Introducing Multiple Windows on iPad

Ken Ferry, iOS System UI
Steve Holt, UIKit
James Savage, Safari
Design intent
App lifecycle changes
Drag and drop
Next steps
Design intent

App lifecycle changes

Drag and drop

Next steps
Where should I add scenes to my app?
Take your portfolio to new heights.

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Get Started

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Fernando Mastrangelo, Design Dissident
THE STUDY OF CELL BIOLOGY

Introduction to the building blocks of life.
Uma Semper

THE STUDY OF CELL BIOLOGY

Introduction to the building blocks of life

Eliss Amet Est

DONEC QUIS


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Mary Ellen Mason

Trip to San Francisco
John, visiting you in San Francisco was so much fun. We definitely need to head back soon. Her...

Derek Parker
Australia Trip
Hi John, Our family vacation to Australia was incredible. We visited Sydney, Brisbane, and M...

Jane Daniels
Dinner
Hi Everyone, I'm so excited to see everyone at dinner tonight. Parking can be tough around th...

Amy Frost
Breakfast Reservations
Hi John, I was thinking we could take the kids out for brunch one of these days. It’d be nice t...

Mark Persson
Lily's Soccer Match
Friends, Lily played in her final game of the soccer season this past weekend and her team....

Alish Kimber
Baby Jessica
Hello Everyone. We wanted to say thank you for all your warm wishes, visits, and great advice y...

Natalia Maric
Backpacking Thailand
Hey Everyone, We just got back from our trip to Thailand. We backpacked the country for two...

Mary Ellen Mason
Troy's Birthday
Hey Everyone, Thanks for joining us for Troy's birthday. We all had an amazing time celebra...
Mary Ellen Mason
To: John, Dave, Natalia, Yulian, Emily, Ivy, Derek

Troy’s Birthday
May 22, 2019 at 3:01 PM

Thanks for joining us for Troy’s birthday. We all had an amazing time celebrating together. The kids had an absolute blast. They’re already planning next year’s party!

We took a lot of great pictures but this one is a favorite from the party.
On May 22, 2019, at 3:01 PM, Jane Daniels <jane.daniels@icloud.com> wrote:

Hi Everyone,

I’m so excited to see everyone at dinner tonight. Parking can be tough around the restaurant, so I would arrive early to give yourself some time to find a spot. The restaurant’s address is below. Call if anything comes up. See you at 7:30!

Pancakes
3835 17th Street
San Francisco, CA 94114

Re: Troy’s Birthday

On May 22, 2019, at 3:01 PM, Mary Ellen Mason <memason412@icloud.com> wrote:

Hey Everyone,

Thanks for joining us for Troy’s birthday. We all had an amazing time celebrating together. The kids had an absolute blast. They’re already planning next year’s party! We took a lot of great pictures, but this one is a favorite from the party:

<Birthday 10.jpg>
On May 22, 2019, at 3:01 PM, Jane Daniels <janedaniels@icloud.com> wrote:

Hi Everyone,

I’m so excited to see everyone at dinner tonight. Parking can be tough around the restaurant so I would arrive early to give yourself some time to find a spot. The restaurant’s address is below. Call if anything comes up. See you at 7:30!

Francies
3875 Tenth Street
San Francisco, CA 94114

Sent from my iPad

On May 22, 2019, at 3:01 PM, Mary Ellen Mason <menason12@icloud.com> wrote:

Hey Everyone,

Thanks for joining us for Troy’s birthday. We all had an amazing time celebrating together. The kids had an absolute blast. They’re already planning next year’s party! We took a lot of great pictures but this one is a favorite from the party:

Birthday 1.jpg
But I have managed to squeeze in some shows...

How far along are you?

Because I can totally catch you up...

NO SPOILERS!

Okay, fine. But I'm feeling a little like this:

I have to say, I am still a little confused as to what is going on. Any ideas?

Yep, check out this site.
Cindy Barrett
Saturday

Steve & James
5/9/19

Janum Trivedi
9/9/18

Cecilia Dantas
10/22/17

Dave & Cecilia
10/21/17

Paul Cashman
10/21/17

Diana Yuen
10/21/17

Grand Canyon
10/21/17

Dave, Cecilia & Diana
10/21/17

Jessica Barbieri
10/21/17

Said:
But I have managed to squeeze in some shows...

Steve Host:
How far along are you?

