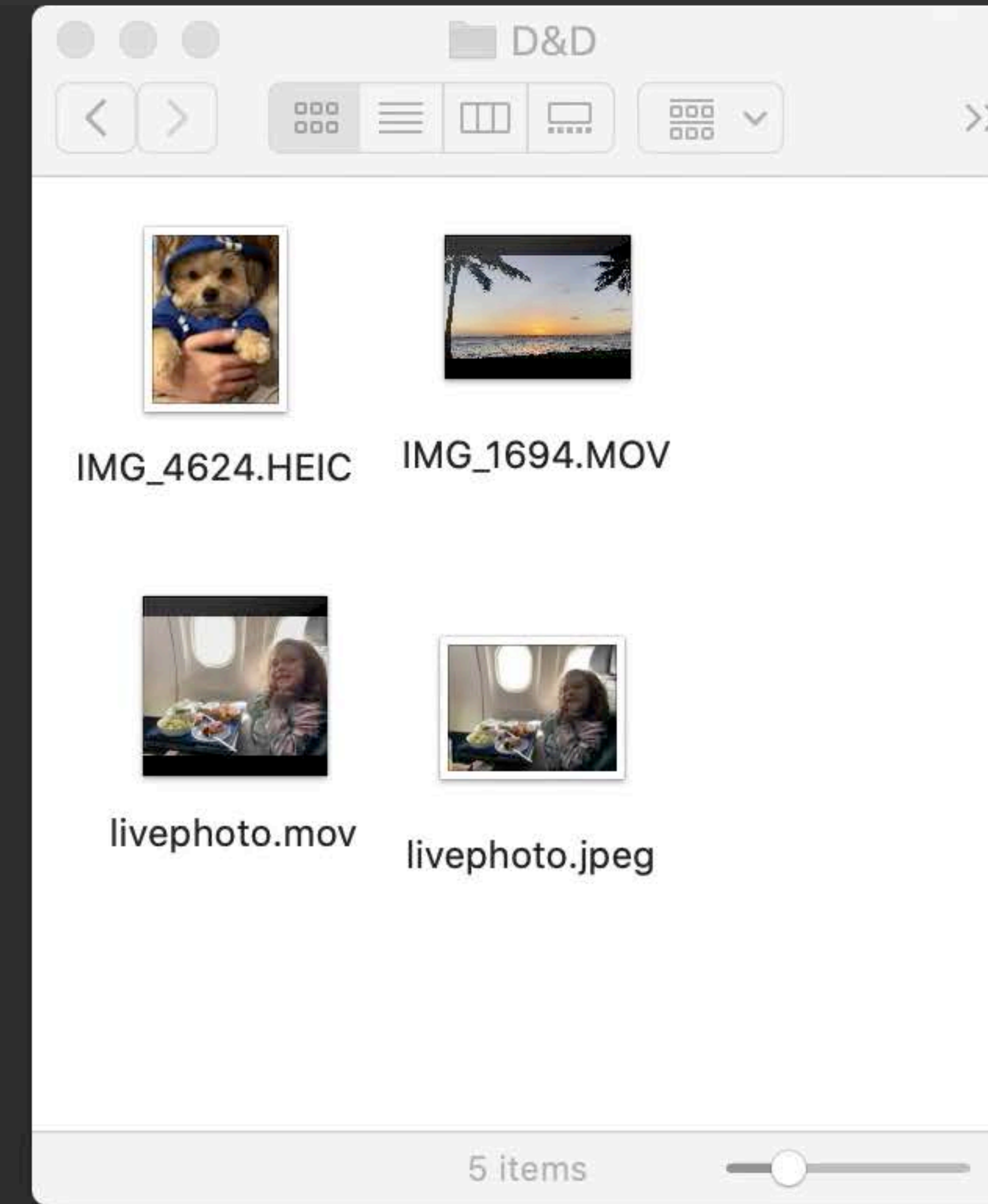
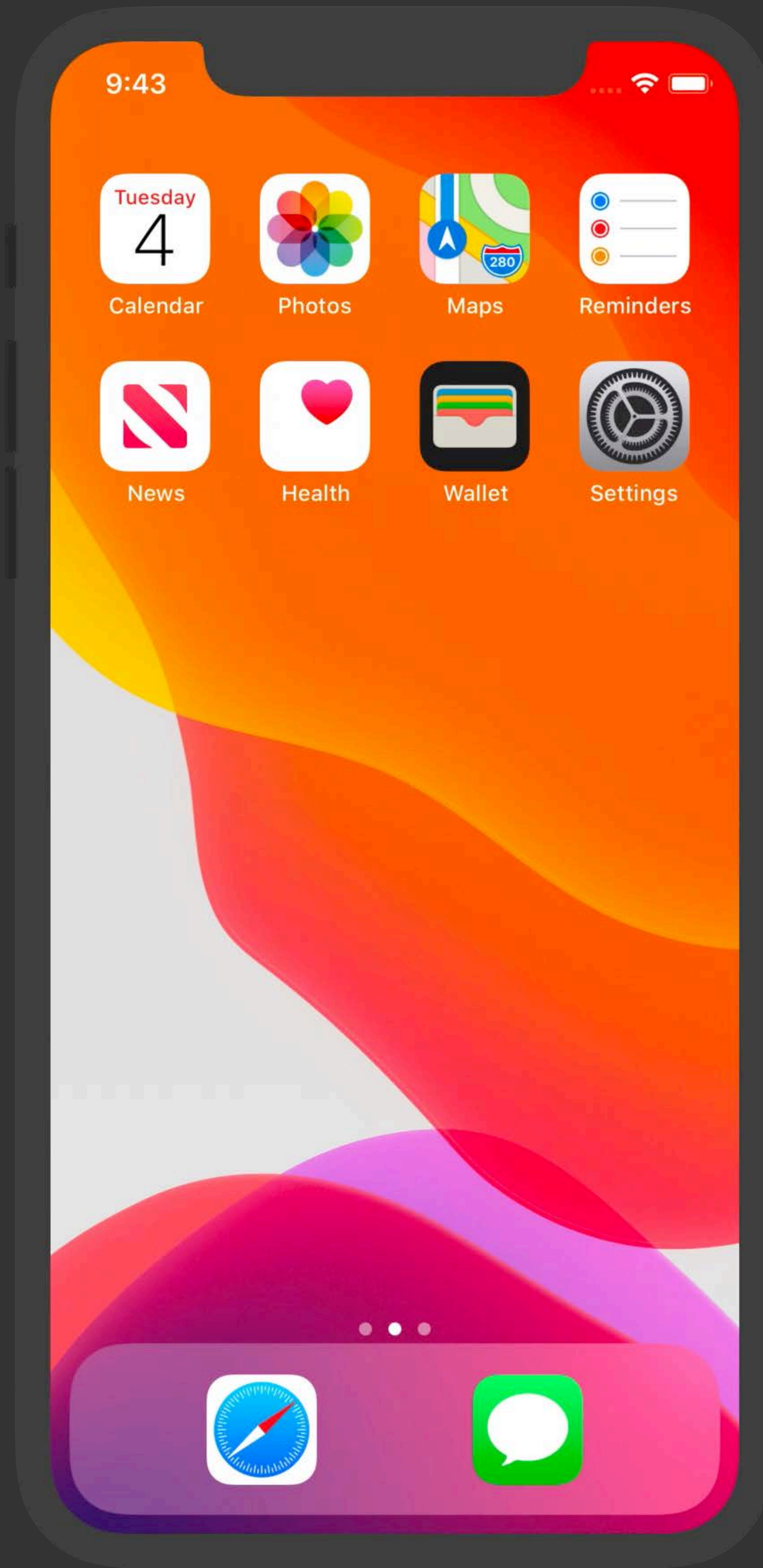
Line Endings No Explicit Line Endings

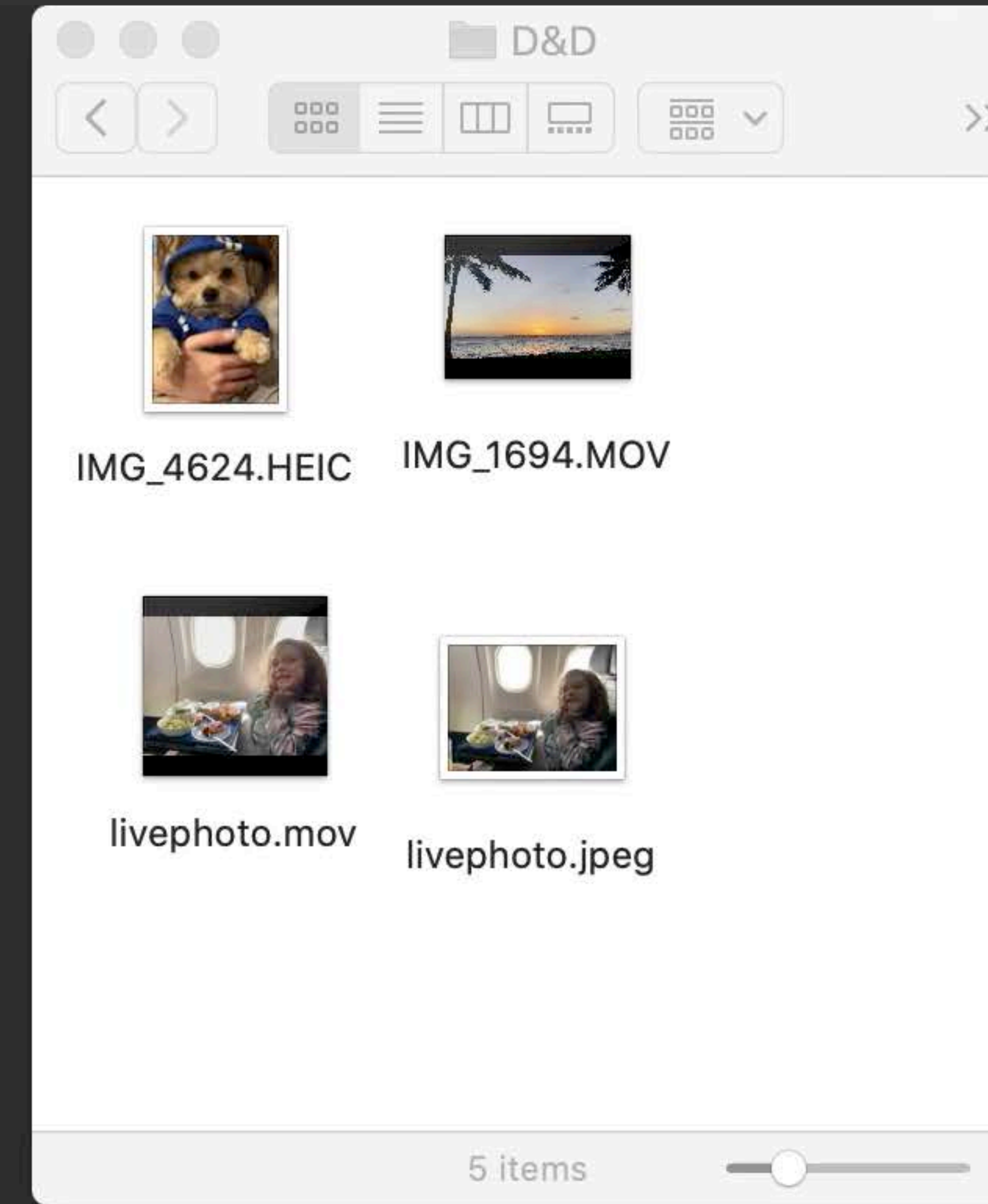
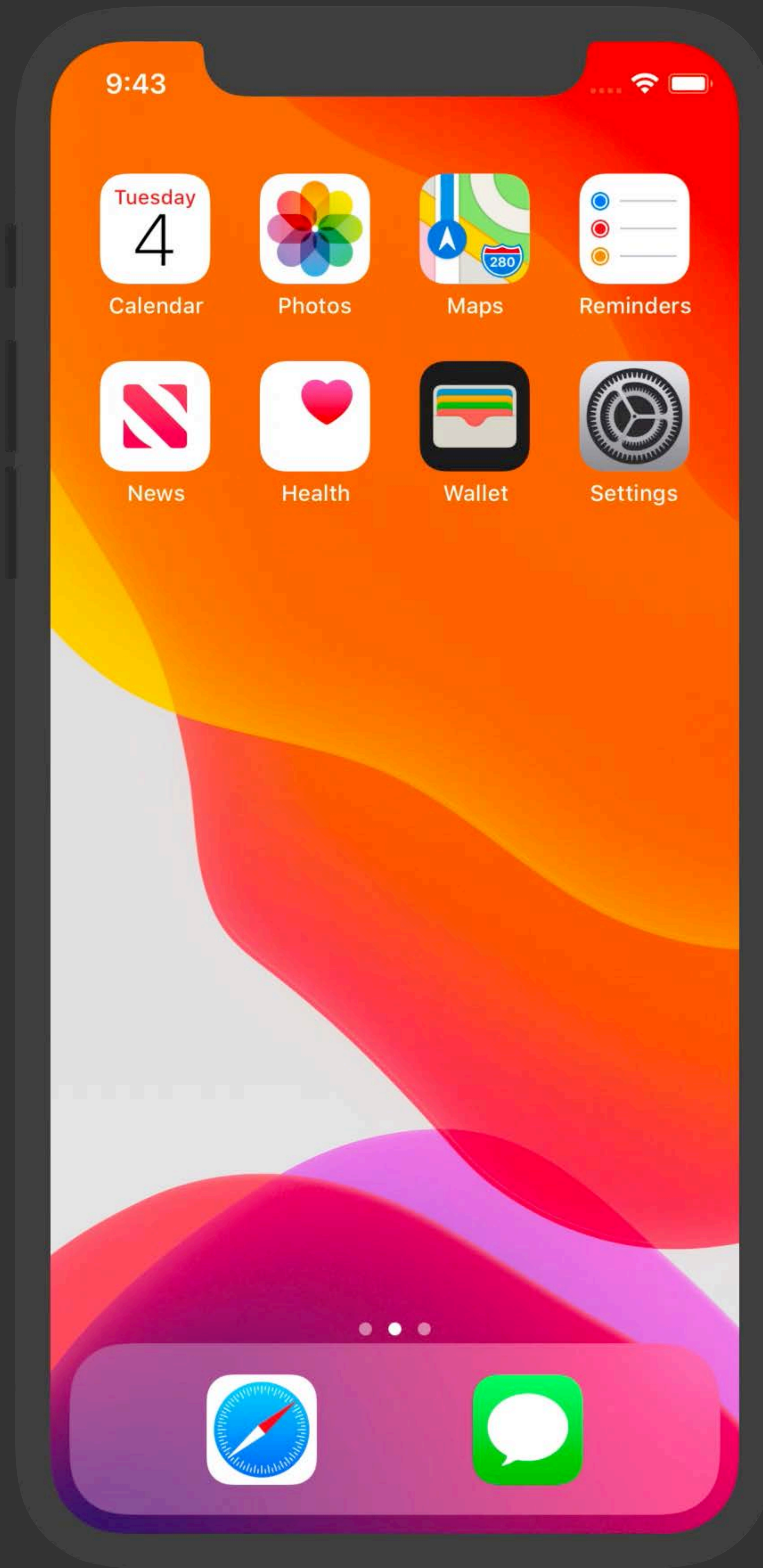
Indent Using Spaces

Widths Tab 4 Indent 4

Wrap lines







apple.com

Apple TV app New

Apple TV+ New

Apple TV 4K

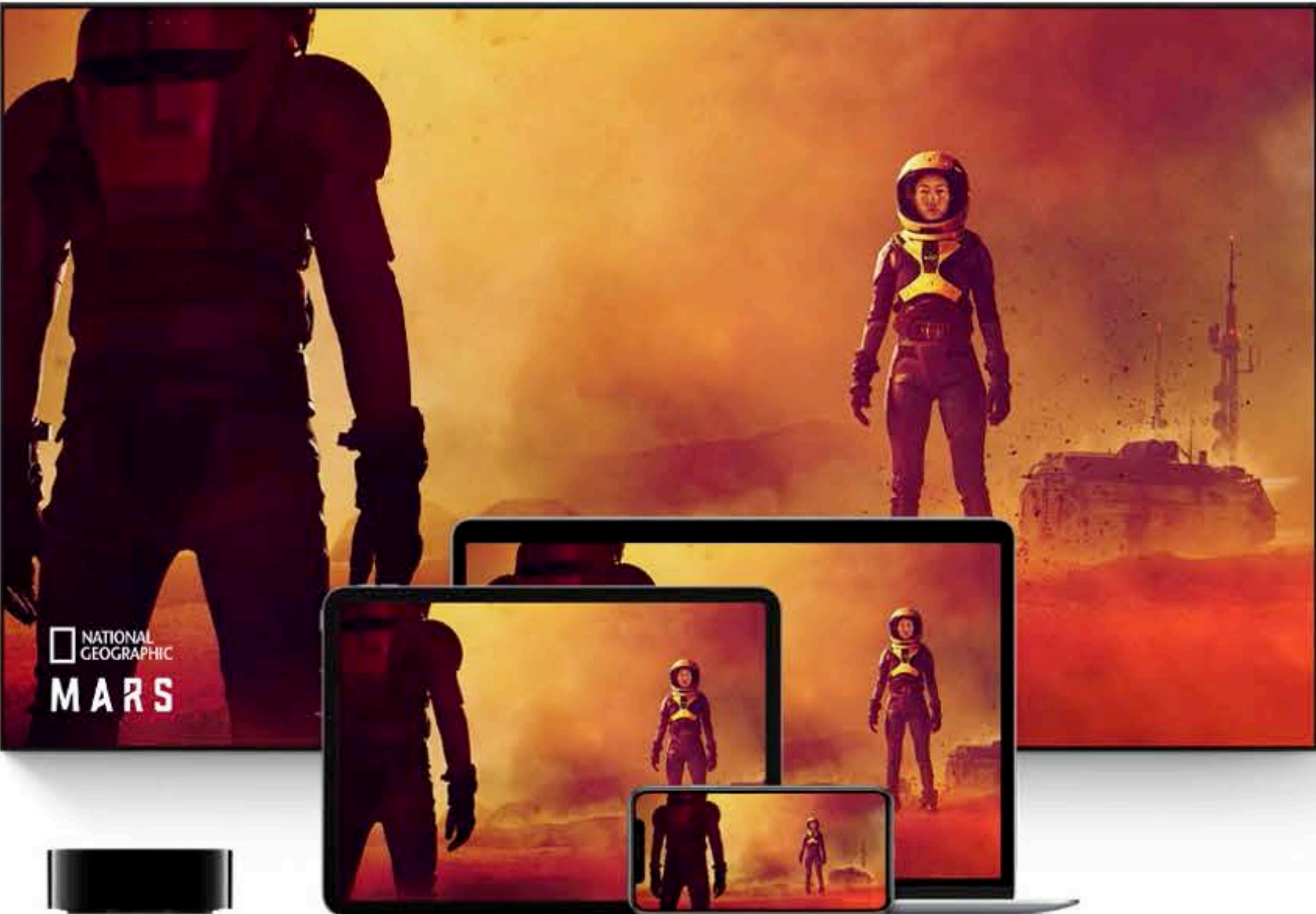
Apple TV HD

AirPlay

Accessories

Apple TV

Our vision for television.



It's TV the way you've always wanted to see it. The cable and premium channels you want. Thousands of movies to buy or rent. Popular streaming services. And coming this fall, original shows and movies from Apple TV+. It's an experience that's curated and personalized to help you discover more of what you love. And it's

10:38

Search or enter website name Cancel

Favorites

Apple Bing Google Yahoo

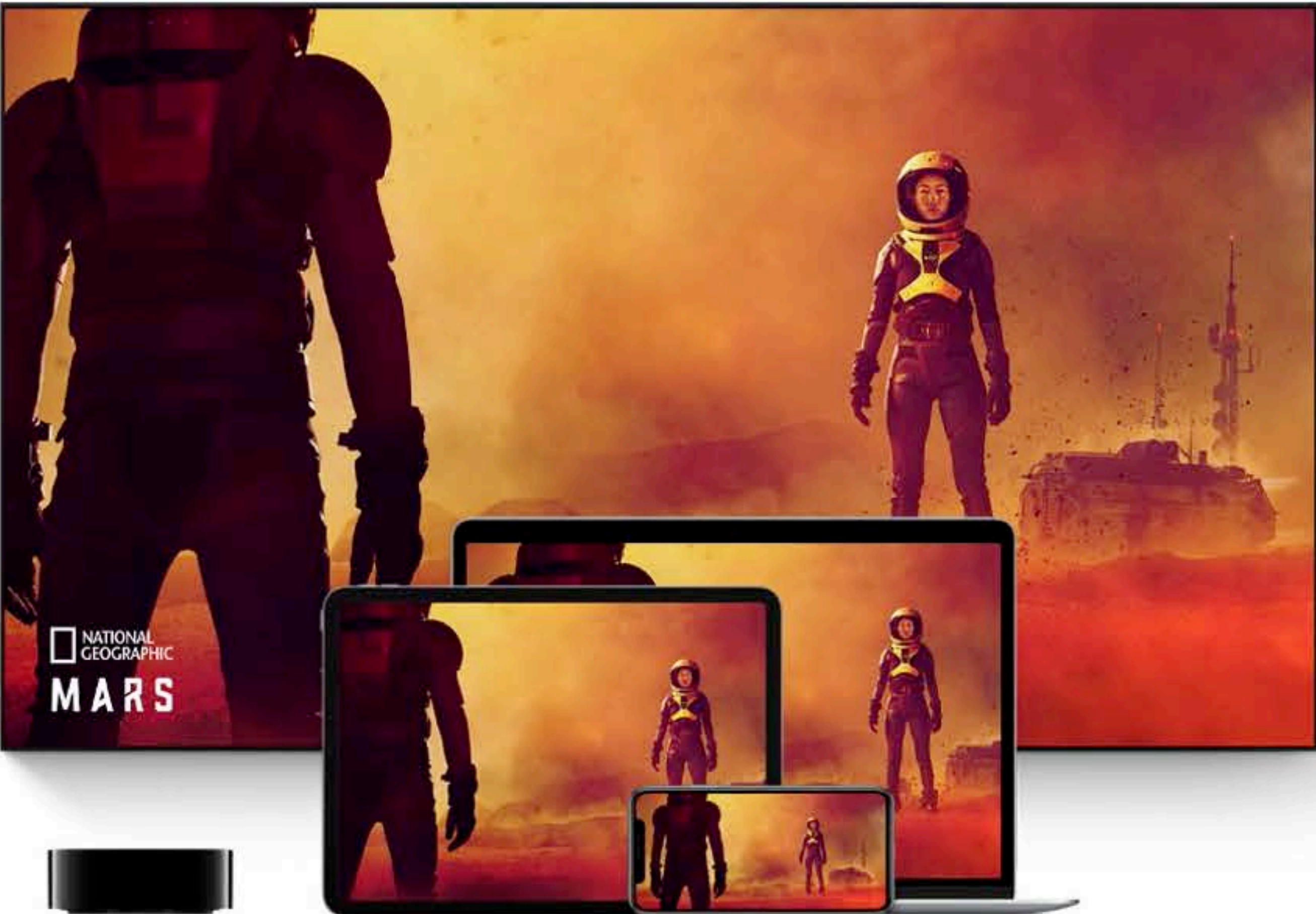
< > Share Bookmarks Copy

apple.com

Apple TV app New Apple TV+ New Apple TV 4K Apple TV HD AirPlay Accessories

Apple TV

Our vision for television.




It's TV the way you've always wanted to see it. The cable and premium channels you want. Thousands of movies to buy or rent. Popular streaming services. And coming this fall, original shows and movies from Apple TV+. It's an experience that's curated and personalized to help you discover more of what you love. And it's

10:38

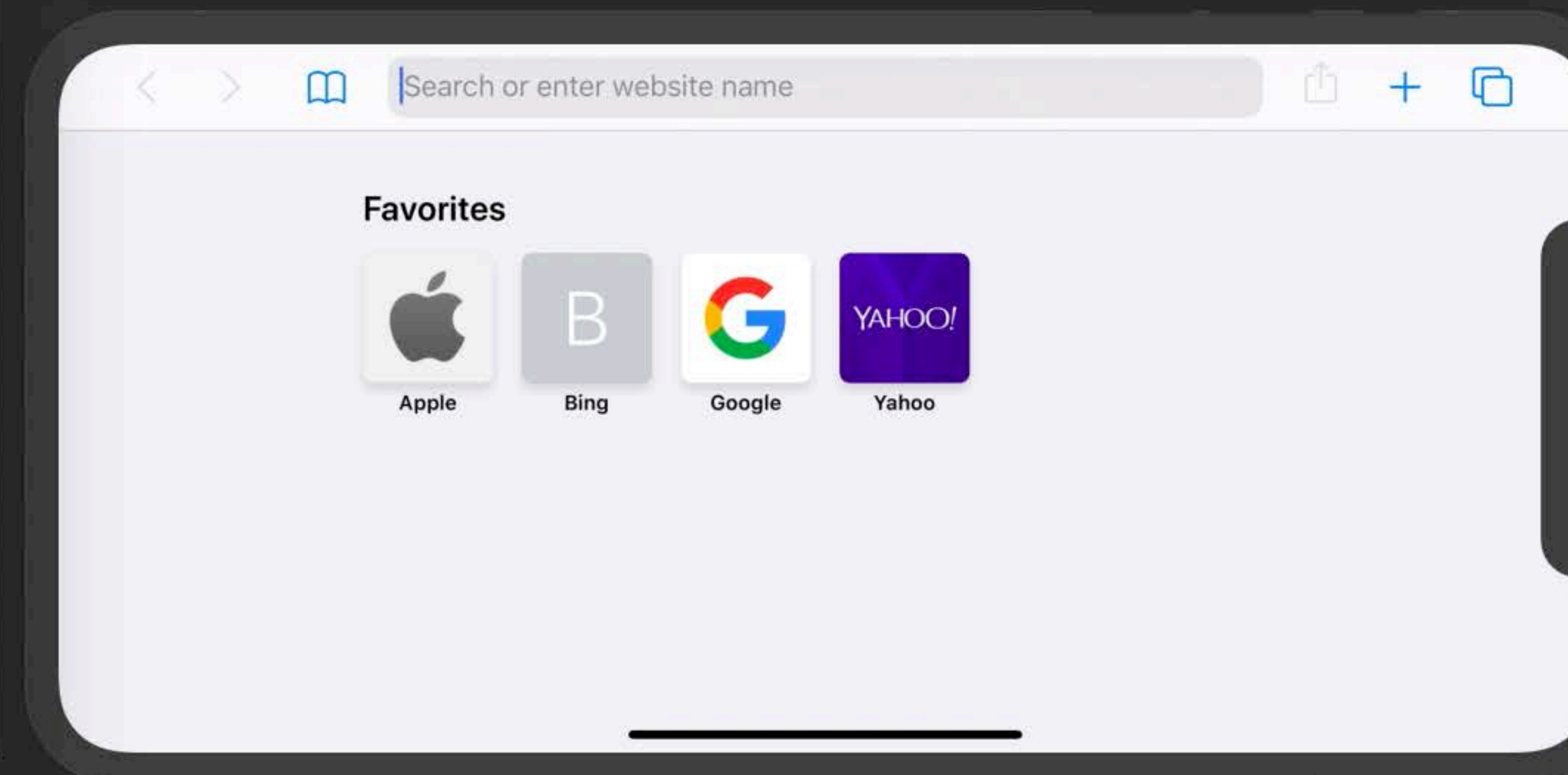
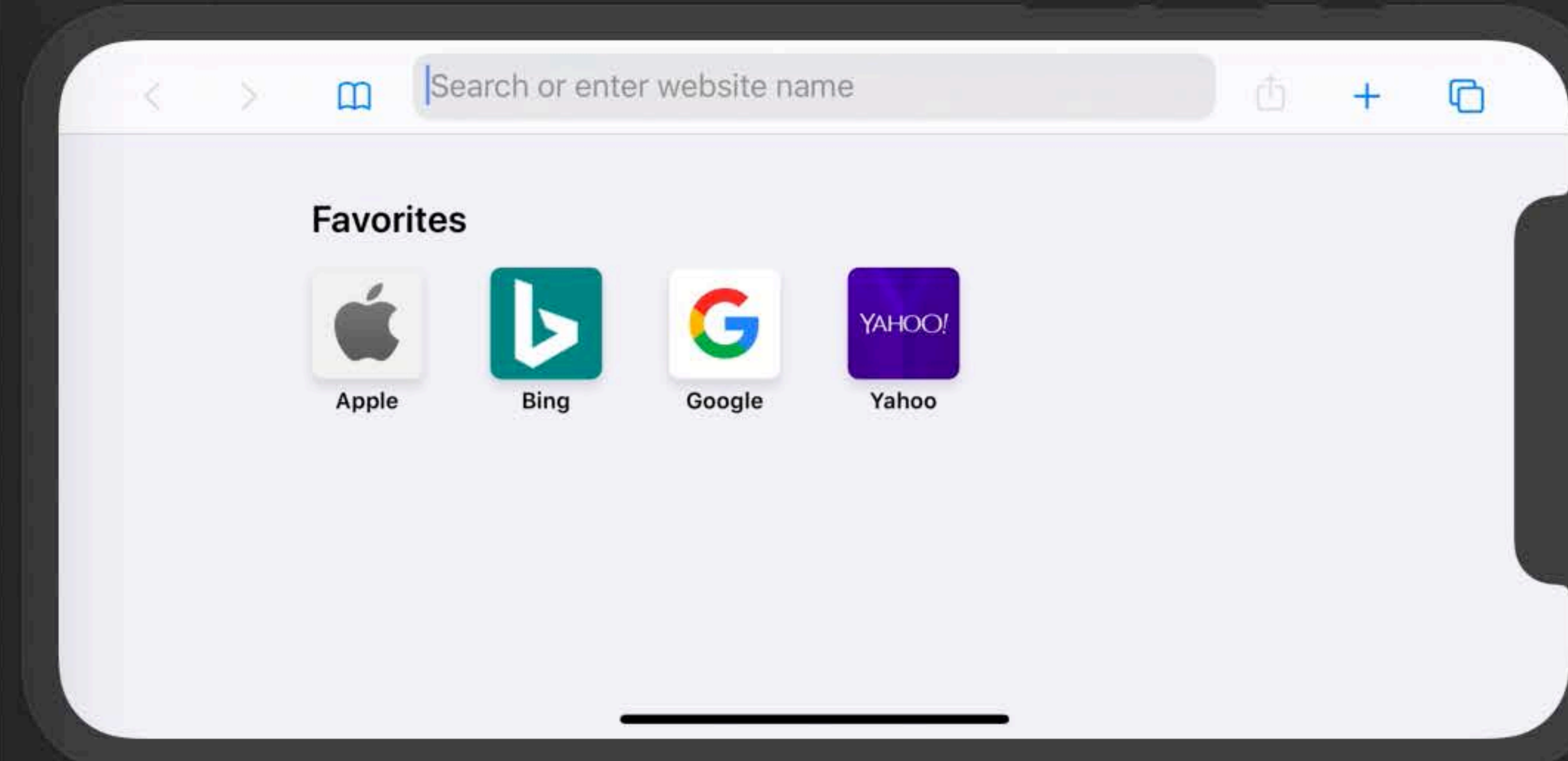
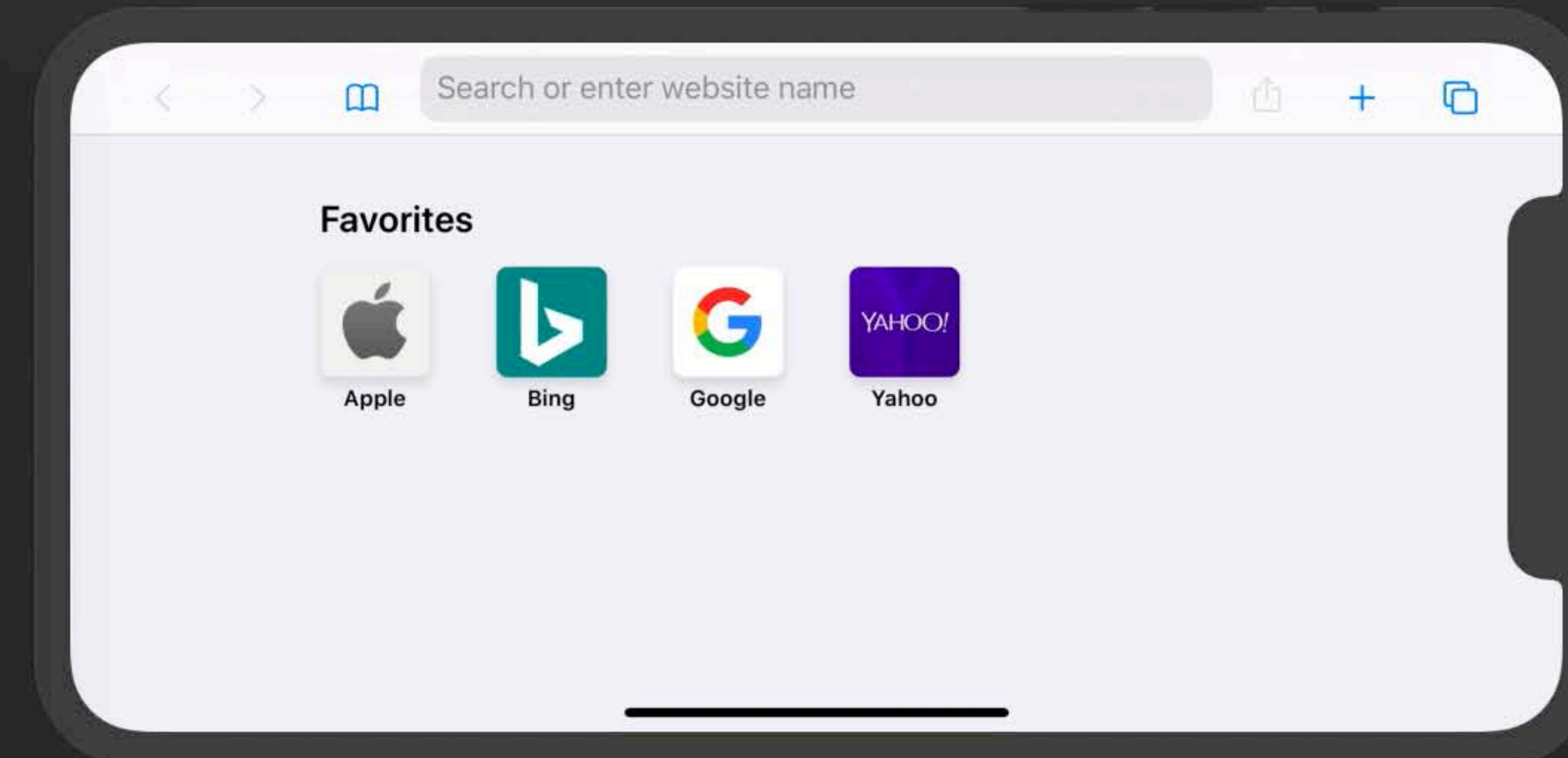
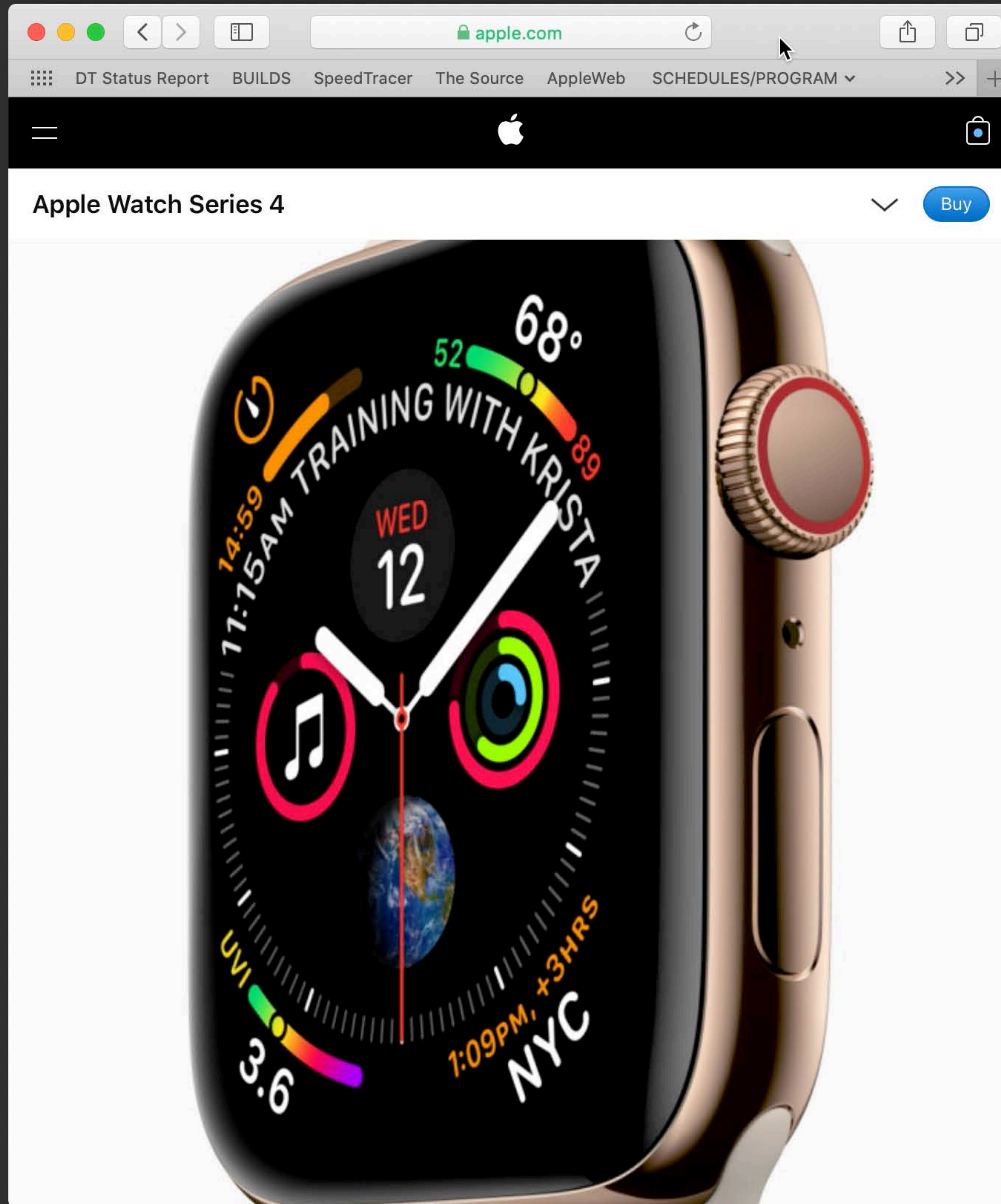
Search or enter website name Cancel

