

App Thinning in Xcode

Session 404

Anders Bertelrud Senior Software Engineer
Patrick Heynen Senior Engineering Manager

What You'll Learn

What You'll Learn

How app distribution is being improved

What You'll Learn

How app distribution is being improved

How to minimize your app's footprint

What You'll Learn

How app distribution is being improved

How to minimize your app's footprint

What this means for your workflow

App Distribution Today

App Distribution Today



App Distribution Today



App Distribution Today



App Distribution Today



App Distribution Today



App Distribution Today



What's in an App?



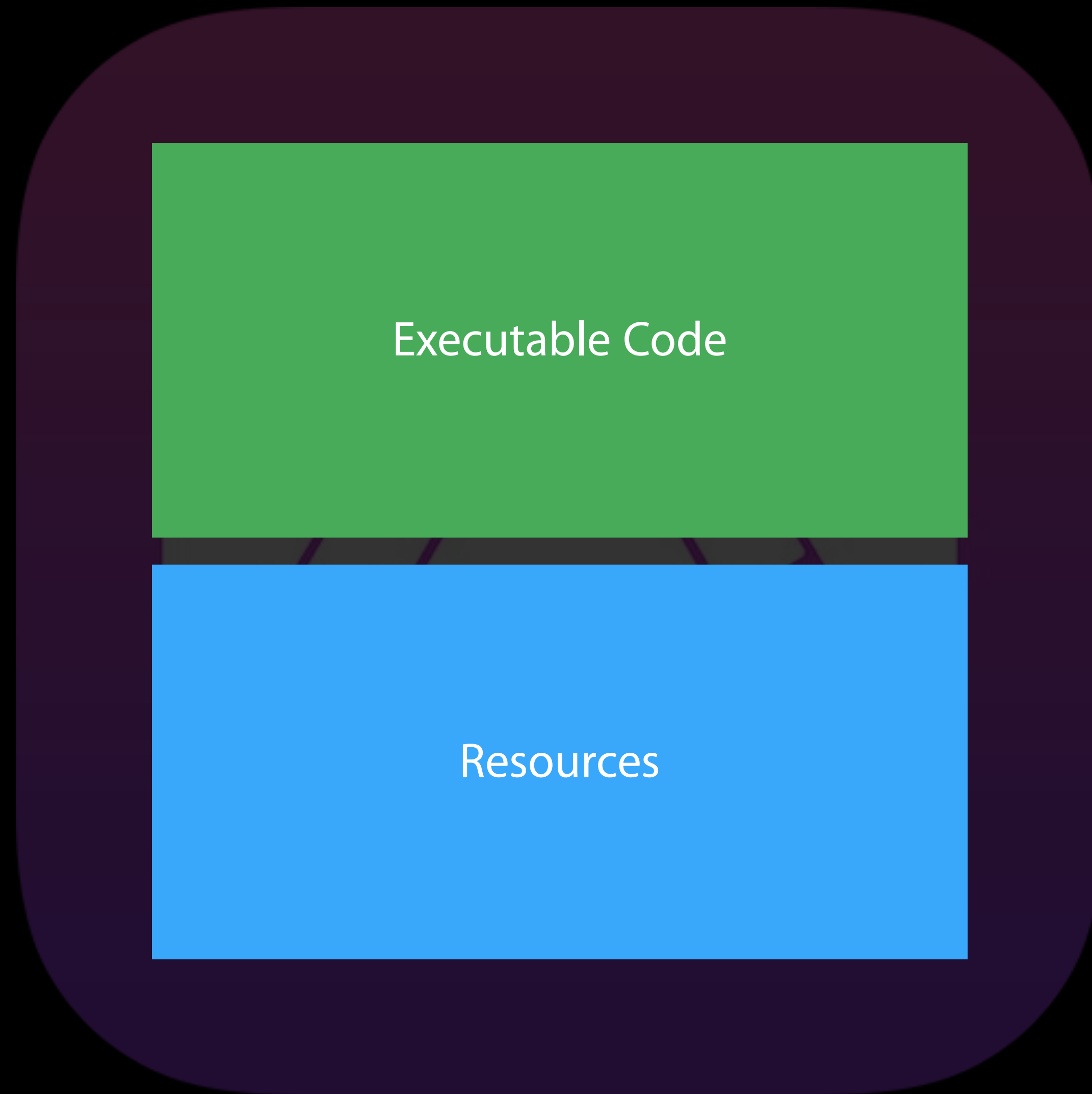
What's in an App?



Executable Code

The diagram shows a dark purple rounded square representing an app icon. Inside, there is a light green rectangle labeled 'Executable Code'. Below this rectangle, there is a faint, stylized illustration of two crossed tools: a pencil on the left and a paintbrush on the right, both in a dark grey color.

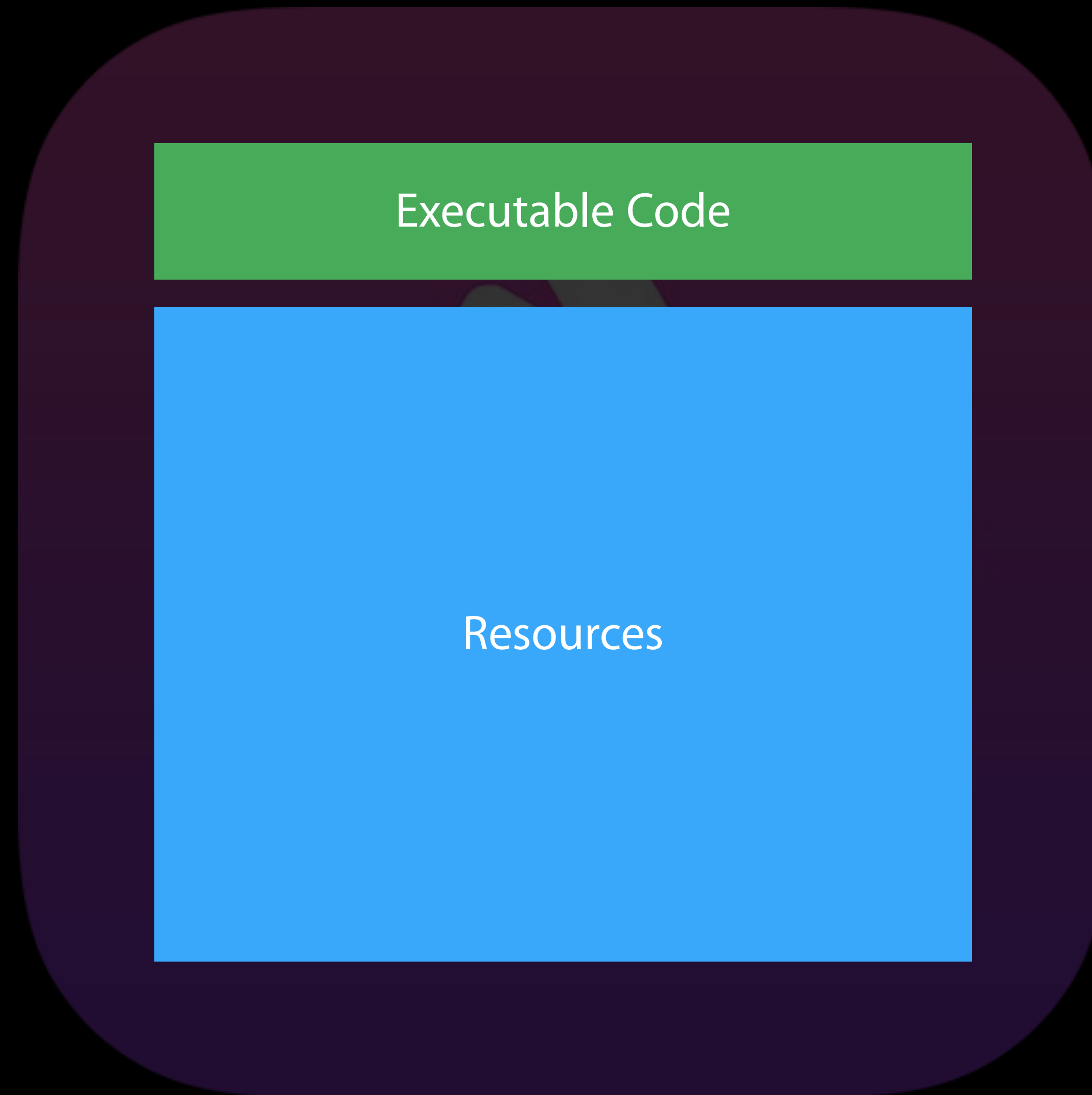
What's in an App?



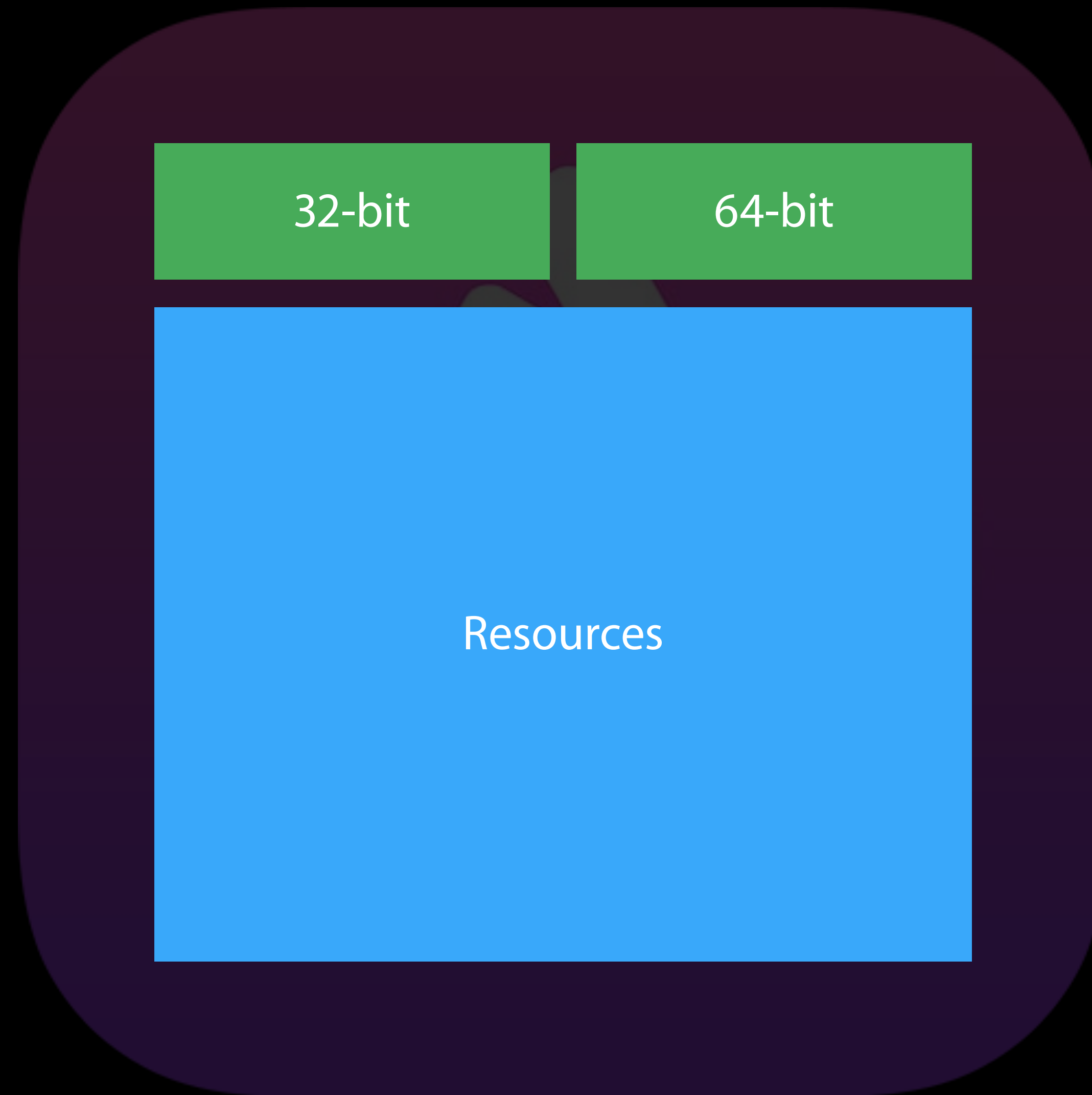
What's in an App?



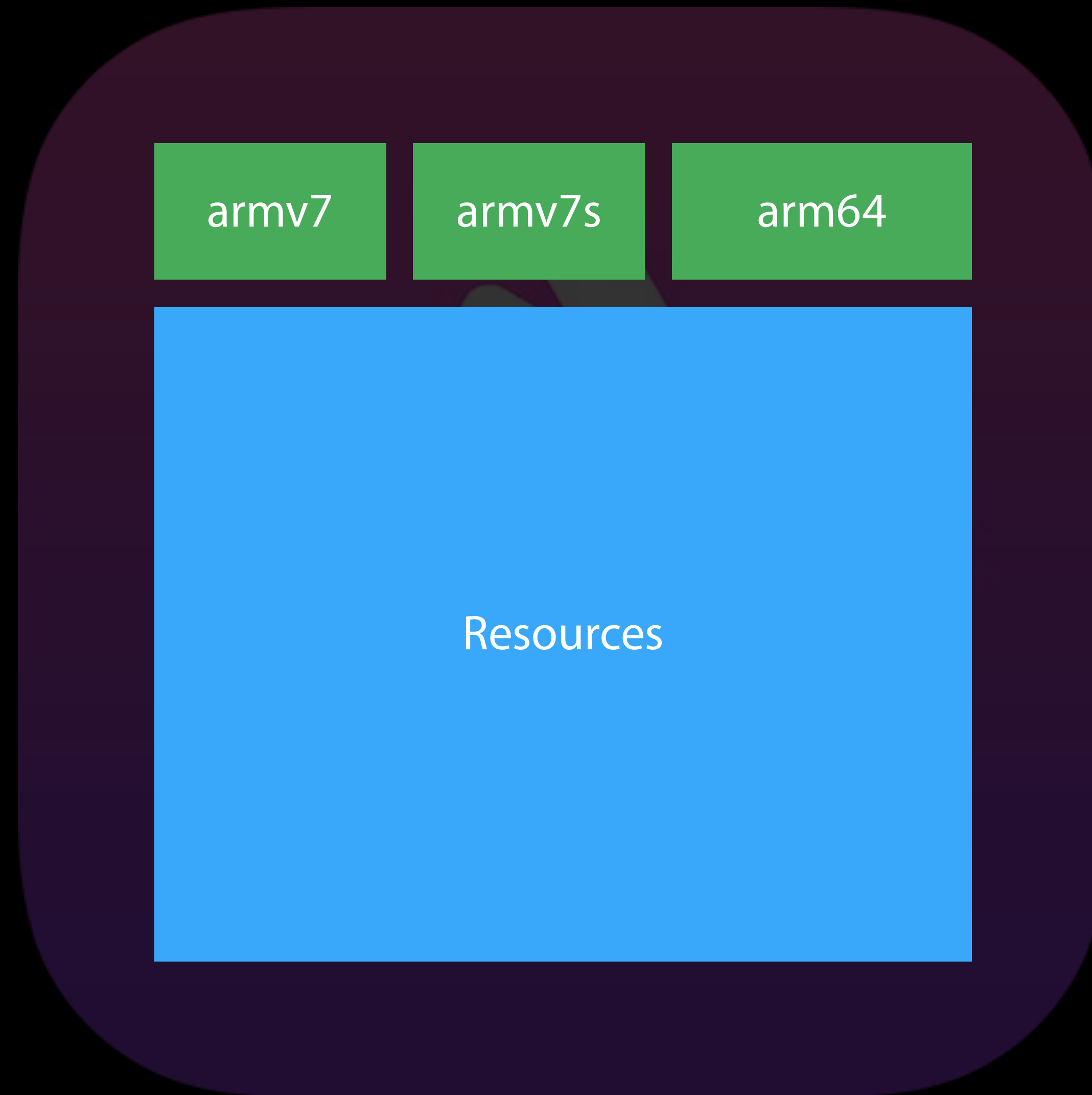
What's in an App?