Because I can totally catch you up...

Said:
Okay, fine. But I'm feeling a little like this:

Attached image of a green monster.

Said:
I have to say, I am still a little confused as to what is going on. Any ideas?

James Yuen:
Yep, check out this site:
Mac
What interactions should create scenes?
Too many clowns?

To: Cindy Barrett

Subject: Too many clowns?

Or not enough? Lemme know.
I. M. Pei, 1917-2019

To celebrate the legendary Chinese-American architect’s illustrious life and career, Surface asked leading figures in architecture to reflect on their favorite Pei buildings.
I. M. Pei, 1917-2019

To celebrate the legendary Chinese-American architect’s illustrious life and career, Surface asked leading figures in architecture to reflect on their favorite Pei buildings.
iPhone XR from $19.99/mo. or $479.
Two great ways to buy. Just trade in your current iPhone online or at an Apple Store.*
Buy › Learn more ›

iPhone X™
All-screen design. Longest battery life ever in an iPhone. Fastest performance. Studio-quality photos.
Learn more › Buy ›
iPhone XR from $19.99/mo. or $479.

Two great ways to buy. Just trade in your current iPhone online or at an Apple Store.*

Buy  Learn more

iPhone X®

All-screen design. Longest battery life ever in an iPhone. Fastest performance. Studio-quality photos.

Learn more  Buy
Breakfast Reservations
May 22, 2019 at 3:01 PM

Hi John,

I was thinking we could take the kids out for brunch one of these days. It'd be nice to get everyone together and the kids will have a blast. Maybe we could get four or five families together. If you're interested, let me know so I can talk to the other Dads and start looking into restaurants. The peninsula seems like a pretty central location for this event. In downtown Palo Alto, Il Fornaio and Saint Michael's Alley both do a full brunch. Il Fornaio has a private room that could work well for a large group like this. There are also some parks that are walking distance. Maybe we could give the moms some time together and take the kids to the park.

Another option is to make this a day in the city. There are a lot of great brunch spots in San Francisco. I hear Mama's is really good but I need to find out if they take reservations. Otherwise, I hear the wait can be pretty long. After brunch, there are a lot of things we could do. The kids would love the Academy of Sciences or the Exploratorium. If we went to the Academy, we could hang out in Golden Gate Park afterwards.

Let me know what you think.

Amy
Breakfast Reservations
May 22, 2019 at 3:01 PM

Hi John,

I was thinking we could take the kids out for brunch one of these days. It’d be nice to get everyone together and the kids will have a blast. Maybe we could get four or five families together. If you’re interested, let me know so I can talk to the other Dads and start looking into restaurants. The peninsula seems like a pretty central location for this event. In downtown Palo Alto, Il Fornaio and Saint Michael’s Alley both do a full brunch. Il Fornaio has a private room that could work well for a large group like this. There are also some parks that are walking distance. Maybe we could give the moms some time together and take the kids to the park.

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Let me know what you think.

Amy
"Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum."
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Design intent

App lifecycle changes

Drag and drop

Next steps
Design intent
App lifecycle changes
Drag and drop
Next steps
Adopting the UIScene Lifecycle
Conceptual Overview

UIWindowScene

UISceneSession
Conceptual Overview

UI structure
Conceptual Overview

UI structure

UIScreen

UIWindow

UIView

UIWindow

UIView

UIWindow

UIView

UIWindow

UIView

UIWindowScene

UIWindowScene

UIScreen
Conceptual Overview

UIScene

Contains UI

Created by the system on demand

Destroyed by the system when unused
Conceptual Overview
UISceneSession

Persisted interface state

Have defined system role

Created for new application representations

Scenes connect and disconnect from sessions
Conceptual Overview

**UISceneSession**

- Persisted interface state
- Have defined system role
- Created for new application representations
- Scenes connect and disconnect from sessions
Conceptual Overview
Application and scene lifecycle
Conceptual Overview
Application and scene lifecycle

- Foreground Active
- Foreground Inactive
- Background

Session A  Session B  Session C
Conceptual Overview

Application and scene lifecycle

- **Foreground Active**
- **Foreground Inactive**
- **Background**

- **Session A**
- **Session B**
- **Session C**

---

**Scene**
Conceptual Overview

Application and scene lifecycle

- **Foreground**
  - Active
  - Inactive
- **Background**
- **App**

Scene

- Session A
- Session B
- Session C
Conceptual Overview
Application and scene lifecycle

