

# Advanced User Interfaces with Collection Views

An iTunes Connect case study

Session 232

Jeff Watkins

iOS Software Engineer

# Introduction

New designs for iTunes Connect

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Pay off technical debt

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Pay off technical debt

Create modern architecture

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New designs for iTunes Connect

Pay off technical debt

Create modern architecture

Sample code: [AdvancedCollectionView-1.0](#)

# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

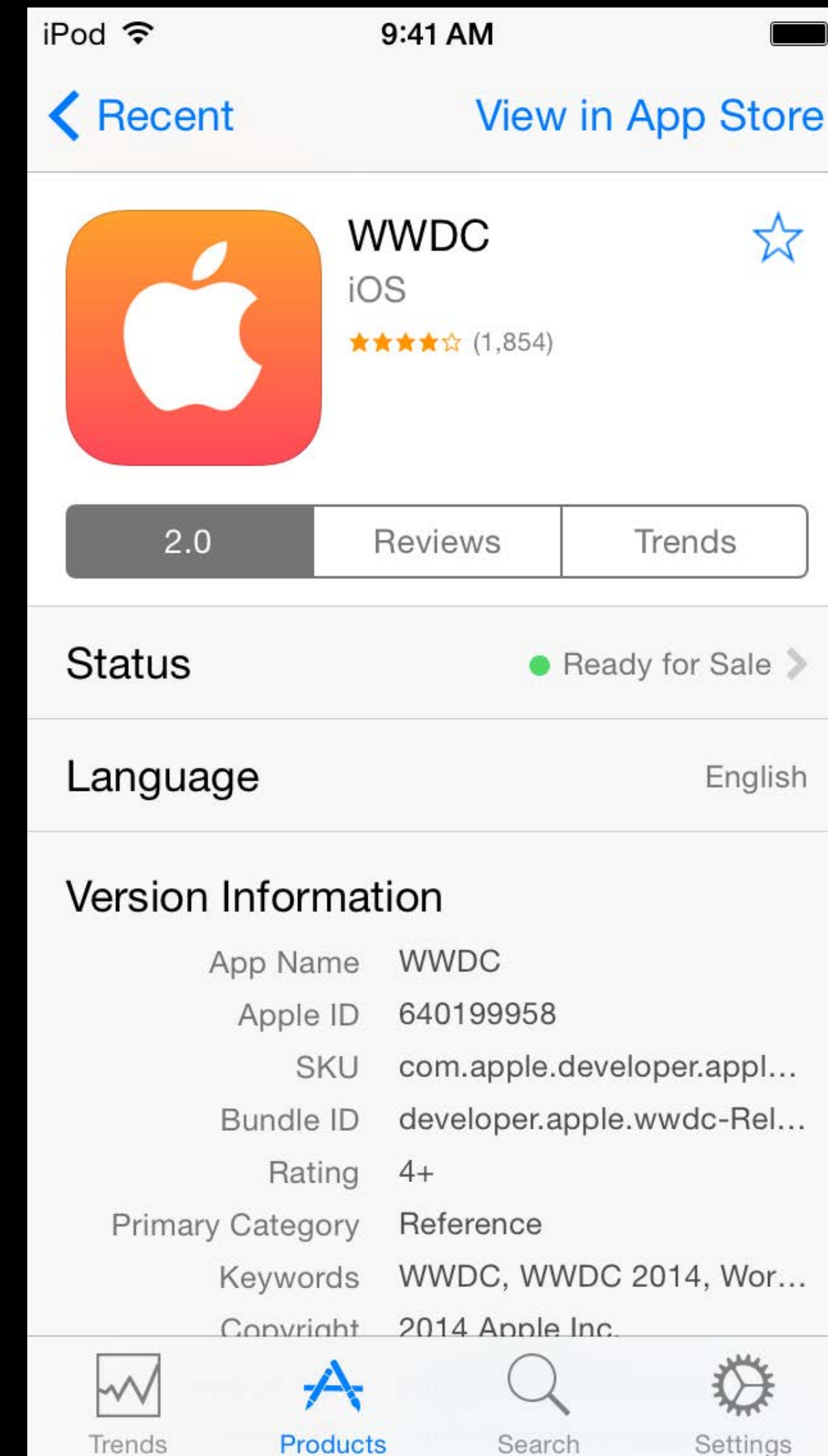
Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering



