

Introducing On Demand Resources

An element of App Thinning

Session 214

Steve Lewallen Frameworks Engineering

Tony Parker Cocoa Frameworks

Agenda

On Demand Resources (ODR)

Agenda

On Demand Resources (ODR)

Overview

Agenda

On Demand Resources (ODR)

Overview

Features and Benefits

Agenda

On Demand Resources (ODR)

Overview

Features and Benefits

Details

Agenda

On Demand Resources (ODR)

Overview

Features and Benefits

Details

Using On Demand Resources

Agenda

On Demand Resources (ODR)

Overview

Features and Benefits

Details

Using On Demand Resources

Best Practices

Overview

The traditional application

Traditional Application

Traditional Application



Executable

Base Resources

Traditional Application

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Traditional Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Traditional Application

App Store

| |
|----------------|
| Executable |
| Base Resources |
| Game Level 1 |
| Game Level 2 |
| Game Level 'n' |

Device

| |
|----------------|
| Executable |
| Base Resources |
| Game Level 1 |
| Game Level 2 |
| Game Level 'n' |

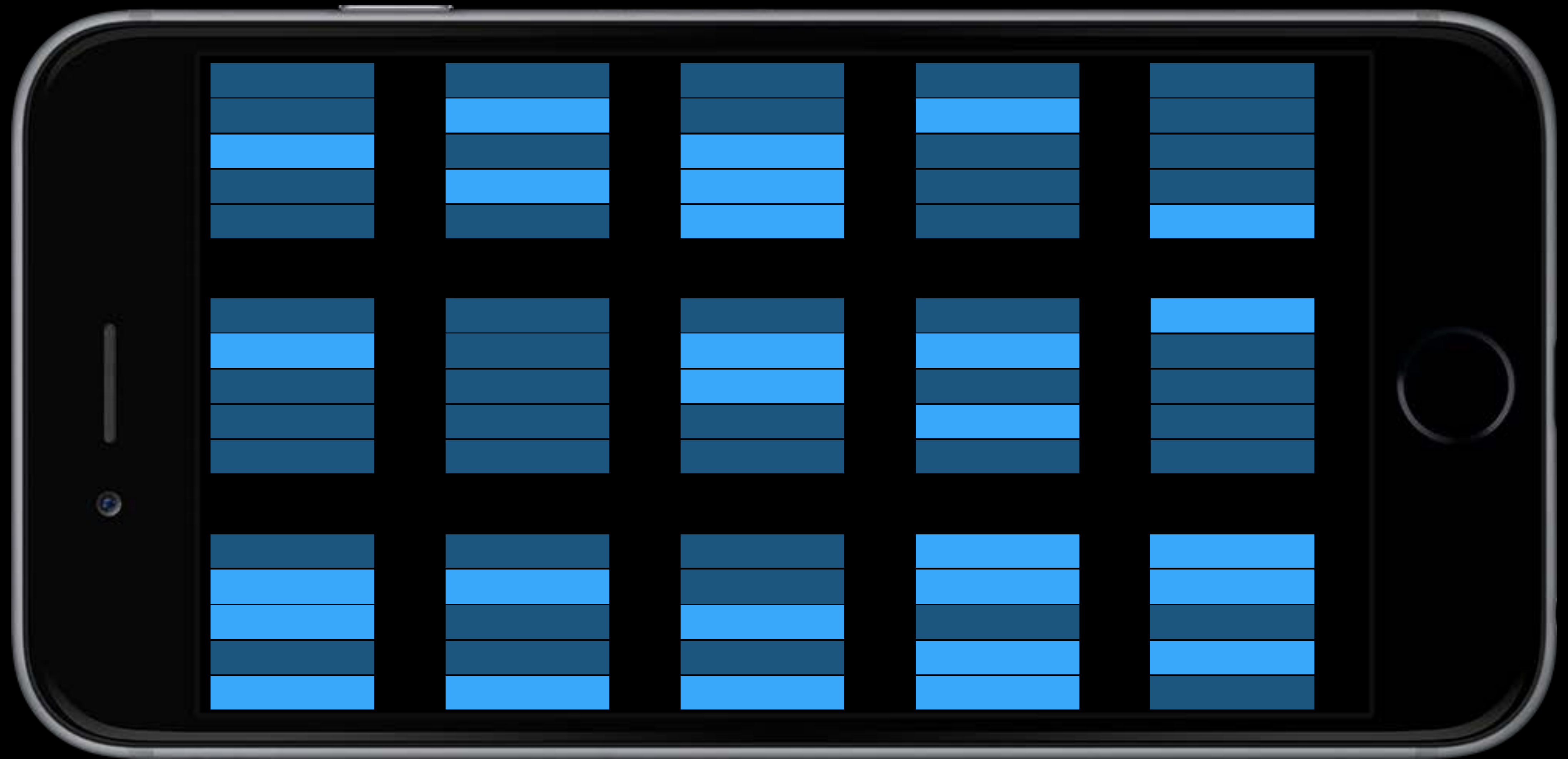
Traditional Application



Traditional Application



Traditional Application



Overview

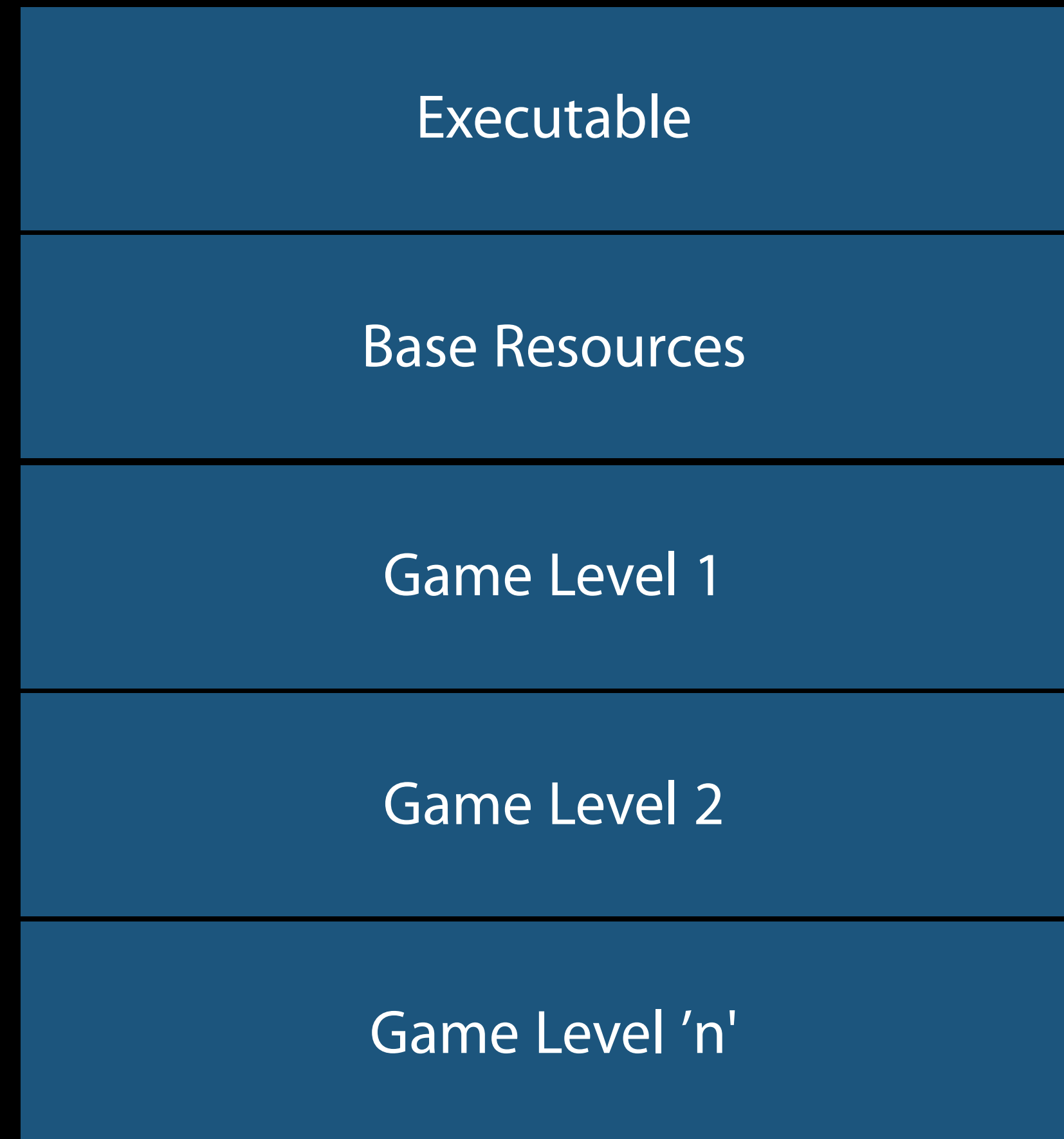
The On Demand Resources application

On Demand Resources Application

Space-friendly packaging

On Demand Resources Application

Space-friendly packaging



On Demand Resources Application

Space-friendly packaging



On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

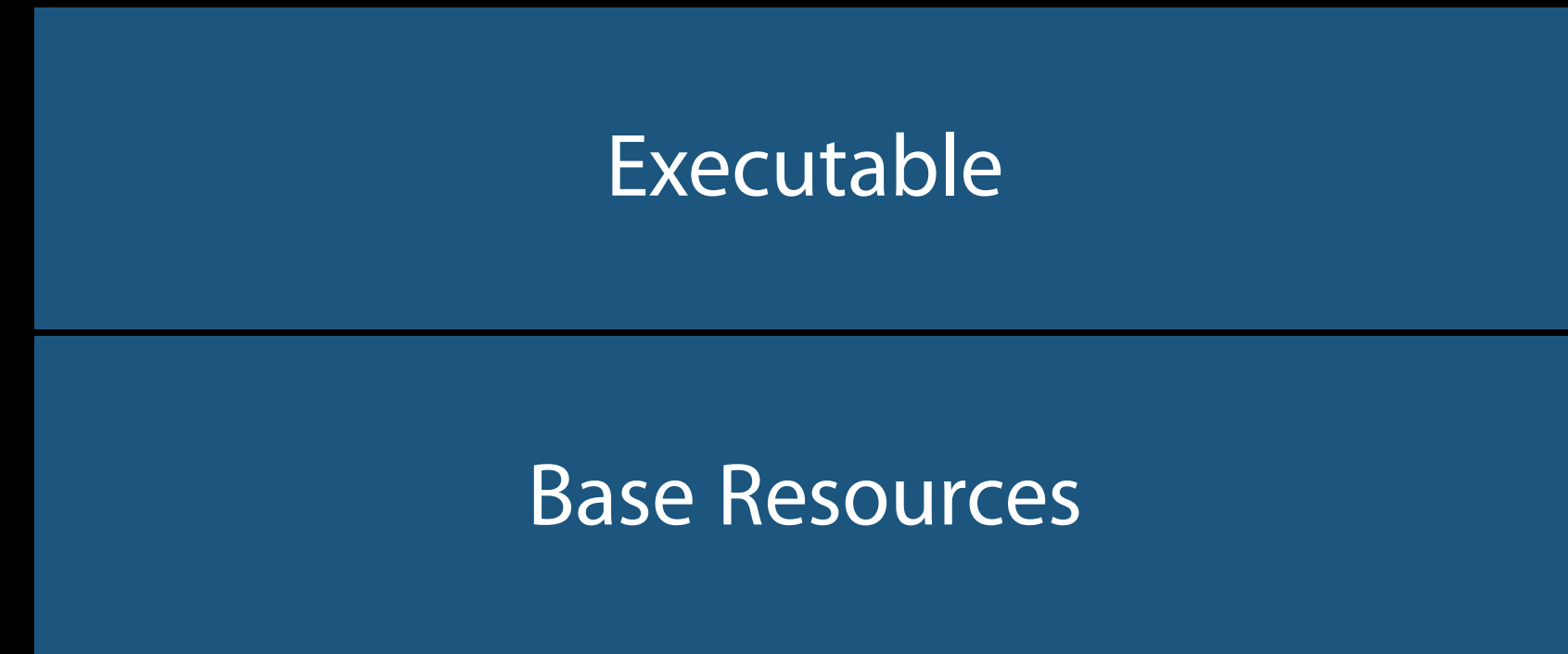
Game Level 2

Game Level 'n'

Device

Executable

Base Resources



On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Device

Executable

Base Resources

Game Level 1

On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Device

Executable

Base Resources

Game Level 1

On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

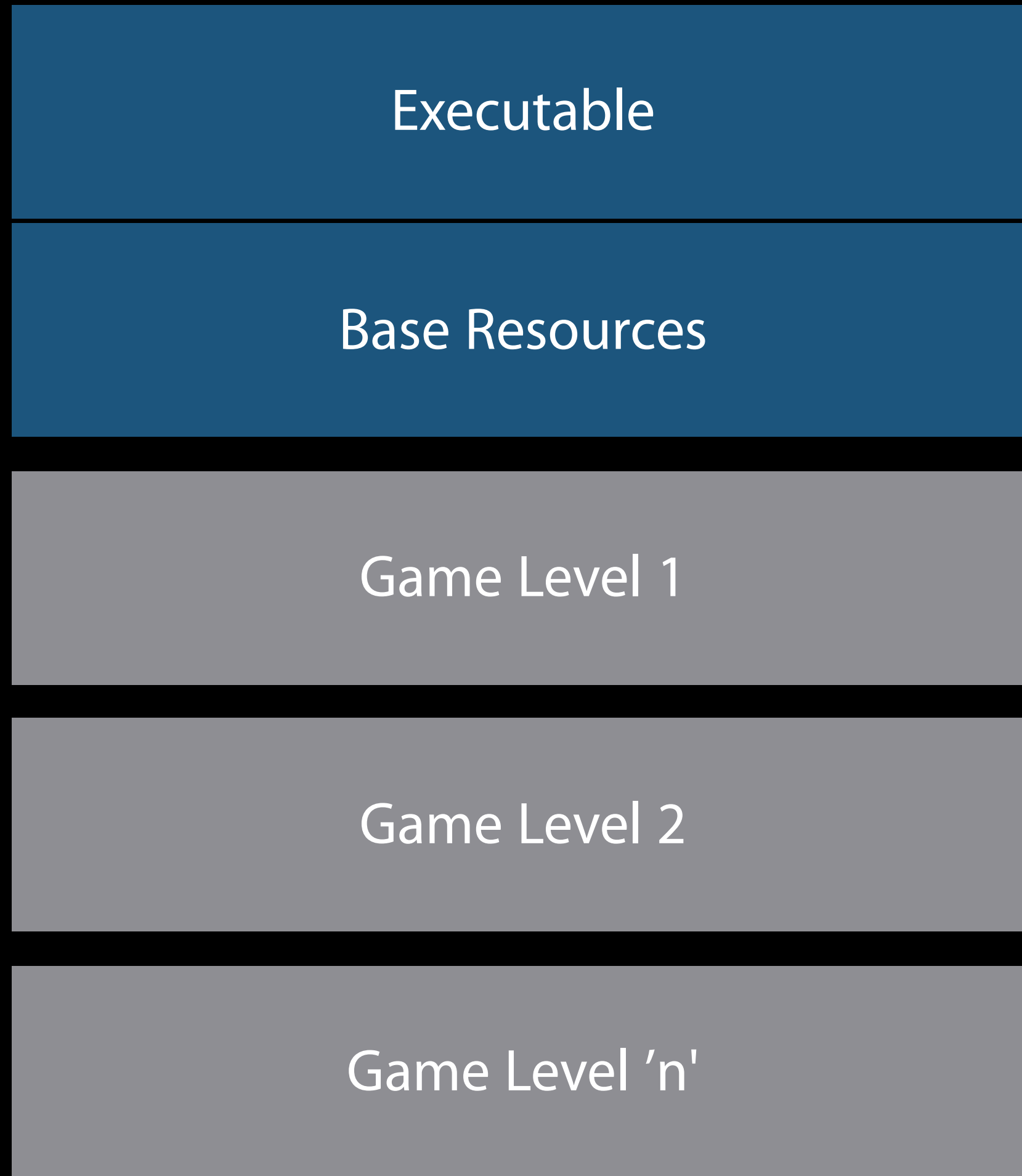
Device

Executable

Base Resources

Game Level 1

Game Level 2



On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

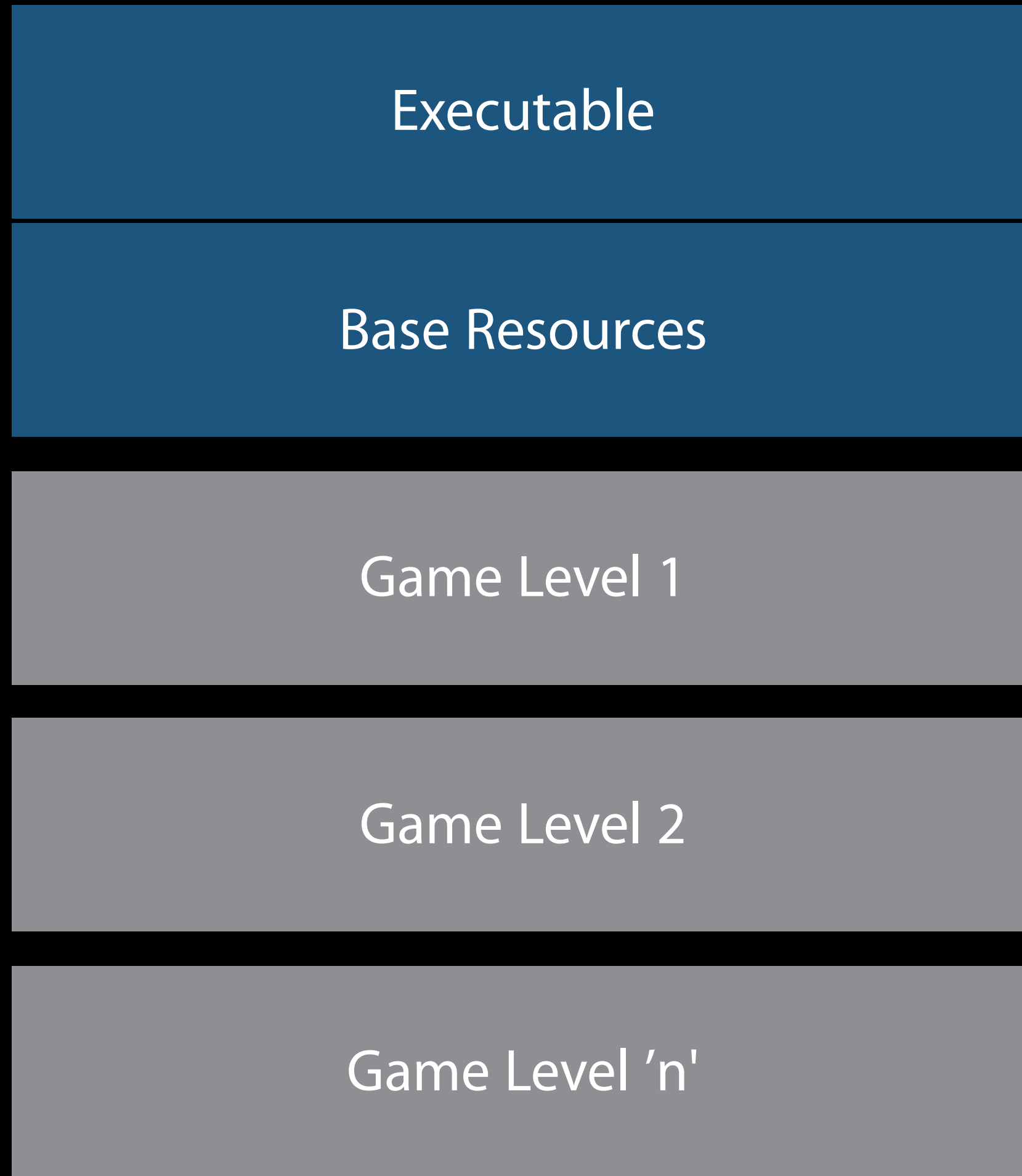
Device

Executable

Base Resources

Game Level 1

Game Level 2



On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Device

Executable

Base Resources

Game Level 1

Game Level 2



On Demand Resources Application

App Store

Executable

Base Resources

Game Level 1

Game Level 2

Game Level 'n'

Device

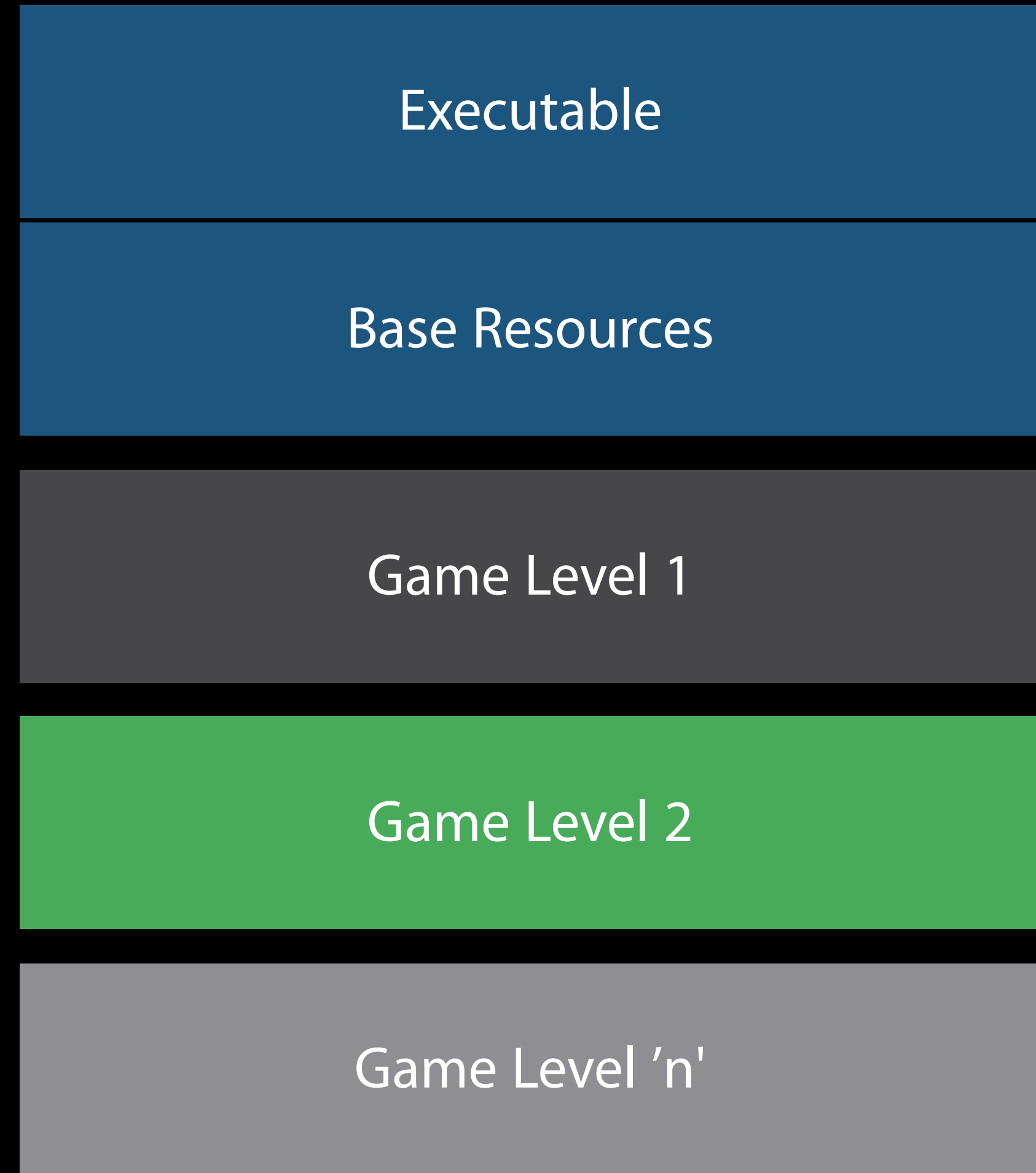
Executable

Base Resources

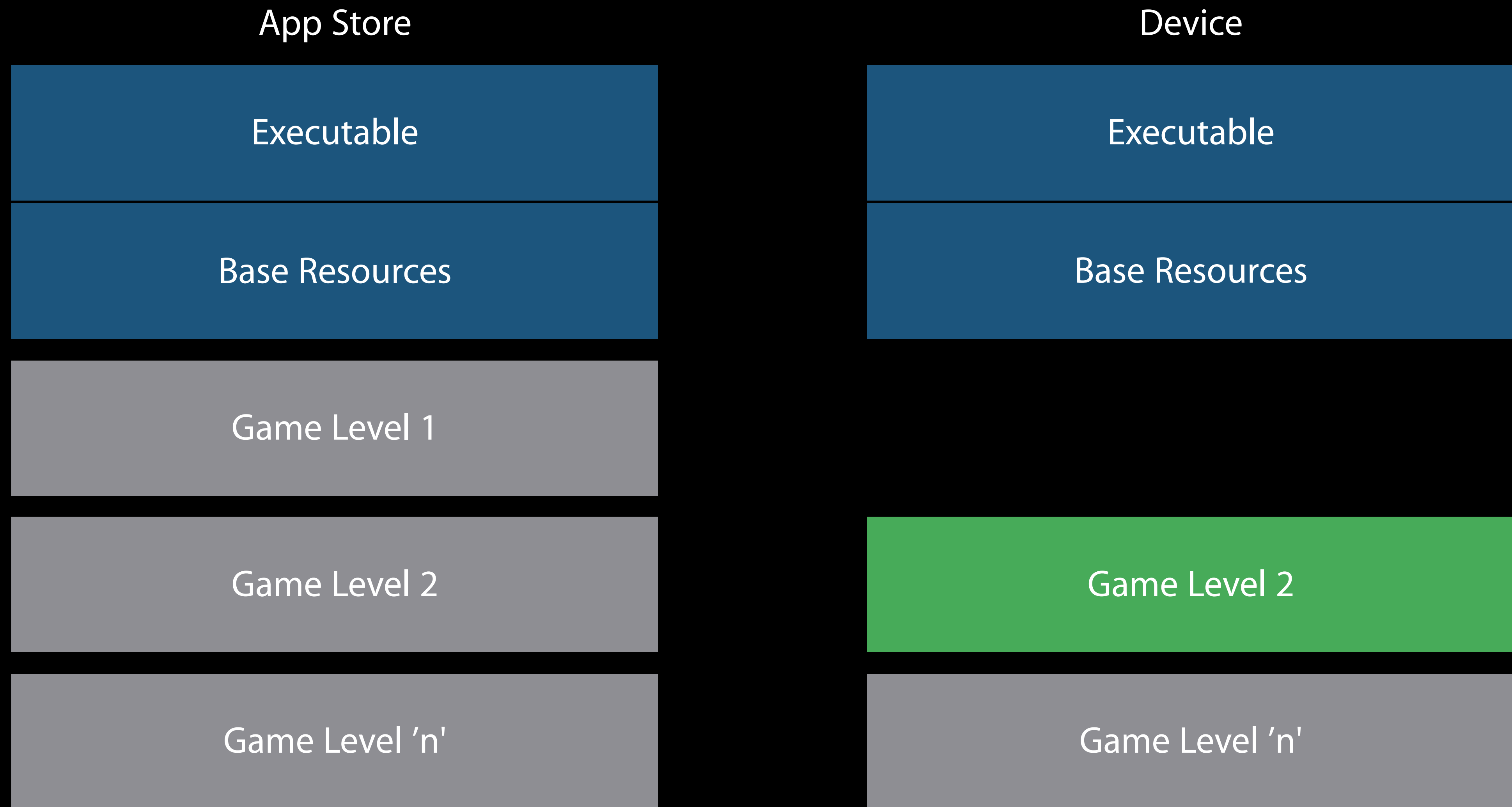
Game Level 1

Game Level 2

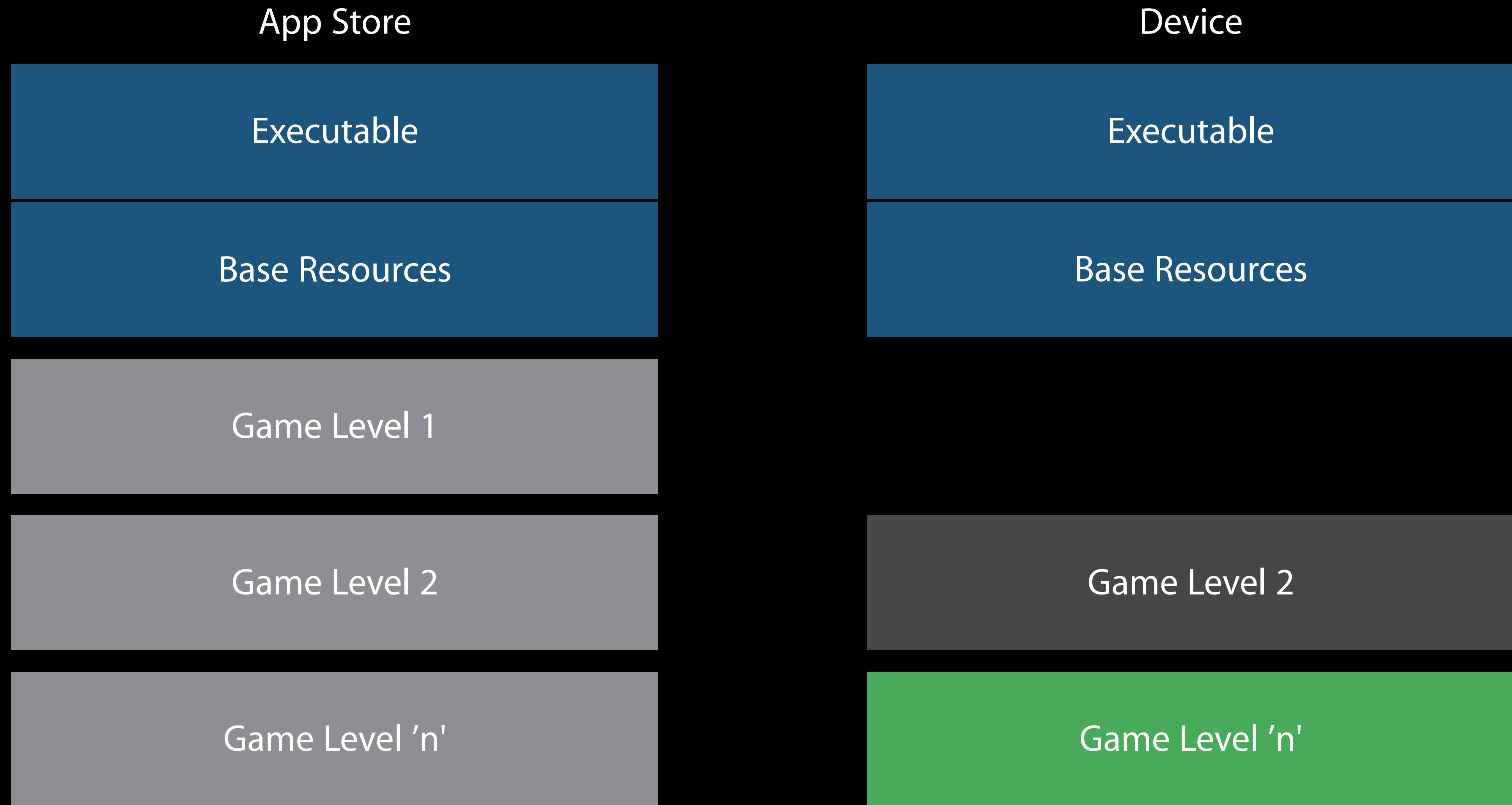
Game Level 'n'



On Demand Resources Application



On Demand Resources Application



Features

Benefits for the developer

On Demand Resources

Features

On Demand Resources

Features

Dynamically loaded content

On Demand Resources

Features

Dynamically loaded content

Hosted on the App Store

On Demand Resources

Features

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

On Demand Resources

Features

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Automated downloads before first launch