Executable Code



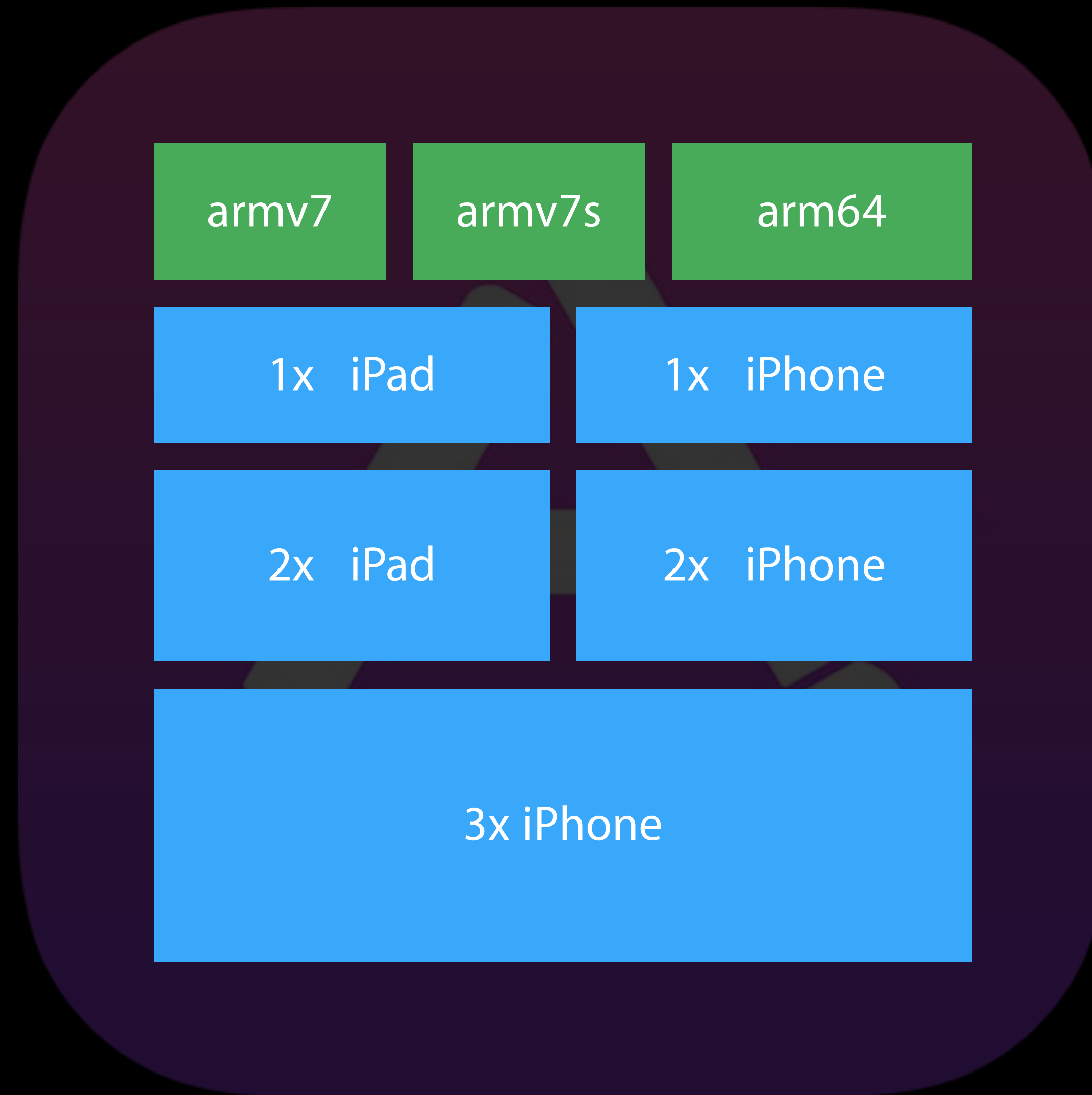
Executable Code



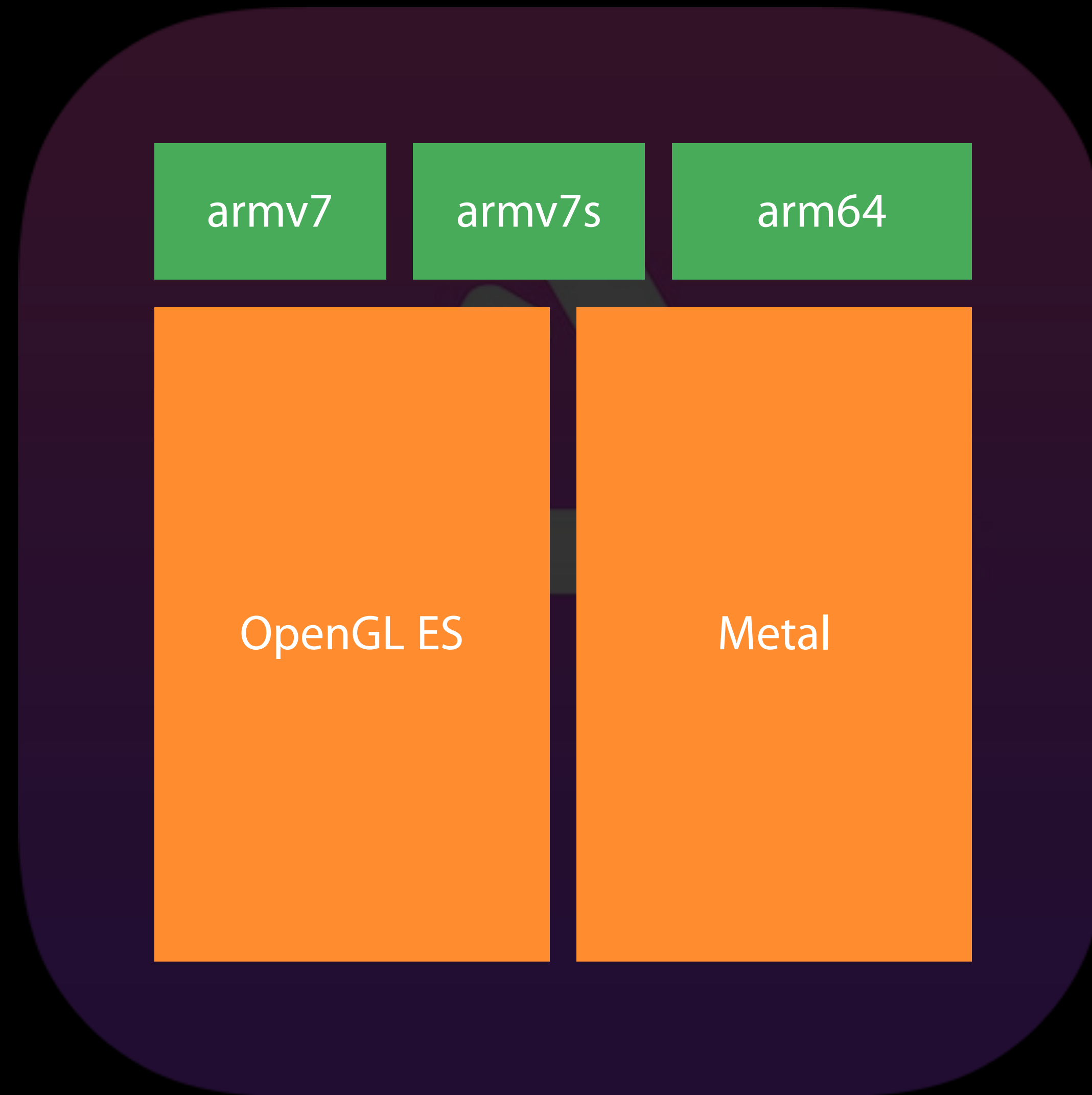
Artwork Scale Factors



Artwork Device Idioms



Graphics Technologies



Memory Classes



Memory Classes



Other Data



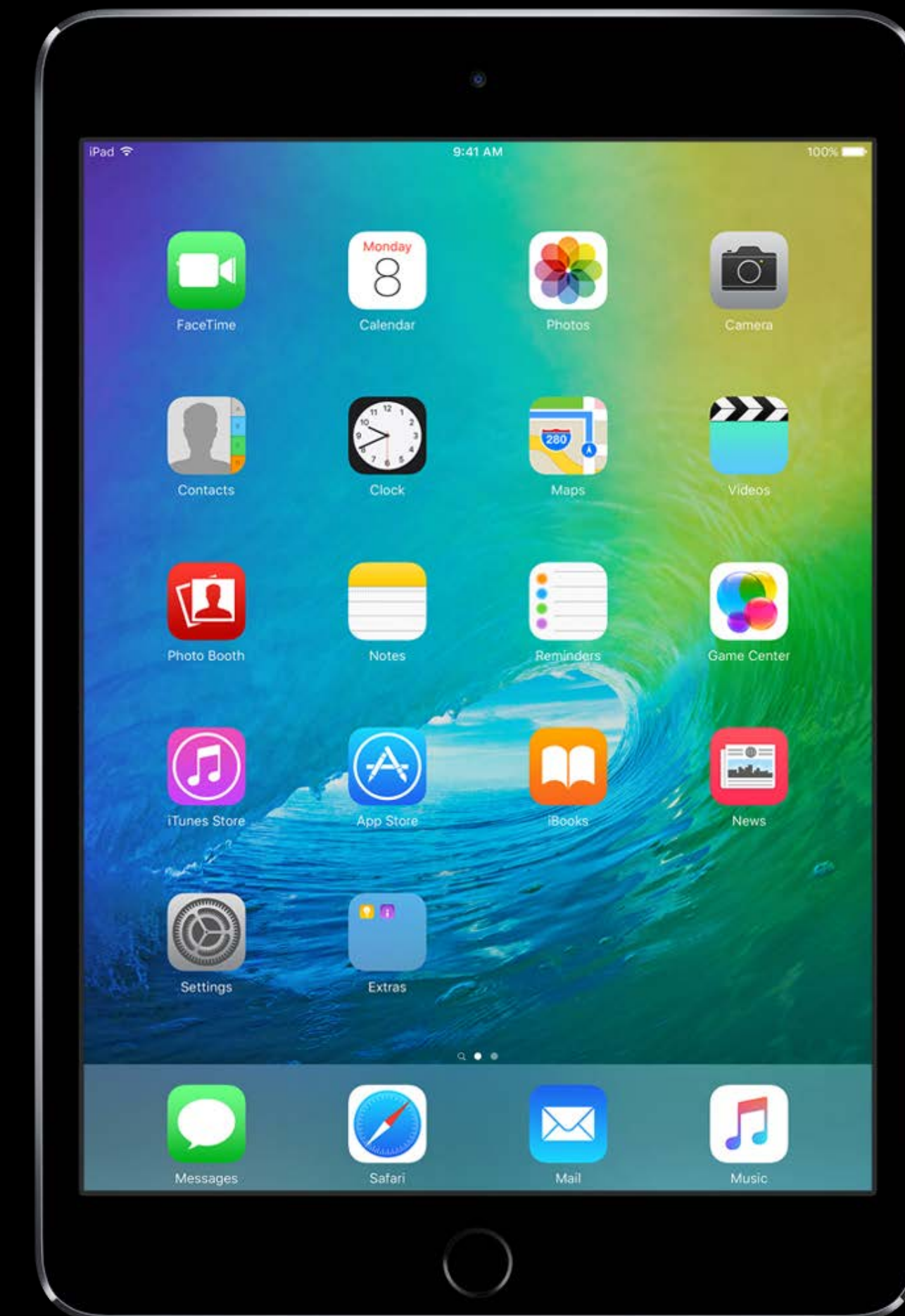
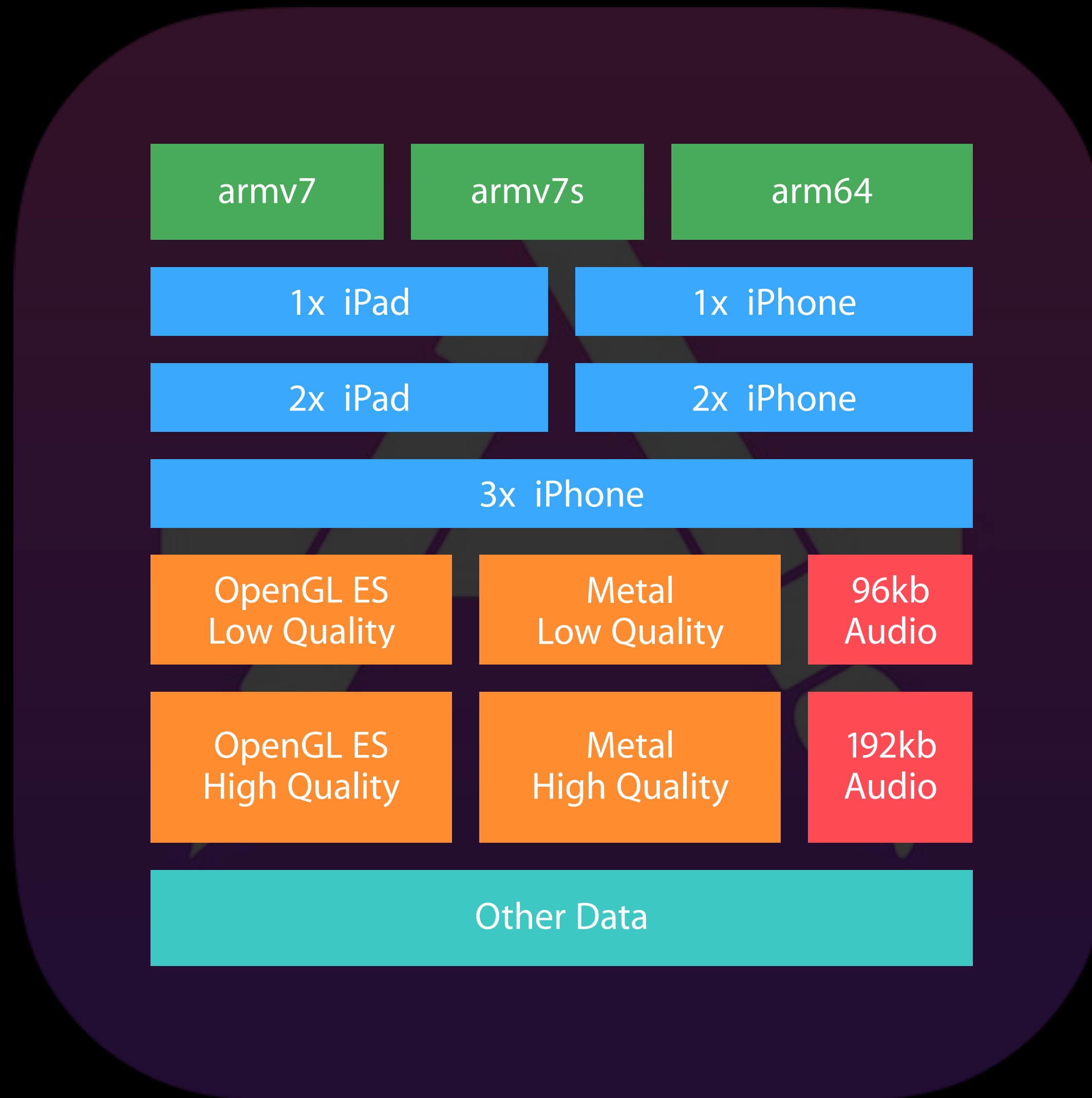
A Bit of Everything



App Slicing

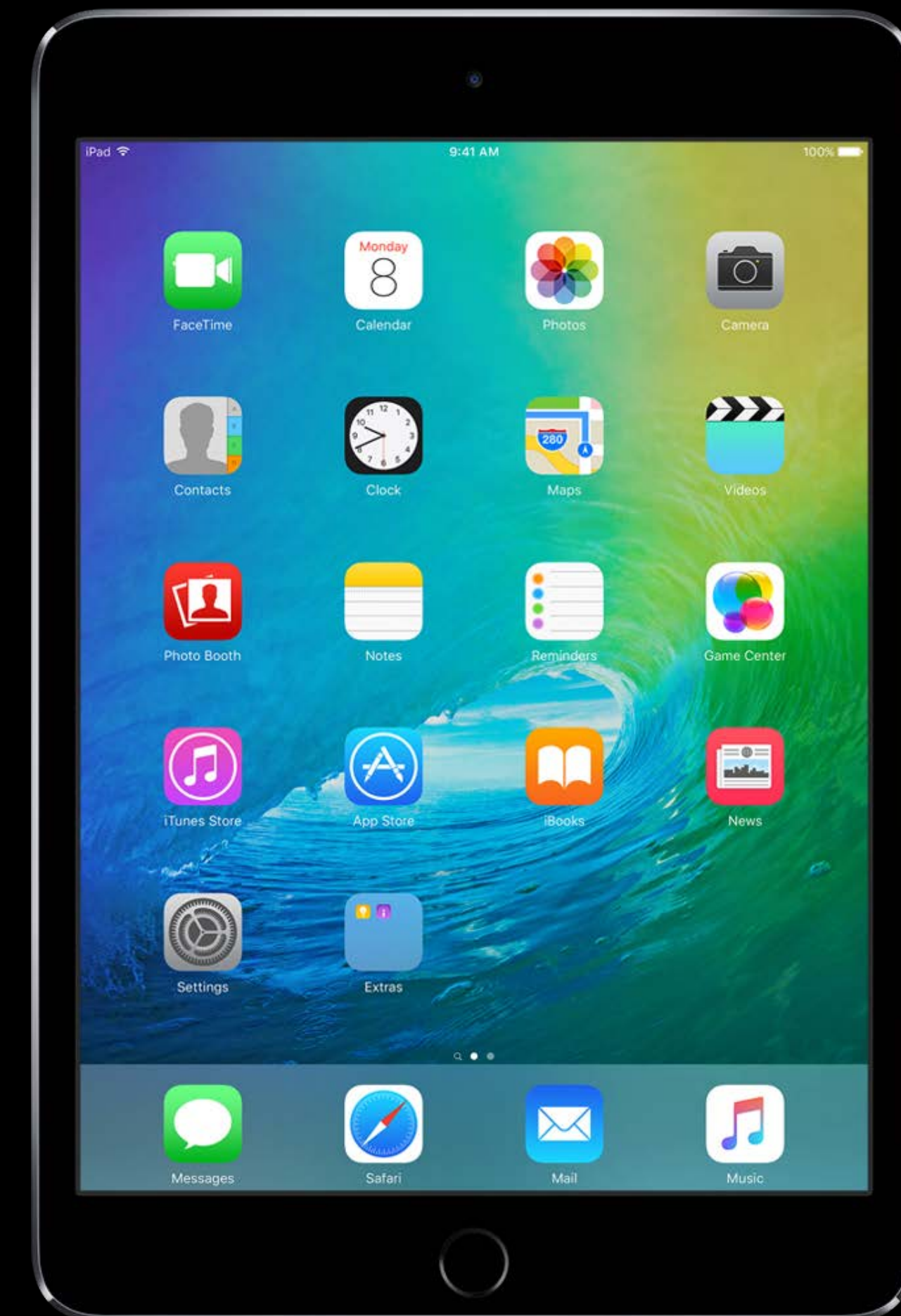


App Slicing



iPad mini

App Slicing



iPad mini

App Slicing



iPad mini

App Slicing



iPad mini

App Slicing



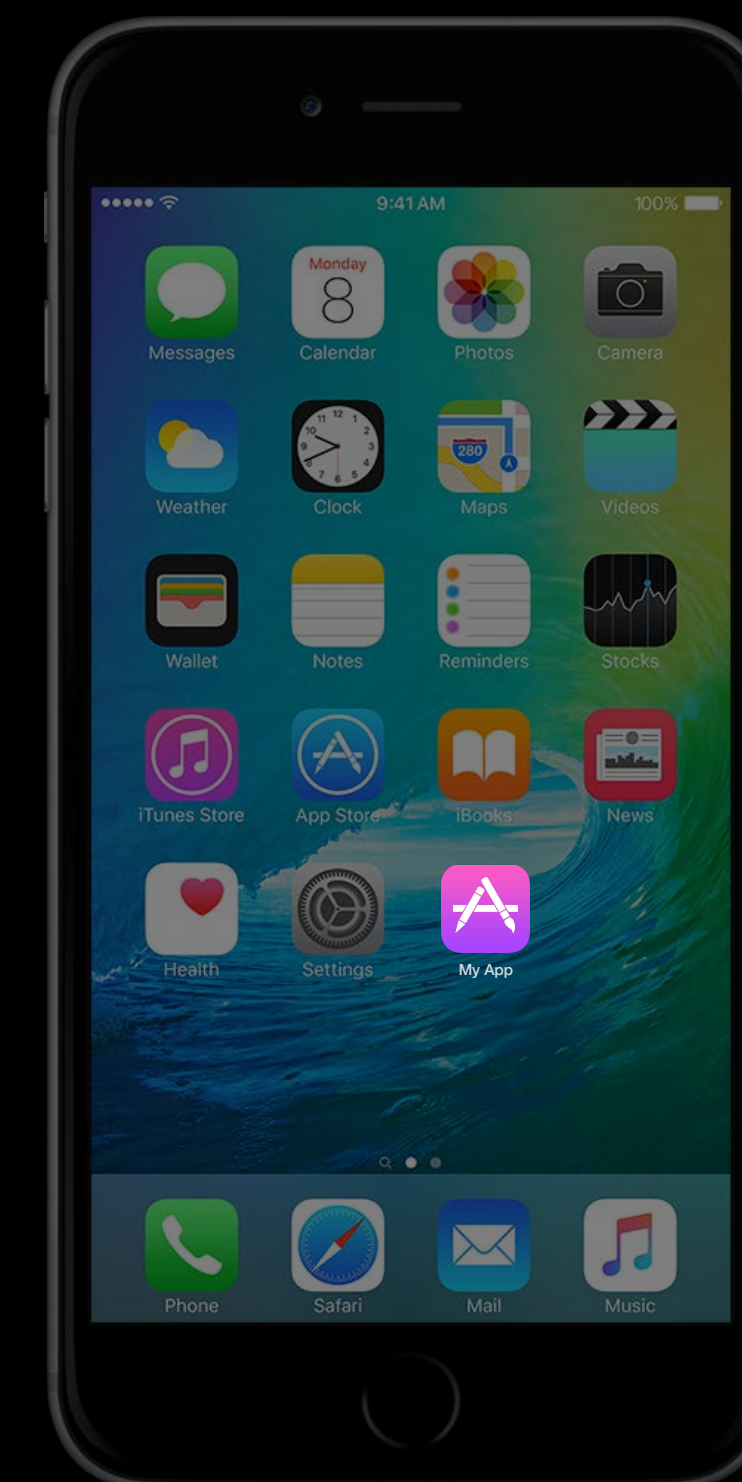
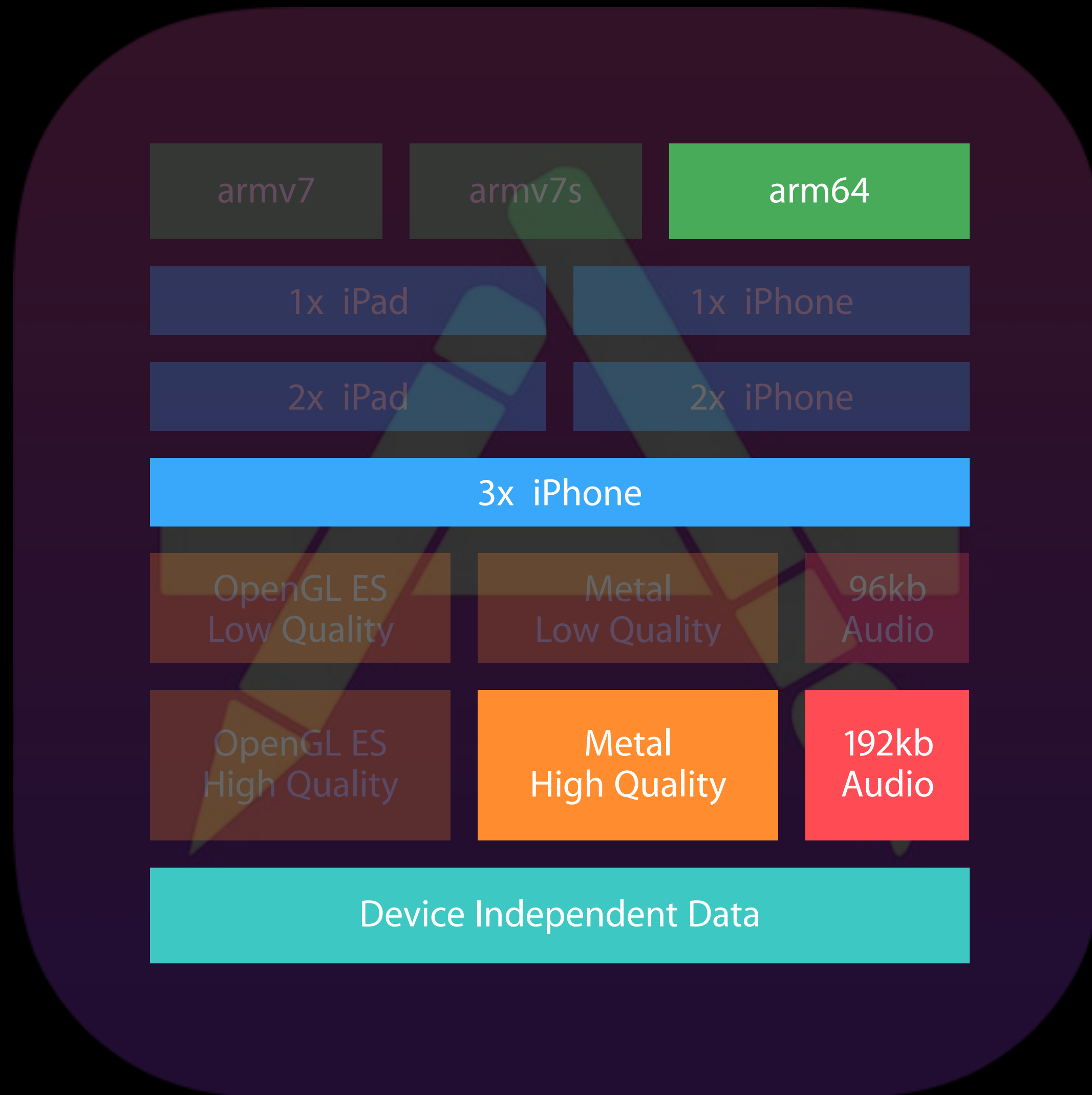
iPhone 6 Plus

App Slicing



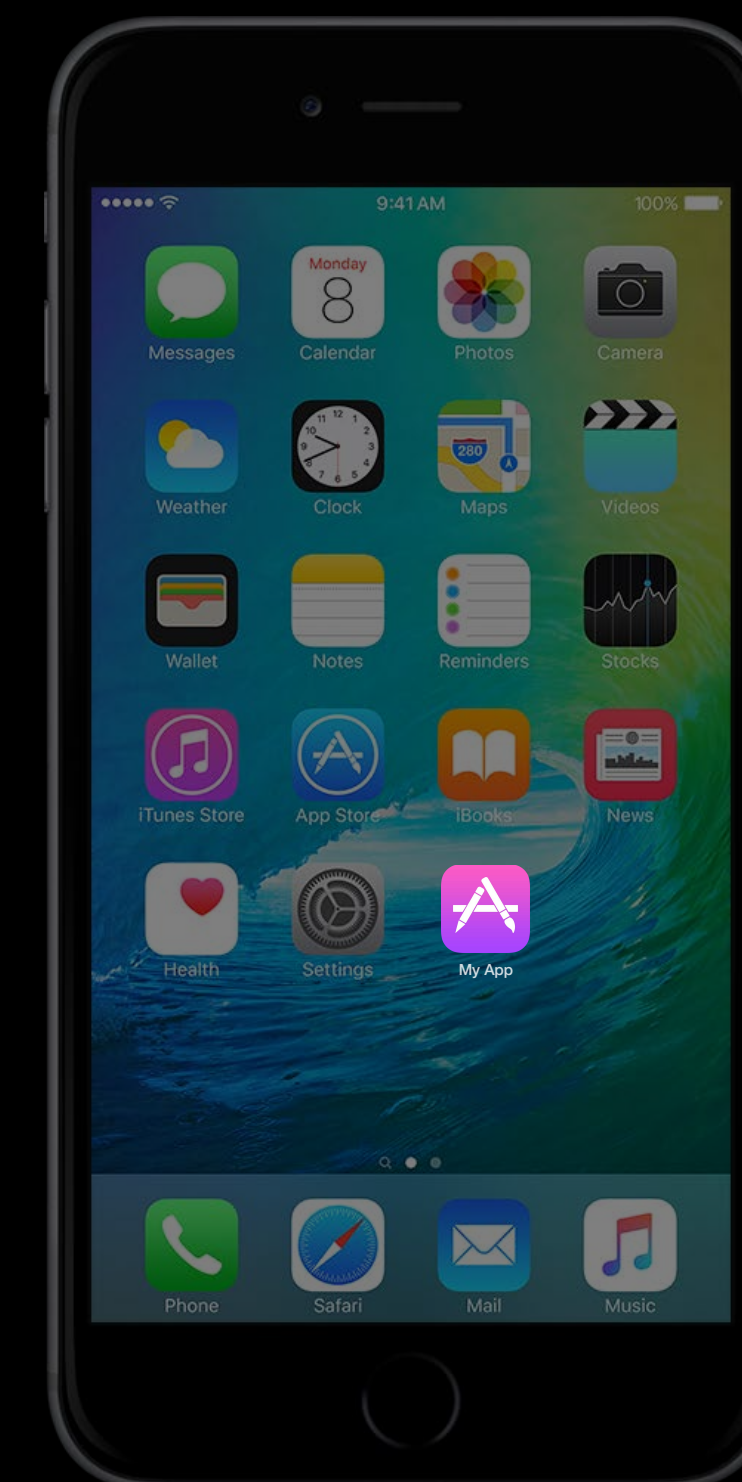
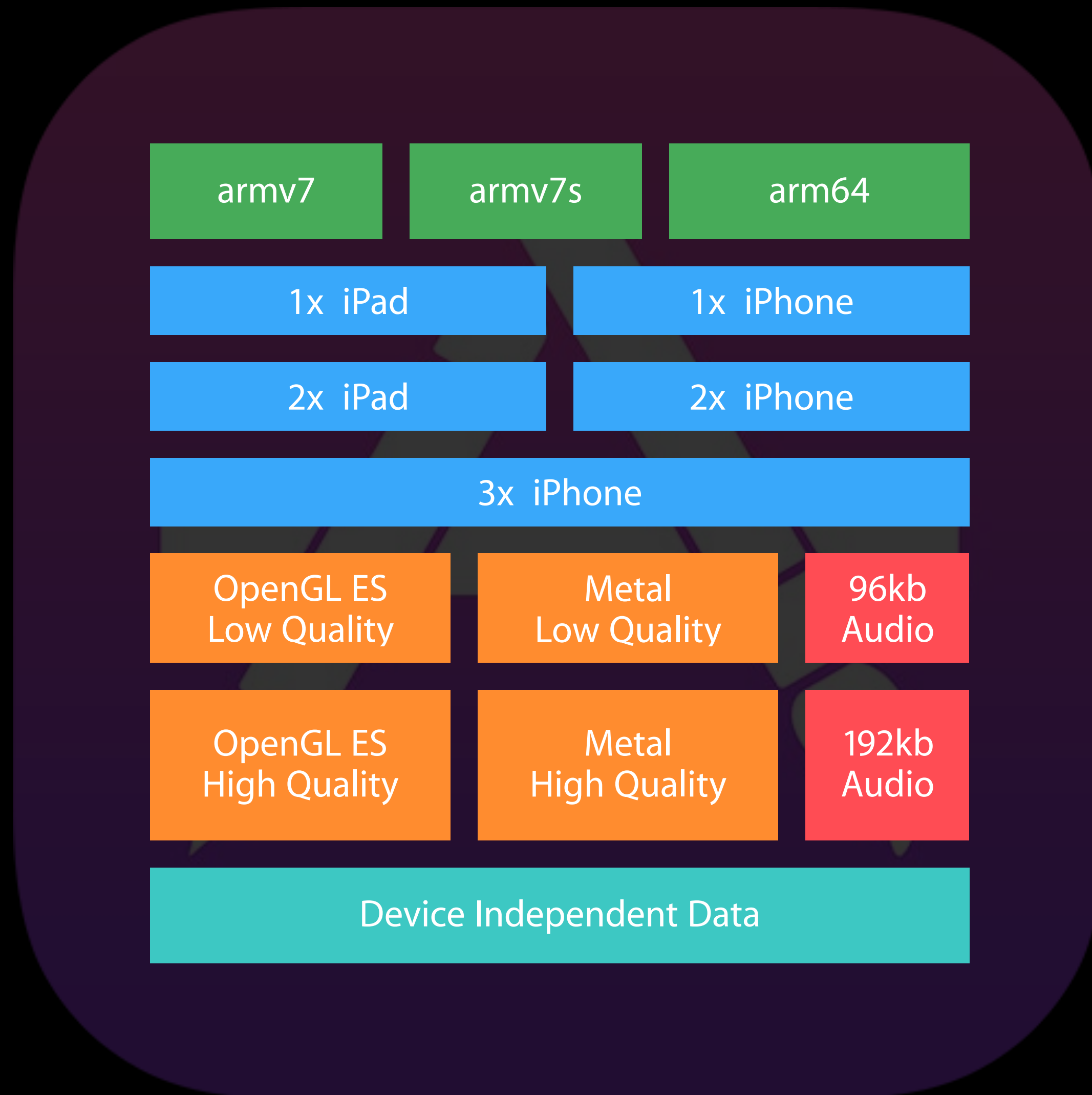
iPhone 6 Plus

App Slicing



iPhone 6 Plus

App Slicing



iPhone 6 Plus

Size Savings (DemoBots)



Size Savings (DemoBots)



Size Savings (DemoBots)



74 MB

Size Savings (DemoBots)



~22 MB

Can We Do Better?

Can We Do Better?

Some things are always needed

- Executable code
- Basic interface and artwork

Can We Do Better?

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Other things may be needed only later

- E.g., an advanced level in a game

Can We Do Better?