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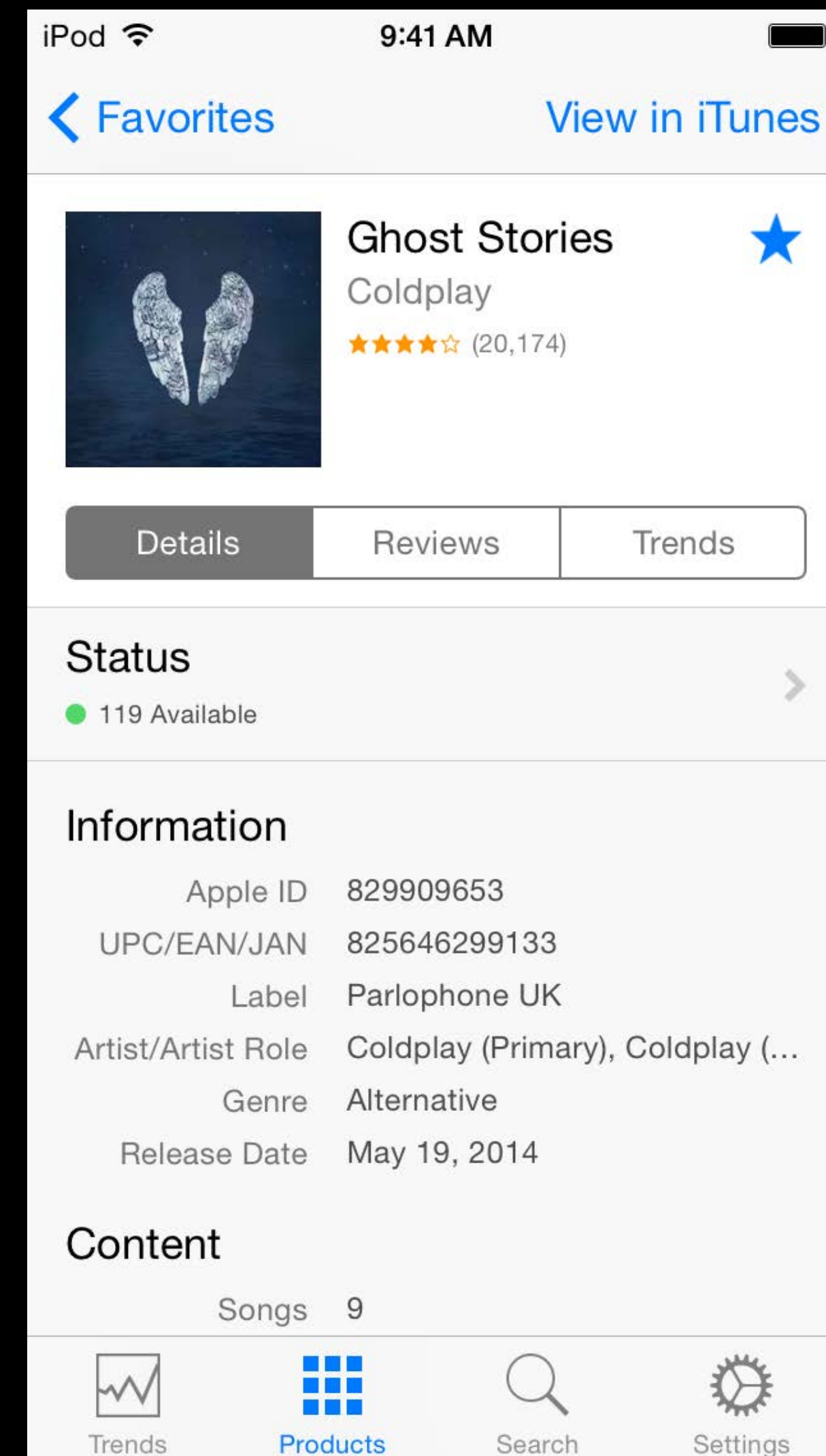
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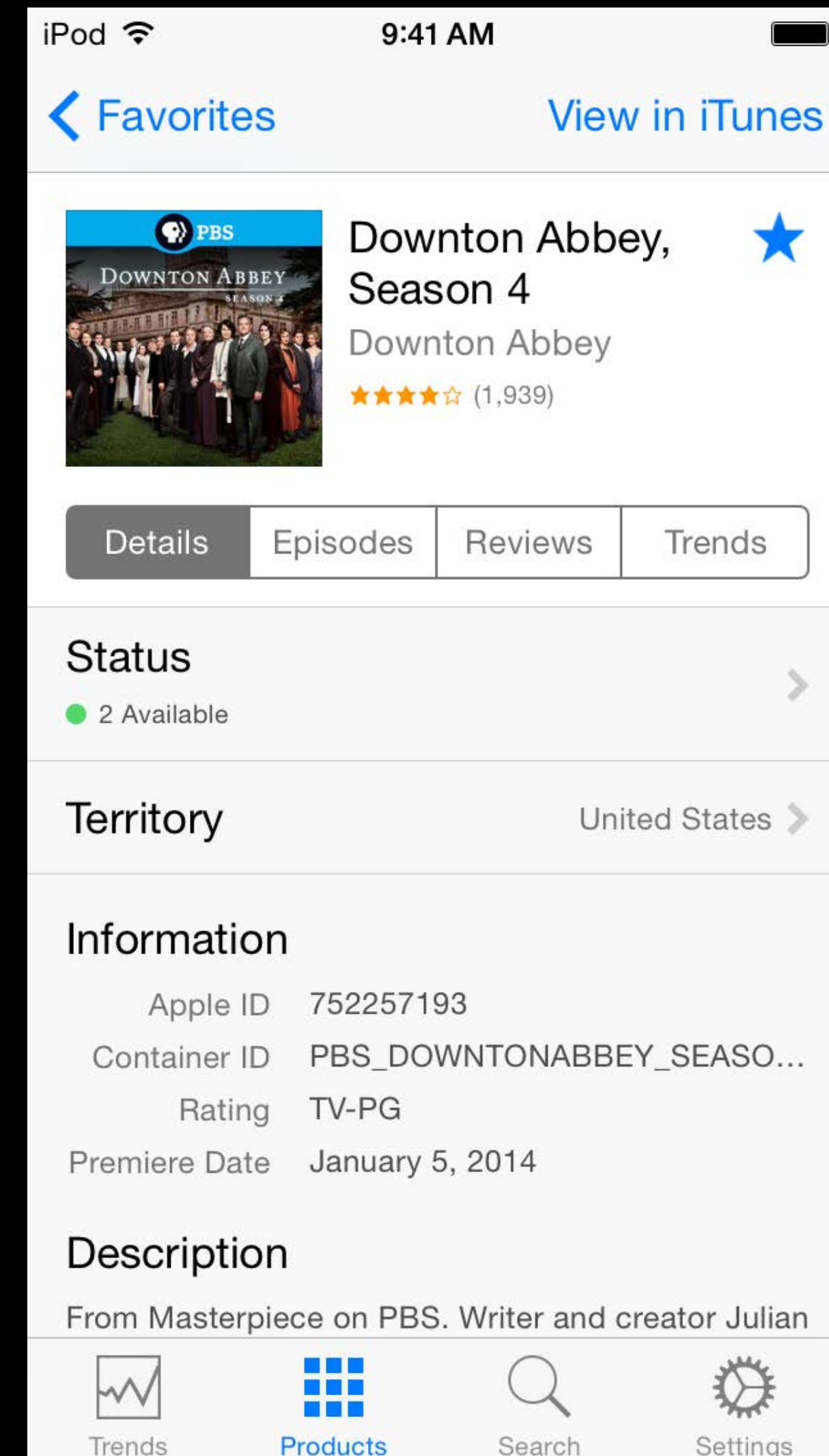
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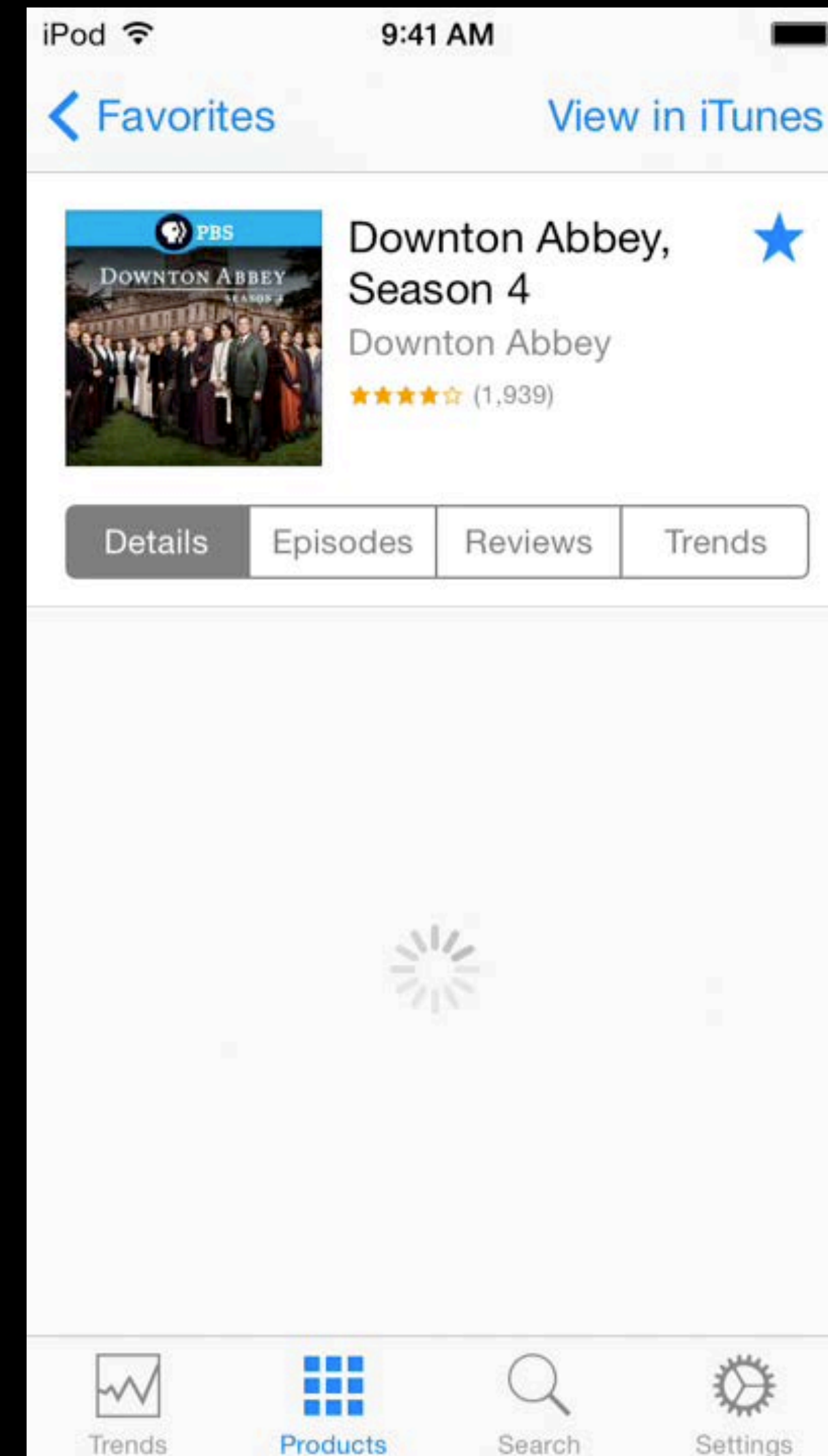