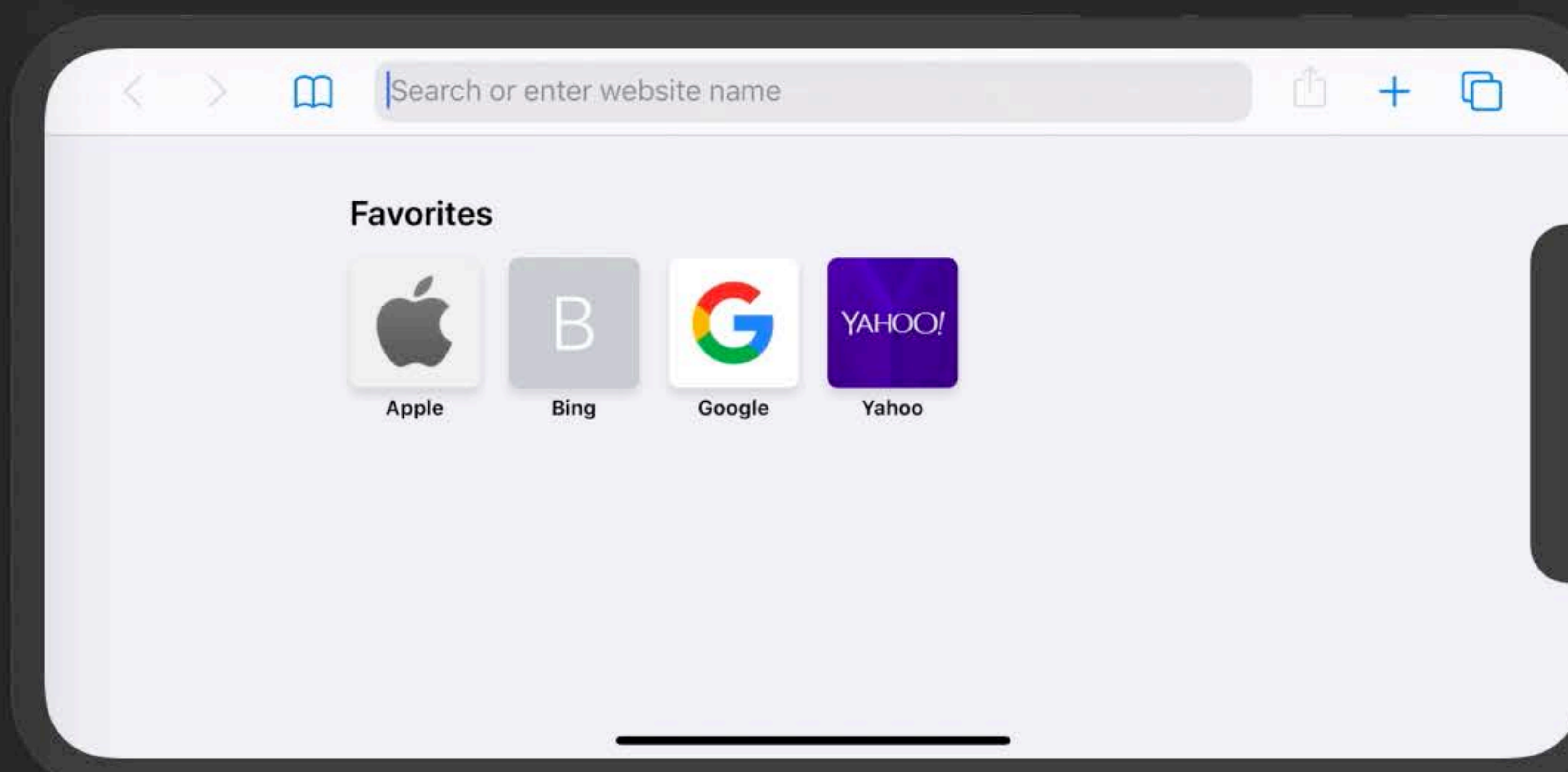
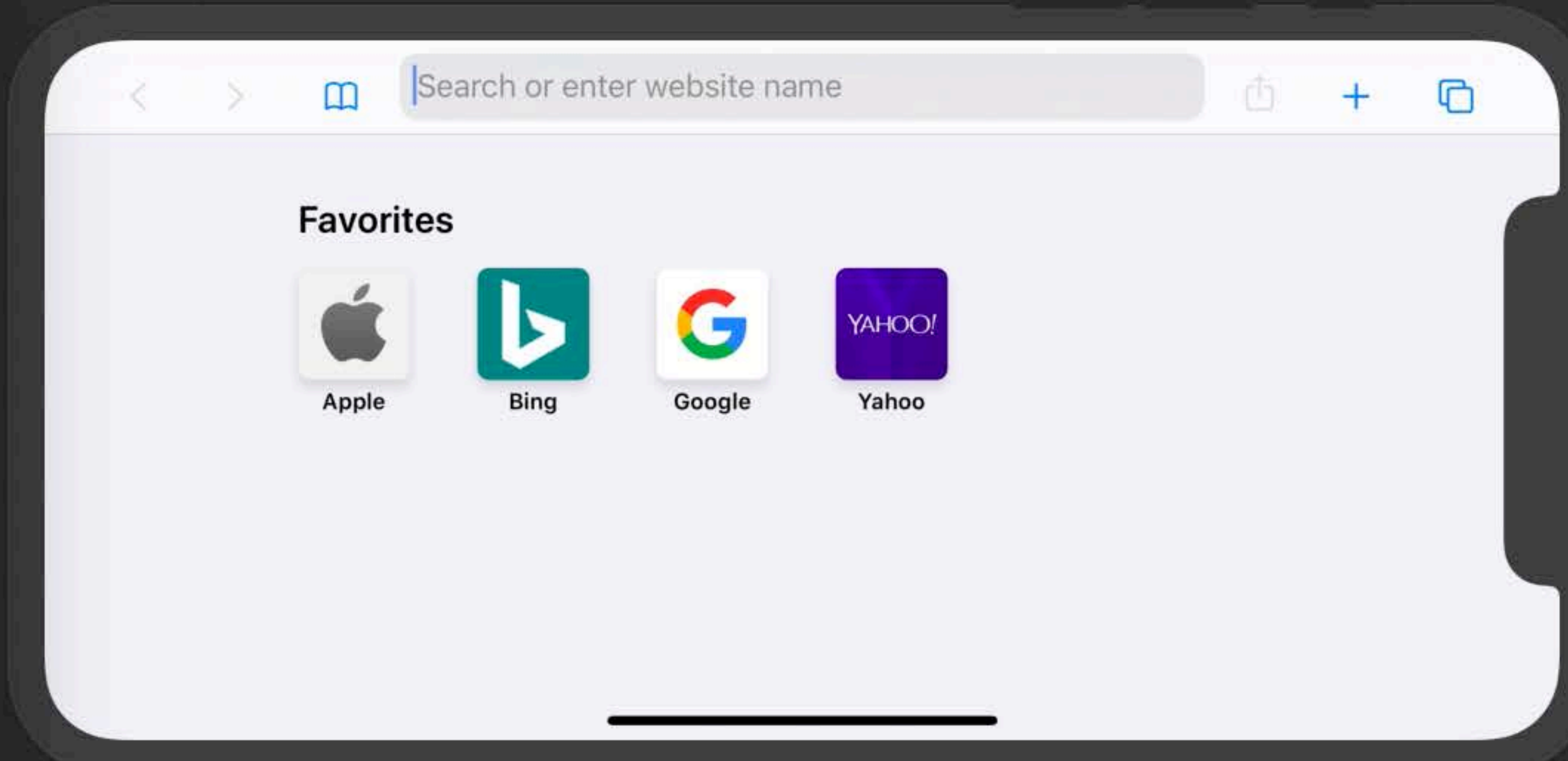
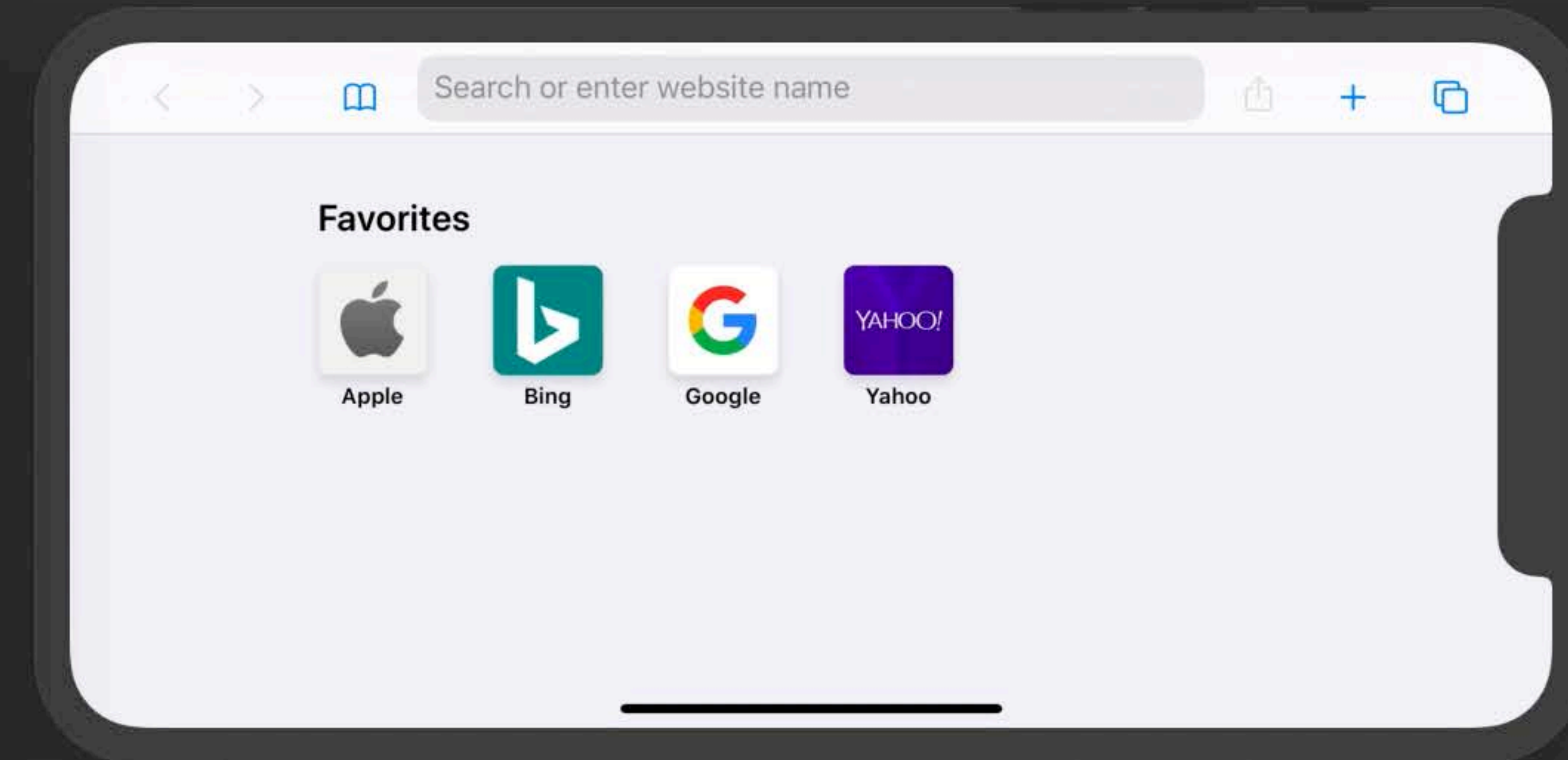
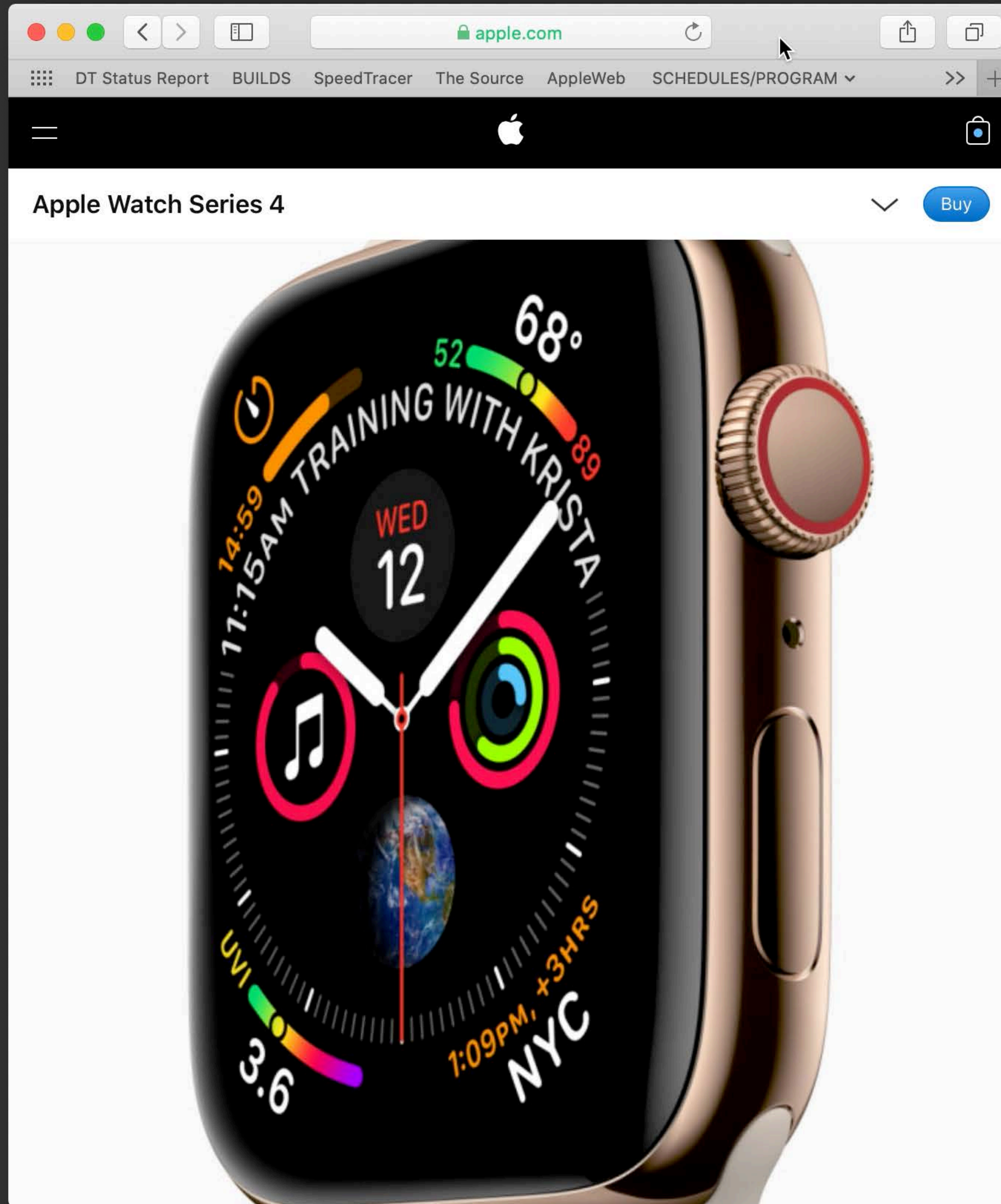
Favorites

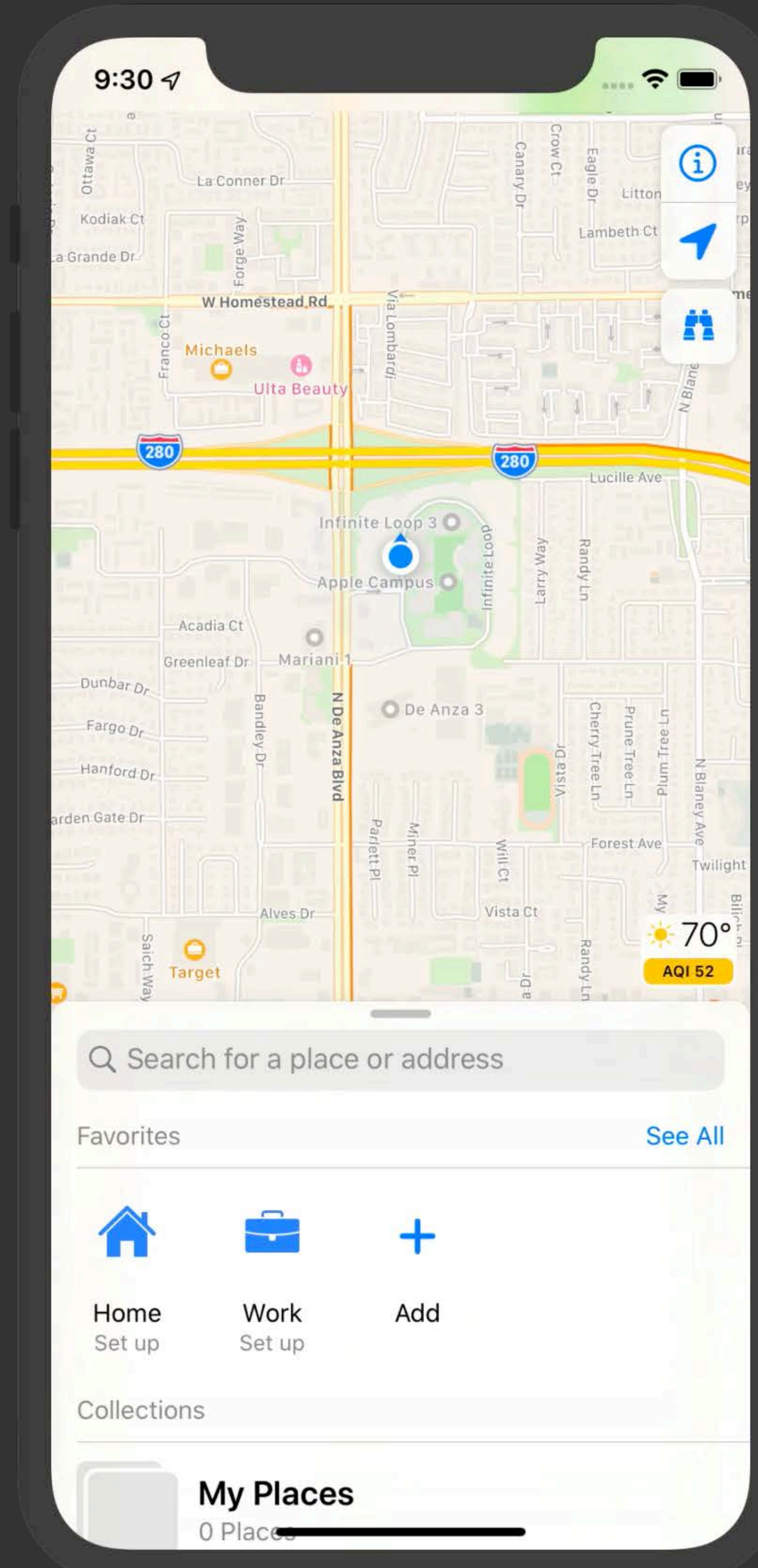
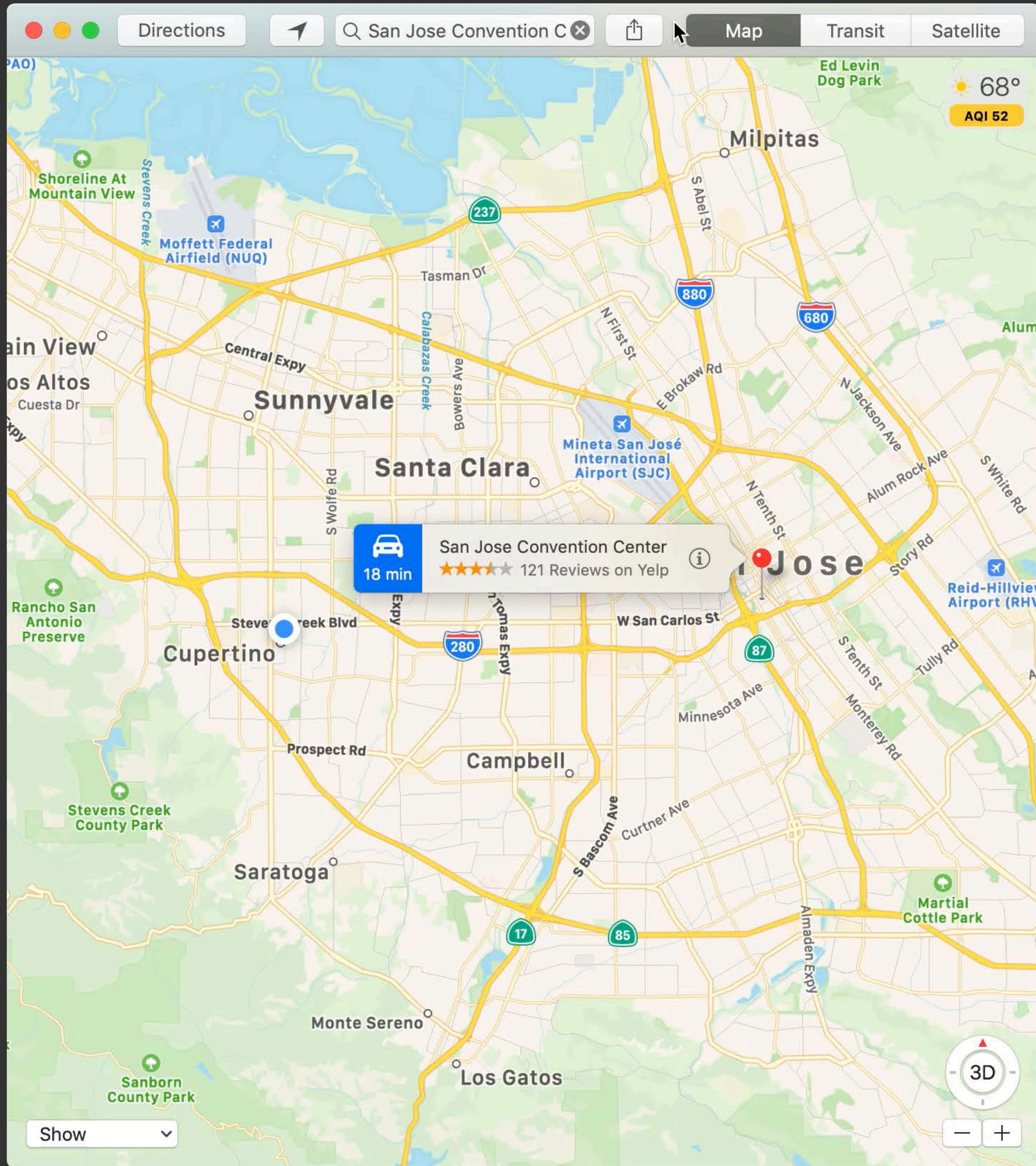


