The Schedule
The Schedule

Major Features
The Schedule

Major Features
Best Practices
Major Features
Authorization
Authorization

Required to access location
Authorization

Required to access location

Allow “Camera” to access your location while you use the app?

Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
Authorization

Required to access location

When-in-use

Allow "Camera" to access your location while you use the app?
Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
Authorization

Required to access location

When-in-use

- requestWhenInUseAuthorization
Authorization

Required to access location

When-in-use

- requestWhenInUseAuthorization

Always

Allow “Camera” to access your location while you use the app?

Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
Authorization

Required to access location

When-in-use
- requestWhenInUseAuthorization

Always
- requestAlwaysAuthorization
Authorization

Required to access location

When-in-use

- requestWhenInUseAuthorization

Always

- requestAlwaysAuthorization

Privacy - Location When In Use Usage Description

| String | Location authorization is required to display your position on a map |

Privacy - Location Always Usage Description

| String | Location authorization is required to automatically journal your day |
When-in-use Authorization
When-in-use Authorization
When-in-use Authorization

Foreground

Blue bar
When-in-use Authorization

Foreground

Blue bar

WatchConnectivity
Standard Location
Standard Location

Single location

- requestLocation
Standard Location

Single location
- `requestLocation`

Continuous location
- `startUpdatingLocation`
Standard Location

Single location

- requestLocation

Continuous location

- startUpdatingLocation
- stopUpdatingLocation
Standard Location

Single location

- requestLocation

Continuous location

- startUpdatingLocation
- stopUpdatingLocation

Features
Standard Location

Single location
- requestLocation

Continuous location
- startUpdatingLocation
- stopUpdatingLocation

Features
- Deferred updates
Standard Location

Single location

• requestLocation

Continuous location

• startUpdatingLocation
• stopUpdatingLocation

Features

• Deferred updates
• Automatic pausing
Continuous Location in the Background
Continuous Location in the Background

Location updates and app continue running
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Stop when done
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Stop when done
Requirements
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Stop when done

Requirements
• Enable background location in information property list
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Stop when done

Requirements

• Enable background location in information property list

• Set `allowsBackgroundLocationUpdates`
Continuous Location in the Background

Location updates and app continue running
When-in-use authorized apps get a blue bar
Stop when done

Requirements

• Enable background location in information property list
• Set `allowsBackgroundLocationUpdates`
• Start continuous location updates in foreground
Standard Location in the Background
Standard Location in the Background

Start in background
Standard Location in the Background

Start in background
Always authorization
Standard Location in the Background

Start in background
Always authorization
No extra runtime
Region Monitoring
Region Monitoring

Monitor for specific locations
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
• Circular Region
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
• Circular Region
• Beacon Region
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
  • Circular Region
  • Beacon Region
Limited resource
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
  • Circular Region
  • Beacon Region
Limited resource
Start with `startMonitoring(for:)`
Region Monitoring

Monitor for specific locations
Continues when app is suspended
Two variants
• Circular Region
• Beacon Region
Limited resource
Start with `startMonitoring(for:)`
Stop with `stopMonitoring(for:)`
Region Monitoring

Triggers
Region Monitoring

Triggers

Notifications

- UNLocationNotificationTrigger
Region Monitoring

Triggers

Notifications

- UNLocationNotificationTrigger

Introduction to Notifications

Pacific Heights  Wednesday 9:00AM
Region Monitoring

Triggers

Notifications

- UNLocationNotificationTrigger

HomeKit

- HMLocationEvent

Introduction to Notifications

Pacific Heights  Wednesday 9:00AM
Region Monitoring
Triggers

Notifications

- UNLocationNotificationTrigger

HomeKit

- HMLocationEvent

When-in-use authorization

Introduction to Notifications  Pacific Heights  Wednesday 9:00AM
Beacon Ranging
Beacon Ranging

UUID, major ID, and minor ID
Beacon Ranging

UUID, major ID, and minor ID
Range to beacons
Beacon Ranging

UUID, major ID, and minor ID
Range to beacons
No extra runtime
Aside

Significant Location Change Monitoring
Significant Location Change Monitoring

Monitor for large changes in location
Significant Location Change Monitoring

Monitor for large changes in location
Useful, but niche
Significant Location Change Monitoring

Monitor for large changes in location
Useful, but niche
Consider Visit Monitoring
Visit Monitoring

Monitor for places of interest to the user
Visit Monitoring

Monitor for places of interest to the user
Suitable for all-day use
Visit Monitoring

Monitor for places of interest to the user
Suitable for all-day use
Continues when app is suspended
Visit Monitoring