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- Executable code
- Basic interface and artwork

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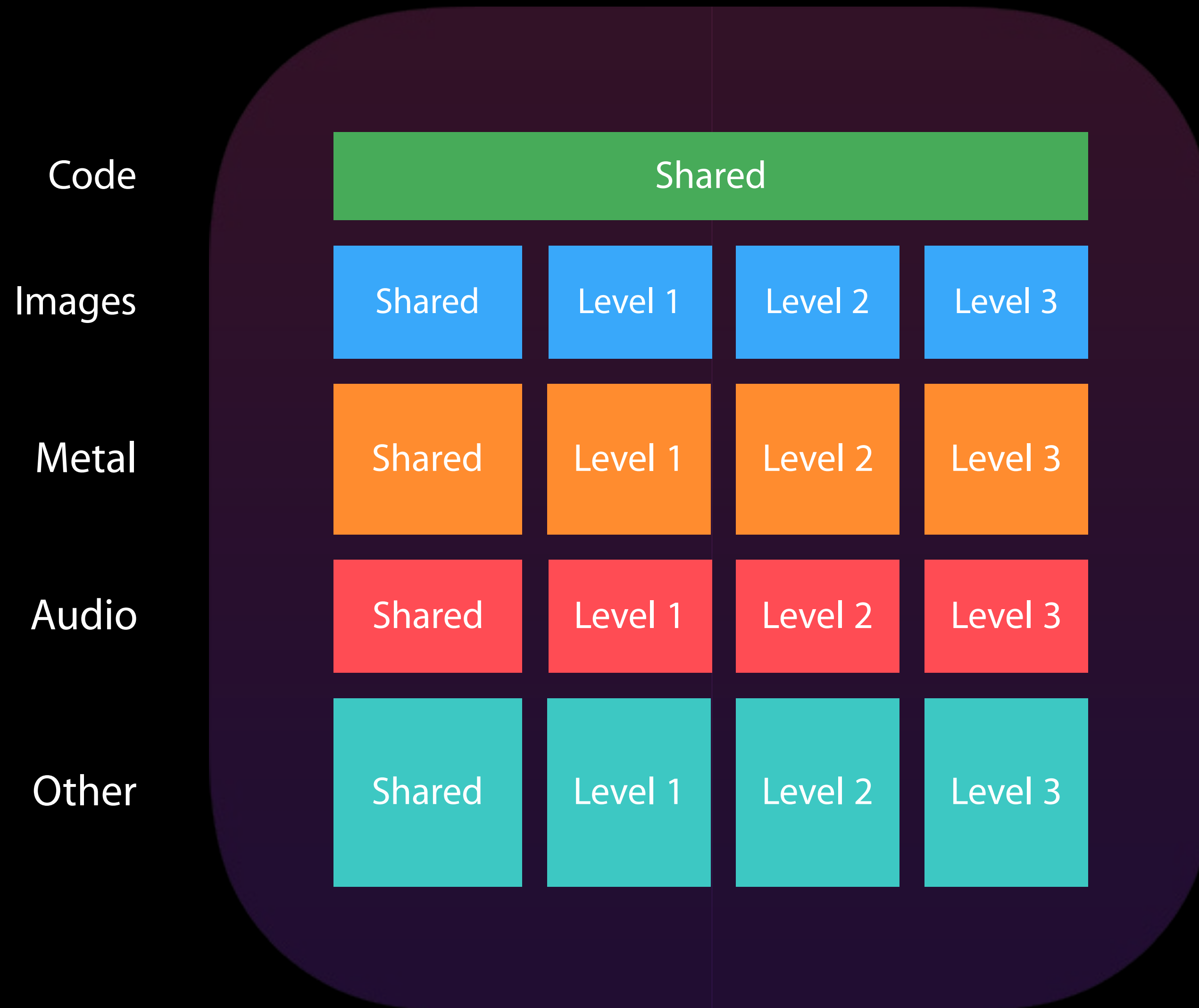
Still other content might never be needed