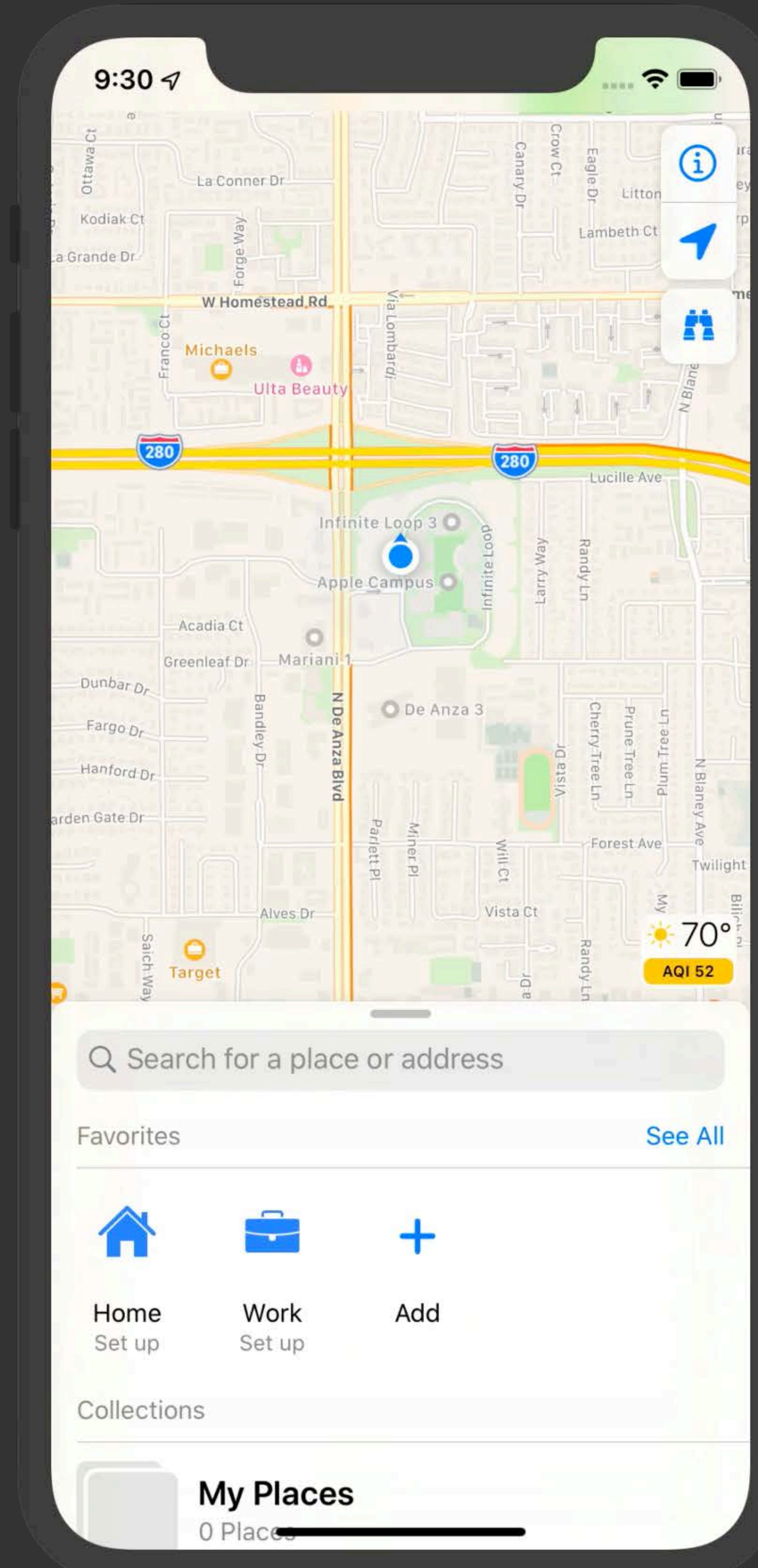
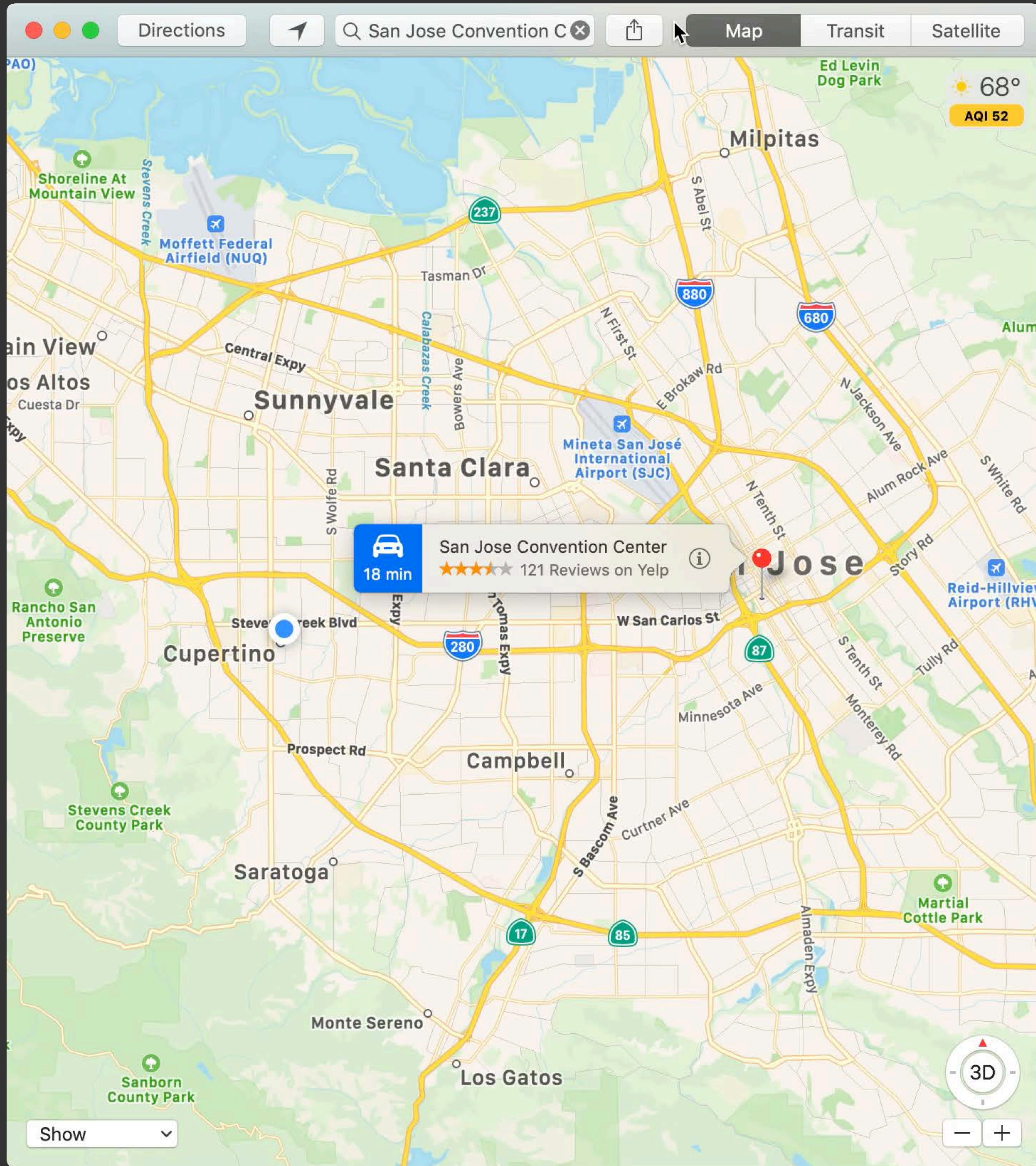
Apple Bing Google Yahoo

< > Share Bookmarks Copy









Other Helpful Hints

Apple Simulator File Edit **Hardware** Debug Window Help

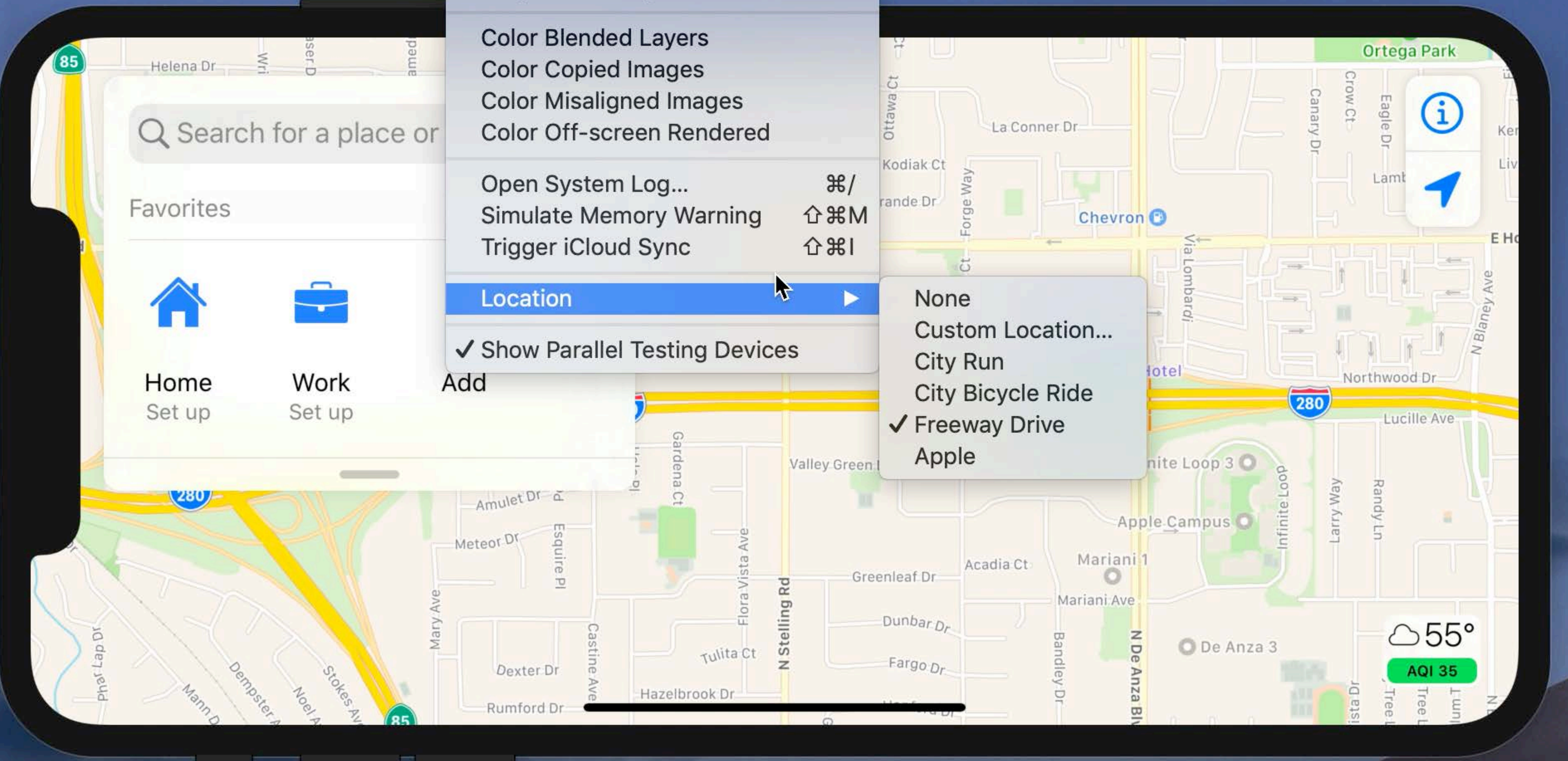
- Device ▶
- Restart
- Erase All Content and Settings...
- Rotate Left ⌘←
- Rotate Right ⌘→
- Orientation ▶
- ✓ Rotate Device Automatically**
- Shake Gesture ^⌘Z
- Home ⌘H
- Lock ⌘L
- Side Button ⌘B
- Siri ⌘⇧H
- Face ID ▶
- Authorize Apple Pay ⌘A
- Show Apple TV Remote ⌘R
- Toggle In-call Status Bar ⌘Y
- Keyboard ▶
- Touch Pressure ▶
- Audio Input ▶
- Audio Output ▶
- Increase Volume ⌘↑
- Decrease Volume ⌘↓
- External Displays ▶

- ✓ Slow Animations
- Graphics Quality Override ▶
- Color Blended Layers
- Color Copied Images
- Color Misaligned Images
- Color Off-screen Rendered
- Open System Log... ⌘/
- Simulate Memory Warning ⌘M
- Trigger iCloud Sync ⌘I

Location ▶

✓ Show Parallel Testing Devices

- None
- Custom Location...
- City Run
- City Bicycle Ride
- ✓ Freeway Drive
- Apple

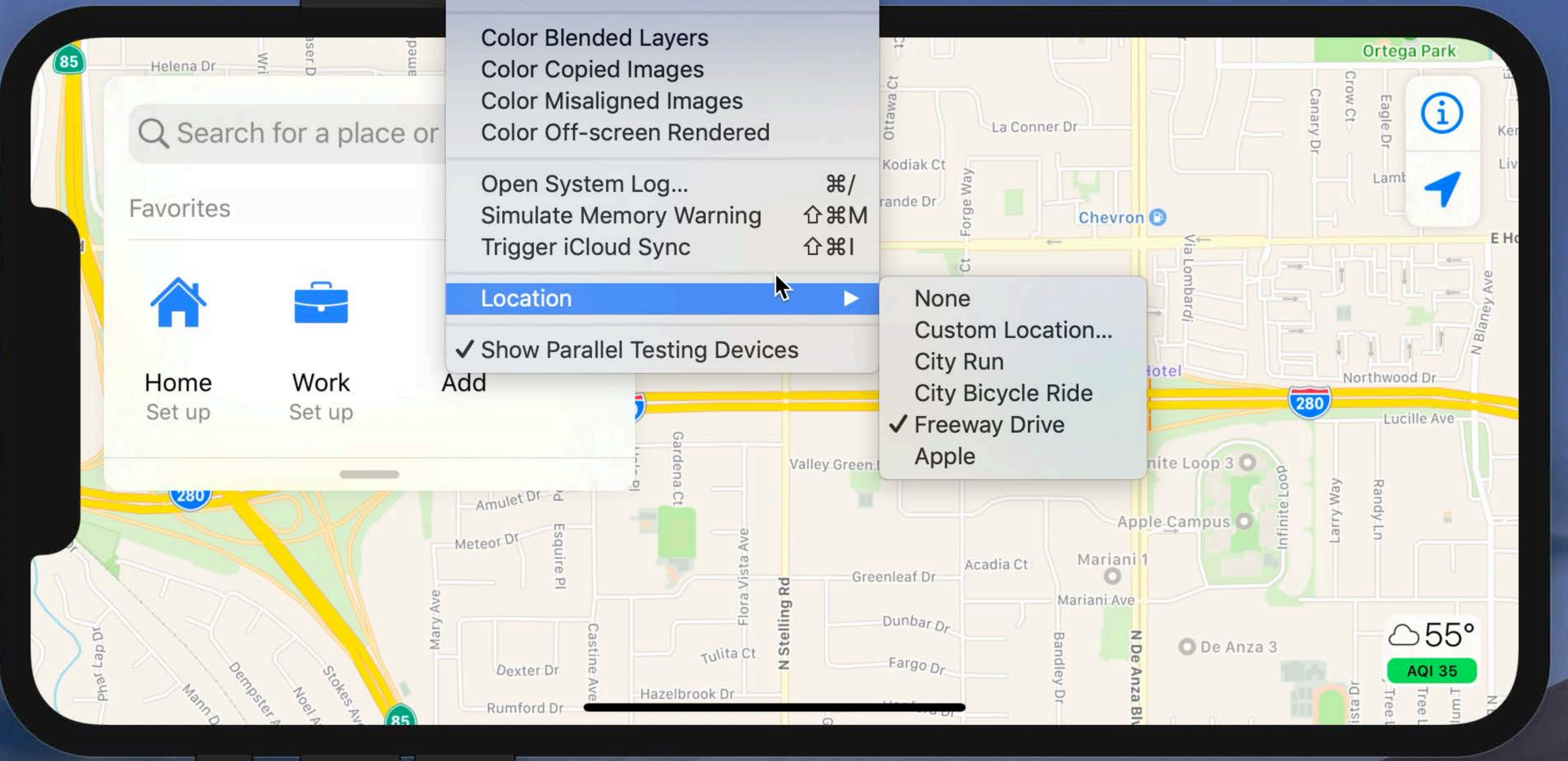


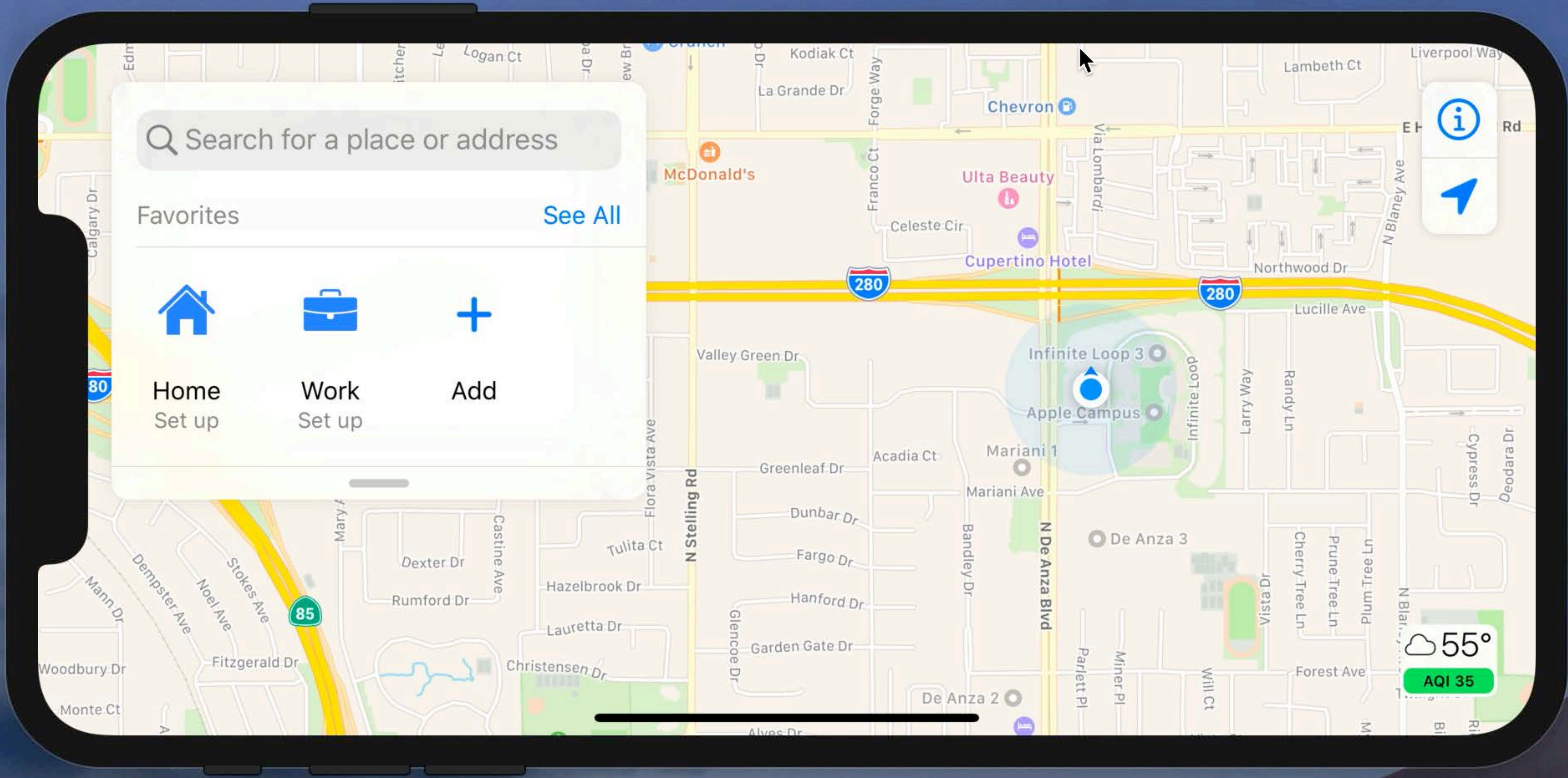
- ✓ Slow Animations
- Graphics Quality Override ▶
- Color Blended Layers
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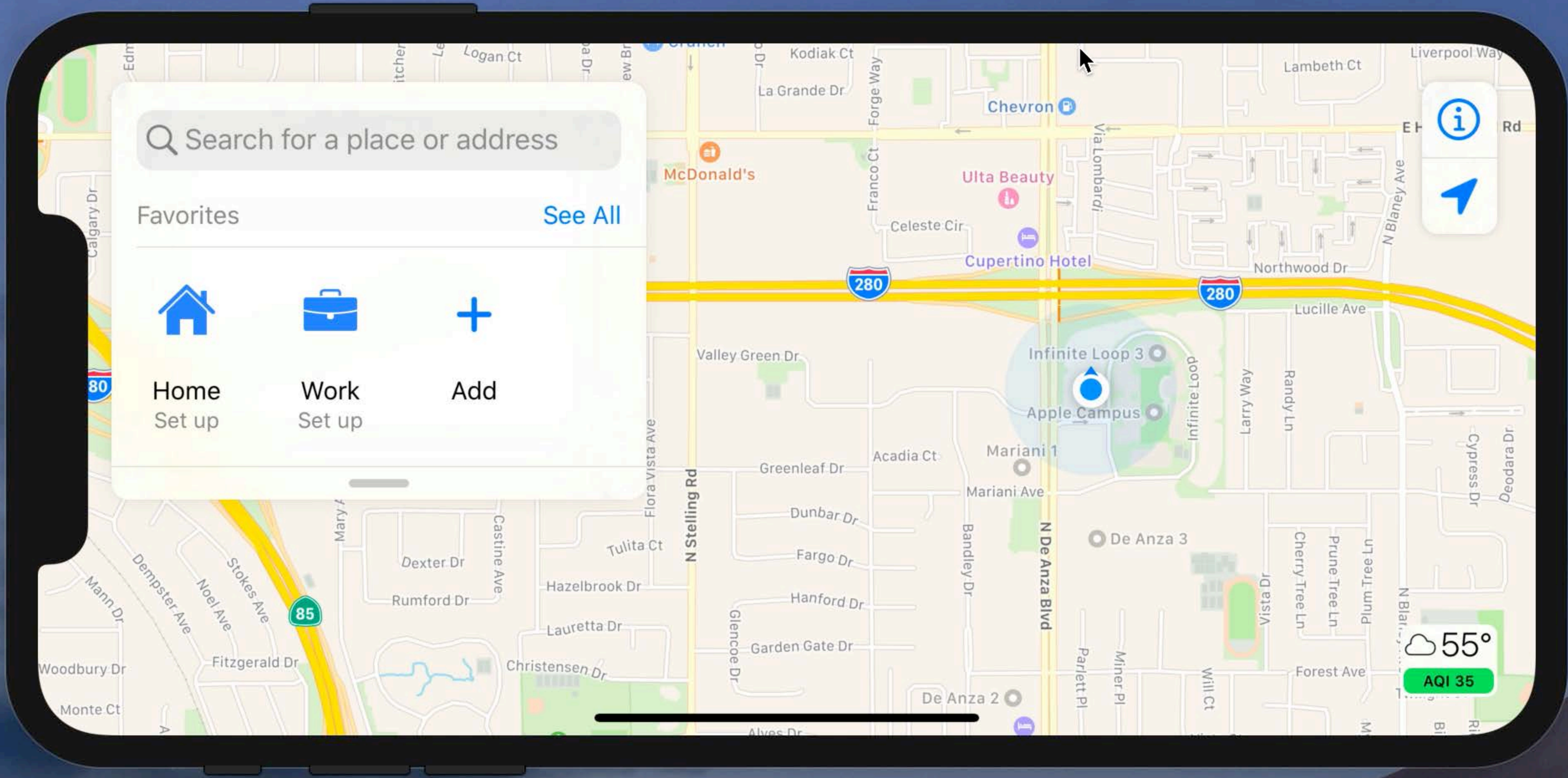
Location ▶

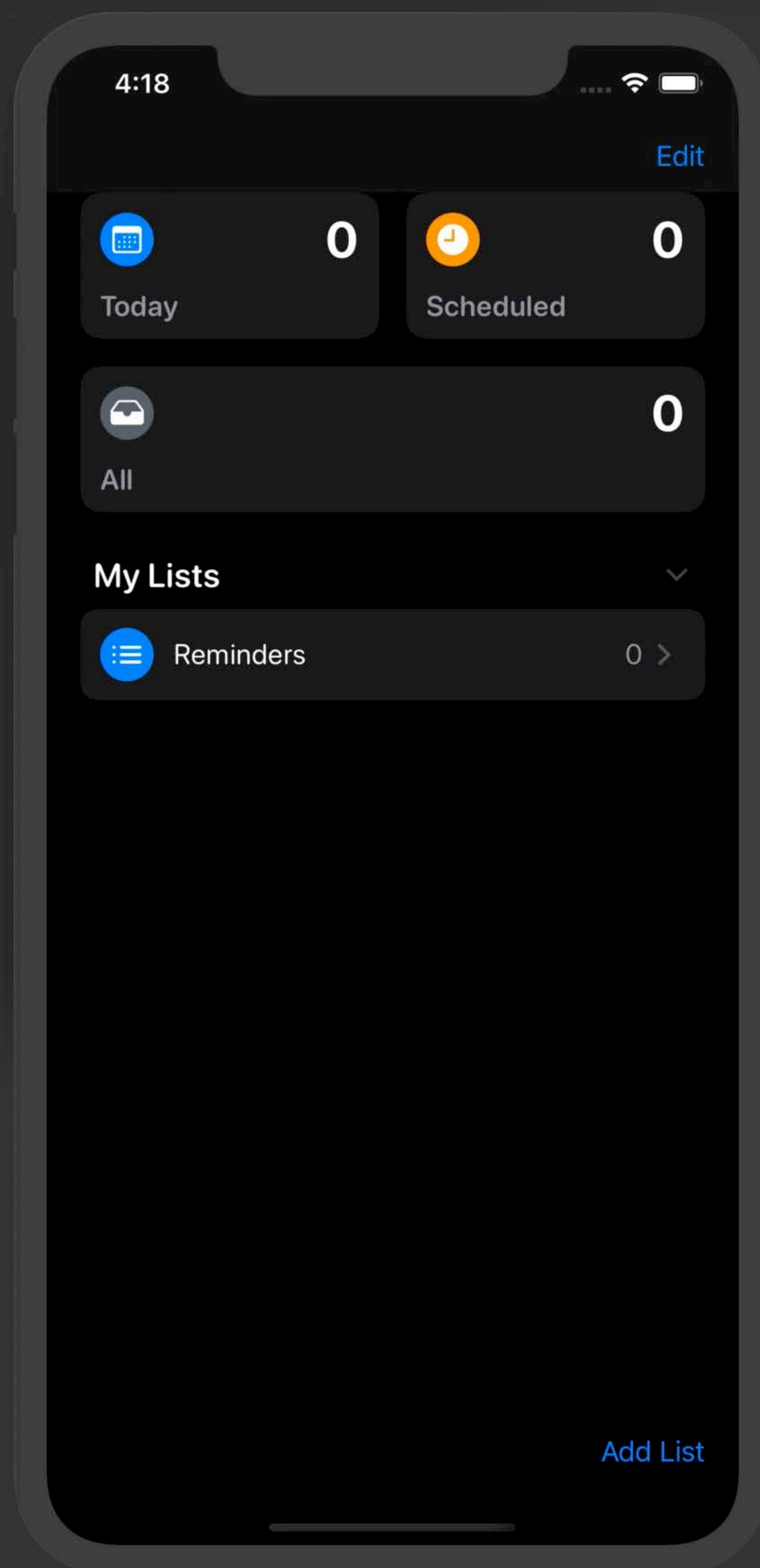
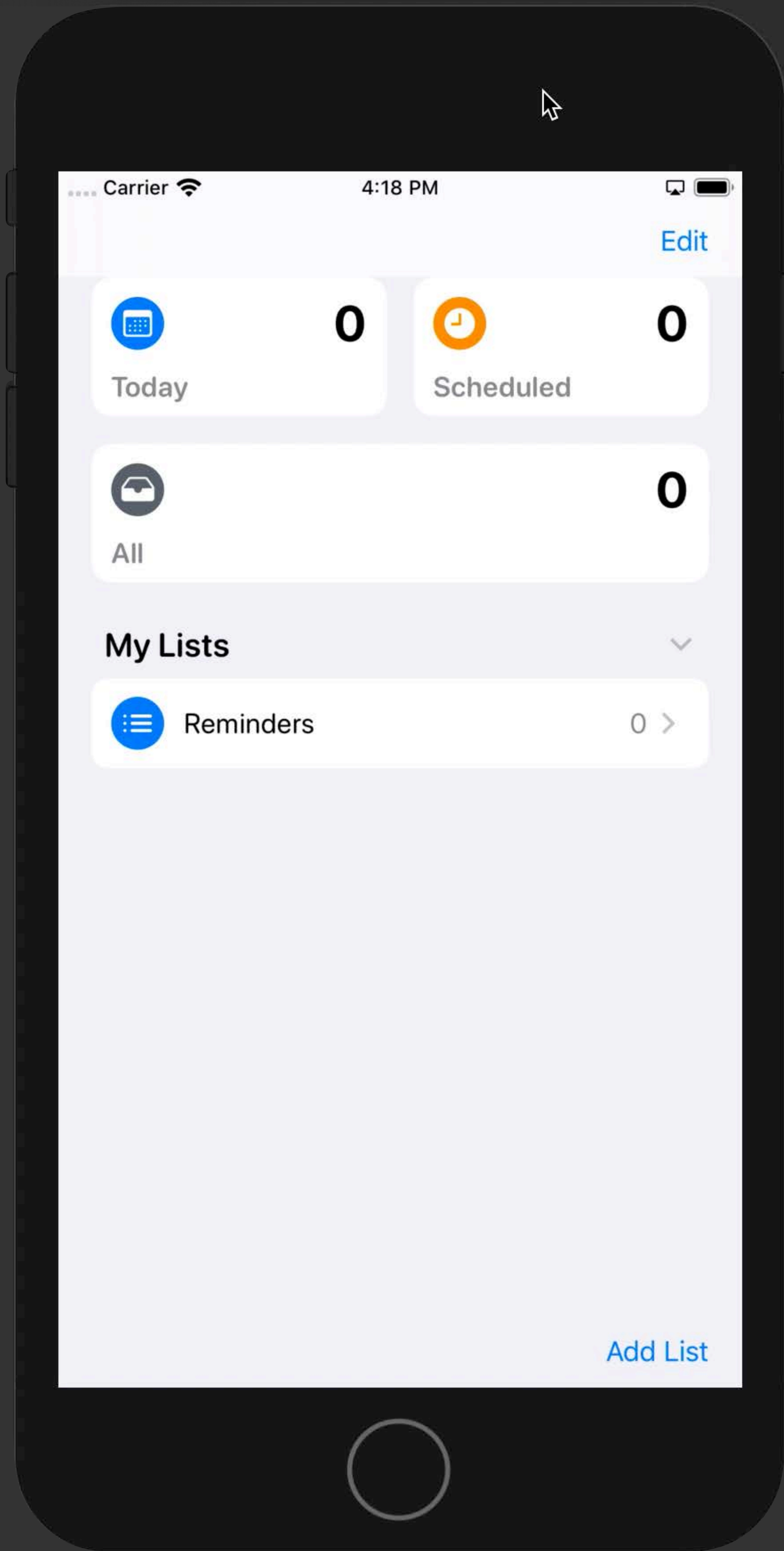
✓ Show Parallel Testing Devices