On Demand Resources

Features

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Automated downloads before first launch

Intelligent content caching

On Demand Resources

Features

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Automated downloads before first launch

Intelligent content caching

Max app size with On Demand Resources increases to 20GB

Features

Benefits for the user

On Demand Resources

User benefits

On Demand Resources

User benefits

Better install experience

On Demand Resources

User benefits

Better install experience

More apps ready to run

On Demand Resources

User benefits

Better install experience

More apps ready to run

Greater, richer app content

Details

Understanding On Demand Resources

On Demand Resources

An element of App Thinning

On Demand Resources

An element of App Thinning

Part of iOS 9's App Thinning

On Demand Resources

An element of App Thinning

Part of iOS 9's App Thinning

Integrated with App Slicing

On Demand Resources

An element of App Thinning

Part of iOS 9's App Thinning

Integrated with App Slicing

- Tailoring the download to a specific device

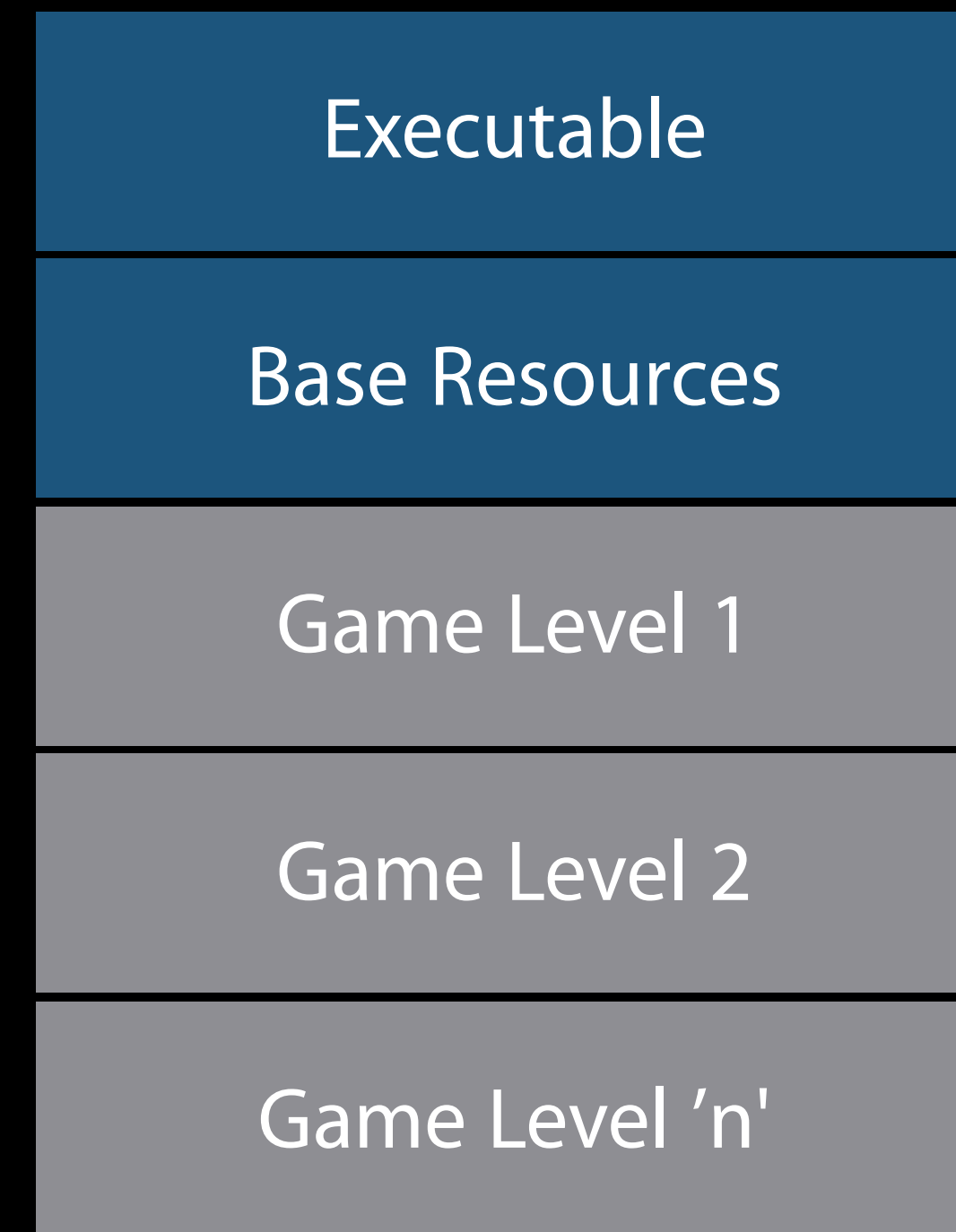
On Demand Resources App Structure

Partitioning content

On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups



On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups



On Demand Resources App Structure

Partitioning content

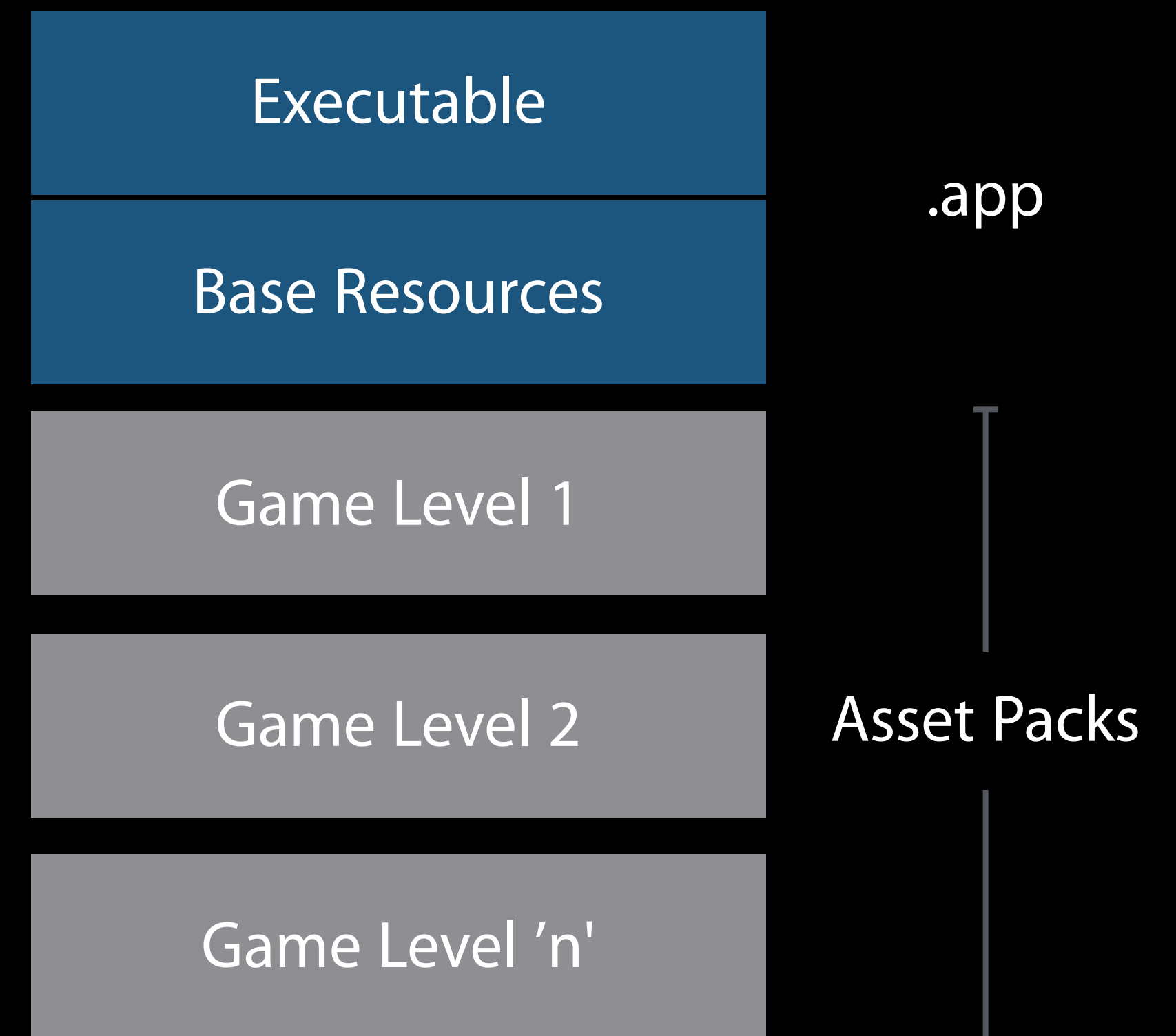
Partition assets into tagged groups



On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups

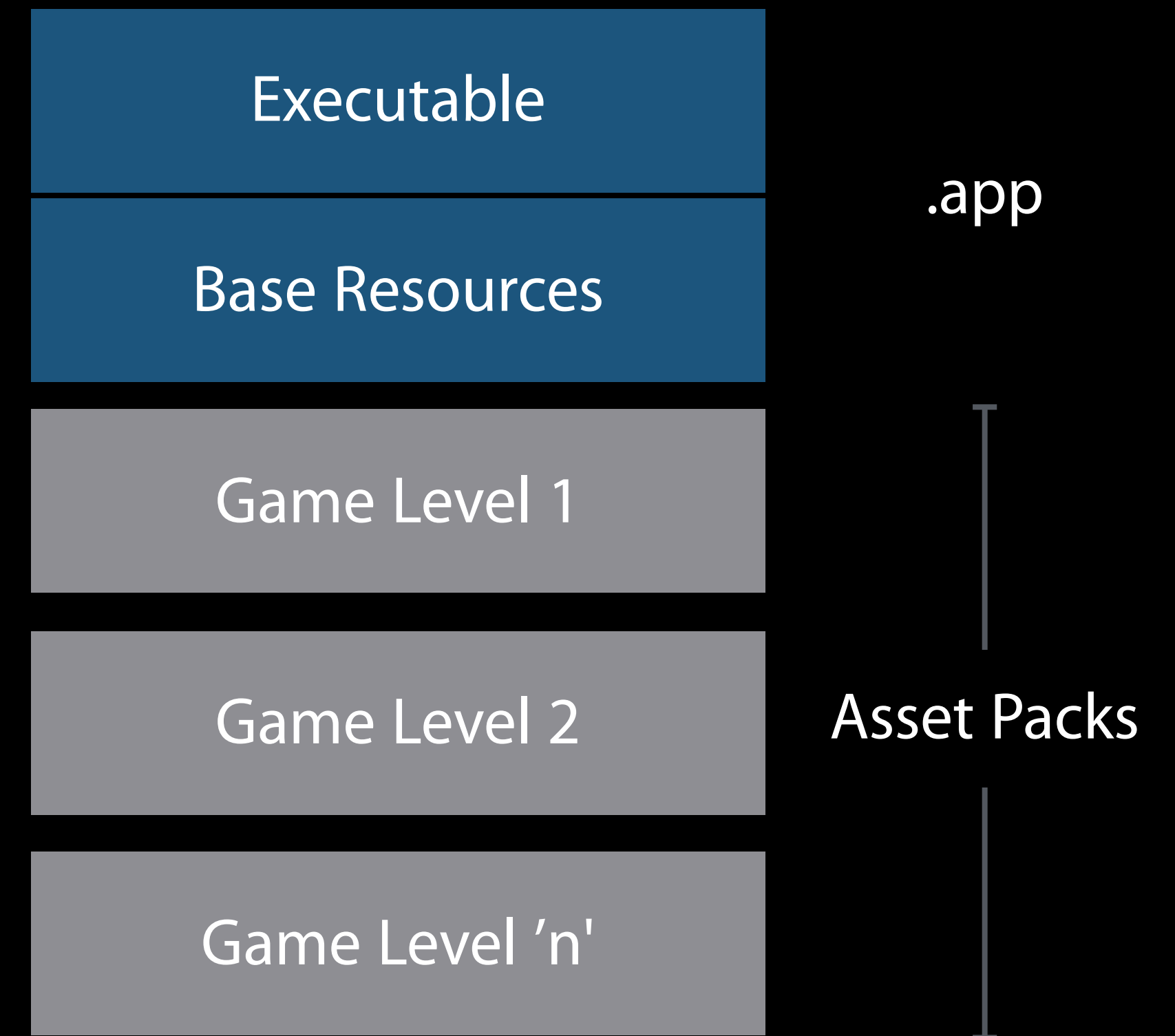


On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups

- Tag assets using Xcode

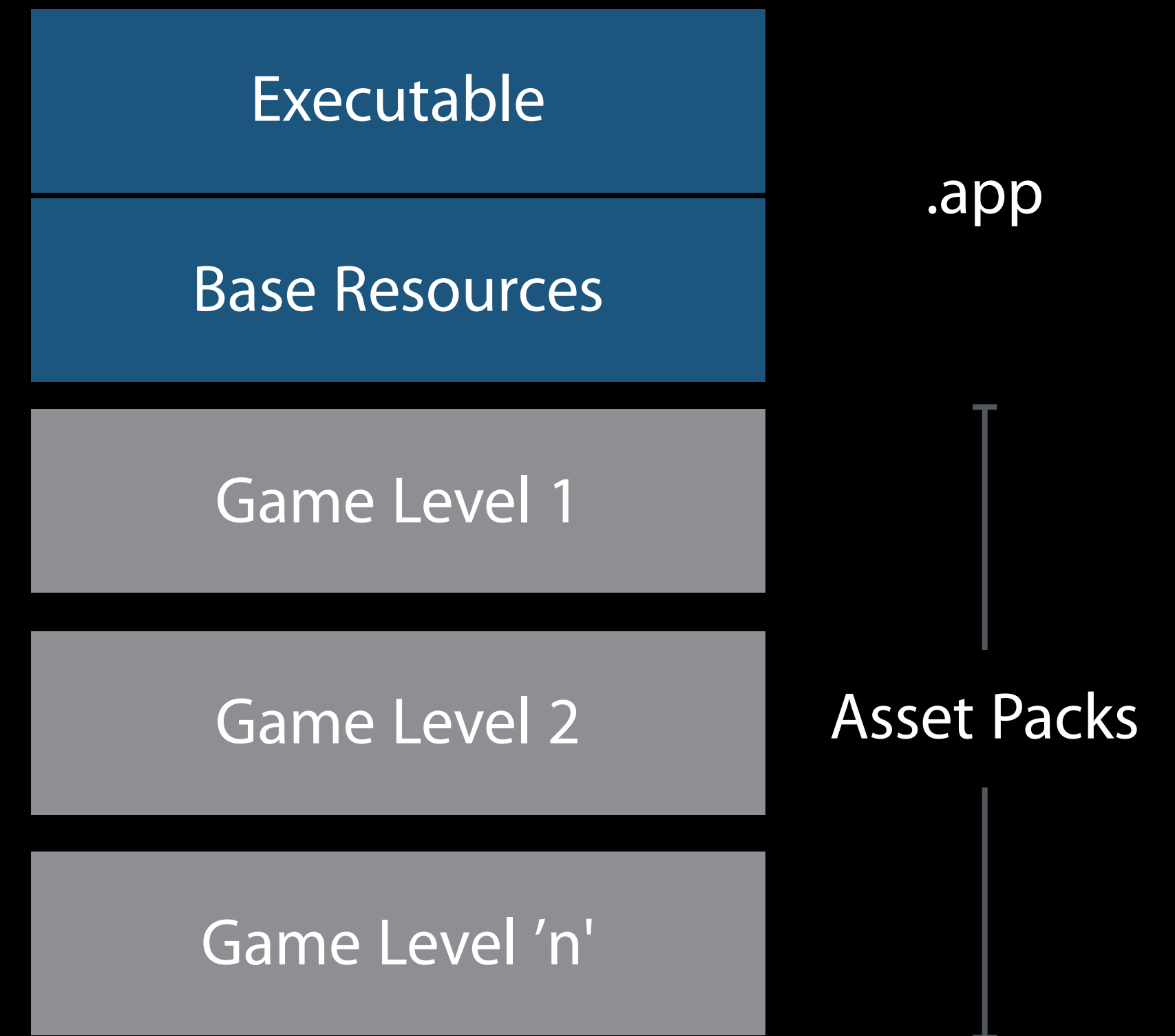


On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups

- Tag assets using Xcode
- Tags are simple strings

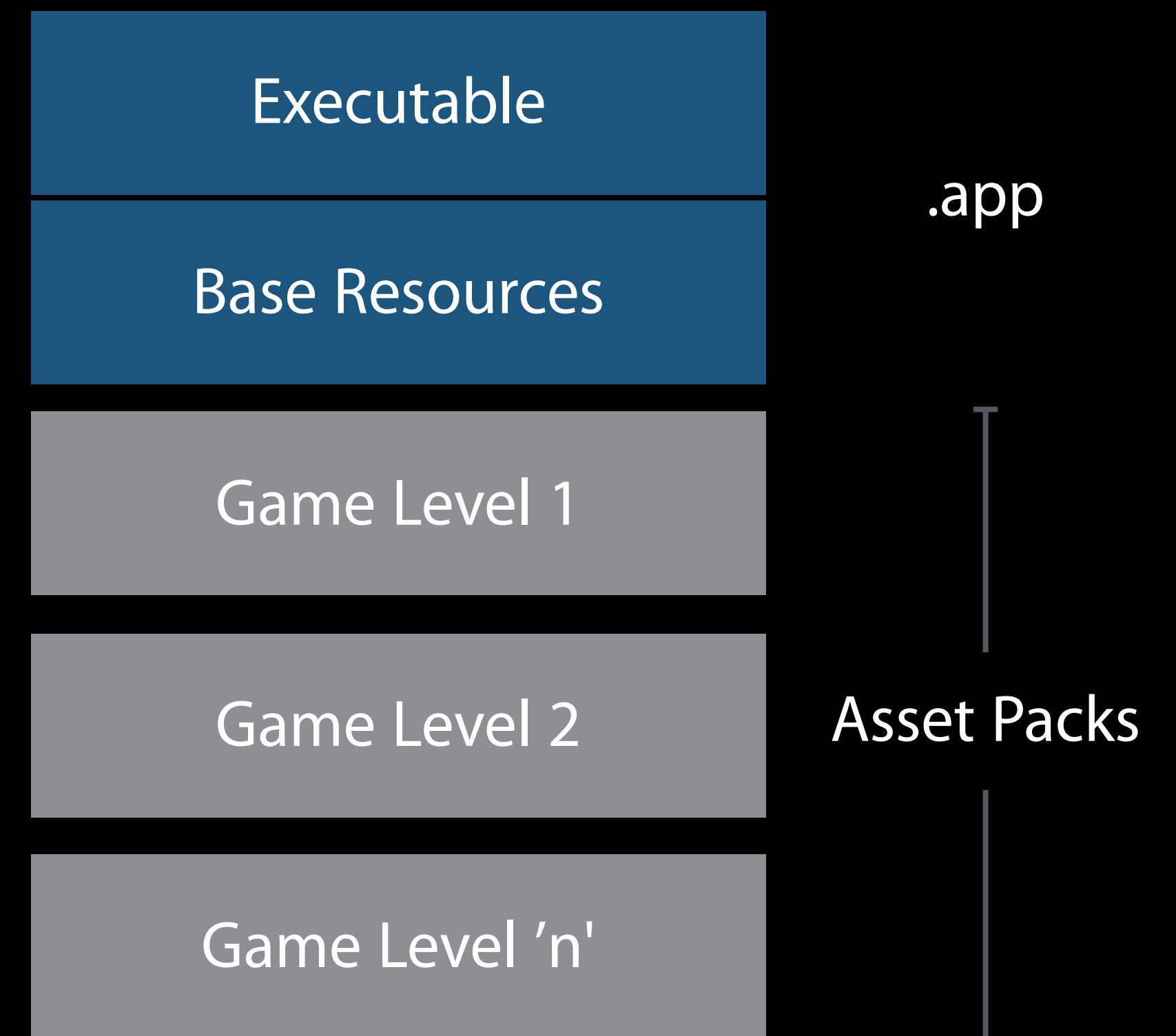


On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups

- Tag assets using Xcode
- Tags are simple strings
 - Ex. "Level 1"

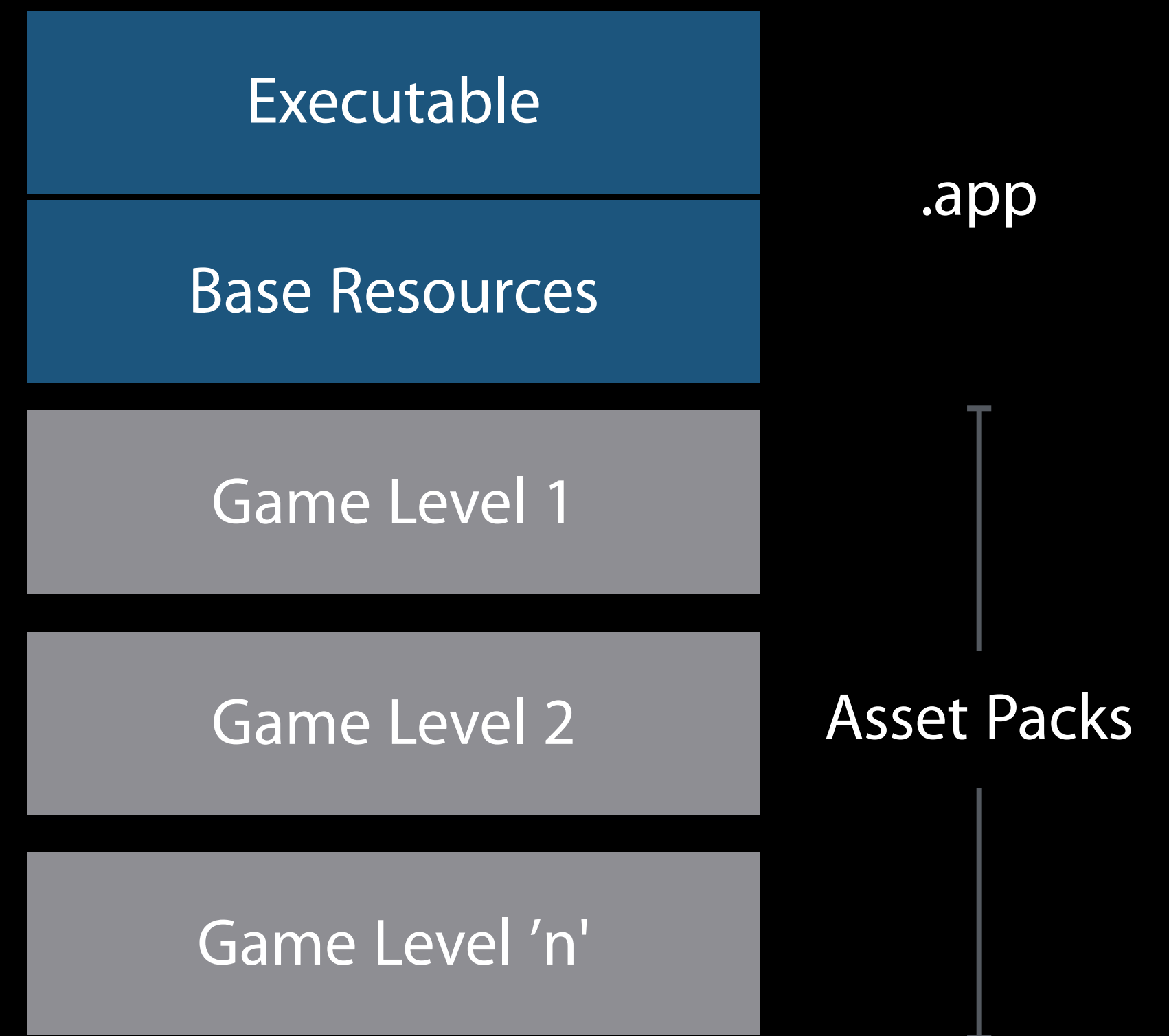


On Demand Resources App Structure

Partitioning content

Partition assets into tagged groups

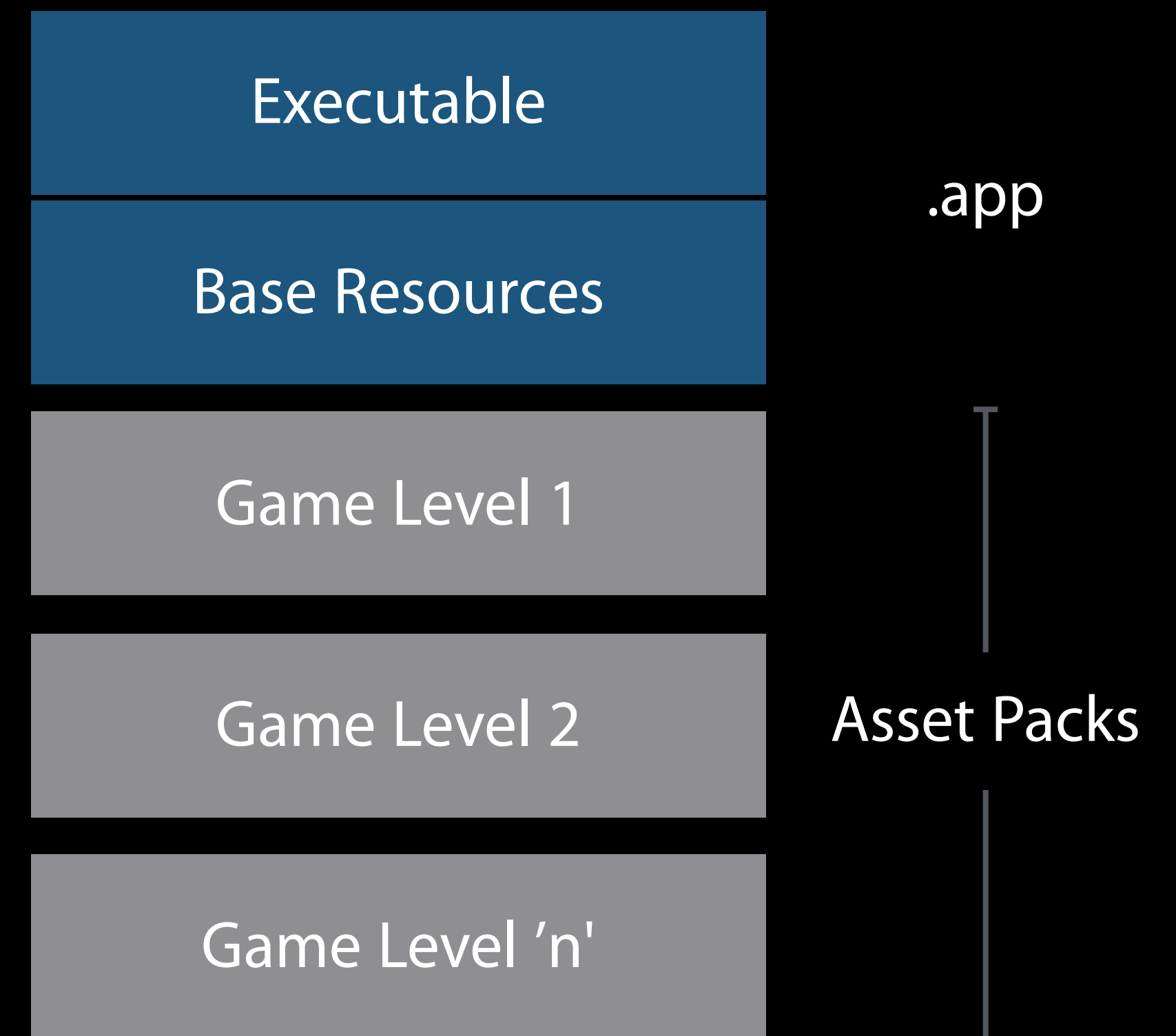
- Tag assets using Xcode
- Tags are simple strings
 - Ex. "Level 1"
- May be single files or entire folders