- E.g., a tutorial that the user watches only once

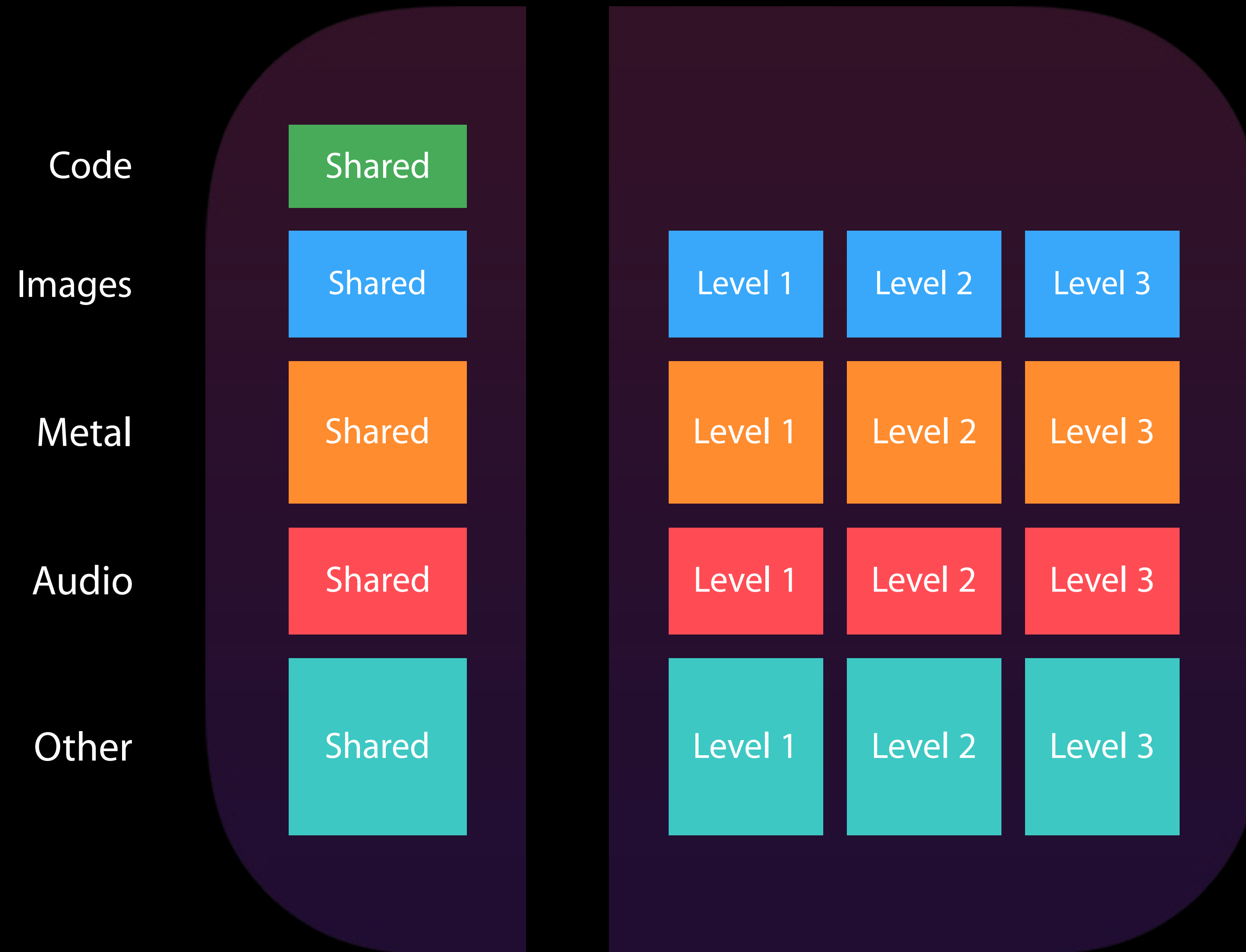
On Demand Resources



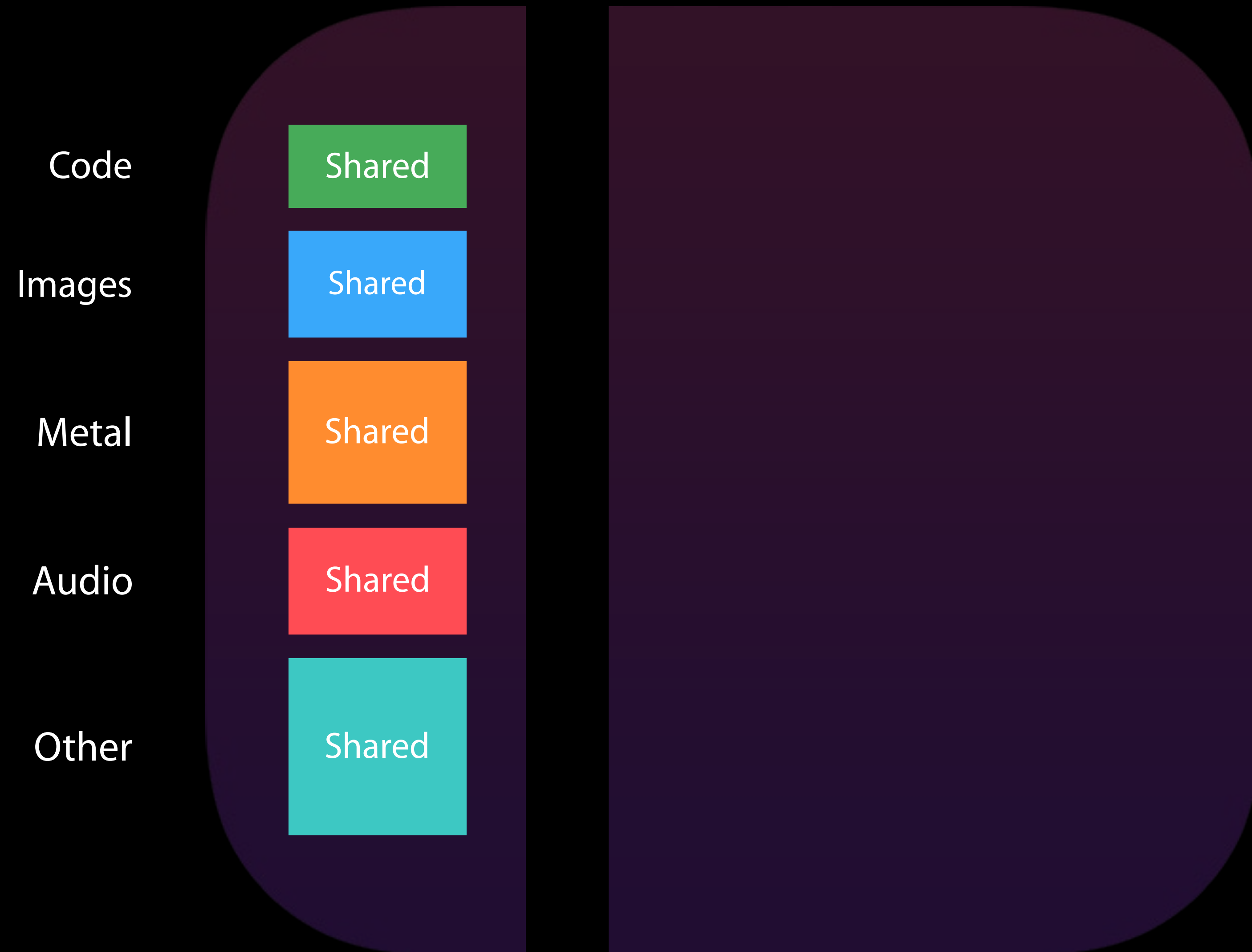
On Demand Resources



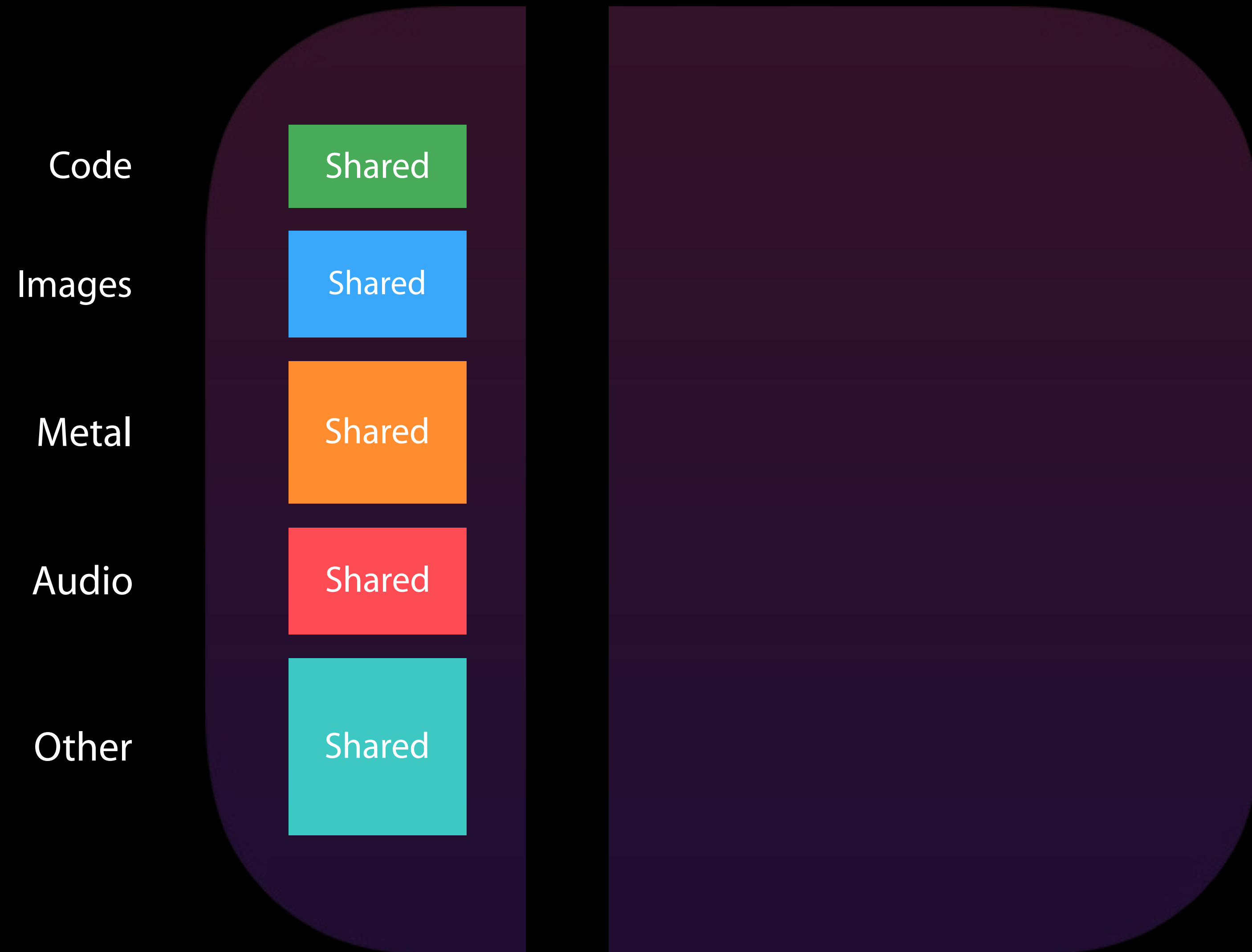
On Demand Resources



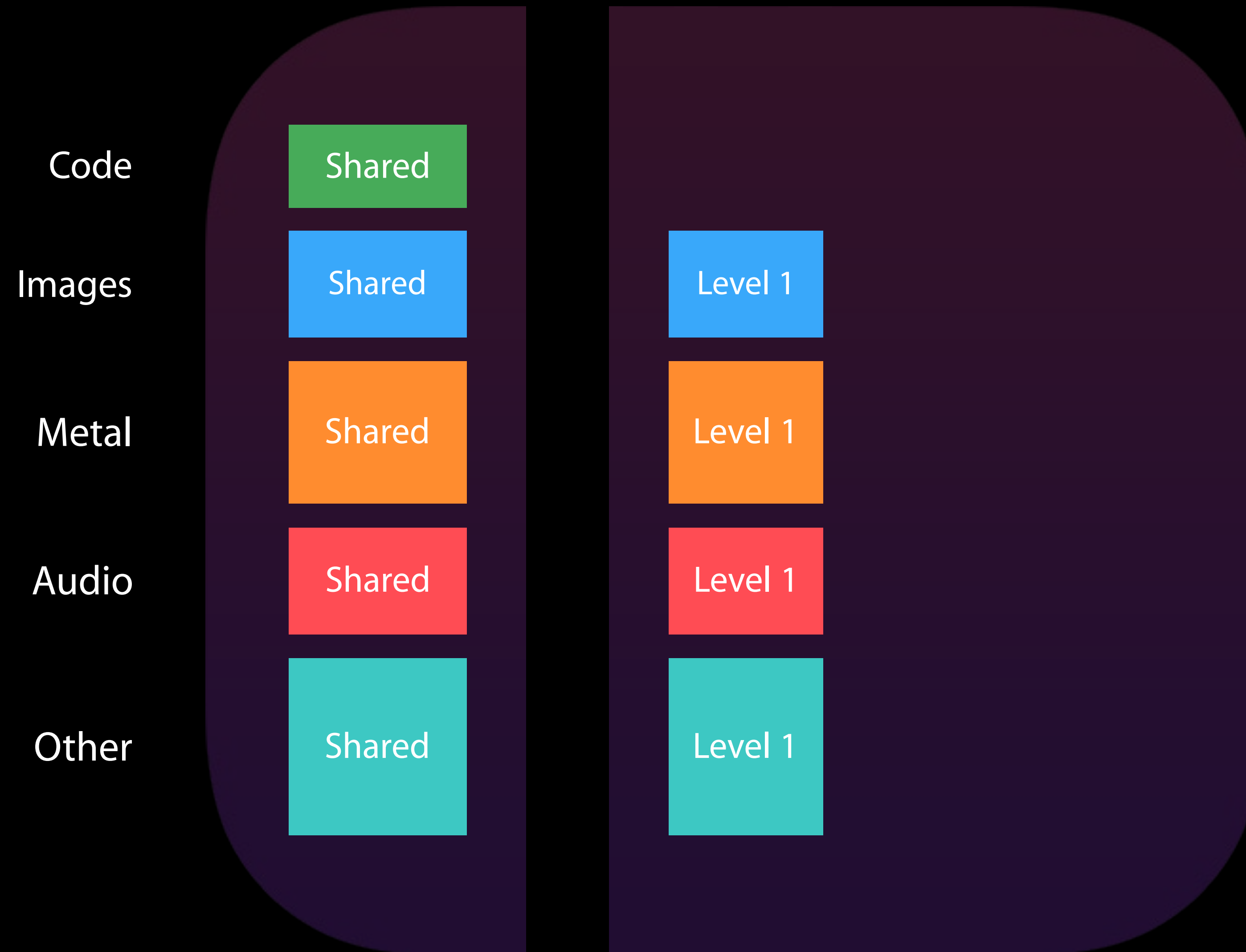
On Demand Resources



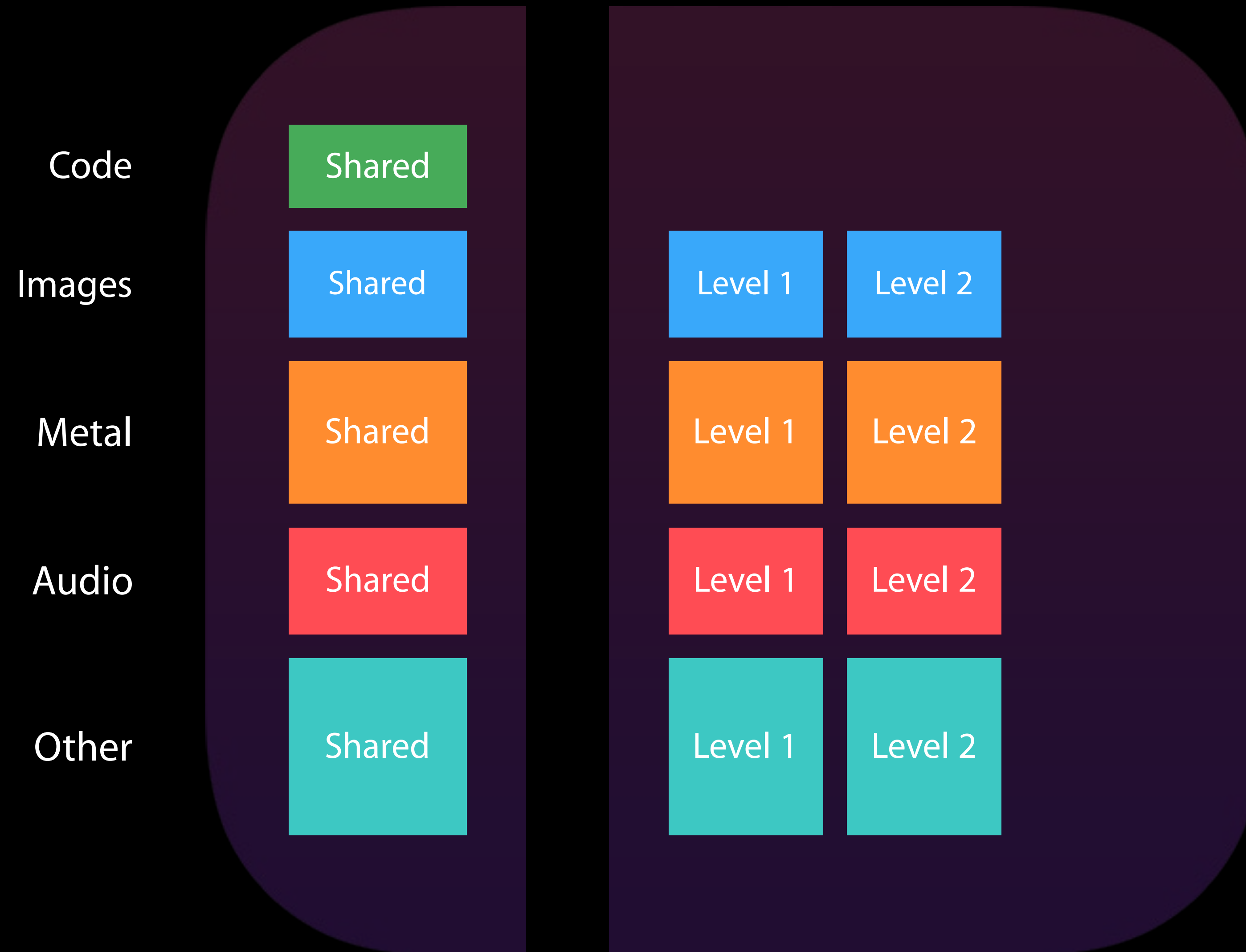
On Demand Resources



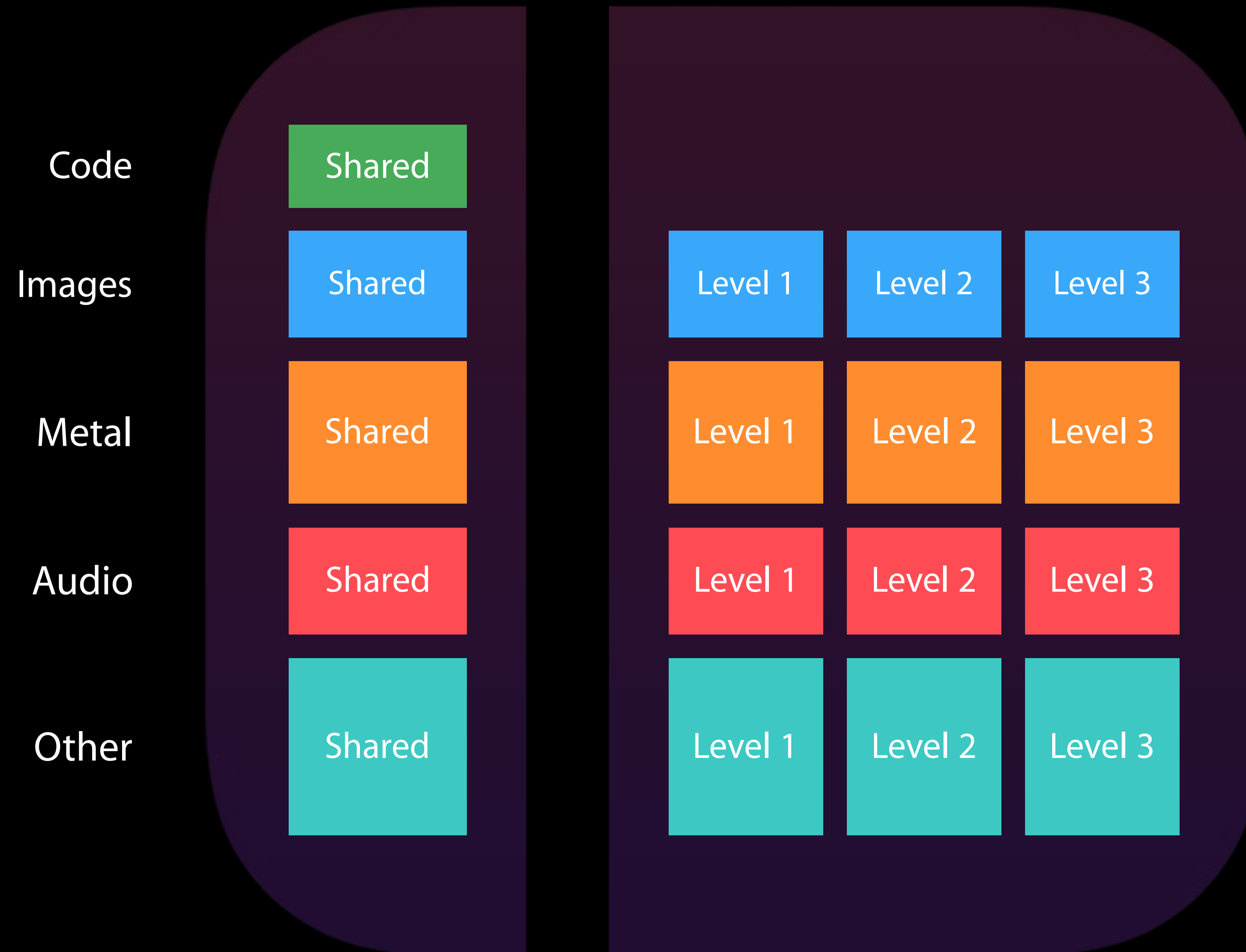
On Demand Resources



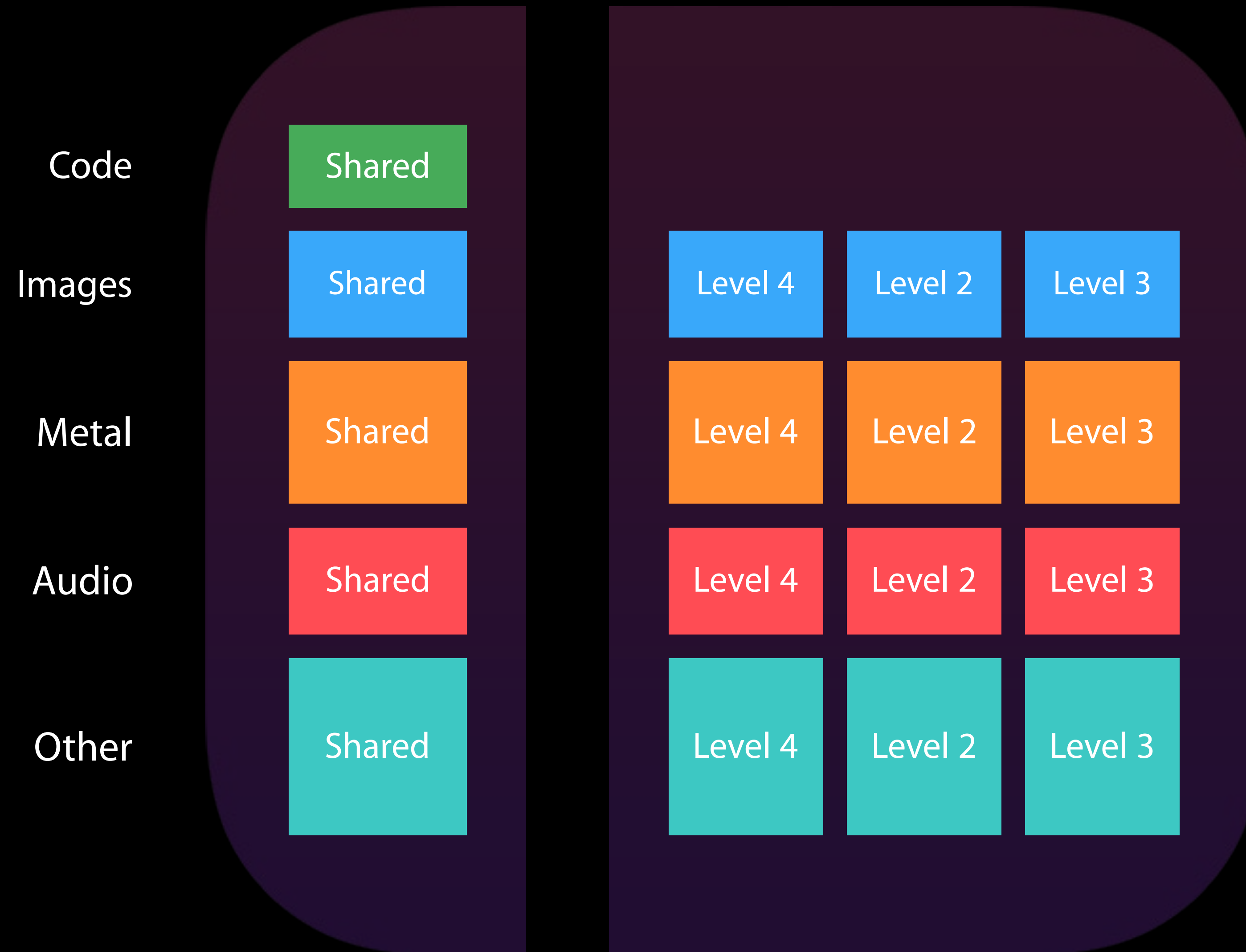
On Demand Resources



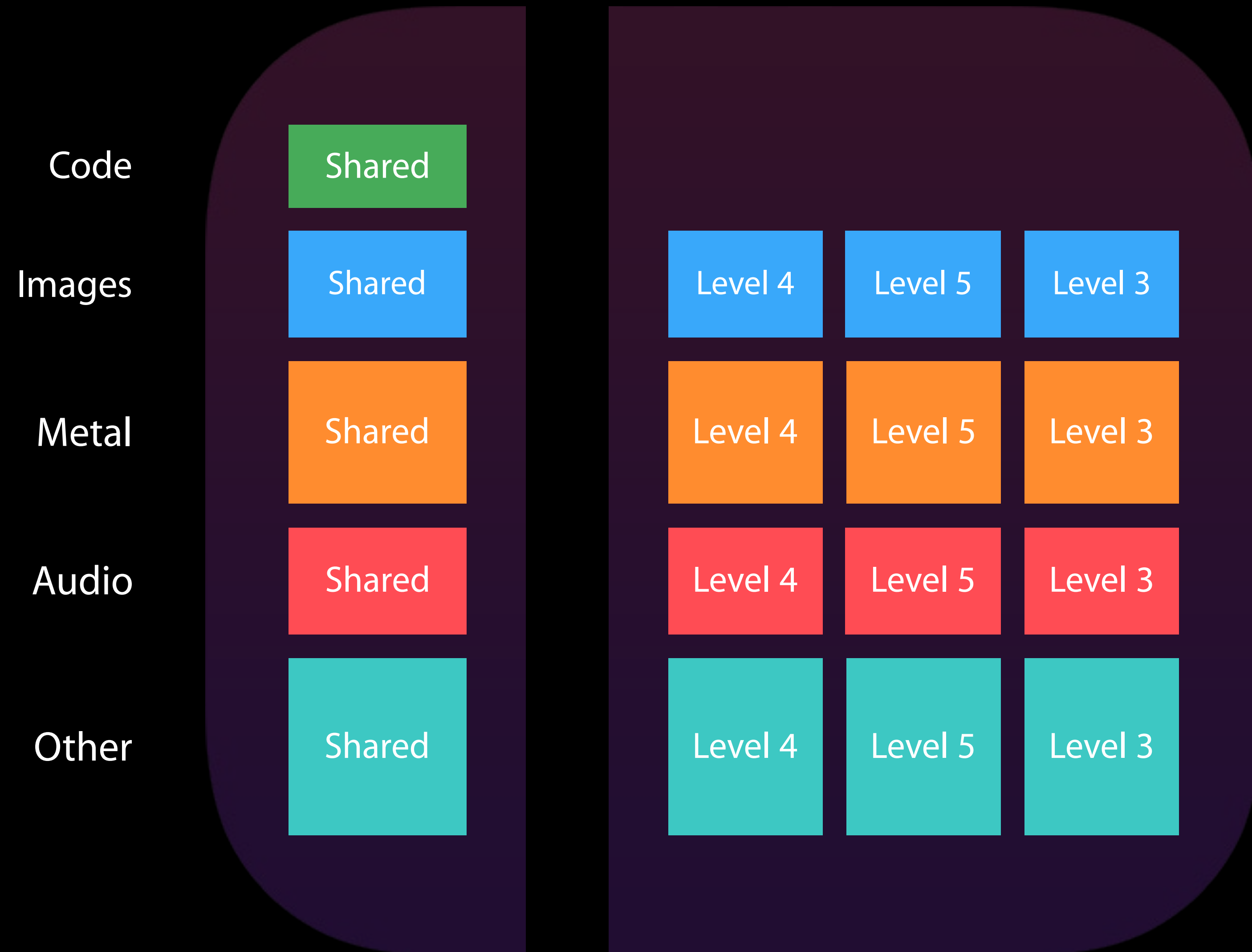
On Demand Resources



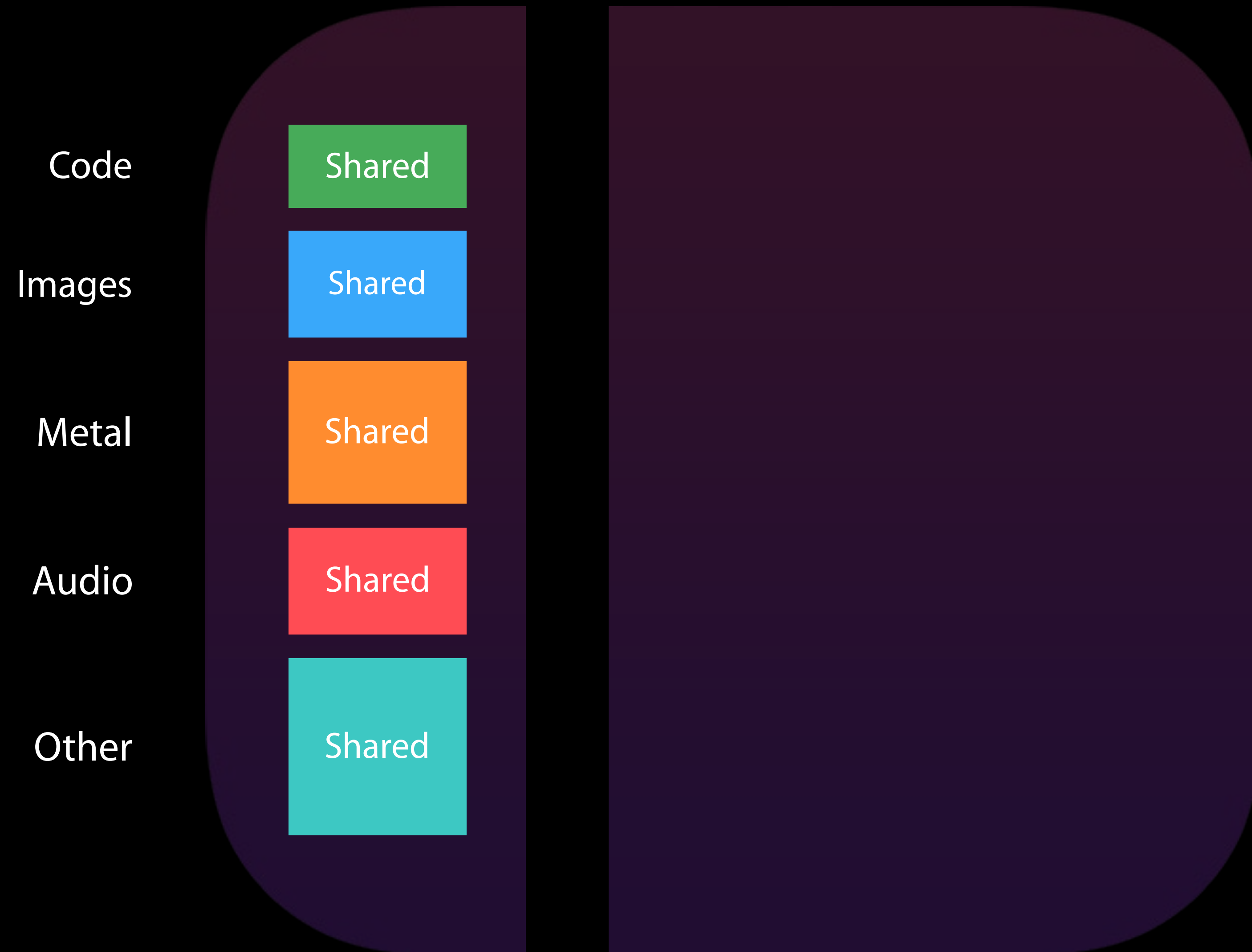
On Demand Resources



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On Demand Resources

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Asset packs are built by Xcode

On Demand Resources

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Can contain any non-executable assets

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Can contain any non-executable assets

Hosted by the App Store

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Downloaded when needed

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Asset packs are built by Xcode

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Device-thinned just like the other content

On Demand Resources

Asset packs are built by Xcode

Can contain any non-executable assets

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Device-thinned just like the other content

Size Savings (DemoBots)



~22 MB

Size Savings (DemoBots)



~14 MB



~8 MB

Advantages

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Support devices with constrained storage

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Shorter download times

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Easier to stay within over-the-air size limits

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Support more types of devices with less compromise

Advantages

Support devices with constrained storage

Shorter download times

Easier to stay within over-the-air size limits

Support more types of devices with less compromise

Add features that couldn't previously fit

Asset Slicing

Patrick Heynen Senior Engineering Manager

How Does It Work?



How Does It Work?

Seamlessly integrated into build, export, and publish workflows



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Seamlessly integrated into build, export, and publish workflows

Post-processing of Asset Catalog and executable files



What Do You Need to Do?

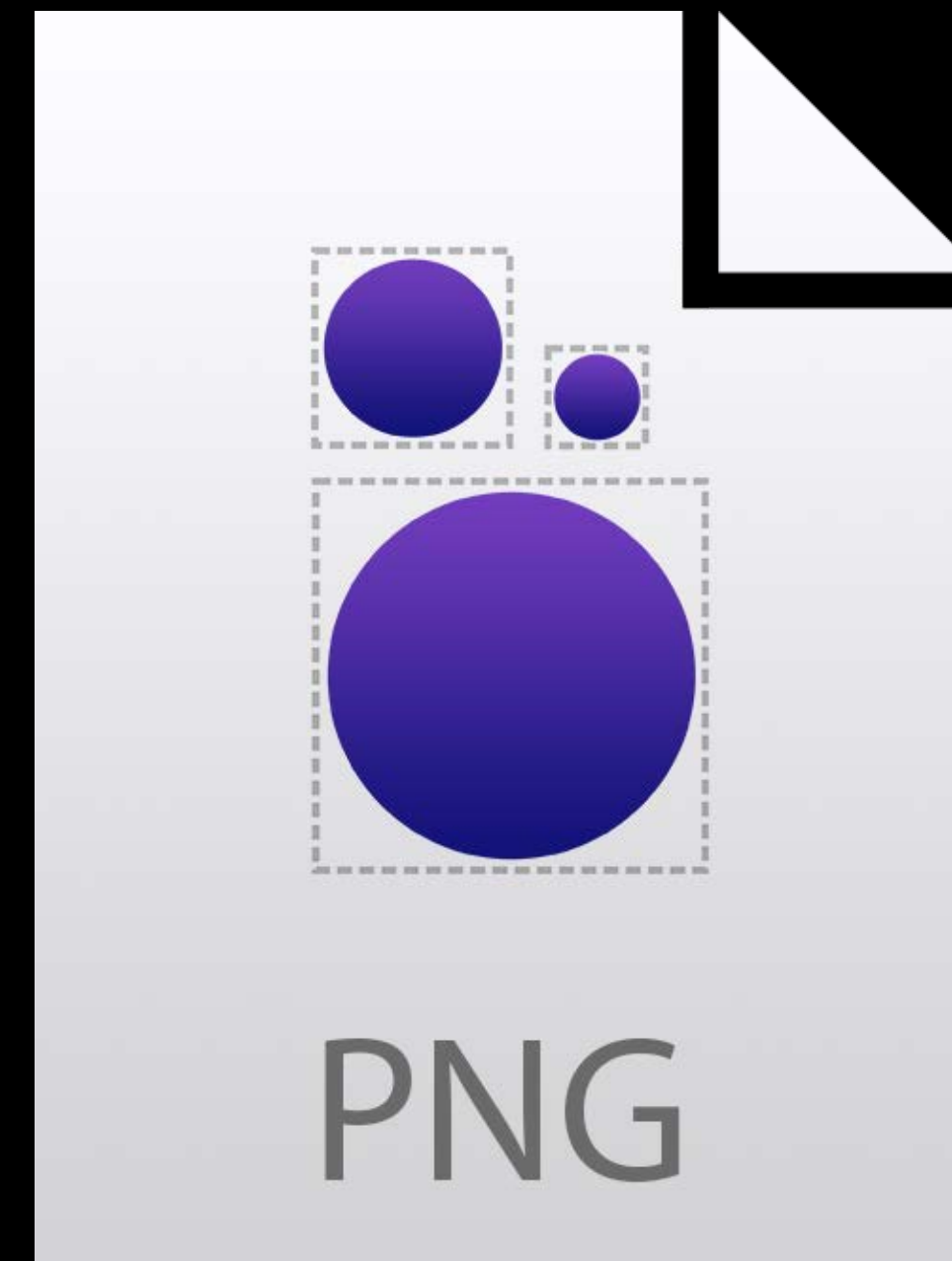
What Do You Need to Do?

You've probably already been doing it

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You've probably already been doing it

- 1x, 2x, 3x Artwork



What Do You Need to Do?

You've probably already been doing it

- 1x, 2x, 3x Artwork

Use Asset Catalogs



Asset Catalogs

Asset Catalogs

Asset Catalogs organize resources according to relevant device traits

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Asset Catalogs organize resources according to relevant device traits

Note: Resources must be in an Asset Catalog to be eligible for thinning

Device Traits

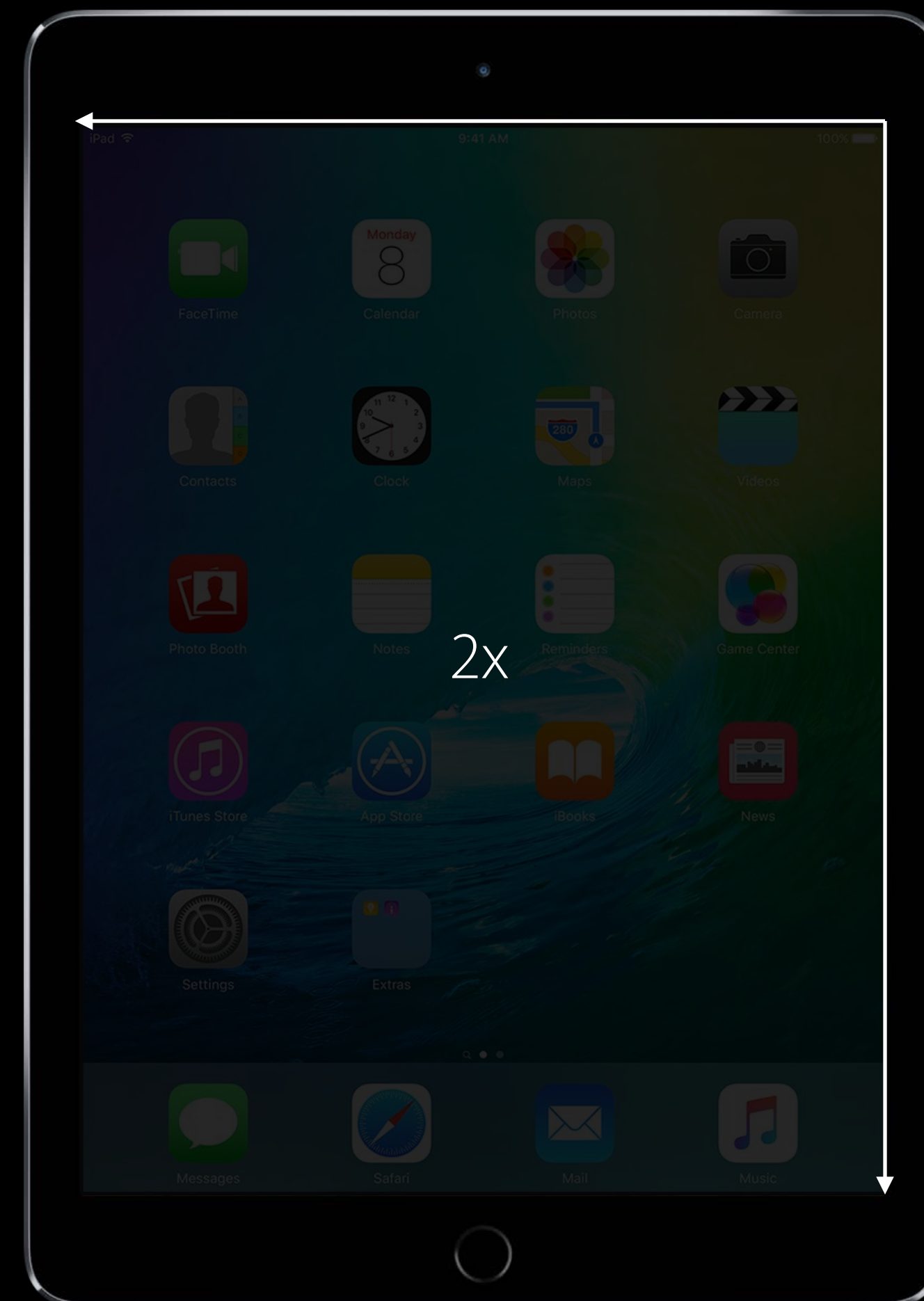
Devices have a key set of characteristics which assets can be optimized for



Device Traits

Devices have a key set of characteristics which assets can be optimized for

- Screen resolution



Device Traits

Devices have a key set of characteristics which assets can be optimized for

- Screen resolution
- Device family



Device Traits

NEW

Device Traits

NEW

- Graphics capabilities
 - Metal GPUFamily1, Metal GPUFamily2
- Memory Level
 - 1GB, 2GB

Asset Catalog Content

Named Images

Named Images

Artwork resources for your application

Named Images

Artwork resources for your application

- PNG, JPG, and PDF formats

Named Data

NEW

Named Data

NEW

Store arbitrary file content

Named Data

NEW

Store arbitrary file content

Classify according to hardware capabilities

Named Data

NEW

Store arbitrary file content

Classify according to hardware capabilities

Use NSDataAsset class to retrieve content in your application

Sprite Atlases

NEW

Sprite Atlases

NEW

Full SpriteKit integration



Sprite Atlases

NEW

Full SpriteKit integration

Automatic creation of SKTextureAtlases
from image assets



Sprite Atlases

NEW

Full SpriteKit integration

Automatic creation of SKTextureAtlases
from image assets

Will be thinned appropriately



Asset Catalogs to App Thinning

Asset Catalogs to App Thinning

Each asset in the catalog has trait markup information

Asset Catalogs to App Thinning

Each asset in the catalog has trait markup information

Traits used to route resources to relevant thinned app variants

Asset Organization

Asset Organization

Cataloging efficiently is key

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Cataloging efficiently is key