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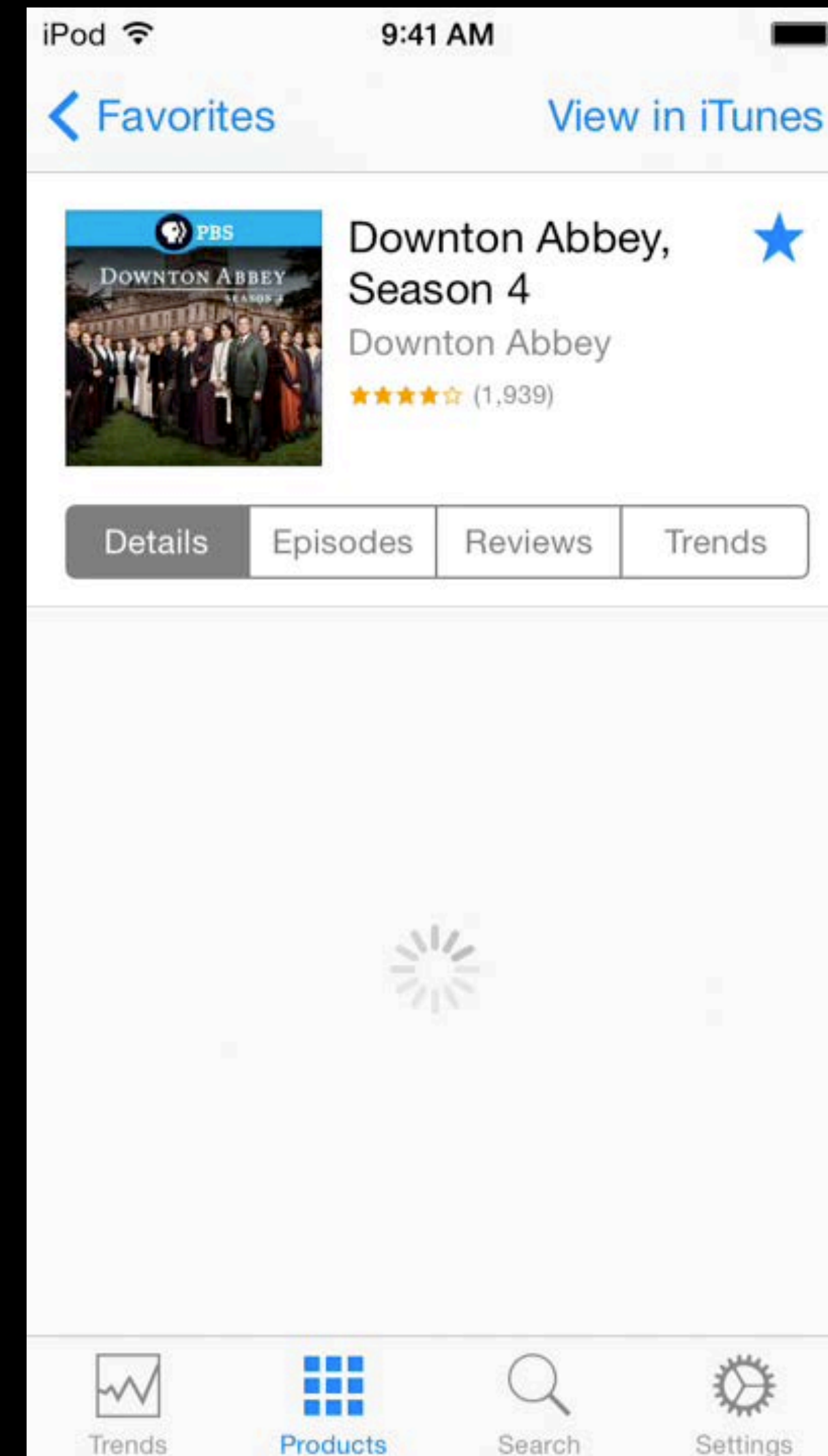
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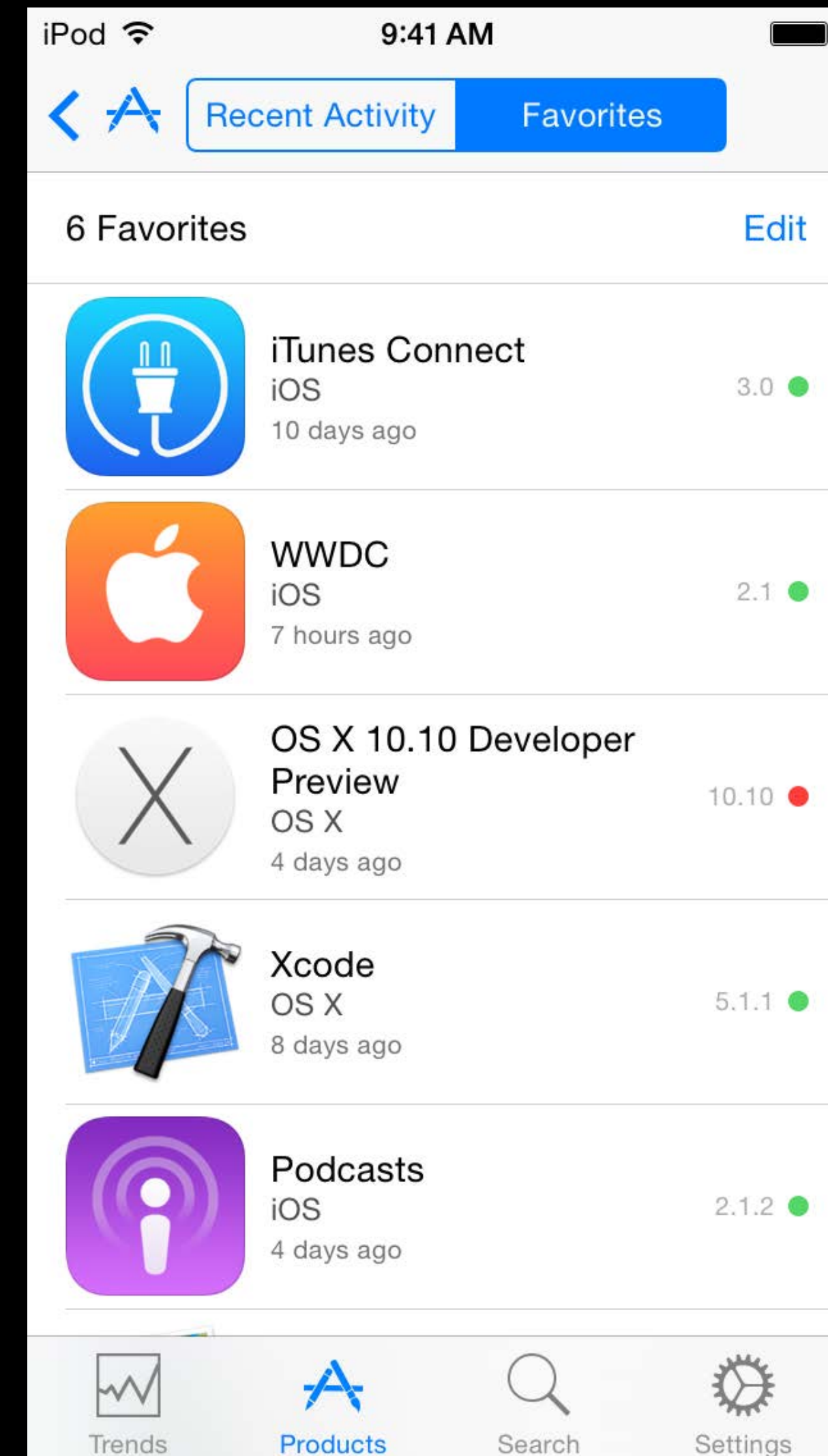