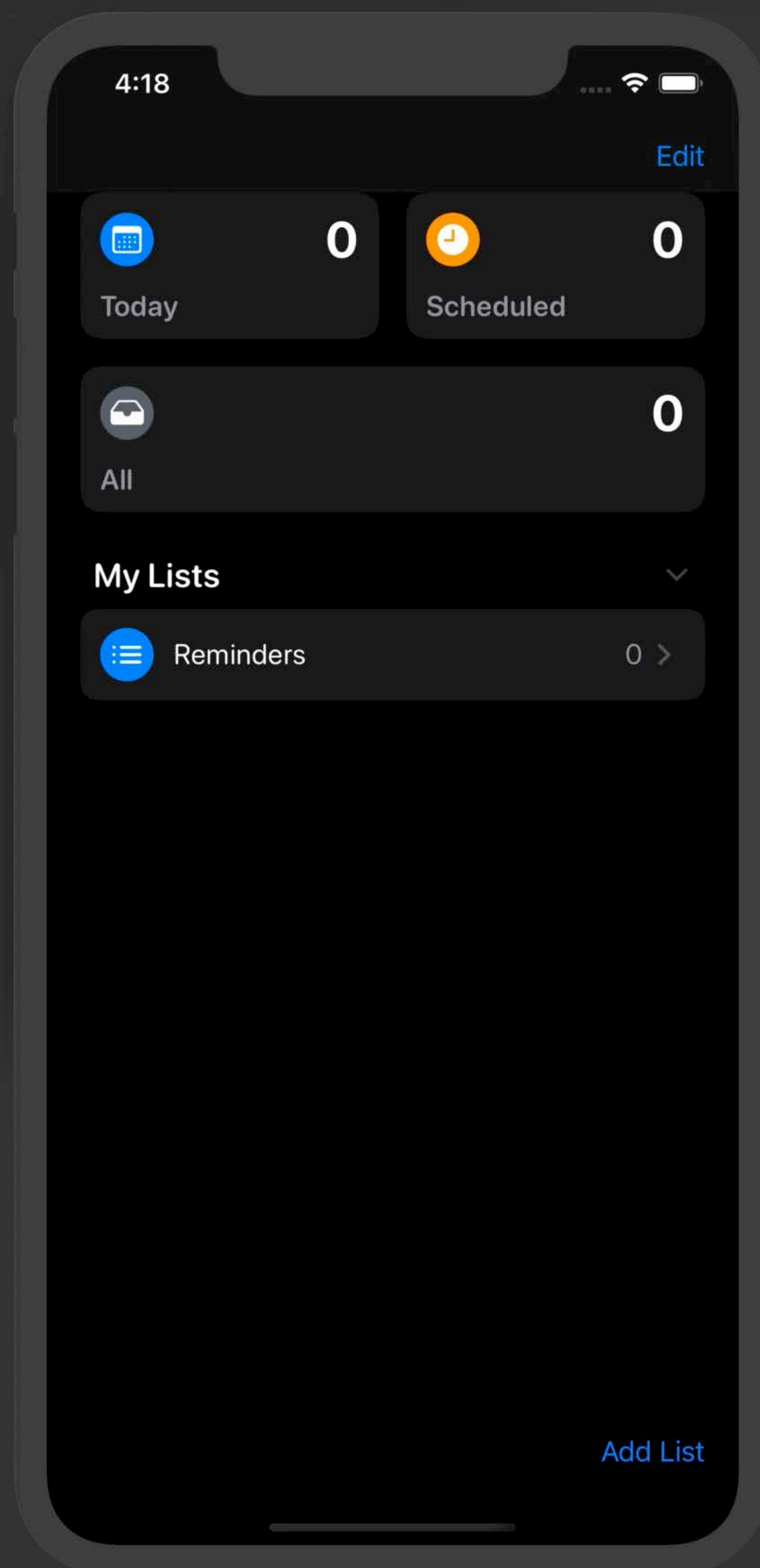
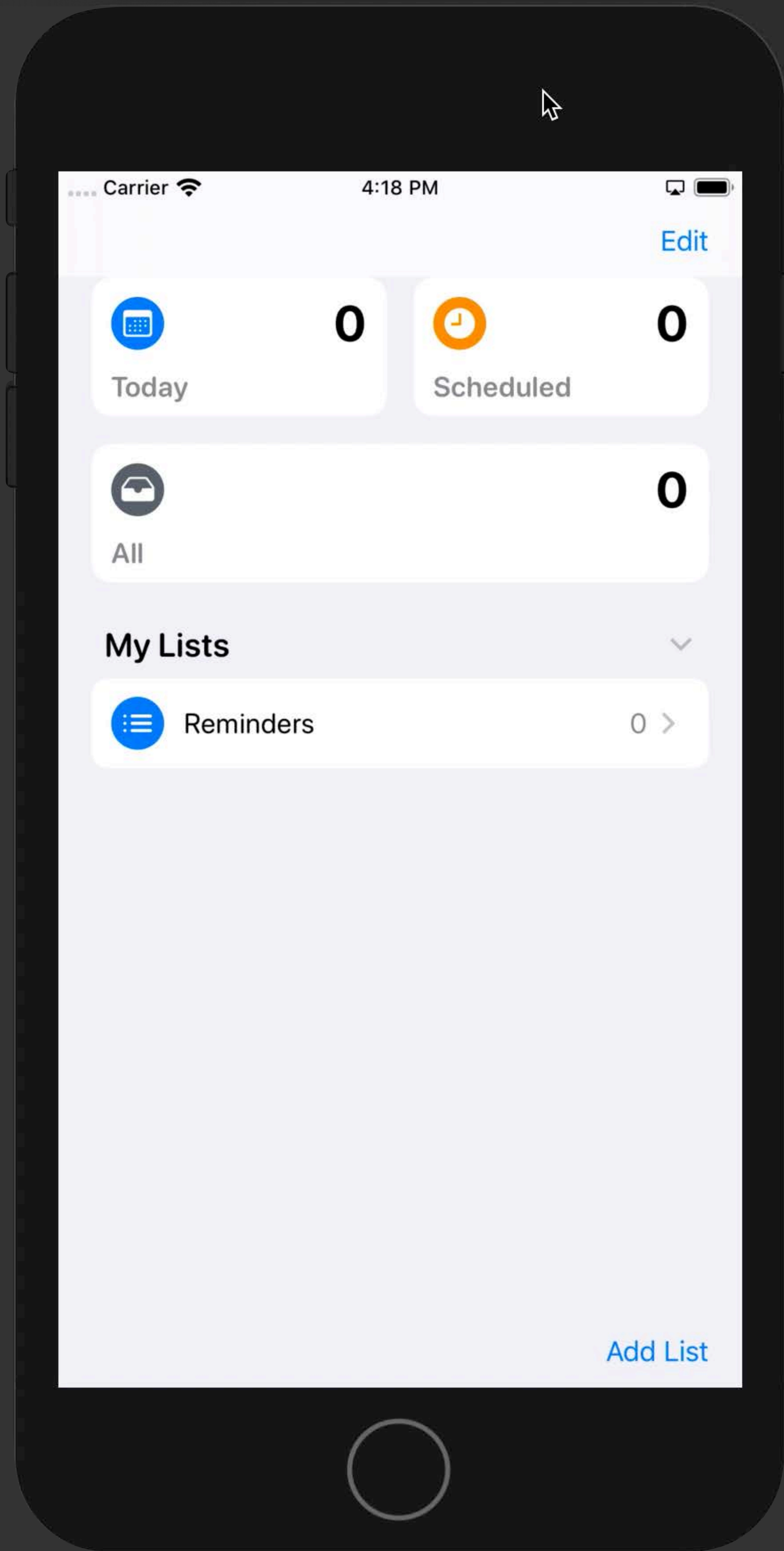
- None
- Custom Location...
- City Run
- City Bicycle Ride
- ✓ Freeway Drive
- Apple

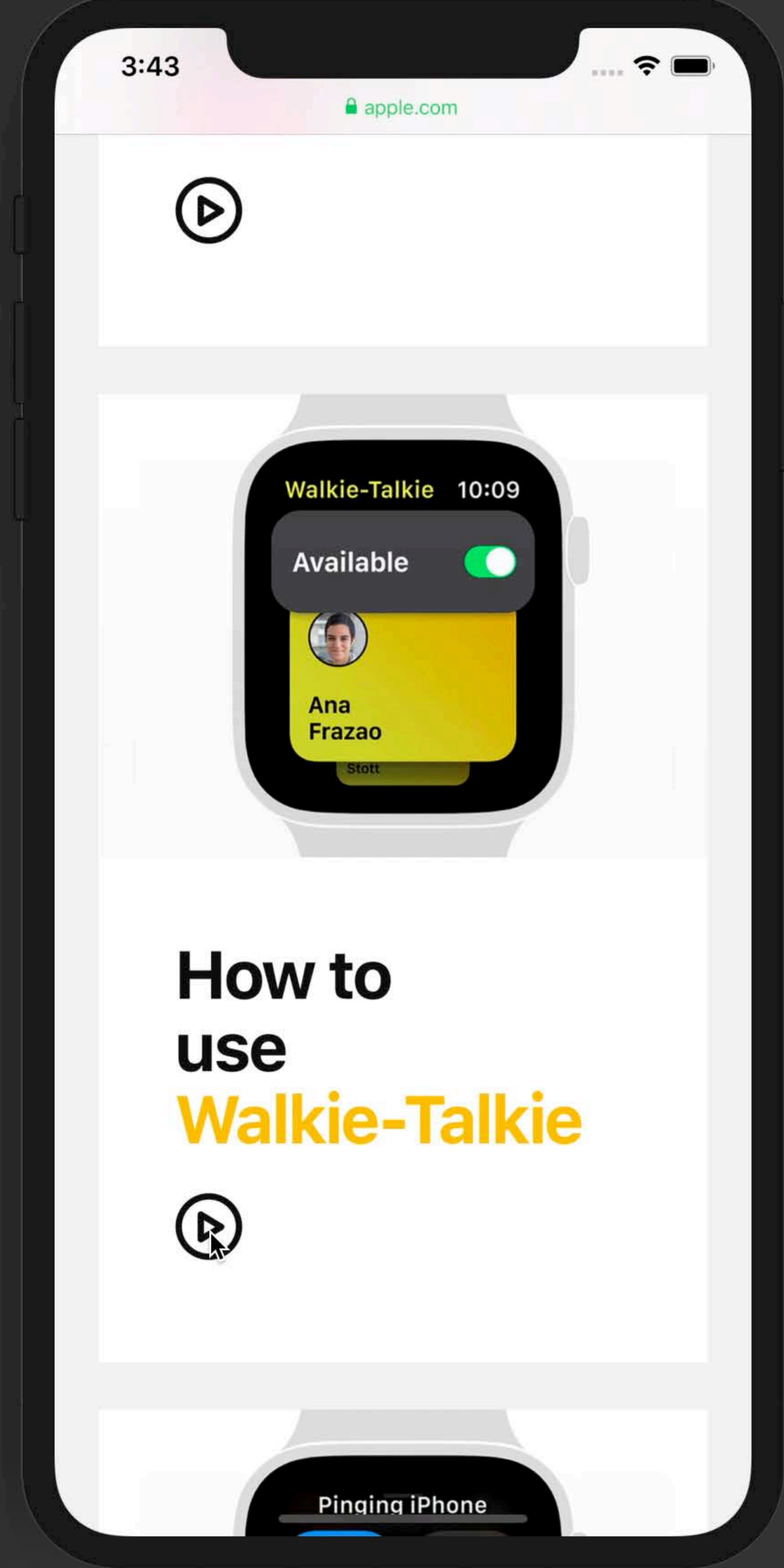
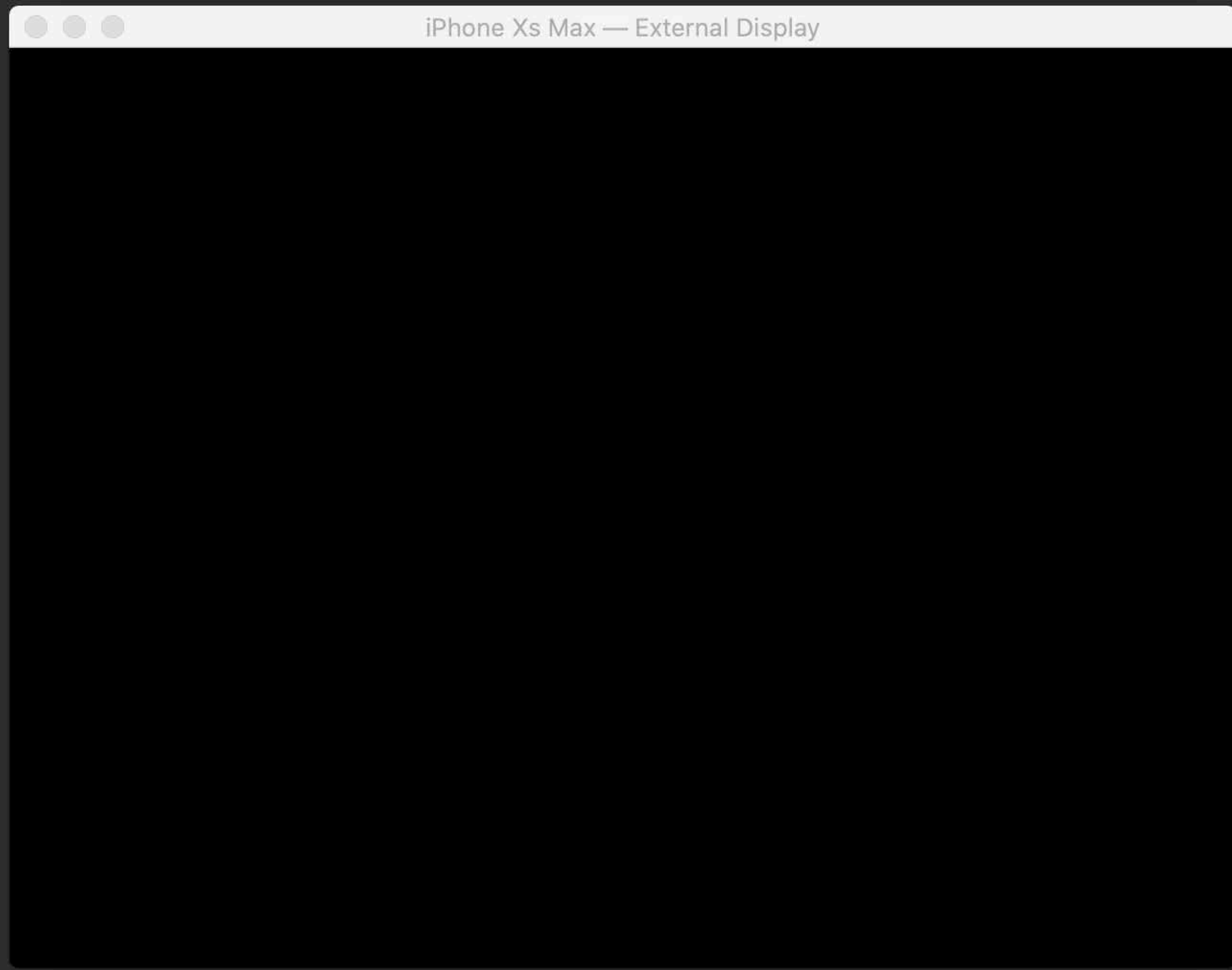


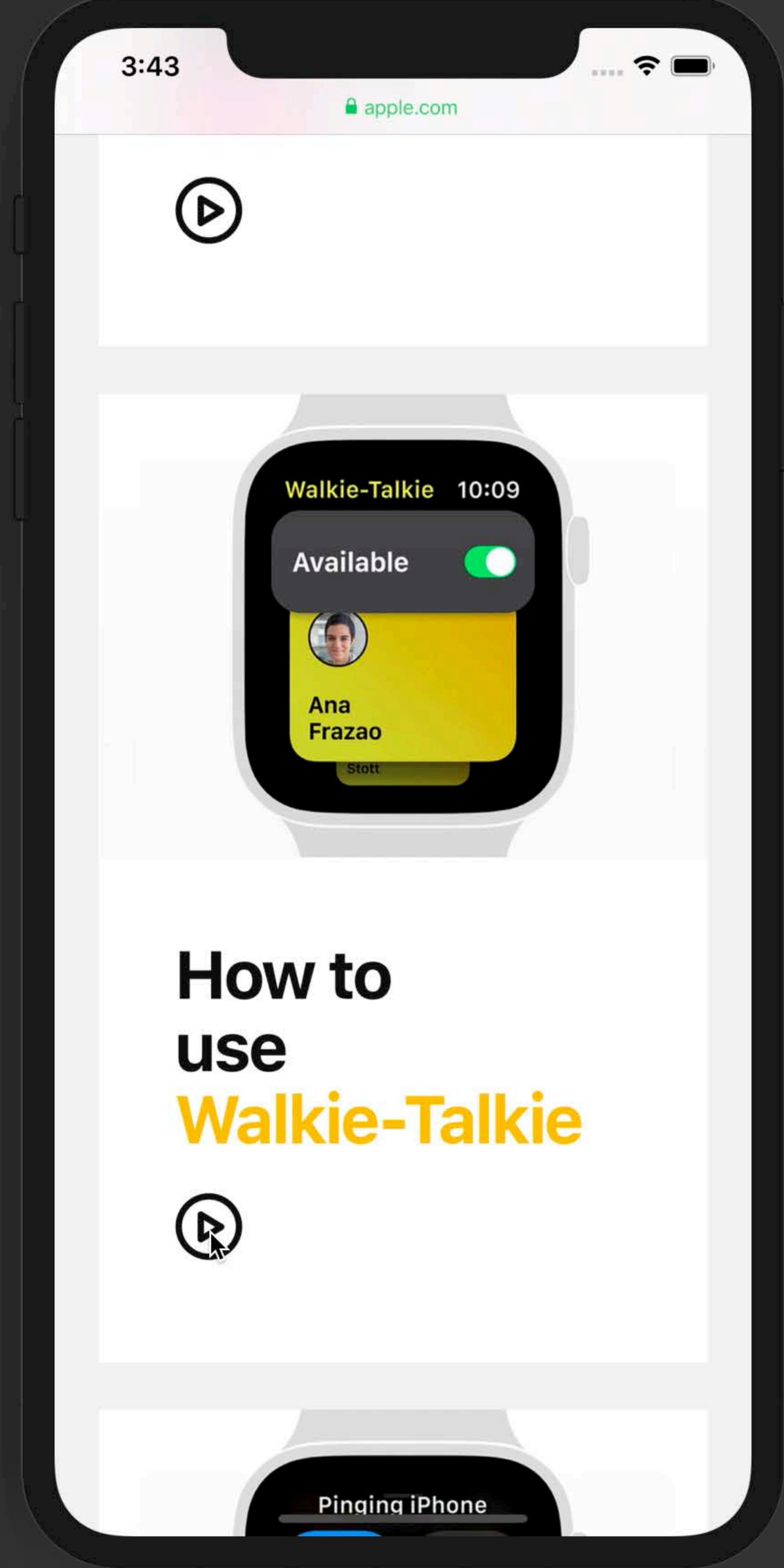
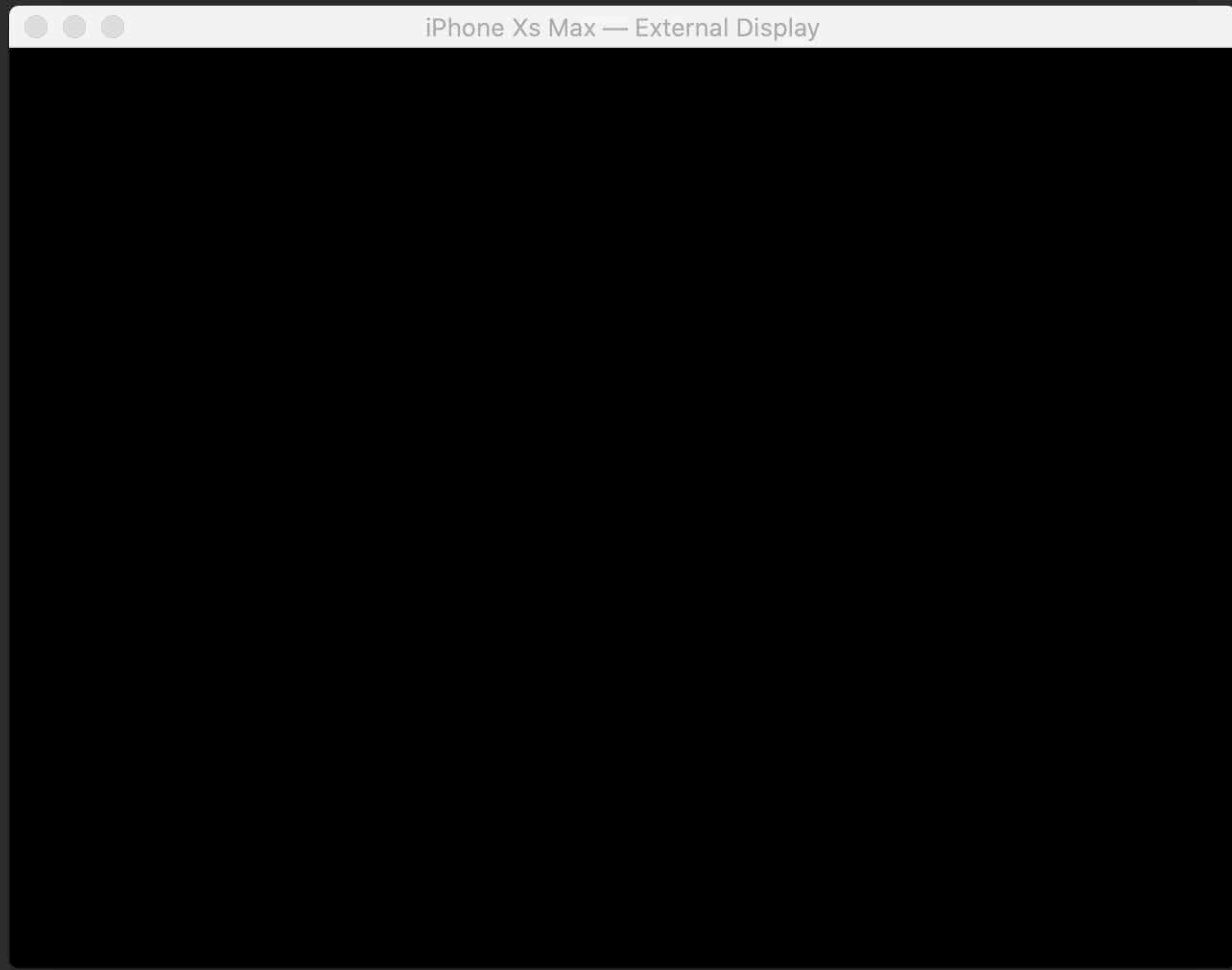








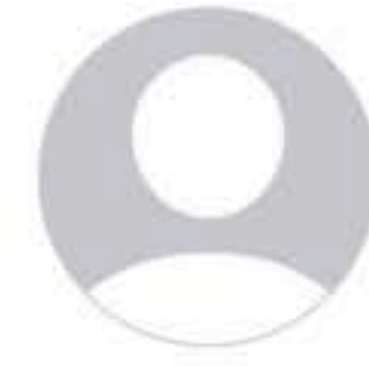




3:50



Settings



Sign in to your iPhone

Set up iCloud, the App Store, and more.