Robust markup means less redundancy in sliced application variants

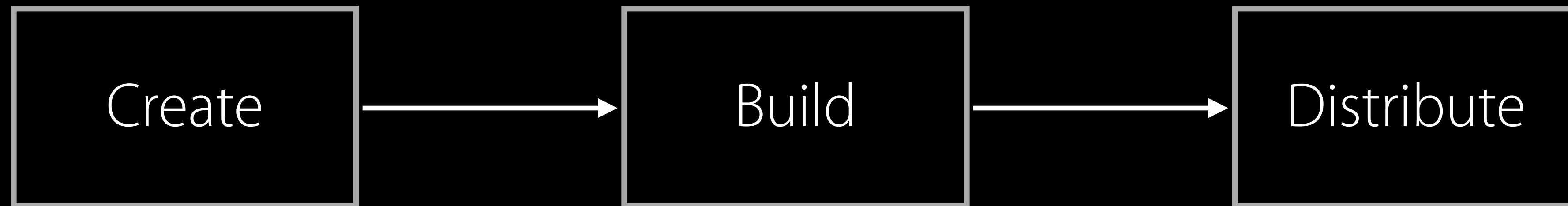
Asset Organization

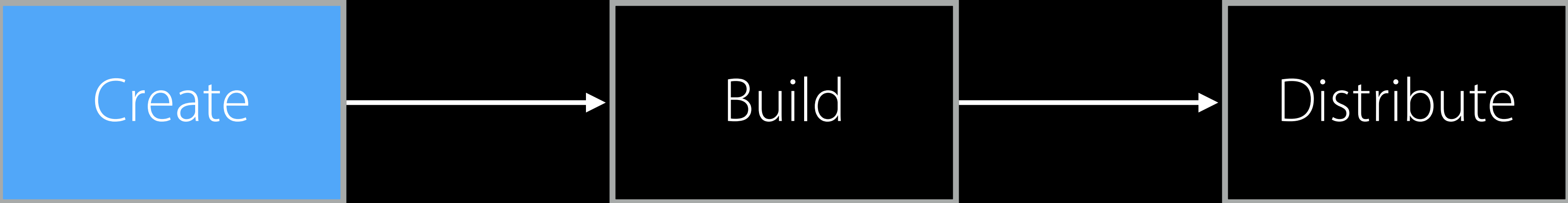
Cataloging efficiently is key

Robust markup means less redundancy in sliced application variants

Don't leave assets as universal if they are only used on one device family

Workflows



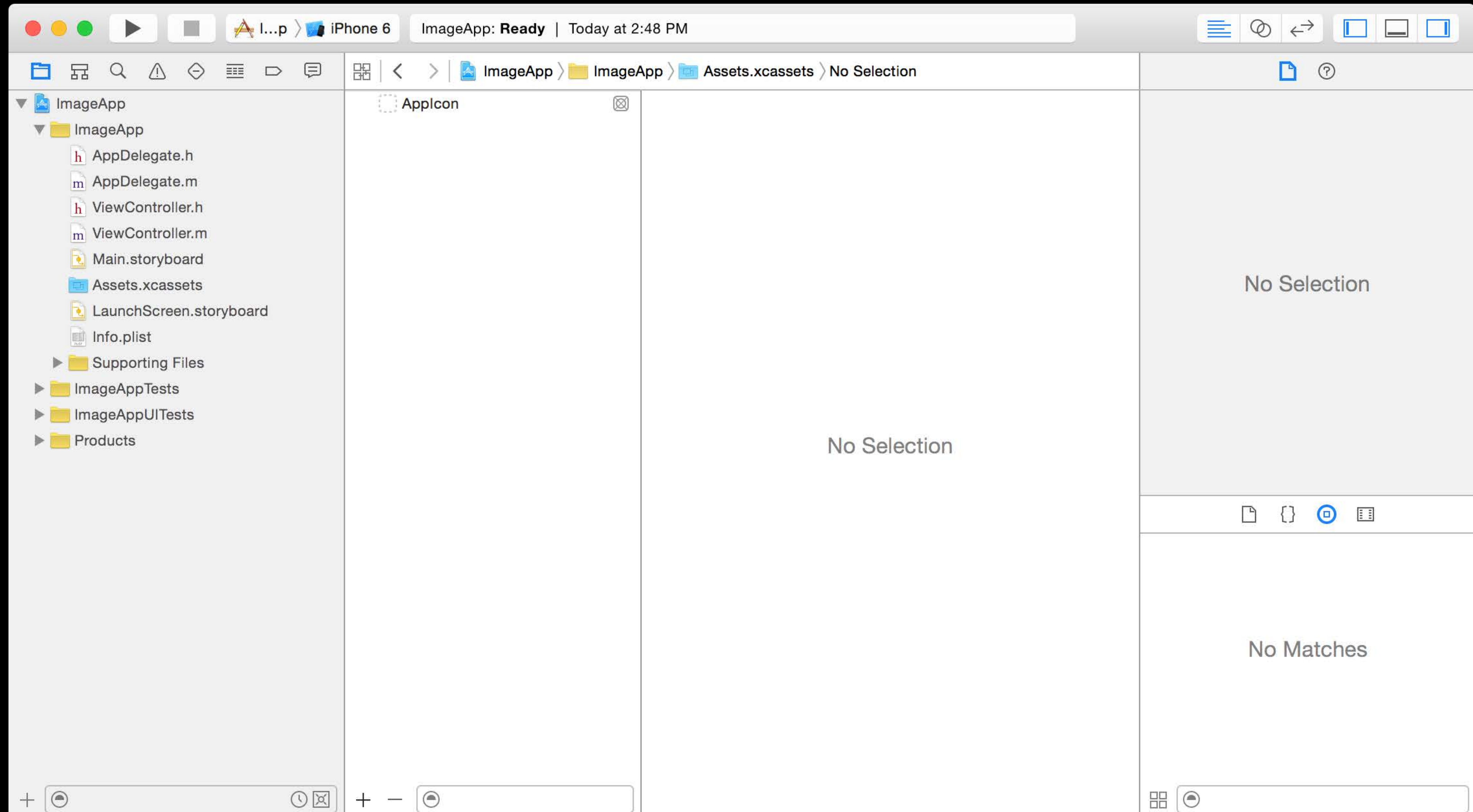


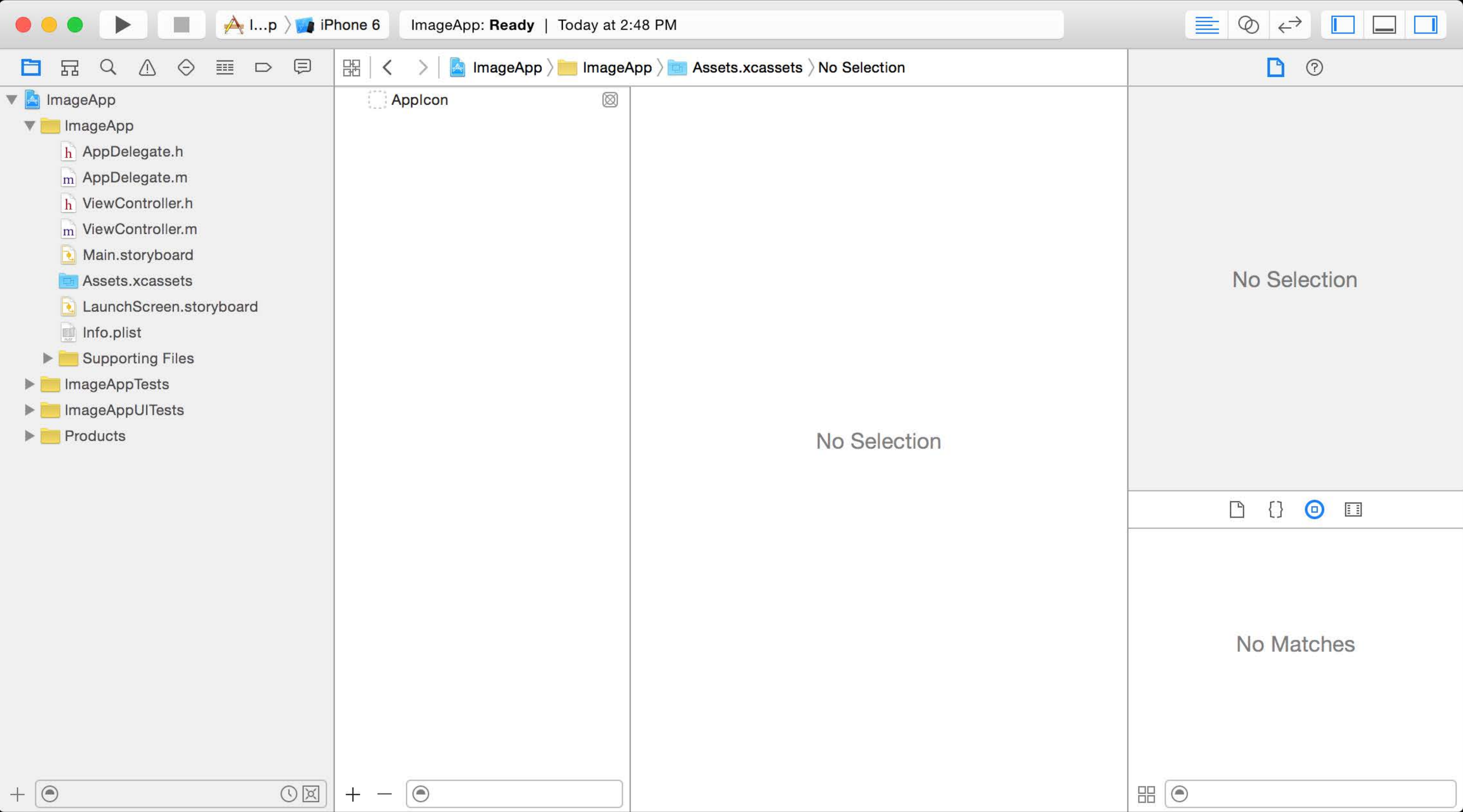
Xcode Asset Catalog Editor

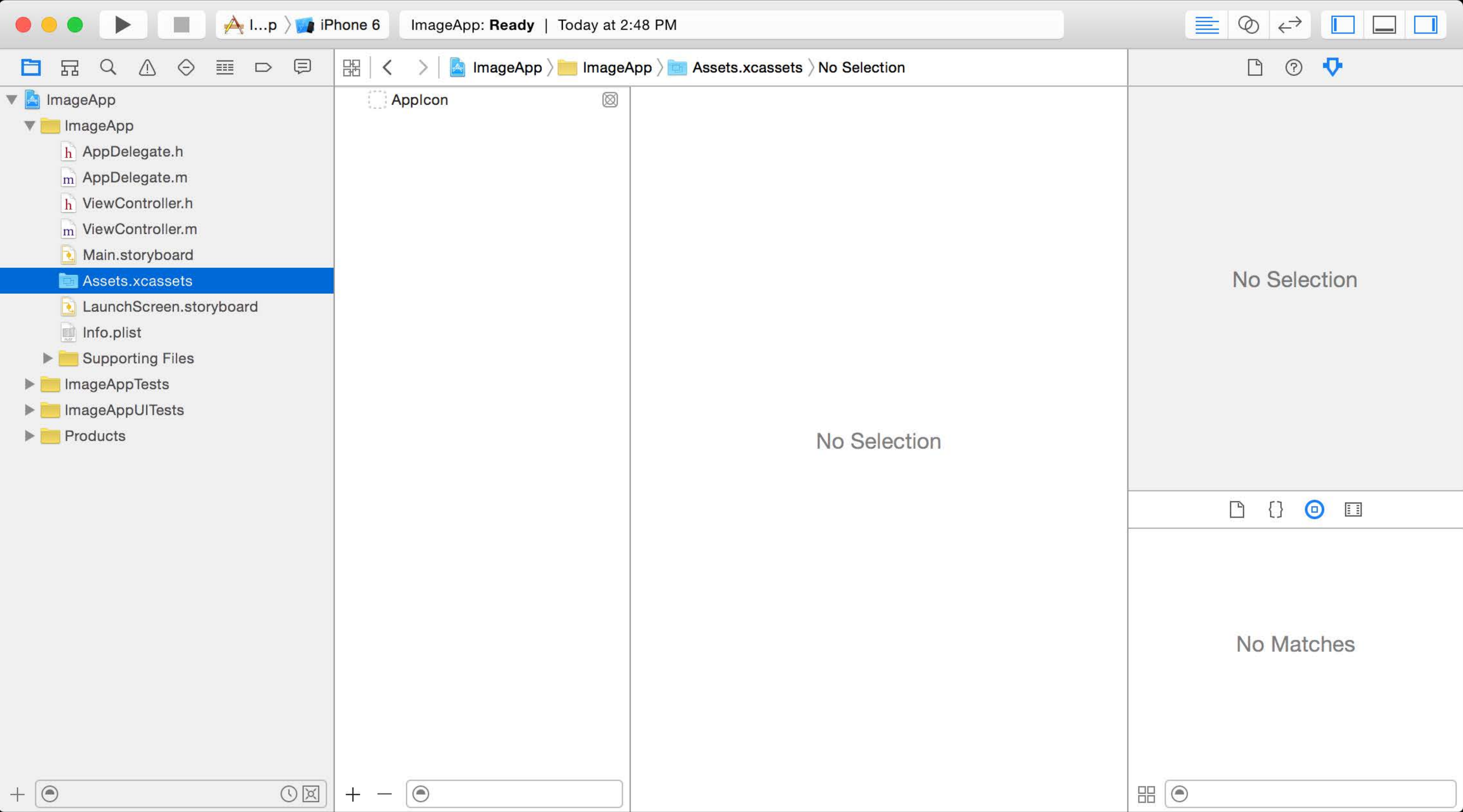
Xcode Asset Catalog Editor

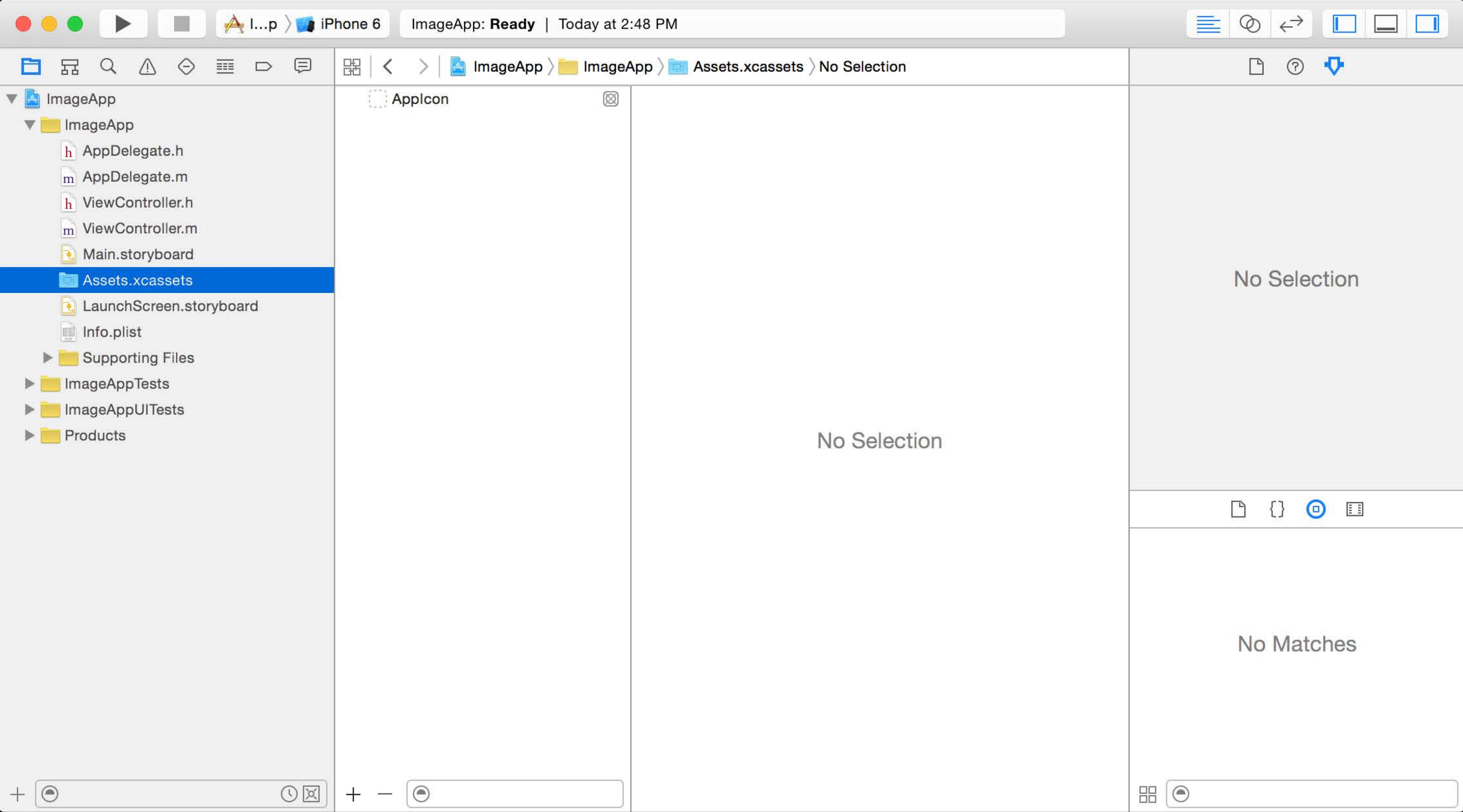


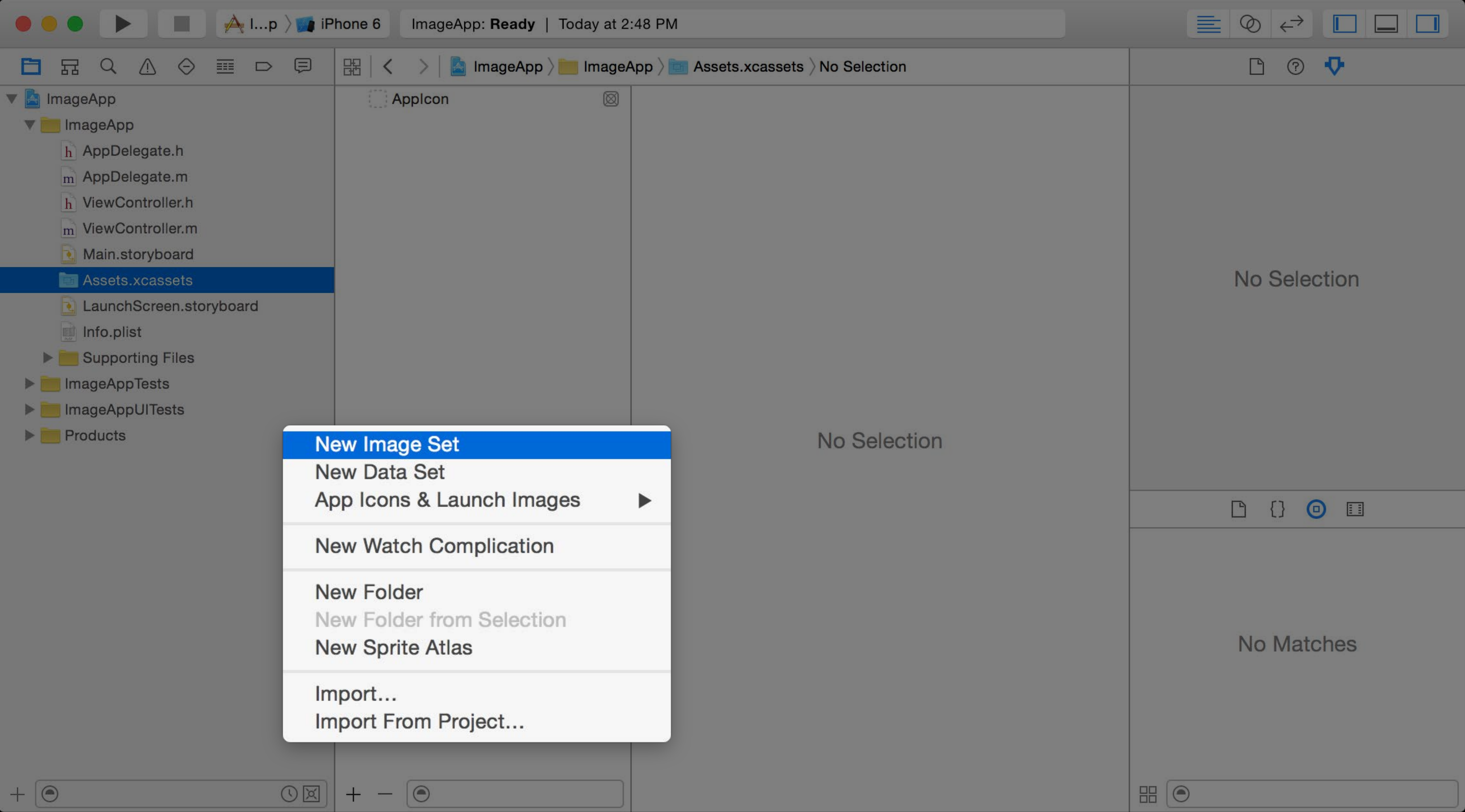
Xcode Asset Catalog Editor

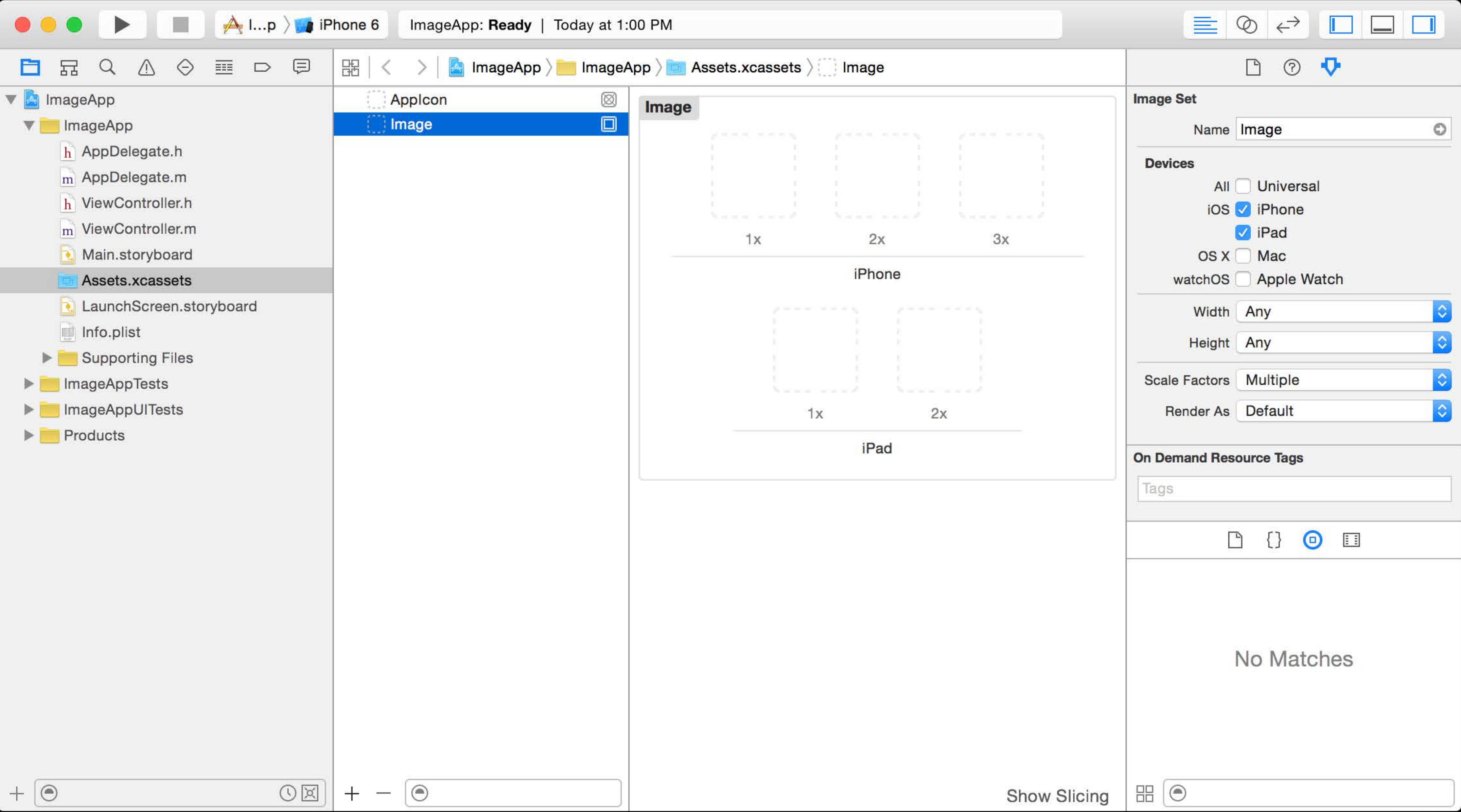


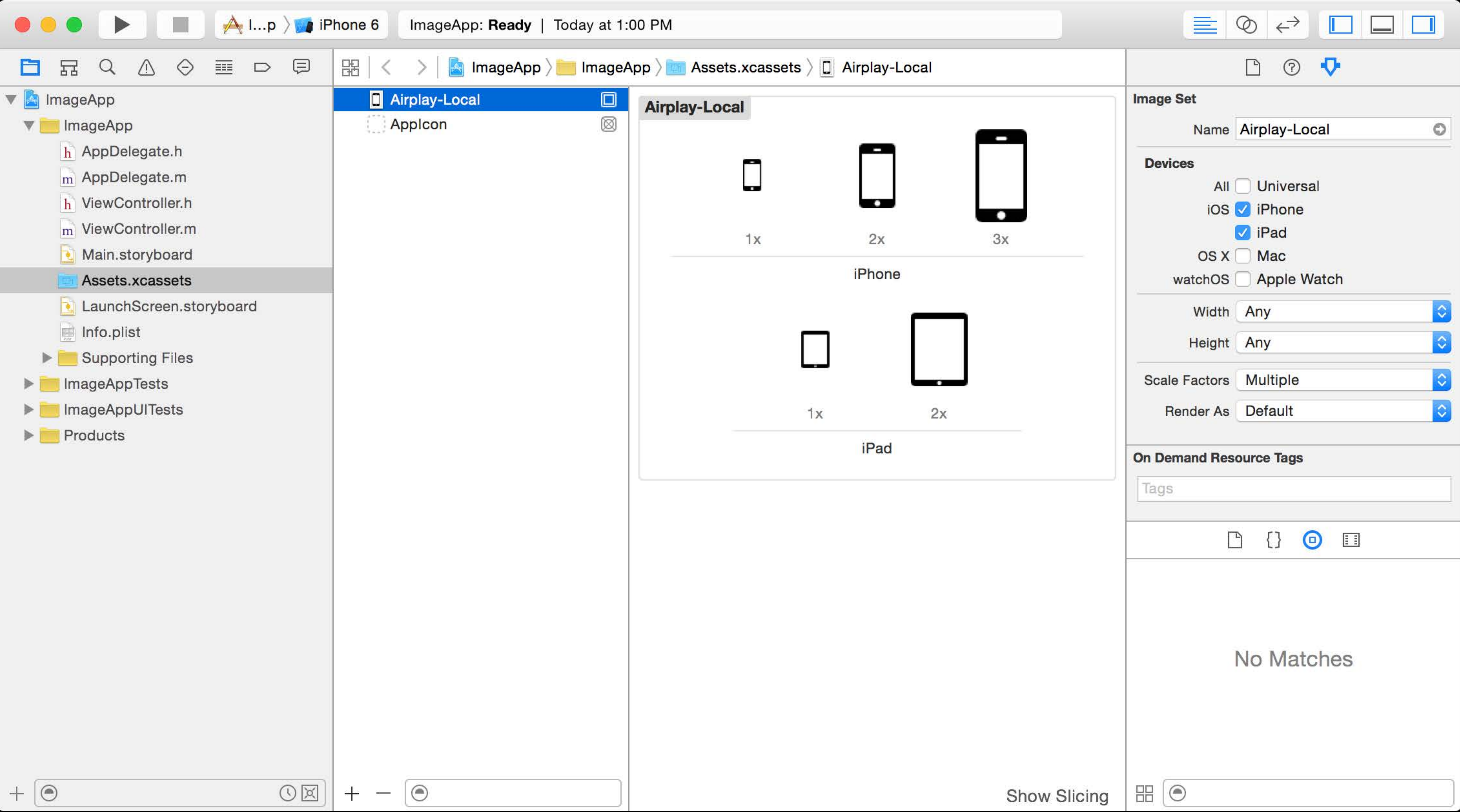












Asset Catalogs and External Toolchains

Asset Catalogs and External Toolchains

What if your team cannot use Xcode for asset production?

Asset Catalogs and External Toolchains

What if your team cannot use Xcode for asset production?

Export image sets and data sets from existing asset pipelines

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XCAAsset Source Artifact Format

Asset Catalogs and External Toolchains

What if your team cannot use Xcode for asset production?

Export image sets and data sets from existing asset pipelines

XCAAsset Source Artifact Format

<http://developer.apple.com/devcenter/ios>

Asset Catalogs and External Toolchains

What if your team cannot use Xcode for asset production?

Export image sets and data sets from existing asset pipelines

XCAAsset Source Artifact Format

Simple folder structure and JSON markup

Image Sets








Name	
▼ 	Airplay-Local.imageset
	Airplay-iPad.png
	Airplay-iPad@2x.png
	Airplay-iPhone.png
	Airplay-iPhone@2x.png
	Airplay-iPhone@3x.png
	Contents.json