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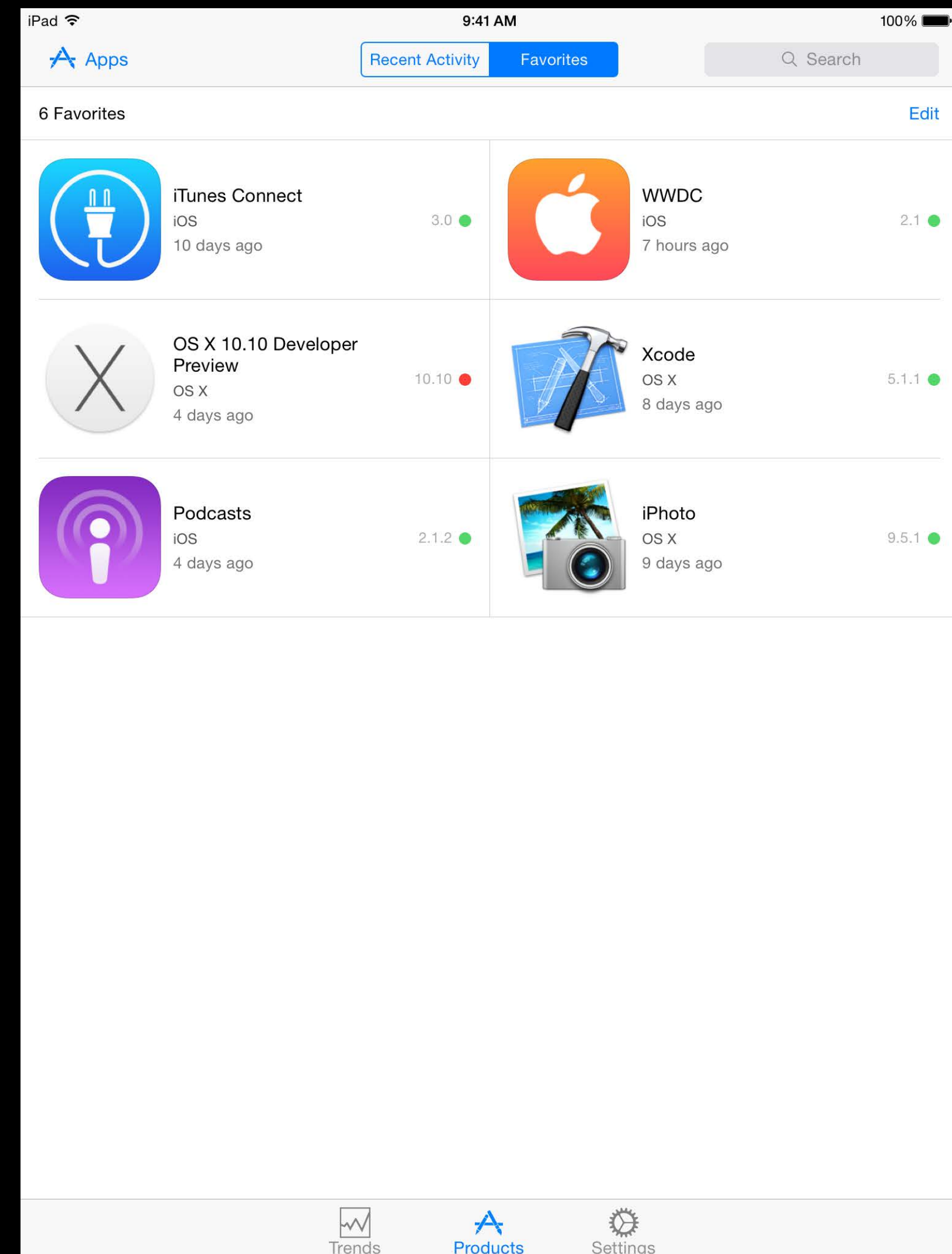
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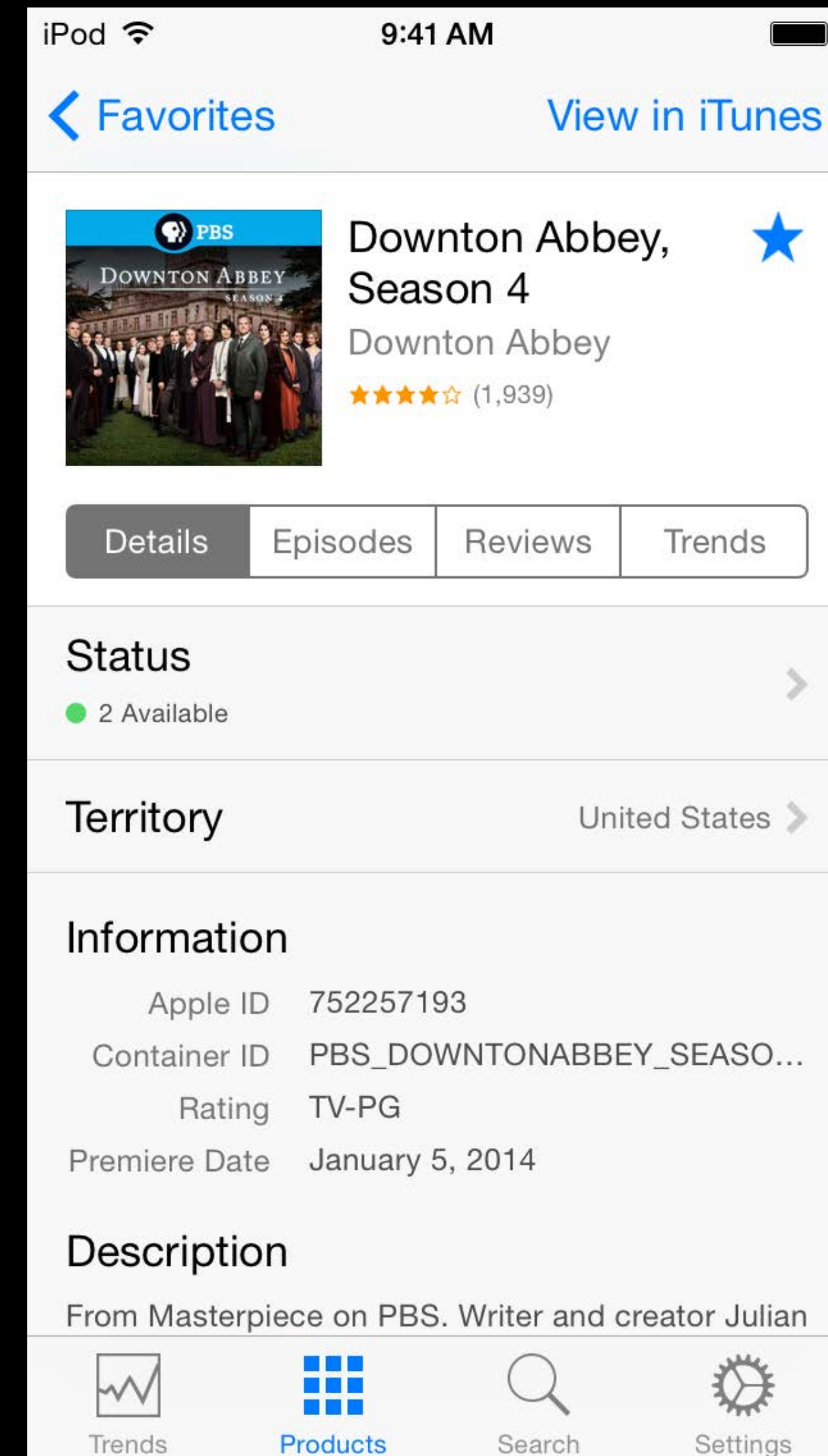
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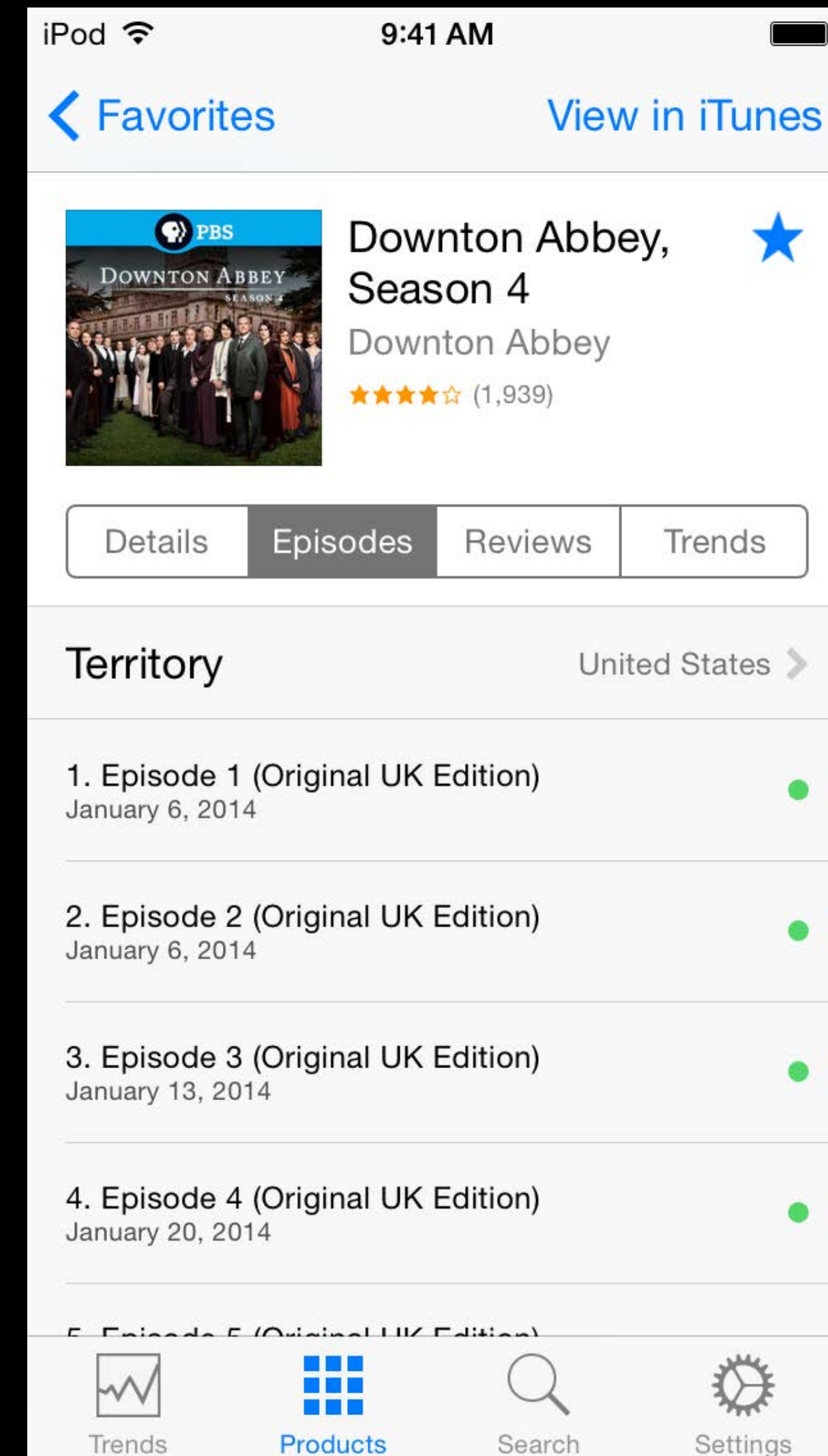