On Demand Resources App Structure

Types of content

Tagged assets

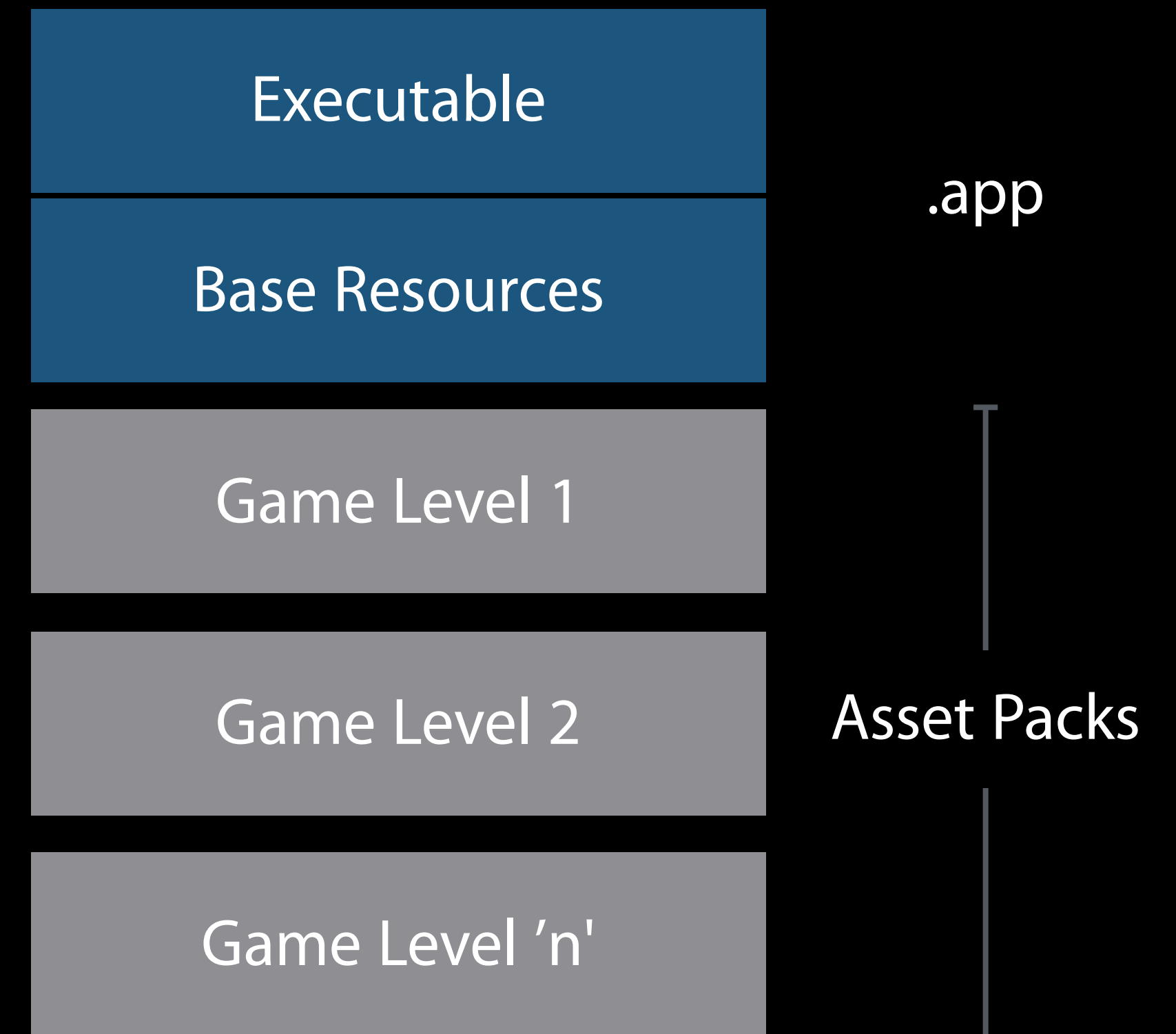


On Demand Resources App Structure

Types of content

Tagged assets

- Images

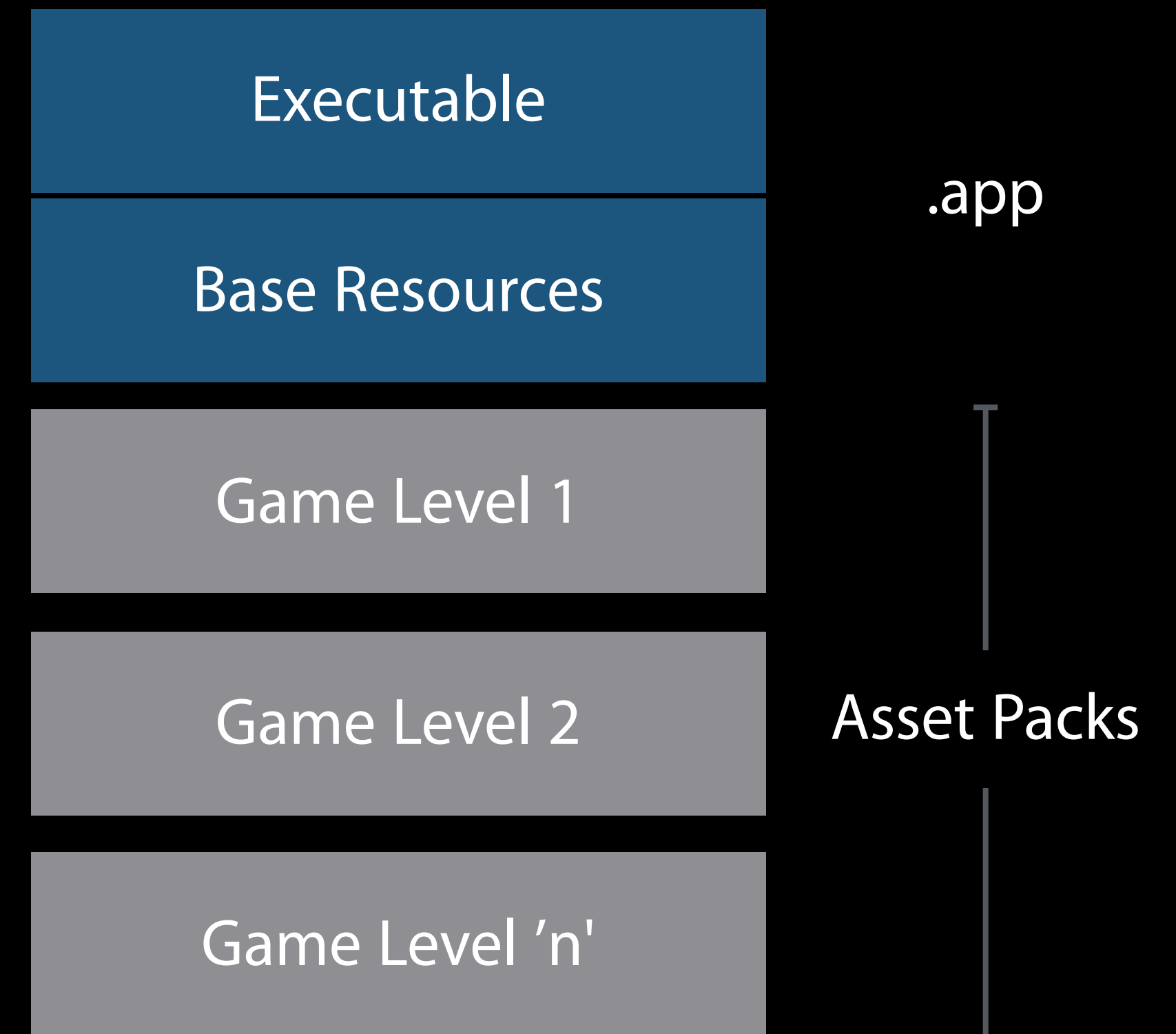


On Demand Resources App Structure

Types of content

Tagged assets

- Images
- Sounds

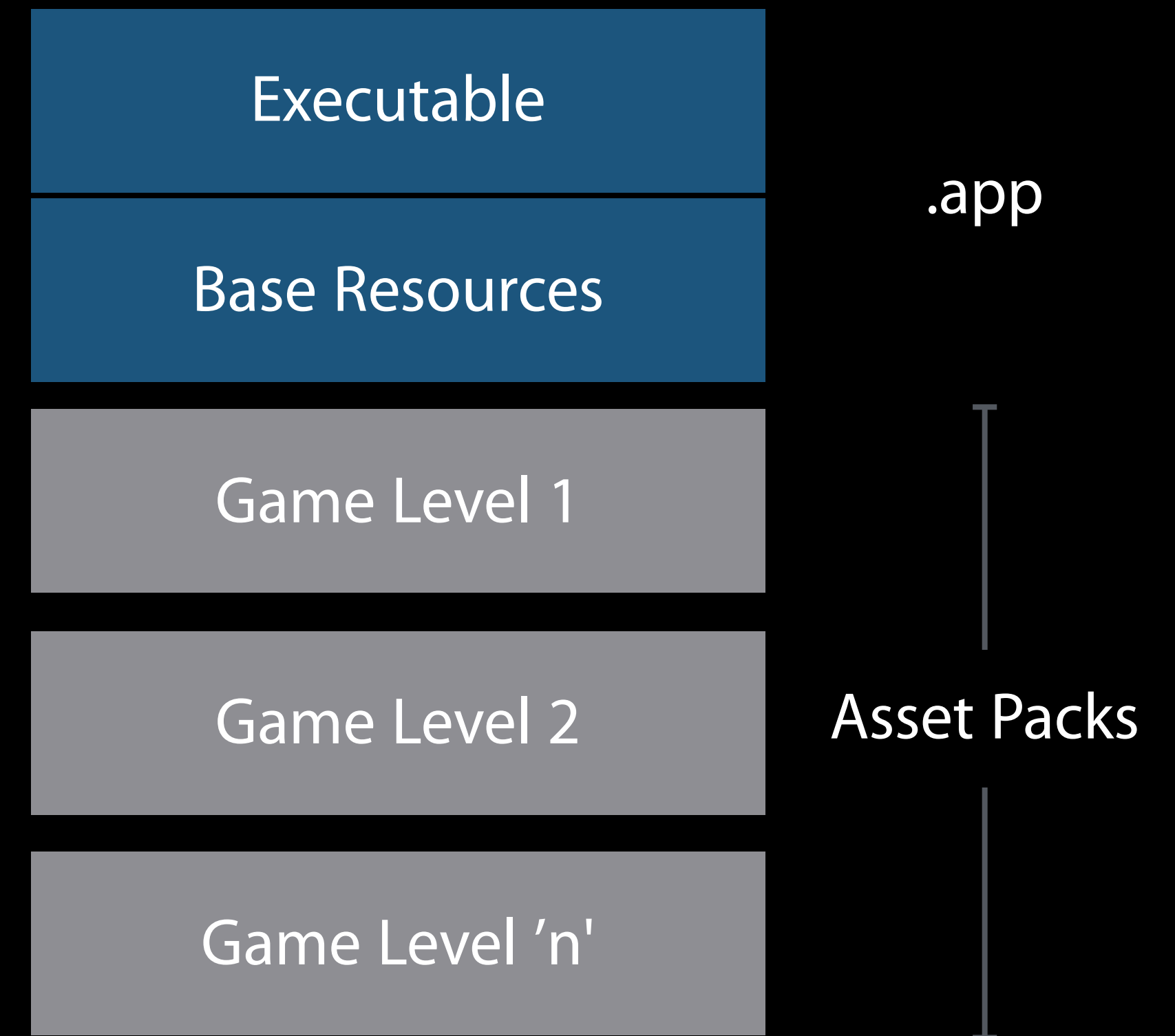


On Demand Resources App Structure

Types of content

Tagged assets

- Images
- Sounds
- Data

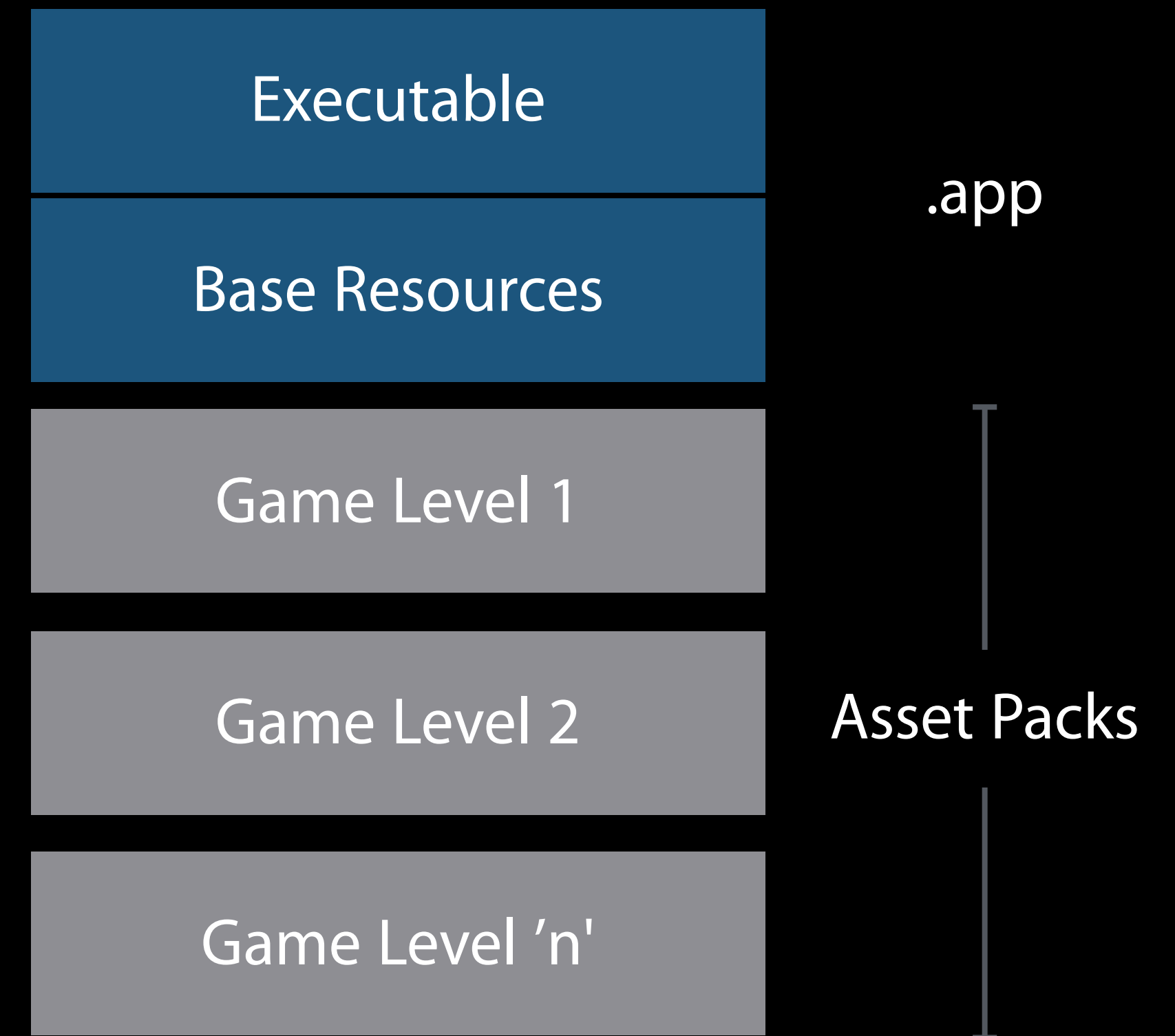


On Demand Resources App Structure

Types of content

Tagged assets

- Images
- Sounds
- Data
- Scripts

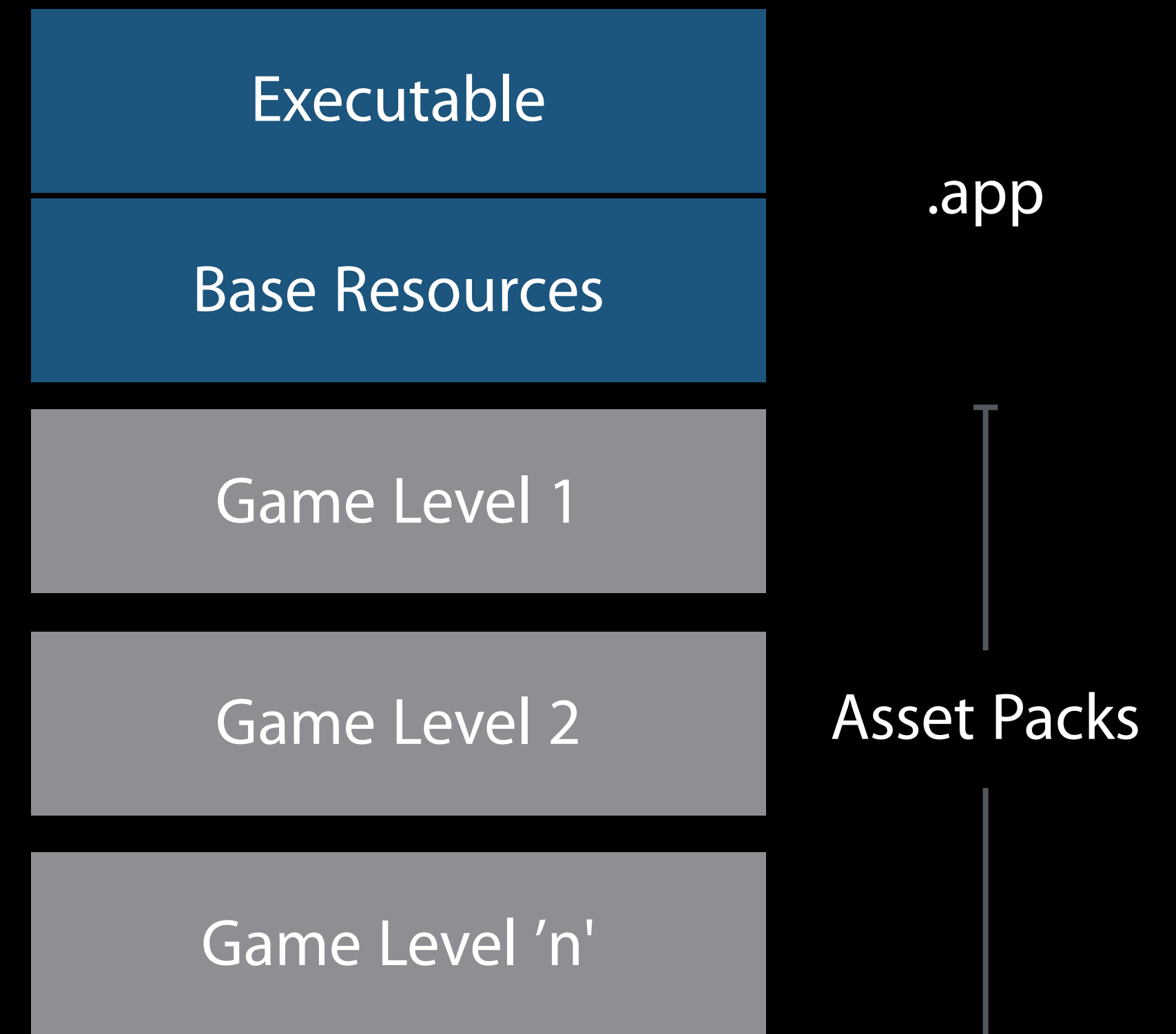


On Demand Resources App Structure

Types of content

Tagged assets

- Images
- Sounds
- Data
- Scripts
- In-app purchased content

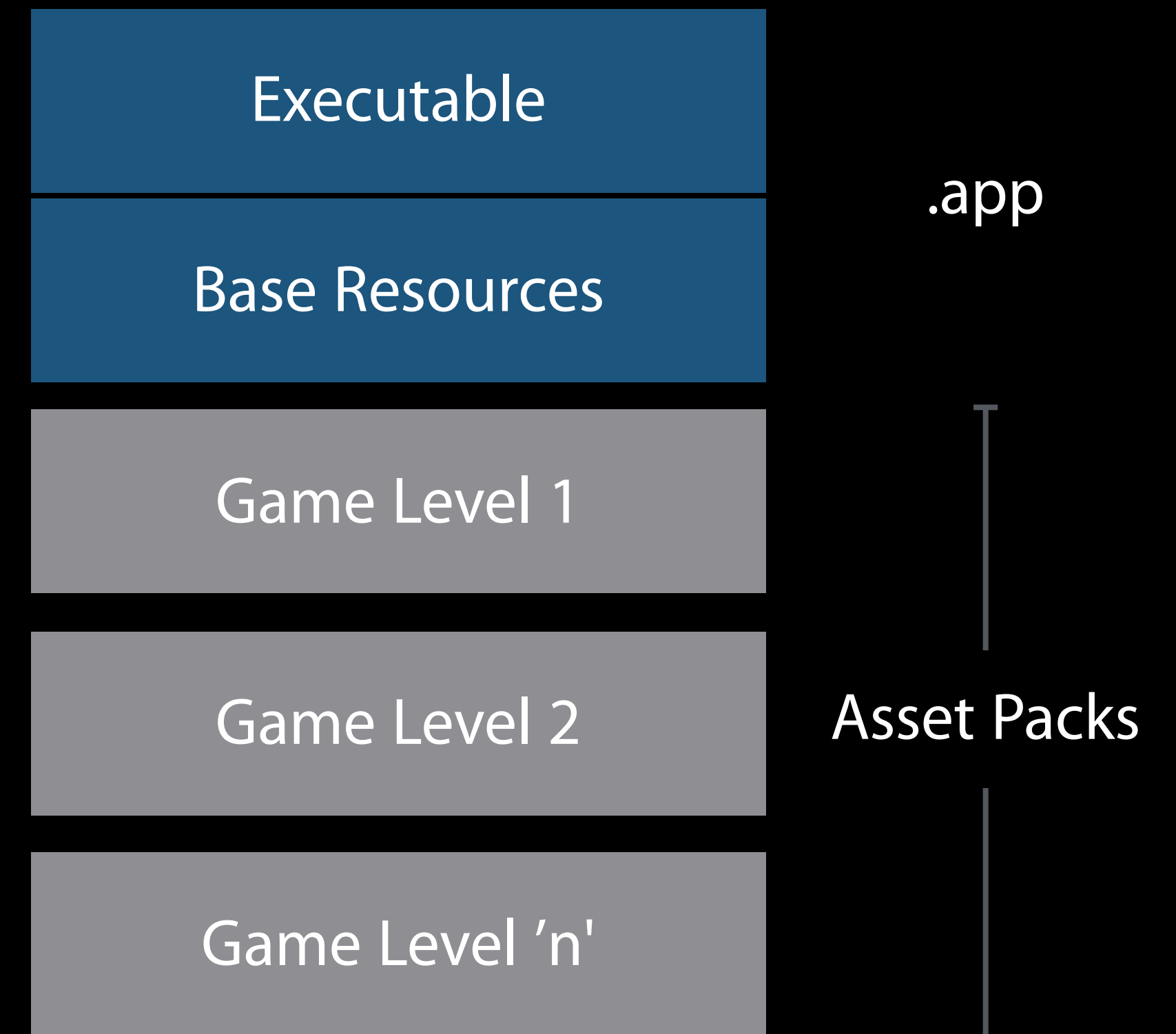


On Demand Resources App Structure

Types of content

Tagged assets

- Images
- Sounds
- Data
- Scripts
- In-app purchased content
- **No executable content**



Hosting On Demand Resources

Whether at deployment or during development

Hosting On Demand Resources

Whether at deployment or during development

App Store

Hosting On Demand Resources

Whether at deployment or during development

App Store

Xcode

Hosting On Demand Resources

Whether at deployment or during development

App Store

Xcode

Xcode Server

Hosting On Demand Resources

Whether at deployment or during development

App Store

Xcode

Xcode Server

TestFlight

Hosting On Demand Resources

Whether at deployment or during development

App Store

Xcode

Xcode Server

TestFlight

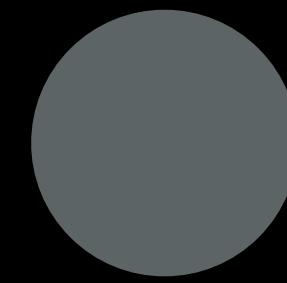
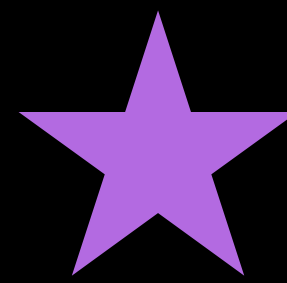
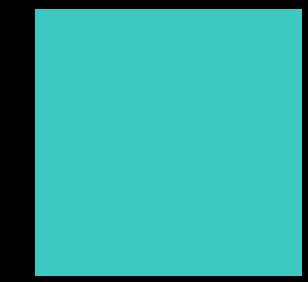
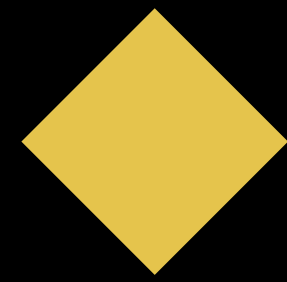
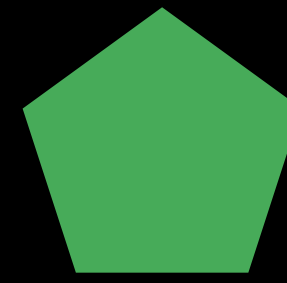
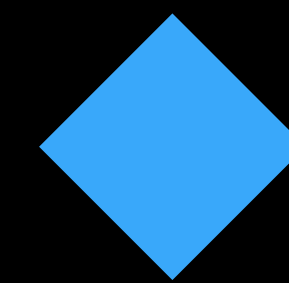
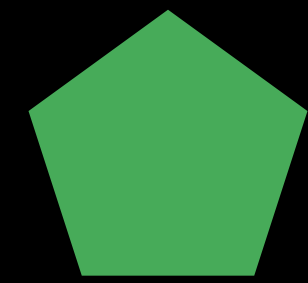
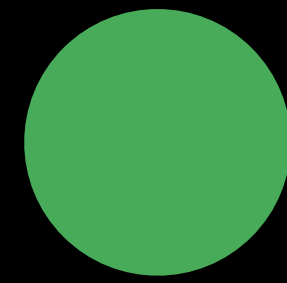
Enterprise Deployment

Getting Started with On Demand Resources

Identifying your assets

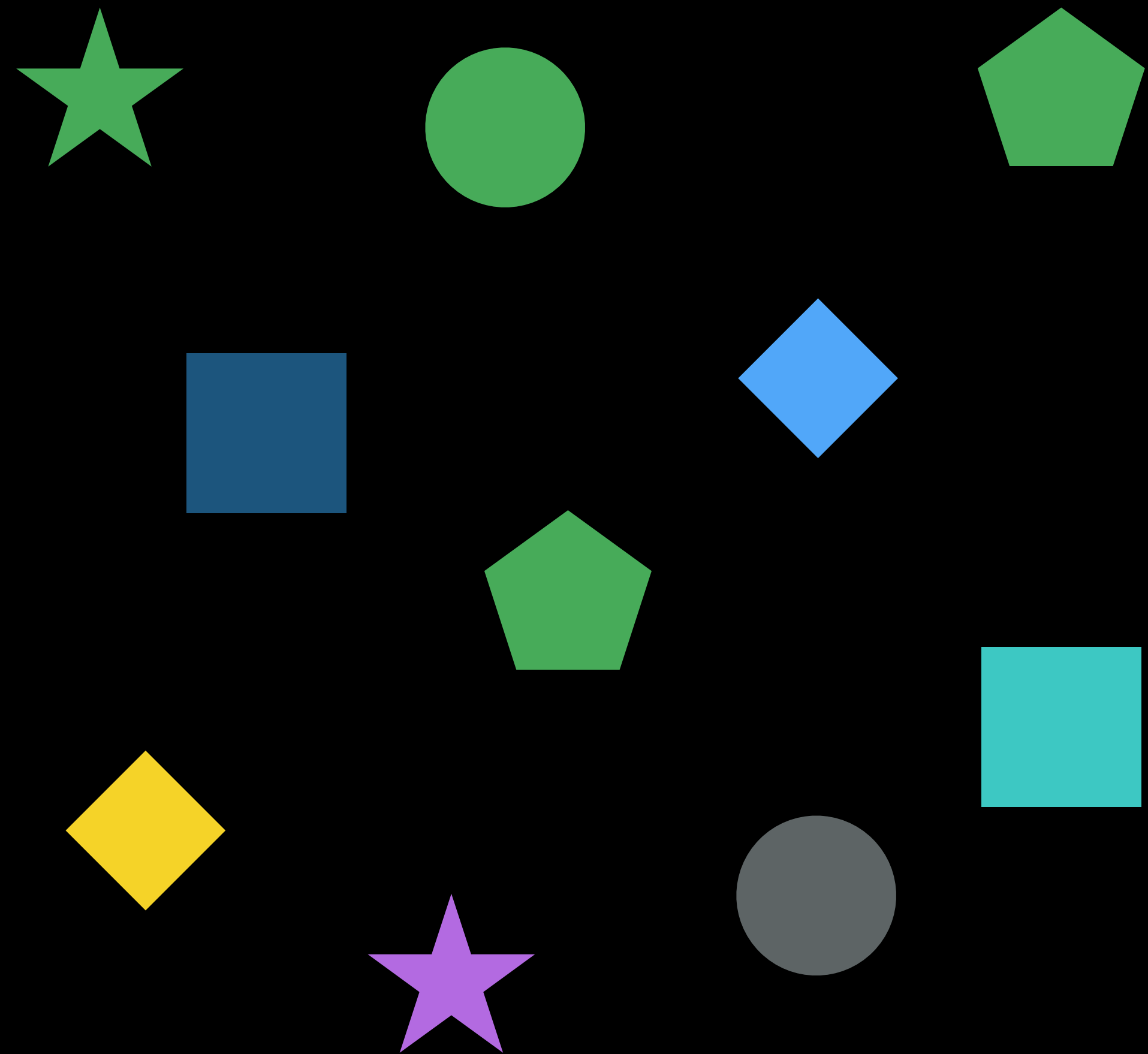
Getting Started with On Demand Resources

Identifying your assets



Getting Started with On Demand Resources

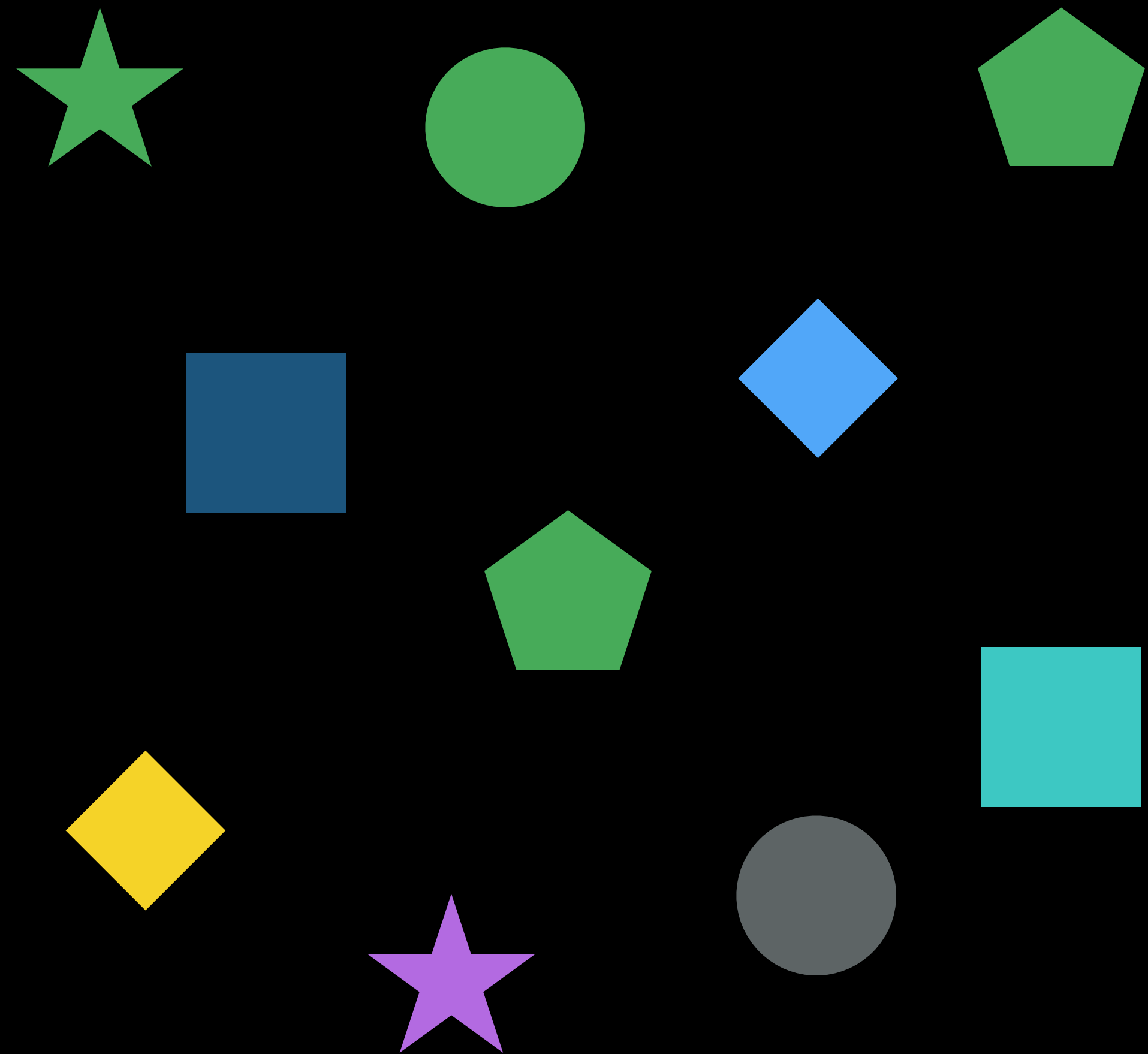
Identifying your assets



Getting Started with On Demand Resources

Tagging your assets

Part 1—Developer tags assets

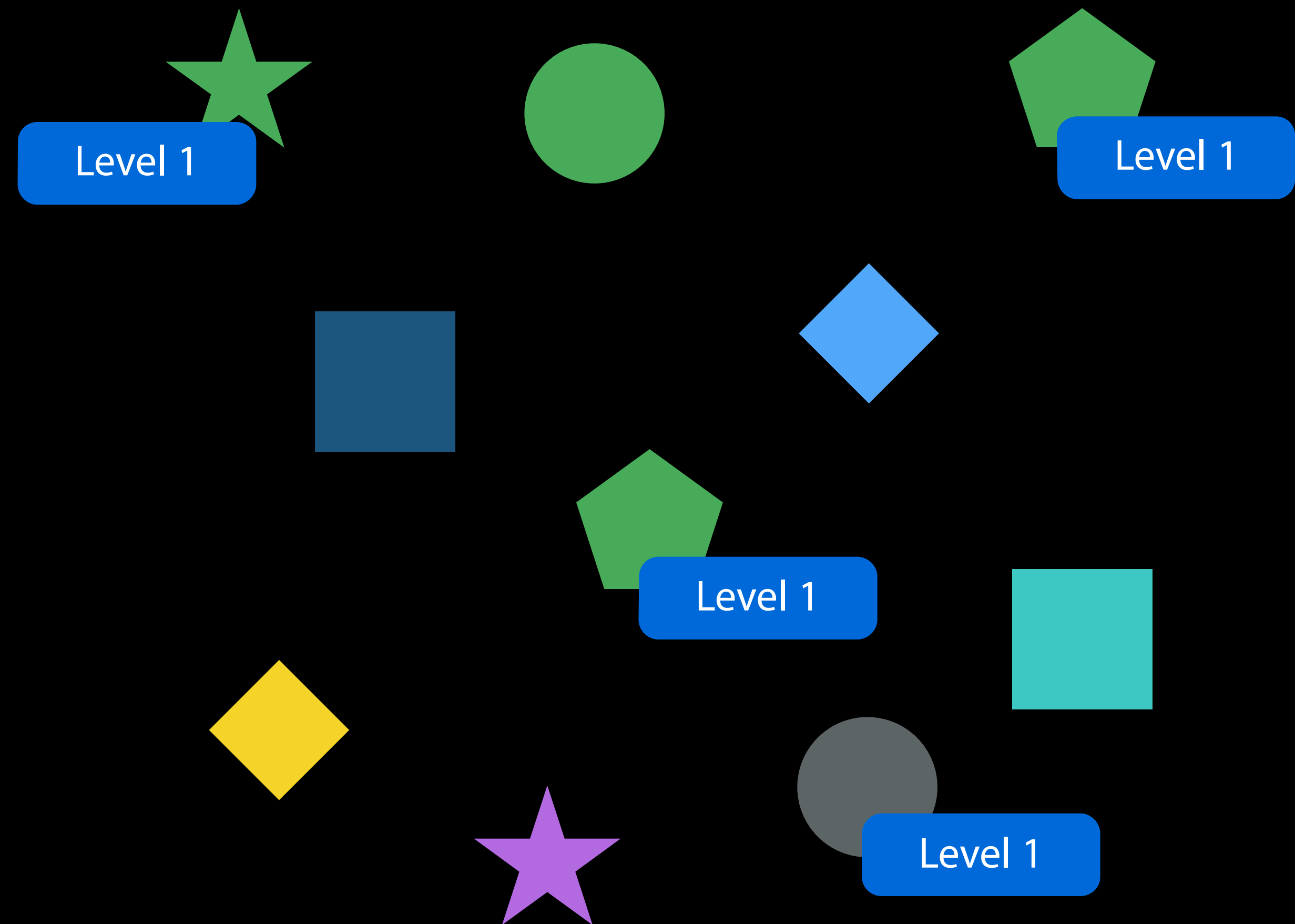


Getting Started with On Demand Resources

Tagging your assets

Part 1—Developer tags assets

- “Level 1”