Image Sets

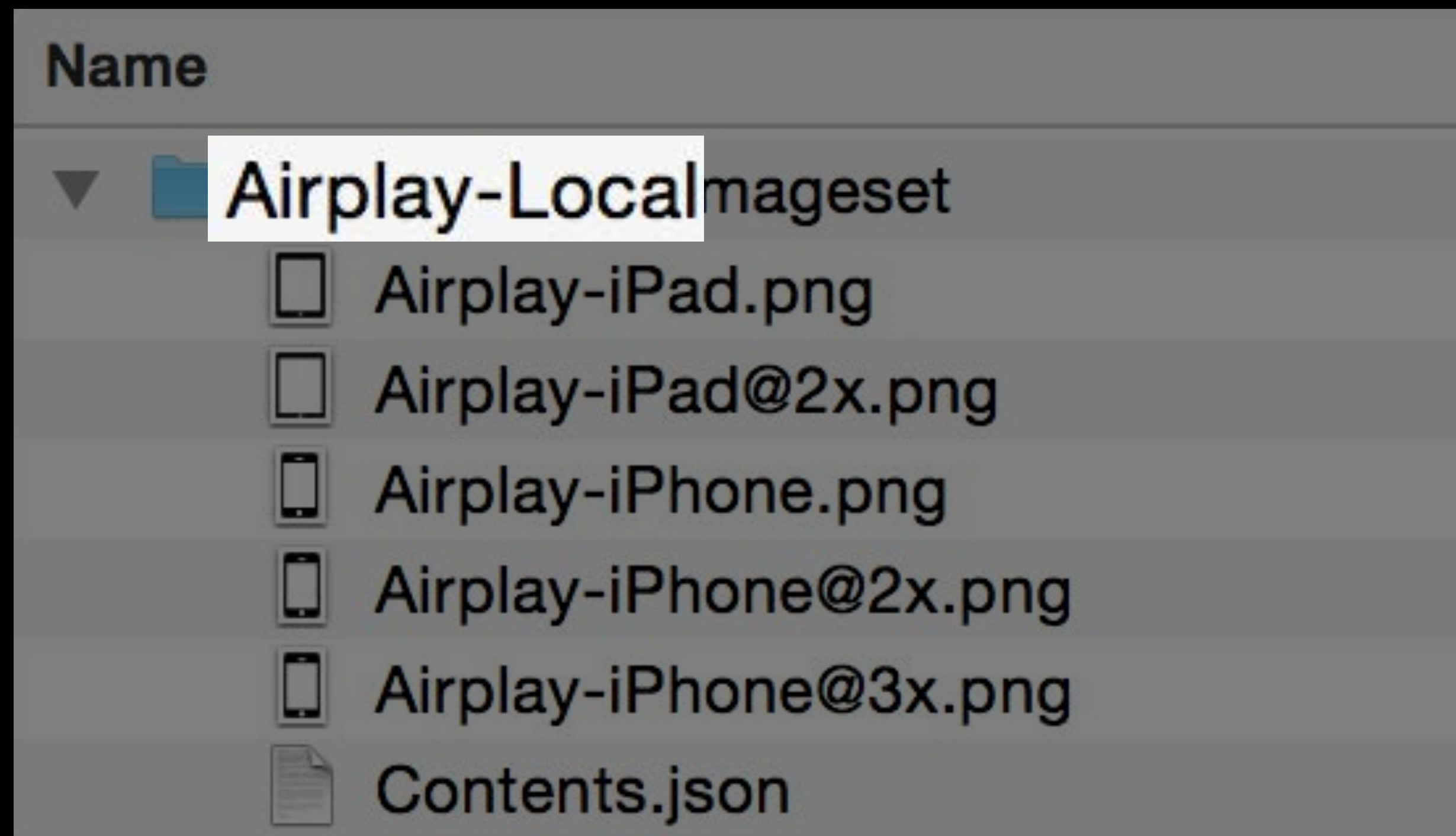


Image Sets

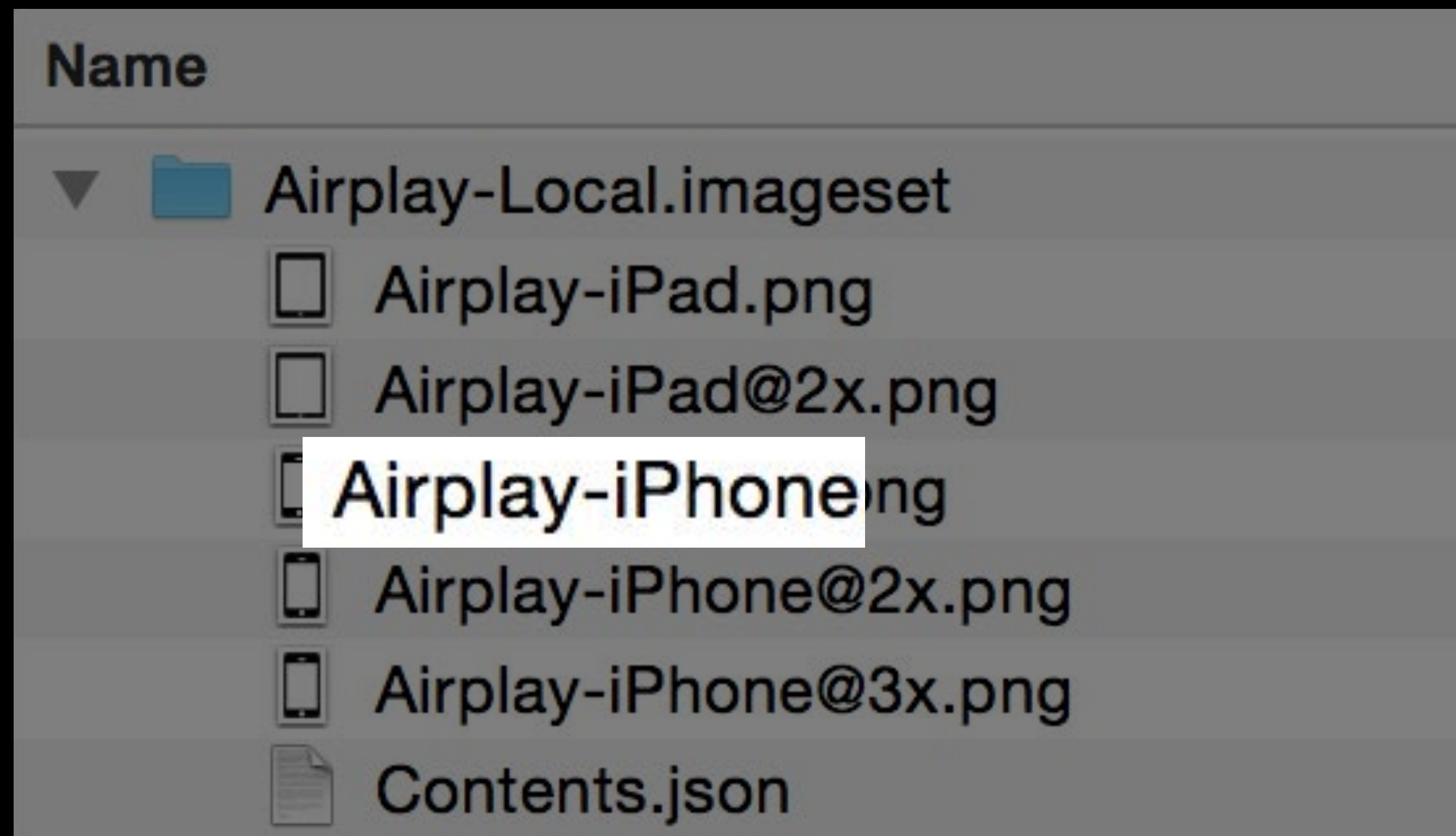
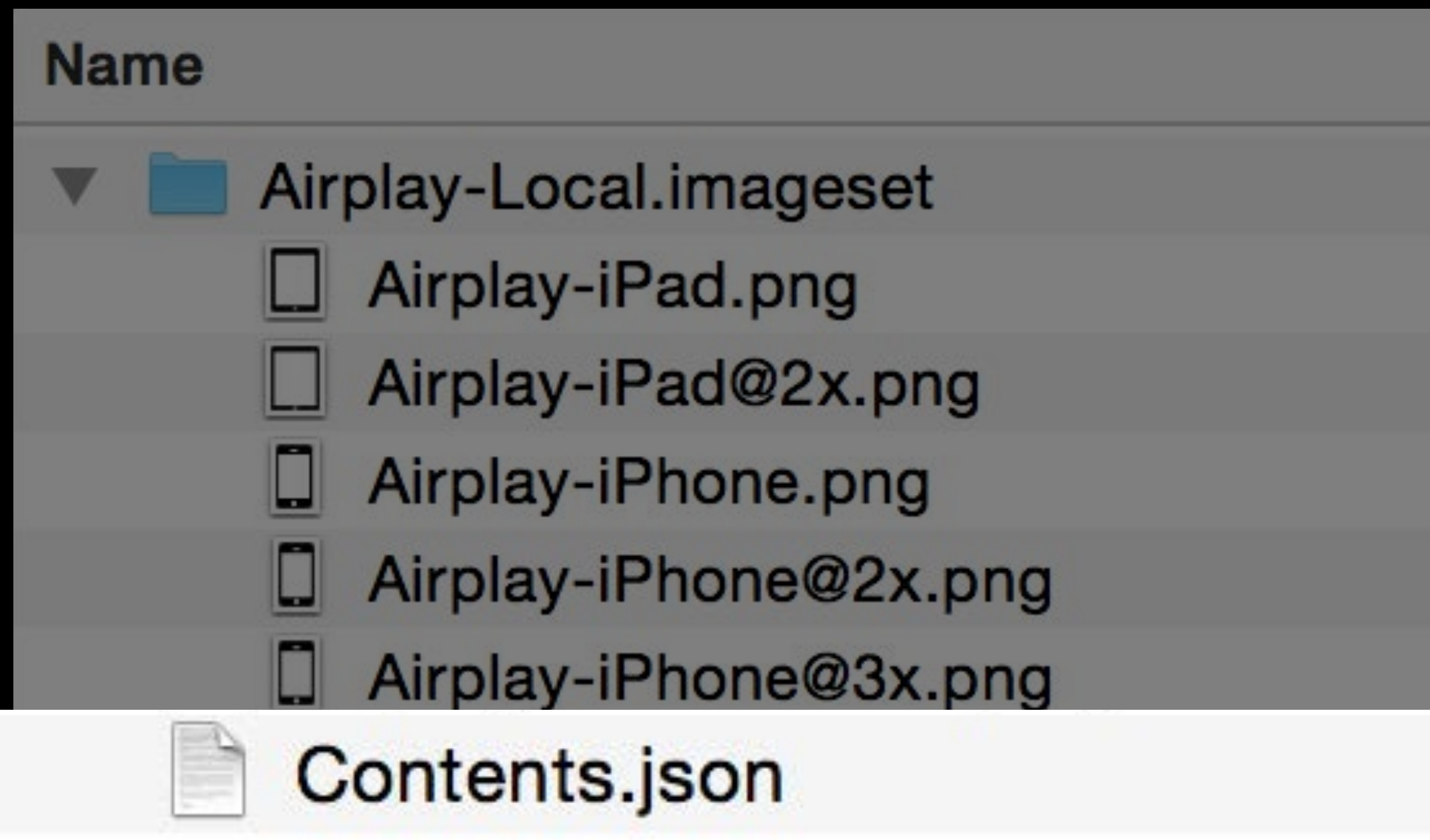


Image Sets



Contents.json

Contains all asset markup information

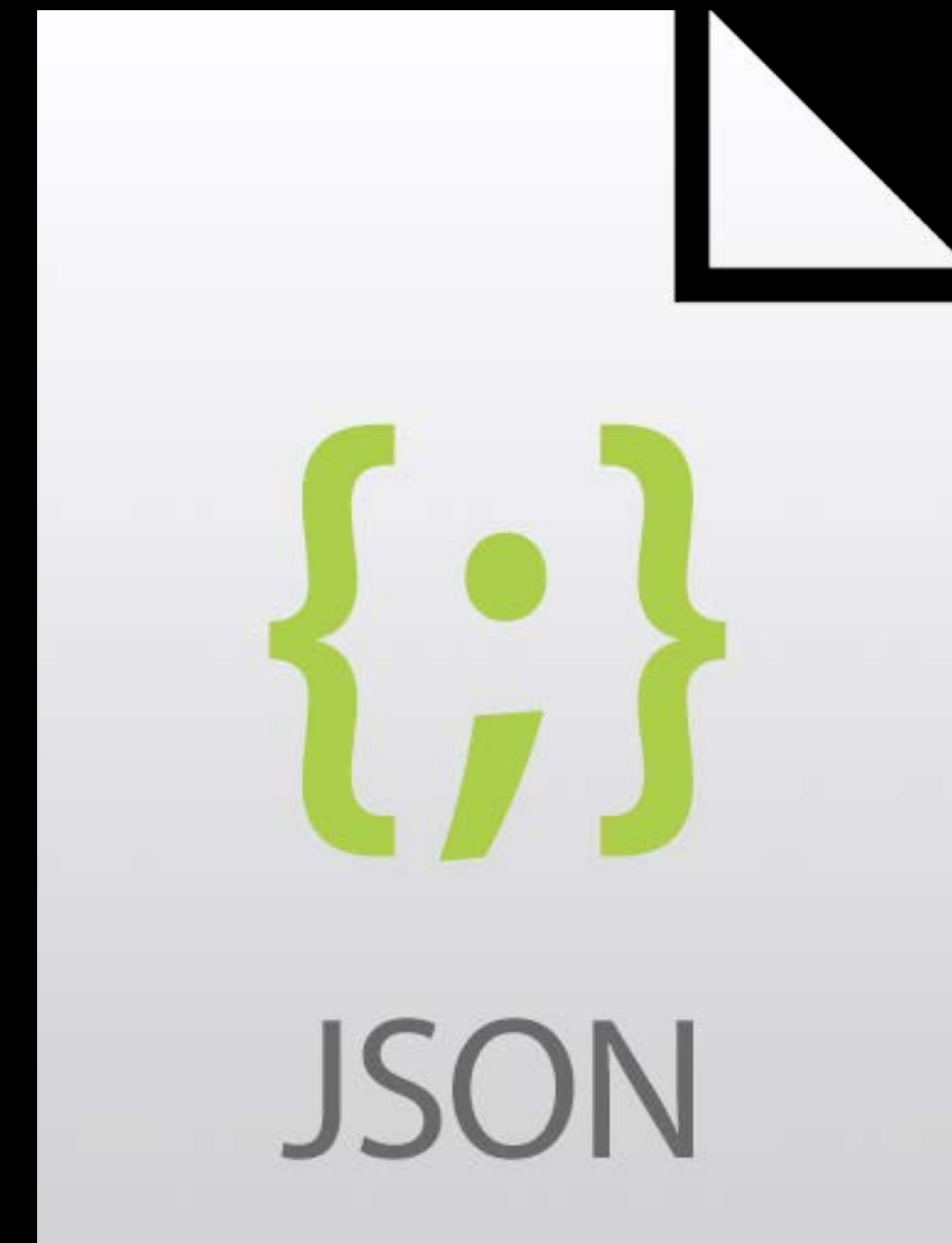
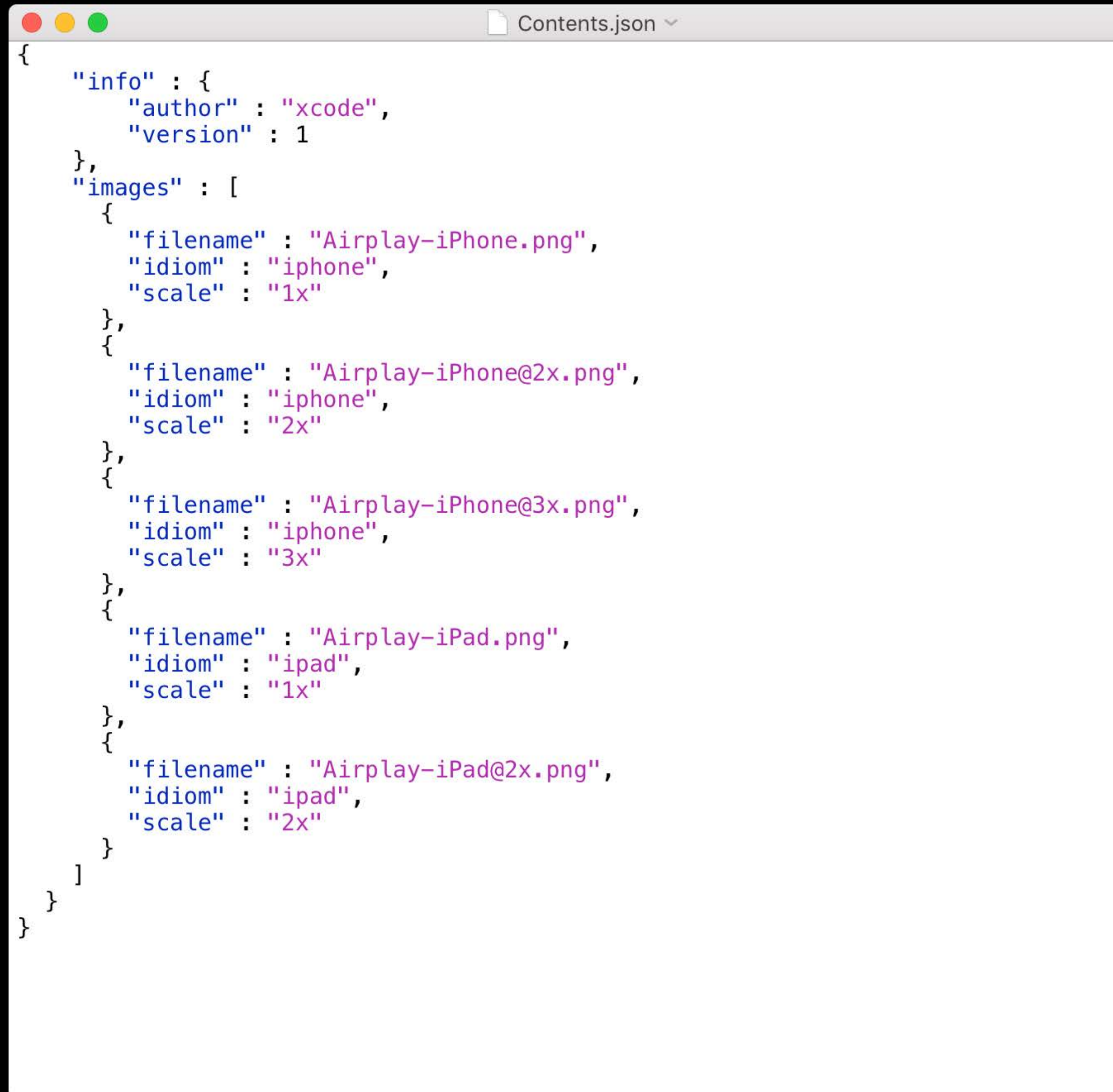


Image Set Contents.json



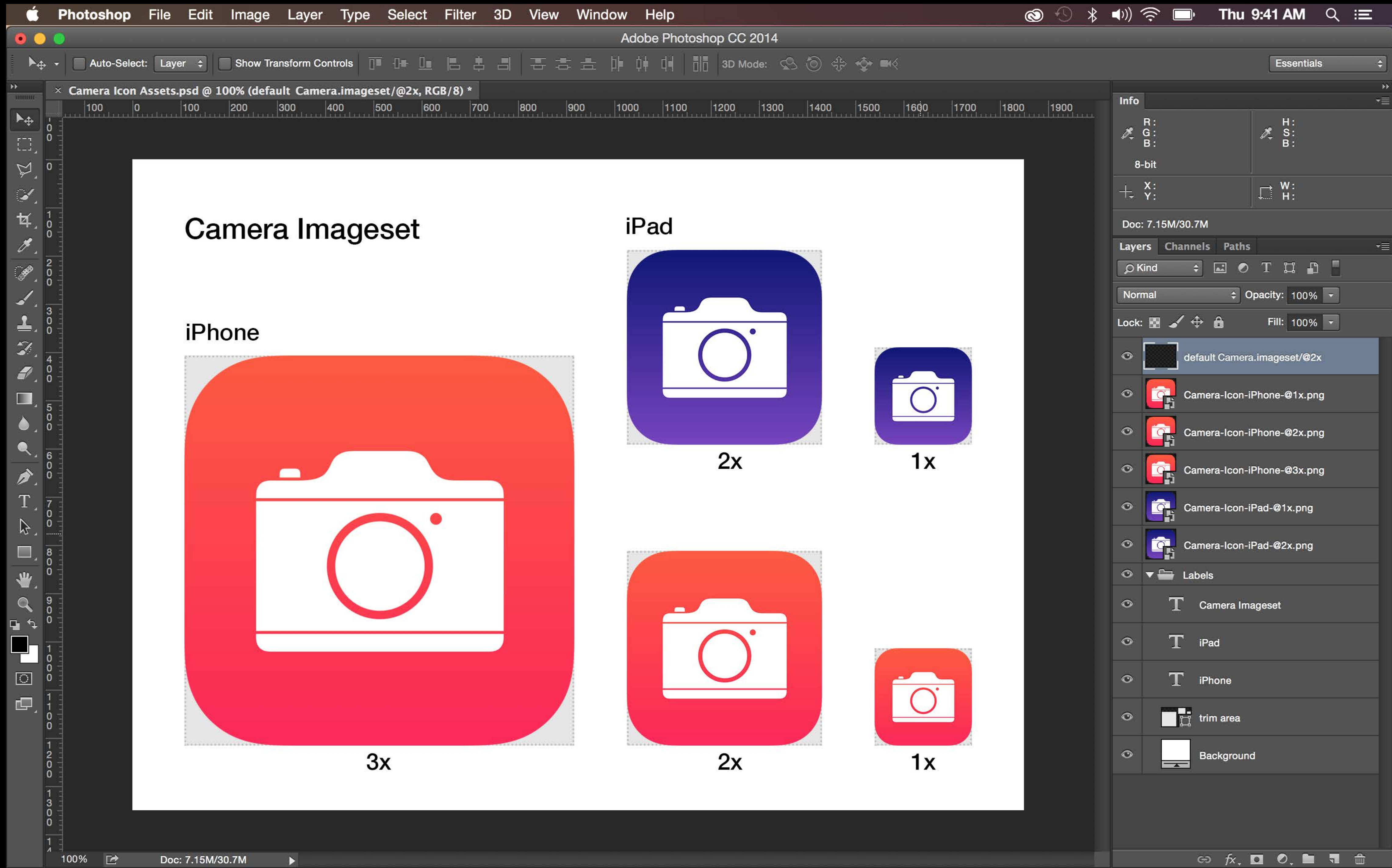
```
{
  "info" : {
    "author" : "xcode",
    "version" : 1
  },
  "images" : [
    {
      "filename" : "Airplay-iPhone.png",
      "idiom" : "iphone",
      "scale" : "1x"
    },
    {
      "filename" : "Airplay-iPhone@2x.png",
      "idiom" : "iphone",
      "scale" : "2x"
    },
    {
      "filename" : "Airplay-iPhone@3x.png",
      "idiom" : "iphone",
      "scale" : "3x"
    },
    {
      "filename" : "Airplay-iPad.png",
      "idiom" : "ipad",
      "scale" : "1x"
    },
    {
      "filename" : "Airplay-iPad@2x.png",
      "idiom" : "ipad",
      "scale" : "2x"
    }
  ]
}
```

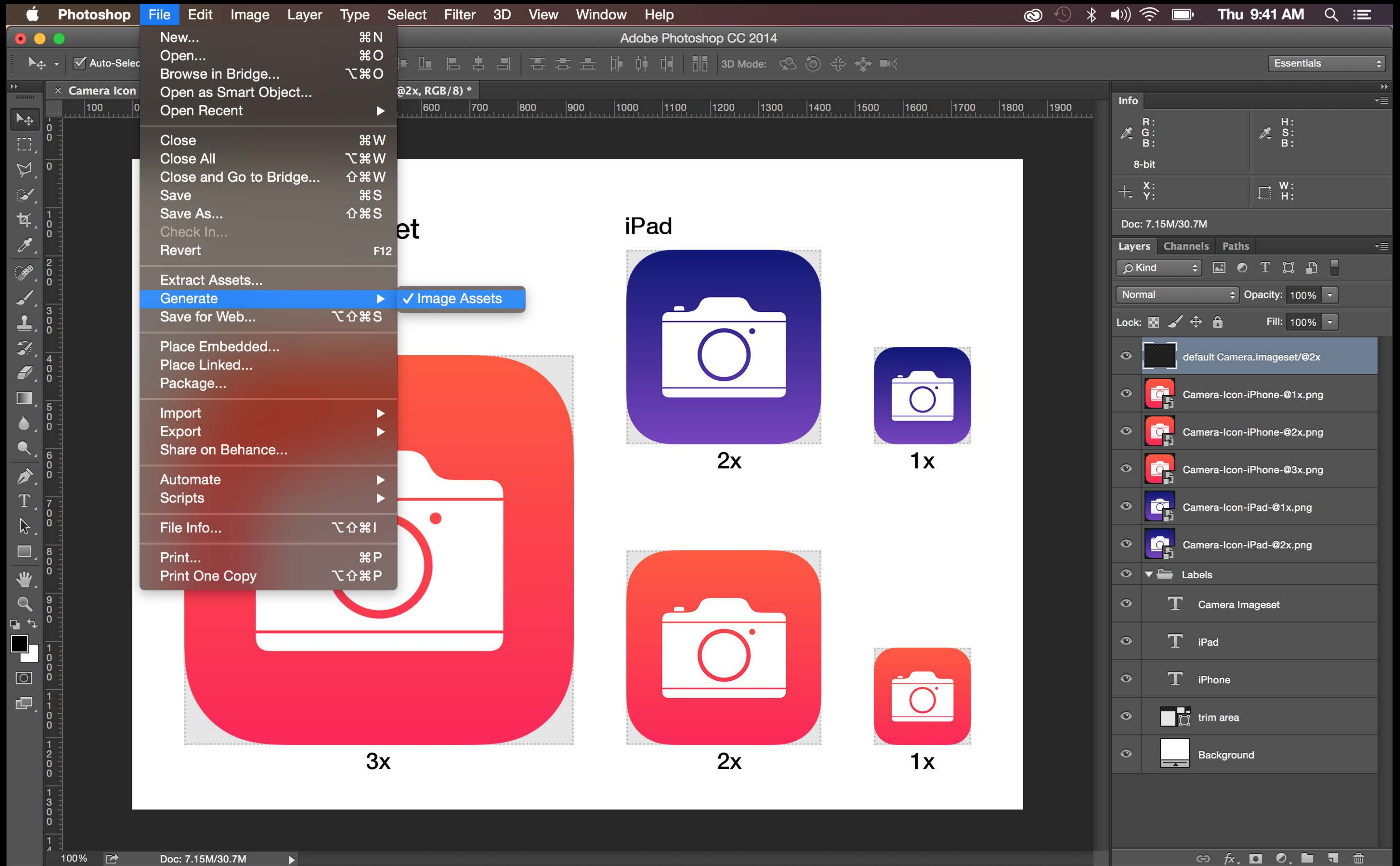
Data Set Contents.json

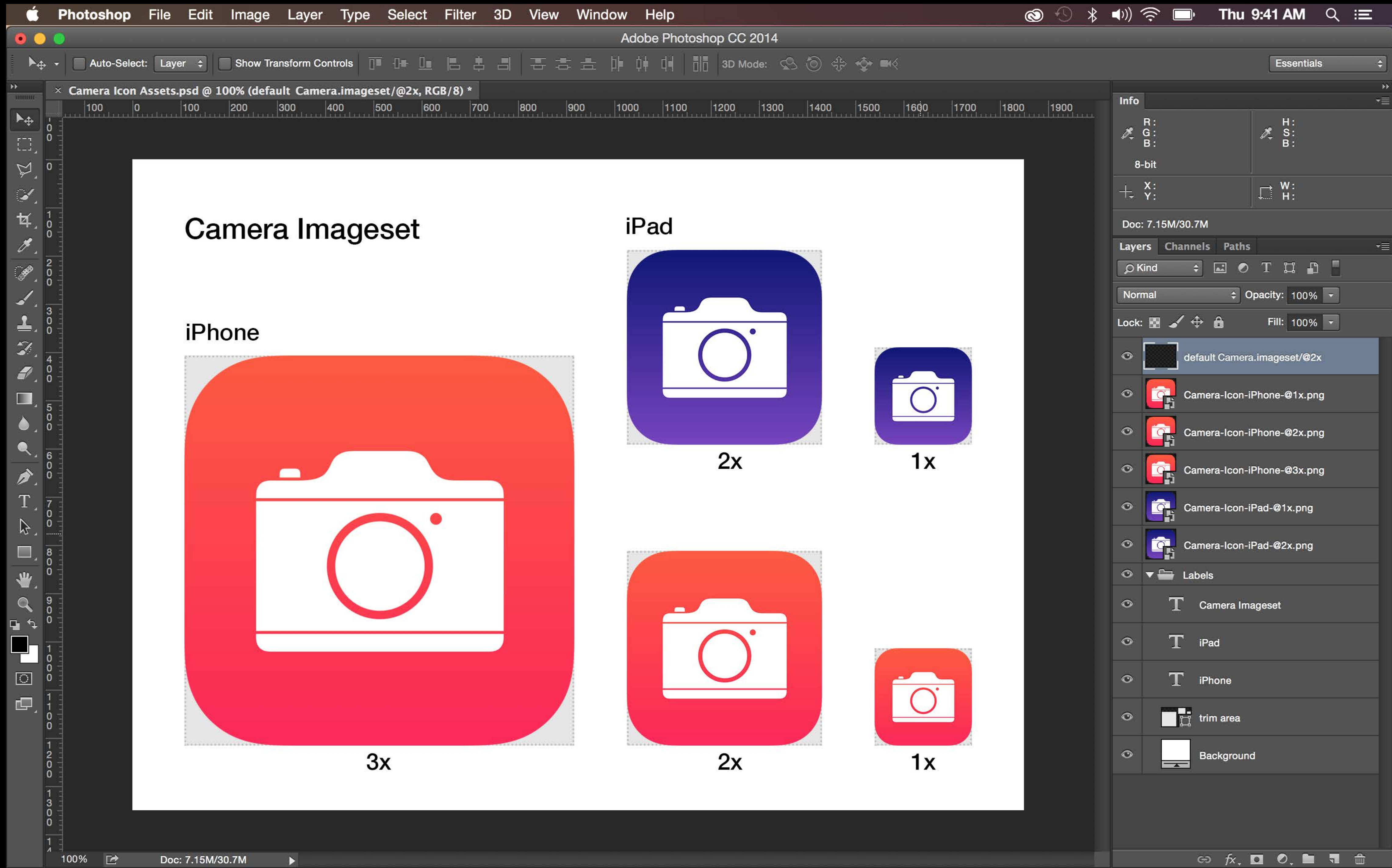
```
Contents.json
{
  "info" : {
    "author" : "xcode",
    "version" : 1
  },
  "data" : [
    {
      "filename" : "NormalMaps_512x512.rg8",
      "universal-type-identifier" : "public.uncompressed-rg8",
      "memory" : "1GB"
    },
    {
      "filename" : "NormalMaps_512x512.eac",
      "universal-type-identifier" : "public.eac",
      "memory" : "1GB",
      "graphicsFeatureSet" : "metal1v2"
    },
    {
      "filename" : "NormalMaps_512x512.astc",
      "universal-type-identifier" : "public.astc",
      "memory" : "1GB",
      "graphicsFeatureSet" : "metal2v2"
    },
    {
      "filename" : "NormalMaps_1024x1024.astc",
      "universal-type-identifier" : "public.astc",
      "memory" : "2GB",
      "graphicsFeatureSet" : "metal2v2"
    }
  ]
}
```