Monitor for places of interest to the user
Suitable for all-day use
Continues when app is suspended
Start with `startMonitoringVisits`
Visit Monitoring

Monitor for places of interest to the user

Suitable for all-day use

Continues when app is suspended

Start with `startMonitoringVisits`

Stop with `stopMonitoringVisits`
Geocoding
Geocoding

Address to coordinates
Geocoding

Address to coordinates
Coordinates to address
Geocoding

Address to coordinates
Coordinates to address
Authorization is not required
Geocoding

Address to coordinates
Coordinates to address
Authorization is not required
Rate limiting
Geocoding

Address to coordinates
Coordinates to address
Authorization is not required
Rate limiting
  • Cache results
Geocoding

Address to coordinates
Coordinates to address
Authorization is not required
Rate limiting
  • Cache results
  • One request per user action
Which Authorization Level?
<table>
<thead>
<tr>
<th>When-in-use</th>
<th>Always</th>
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Which Authorization Level?
### Which Authorization Level?

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### Which Authorization Level?

<table>
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<tr>
<td>Region Monitoring</td>
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<td>Visit Monitoring</td>
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<tr>
<td>Significant Location Change Monitoring</td>
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Availability
Availability

Standard Location
Background Location Session
Beacon Ranging
Region Monitoring
Visit Monitoring
Significant Location Change Monitoring
Geocoding
### Availability

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## Availability

<table>
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<th>macOS</th>
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<td>✓</td>
<td>Circular Regions</td>
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## Availability

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# Availability

<table>
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</table>

TVOS includes Single Location.
Best Practices
Privacy
Privacy

The most important part
Privacy

The most important part
You must respect the user’s privacy
Privacy

The most important part
You must respect the user’s privacy
You must respect the user’s privacy
Privacy

The most important part
You must respect the user’s privacy
You must respect the user’s privacy
Don’t ask for more than you need
Privacy

The most important part
You must respect the user’s privacy
Don’t ask for more than you need
Make it clear
Privacy
Continued

Anonymize server queries
Privacy
Continued

Anonymize server queries
Use file protection
Power
Core Location’s power cost is highly variable
Power

Core Location’s power cost is highly variable
Users like their batteries
Power

Core Location’s power cost is highly variable
Users like their batteries
Design with power in mind
Power

Core Location’s power cost is highly variable
Users like their batteries
Design with power in mind
Using the right API matters
Which API?
Which API?

Now or Later?
Which API?

Now or Later?

Now

Why?

Later

Where?

Specific Location

Region Monitoring

Any Location

Visit Monitoring
Which API?

Deferred Location Updates

Now or Later?

Now

Fitness

Why?

Later

Where?

Specific Location

Region Monitoring

Any Location

Visit Monitoring

Deferred Location Updates

Fitness

Why?

Now or Later?

Later
Which API?

Now or Later?

- Now
- Later

Why?

- Fitness
- Navigation

Where?

- Specific Location
- Any Location
Which API?

Continuous Location

Why?
- Fitness
- Other
- Navigation

Where?
- Specific Location
- Any Location

Now or Later?
- Now
- Later

Deferred Location Updates

Continuous Updating UI?
- Yes
- No (Deferred Location Updates)

Region Monitoring

Visit Monitoring
Which API?

Now or Later?

Now

No

Fitness

Continuously Updating UI?

Yes

Recording a Track?

Yes

Deferred Location Updates

No

No

Later

Why?

Other

Navigation

Where?

Specific Location

Any Location

Continuous Location

Recording a Track?

Yes

Region Monitoring

No

Any Location

Single Location

Visit Monitoring
Authorization
Best practices
Authorization

Best practices

Use when-in-use authorization when possible
Authorization

Best practices

Use when-in-use authorization when possible

Communicate
Authorization

Best practices

Use when-in-use authorization when possible

Communicate
Authorization

Best practices

Use when-in-use authorization when possible

Communicate

Direct users to settings

- UIApplicationOpenSettingsURLString
Authorization

Best practices

Use when-in-use authorization when possible

Communicate

Direct users to settings

• UIApplicationOpenSettingsURLString
Threading
Best practices
Threading

Best practices

CLLocationManager requires a runloop
Threading

Best practices

`CLLocationManager` requires a runloop

You can use `CLLocationManager` on the main thread
Threading

Best practices

CLLocationManager requires a runloop

You can use **CLLocationManager** on the main thread

Interact with **CLLocationManager** from the thread it was created on
// Requesting authorization

func requestAuthorization() {
    let manager = CLLocationManager()
    manager.requestWhenInUseAuthorization()
}

func requestAuthorization() {
    let manager = CLLocationManager()
    manager.requestWhenInUseAuthorization()
}
// Requesting authorization

class LocationAuthorizationRequester {
    static let manager = CLLocationManager()

    func requestAuthorization() {
        LocationAuthorizationRequester.manager.requestWhenInUseAuthorization()
    }
}

class LocationAuthorizationRequester {

    static let manager = CLLocationManager()

    func requestAuthorization() {
        LocationAuthorizationRequester.manager.requestWhenInUseAuthorization()
    }
}