Bluetooth

Unavailable >



General >



Accessibility >



Privacy >



Passwords & Accounts >



Maps >



Safari >



News >



Shortcuts >



Health >



Siri & Search >



Photos >

3:50



Settings



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Siri & Search >



Photos >



Calendar



Photos



Reminders



Contacts



Maps



News



Settings





Calendar



Photos



Reminders



Contacts



Maps

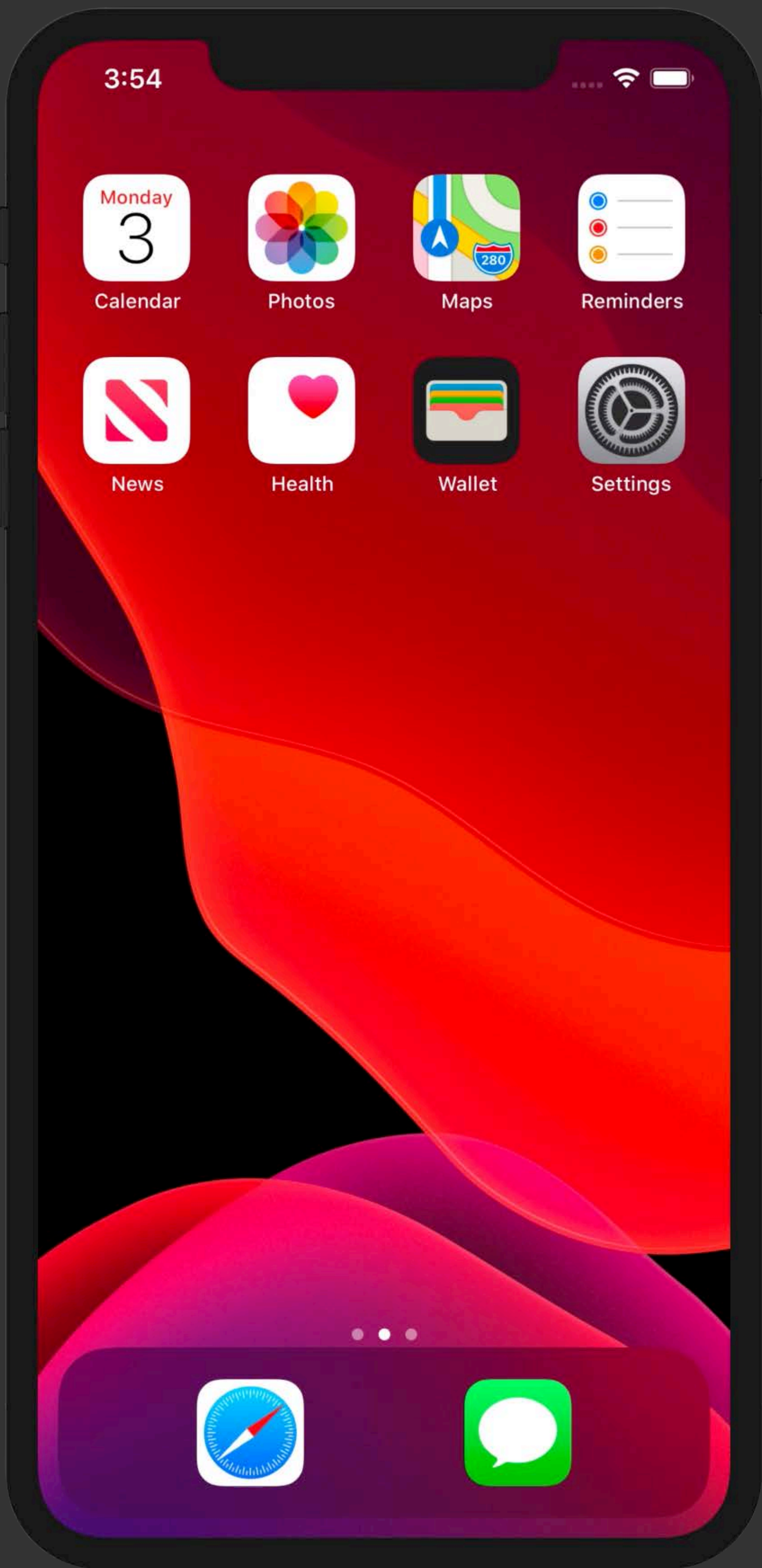


News

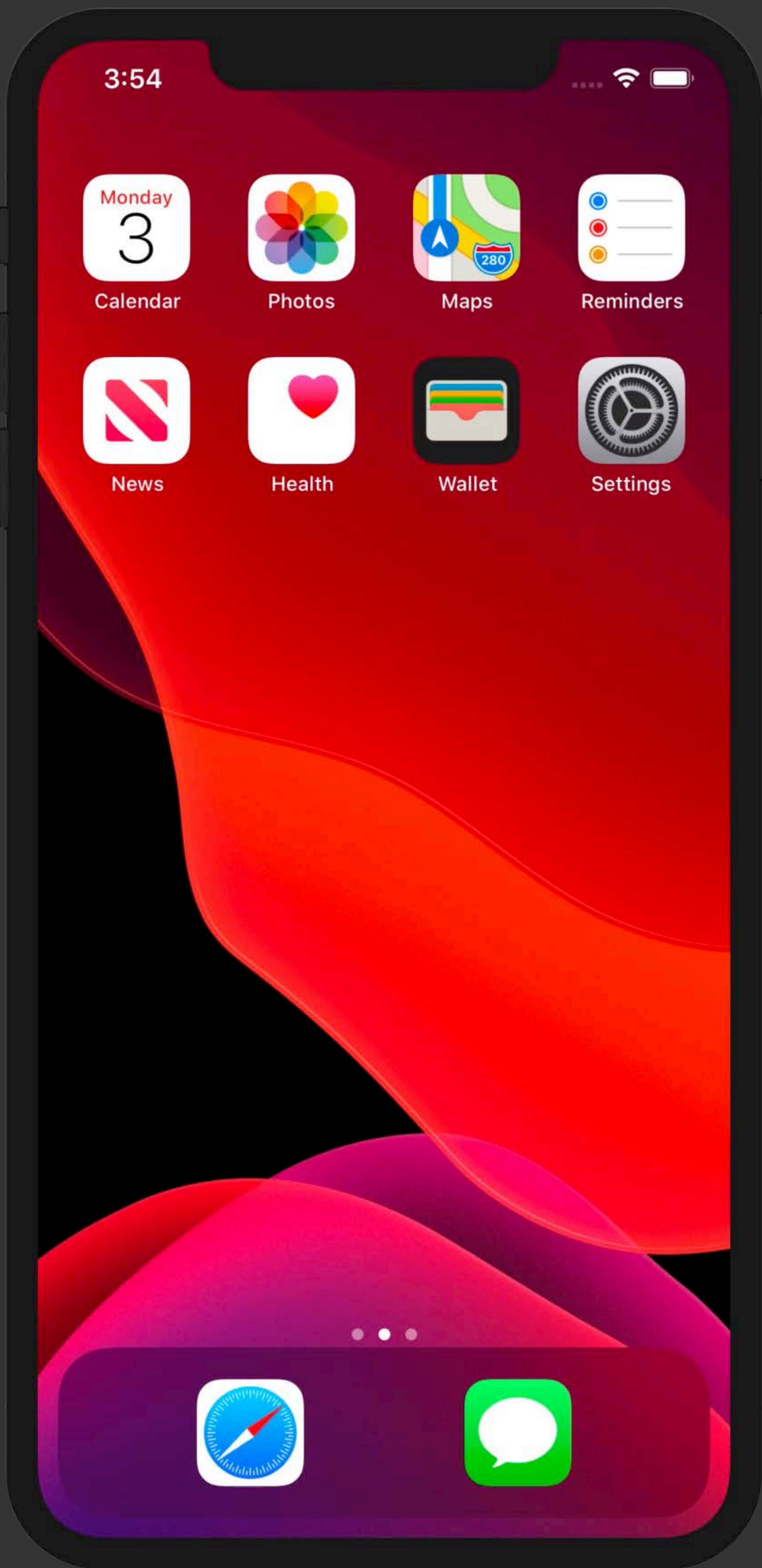


Settings

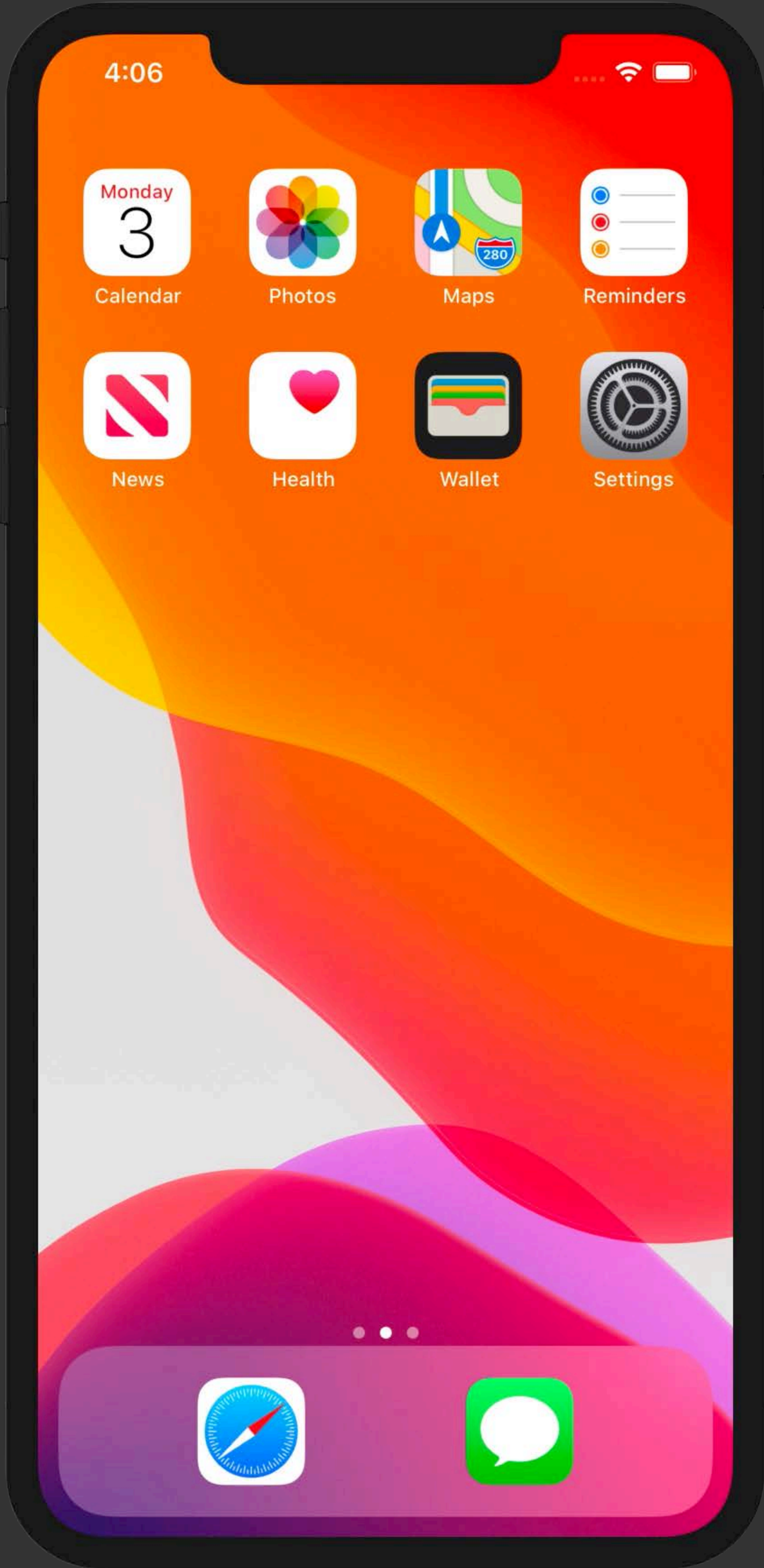




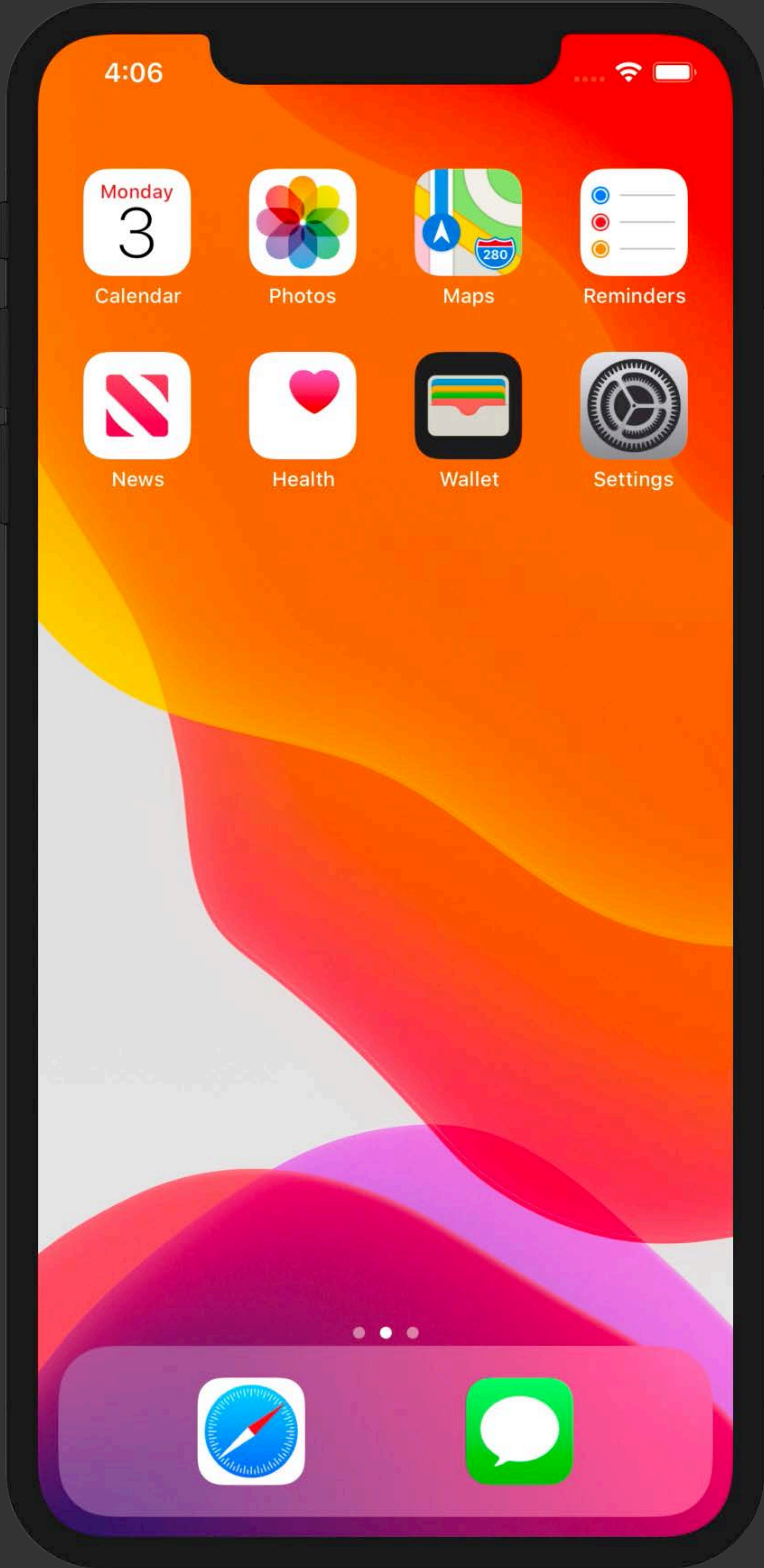
iPhone Xs Max — 13.0



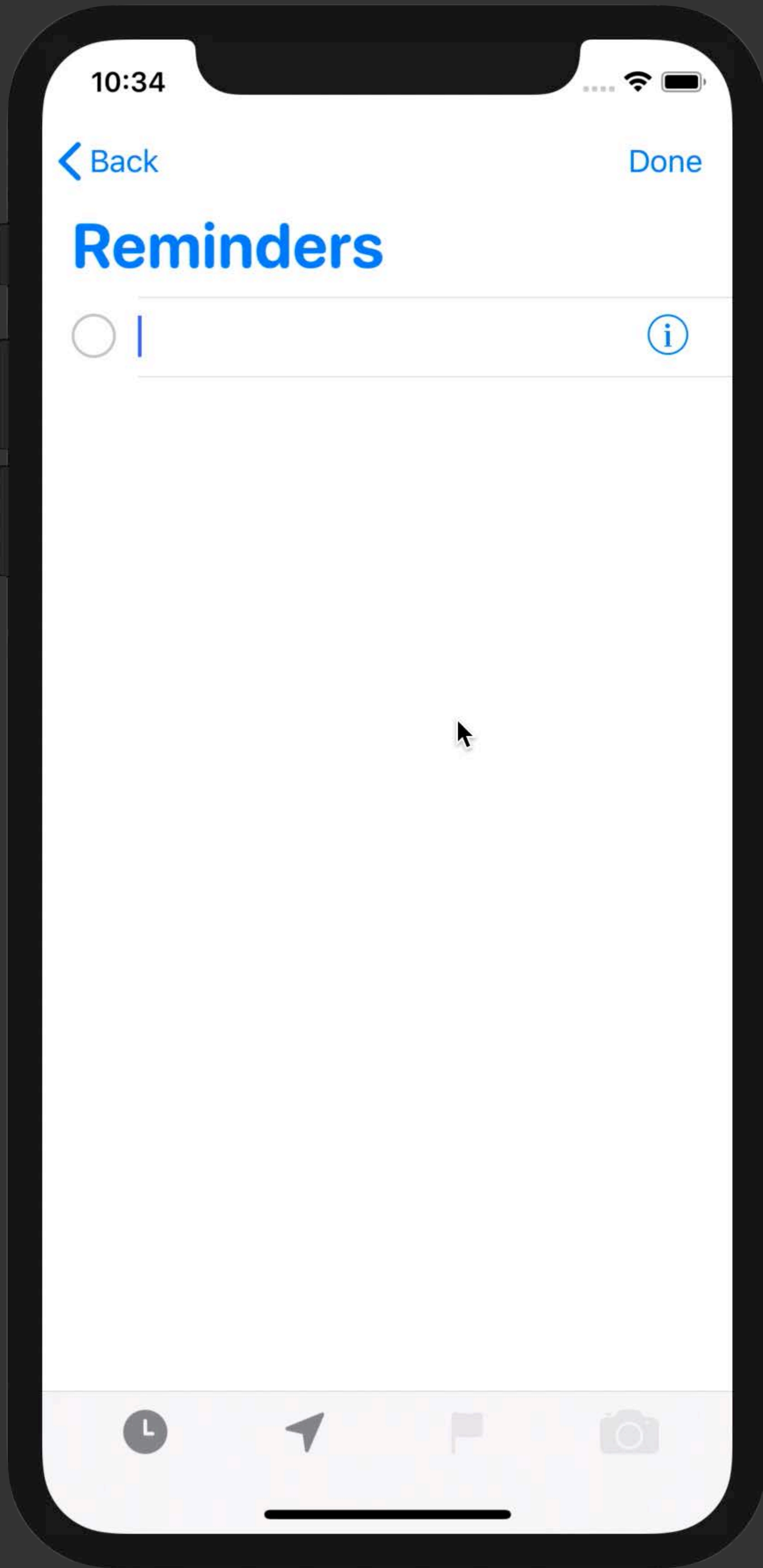
iPhone Xs Max — 13.0

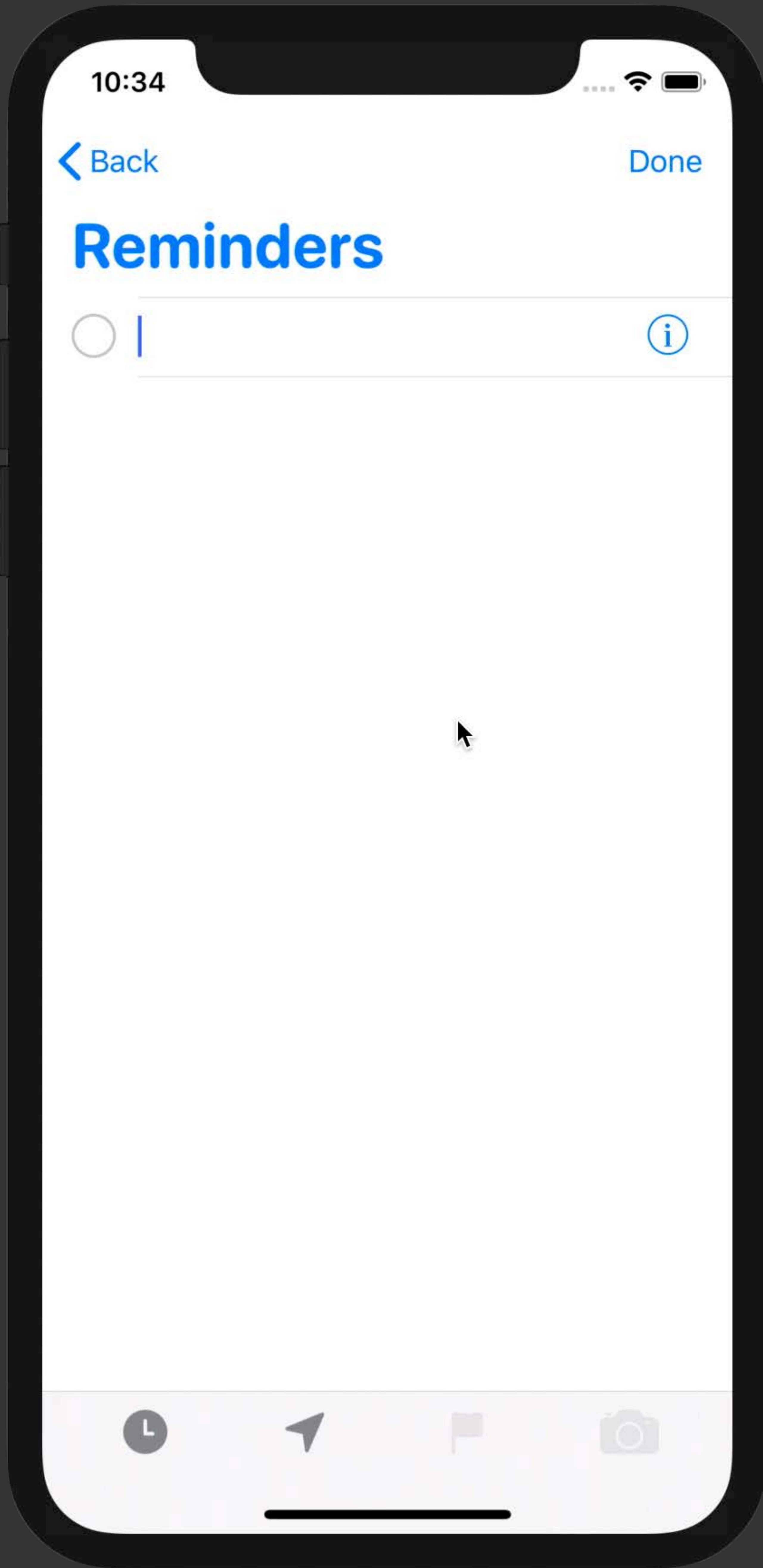


iPhone Xs Max — 13.0



iPhone Xs Max — 13.0







Apple Watch Series 4 - 44mm — 6.0



Apple Watch Series 4 - 44mm — 6.0

Share What You Learned

Simulator from the Command Line

Russ Bishop, Simulator and Devices Engineer

xcrun simctl

xcrun simctl


```
xcrun simctl help
```

simctl

```
$ xcrun simctl list
```

simctl

```
$ xcrun simctl list
== Device Types ==
iPhone X (com.apple.CoreSimulator.SimDeviceType.iPhone-X)
iPhone Xs (com.apple.CoreSimulator.SimDeviceType.iPhone-XS)
iPhone Xs Max (com.apple.CoreSimulator.SimDeviceType.iPhone-XS-Max)
== Runtimes ==
iOS 13.0 - com.apple.CoreSimulator.SimRuntime.iOS-13-0
tvOS 13.0 - com.apple.CoreSimulator.SimRuntime.tvOS-13-0
watchOS 6.0 - com.apple.CoreSimulator.SimRuntime.watchOS-6-0
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
```

simctl

```
$ xcrun simctl list
== Device Types ==
iPhone X (com.apple.CoreSimulator.SimDeviceType.iPhone-X)
iPhone Xs (com.apple.CoreSimulator.SimDeviceType.iPhone-XS)
iPhone Xs Max (com.apple.CoreSimulator.SimDeviceType.iPhone-XS-Max)
== Runtimes ==
iOS 13.0 - com.apple.CoreSimulator.SimRuntime.iOS-13-0
tvOS 13.0 - com.apple.CoreSimulator.SimRuntime.tvOS-13-0
watchOS 6.0 - com.apple.CoreSimulator.SimRuntime.watchOS-6-0
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
```

simctl

```
$ xcrun simctl list
== Device Types ==
iPhone X (com.apple.CoreSimulator.SimDeviceType.iPhone-X)
iPhone Xs (com.apple.CoreSimulator.SimDeviceType.iPhone-XS)
iPhone Xs Max (com.apple.CoreSimulator.SimDeviceType.iPhone-XS-Max)
== Runtimes ==
iOS 13.0 - com.apple.CoreSimulator.SimRuntime.iOS-13-0
tvOS 13.0 - com.apple.CoreSimulator.SimRuntime.tvOS-13-0
watchOS 6.0 - com.apple.CoreSimulator.SimRuntime.watchOS-6-0
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
```

simctl

```
$ xcrun simctl list
== Device Types ==
iPhone X (com.apple.CoreSimulator.SimDeviceType.iPhone-X)
iPhone Xs (com.apple.CoreSimulator.SimDeviceType.iPhone-XS)
iPhone Xs Max (com.apple.CoreSimulator.SimDeviceType.iPhone-XS-Max)
== Runtimes ==
iOS 13.0 - com.apple.CoreSimulator.SimRuntime.iOS-13-0
tvOS 13.0 - com.apple.CoreSimulator.SimRuntime.tvOS-13-0
watchOS 6.0 - com.apple.CoreSimulator.SimRuntime.watchOS-6-0
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
```

simctl

```
$ xcrun simctl list
== Device Types ==
iPhone X (com.apple.CoreSimulator.SimDeviceType.iPhone-X)
iPhone Xs (com.apple.CoreSimulator.SimDeviceType.iPhone-XS)
iPhone Xs Max (com.apple.CoreSimulator.SimDeviceType.iPhone-XS-Max)
== Runtimes ==
iOS 13.0 - com.apple.CoreSimulator.SimRuntime.iOS-13-0
tvOS 13.0 - com.apple.CoreSimulator.SimRuntime.tvOS-13-0
watchOS 6.0 - com.apple.CoreSimulator.SimRuntime.watchOS-6-0
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
```

simctl

```
$ xcrun simctl list devices
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
    iPhone XS (69F48379-5DF4-42F3-BD49-2348ACD0E4E0) (Shutdown)
    iPhone XS Max (743D07F9-C418-40FC-8745-2E23E65A9A00) (Shutdown)
    iPhone XR (C6001449-5D04-4647-89FD-5052EA0D18C5) (Shutdown)
    iPhone XR too (065A5682-94E0-4537-93B8-6E5D362612E2) (Shutdown)
-- tvOS 13.0 --
    AppleTV 4K (24E9EE3F-9411-4526-ACDE-24A3F27C8CB0) (Shutdown)
-- watchOS 6.0 --
    Apple Watch Series 4 - 44mm (23F66837-5294-44B3-A787-2BF29610FB00) (Shutdown)
```


simctl

```
$ xcrun simctl list devices "iPhone X"
== Devices ==
-- iOS 13.0 --
    iPhone X (25375541-C484-47C2-BAB8-78E8CAD3F19E) (Shutdown)
    iPhone XS (69F48379-5DF4-42F3-BD49-2348ACD0E4E0) (Shutdown)
    iPhone XS Max (743D07F9-C418-40FC-8745-2E23E65A9A00) (Shutdown)
    iPhone XR (C6001449-5D04-4647-89FD-5052EA0D18C5) (Shutdown)
    iPhone XR too (065A5682-94E0-4537-93B8-6E5D362612E2) (Shutdown)
-- tvOS 13.0 --
-- watchOS 6.0 --
```

simctl

```
$ xcrun simctl list --json
{
  "com.apple.CoreSimulator.SimRuntime.iOS-13-0" : [
    { "state" : "Shutdown",
      "isAvailable" : true,
      "name" : "iPhone X",
      "udid" : "25375541-C484-47C2-BAB8-78E8CAD3F19E" },
    { "state" : "Shutdown",
      "isAvailable" : true,
      "name" : "iPhone Xs",
      "udid" : "69F48379-5DF4-42F3-BD49-2348ACD0E4E0" },
    ...
  ]
}
```

simctl

```
$ xcrun simctl create <name> <device type> <runtime>
```

simctl

```
$ xcrun simctl create "Test Watch" <device type> <runtime>
```

simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" <runtime>
```

simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" watchOS6.0
```

simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" watchOS6.0␣  
E1CF7D9D-9961-42E7-87CB-881A14EF479C
```

simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" watchOS6.0  
E1CF7D9D-9961-42E7-87CB-881A14EF479C
```

```
$ NEW_DEVICE=$(xcrun simctl create "Test Phone" "iPhone XR" iOS13.0)
```


simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" watchOS6.0↵  
E1CF7D9D-9961-42E7-87CB-881A14EF479C
```

```
$ NEW_DEVICE=$(xcrun simctl create "Test Phone" "iPhone XR" iOS13.0)↵
```

```
$ echo "🤖 Created ${NEW_DEVICE}"↵
```

simctl

```
$ xcrun simctl create "Test Watch" "Apple Watch Series 4 - 44mm" watchOS6.0↵  
E1CF7D9D-9961-42E7-87CB-881A14EF479C
```

```
$ NEW_DEVICE=$(xcrun simctl create "Test Phone" "iPhone XR" iOS13.0)↵
```

```
$ echo "🤖 Created ${NEW_DEVICE}"↵
```

```
🤖 Created 2772A4D0-EC31-4385-AB56-C1C6D22DA6D5
```

simctl

```
$ xcrun simctl spawn <device> <command> <arguments>
```

simctl

```
$ xcrun simctl spawn booted defaults write com.example.app ResetDatabase -bool YES
```

simctl

```
$ xcrun simctl spawn booted defaults write com.example.app ResetDatabase -bool YES
```

simctl

```
$ xcrun simctl spawn booted log stream --predicate 'senderImagePath CONTAINS "nsurlsessiond"'
```

simctl

```
$ xcrun simctl spawn booted log stream --predicate 'senderImagePath CONTAINS "NSURLSession"'
```

```
NSURLSession: [com.appleNSURLSession:background] Task <0402>.<1> resuming, QOS(0x19)
```

```
NSURLSession: [com.appleNSURLSession:background] Task <0402>.<1> resuming
```

```
NSURLSession: [com.appleNSURLSession:background] Task <0402>.<1> has not requested a begin  
delay
```

```
NSURLSession: [com.appleNSURLSession:background] Task <0402>.<1> skipping delayed request  
callback - delegate not implemented
```

```
NSURLSession: [com.appleNSURLSession:background] Task <0402>.<1> will begin
```

```
NSURLSession: [com.appleNSURLSession:background] Task <5743>.<2> dataTaskWithRequest:  
<NSMutableURLRequest: 0x7f955d50d2c0> { URL: <private> } [allowsCellularAccess: 1]
```

simctl

```
$ xcrun simctl diagnose
```


simctl

```
$ xcrun simctl diagnose -l
```

simctl

```
$ xcrun simctl diagnose -l
```

```
Successfully wrote simctl diagnose archive to 'simctl_diagnose_2019_06_07.tar.gz'
```

simctl

```
$ xcrun simctl diagnose -l  
Successfully wrote simctl diagnose archive to 'simctl_diagnose_2019_06_07.tar.gz'
```



Include a simctl diagnose when filing bugs

simctl

```
$ xcrun simctl launch <device> <bundle> <arguments>
```

simctl

```
$ xcrun simctl launch booted <bundle> <arguments>
```

simctl

```
$ xcrun simctl launch booted com.apple.example <arguments>
```

simctl

```
$ xcrun simctl launch booted com.apple.example -MyDefaultKey YES
```

simctl

```
$ xcrun simctl launch booted com.apple.example -MyDefaultKey YES
```


simctl

```
$ xcrun simctl launch --console-pty booted com.apple.example -MyDefaultKey YES
```

simctl

```
$ xcrun simctl launch --console-pty booted com.apple.example -MyDefaultKey YES
```

simctl

```
$ xcrun simctl launch --console-pty booted com.apple.example -MyDefaultKey YES
com.apple.example: 42042
2019-05-22 23:22:36.766 [Example] Selected Device: Apple iOS simulator GPU
2019-05-22 23:22:36.766 [Example] Starting Rendering...
2019-05-22 23:22:36.766 [Example] Press ENTER to print frame count
```

simctl

```
$ xcrun simctl launch --console-pty booted com.apple.example -MyDefaultKey YES
com.apple.example: 42042
2019-05-22 23:22:36.766 [Example] Selected Device: Apple iOS simulator GPU
2019-05-22 23:22:36.766 [Example] Starting Rendering...
2019-05-22 23:22:36.766 [Example] Press ENTER to print frame count
```

simctl

```
$ xcrun simctl launch --console-pty booted com.apple.example -MyDefaultKey YES
com.apple.example: 42042
2019-05-22 23:22:36.766 [Example] Selected Device: Apple iOS simulator GPU
2019-05-22 23:22:36.766 [Example] Starting Rendering...
2019-05-22 23:22:36.766 [Example] Press ENTER to print frame count
↵
Frame Count: 931
^C
$
```

Other simctl Commands



Other simctl Commands

```
$ xcrun simctl boot <device>
```

Other simctl Commands

```
$ xcrun simctl boot <device>
```

```
$ xcrun simctl shutdown <device>
```


Other simctl Commands

```
$ xcrun simctl boot <device>
```

```
$ xcrun simctl shutdown all
```

Other simctl Commands

```
$ xcrun simctl boot <device>  
$ xcrun simctl shutdown all  
$ xcrun simctl delete <device>
```

Other simctl Commands

```
$ xcrun simctl boot <device>  
$ xcrun simctl shutdown all  
$ xcrun simctl delete unavailable
```

Other simctl Commands

```
$ xcrun simctl boot <device>  
$ xcrun simctl shutdown all  
$ xcrun simctl delete unavailable  
$ xcrun simctl pair <watch> <phone>
```

Other simctl Commands

```
$ xcrun simctl boot <device>
$ xcrun simctl shutdown all
$ xcrun simctl delete unavailable
$ xcrun simctl pair <watch> <phone>
$ xcrun simctl addmedia <device> <file1> <file2>
```

Other simctl Commands

```
$ xcrun simctl boot <device>
$ xcrun simctl shutdown all
$ xcrun simctl delete unavailable
$ xcrun simctl pair <watch> <phone>
$ xcrun simctl addmedia <device> <file1> <file2>
$ xcrun simctl get_app_container <device> <bundle id> <type>
```

Other simctl Commands

```
$ xcrun simctl boot <device>
```

```
$ xcrun simctl shutdown all
```

```
$ xcrun simctl delete unavailable
```

```
$ xcrun simctl pair <watch> <phone>
```

```
$ xcrun simctl addmedia <device> <file1> <file2>
```

```
$ xcrun simctl get_app_container <device> <bundle id> <type>
```

```
$ xcrun simctl install <device> <example.app>
```

Other simctl Commands

```
$ xcrun simctl boot <device>
$ xcrun simctl shutdown all
$ xcrun simctl delete unavailable
$ xcrun simctl pair <watch> <phone>
$ xcrun simctl addmedia <device> <file1> <file2>
$ xcrun simctl get_app_container <device> <bundle id> <type>
$ xcrun simctl install <device> <example.app>
$ xcrun simctl io <device> screenshot <output.png>
```


simctl