Example: Image Set Creation

Hypothetical workflow using Photoshop CC Generator







Camera Assets-assets

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🔖

Search

Camera Assets-assets

Favorites

📁 All My Files

📶 AirDrop

🖨 Desktop

☁ iCloud Drive

📂 Applications

📄 Documents

⬇ Downloads

🔗 Creative Cloud Files

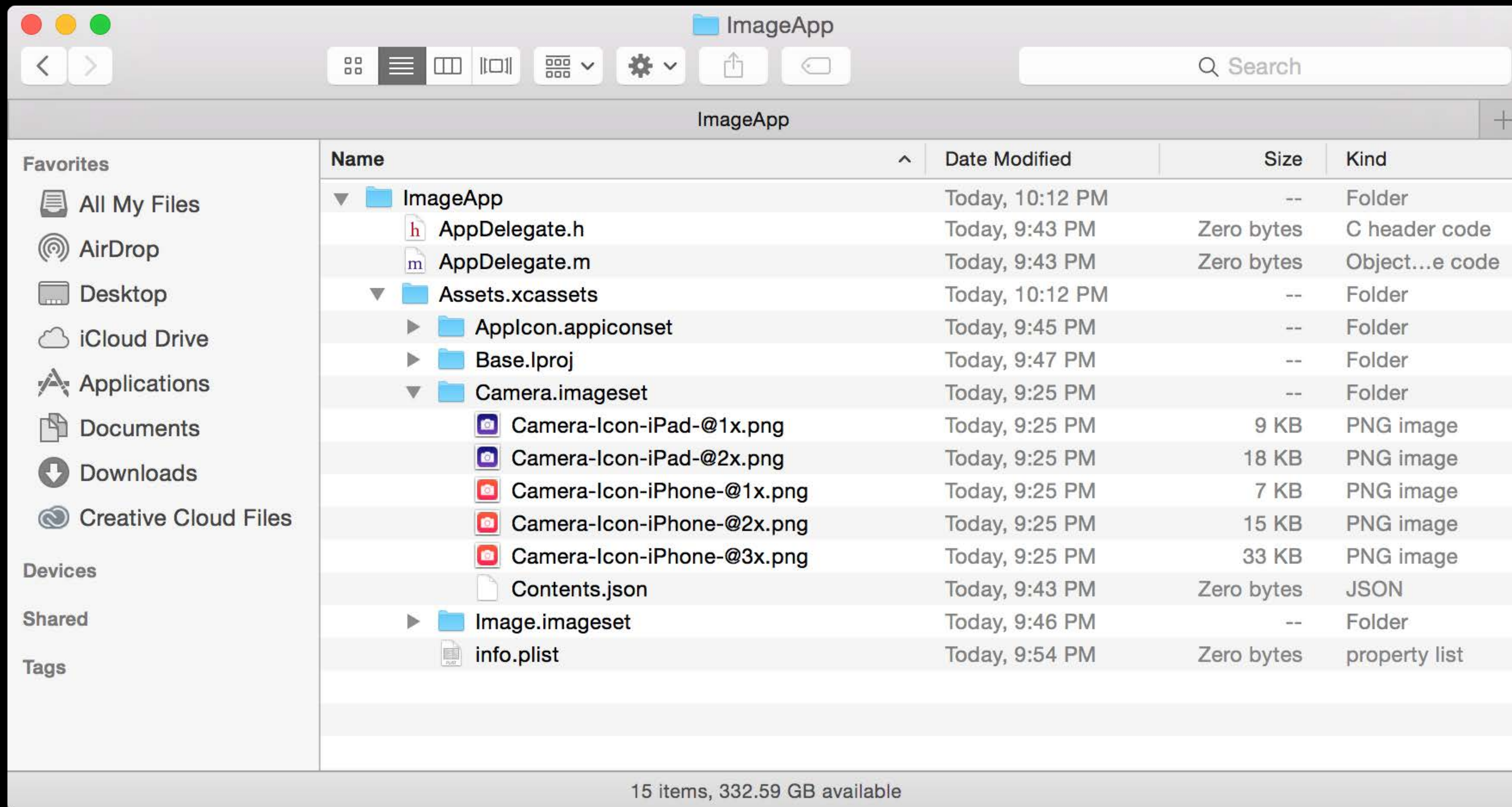
Devices

Shared

Tags

Name	Date Modified	Size	Kind
▼ Artwork-assets-files	Today, 10:14 PM	--	Folder
📄 Camera Icon Assets.psd	Today, 9:25 PM	2.9 MB	Adobe...ument
▼ Camera Assets-assets	Today, 10:14 PM	--	Folder
▼ Camera.imageset	Today, 9:25 PM	--	Folder
📄 Camera-Icon-iPad-@1x.png	Today, 9:25 PM	9 KB	PNG image
📄 Camera-Icon-iPad-@2x.png	Today, 9:25 PM	18 KB	PNG image
📄 Camera-Icon-iPhone-@1x.png	Today, 9:25 PM	7 KB	PNG image
📄 Camera-Icon-iPhone-@2x.png	Today, 9:25 PM	15 KB	PNG image
📄 Camera-Icon-iPhone-@3x.png	Today, 9:25 PM	33 KB	PNG image
📄 Contents.json	Today, 9:43 PM	Zero bytes	JSON

10 items, 332.59 GB available



ImageApp

Search

ImageApp

Favorites

- All My Files
- AirDrop
- Desktop
- iCloud Drive
- Applications
- Documents
- Downloads
- Creative Cloud Files

Devices

Shared

Tags

Name	Date Modified	Size	Kind
ImageApp	Today, 10:12 PM	--	Folder
AppDelegate.h	Today, 9:43 PM	Zero bytes	C header code
AppDelegate.m	Today, 9:43 PM	Zero bytes	Object...e code
Assets.xcassets	Today, 10:12 PM	--	Folder
AppIcon.appiconset	Today, 9:45 PM	--	Folder
Base.lproj	Today, 9:47 PM	--	Folder
Camera.imageset	Today, 9:25 PM	--	Folder
Camera-Icon-iPad-@1x.png	Today, 9:25 PM	9 KB	PNG image
Camera-Icon-iPad-@2x.png	Today, 9:25 PM	18 KB	PNG image
Camera-Icon-iPhone-@1x.png	Today, 9:25 PM	7 KB	PNG image
Camera-Icon-iPhone-@2x.png	Today, 9:25 PM	15 KB	PNG image
Camera-Icon-iPhone-@3x.png	Today, 9:25 PM	33 KB	PNG image
Contents.json	Today, 9:43 PM	Zero bytes	JSON
Image.imageset	Today, 9:46 PM	--	Folder
info.plist	Today, 9:54 PM	Zero bytes	property list

15 items, 332.59 GB available

Integrating with Your Xcode Project

Project must have an xcasset folder reference

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Project must have an xcasset folder reference

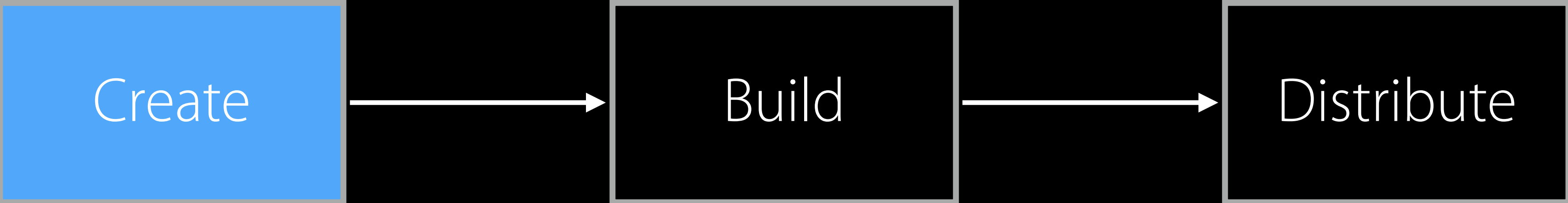
Place any externally generated content within xcasset folder

Integrating with Your Xcode Project

Project must have an xcasset folder reference

Place any externally generated content within xcasset folder

No limitations on file hierarchy

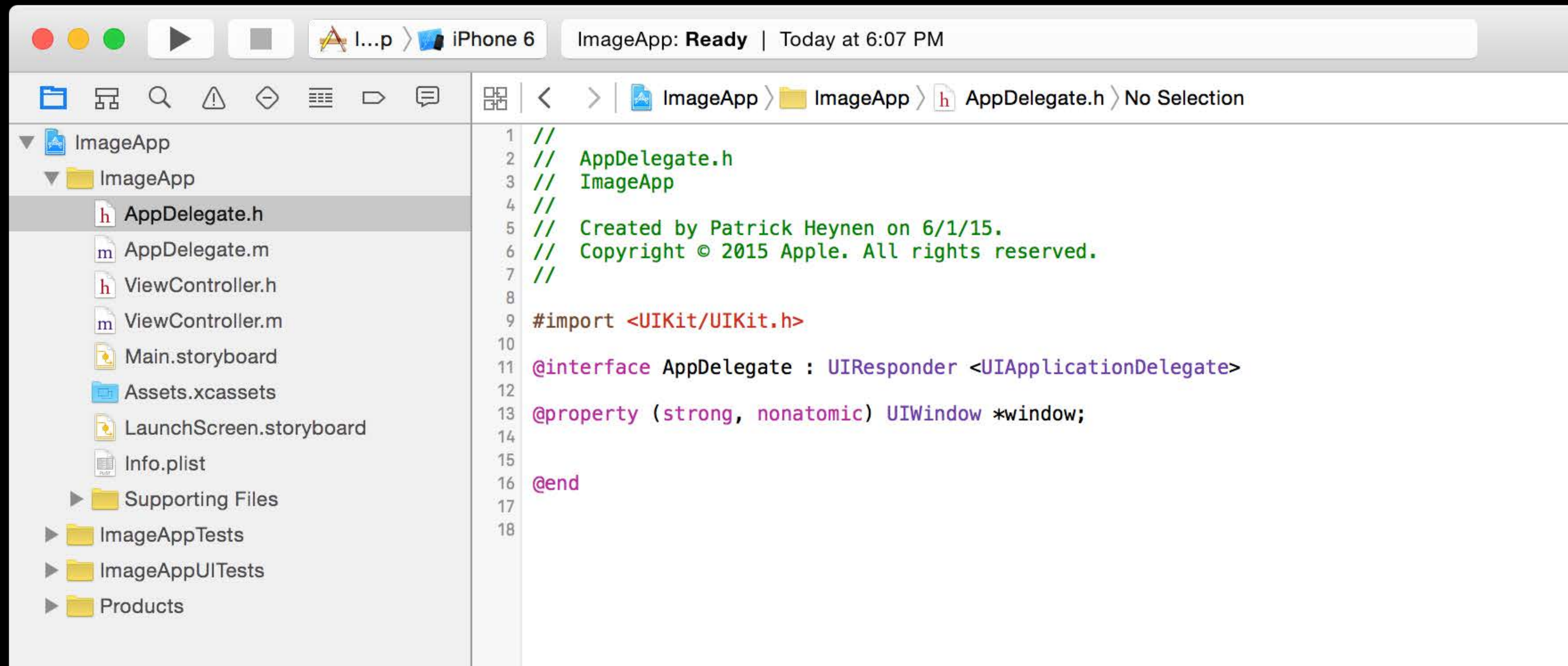




Build Workflow

Build Workflow

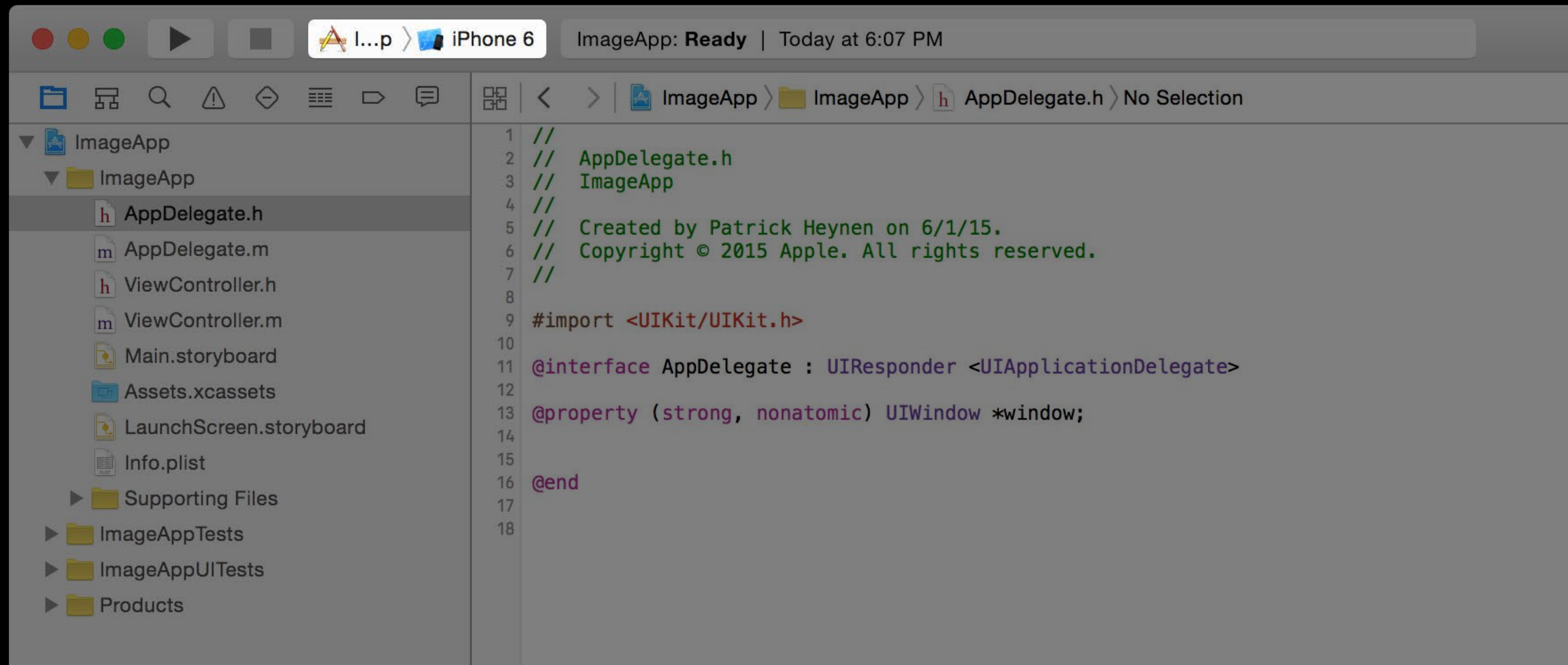
Xcode Build and Run automatically thins resources for the active run destination



Build Workflow

Xcode Build and Run automatically thins resources for the active run destination

Supported for all simulator and device run destinations

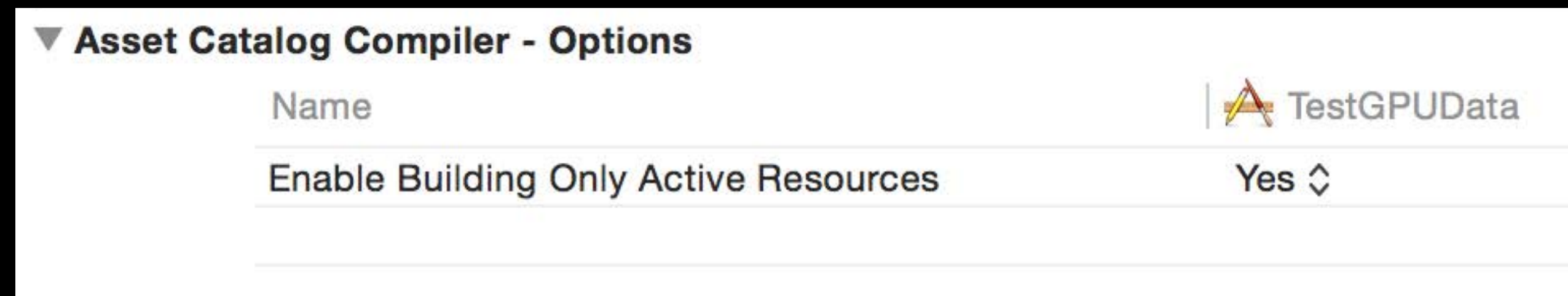


Build Workflow

Xcode Build and Run automatically thins resources for the active run destination

Supported for all simulator and device run destinations

ENABLE_ONLY_ACTIVE_RESOURCES target build setting



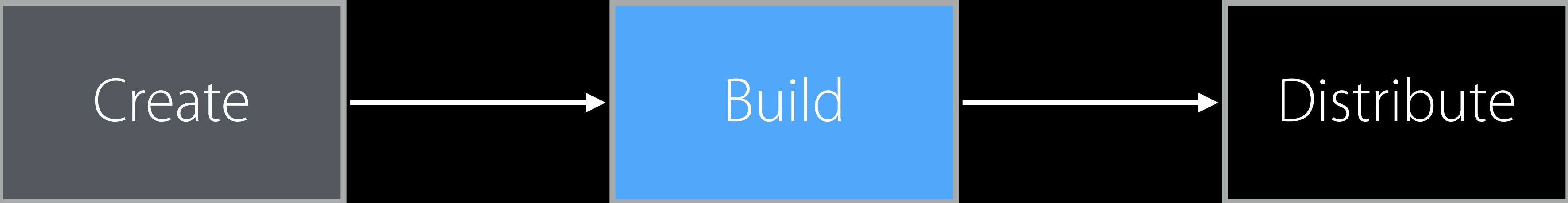
Build Workflow

Speeds up iterative development

Build Workflow

Speeds up iterative development

Test impact of cataloging changes on thinned outputs





Distributing Thinned Applications

Distributing Thinned Applications

App Store Purchase



Distributing Thinned Applications

App Store Purchase

TestFlight



Distributing Thinned Applications

App Store Purchase

TestFlight

Ad-hoc/Enterprise Distribution



Distributing Thinned Applications

App Store Purchase

TestFlight

Ad-hoc/Enterprise Distribution

Xcode Server



Ad-hoc/Enterprise Distribution

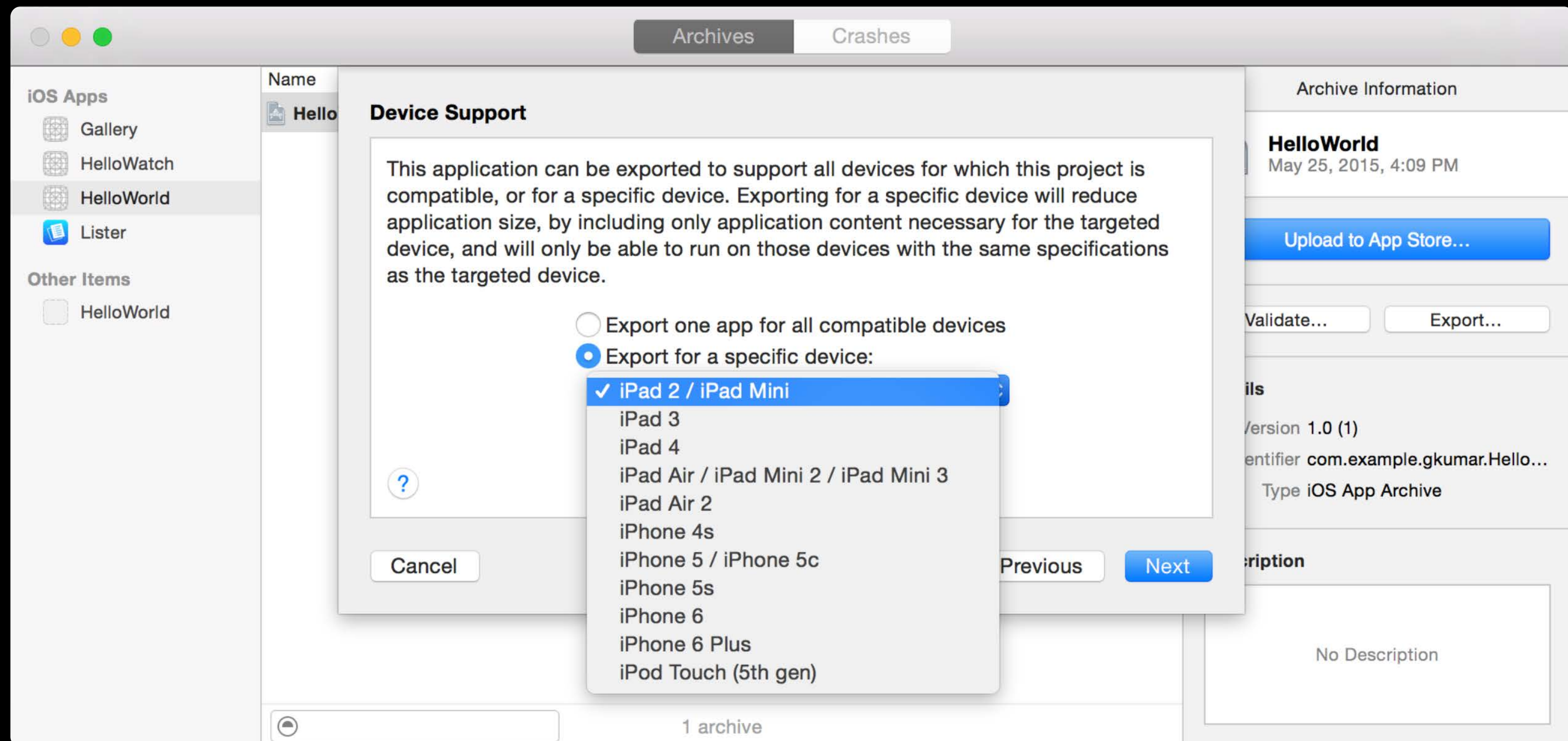


Ad-hoc/Enterprise Distribution

Export for a specific device

Ad-hoc/Enterprise Distribution

Export for a specific device



Ad-hoc/Enterprise Distribution

Export thinned variants for all compatible devices

Ad-hoc/Enterprise Distribution

Export thinned variants for all compatible devices



Ad-hoc/Enterprise Distribution

Export thinned variants for all compatible devices



Ad-hoc/Enterprise Distribution

Export thinned variants for all compatible devices



Ad-hoc/Enterprise Distribution

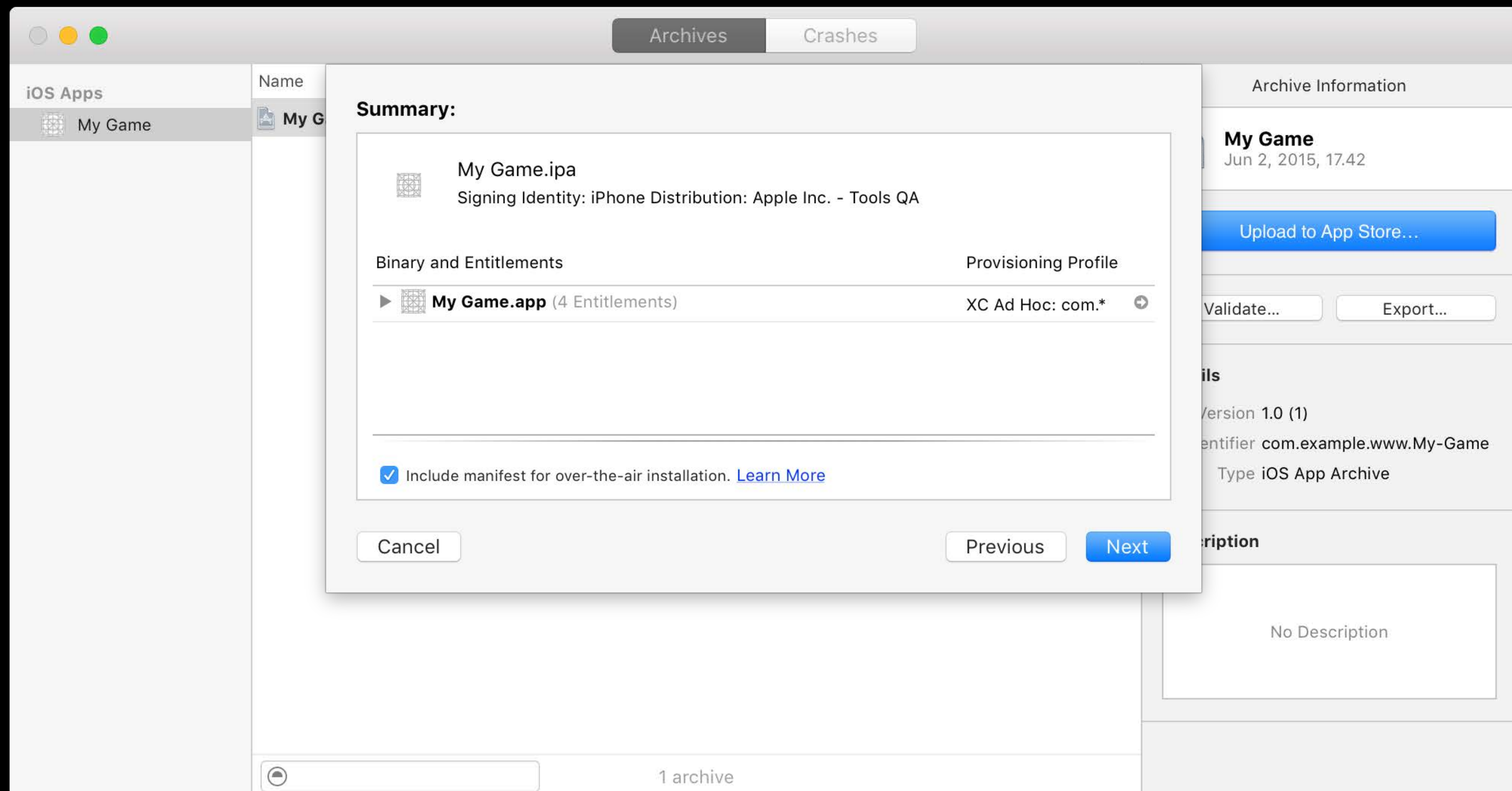
Export thinned variants for all compatible devices