// Requesting authorization
// Requesting authorization

class LocationAuthorizationRequester {
    static let manager = CLLocationManager()

    func requestAuthorization() {
        LocationAuthorizationRequester.manager.requestWhenInUseAuthorization()
    }
}
// Requesting authorization

class ViewController: UIViewController {
    let manager = CLLocationManager()

    func requestAuthorization() {
        self.manager.requestWhenInUseAuthorization()
    }

    // ...
}

// Requesting authorization

class ViewController: UIViewController {
    let manager = CLLocationManager()

    func requestAuthorization() {
        self.manager.requestWhenInUseAuthorization()
    }

    // ...
}

// ...
class ViewController: UIViewController {

    let manager = CLLocationManager()

    func requestAuthorization() {
        self.manager.requestWhenInUseAuthorization()
    }

    // ...
}
Standard Location

Best practices
Standard Location

Best practices

Use `requestLocation`
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing

Use deferred location updates
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing

Use deferred location updates

Energy Log Instrument
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing

Use deferred location updates

Energy Log Instrument

Set `allowsBackgroundLocationUpdates`
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing

Use deferred location updates

Energy Log Instrument

Set `allowsBackgroundLocationUpdates`
Standard Location

Best practices

Use `requestLocation`

Set `desiredAccuracy` property

Enable automatic pausing

Use deferred location updates

Energy Log Instrument

Set `allowsBackgroundLocationUpdates`
Monitoring APIs

Best practices
Monitoring APIs
Best practices

Use a single `CLLocationManager`
Monitoring APIs

Best practices

Use a single `CLLocationManager`

Monitoring continues until explicitly stopped
Monitoring APIs

Best practices

Use a single `CLLocationManager`

Monitoring continues until explicitly stopped

Stop monitoring on launch if you’re unsure of your state
Monitoring APIs
Best practices

Use a single `CLLocationManager`
Monitoring continues until explicitly stopped
Stop monitoring on launch if you’re unsure of your state

```swift
let manager = CLLocationManager()
manager.stopMonitoringVisits()
manager.stopMonitoringSignificantLocationChanges()
for region in manager.monitoredRegions {
    manager.stopMonitoring(for: region)
}
```
Indoor Location
Indoor Location

Automatic
Indoor Location

Automatic

mapsconnect.apple.com
Indoor Location

Automatic
mapsconnect.apple.com
Beacon region monitoring
watchOS
watchOS

iPhone automatically assists
watchOS

iPhone automatically assists
When-in-use authorization
watchOS

iPhone automatically assists
When-in-use authorization

`startUpdatingLocation` is available*

*`startUpdatingLocation` will be available in a future seed
iPhone automatically assists
When-in-use authorization

`startUpdatingLocation` is available*

*`startUpdatingLocation` will be available in a future seed

Building Great Workout Apps
macOS

Always authorization
macOS

Always authorization
Automatic prompting
macOS

Always authorization
Automatic prompting
Use `requestLocation`
tvOS
tvOS

You have

- Single location
- Geocoding
- MapKit
tvOS

You have

• Single location
• Geocoding
• MapKit

Respect the user’s privacy
Best Practices
Best Practices

Respect the user’s privacy
Best Practices

Respect the user’s privacy
Conserve power
Best Practices

Respect the user’s privacy
Conserve power
Use the right API
Best Practices

Respect the user’s privacy
Conserve power
Use the right API
Look at Potloc
More Information

https://developer.apple.com/wwdc16/716
<table>
<thead>
<tr>
<th>Related Sessions</th>
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<tr>
<td>What's New in watchOS 3</td>
<td>Presidio</td>
<td>Tuesday 5:00PM</td>
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<tr>
<td>Introduction to Notifications</td>
<td>Pacific Heights</td>
<td>Wednesday 9:00AM</td>
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<td>Building Great Workout Apps</td>
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<td>Friday 11:00AM</td>
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<td>Labs</td>
<td>Frameworks Lab</td>
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<td>Frameworks Lab C</td>
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<td>Notifications Lab</td>
<td>Graphics, Games and Media Lab B</td>
<td>Friday 9:00AM</td>
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