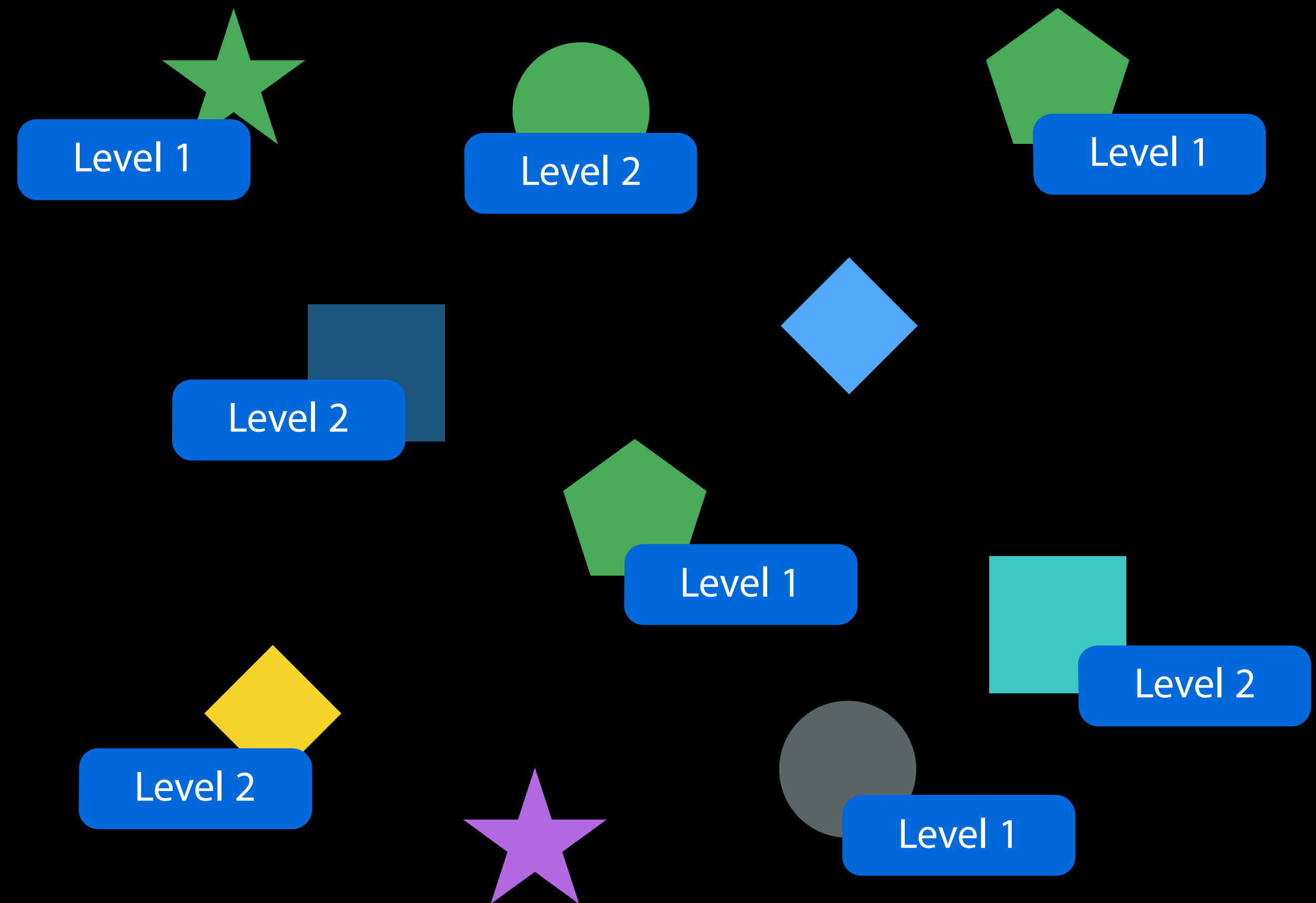


Getting Started with On Demand Resources

Tagging your assets

Part 1—Developer tags assets

- “Level 1”
- “Level 2”

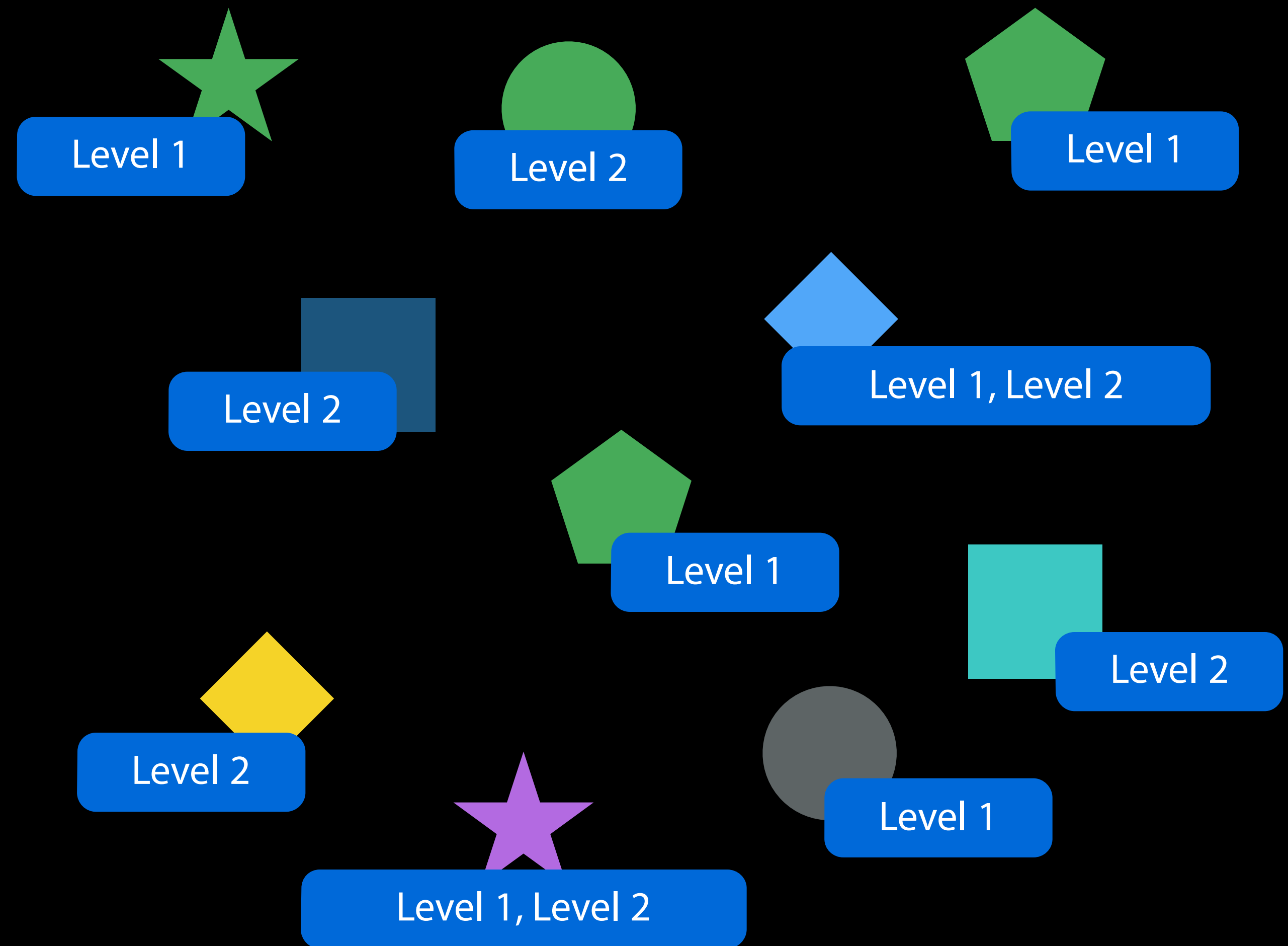


Getting Started with On Demand Resources

Tagging your assets

Part 1—Developer tags assets

- “Level 1”
- “Level 2”
- “Level 1,” “Level 2”

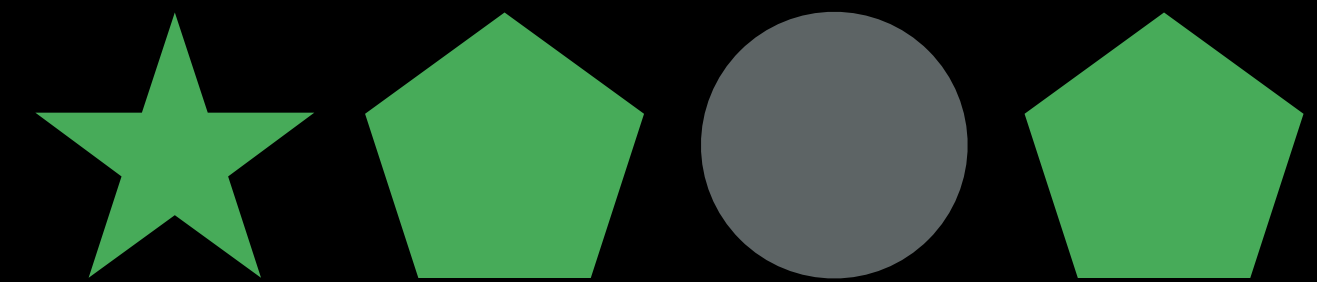


Getting Started with On Demand Resources

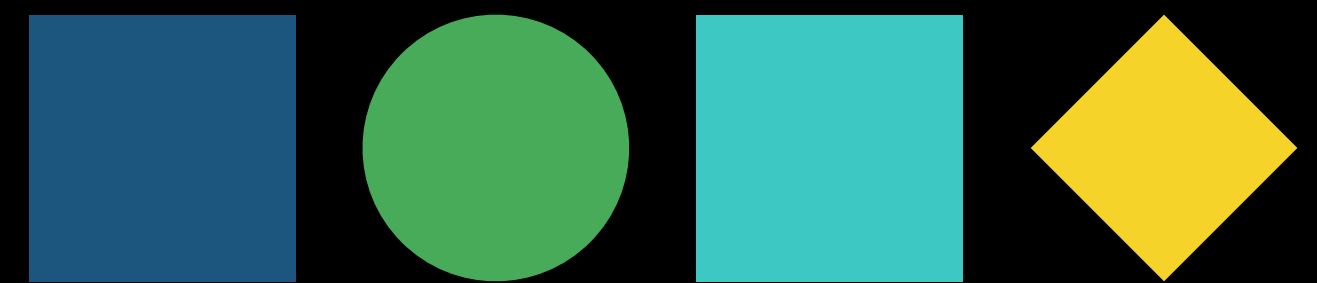
Xcode creates asset packs from tags

Part 2—Xcode creates asset packs

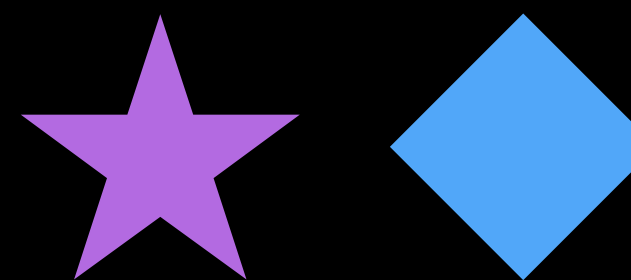
Level 1



Level 2



Level 1 + Level 2

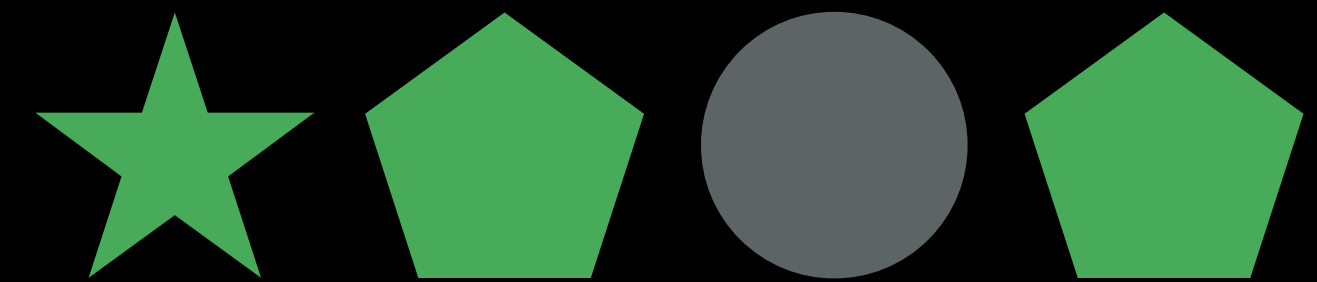


Getting Started with On Demand Resources

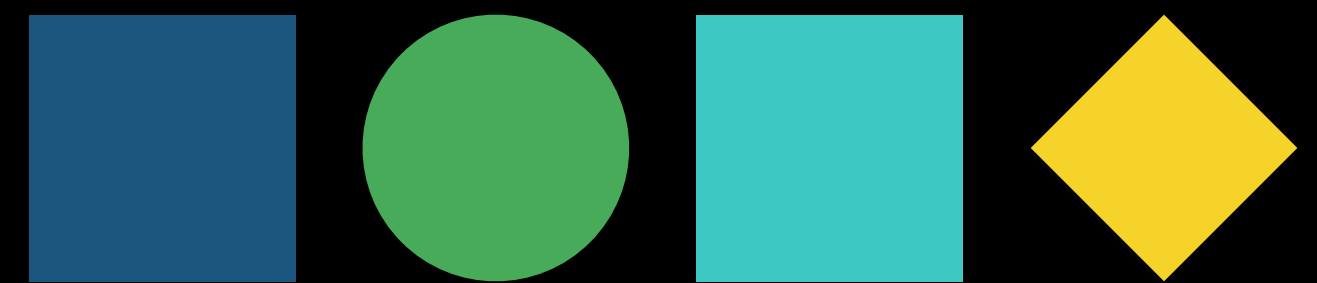
Xcode creates asset packs from tags

Part 2—Xcode creates asset packs

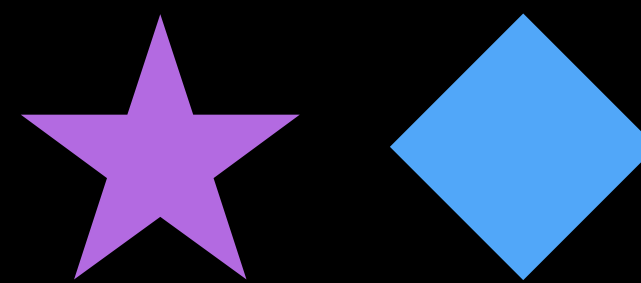
Level 1



Level 2



Level 1 + Level 2

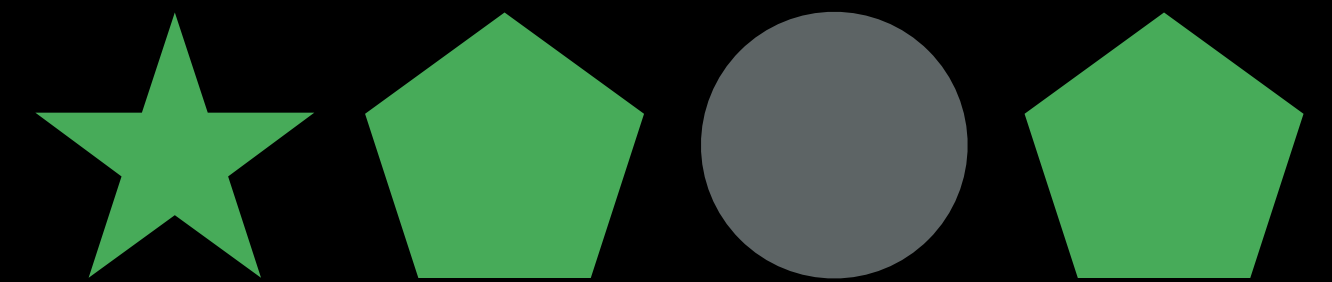


Getting Started with On Demand Resources

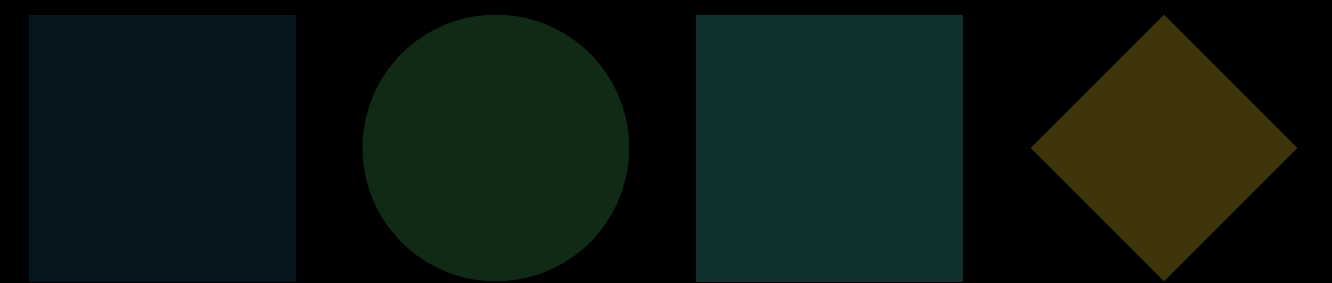
Xcode creates asset packs from tags

Part 2—Xcode creates asset packs

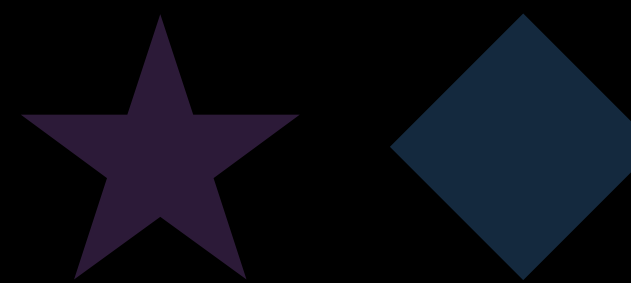
Level 1



Level 2



Level 1 + Level 2



Getting Started with On Demand Resources

Xcode creates asset packs from tags

Part 2—Xcode creates asset packs



Getting Started with On Demand Resources

Xcode creates asset packs from tags

Part 2—Xcode creates asset packs

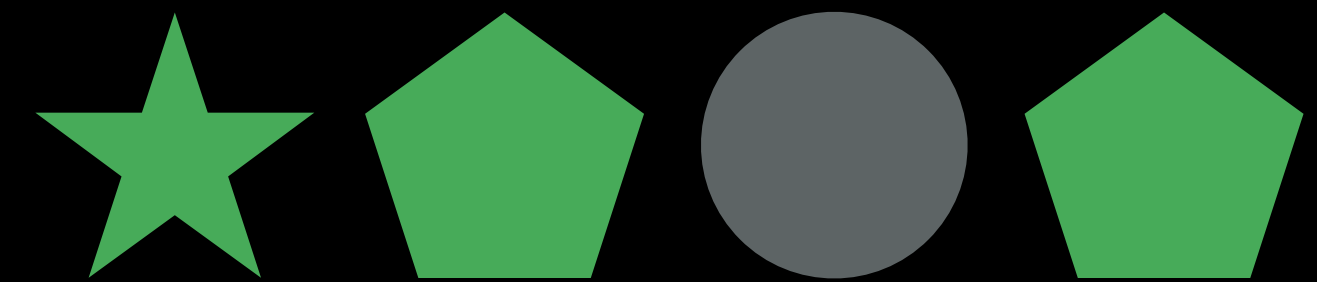


Getting Started with On Demand Resources

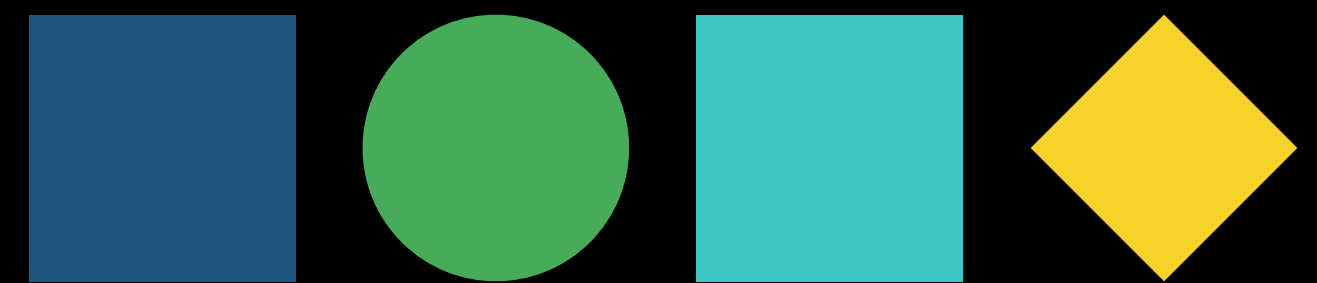
Xcode creates asset packs from tags

Part 2—Xcode creates asset packs

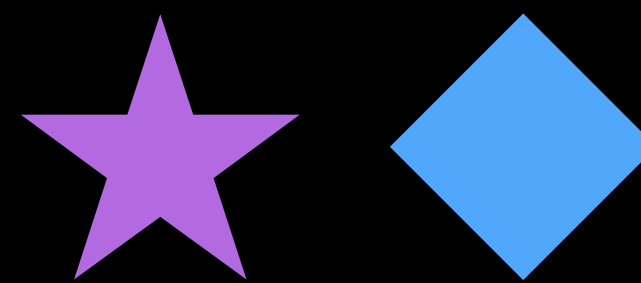
Level 1



Level 2



Level 1 + Level 2



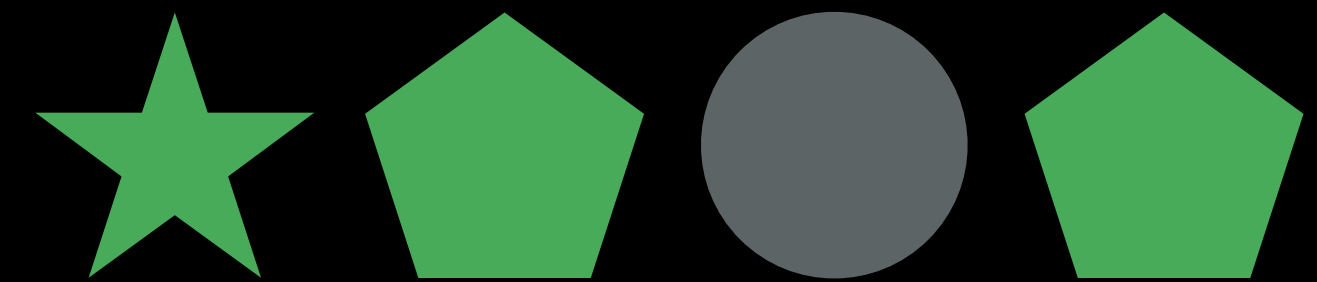
Getting Started with On Demand Resources

Developer requests assets

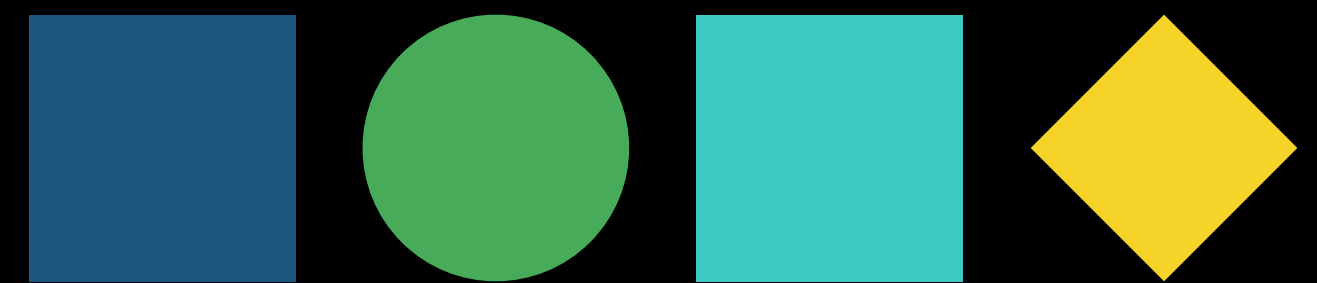
Part 3—Developer requests assets by tag

- Request "Level 1"

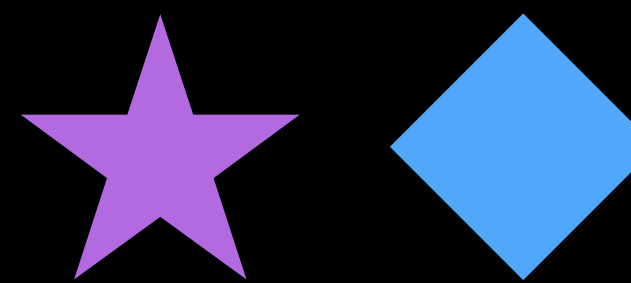
Level 1



Level 2



Level 1 + Level 2



Getting Started with On Demand Resources

Developer requests assets

Part 3—Developer requests assets by tag

- Request "Level 1"



Getting Started with On Demand Resources

Developer requests assets

Part 3—Developer requests assets by tag

- Request "Level 1"



- Request "Level 2"



On Demand Resources API

Tony Parker Cocoa Frameworks

NSBundleResourceRequest

NSBundleResourceRequest

Foundation-level command object

- Set up with tags and other options
- Tell it to begin a request

NSBundleResourceRequest

Foundation-level command object

- Set up with tags and other options
- Tell it to begin a request

Create as many as you need—the system reference counts tags

NSBundleResourceRequest

Foundation-level command object

- Set up with tags and other options
- Tell it to begin a request

Create as many as you need—the system reference counts tags

Request decoupled from use of resources

NSBundleResourceRequest

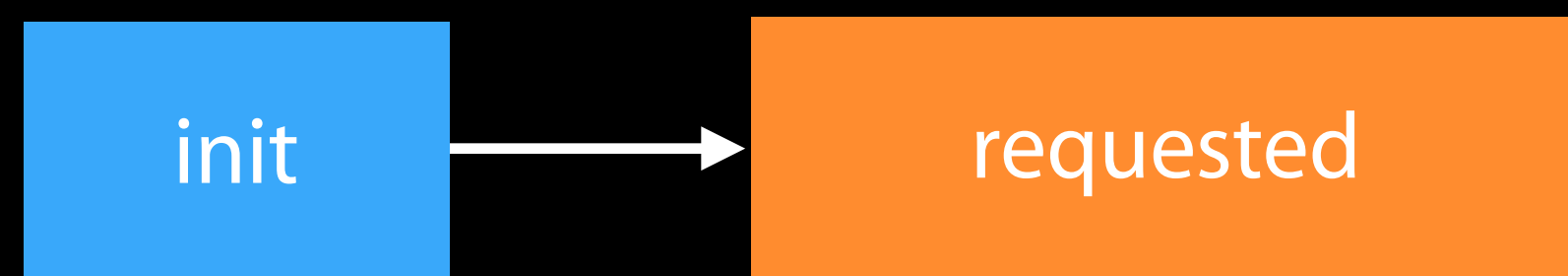
State machine



init

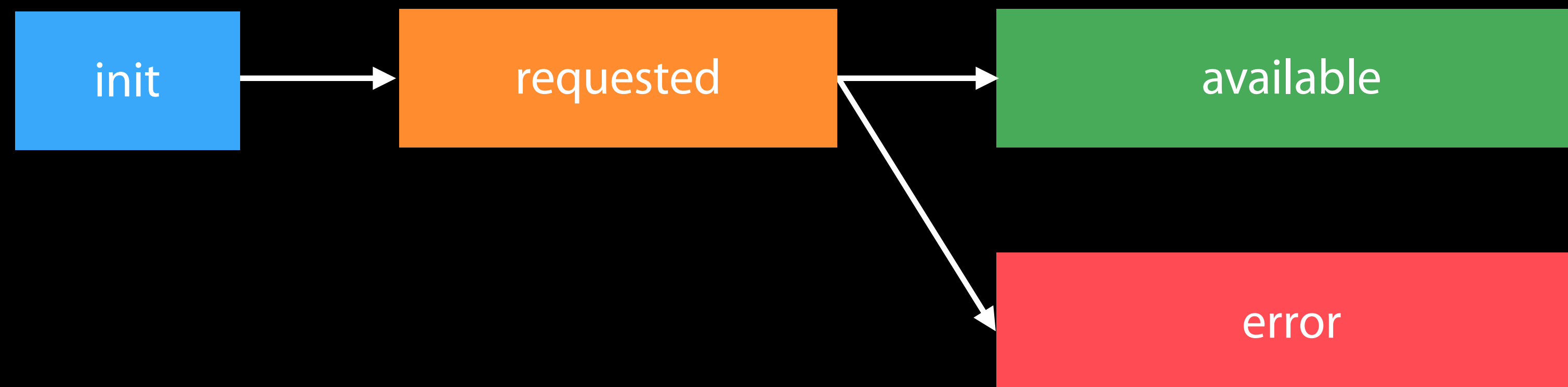
NSBundleResourceRequest

State machine



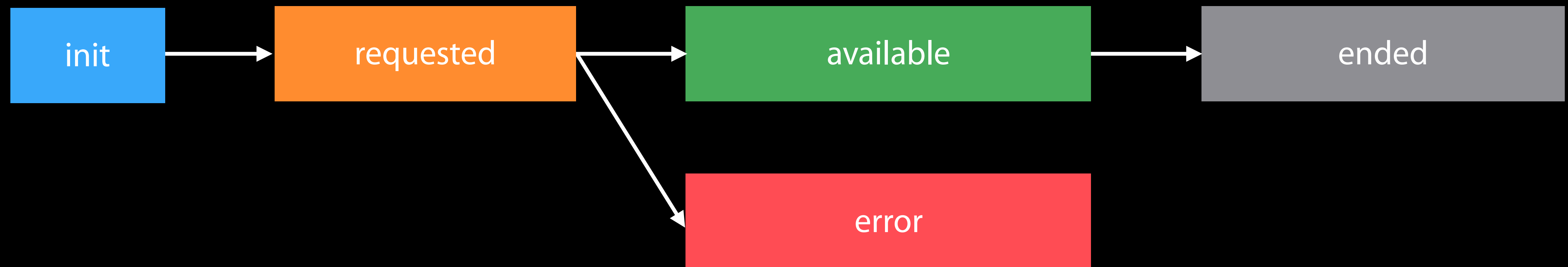
NSBundleResourceRequest

State machine



NSBundleResourceRequest

State machine



NSBundleResourceRequest

Basic methods

NSBundleResourceRequest

Basic methods

Initialize with set of tags

```
convenience init(tags: Set<String>)
```

NSBundleResourceRequest

Basic methods

Initialize with set of tags

```
convenience init(tags: Set<String>)
```

Begin a request

```
func beginAccessingResourcesWithCompletionHandler((NSError?) -> Void)
```