Over-the-Air Installation

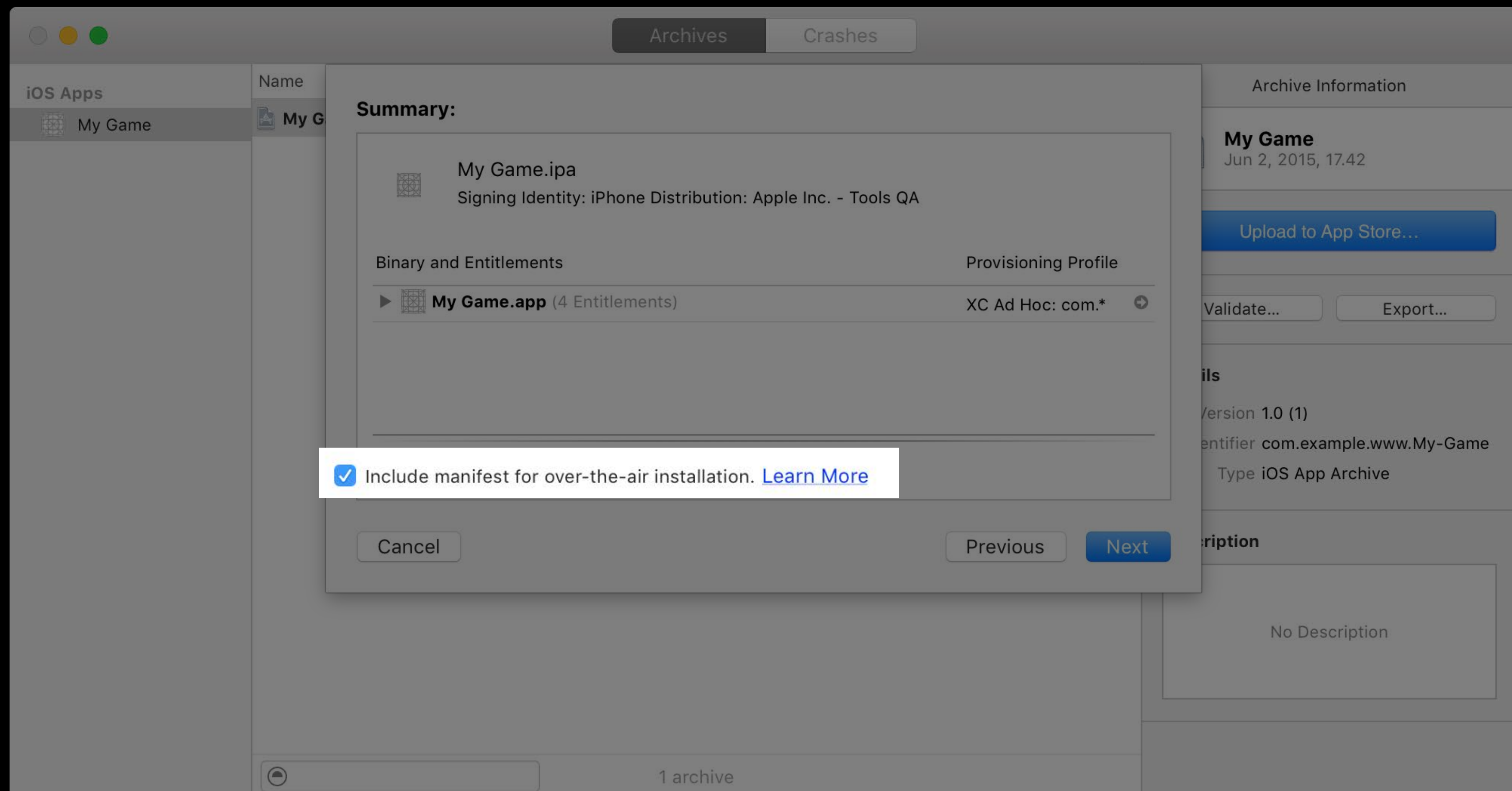
Over-the-Air Installation

Save for Ad-Hoc/Enterprise with distribution manifest option

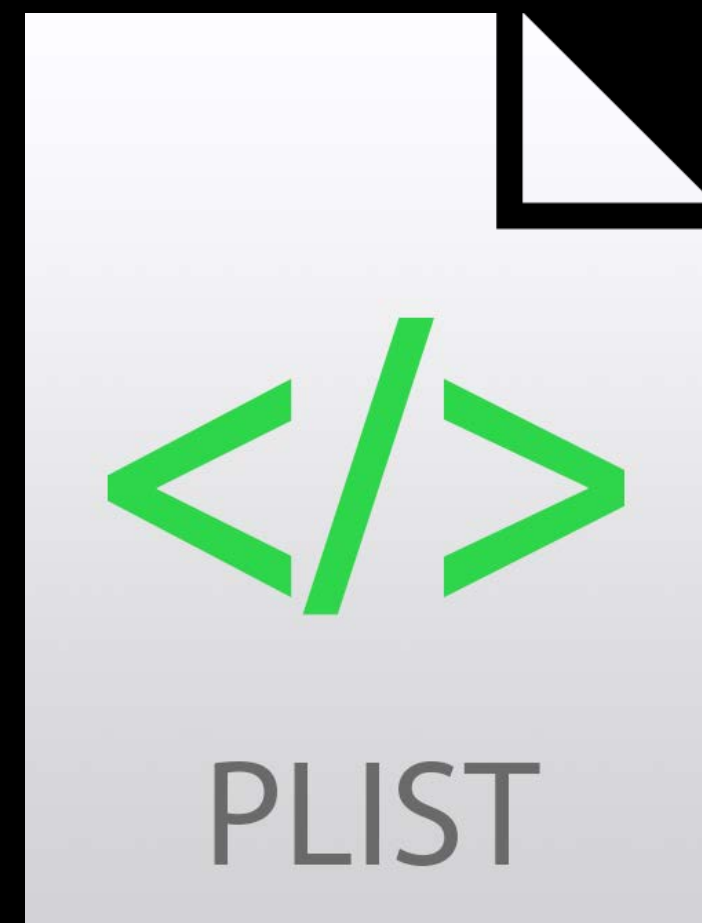


Over-the-Air Installation

Save for Ad-Hoc/Enterprise with distribution manifest option



Over-the-Air Installation



Manifest Plist



Over-the-Air Installation

Xcode generates manifest plist containing URLs for each app variant



Over-the-Air Installation

Xcode generates manifest plist containing URLs for each app variant

URLs are indexed by supported product type

Device automatically installs URL appropriate for its product type



Over-the-Air Installation

Xcode generates manifest plist containing URLs for each app variant

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Xcode Server

Xcode Server



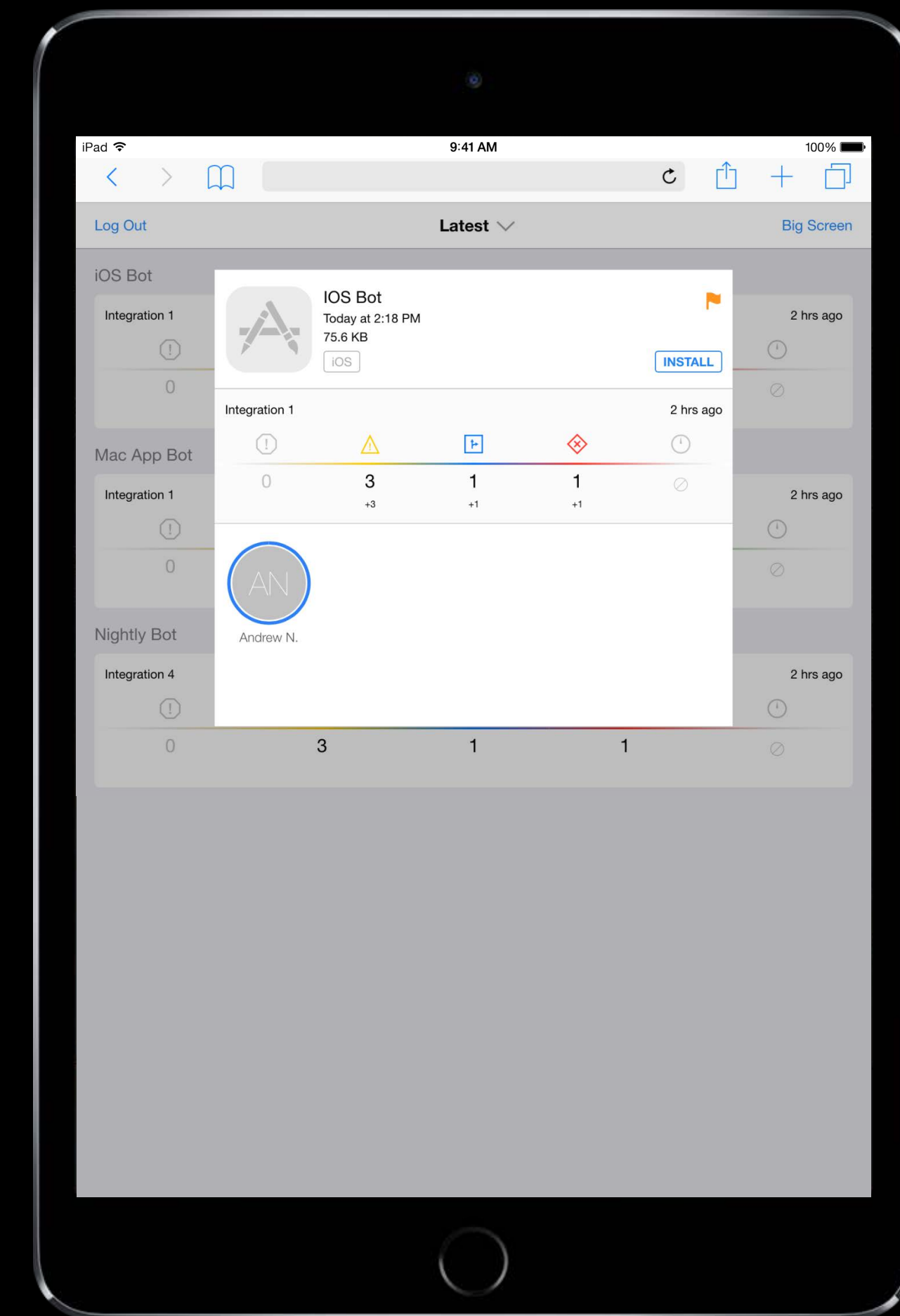
Xcode Server

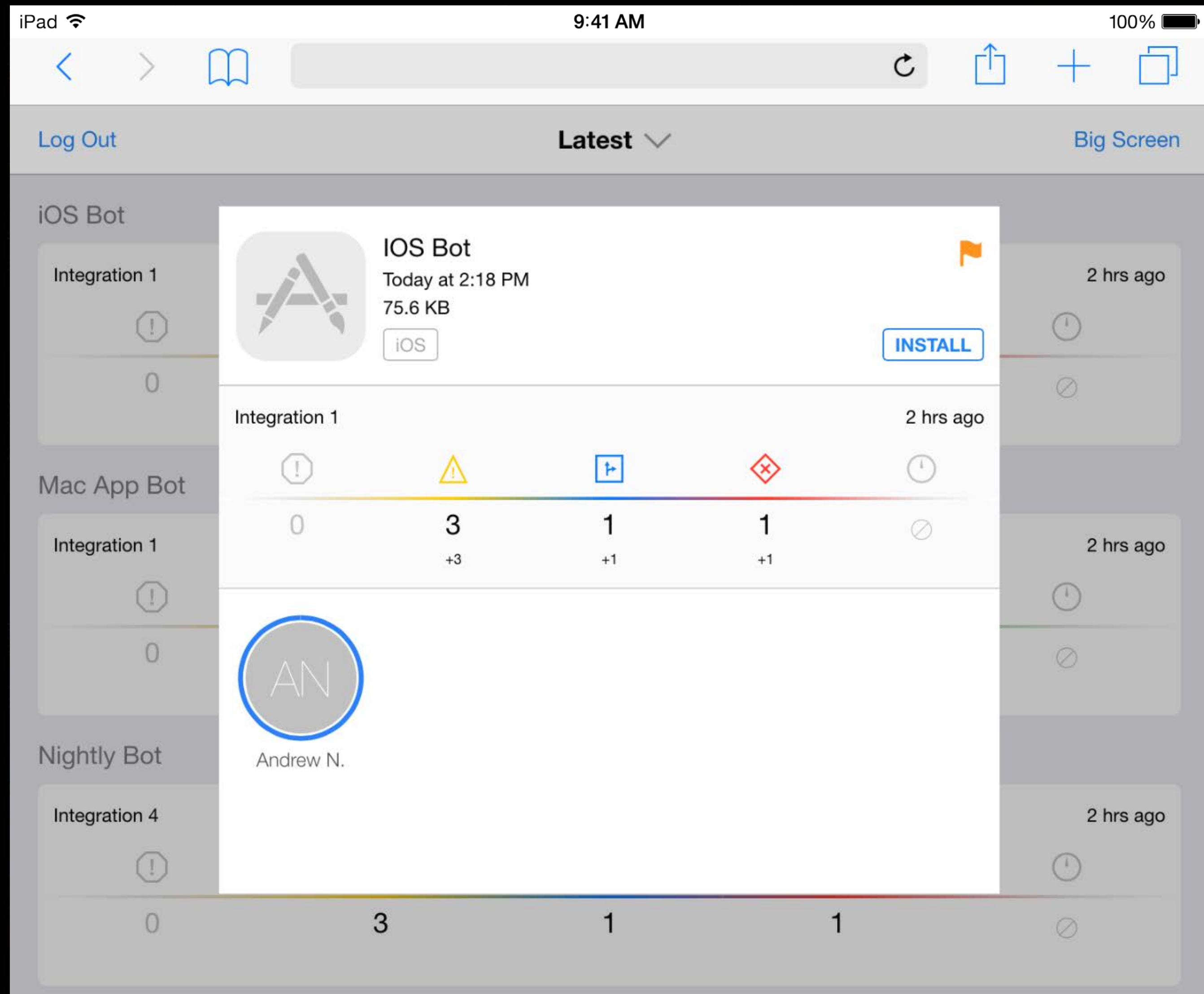
Turnkey solution for building, hosting, and distributing thinned apps



Xcode Server

All app variants built by Integration Bots





iPad

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Log Out

Latest

Big Screen

iOS Bot

Integration 1

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Mac App Bot

Integration 1

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Nightly Bot

Integration 4

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IOS Bot

Today at 2:18 PM

75.6 KB

iOS

INSTALL

Integration 1

2 hrs ago

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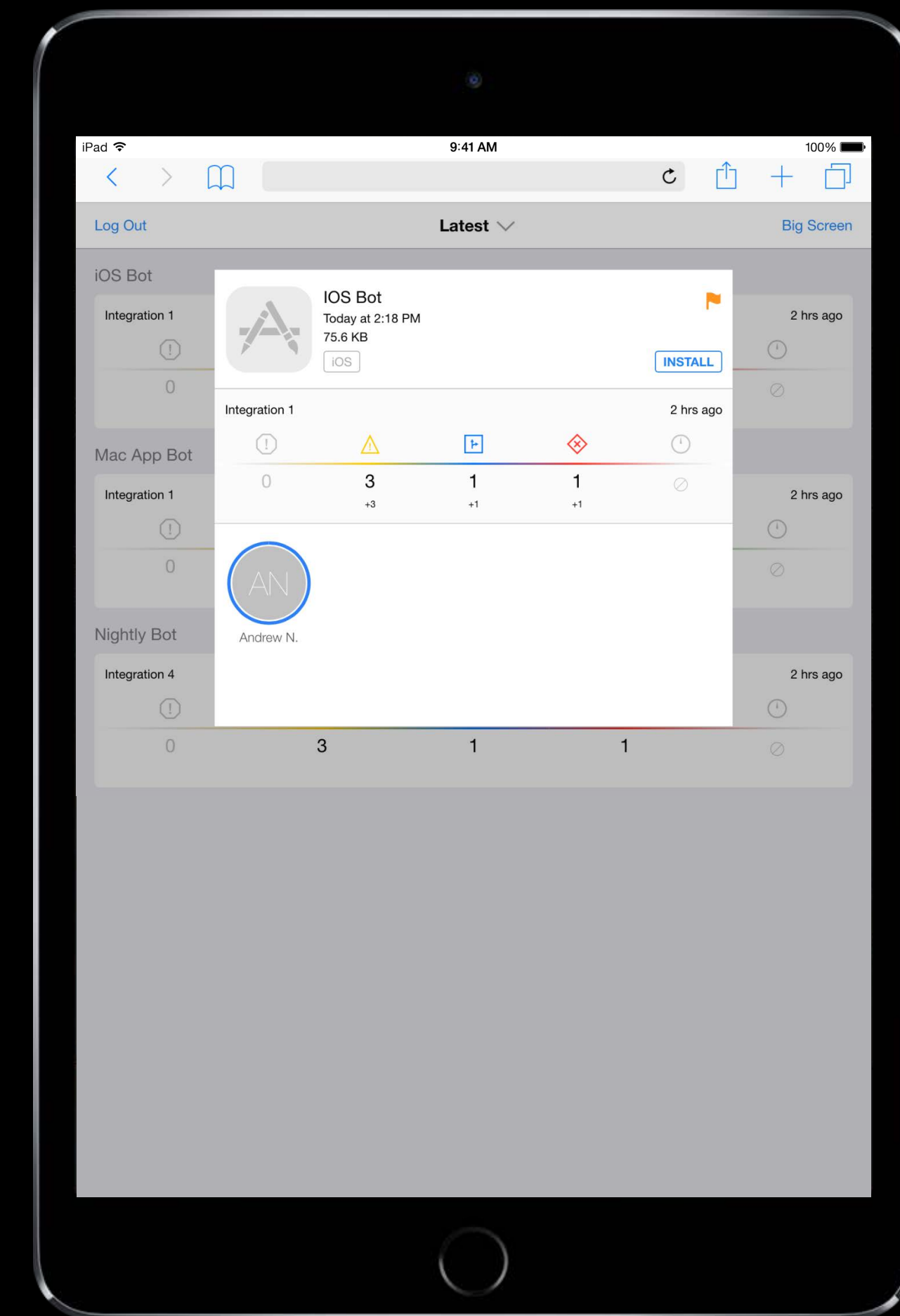
+1

AN

Andrew N.

Xcode Server

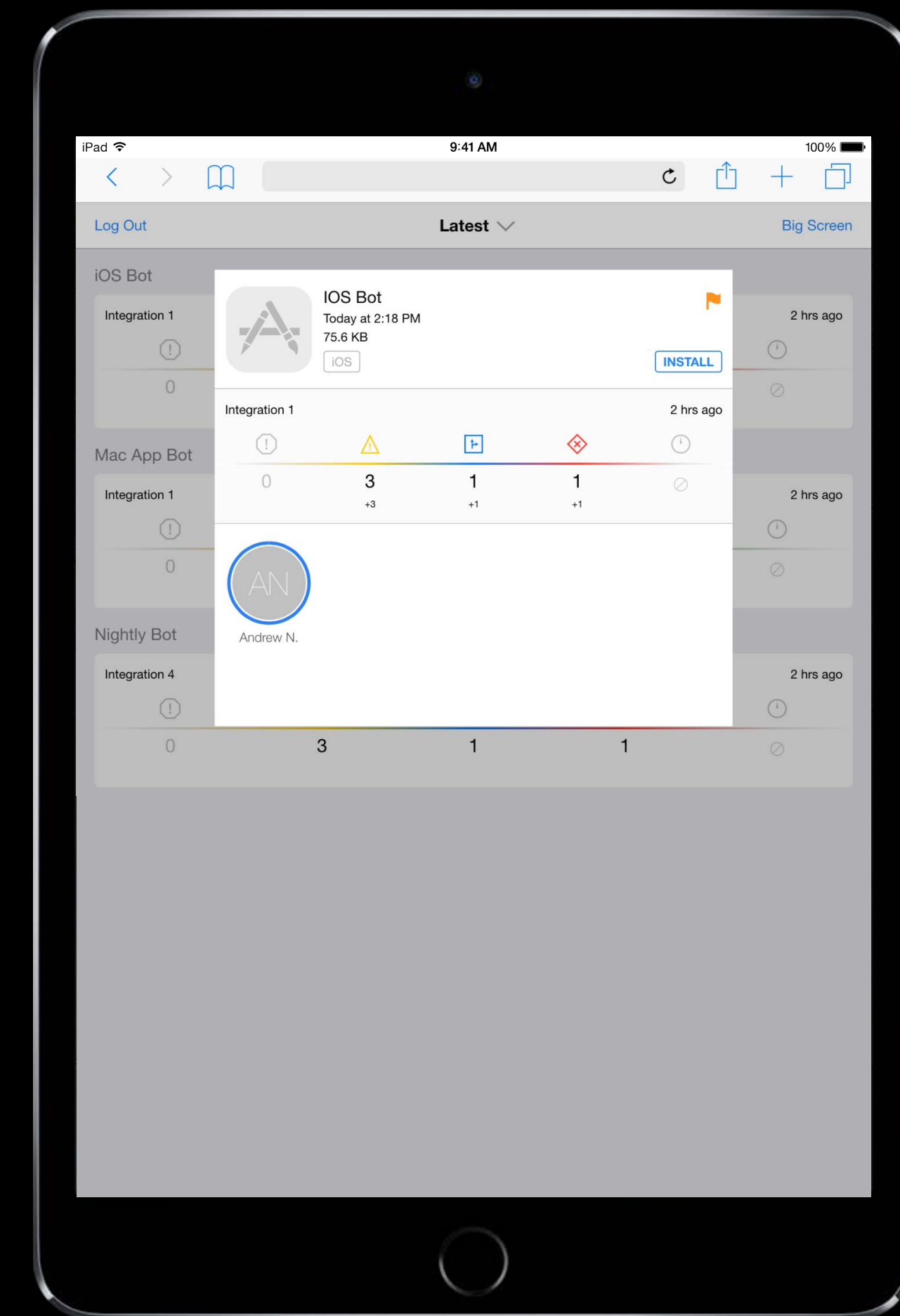
Point your device at the server web portal and go



Xcode Server

Point your device at the server web portal and go

Streamlined installation of thinned applications using over-the-air manifest





What We've Seen

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How app distribution is being improved

What We've Seen

How app distribution is being improved

How to minimize your app's footprint

What We've Seen

How app distribution is being improved

How to minimize your app's footprint

What this means for your workflow

What You Should Do

What You Should Do

Create tailored versions of assets



What You Should Do

Create tailored versions of assets

Use Asset Catalogs to organize your assets

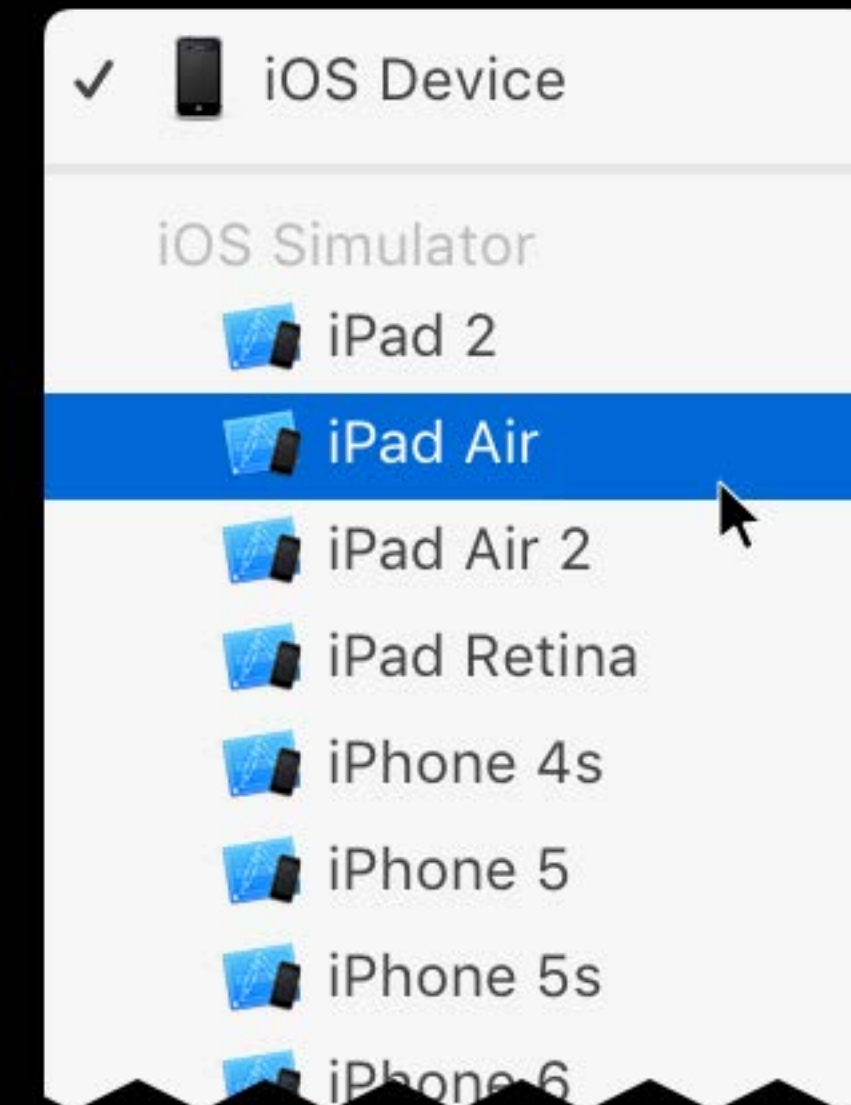


What You Should Do

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Test your thinned app variants using Xcode



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Use Xcode Server to automate builds



What You Should Do

Create tailored versions of assets

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Take advantage of On Demand Resources



More Information

Swift Language Documentation

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

Apple Developer Forums

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

Asset Catalog Format Documentation

<http://developer.apple.com/devcenter/ios>

App Distribution Guide

Read the “App Thinning” chapter

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Swift Evangelist

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Curt Rothert

Frameworks Evangelist

rothert@apple.com

Related Sessions

What's New in Xcode	Presidio	Tuesday 9:00AM
What's New in Metal, Part 1	Presidio	Tuesday 3:30PM
What's New in SpriteKit	Mission	Wednesday 10:00AM
Introducing On Demand Resources	Pacific Heights	Wednesday 4:30PM
Deeper into GameplayKit with DemoBots	Mission	Thursday 1:30PM

Related Labs

App Thinning Lab	Developer Tools Lab C	Wednesday 1:30PM
On Demand Resources Lab	Frameworks Lab B	Thursday 11:00AM