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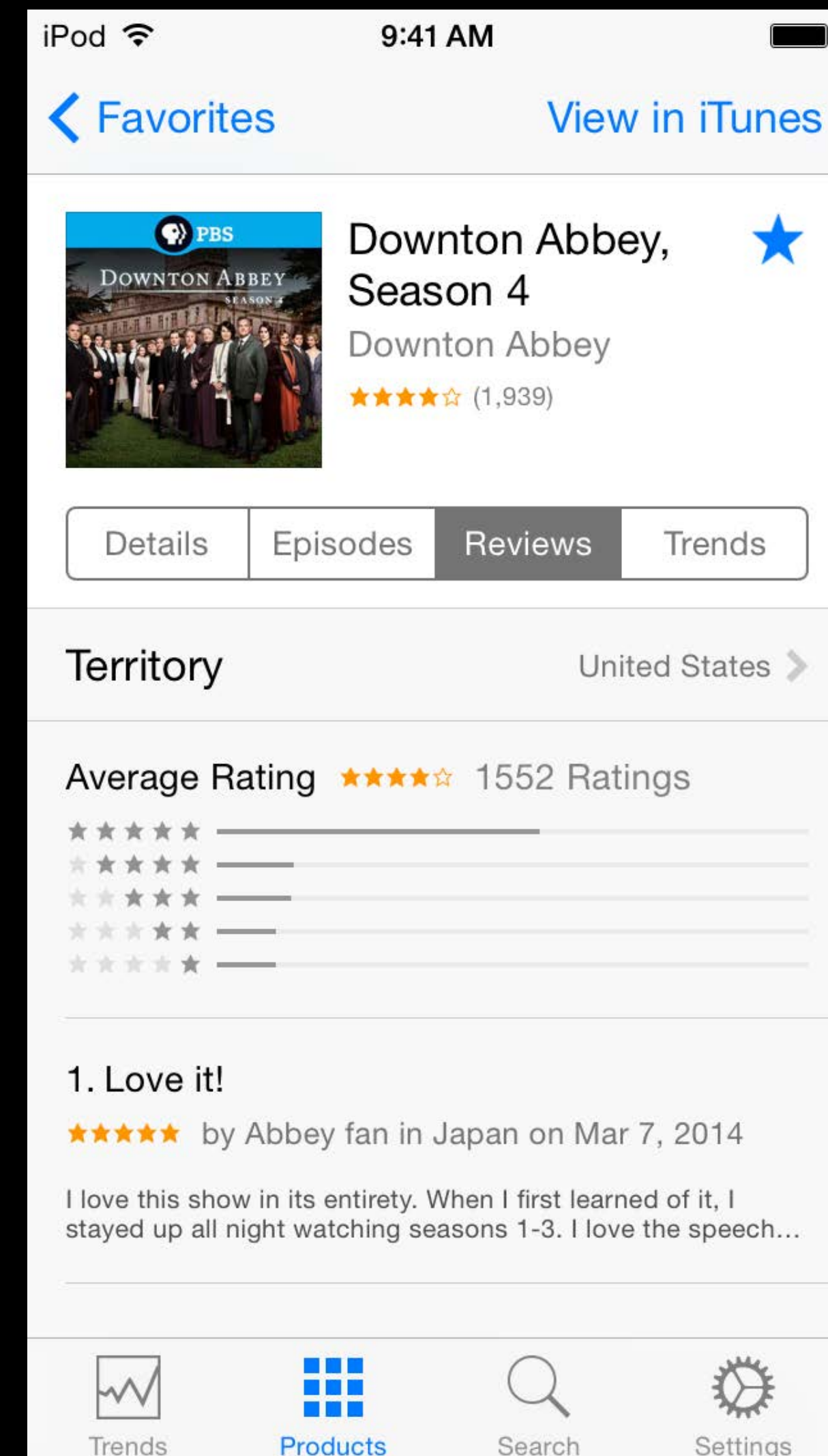
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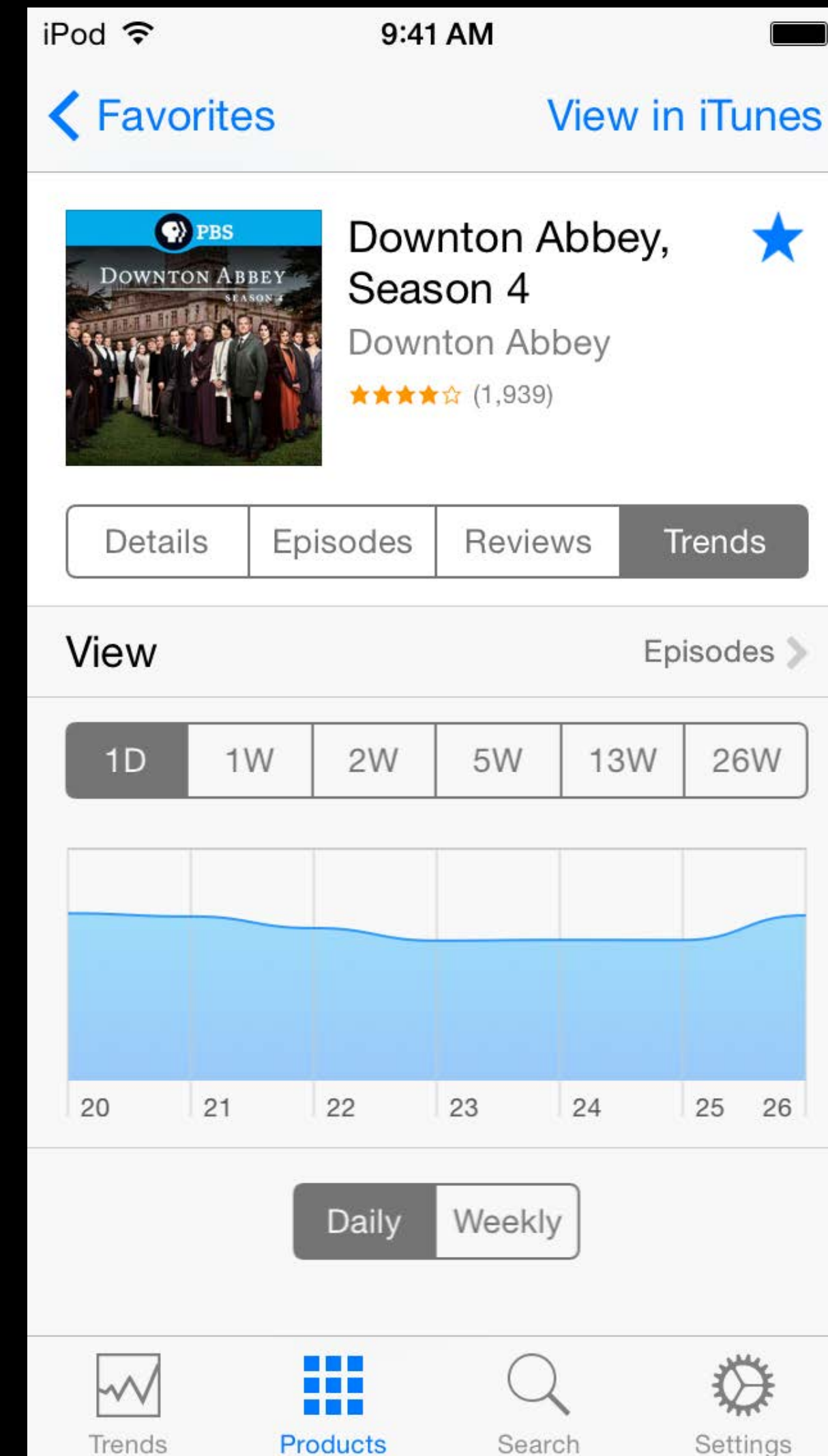
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