- Foreground
  - Active
  - Inactive
- Background

Sessions:
- Session A
- Session B
- Session C
Conceptual Overview

Functional roles

Application State

UIApplication

Application Events and Lifecycle

UIApplicationDelegate

UIApplicationDelegate
Conceptual Overview

Functional roles

- Process State
  - UIApplication
- Process Events and Lifecycle
  - UIApplicationDelegate
- UI State
  - UIWindowScene
- UI Events and Lifecycle
  - UIWindowSceneDelegate
- Persisted UI State
  - UISceneSession
Conceptual Overview

Migrating your code

application(_:didFinishLaunchingWithOptions:)
applicationWillEnterForeground(_:)
applicationDidBecomeActive(_:)
applicationWillResignActive(_:)
applicationDidEnterBackground(_:)

...

application(_:open:options:)

...

application(_:continue:restorationHandler:)
Conceptual Overview

Migrating your code

```swift
scene(_:willConnectTo:options:)
sceneWillEnterForeground(_:)
sceneDidBecomeActive(_:)
sceneWillResignActive(_:)
sceneDidEnterBackground(_:)
...
scene(_:openURLContexts:)
...
scene(_:continue:)
```
Conceptual Overview

UIScene state restoration

State restoration is now data in the form of NSUserActivity

Requested from UISceneDelegate

Accessible at any time via UISceneSession.stateRestorationActivity
Demo

Adopting multiple window support

Steve Holt
Design intent
App lifecycle changes
Drag and drop
Next steps
Design intent
App lifecycle changes
Drag and drop
Next steps
Conceptual Overview
Drag and drop

NSUserActivity based

Can add to existing UIDragItem’s NSItemProvider
Design intent
App lifecycle changes
Drag and drop
Next steps
Design intent
App lifecycle changes
Drag and drop
Next steps
Next Steps for Your App

James Savage
Manage Scene Sessions
API on UIApplication

Create new scenes
• requestSceneSessionActivation(_:userActivity:options:errorHandler:)

Update existing scenes
• requestSceneSessionRefresh(_:)

Close scenes
• requestSceneSessionDestruction(_:options:errorHandler:)
@IBAction func handleLongPress(forDocumentAt url: URL) {

    if let existingSession = findSession(for: url) {
        UIApplication.shared.requestSceneSessionActivation(existingSession, userActivity: nil, options: nil)
    } else {
        let activity = NSUserActivity(activityType: "com.example.MyApp.EditDocument")
        activity.userInfo["url"] = url

        UIApplication.shared.requestSceneSessionActivation(nil, userActivity: activity, options: nil)
    }

}
@IBAction func handleLongPress(forDocumentAt url: URL) {

    if let existingSession = findSession(for: url) {
        UIApplication.shared.requestSceneSessionActivation(existingSession, userActivity: nil, options: nil)
    } else {
        let activity = NSUserActivity(activityType: "com.example.MyApp.EditDocument")
        activity.userInfo["url"] = url

        UIApplication.shared.requestSceneSessionActivation(nil, userActivity: activity, options: nil)
    }

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@IBAction func handleLongPress(forDocumentAt url: URL) {

    if let existingSession = findSession(for: url) {
        UIApplication.shared.requestSceneSessionActivation(existingSession, userActivity: nil,
        options: nil)
    } else {
        let activity = NSUserActivity(activityType: "com.example.MyApp.EditDocument")
        activity.userInfo["url"] = url

        UIApplication.shared.requestSceneSessionActivation(nil, userActivity: activity,
        options: nil)
    }
}
func application(_ application: UIApplication,
    didReceiveRemoteNotification userInfo: [AnyHashable:Any],
    fetchCompletionHandler completionHandler: @escaping (UIBackgroundFetchResult) -> Void) {

    let session = findSession(for: userInfo)
    application.requestSceneSessionRefresh(session)

}
func application(_ application: UIApplication,
    didReceiveRemoteNotification userInfo: [AnyHashable: Any],
    fetchCompletionHandler completionHandler: @escaping (UIBackgroundFetchResult) -> Void) {

    let session = findSession(for: userInfo)
    application.requestSceneSessionRefresh(session)