```
$ xcrun simctl clone <device> <clone name>
```

Demo

NEW

Metal in Simulator

Amazing rendering, amazing speed

Katelyn Hicks, GPU Software Engineer

Simulator Now Supports Metal



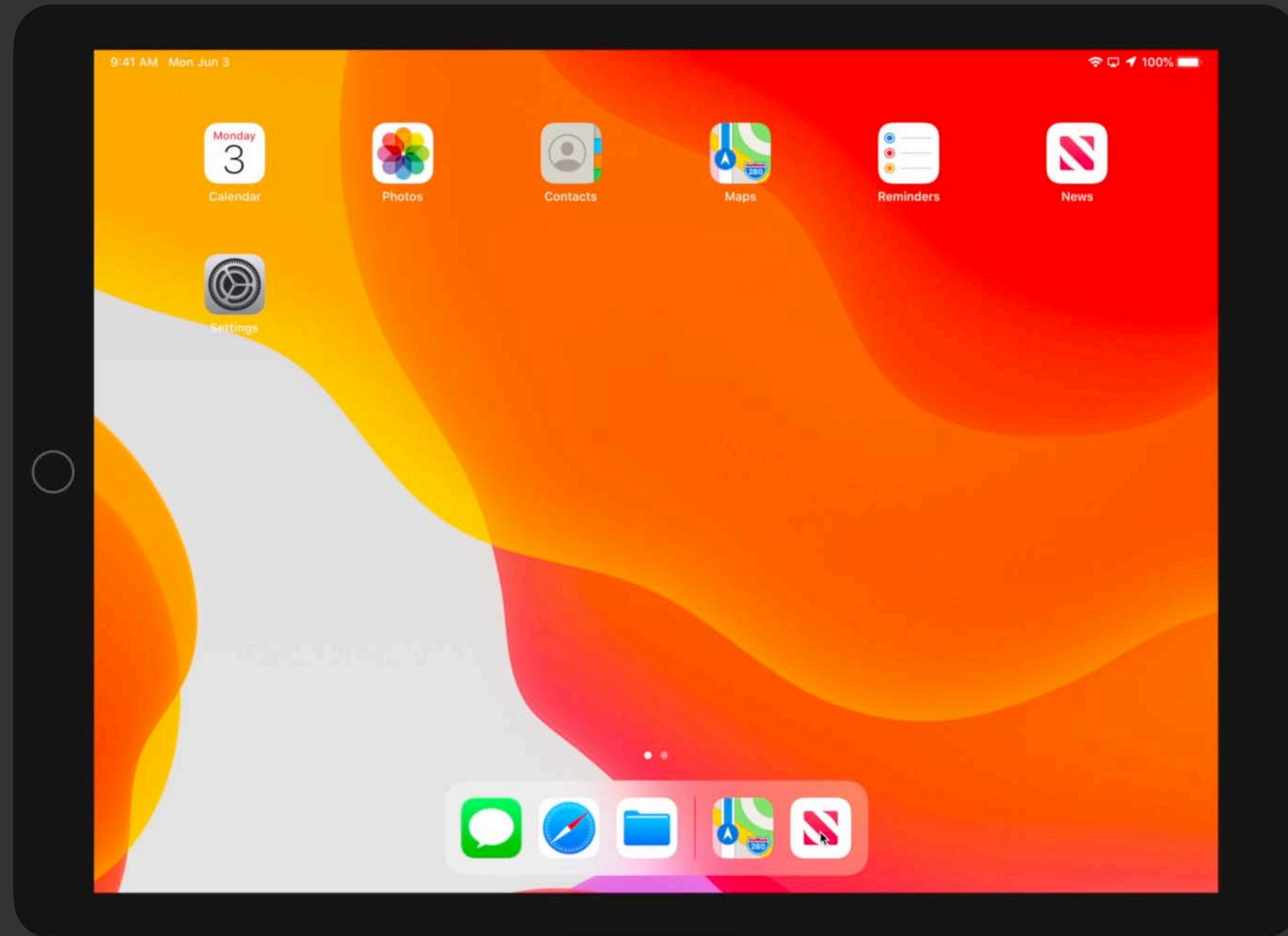
NEW

Simulator is much faster through Metal

Metal can be used in your application

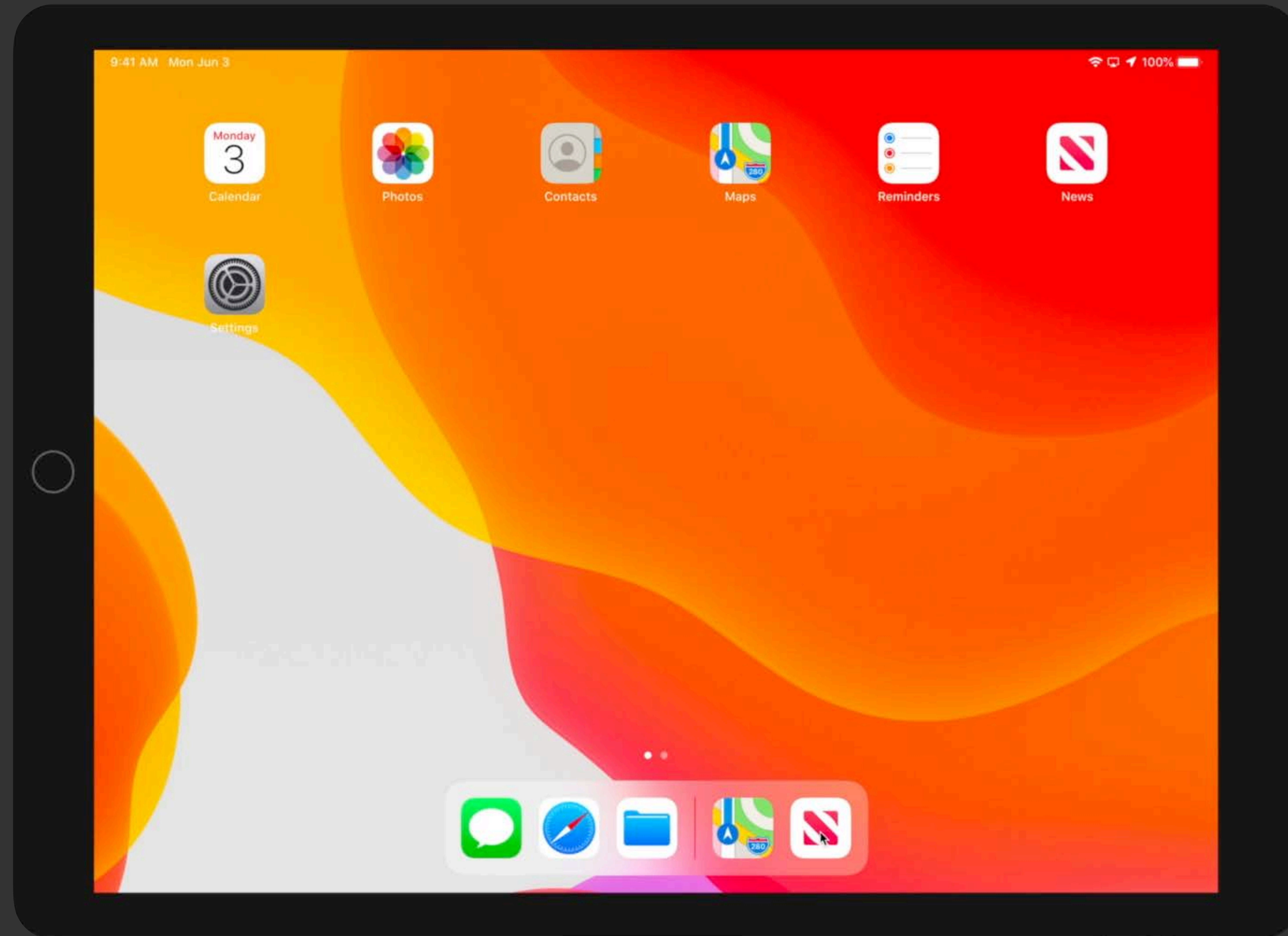
Simulator Now Supports Metal

NEW



Simulator Now Supports Metal

NEW



Apple Frameworks Are Now Accelerated

NEW



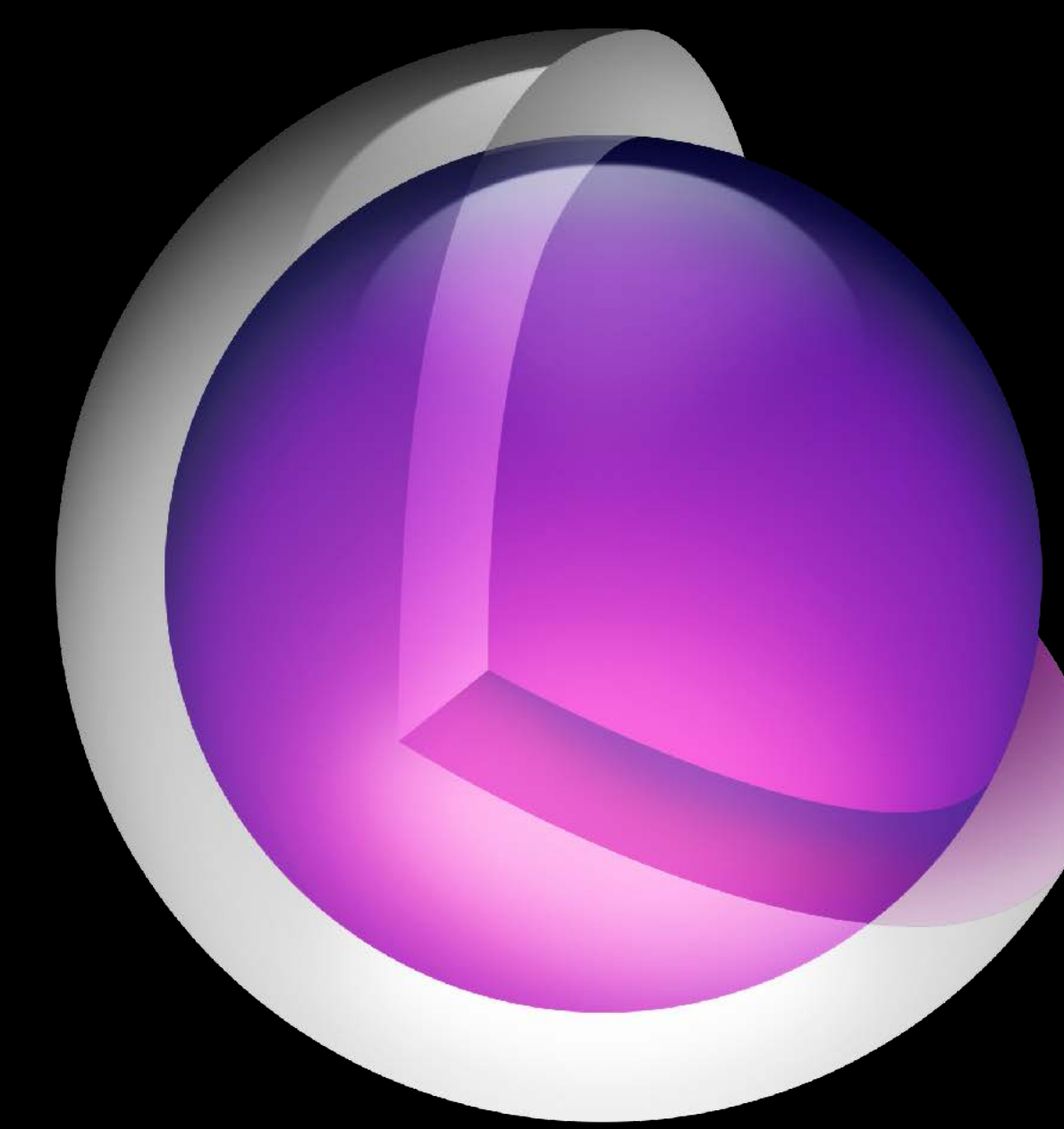
UIKit



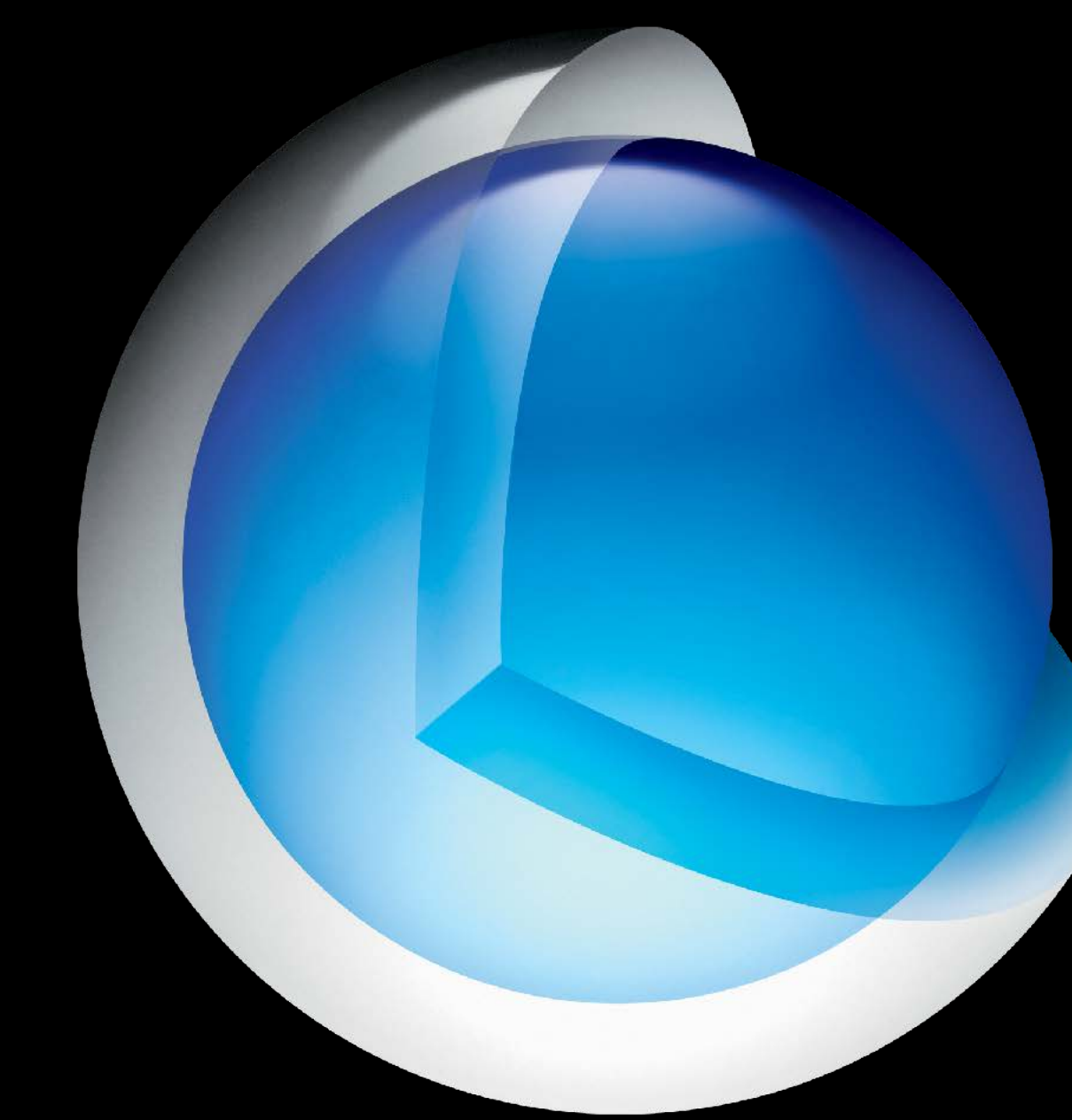
SpriteKit



SceneKit



CoreAnimation



CoreImage



MapKit

Apple Frameworks Are Now Accelerated

NEW



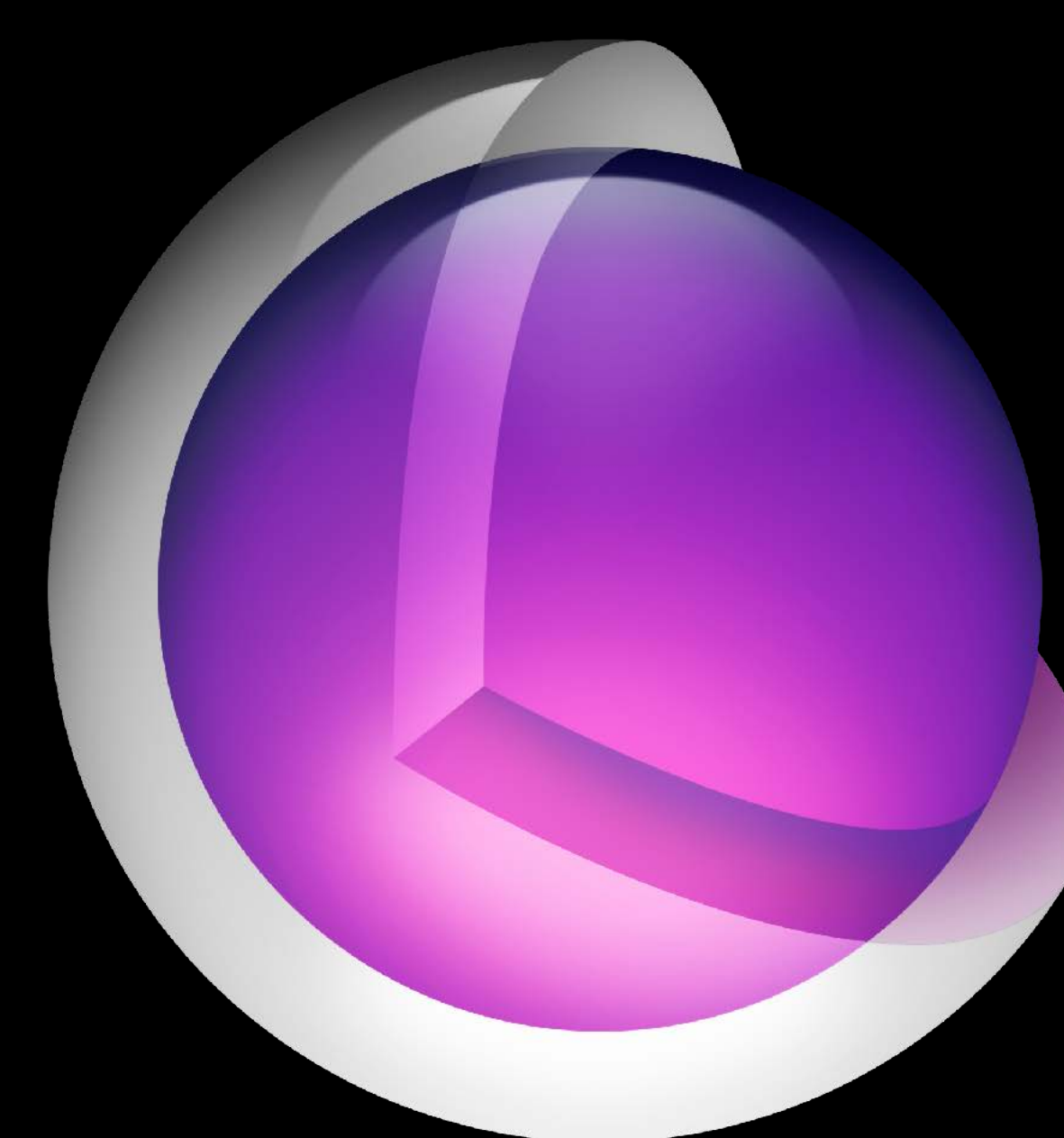
UIKit



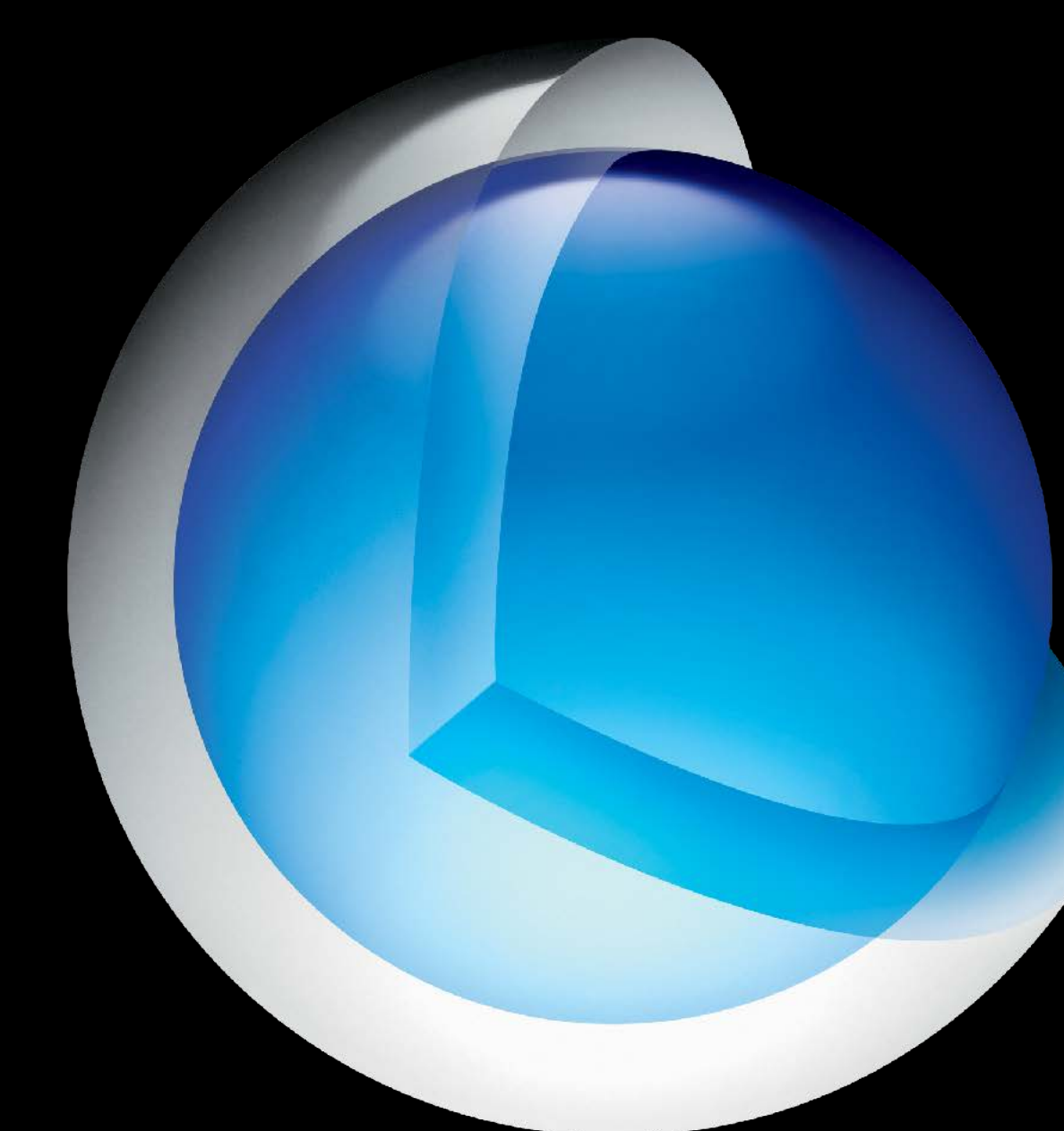
SpriteKit



SceneKit



CoreAnimation



CoreImage

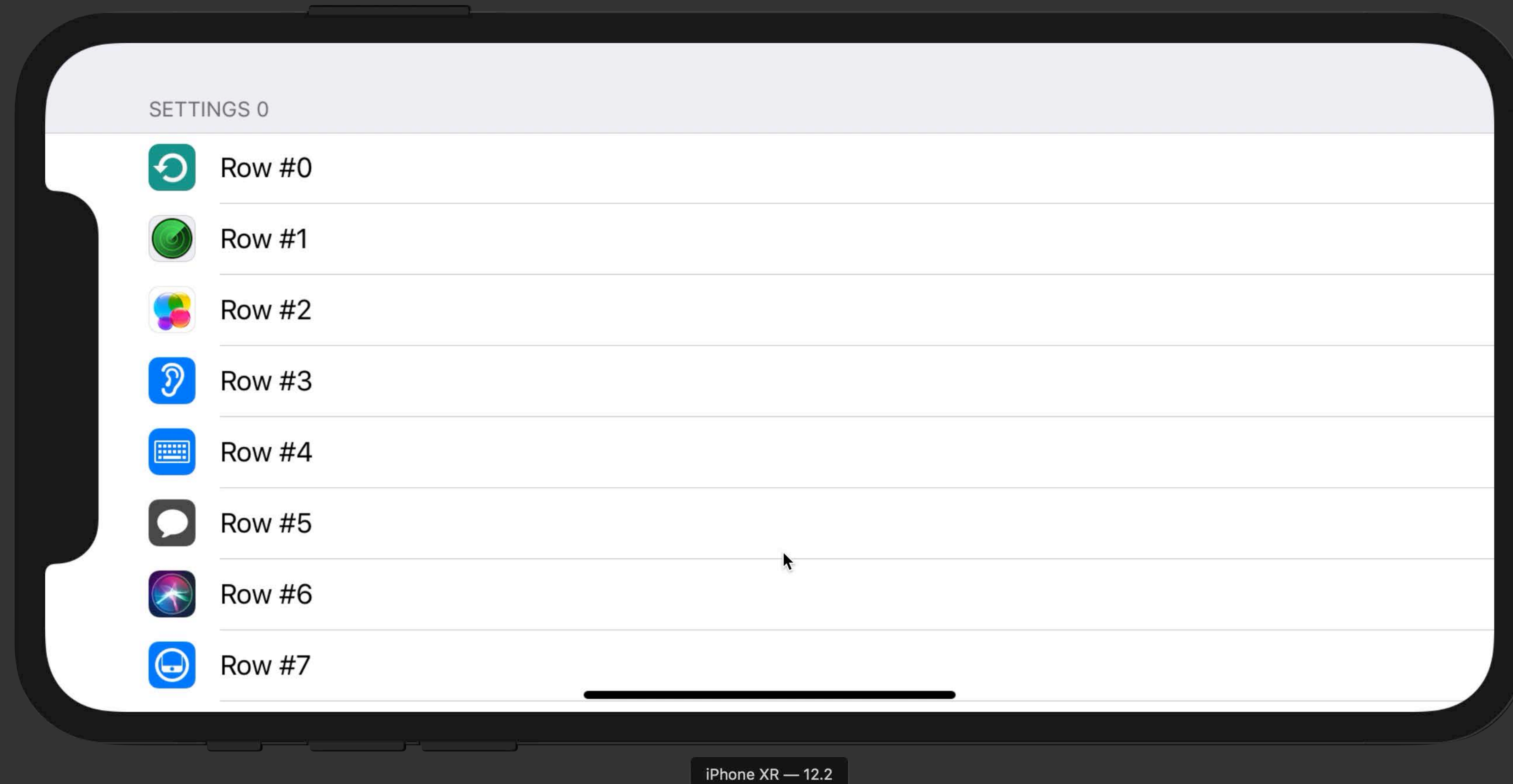


MapKit

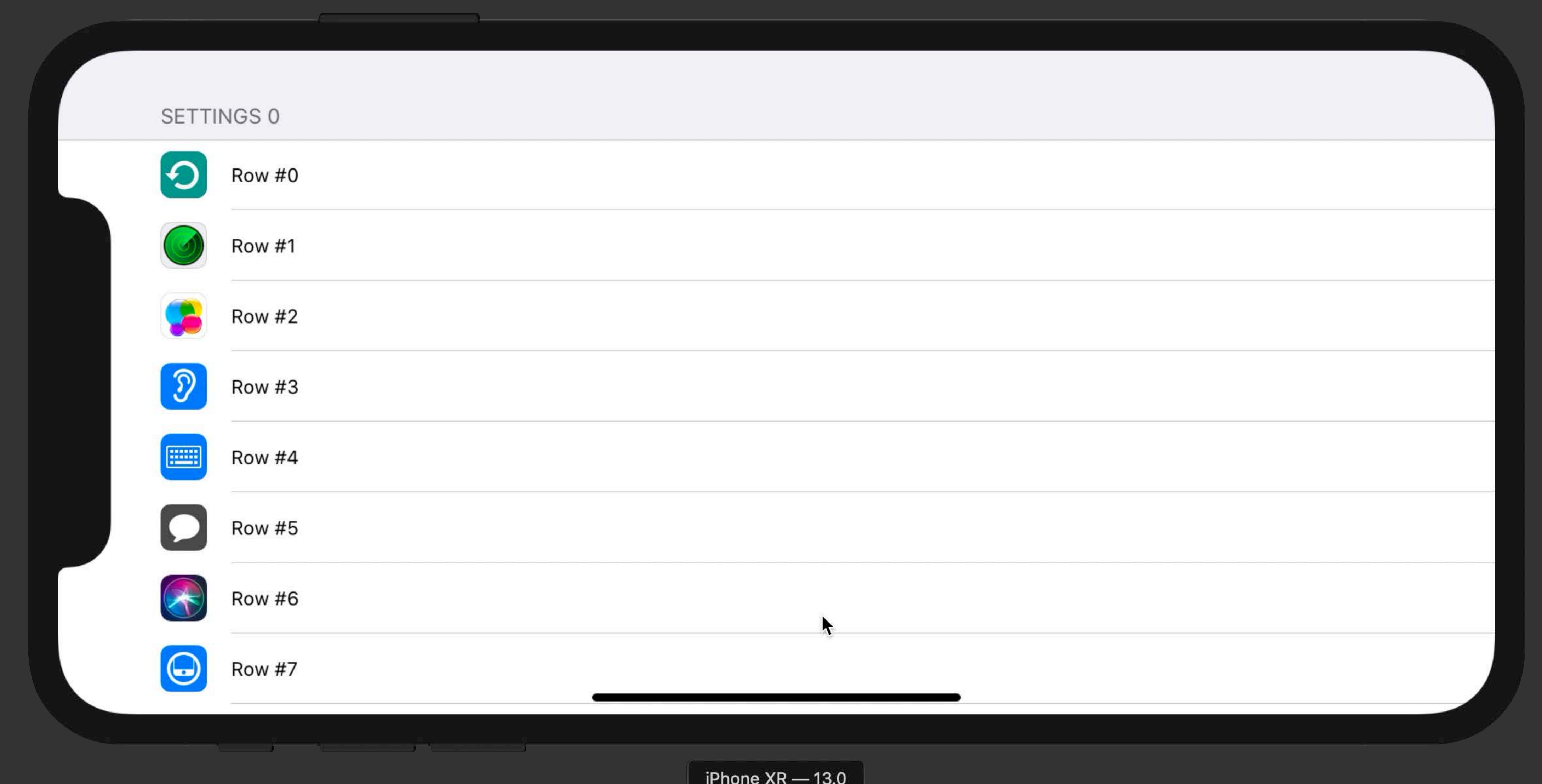
The transition is transparent

Performance Improvements

UIKit



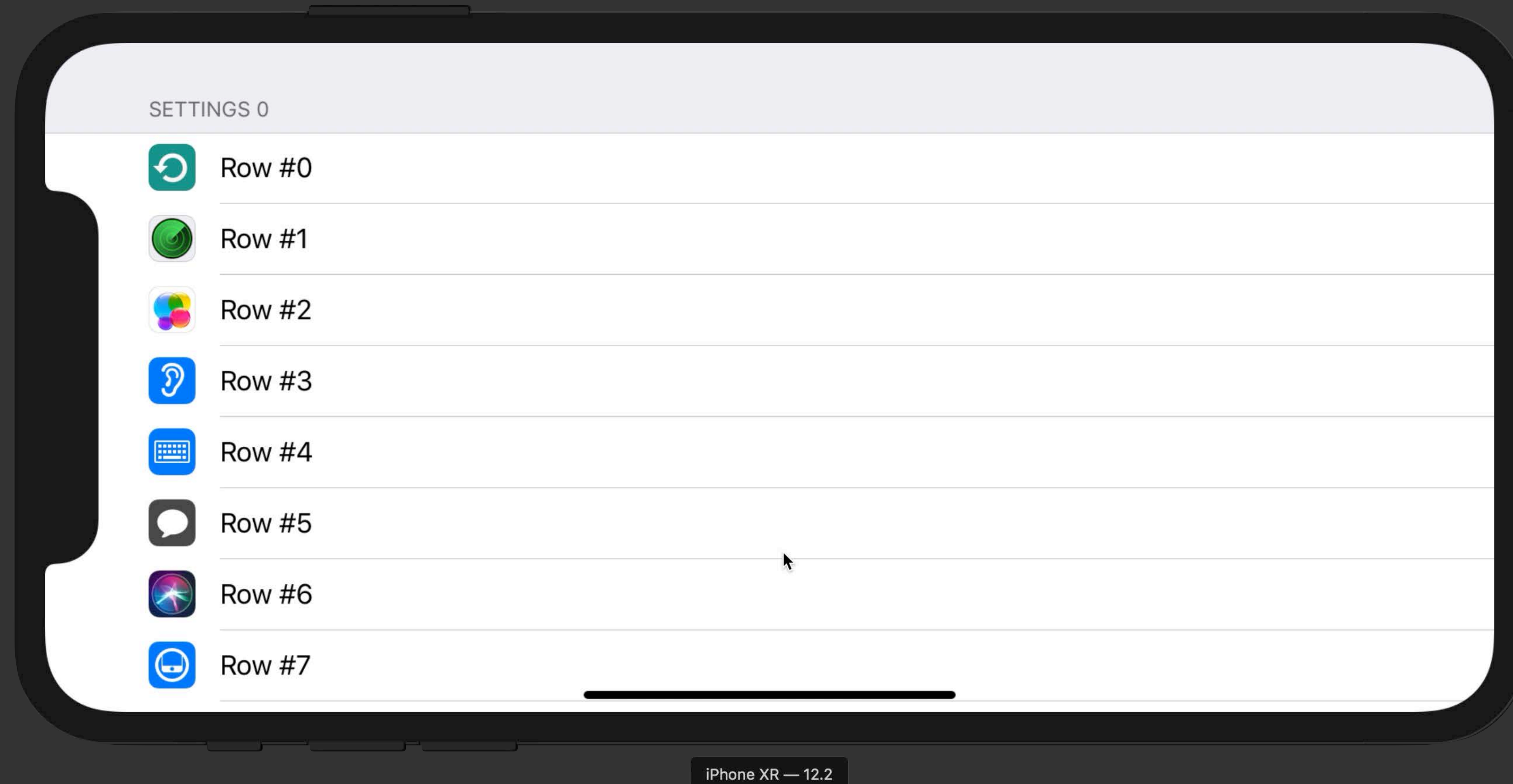
Previous Xcode Versions



Xcode 11 and macOS 10.15

Performance Improvements

UIKit



Previous Xcode Versions



Xcode 11 and macOS 10.15

Performance Improvements

SpriteKit



Previous Xcode Versions



Xcode 11 and macOS 10.15

Performance Improvements

SpriteKit



Previous Xcode Versions



Xcode 11 and macOS 10.15

Performance Improvements

SceneKit



iPhone XR — 12.2

Previous Xcode Versions



iPhone XR — 13.0

Xcode 11 and macOS 10.15

Performance Improvements

SceneKit



iPhone XR — 12.2

Previous Xcode Versions



iPhone XR — 13.0

Xcode 11 and macOS 10.15

Performance Improvements



iPad Air (3rd generation) — 13.0



Performance Improvements



iPad Air (3rd generation) — 13.0



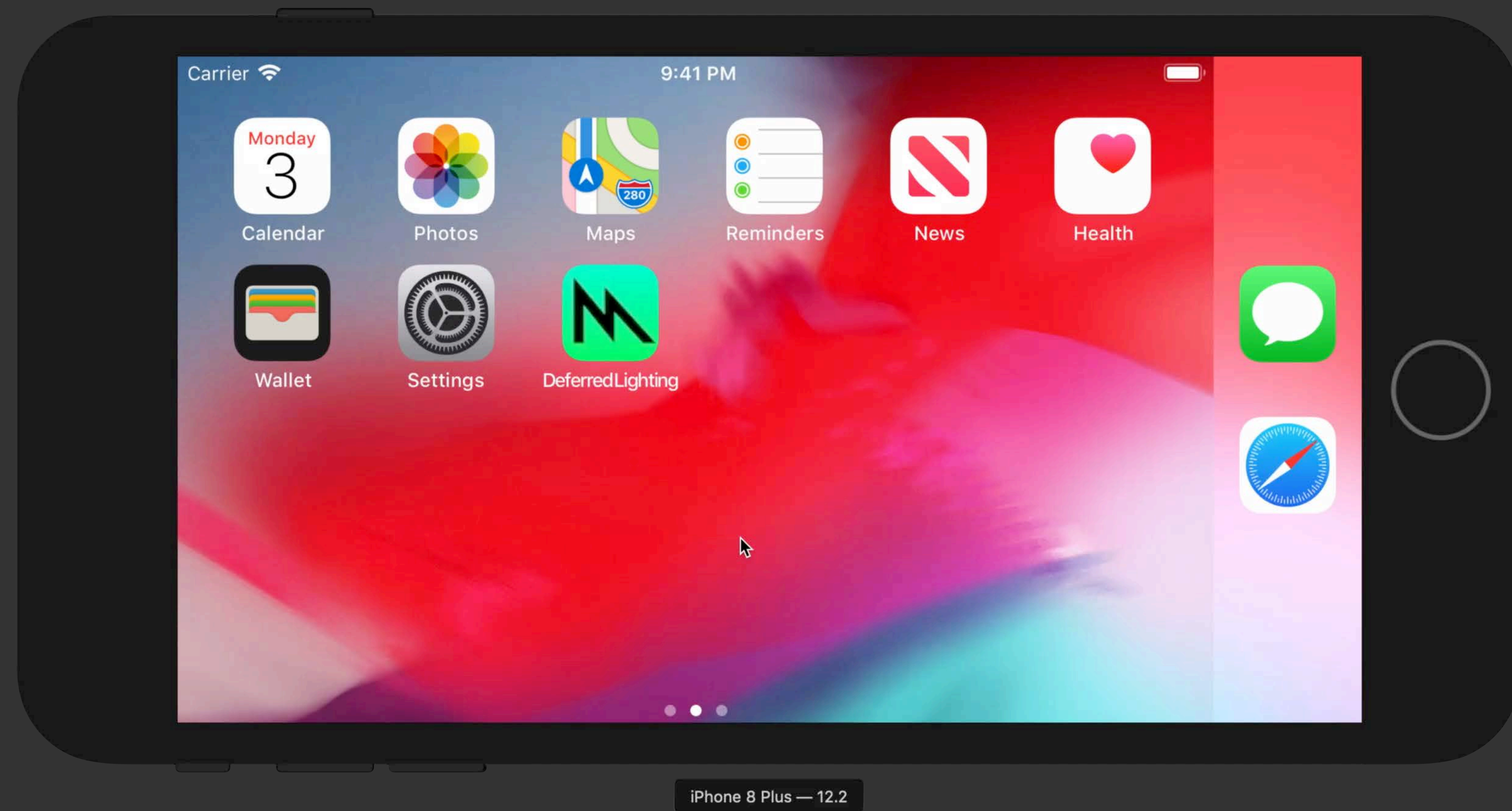
Metal API Is Now Available

NEW

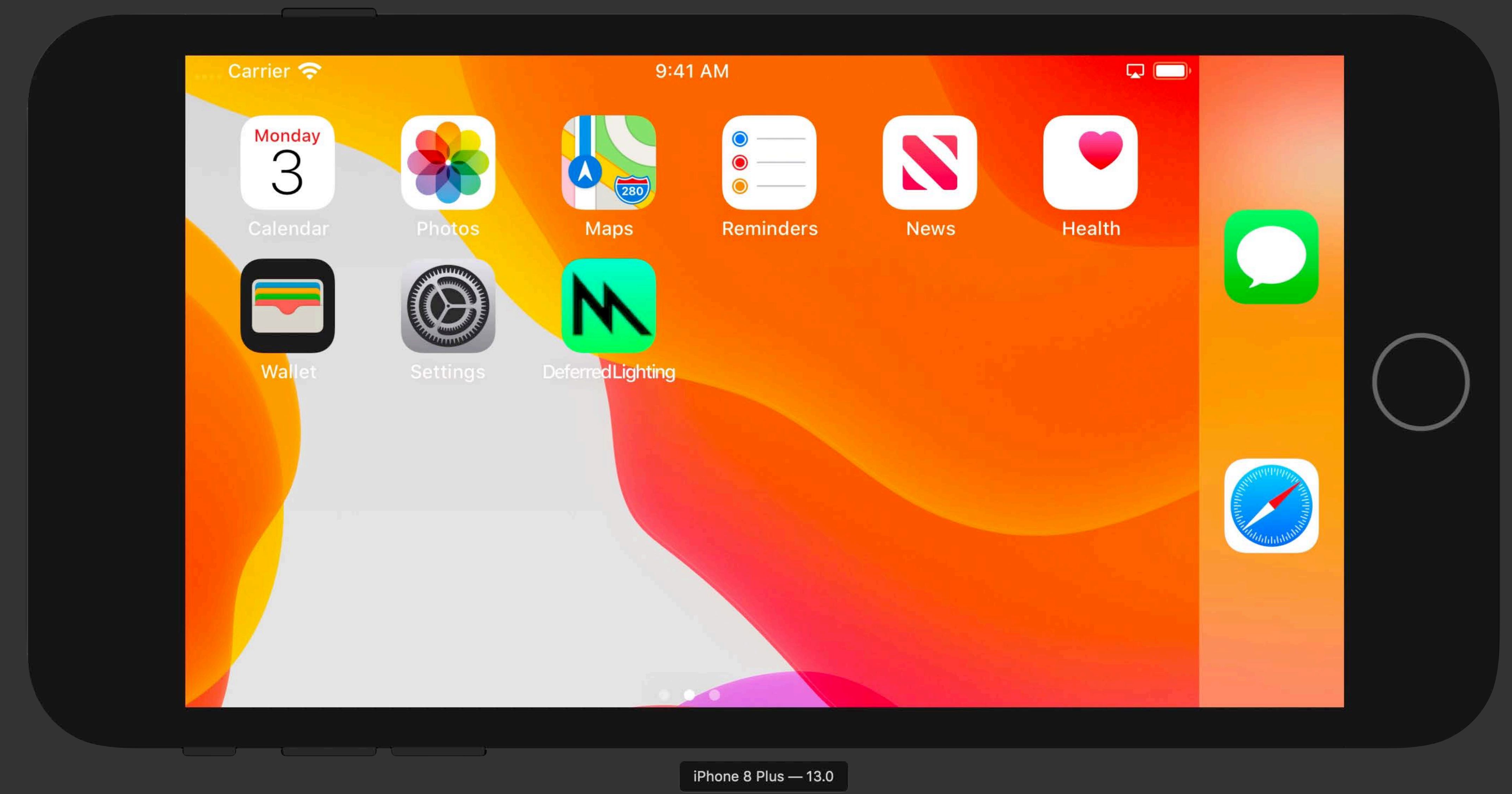
And fully accelerated using the Mac GPU



Enabling Metal Development in Simulator

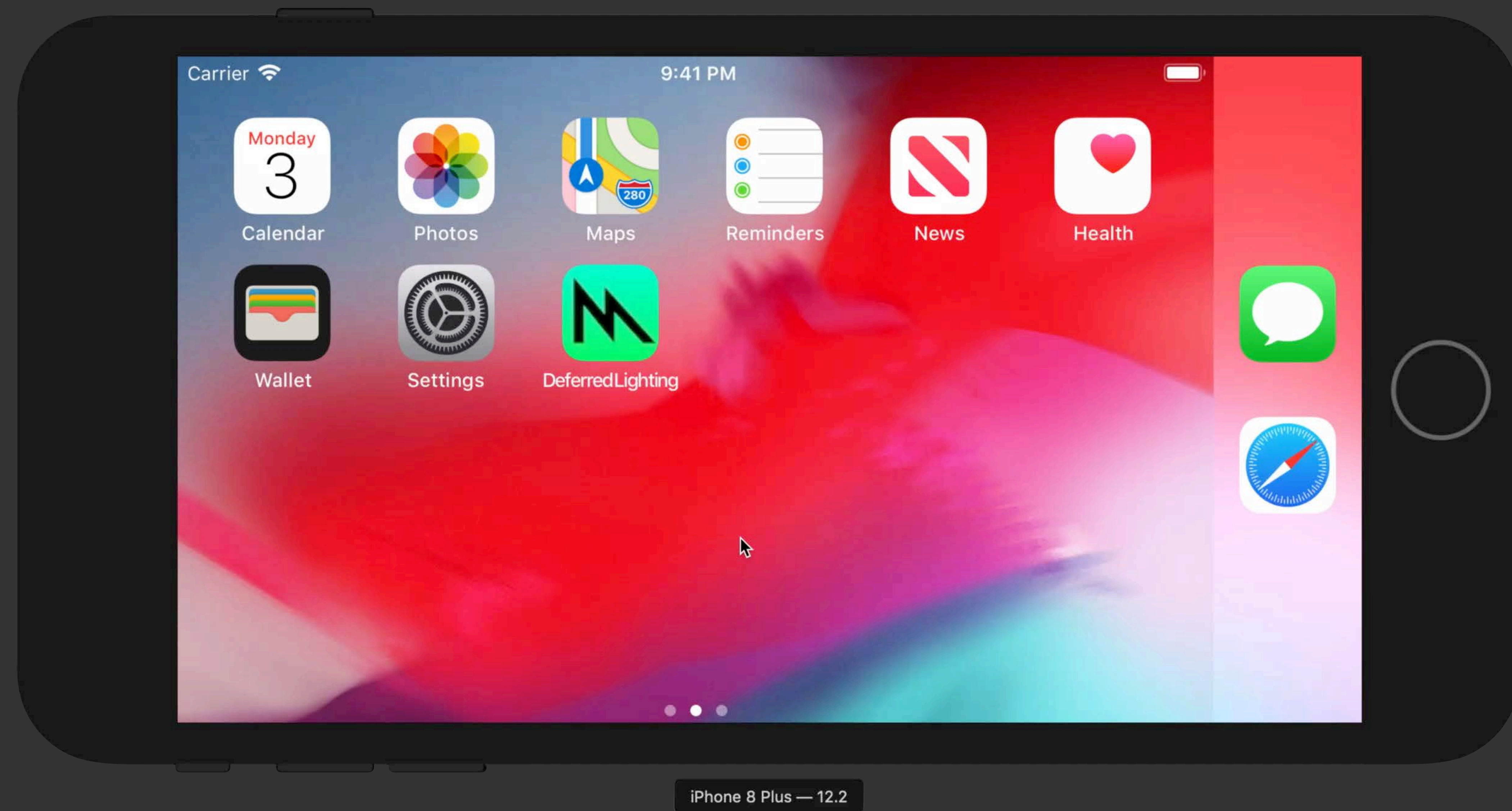


Previous Xcode Versions

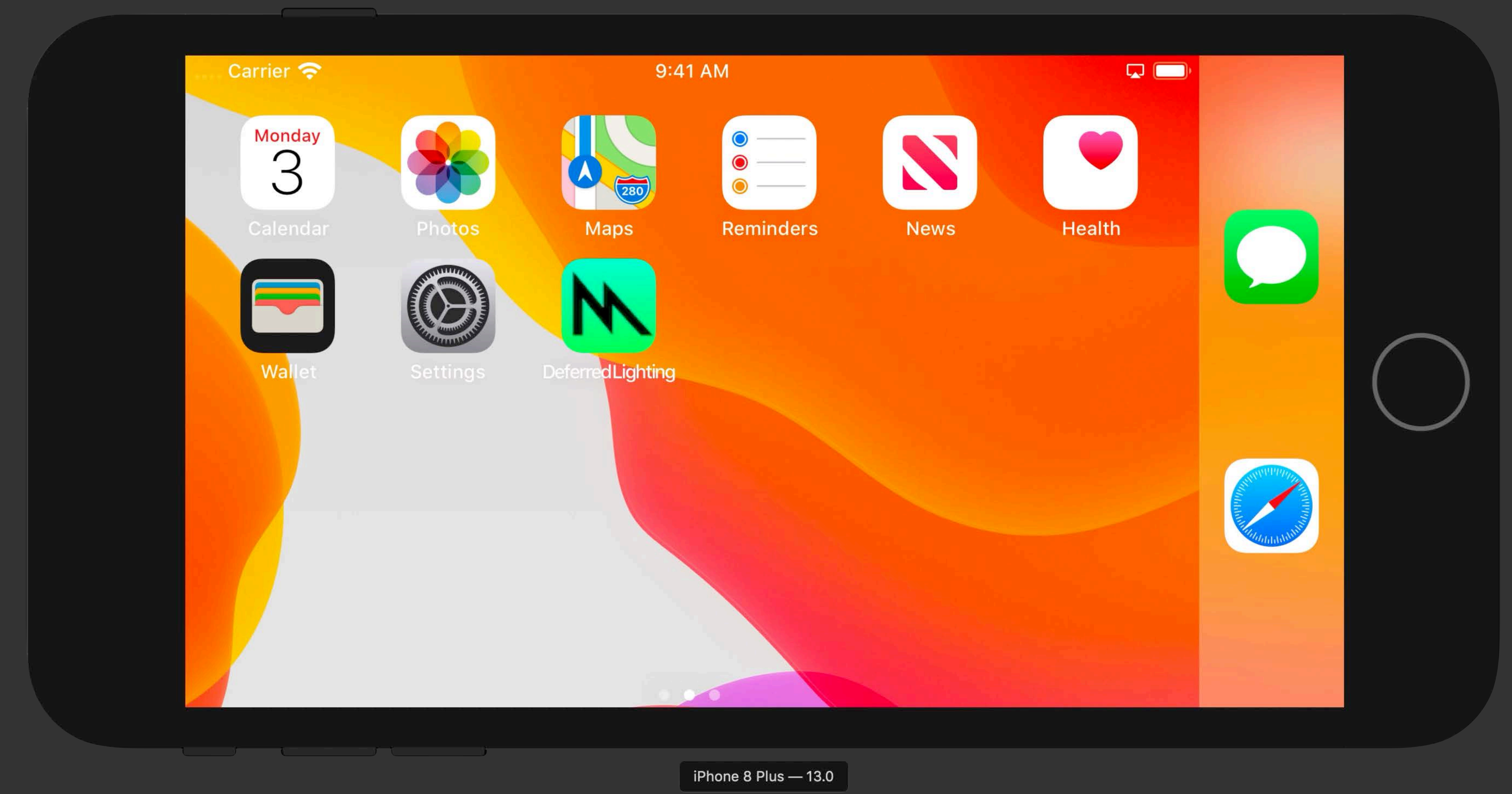


Xcode 11 and macOS 10.15

Enabling Metal Development in Simulator

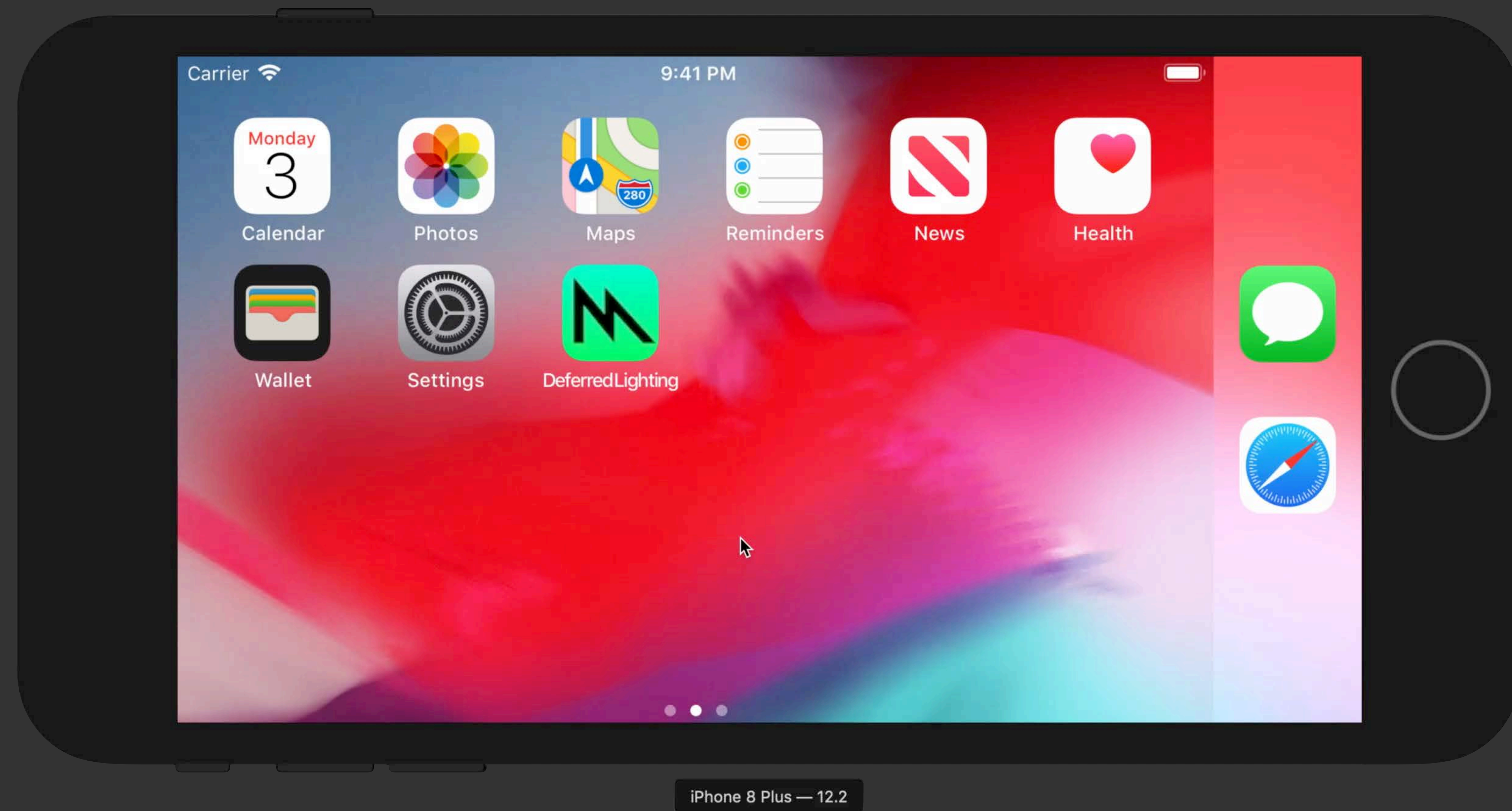


Previous Xcode Versions

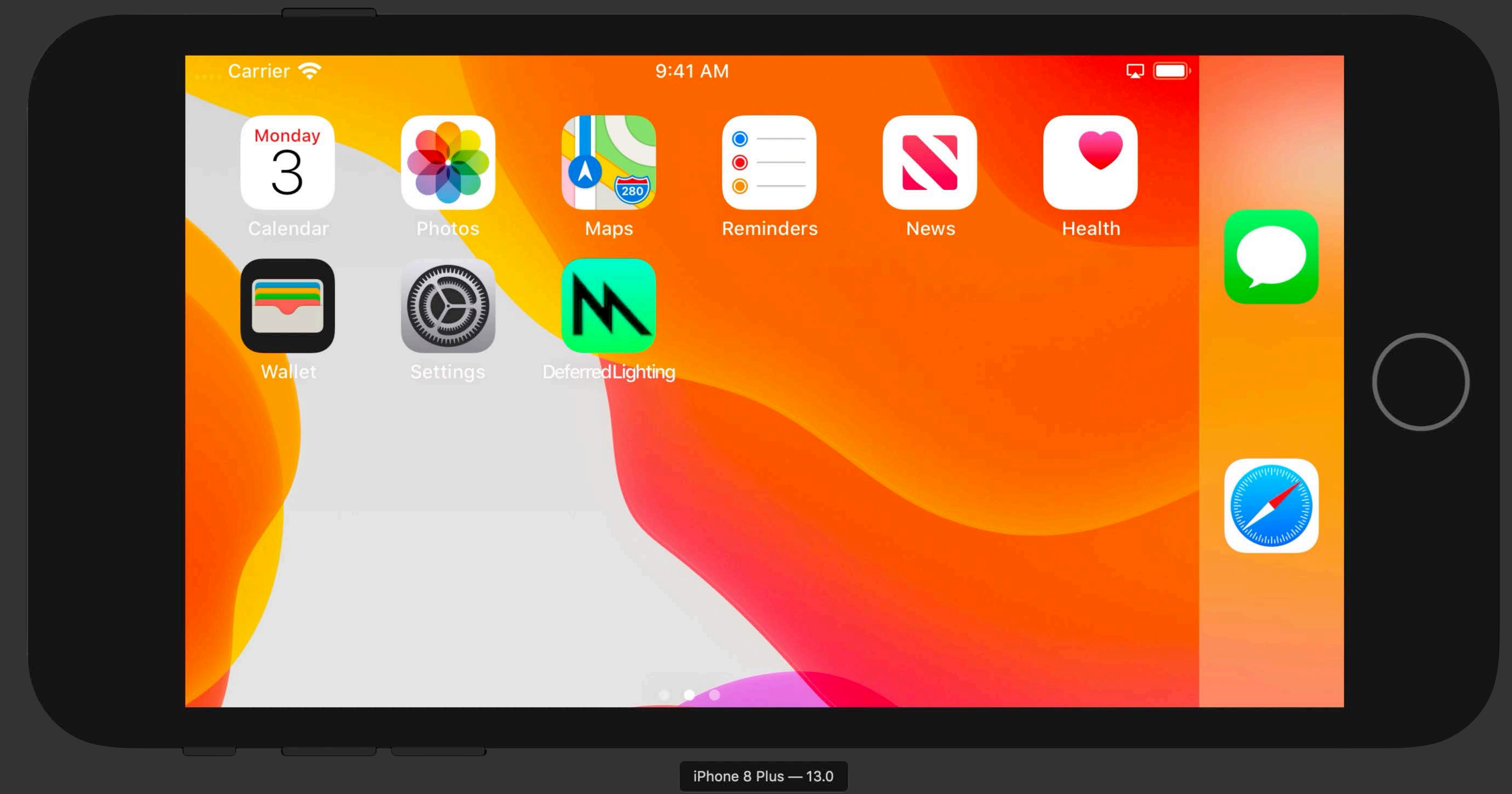


Xcode 11 and macOS 10.15

Enabling Metal Development in Simulator



Previous Xcode Versions



Xcode 11 and macOS 10.15

Using Metal API in Simulator

GPU Family

GPU Family

Easy to use GPU capability query

GPU Family

Easy to use GPU capability query

Introduces three families

GPU Family

Easy to use GPU capability query