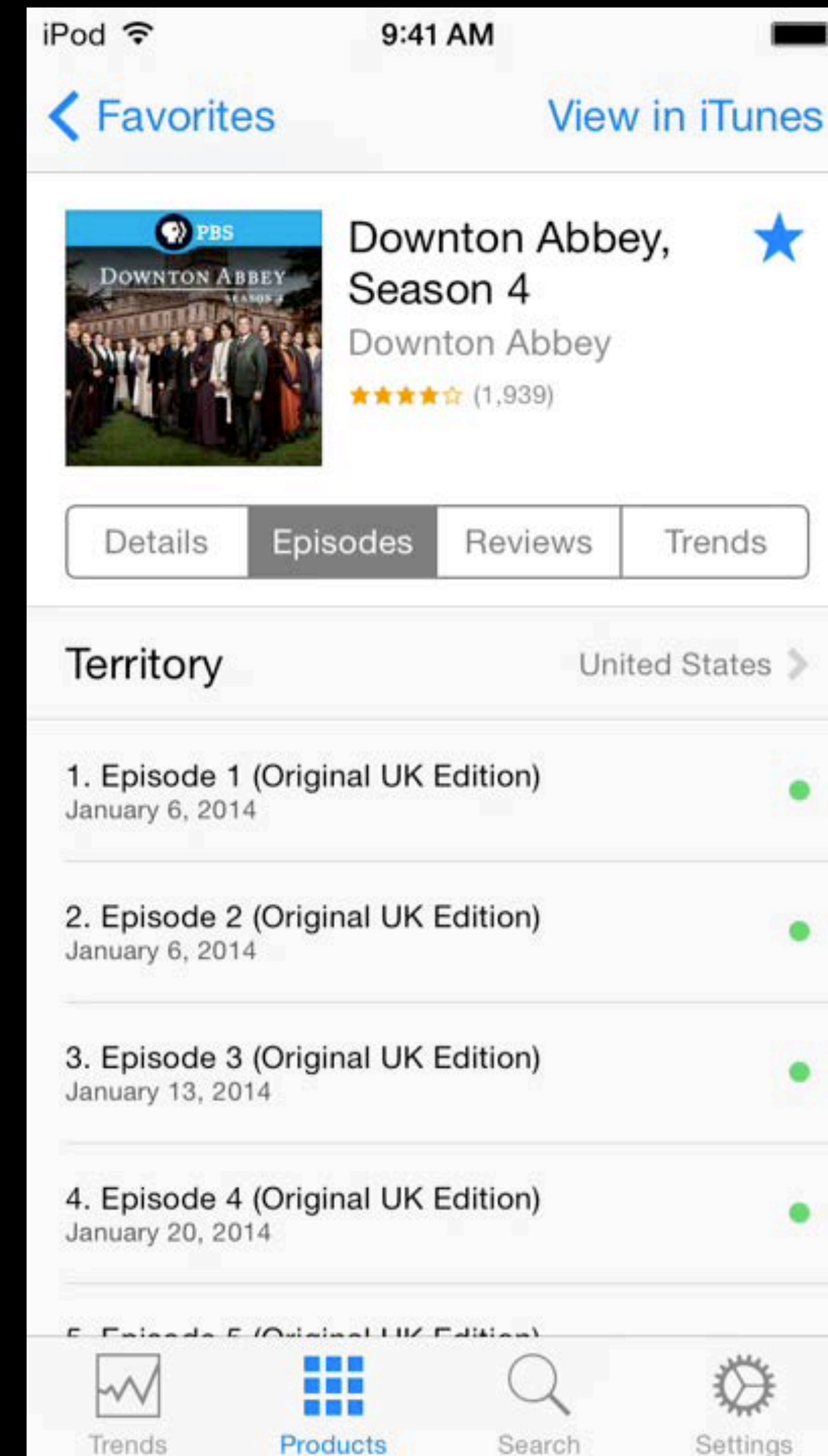
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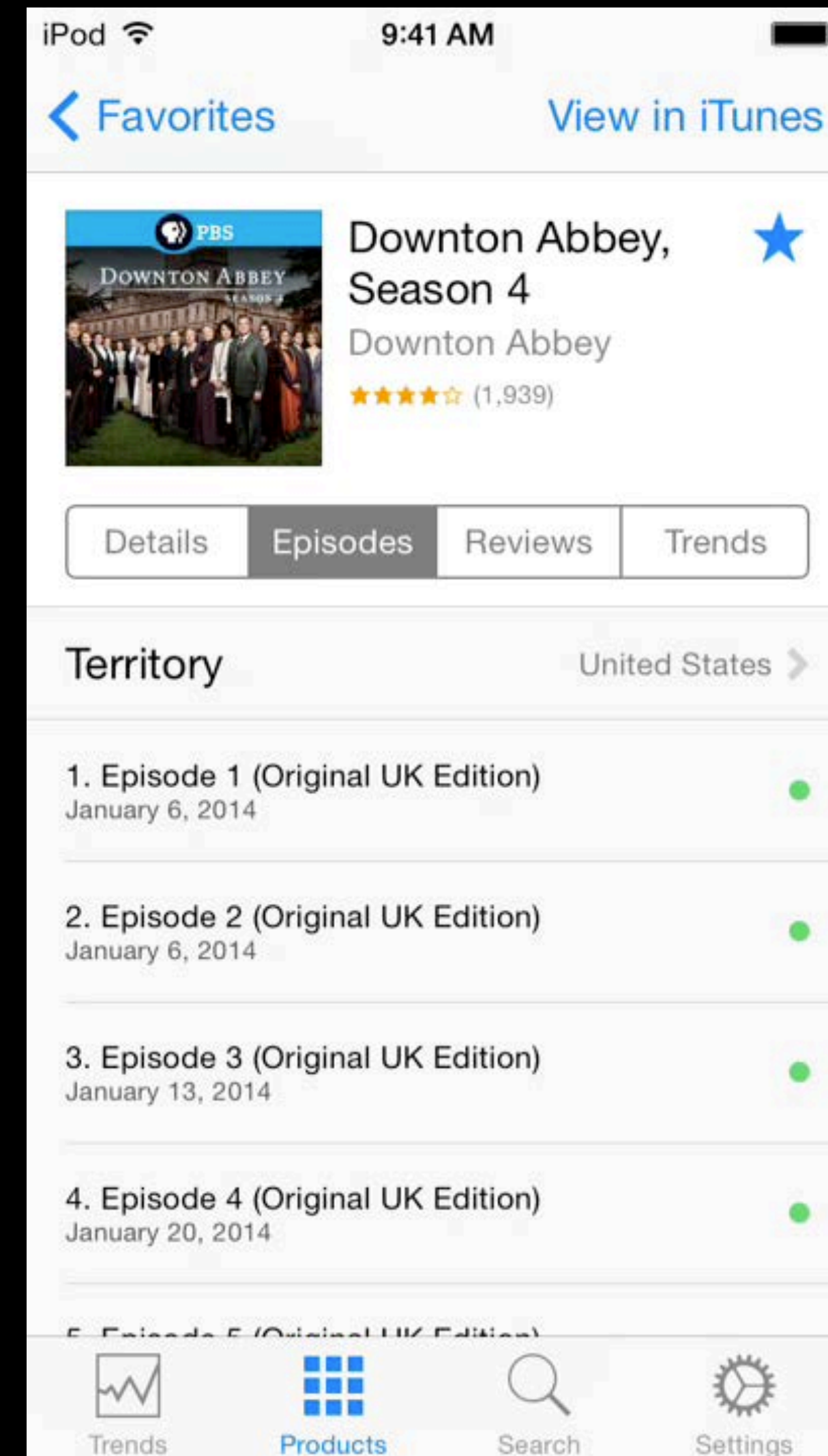
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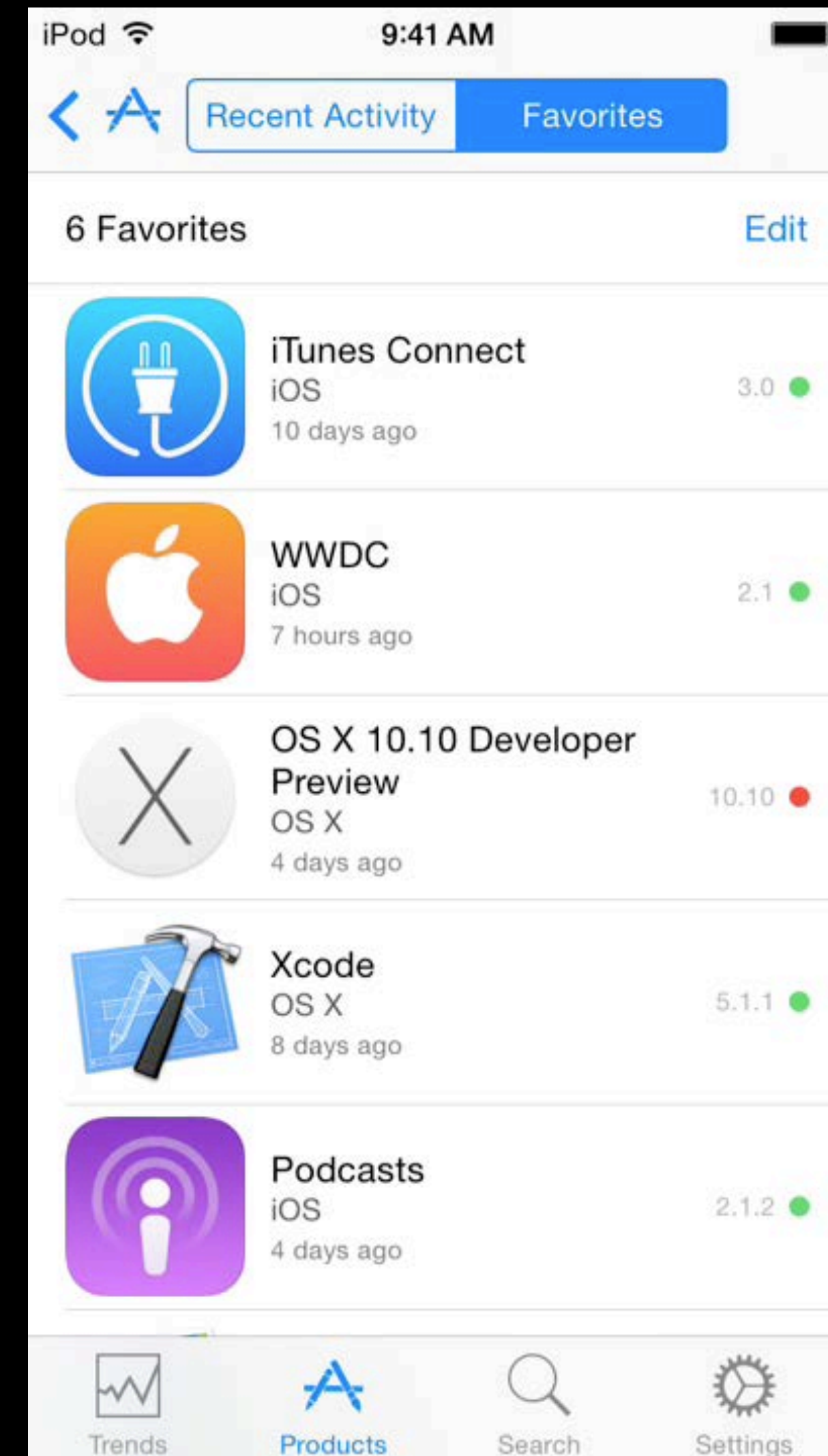