NSBundleResourceRequest

Basic methods

Initialize with set of tags

```
convenience init(tags: Set<String>)
```

Begin a request

```
func beginAccessingResourcesWithCompletionHandler((NSError?) -> Void)
```

Tell the system you're finished

```
func endAccessingResources()
```

Demo

On Demand Resources

Progress Reporting

Information on progress of request

```
var progress: NSProgress
```

Progress Reporting

Information on progress of request

```
var progress: NSProgress
```

Cancel a request

```
request.progress.cancel()
```

```
request.progress.pause()
```

```
request.progress.resume()
```

Progress Reporting

Information on progress of request

```
var progress: NSProgress
```

Cancel a request

```
request.progress.cancel()
```

```
request.progress.pause()
```

```
request.progress.resume()
```

Conditional Requests

Conditional Requests

Access resources, but only if they are already downloaded

```
func conditionallyBeginAccessingResourcesWithCompletionHandler((Bool) -> Void)
```

Conditional Requests

Access resources, but only if they are already downloaded

```
func conditionallyBeginAccessingResourcesWithCompletionHandler((Bool) -> Void)
```



init

Conditional Requests

Access resources, but only if they are already downloaded

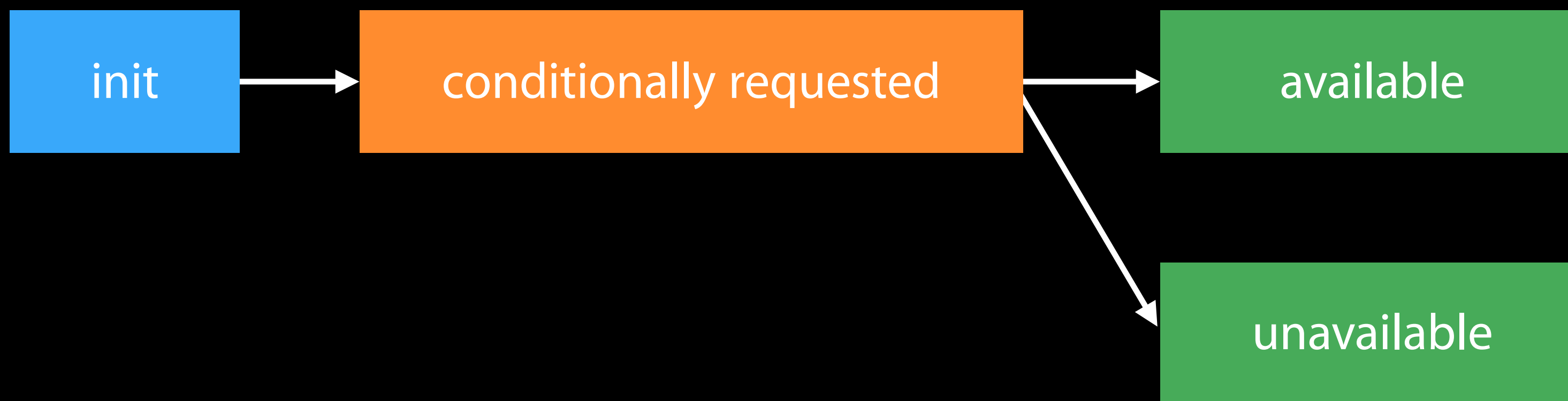
```
func conditionallyBeginAccessingResourcesWithCompletionHandler((Bool) -> Void)
```



Conditional Requests

Access resources, but only if they are already downloaded

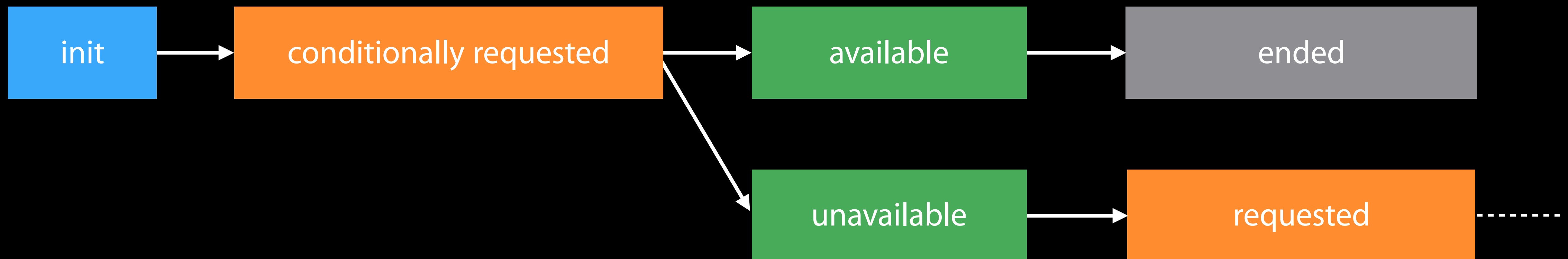
```
func conditionallyBeginAccessingResourcesWithCompletionHandler((Bool) -> Void)
```



Conditional Requests

Access resources, but only if they are already downloaded

```
func conditionallyBeginAccessingResourcesWithCompletionHandler((Bool) -> Void)
```



Loading Priority

```
var loadingPriority: Double
```

Loading Priority

```
var loadingPriority: Double
```

Provides ordering for outstanding requests in your app

Loading Priority

```
var loadingPriority: Double
```

Provides ordering for outstanding requests in your app

Value ranges from zero to one

Loading Priority

`var loadingPriority: Double`

Provides ordering for outstanding requests in your app

Value ranges from zero to one

For urgent requests, use `NSBundleResourceRequestLoadingPriorityUrgent`

Preservation Priority

```
extension NSBundle {  
    func setPreservationPriority(Double, forTags: Set<String>)  
}
```

Preservation Priority

```
extension NSBundle {  
    func setPreservationPriority(Double, forTags: Set<String>)  
}
```

Provides ordering of purging for unused tags in your app

Preservation Priority

```
extension NSBundle {  
    func setPreservationPriority(Double, forTags: Set<String>)  
}
```

Provides ordering of purging for unused tags in your app

Value ranges from zero to one

Best Practices

Building optimal On Demand Resources applications

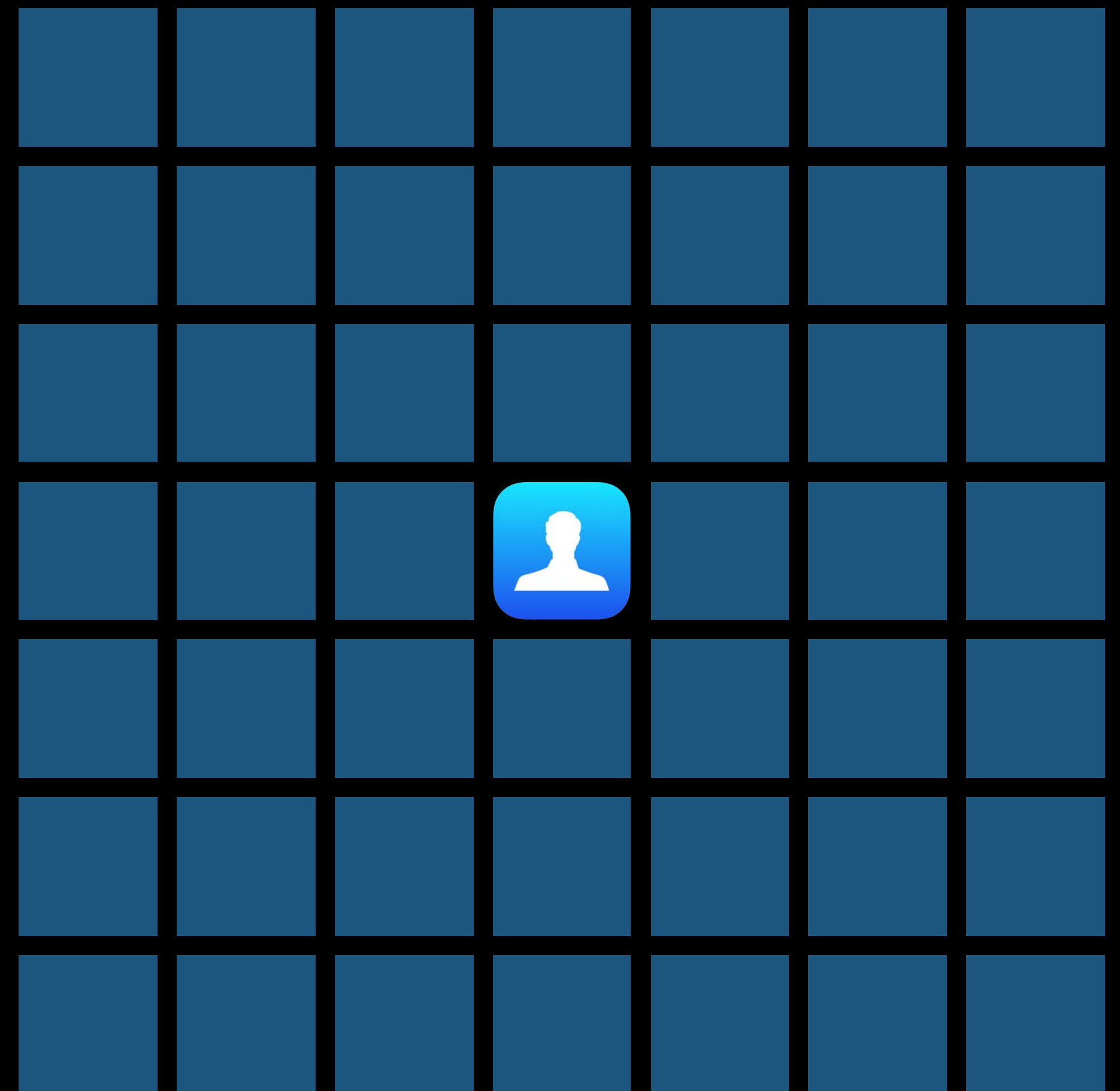
Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Random Access



Consider Your App's Behavior

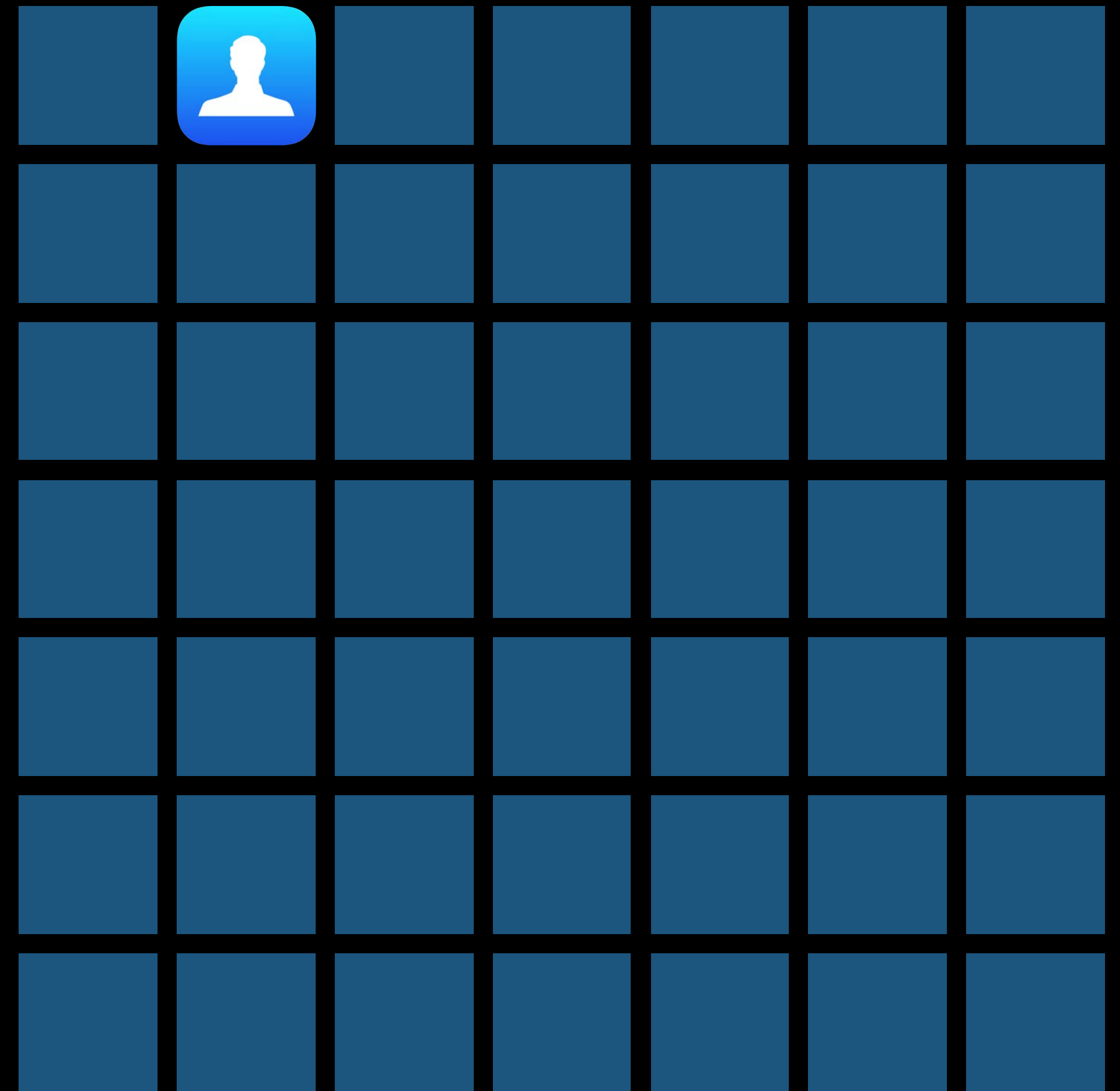
Understand app behavior to tag assets appropriately

Random Access

- Entirely unpredictable

Use many tags

- Tag small groups of assets for progressive download and consumption



Consider Your App's Behavior

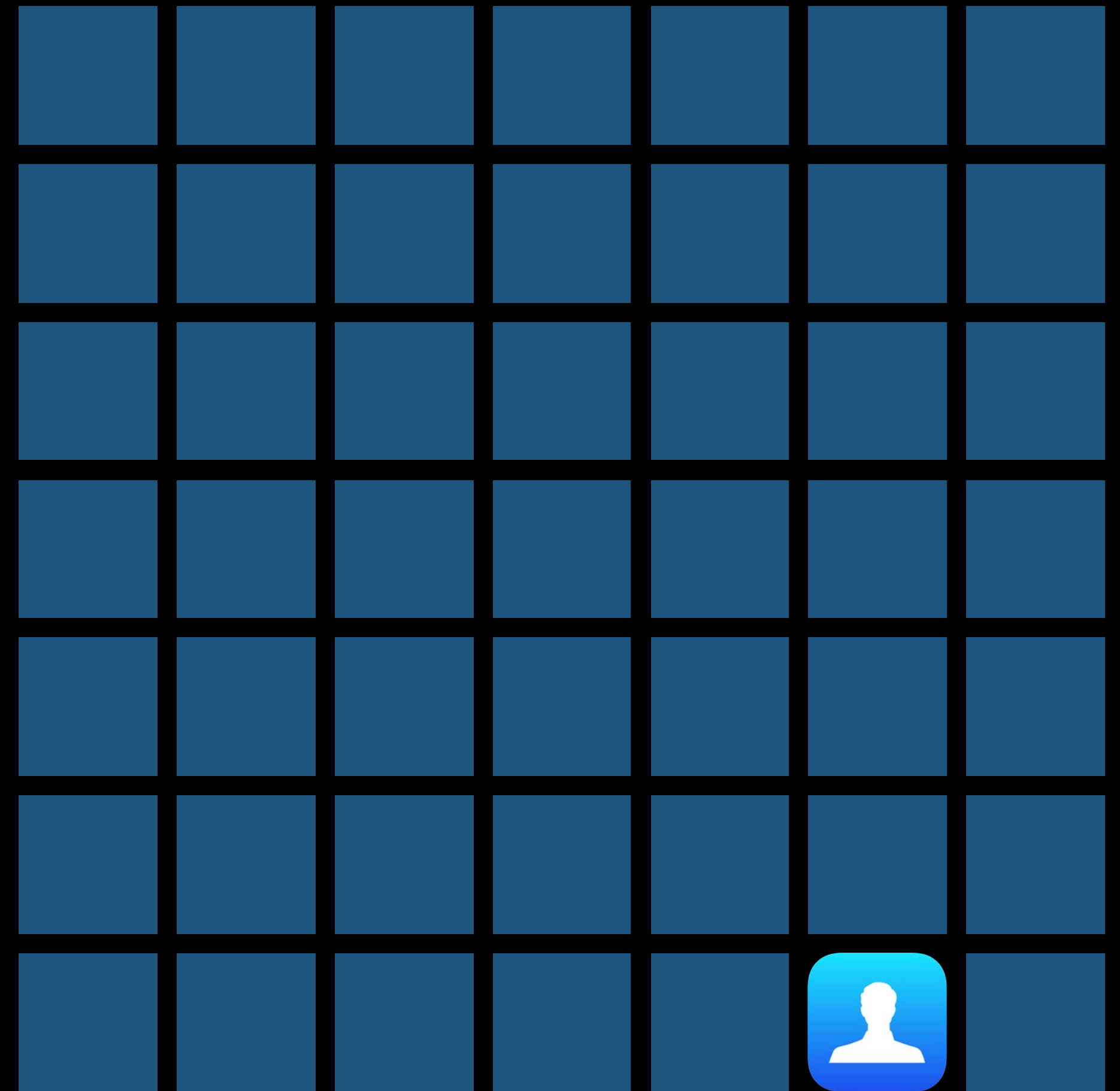
Understand app behavior to tag assets appropriately

Random Access

- Entirely unpredictable

Use many tags

- Tag small groups of assets for progressive download and consumption



Consider Your App's Behavior

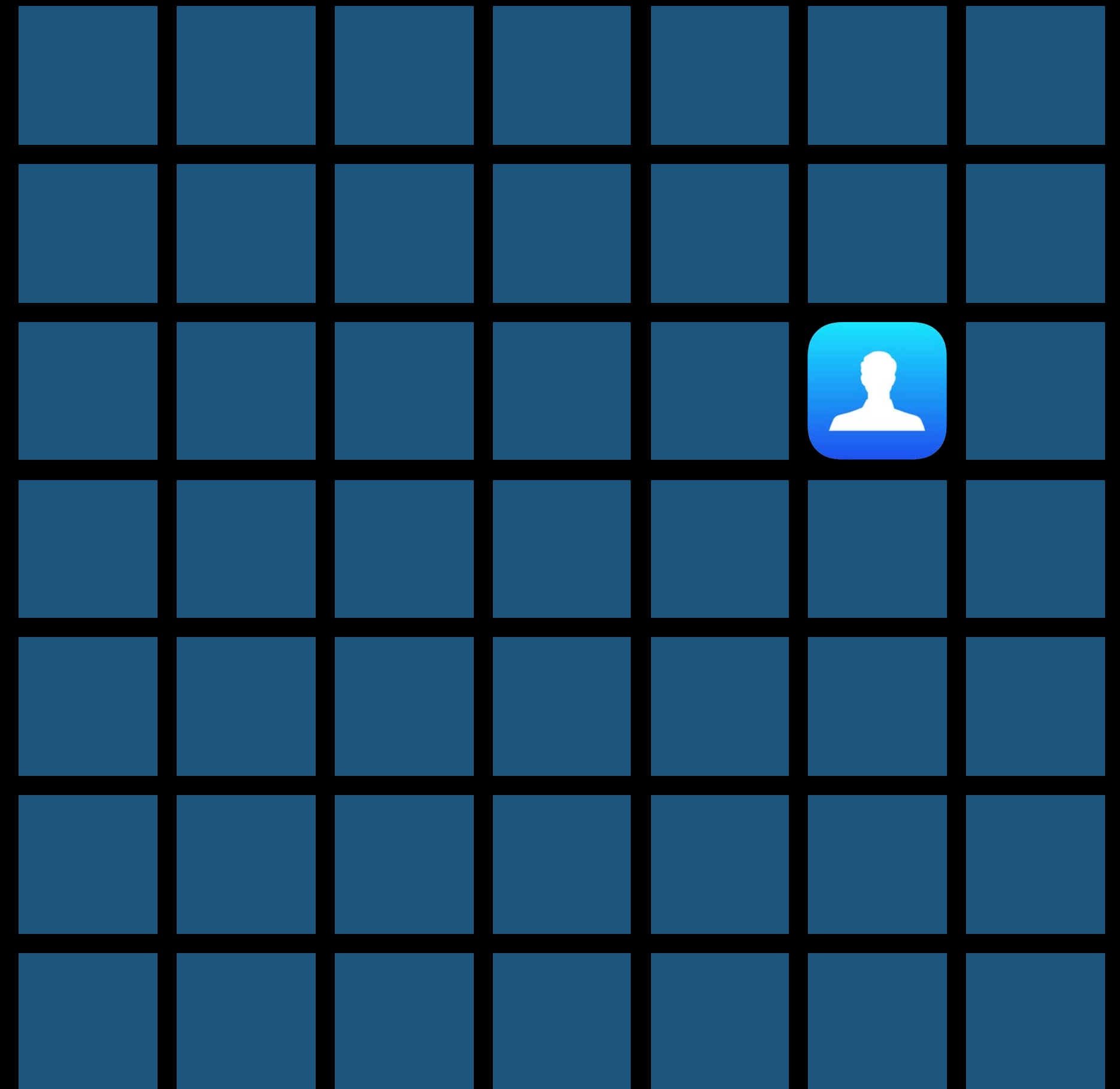
Understand app behavior to tag assets appropriately

Random Access

- Entirely unpredictable

Use many tags

- Tag small groups of assets for progressive download and consumption



Consider Your App's Behavior

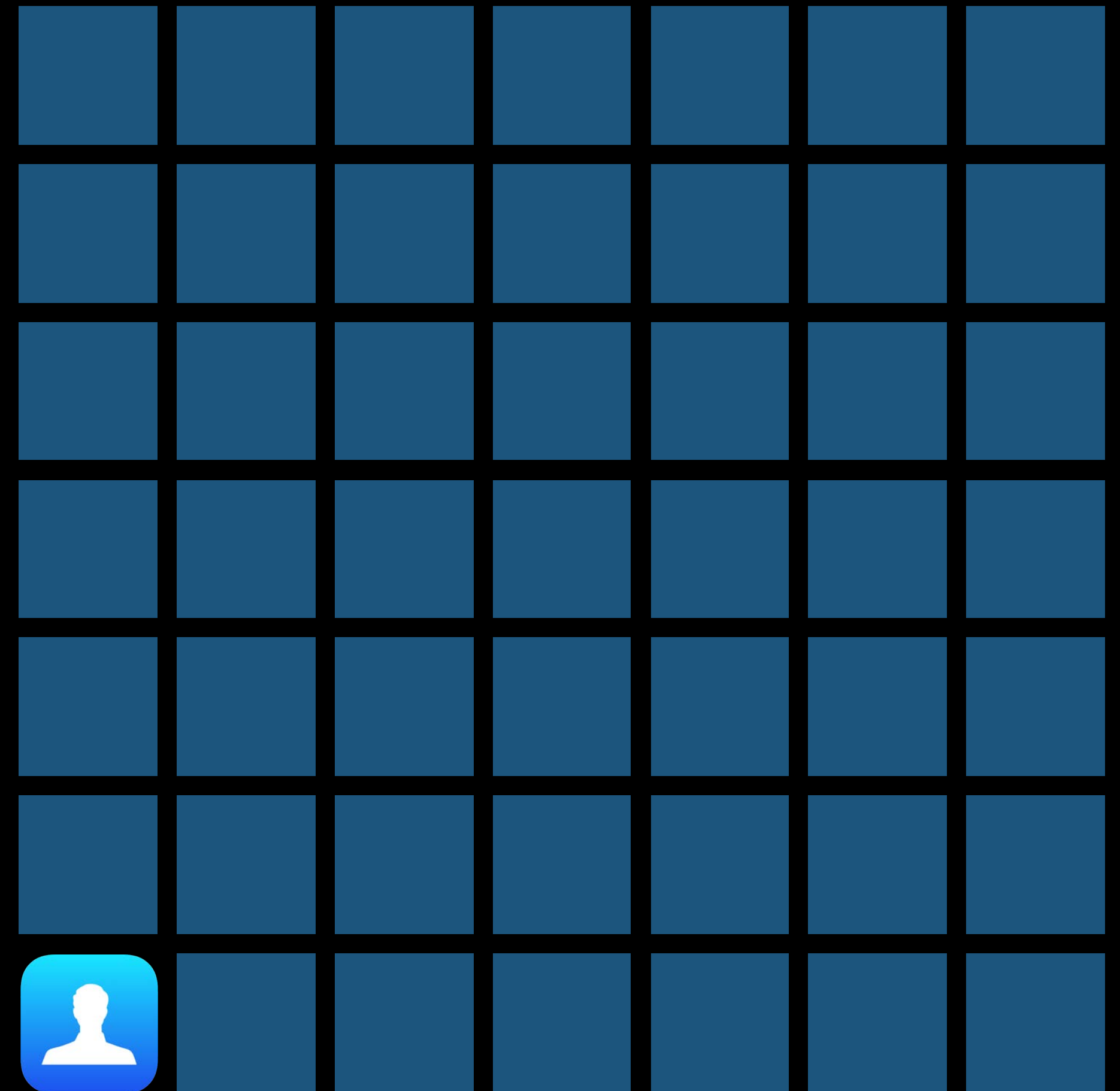
Understand app behavior to tag assets appropriately

Random Access

- Entirely unpredictable

Use many tags

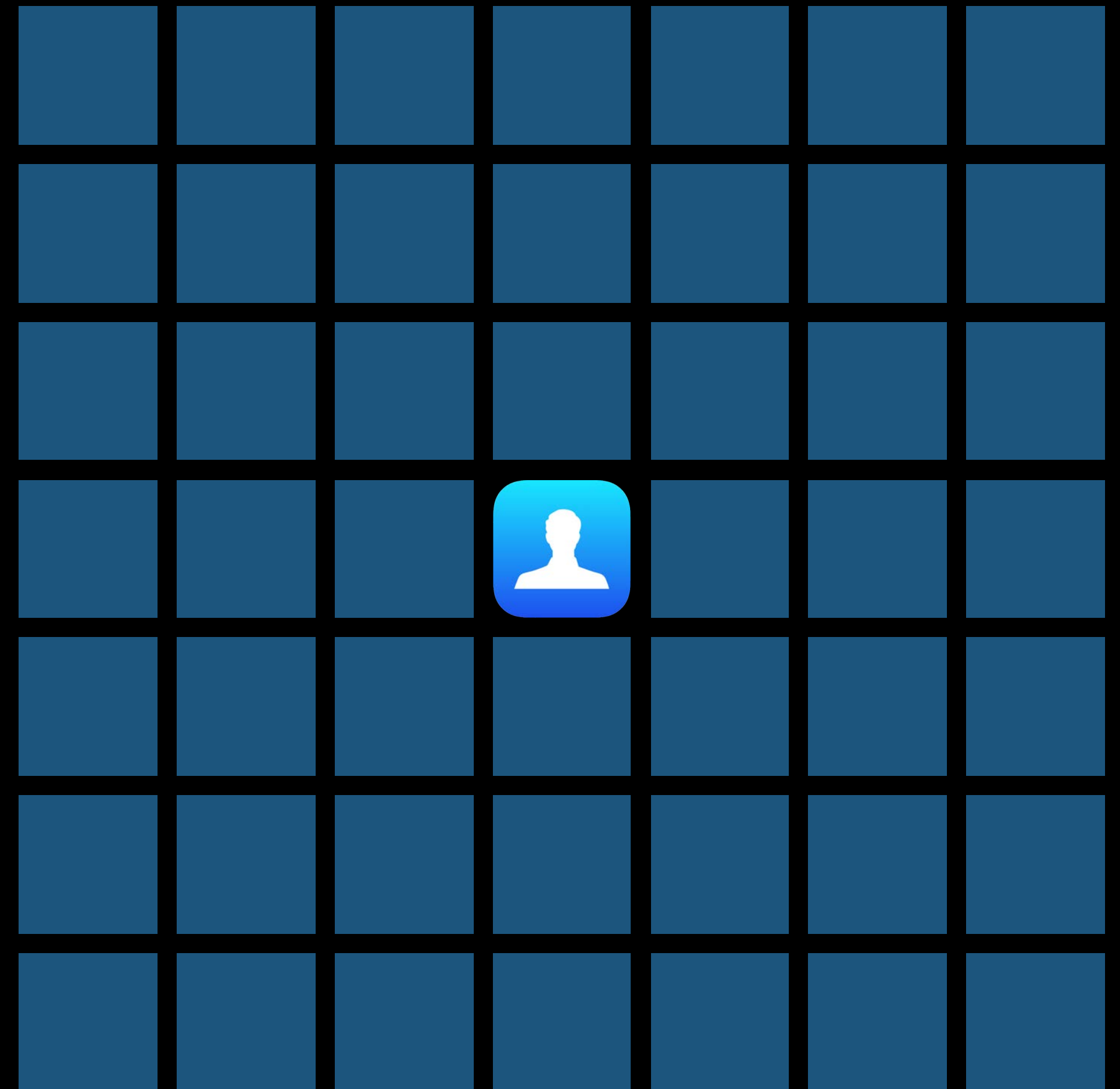
- Tag small groups of assets for progressive download and consumption



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Limited Prediction



Consider Your App's Behavior

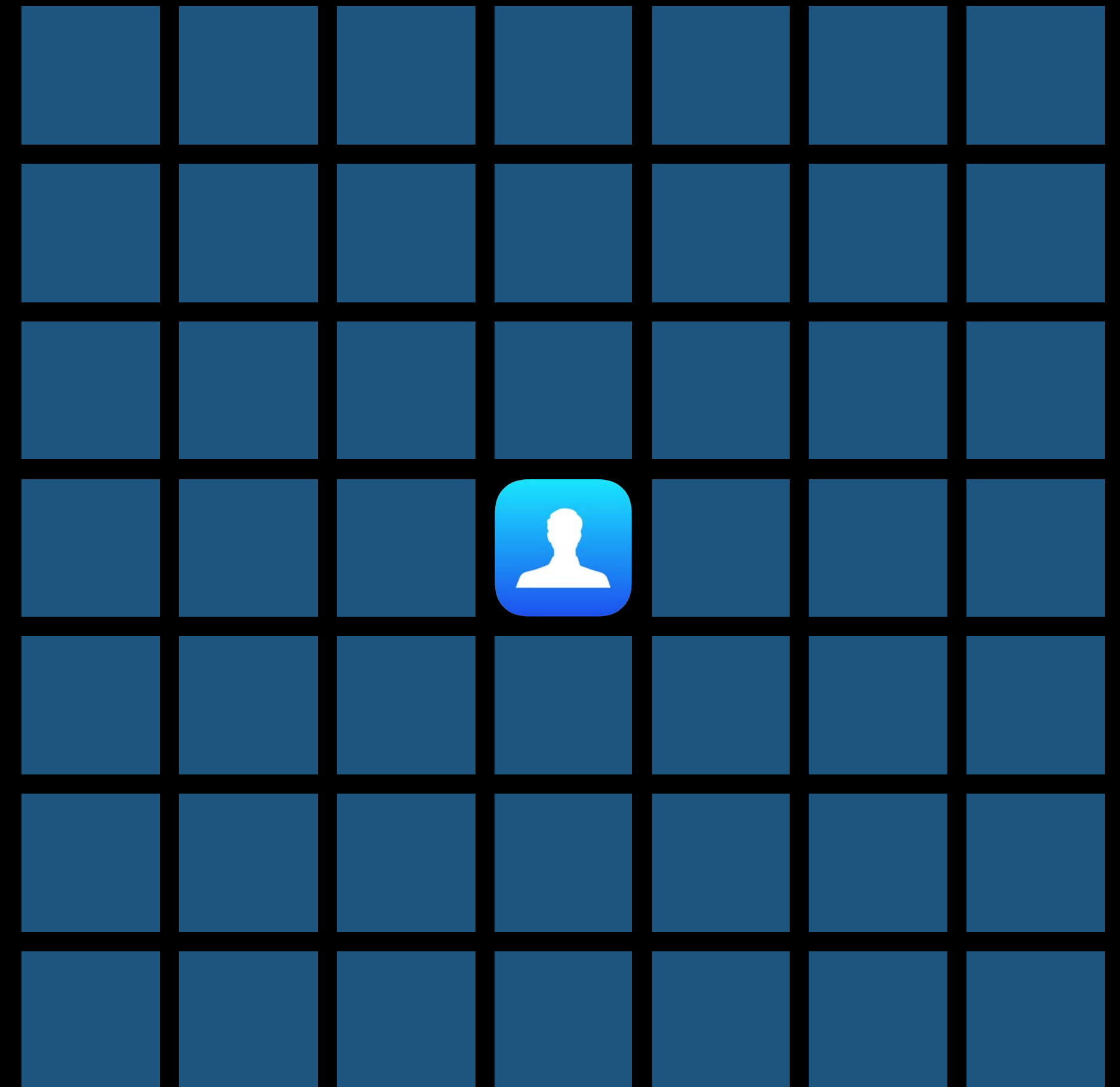
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