Introduces three families

- Common — Supported by all platforms

GPU Family

Easy to use GPU capability query

Introduces three families

- Common — Supported by all platforms
- Mac — macOS GPUs

GPU Family

Easy to use GPU capability query

Introduces three families

- Common — Supported by all platforms
- Mac — macOS GPUs
- Apple — iOS and tvOS GPUs

GPU Family

Easy to use GPU capability query

Introduces three families

- Common — Supported by all platforms
- Mac — macOS GPUs
- Apple — iOS and tvOS GPUs

Simulator supports `MTLGPUFamilyApple2`

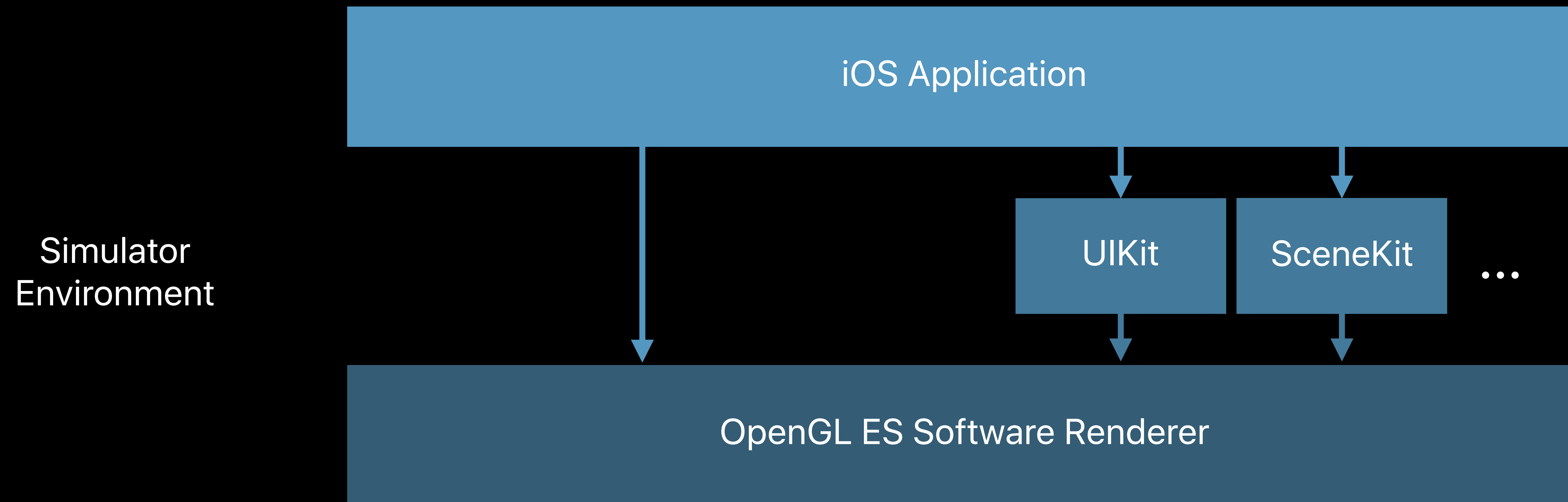
Achieving GPU Hardware Acceleration



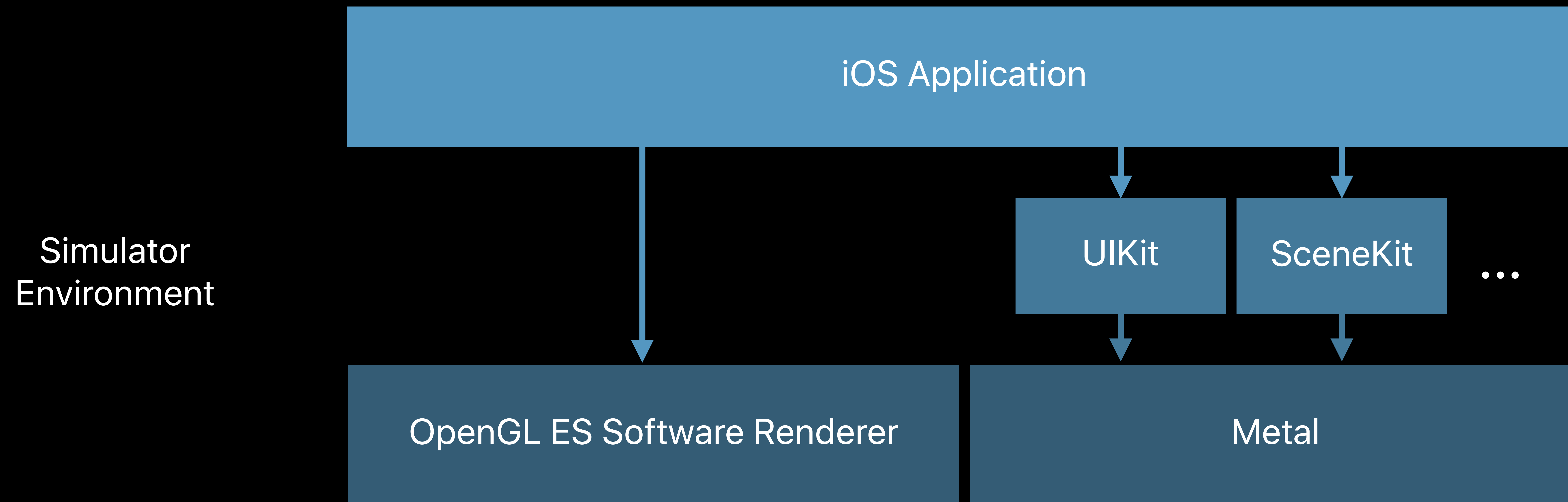
iOS Application

Simulator
Environment

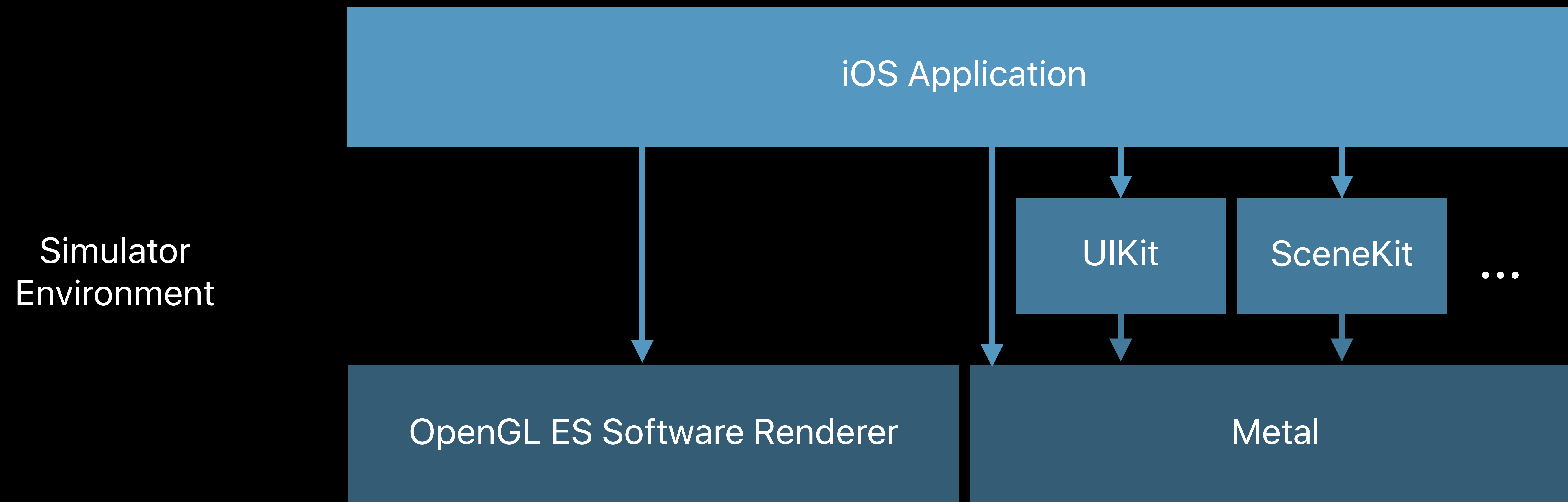
Achieving GPU Hardware Acceleration



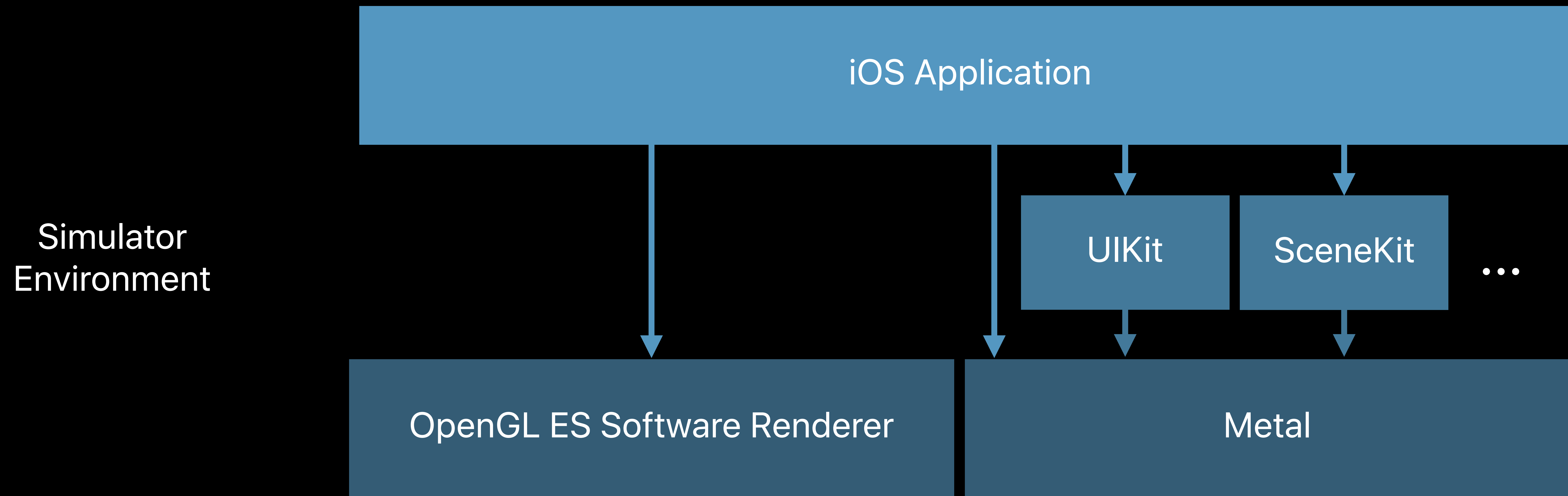
Achieving GPU Hardware Acceleration



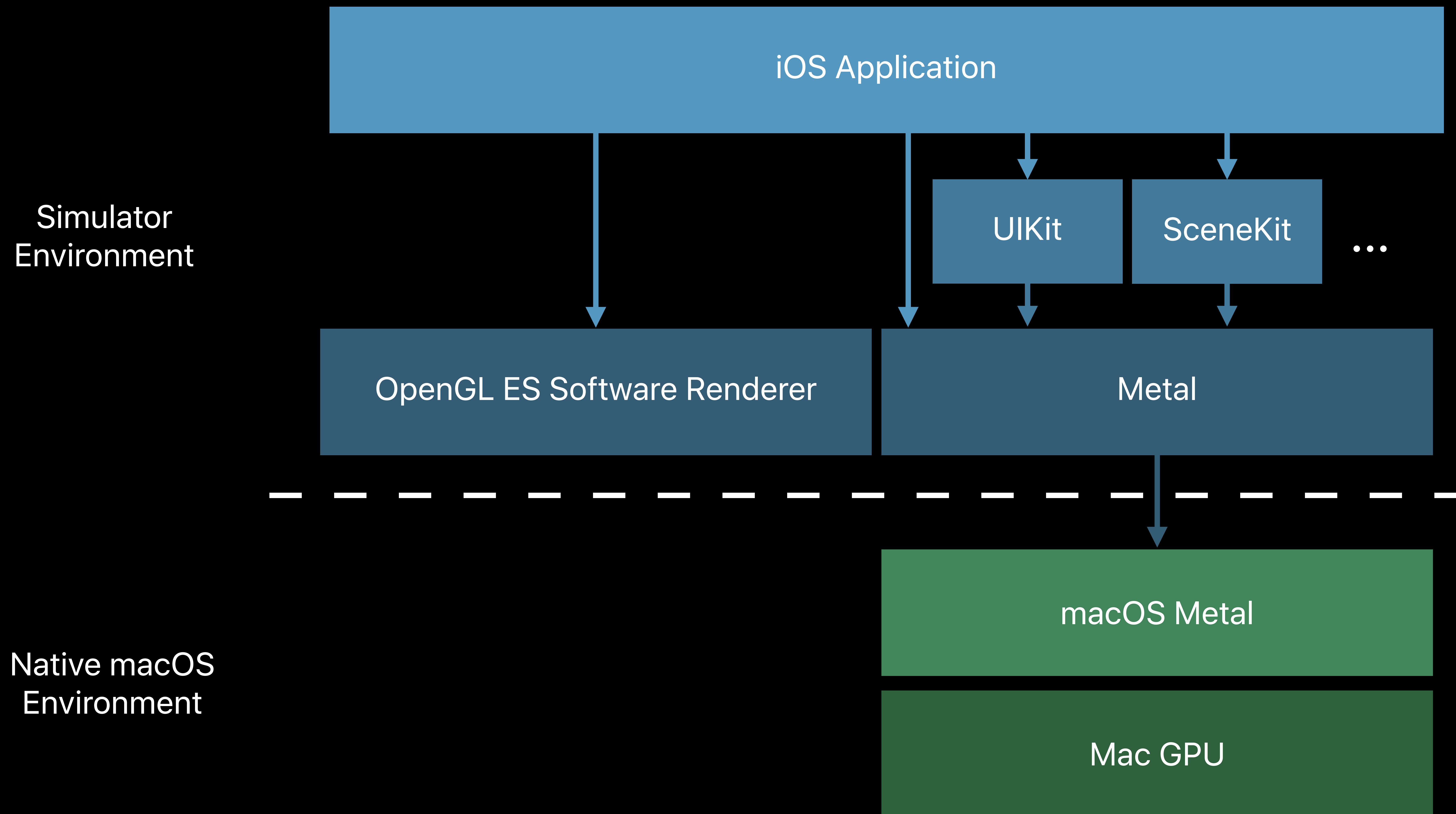
Achieving GPU Hardware Acceleration



Achieving GPU Hardware Acceleration



Achieving GPU Hardware Acceleration



Test Performance on Actual Devices

Test Performance on Actual Devices

Simulator performance is not representative device performance

Test Performance on Actual Devices

Simulator performance is not representative device performance

As always — profile and optimize on actual devices

Texture Storage in Metal API

Texture storage modes are different on macOS and iOS

Texture Storage in Metal API

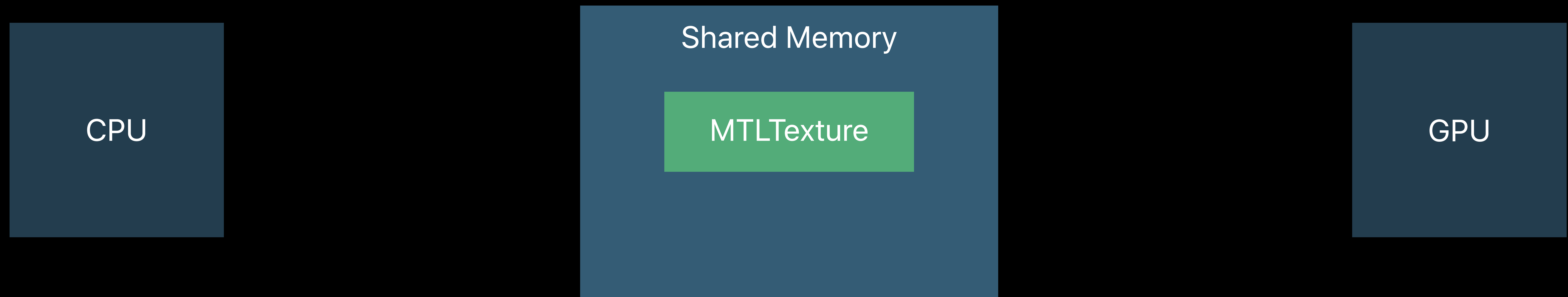
Texture storage modes are different on macOS and iOS

	Private	Shared	Memoryless	Managed
iOS and tvOS	●	●	●	
macOS	●			●

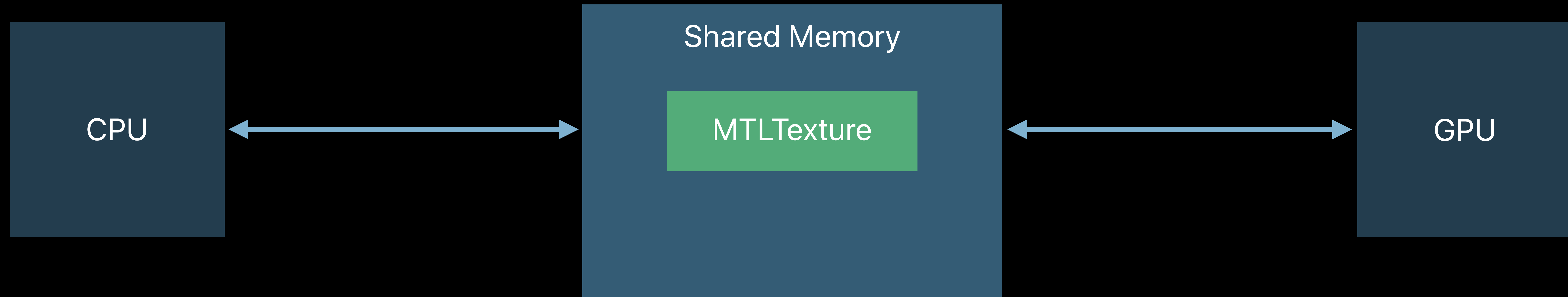
Texture Storage in Simulator

	Private	Shared	Memoryless	Managed
iOS and tvOS	●	●	●	
Simulator	●	●	●	

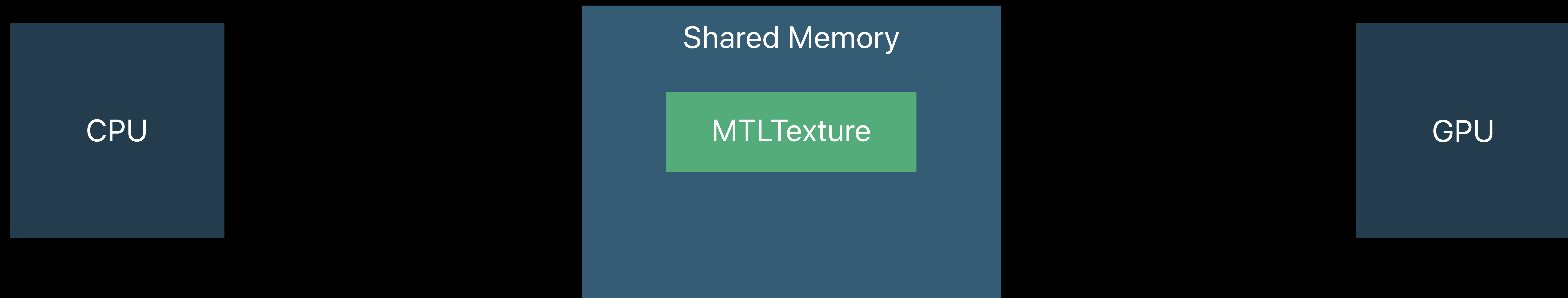
Shared Memory Model



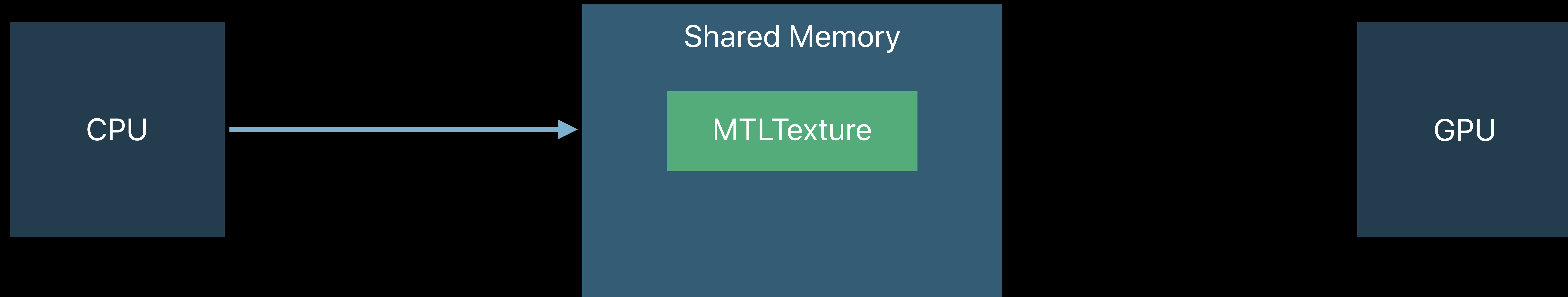
Shared Memory Model



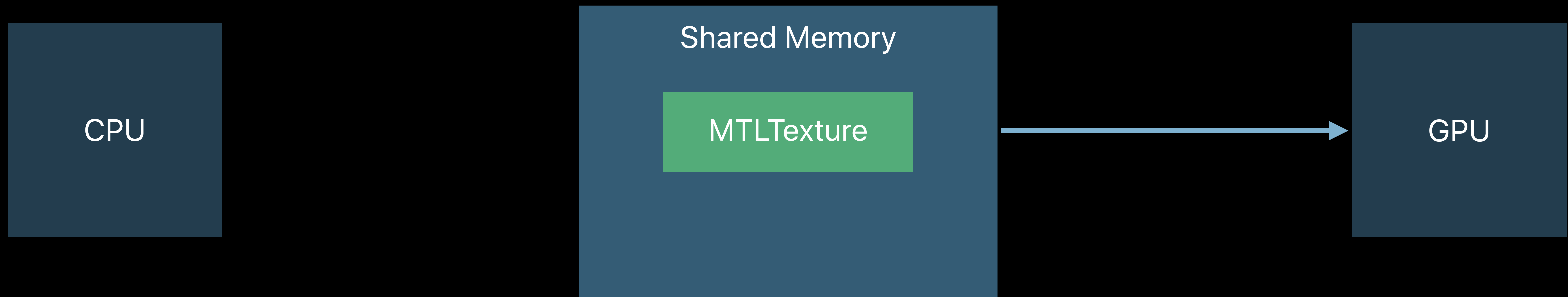
Shared Memory Model



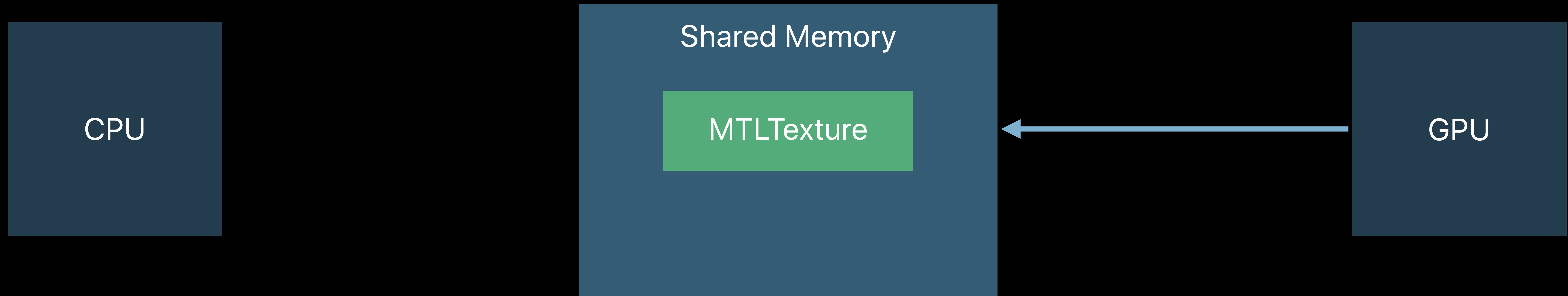
Shared Memory Model



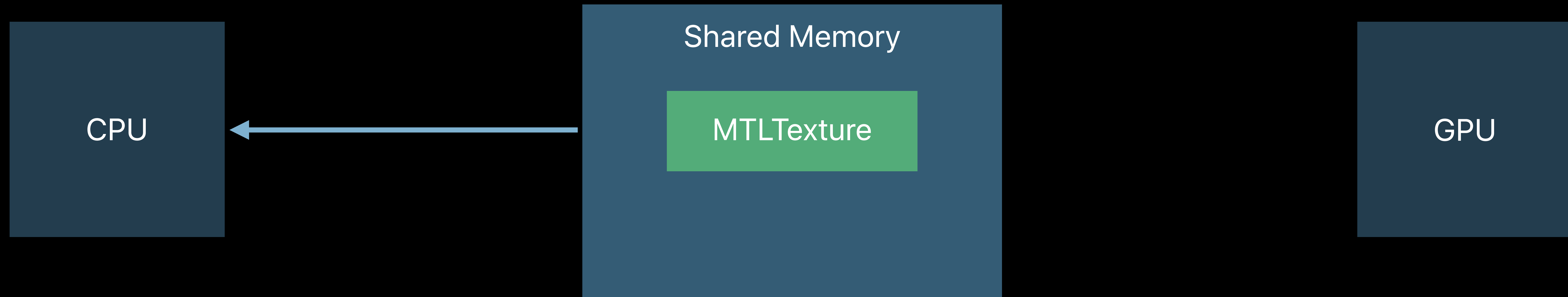
Shared Memory Model



Shared Memory Model



Shared Memory Model

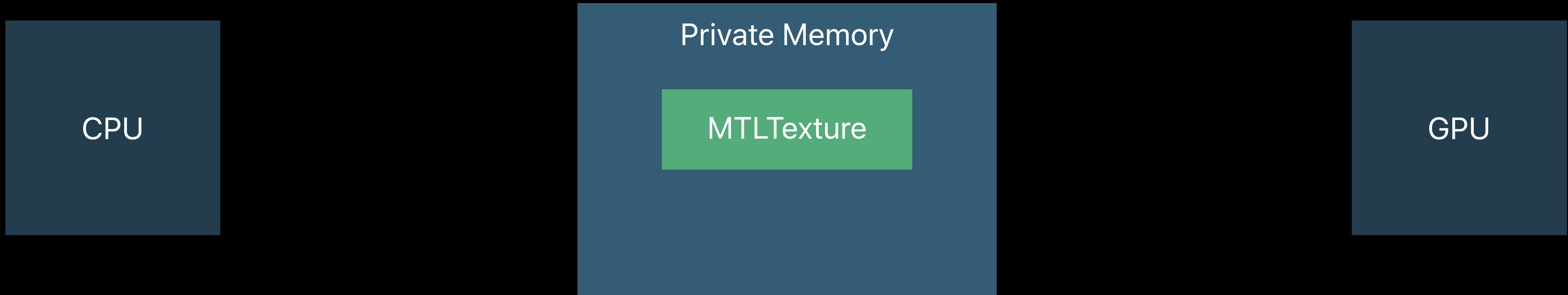


Texture Storage Differences in Simulator

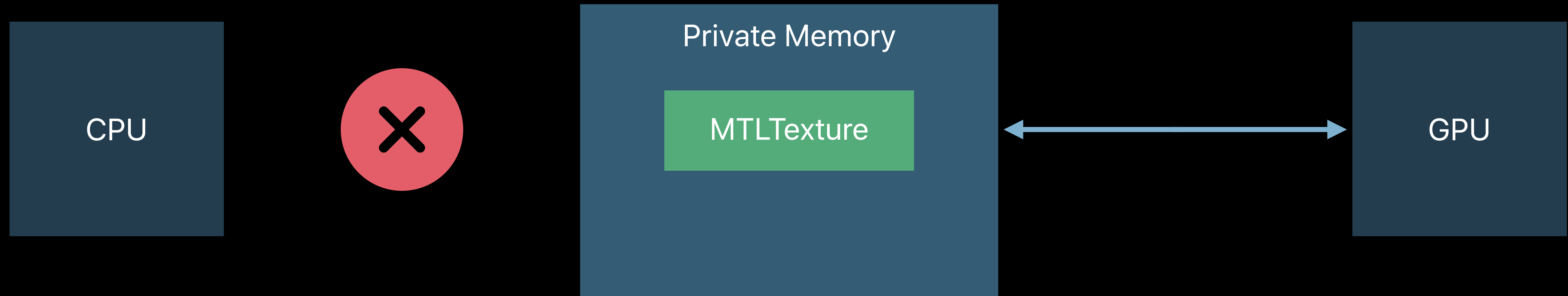
Texture types that require `MTLStorageMode.private` in Simulator

- Multisampled
- Depth Stencil
- Linear

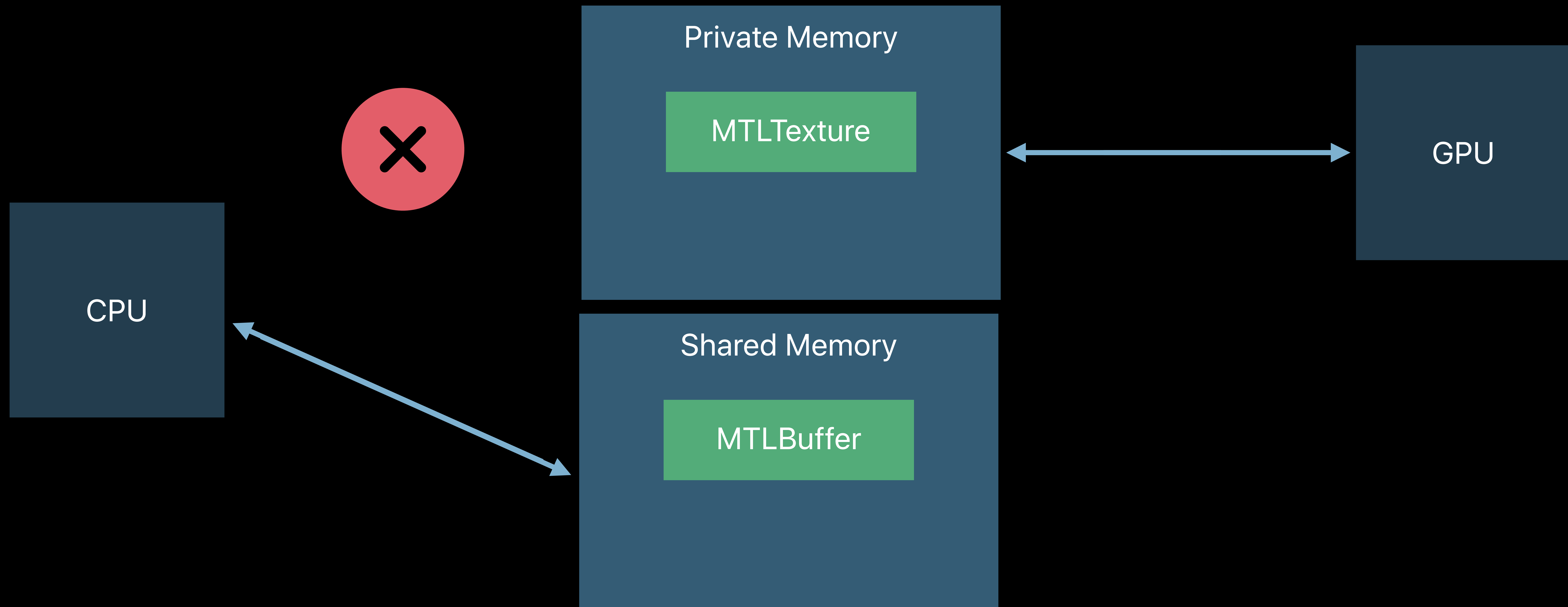
Private Memory Model



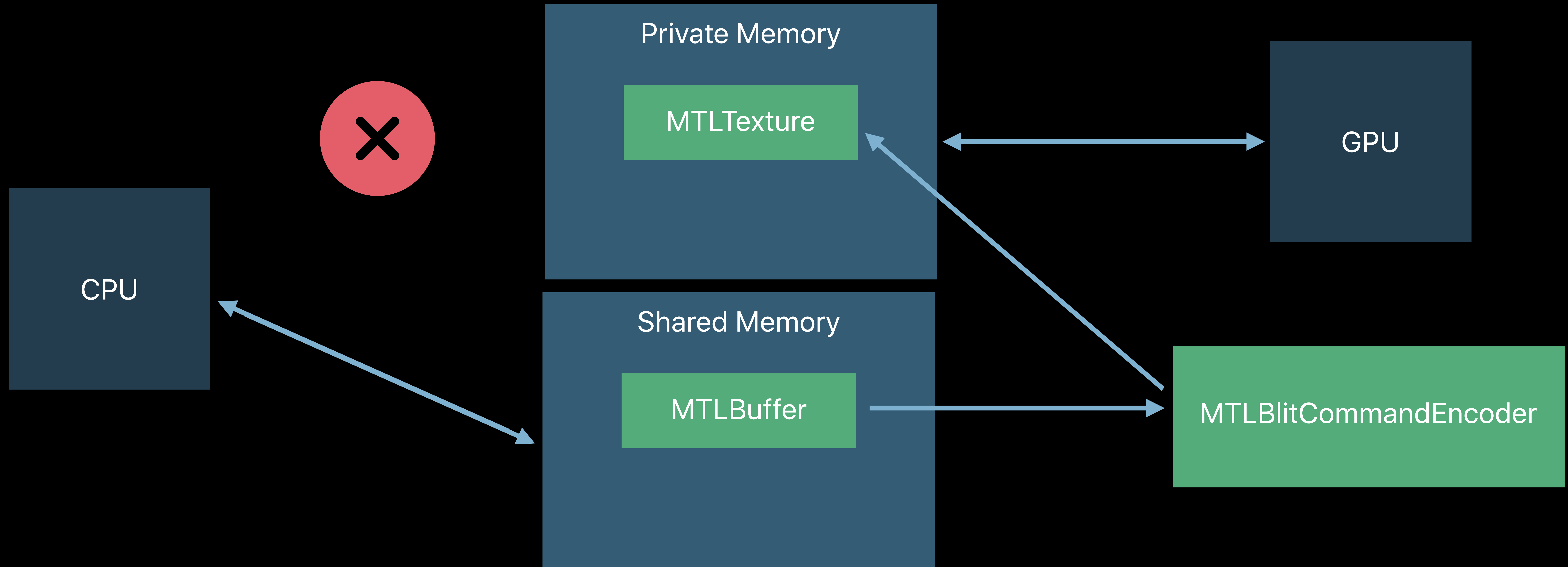
Private Memory Model



Private Memory Model



Private Memory Model