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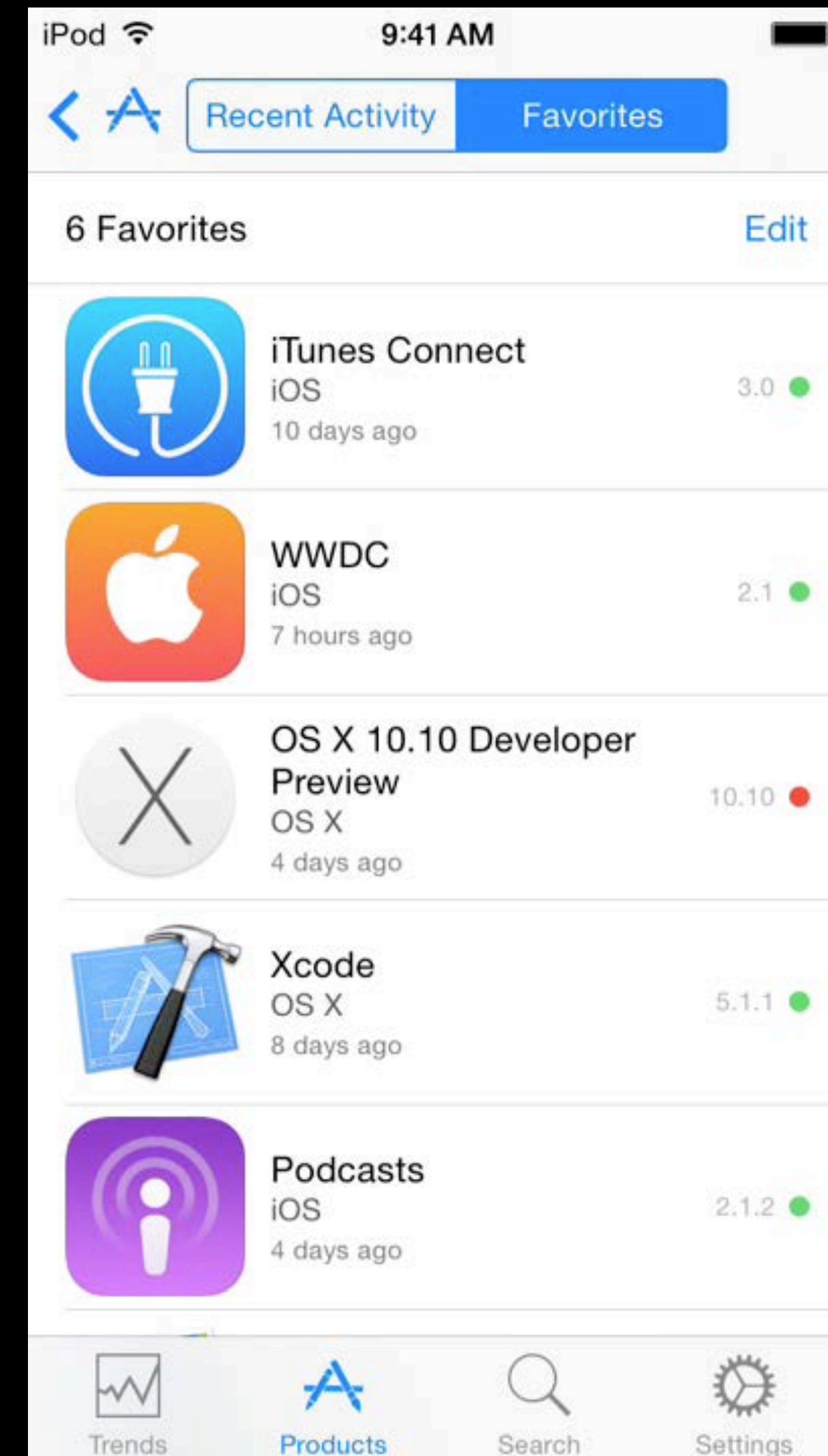
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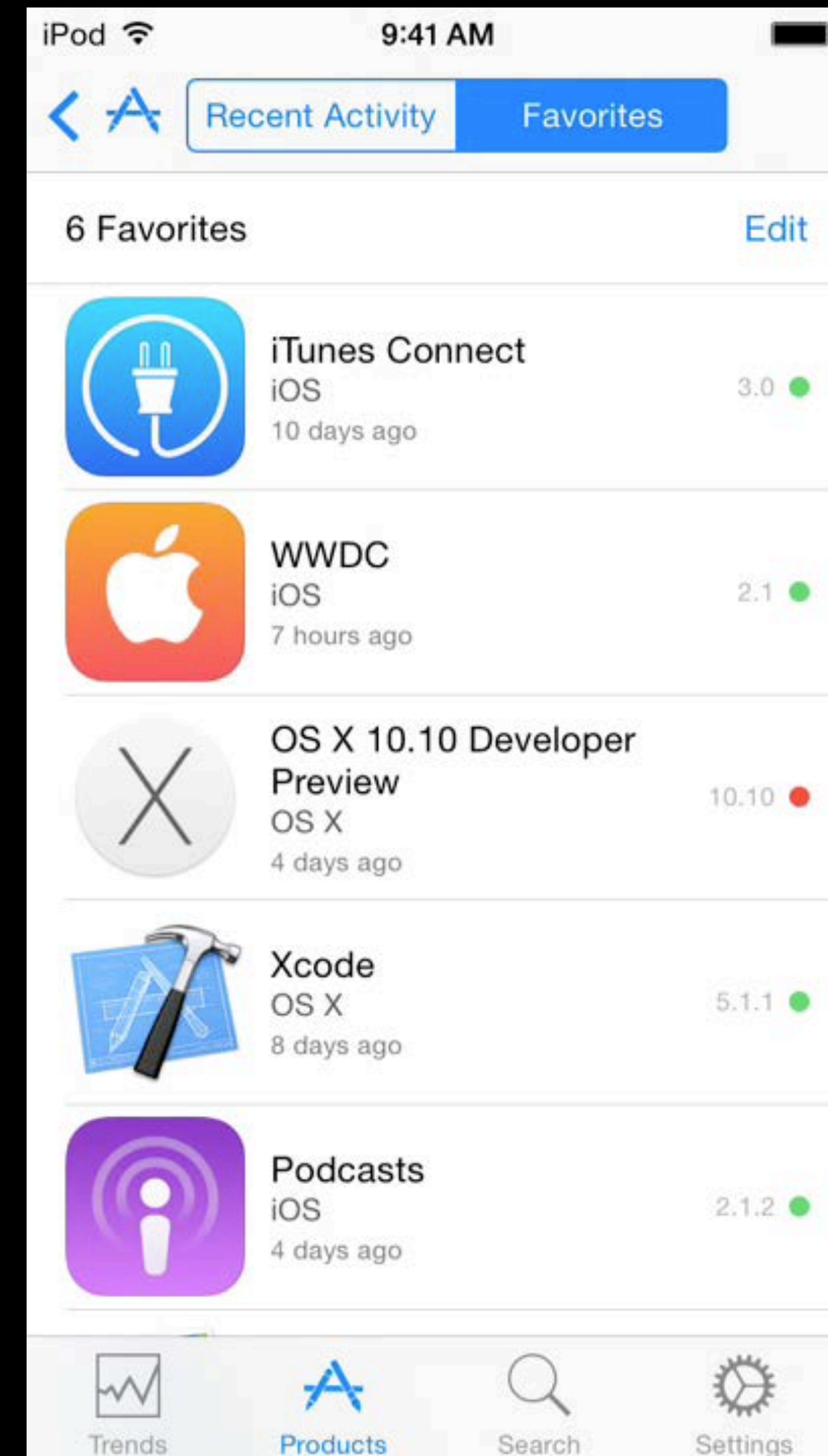
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# Data Sources