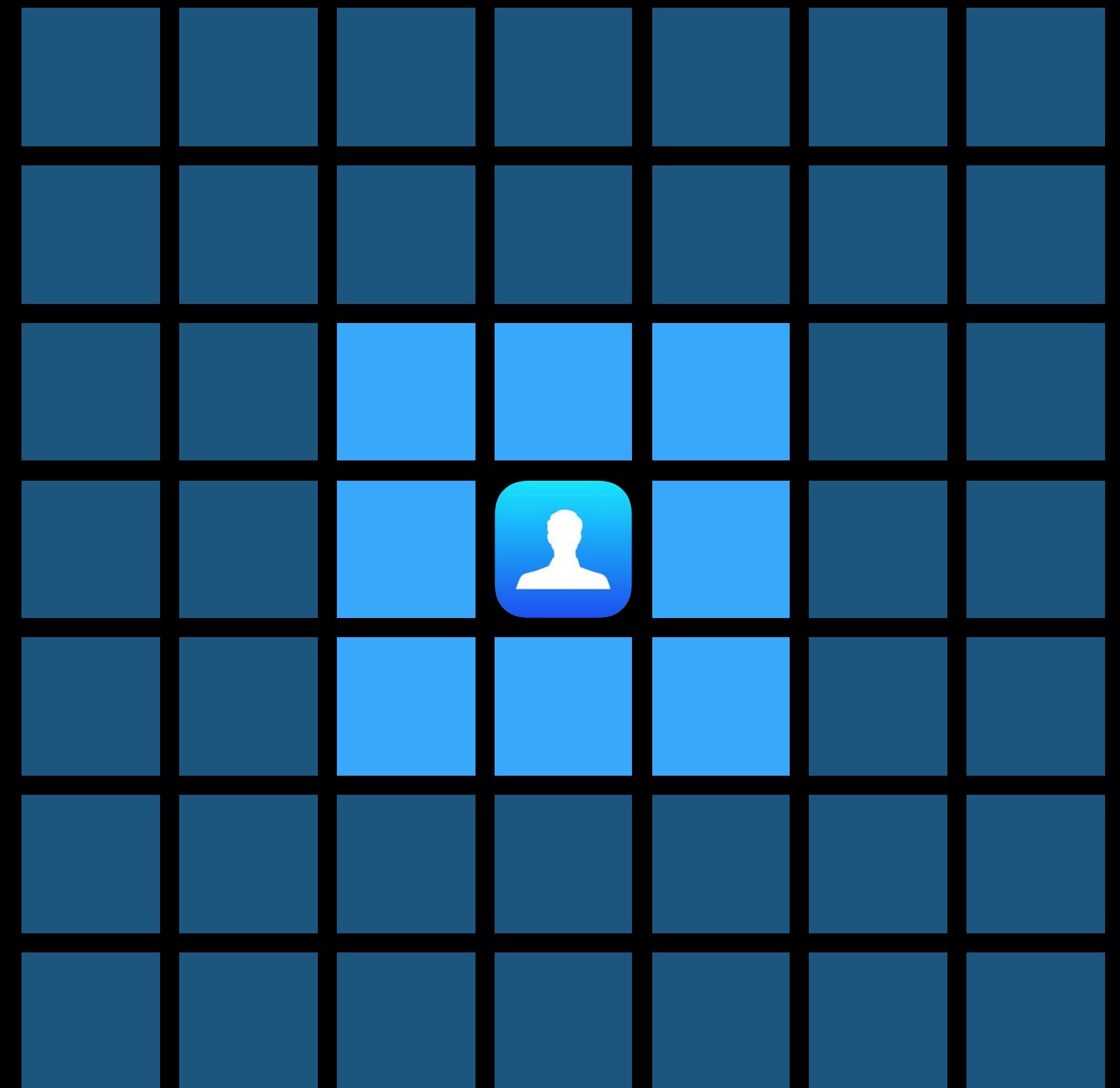
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

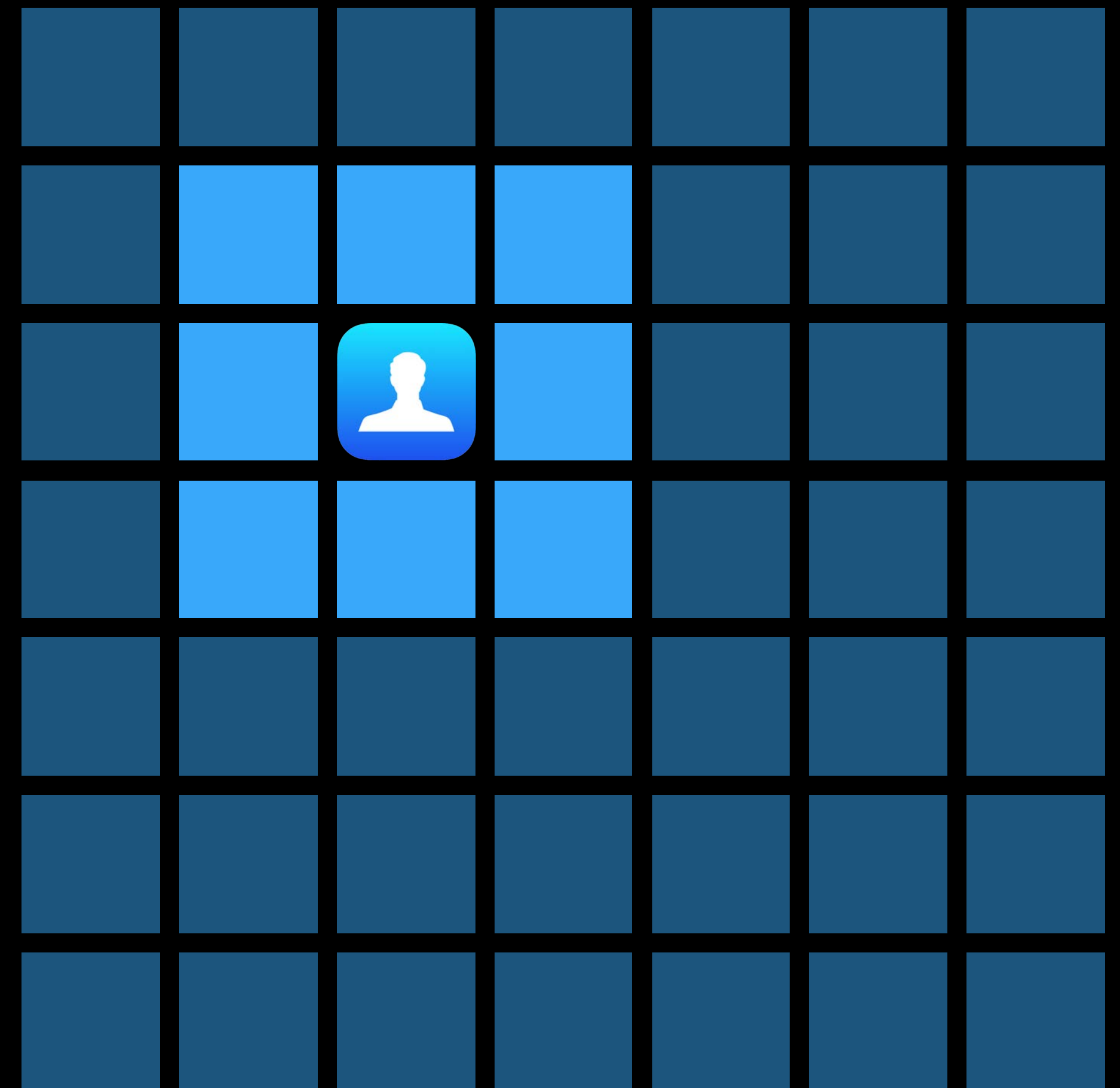
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

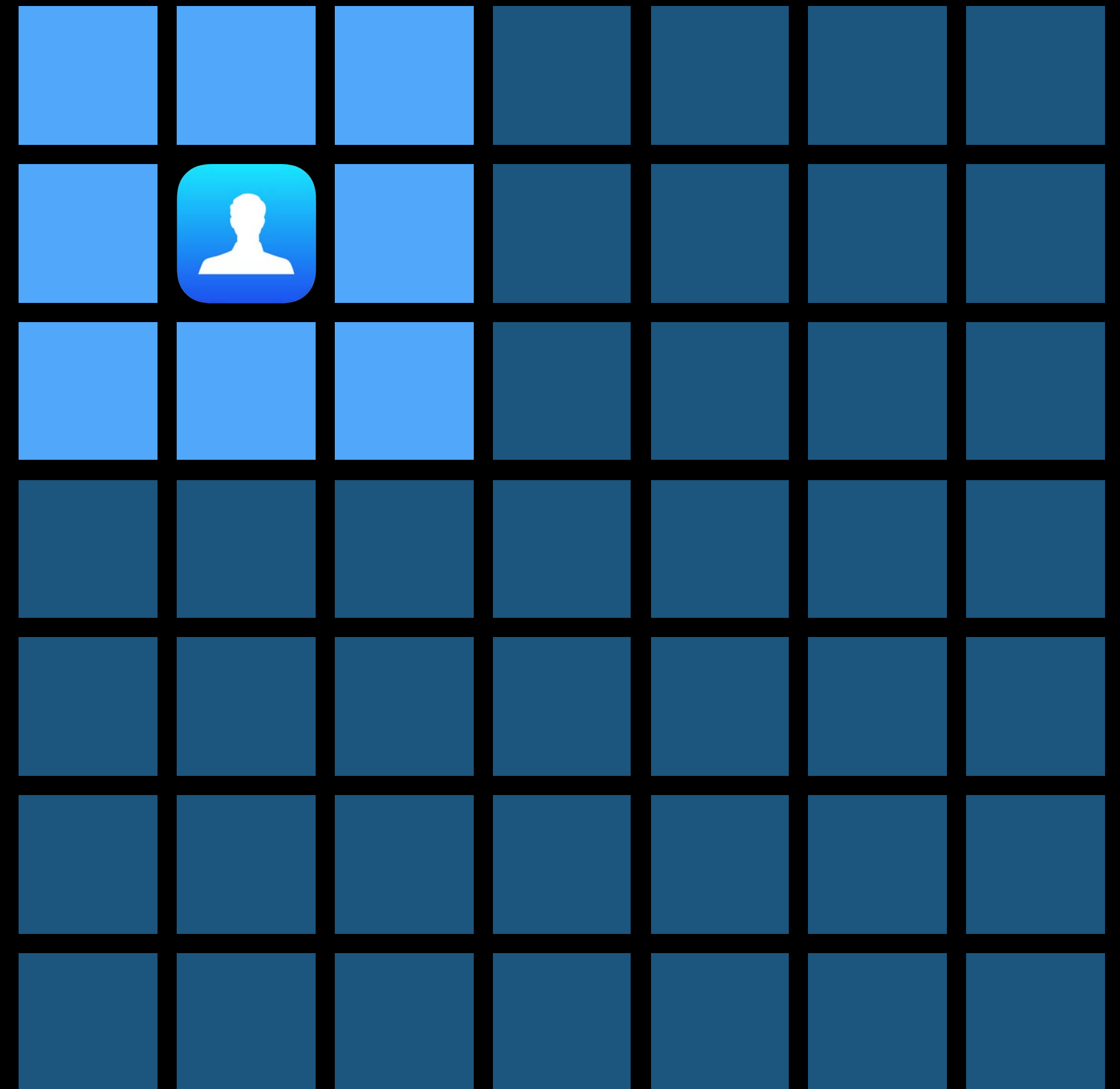
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

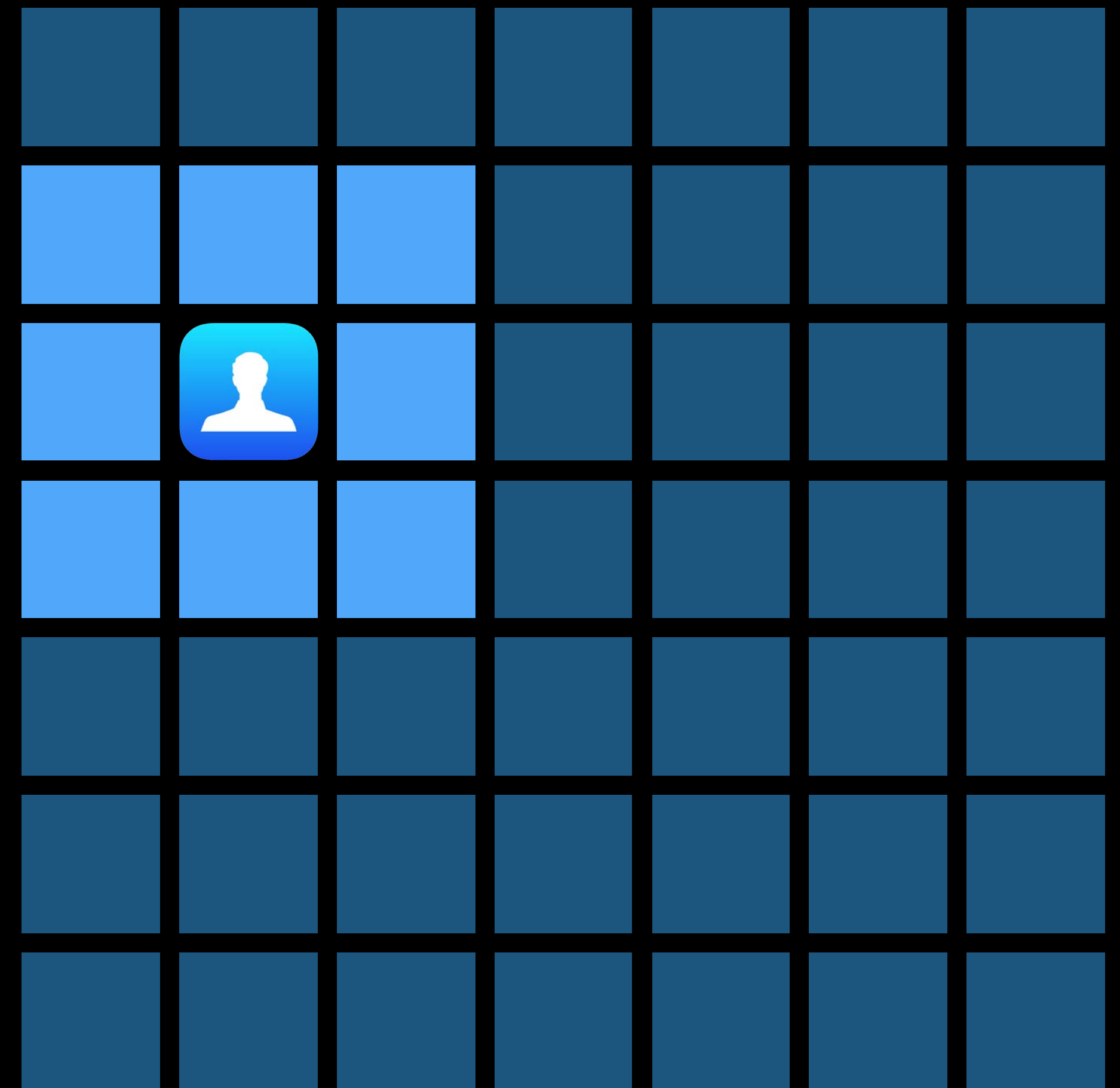
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

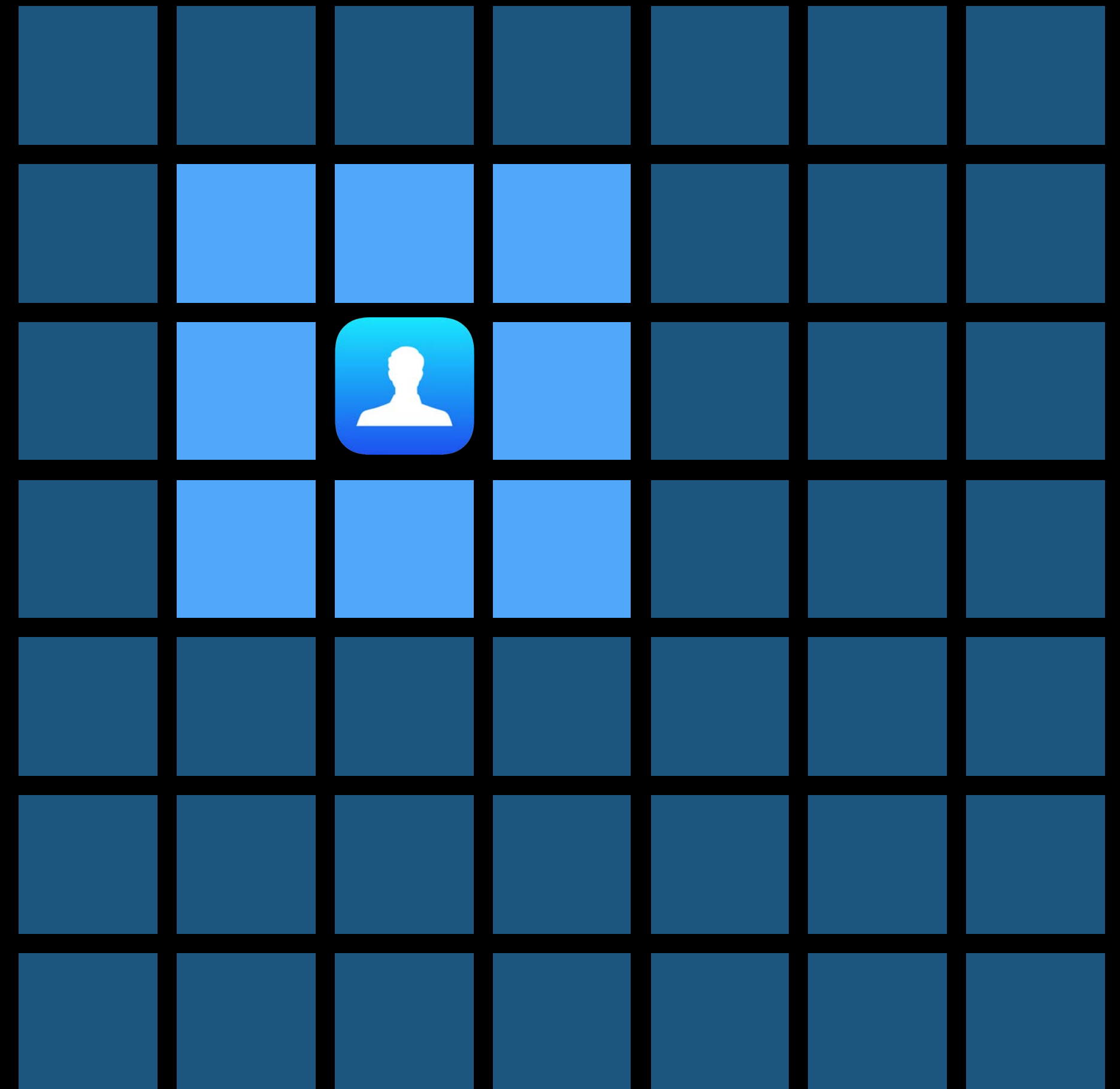
Understand app behavior to tag assets appropriately

Limited Prediction

- Semi-predictable
- Many possibilities will not be used

Use many tags

- Load subset of possibles
- Quickly end accessing on unused asset requests



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



Consider Your App's Behavior

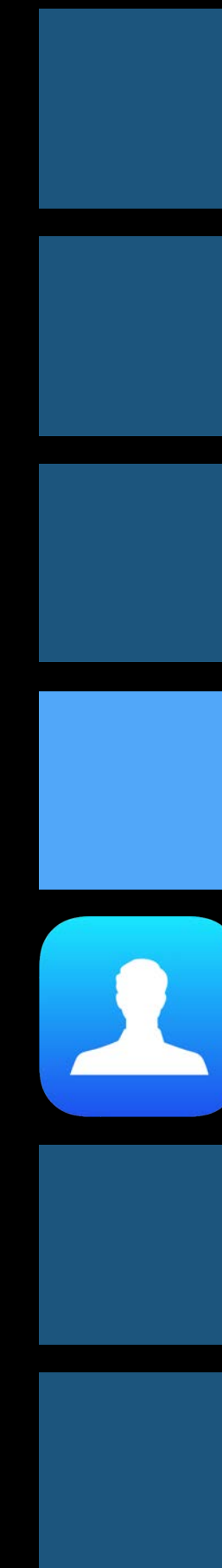
Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



Consider Your App's Behavior

Understand app behavior to tag assets appropriately

Linear

- Majority of assets will be used

Download well in advance

End accessing assets when done using



The On Demand Resources Timeline

Scheduling resource loading

.