```
// For Simulator, multisampled, depth, stencil, and linear textures must be private
textureDescriptor.pixelFormat = .depth32Float_stencil8

#if targetEnvironment(simulator)
textureDescriptor.storageMode = .private
#else
textureDescriptor.storageMode = .shared
#endif

// Create the texture with the supported storage mode
let texture = device.makeTexture(descriptor: textureDescriptor)!

if texture.storageMode == .private {
    // Create and initialize a temporary shared buffer or texture
    let tmpBuffer = device.makeBuffer(length: textureSize, options: .storageModeShared)!
    initWithTextureData(buffer: tmpBuffer)
    // Blit the contents to the private texture
    blitData(fromBuffer: tmpBuffer, toTexture: texture)
}
```

```
// For Simulator, multisampled, depth, stencil, and linear textures must be private
textureDescriptor.pixelFormat = .depth32Float_stencil18
```

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```
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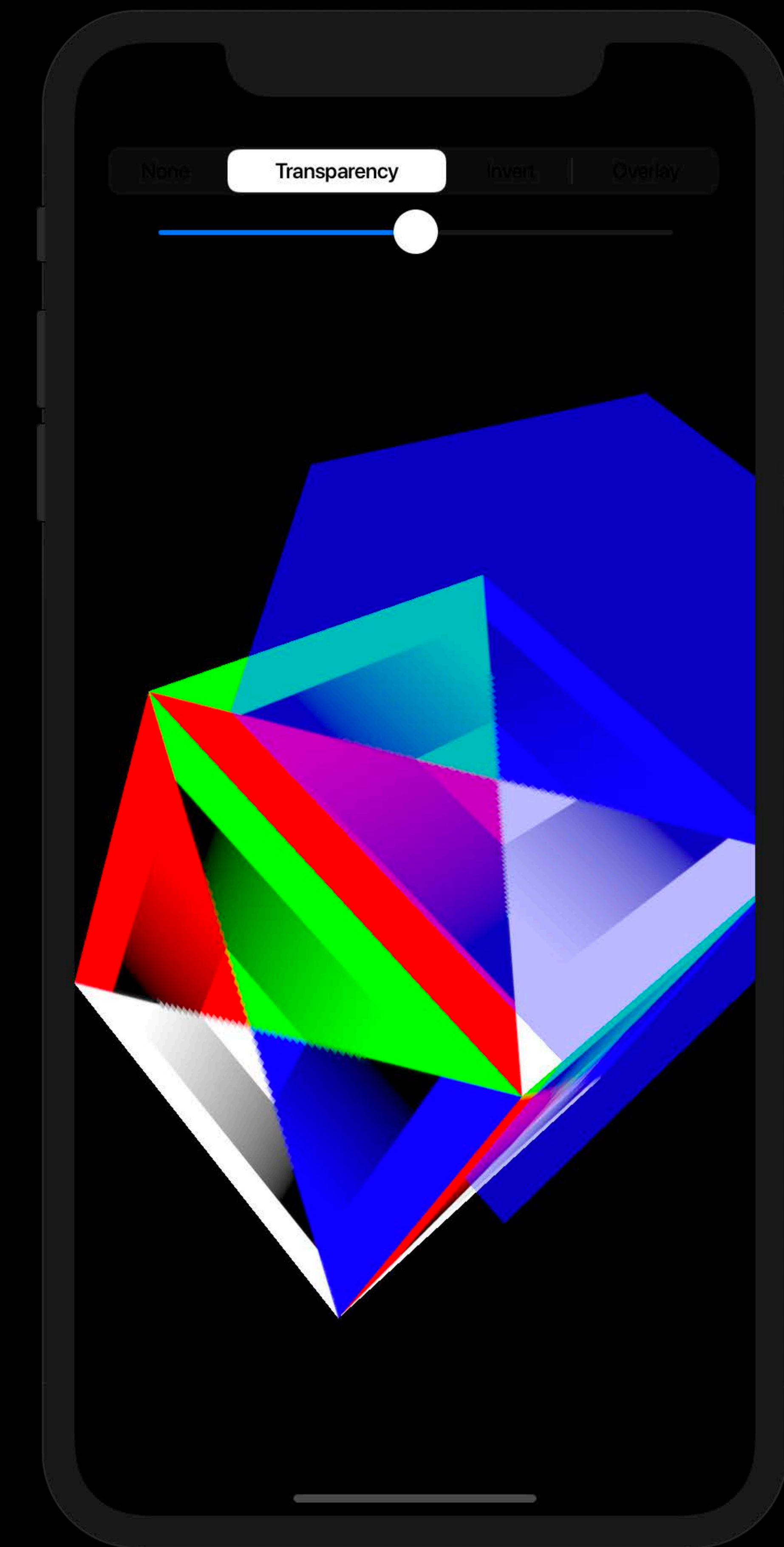
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Supporting Simulator in a Metal App

Full documentation of the few differences in Simulator

Sample code available



Summary

Simulator is iOS, watchOS, or tvOS userspace running on macOS kernel

Simulator is fastest, easiest way to simulate devices on your Mac

`xcrun simctl` for command line and scripts

Simulator now has GPU acceleration through Metal

More Information

developer.apple.com/wwdc19/418