}
// Close a Window

func closeWindow(and action: DraftAction) {

    let options = UIWindowScene.DestructionRequestOptions()

    switch action {
    case .send:   options.windowDismissalAnimation = .commit
    case .save:   options.windowDismissalAnimation = .decline
    case .delete: options.windowDismissalAnimation = .standard
    }

    let session = view.window?.windowScene?.session
    UIApplication.shared.requestSceneSessionDestruction(session, options: options)
}


// Close a Window

func closeWindow(and action: DraftAction) {

    let options = UIWindowScene.DestructionRequestOptions()

    switch action {
    case .send:   options.windowDismissalAnimation = .commit
    case .save:   options.windowDismissalAnimation = .decline
    case .delete: options.windowDismissalAnimation = .standard
    }

    let session = view.window!.windowScene!.session
    UIApplication.shared.requestSceneSessionDestruction(session, options: options)
}

// Close a Window

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    switch action {
    case .send:   options.windowDismissalAnimation = .commit
    case .save:   options.windowDismissalAnimation = .decline
    case .delete: options.windowDismissalAnimation = .standard
    }

    let session = view.window!.windowScene!.session
    UIApplication.shared.requestSceneSessionDestruction(session, options: options)
}


// State Restoration

class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

}

// State Restoration

class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

}

NEW
// State Restoration

class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

    var persistentIdentifier: String { get }

}
// State Restoration

class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

    var persistentIdentifier: String { get }

}

NEW
class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

    var persistentIdentifier: String { get }

    // Values must be property list type
    var userInfo: [String: AnyHashable]

}

// State Restoration
class UISceneSession {

    var stateRestorationUserActivity: NSUserActivity

    var persistentIdentifier: String { get }

    // Values must be property list type
    var userInfo: [String: AnyHashable]
}

// State Restoration
Debugging Tips
Debugging Tips

Every app has unique challenges
Debugging Tips

Every app has unique challenges

Expect to make changes
Debugging Tips

Every app has unique challenges
Expect to make changes
Test, test, and test more
Debugging Tips

Every app has unique challenges
Expect to make changes
Test, test, and test more
Focus on multiple scenes
UserDefaults.standard
NotificationCenter.default
UIScreen.main
FileManager.default
UIDevice.current
UIApplication.shared
MyFancySingleton.shared

UIDevice.current

UserDefaults.standard

NotificationCenter.default

UIScreen.main

UIApplication.shared

FileManager.default

AppData.shared

globalVar

(UIApplication.shared.delegate as! AppDelegate)
UserDefaults.standard
NotificationCenter.default
UIDevice.current
UserDefaults.standard
NotificationCenter.default
UIScreen.main
UIApplication.shared
FileManager.default
AppData.shared
MyFancySingleton.shared
"~/Library/MyApp/Draft"
(UIApplication.shared.delegate as! AppDelegate)
globalVar
Case Study
State restoration
Here's to the crazy ones.

The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About the only thing you can't do is ignore them. Because they change things. They push the human race forward. And while some may see them as the crazy ones, we see genius. Because the people who are crazy enough to think they can change the world, are the ones who do.

Shopping List

- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatoes
- Avocado
- Toast
Shopping List

- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatos
- Avocado
- Toast

Shopping List

- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatos
- Avocado
- Toast
title: "Chocolate Chip Cookie Recipe"
body: "Milk, Eggs, Flour, ..."
Case Study
State restoration

title: "Chocolate Chip Cookie Recipe"
body: "Milk, Eggs, Flour, ...

id: 09AD3F-983DB1-12005F
Case Study
State restoration

Title: "Chocolate Chip Cookie Recipe"
Body: "Milk, Eggs, Flour, ..."
Id: 09AD3F-983DB1-12005F

Title: "Here’s to the crazy ones."
Body: "The misfits. The rebels..."
Id: A763D79-489F2B-BC3192
Case Study
State restoration

title: "Chocolate Chip Cookie Recipe"
body: "Milk, Eggs, Flour, ..."
id: 09AD3F-983DB1-12005F
Case Study
State restoration

Called immediately if app is running

Otherwise, called shortly after next launch

```swift
protocol UIApplicationDelegate {
  func application(_ application: UIApplication,
                didDiscardSceneSessions sceneSessions: Set<UISceneSession>)
}
```
Case Study
UserDefaults
Here's to the crazy ones.

The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They'll always be the first to sit in the back seat. But they are the champions of the world. They are the ones who say things they've never said and dream things no one ever dreamed. They are the ones who never know defeat because even today, they still have the courage to do what the rest of us can only dream of.