The On Demand Resources Timeline

Scheduling resource loading

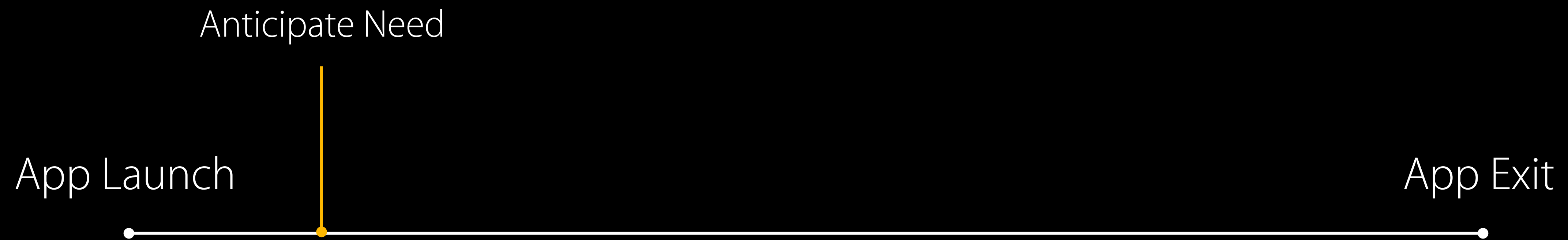
App Launch

App Exit



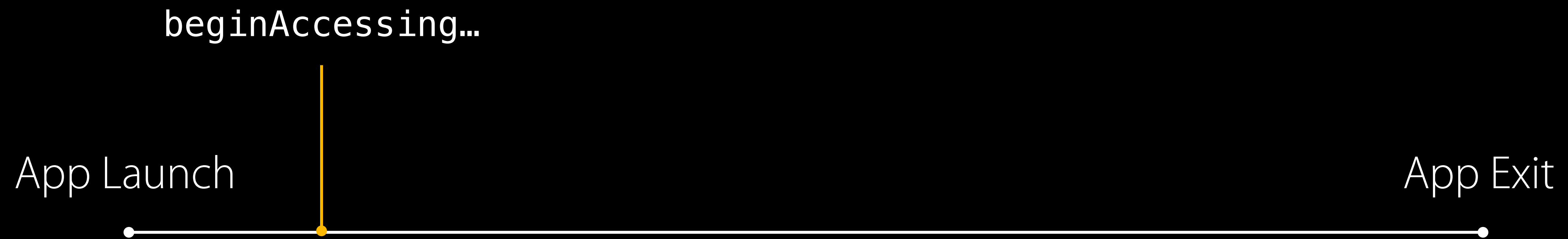
The On Demand Resources Timeline

Scheduling resource loading



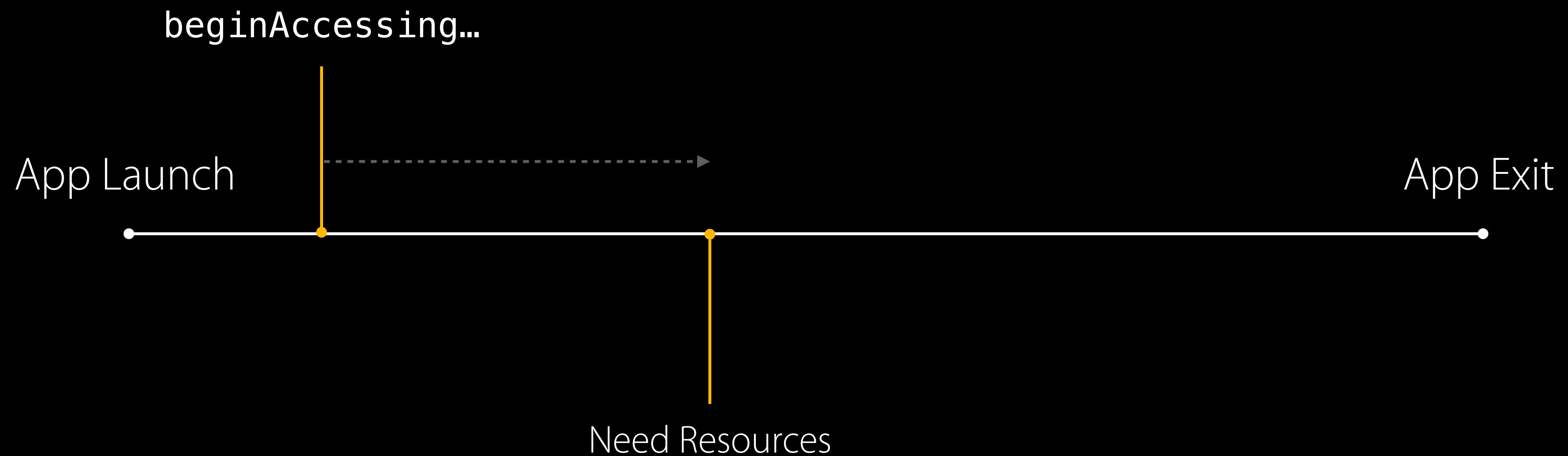
The On Demand Resources Timeline

Scheduling resource loading



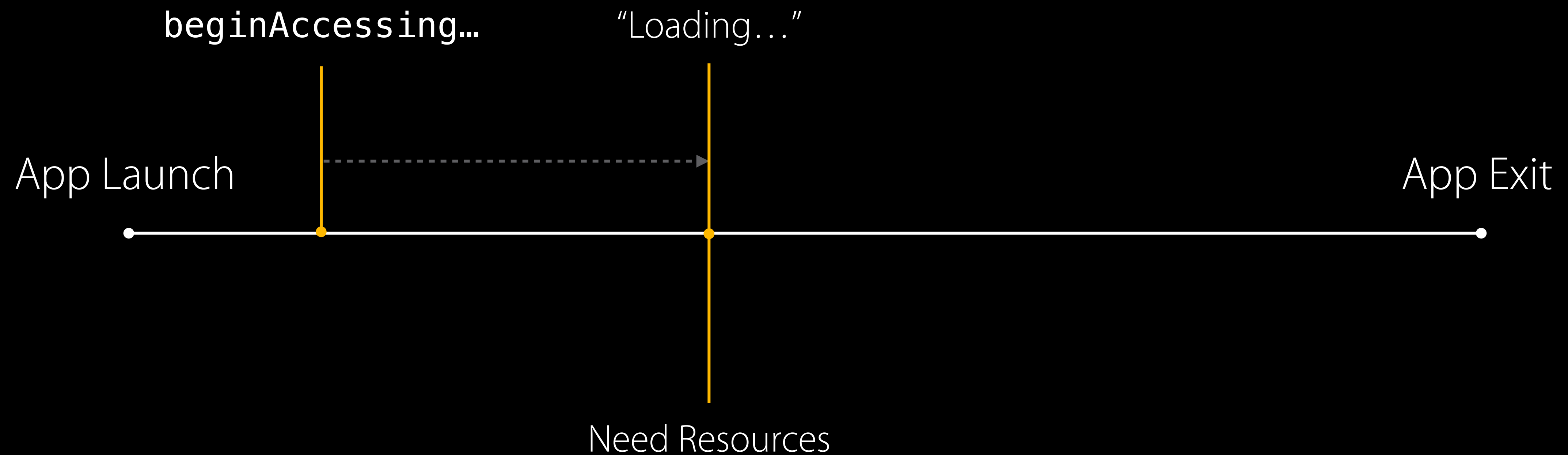
The On Demand Resources Timeline

Scheduling resource loading



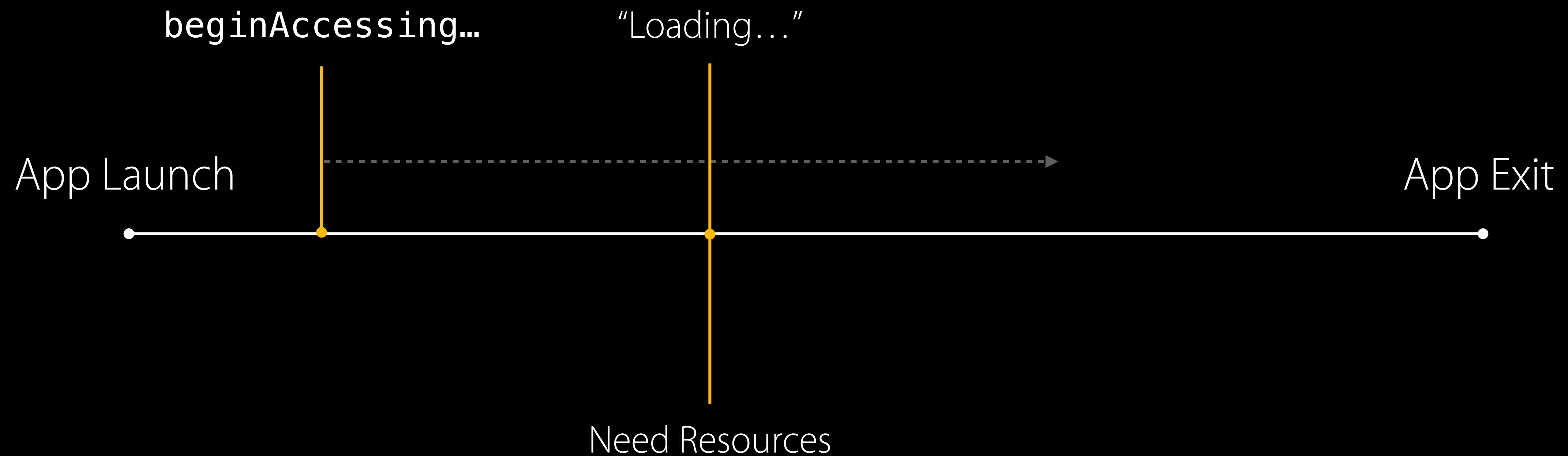
The On Demand Resources Timeline

Scheduling resource loading



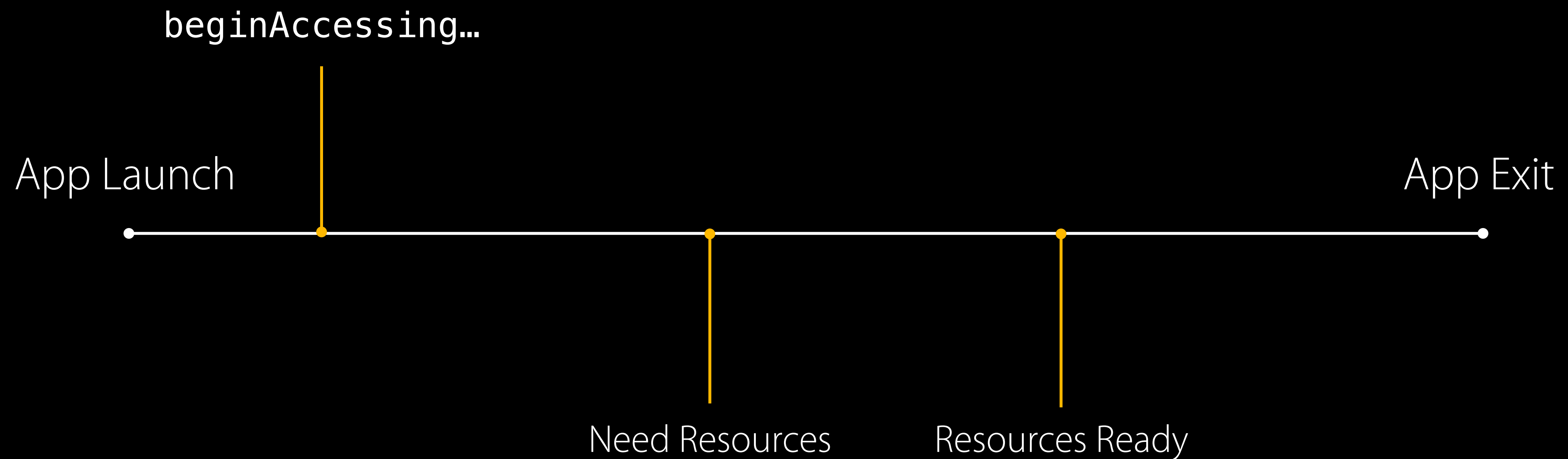
The On Demand Resources Timeline

Scheduling resource loading



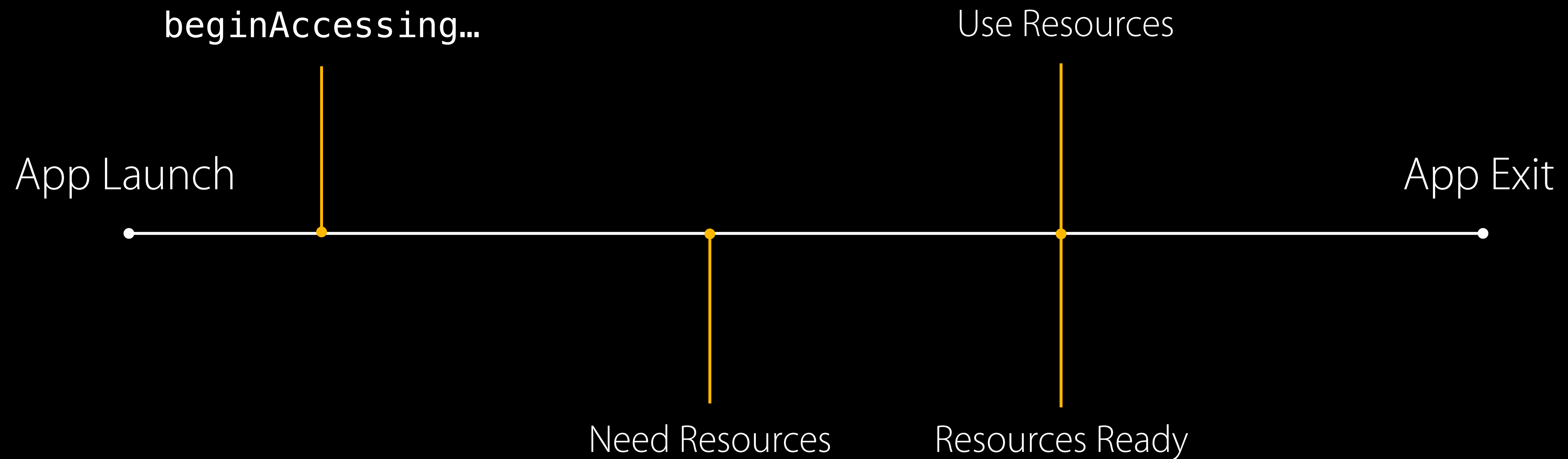
The On Demand Resources Timeline

Scheduling resource loading



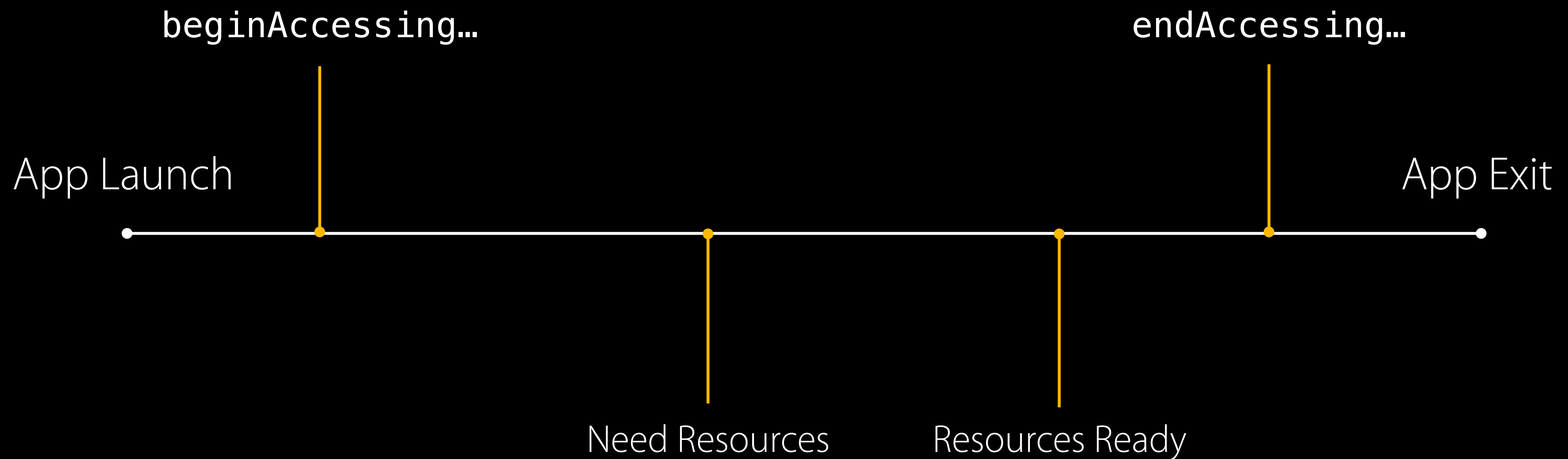
The On Demand Resources Timeline

Scheduling resource loading



The On Demand Resources Timeline

Scheduling resource loading



Optimize App Installation

Include initially required resources with app install

Optimize App Installation

Include initially required resources with app install

Consider what is required immediately
on first launch

- Ex. Level 1 of game

Optimize App Installation

Include initially required resources with app install

Consider what is required immediately on first launch

- Ex. Level 1 of game
- Add tags to Xcode's "Initial Install Tags" prefetch priority

Initial Install Tags (140MB)

Common Textures (50MB)

Common Sounds (30MB)

Level 1 (60MB)

Optimize App Installation

Include initially required resources with app install

Consider what is required immediately on first launch

- Ex. Level 1 of game
- Add tags to Xcode's "Initial Install Tags" prefetch priority
 - Included in total size of app in App Store

Initial Install Tags (140MB)

Common Textures (50MB)

Common Sounds (30MB)

Level 1 (60MB)

Automate Post-Installation

Downloading additional content

Consider what is required next

- Ex. Level 2 of game

Automate Post-Installation

Downloading additional content

Consider what is required next

- Ex. Level 2 of game
- Use Xcode to assign a prefetch order

Prefetched Tag Order (120MB)

Level 2 Part 1 (40MB)

Level 2 Part 2 (45MB)

Level 2 Part 3 (35MB)

Caching

User behavior and developer hints inform caching

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Attributes effecting purging

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Attributes effecting purging

- Last used timestamp

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Attributes effecting purging

- Last used timestamp
- Preservation priority

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Attributes effecting purging

- Last used timestamp
- Preservation priority
 - A ranking of the most important tags (0.0 to 1.0)

Caching

User behavior and developer hints inform caching

On Demand Resources content may be purged when storage space is low

Attributes effecting purging

- Last used timestamp
- Preservation priority
 - A ranking of the most important tags (0.0 to 1.0)
- Application running state

Caching

Preserving On Demand Resources Content

Caching

Preserving On Demand Resources Content

Avoid large capacity tags in order to avoid over-purging

- 64MB per tag is recommended

Caching

Preserving On Demand Resources Content

Avoid large capacity tags in order to avoid over-purging

- 64MB per tag is recommended

Properly set preservation priority

- Avoid marking all tags with highest preservation priority of 1.0

Caching

Preserving On Demand Resources Content

Avoid large capacity tags in order to avoid over-purging

- 64MB per tag is recommended

Properly set preservation priority

- Avoid marking all tags with highest preservation priority of 1.0

Always indicate when done with a tag

- Call "... **endAccessingResources**" when done with a tag
- Allow the request to dealloc

Performance Considerations

Tradeoffs

Performance Considerations

Tradeoffs

On Demand Resources downloads balance resource utilization with speed of download

- Downloads may be done during game play while not overly consuming CPU

Performance Considerations

Tradeoffs

On Demand Resources downloads balance resource utilization with speed of download

- Downloads may be done during game play while not overly consuming CPU

Urgent loading priority

- Used when speed of download is most important, regardless of CPU

```
request.loadingPriority = NSBundleResourceRequestLoadingPriorityUrgent
```