Shopping List

- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatoes
- Avocado
- Toast
Here's to the crazy ones.

The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them... but the real children of civilization don't see them as crazy, but asbrave.
Here's to the crazy ones.

The misfits. The rebels. The troublemakers. The round pegs in the square holes. The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them. About things they can change things for a better place.

Shopping List

- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatoes
- Avocado
- Toast
// Add a Key-Value Observable Property to UserDefaults

extension UserDefaults {

    private static let isInfoBarHiddenKey = "IsInfoBarHidden"

    @objc dynamic var isInfoBarHidden: Bool {
        get { return bool(forKey: UserDefaults.isInfoBarHiddenKey) }
        set { set(newValue, forKey: UserDefaults.isInfoBarHiddenKey) }
    }

}
// Add a Key-Value Observable Property to UserDefaults

extension UserDefaults {

    private static let isInfoBarHiddenKey = "IsInfoBarHidden"

    @objc dynamic var isInfoBarHidden: Bool {
        get { return bool(forKey: UserDefaults.isInfoBarHiddenKey) }
        set { set(newValue, forKey: UserDefaults.isInfoBarHiddenKey) }
    }

}
// Observe Changes in the View Controller

class DocumentViewController: UIViewController {

    // Must retain observation for it to remain active.
    private var observer: NSKeyValueObservation?

    override func viewDidLoad() {
        observer = UserDefaults.standard.observe(
            UserDefaults.isInfoBarHidden,
            options: .initial, changeHandler: { [weak self](_, _) in
                let controller = self?.navigationController?
                controller.isToolbarHidden = UserDefaults.standard.isInfoBarHidden
            }
        )
    }
}
// Observe Changes in the View Controller

class DocumentViewController: UIViewController {

    // Must retain observation for it to remain active.
    private var observer: NSKeyValueObservation? = nil

    override func viewDidLoad() {
        observer = UserDefaults.standard.observe(
            UserDefaults.isInfoBarHidden,
            options: .initial, changeHandler: { [weak self](_, _) in
                let controller = self?.navigationController?.controller
                controller?.isToolbarHidden = UserDefaults.standard.isInfoBarHidden
            })
    }

}
// Observe Changes in the View Controller

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        options: .initial, changeHandler: {
            [weak self](_, _) in
            let controller = self?.navigationController?
            controller?.isToolbarHidden = UserDefaults.standard.isInfoBarHidden
        }
    )
  }

}
Here's to the crazy ones.
The misfits. The rebels. The troublemakers. The round pegs in the square holes.
The ones who see things differently. They're not fond of rules. And they have no respect for the status quo. You can quote them, disagree with them, glorify or vilify them.
They can change the world - because they think differently. And when they think differently, they change things. They change things because they're different.

Shopping List
- 12 eggs
- Butter
- Sugar
- Milk
- Orange juice
- Lettuce
- Tomatoes
- Avocado
- Toast
UIApplication Deprecations

Status bar appearance and layout

- statusBarStyle
- statusBarHidden
- statusBarOrientation

Opening URLs

- open(_:options:completionHandler:)

Windows

- keyWindow
Replacement API

Status bar appearance and layout
- UIWindowScene.statusBarManager
- UIWindowScene.interfaceOrientation

Opening URLs
- UIWindowScene.open(_:options:completionHandler:)

Key Windows
- Track windows manually
Summary
Summary

Many powerful new features in multitasking
Summary

Many powerful new features in multitasking

Users will expect these new behaviors
Summary

Many powerful new features in multitasking

Users will expect these new behaviors

Easy to adopt in existing or new apps
Summary

Many powerful new features in multitasking
Users will expect these new behaviors
Easy to adopt in existing or new apps
Most problems have simple solutions
Summary

Many powerful new features in multitasking

Users will expect these new behaviors

Easy to adopt in existing or new apps

Most problems have simple solutions

Use UIWindowScene to replace deprecated UIApplication methods
More Information

developer.apple.com/wwdc19/212

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>UIKit and Dark Mode Lab</td>
<td>Wednesday, 11:00</td>
</tr>
<tr>
<td>UIKit and Multitasking</td>
<td>Thursday, 2:00</td>
</tr>
<tr>
<td>UIKit Lab</td>
<td>Friday, 11:00</td>
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