Performance Testing

Analyzing download performance and latency

Performance Testing

Analyzing download performance and latency

Real world testing

Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server

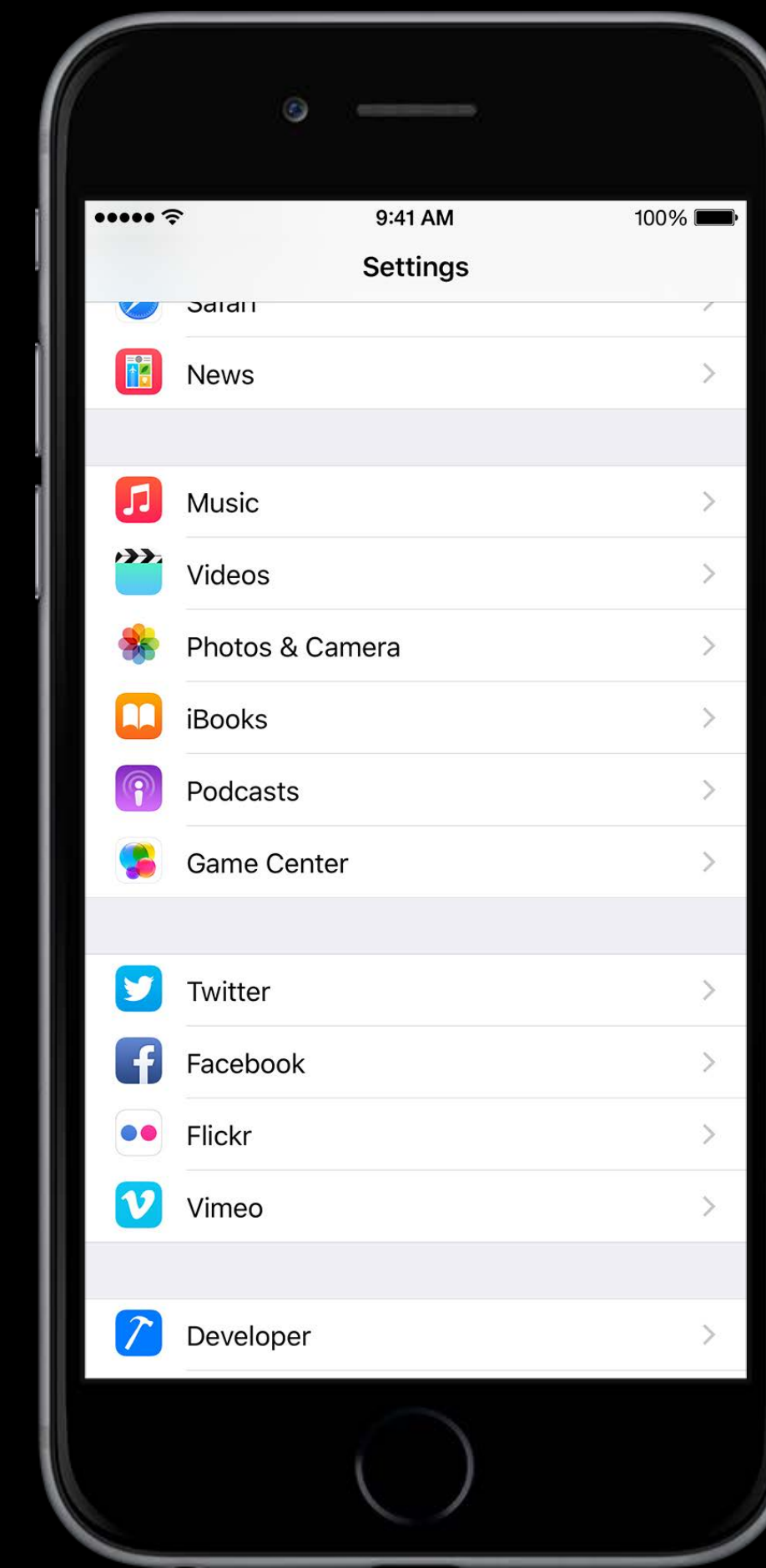


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

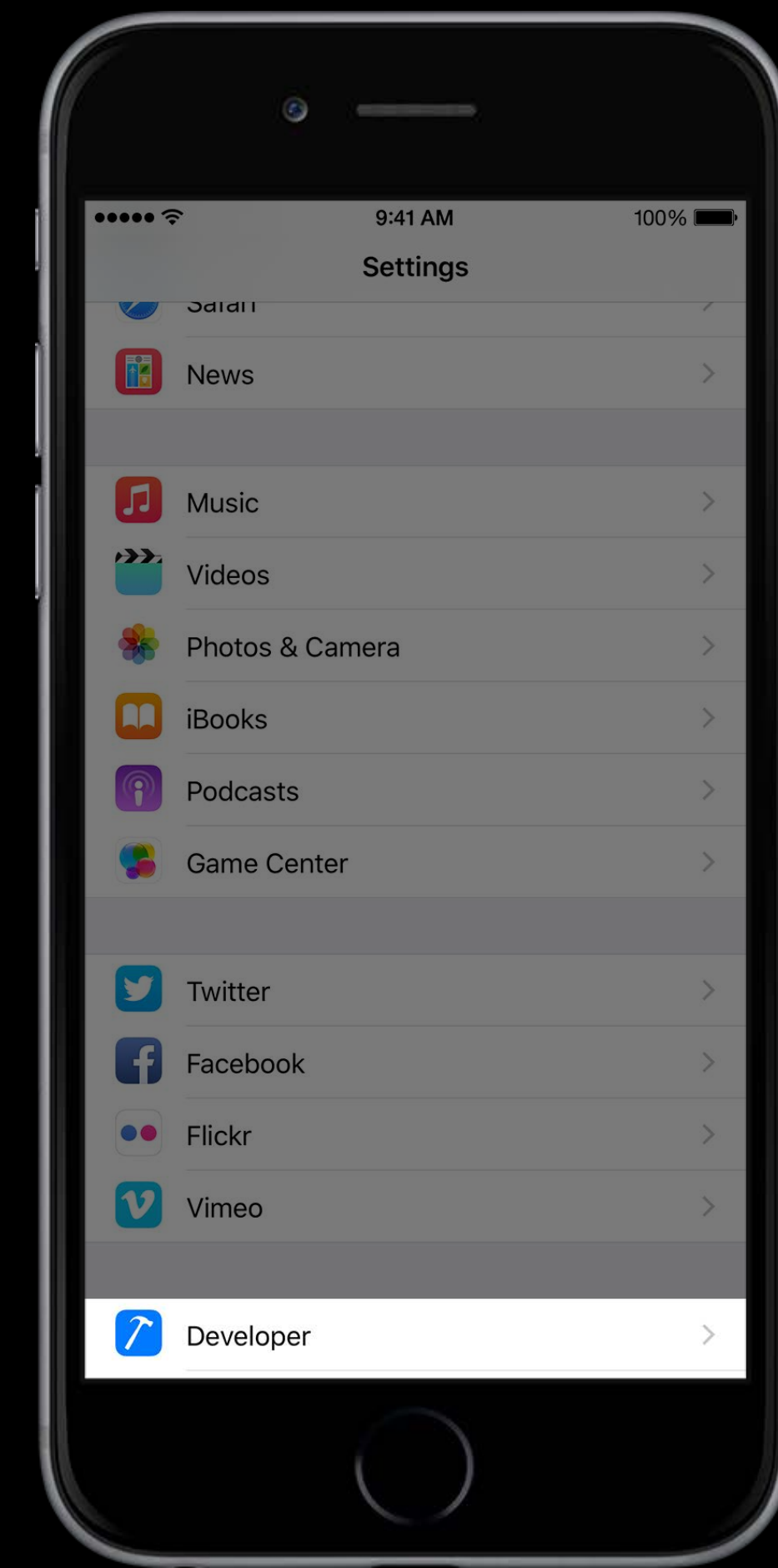


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

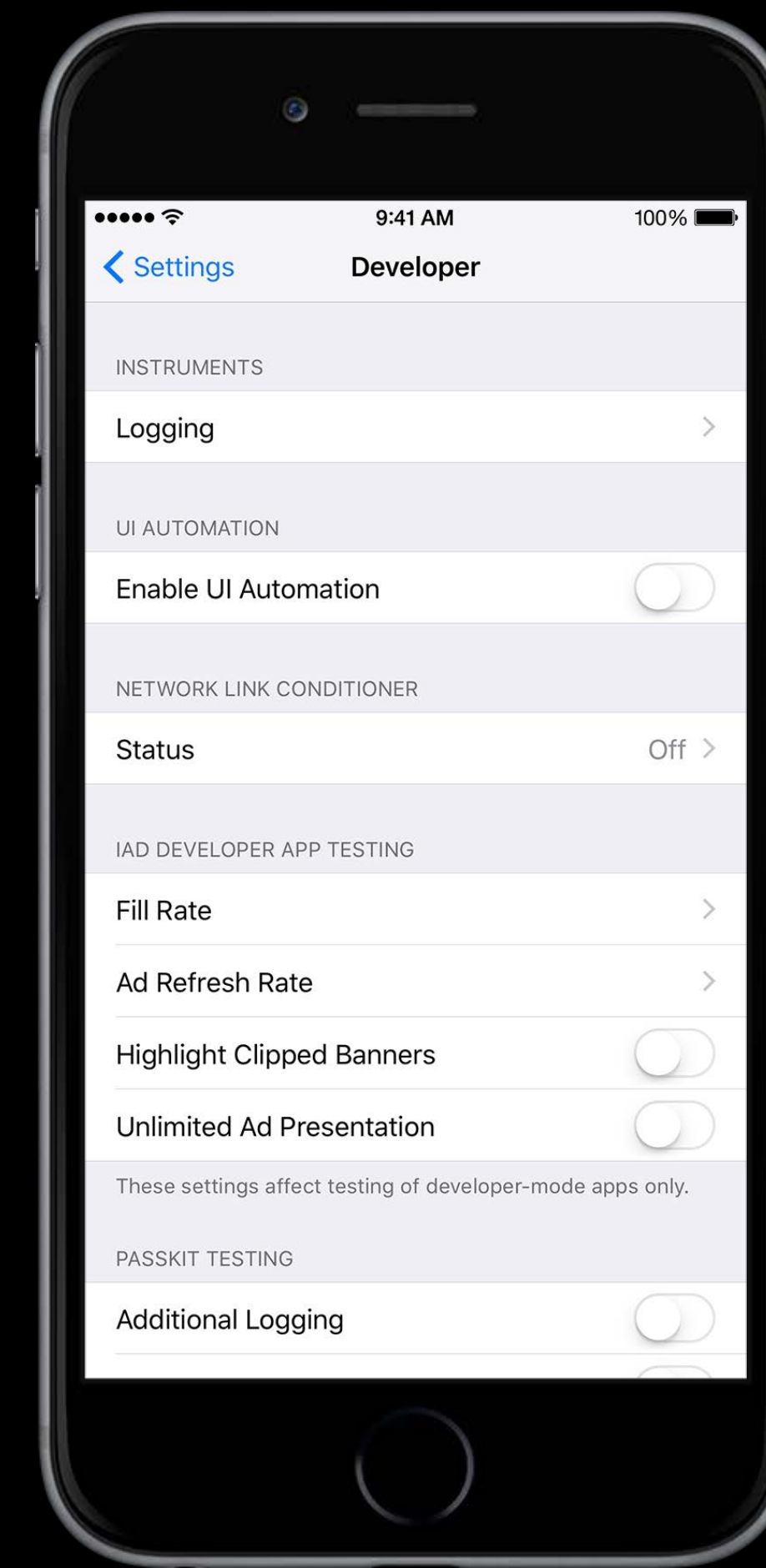


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

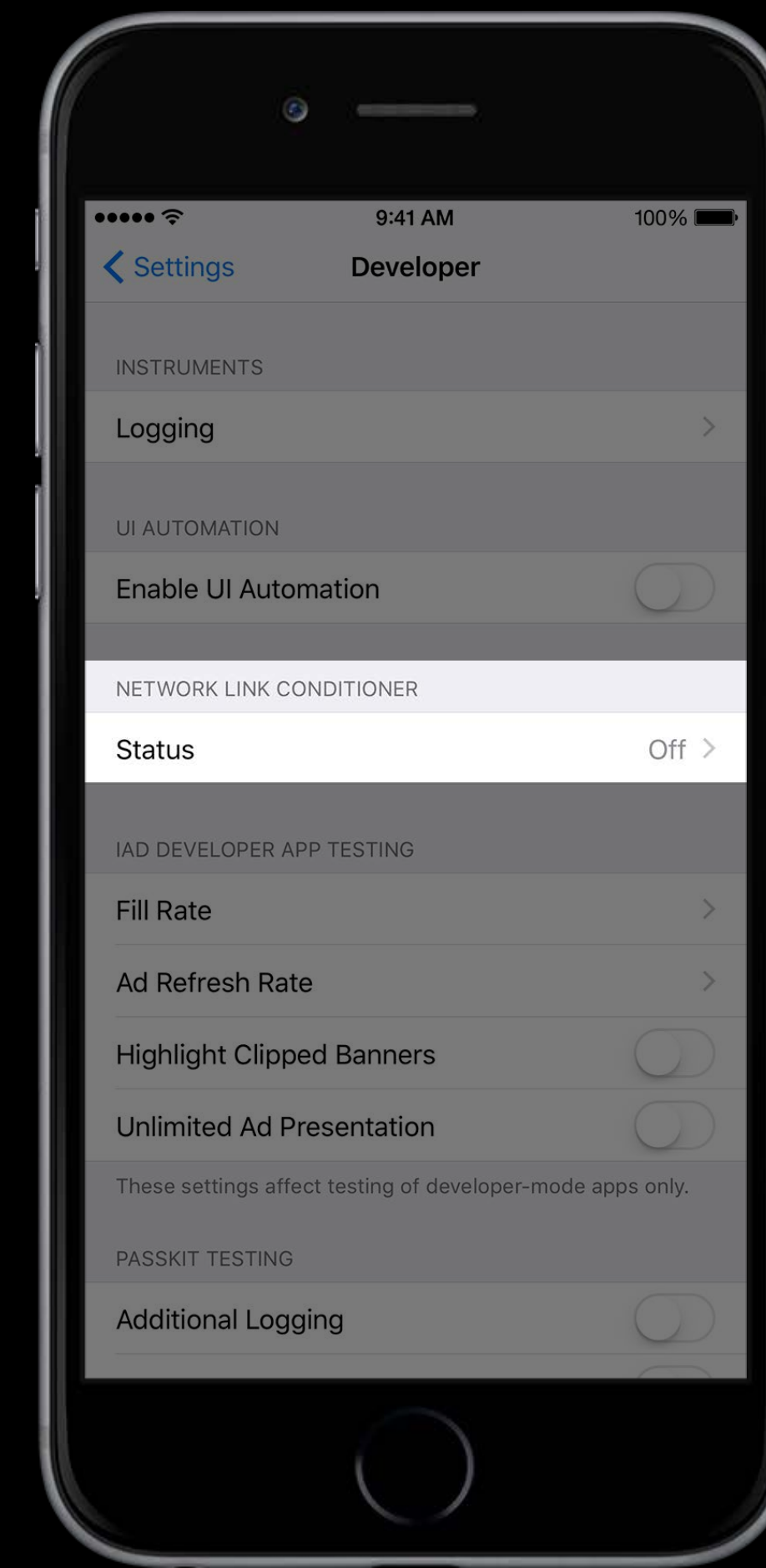


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

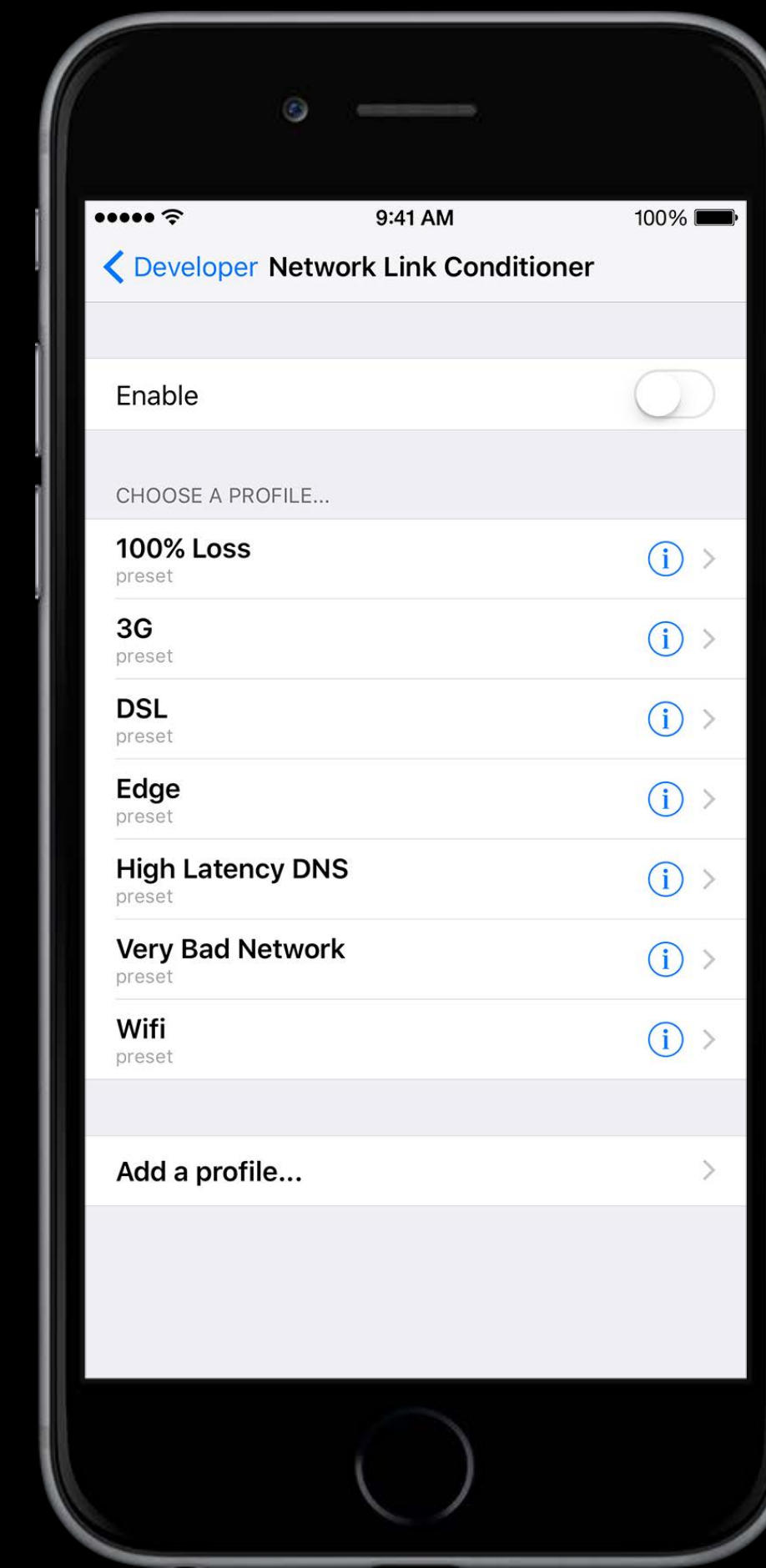


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

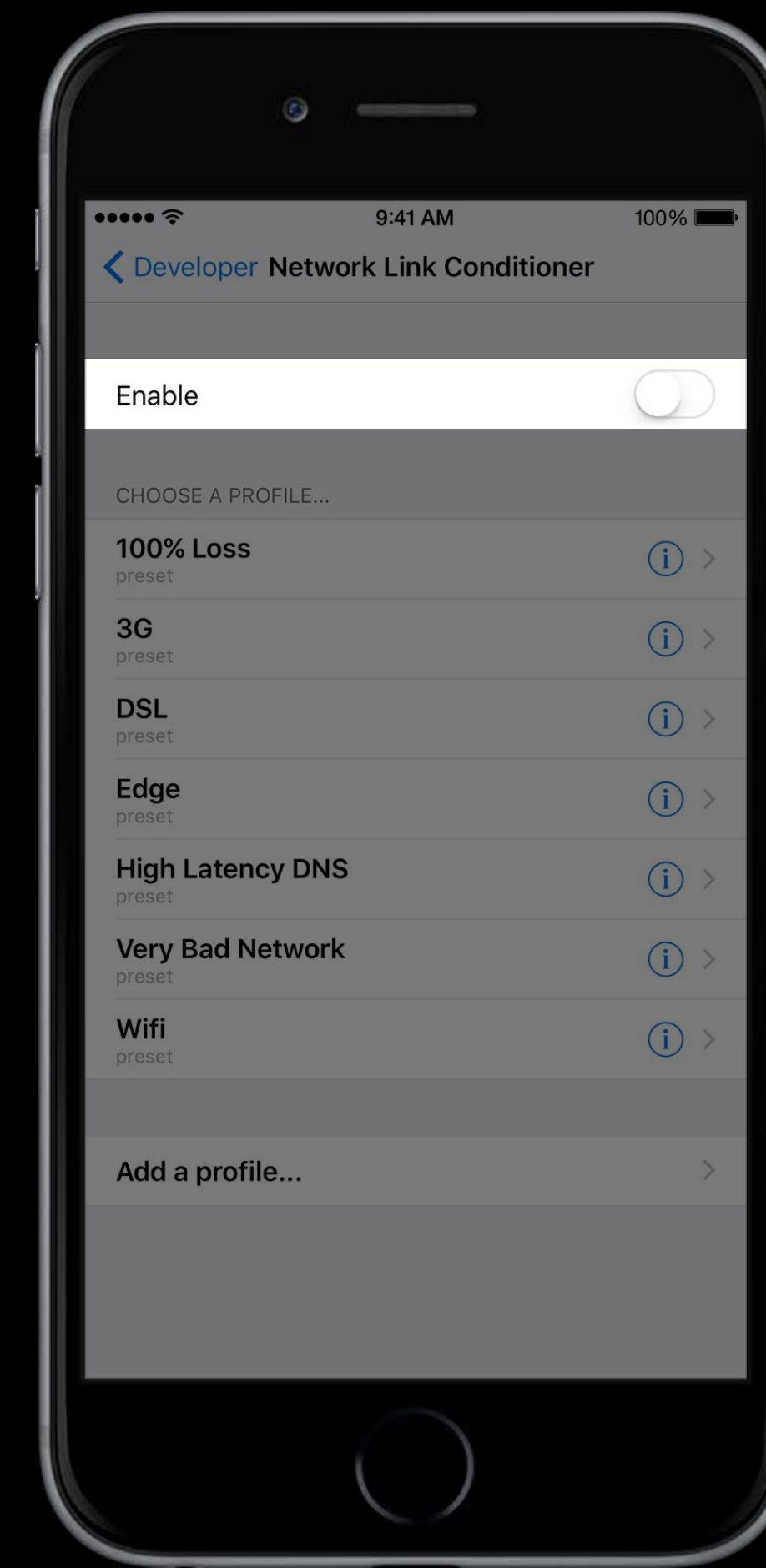


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

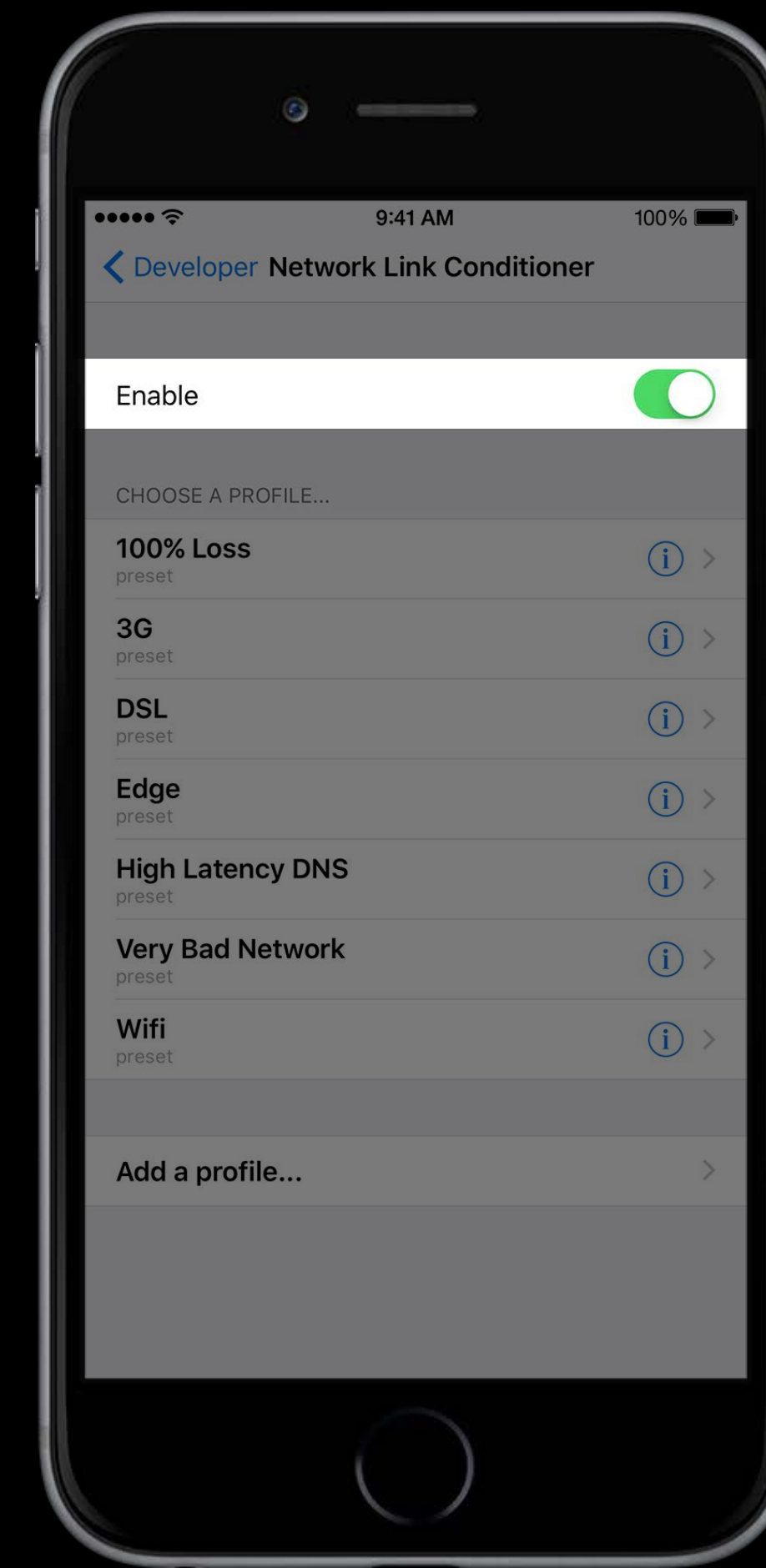


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

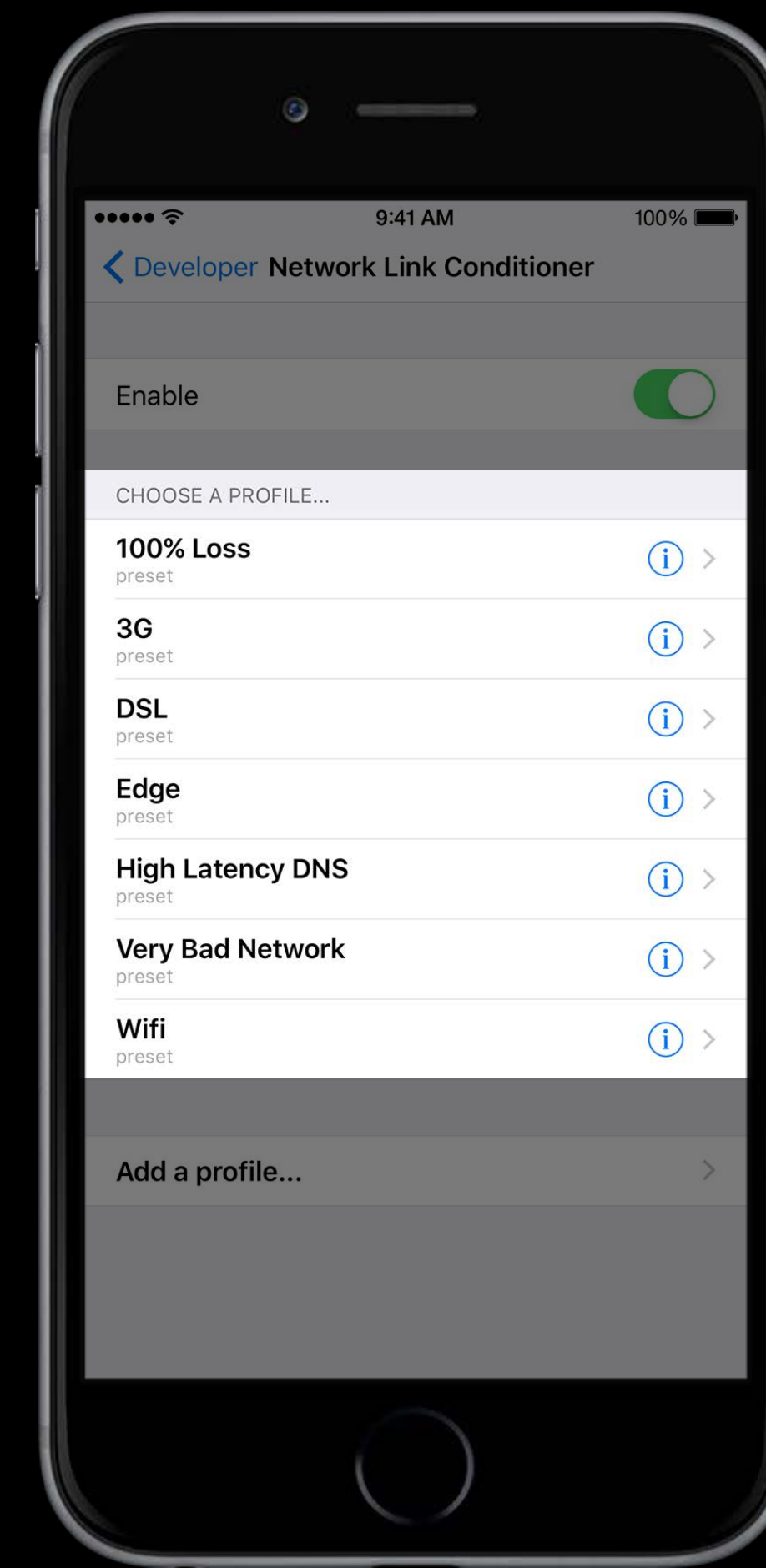


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

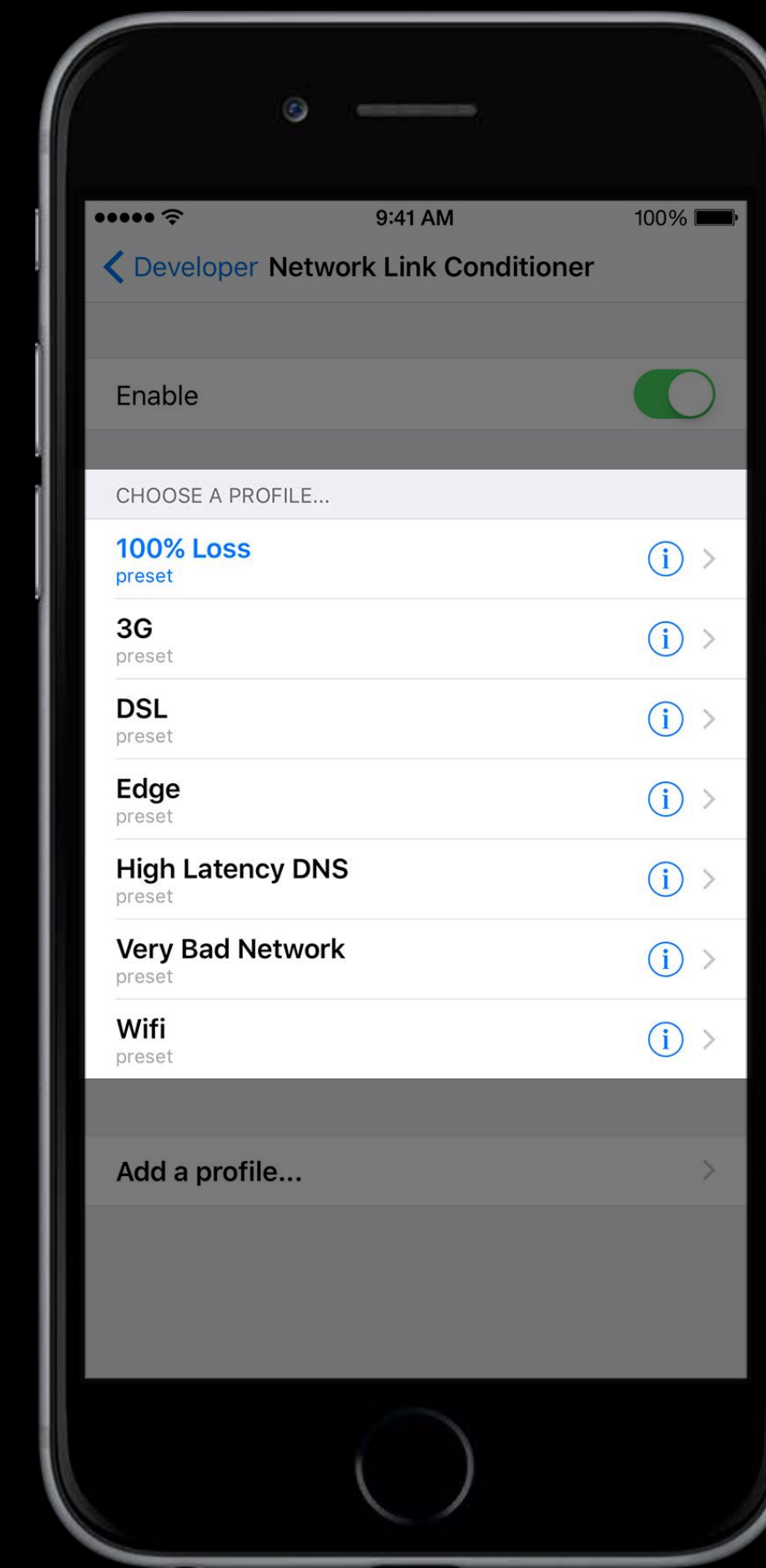


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

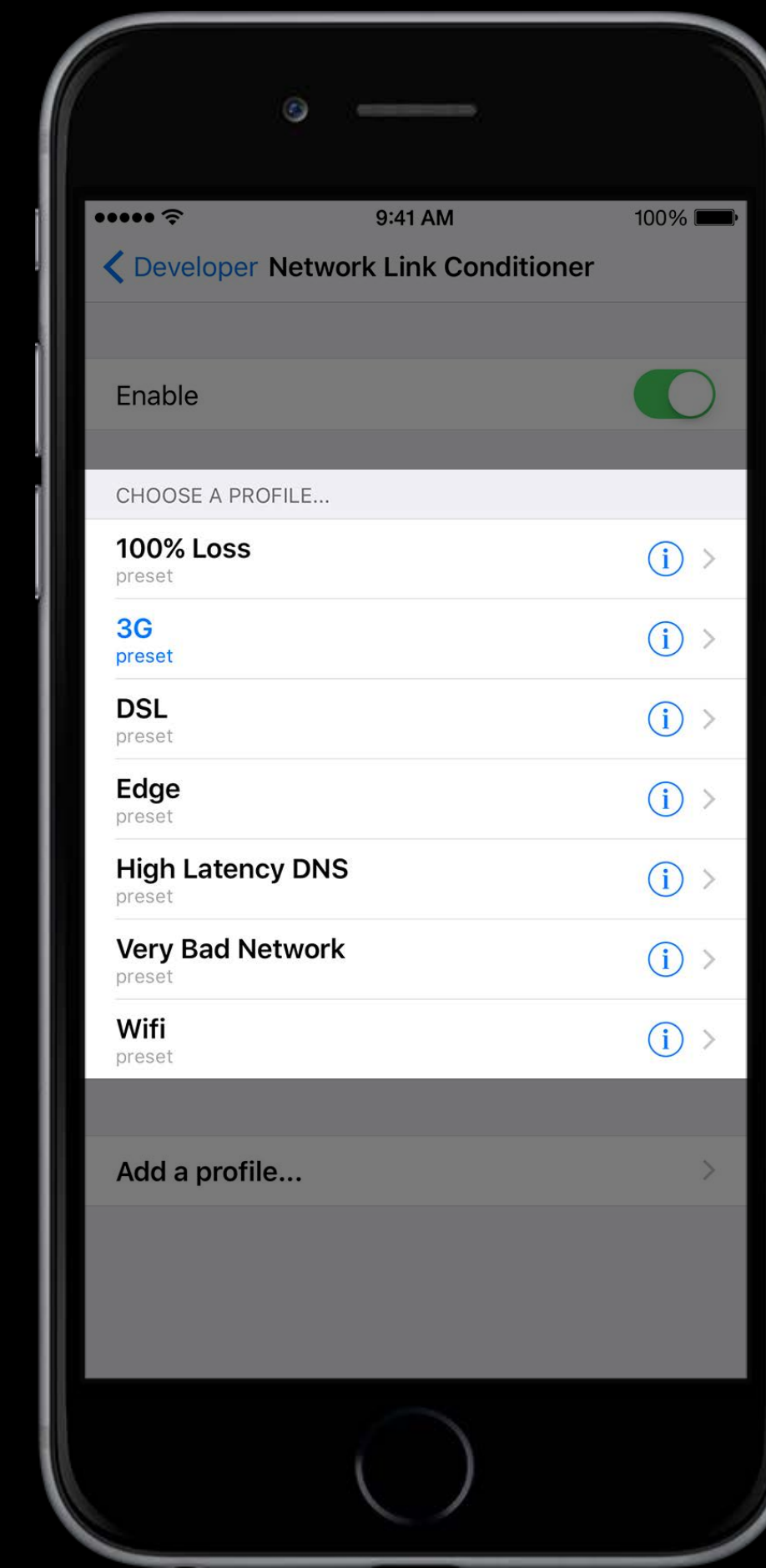


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

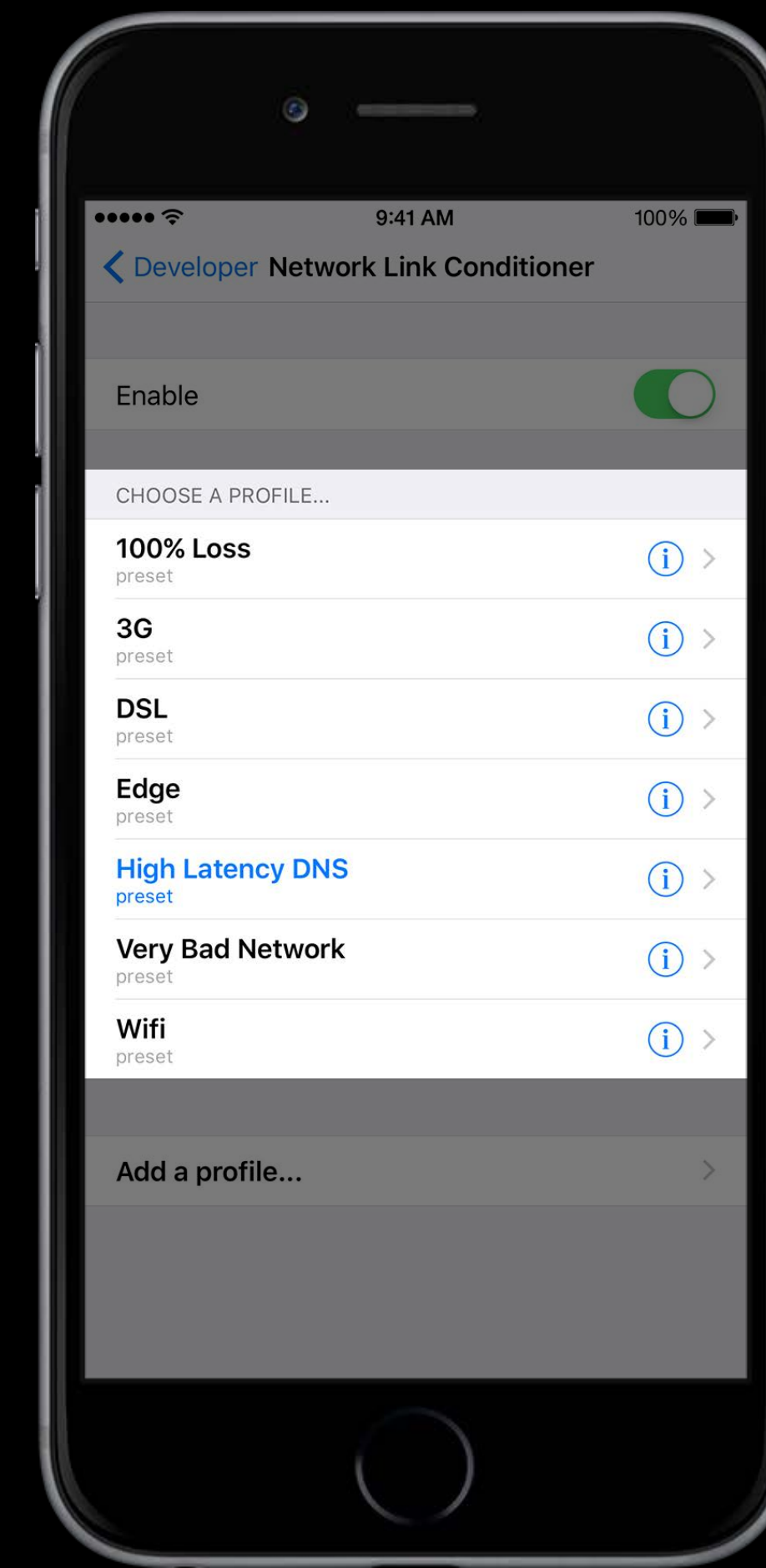


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”

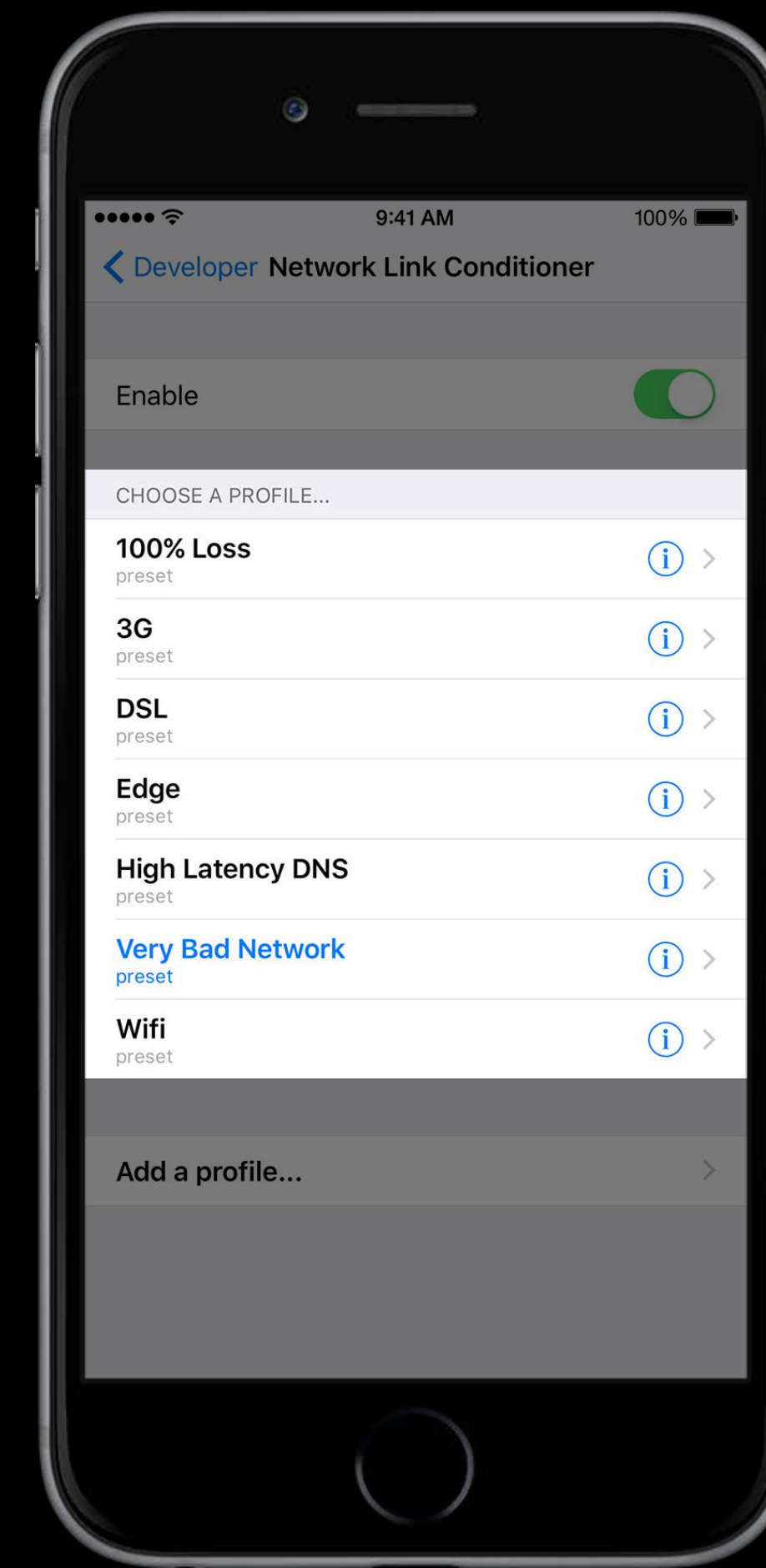


Performance Testing

Analyzing download performance and latency

Real world testing

- Host assets via TestFlight or Xcode Server
- Use the Developer Tools “Network Link Conditioner”



Networking Errors

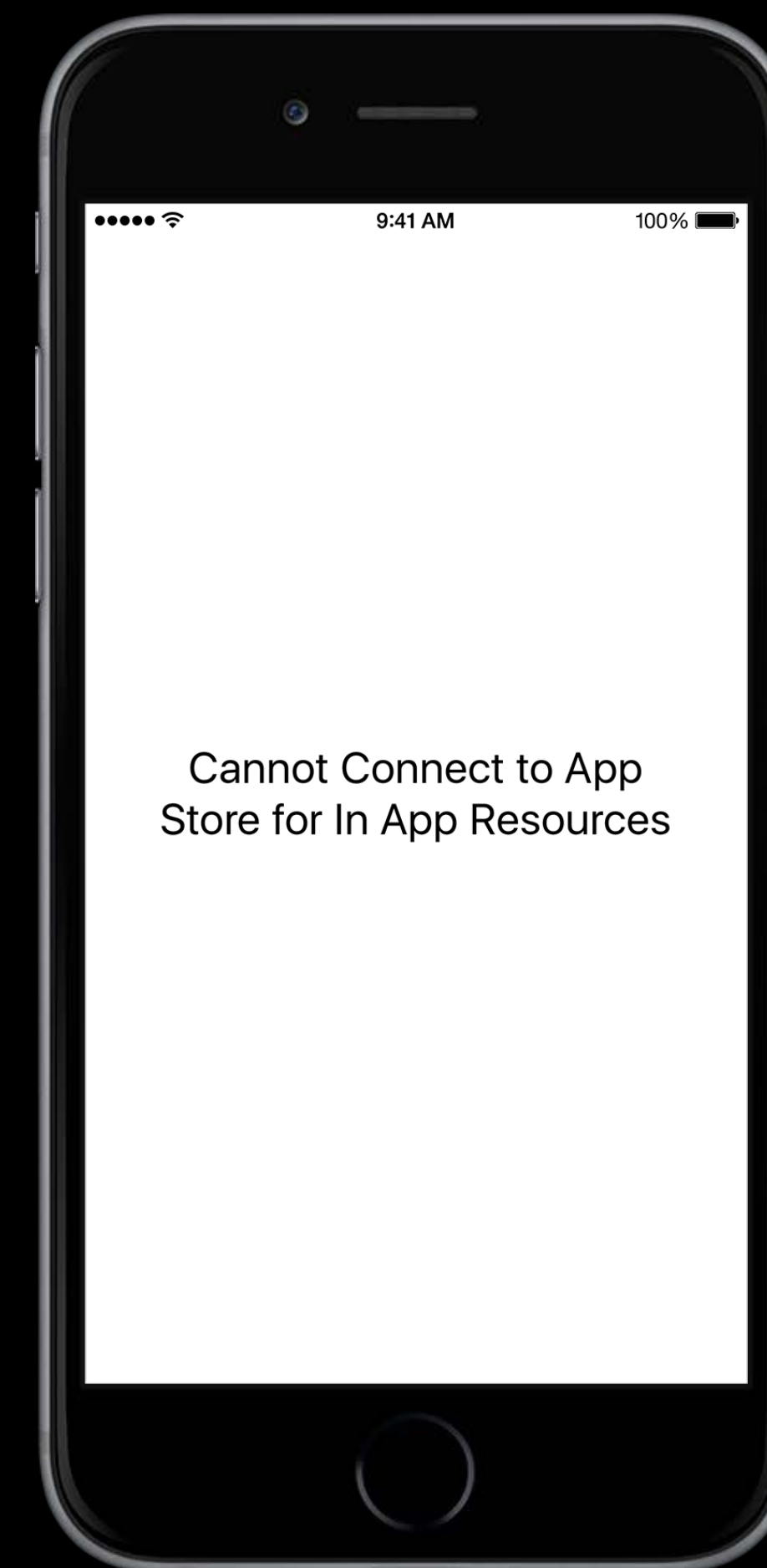
Properly handle errors for a better user experience

Networking Errors

Properly handle errors for a better user experience

No network connection at time of request

NSURLErrorNotConnectedToInternet



Networking Errors

Properly handle errors for a better user experience

No network connection at time of request

`NSURLErrorNotConnectedToInternet`

Resource does not exist

`NSURLErrorResourceUnavailable`

Storage Space Errors

Properly handle errors for a better user experience

Storage Space Errors

Properly handle errors for a better user experience

Requesting more than 2GB "in use" result in an error

Storage Space Errors

Properly handle errors for a better user experience

Requesting more than 2GB “in use” result in an error

Insufficient local storage results in notification

NSBundleResourceRequestLowDiskSpaceNotification

Cellular Data

Accounting for On Demand Resources downloads

On Demand Resources downloads

Cellular Data

Accounting for On Demand Resources downloads

On Demand Resources downloads

- Controlled by application's cellular data switch

Cellular Data

Accounting for On Demand Resources downloads

On Demand Resources downloads

- Controlled by application's cellular data switch
- Counted towards cellular data usage of application

Cellular Data

Accounting for On Demand Resources downloads

On Demand Resources downloads

- Controlled by application's cellular data switch
- Counted towards cellular data usage of application

100MB cellular download install limit

Cellular Data

Accounting for On Demand Resources downloads

On Demand Resources downloads

- Controlled by application's cellular data switch
- Counted towards cellular data usage of application

100MB cellular download install limit

- On Demand Resources with tags under "Initial Install Tags" count towards this limit

Vital Statistics

Numbers to remember

Vital Statistics

Numbers to remember

Maximum app size

- 2GB for .app bundle
- 20GB including On Demand Resources content

Vital Statistics

Numbers to remember

Maximum app size

- 2GB for .app bundle
- 20GB including On Demand Resources content

2GB of Initial and Prefetched On Demand Resources content (sliced, uncompressed)

Vital Statistics

Numbers to remember

Maximum app size

- 2GB for .app bundle
- 20GB including On Demand Resources content

2GB of Initial and Prefetched On Demand Resources content (sliced, uncompressed)

2GB of On Demand Resources “in use” content (sliced, uncompressed)

- “In use” On Demand Resources content is included in the size of your application via usage settings

Vital Statistics

Numbers to remember

Maximum app size

- 2GB for .app bundle
- 20GB including On Demand Resources content

2GB of Initial and Prefetched On Demand Resources content (sliced, uncompressed)

2GB of On Demand Resources “in use” content (sliced, uncompressed)

- “In use” On Demand Resources content is included in the size of your application via usage settings

Single asset pack must be no larger than 512MB (sliced, uncompressed)

On Demand Resources

Summary

On Demand Resources

Summary

Dynamically loaded content

On Demand Resources

Summary

Dynamically loaded content

Hosted on the App Store

On Demand Resources

Summary

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

On Demand Resources

Summary

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Prioritized downloads

On Demand Resources

Summary

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Prioritized downloads

Intelligent content caching

On Demand Resources

Summary

Dynamically loaded content

Hosted on the App Store

Downloadable during app install and by request

Prioritized downloads

Intelligent content caching

Max app size with On Demand Resources increases to 20GB

More Information

Documentation

On-Demand Resources Guide

NSBundleResourceRequest Class Reference

App Distribution Guide

Sample Code

DemoBots

<http://developer.apple.com/library>

Technical Support

Apple Developer Forums

Developer Technical Support

General Inquiries

Curt Rothert, App Frameworks Evangelist

rothert@apple.com

Related Sessions and Lab

| | | |
|---|------------------|------------------|
| App Thinning in Xcode | Presidio | Wednesday 9:00AM |
| Continuous Integration and Code Coverage in Xcode | Presidio | Thursday 10:00AM |
| Best Practices for Progress Reporting | Pacific Heights | Friday 1:30PM |
| On Demand Resources Lab | Frameworks Lab B | Thursday 11:00AM |

 WWDC 15