Minimizing complexity

iPod 9:41 AM

[Favorites](#) [View in iTunes](#)

**Ghost Stories** ★

Coldplay

★★★★☆ (20,174)

Details | Reviews | Trends

**Status** >

● 119 Available

**Information**

Apple ID	829909653
UPC/EAN/JAN	825646299133
Label	Parlophone UK
Artist/Artist Role	Coldplay (Primary), Coldplay (...)
Genre	Alternative
Release Date	May 19, 2014

**Content**

Songs 9

Trends | **Products** | Search | Settings

iPod 9:41 AM

[Favorites](#) [View in iTunes](#)

**Downton Abbey, Season 4** ★

Downton Abbey

★★★★☆ (1,939)

Details | Episodes | Reviews | Trends

**Status** >

● 2 Available

**Territory** United States >

**Information**

Apple ID	752257193
Container ID	PBS_DOWNTONABBEY_SEASO...
Rating	TV-PG
Premiere Date	January 5, 2014

**Description**

From Masterpiece on PBS. Writer and creator Julian

Trends | **Products** | Search | Settings

iPod 9:41 AM

[Recent](#) [View in App Store](#)

**WWDC** ★

iOS

★★★★☆ (1,854)

2.0 | Reviews | Trends

**Status** ● Ready for Sale >

**Language** English

**Version Information**

App Name	WWDC
Apple ID	640199958
SKU	com.apple.developer.appl...
Bundle ID	developer.apple.wwdc-Rel...
Rating	4+
Primary Category	Reference
Keywords	WWDC, WWDC 2014, Wor...
Copyright	2014 Apple Inc.

Trends | **Products** | Search | Settings



iPod 9:41 AM

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# Traditional Data Source

Implemented in `UICollectionViewController`

Either

- One gigantic controller
- One controller per content type

Doesn't encourage code reuse for similar sections

# Aggregate Data Source

Implement data sources as separate objects

Enables code reuse

Single view controller

# Aggregate Data Source

AAPLDataSource

The base data source class

AAPLSegmentedDataSource

Multiple children; only one active at a time

AAPLComposedDataSource

Multiple children; all active at once

AAPLBasicDataSource

One section; items stored in an NSArray

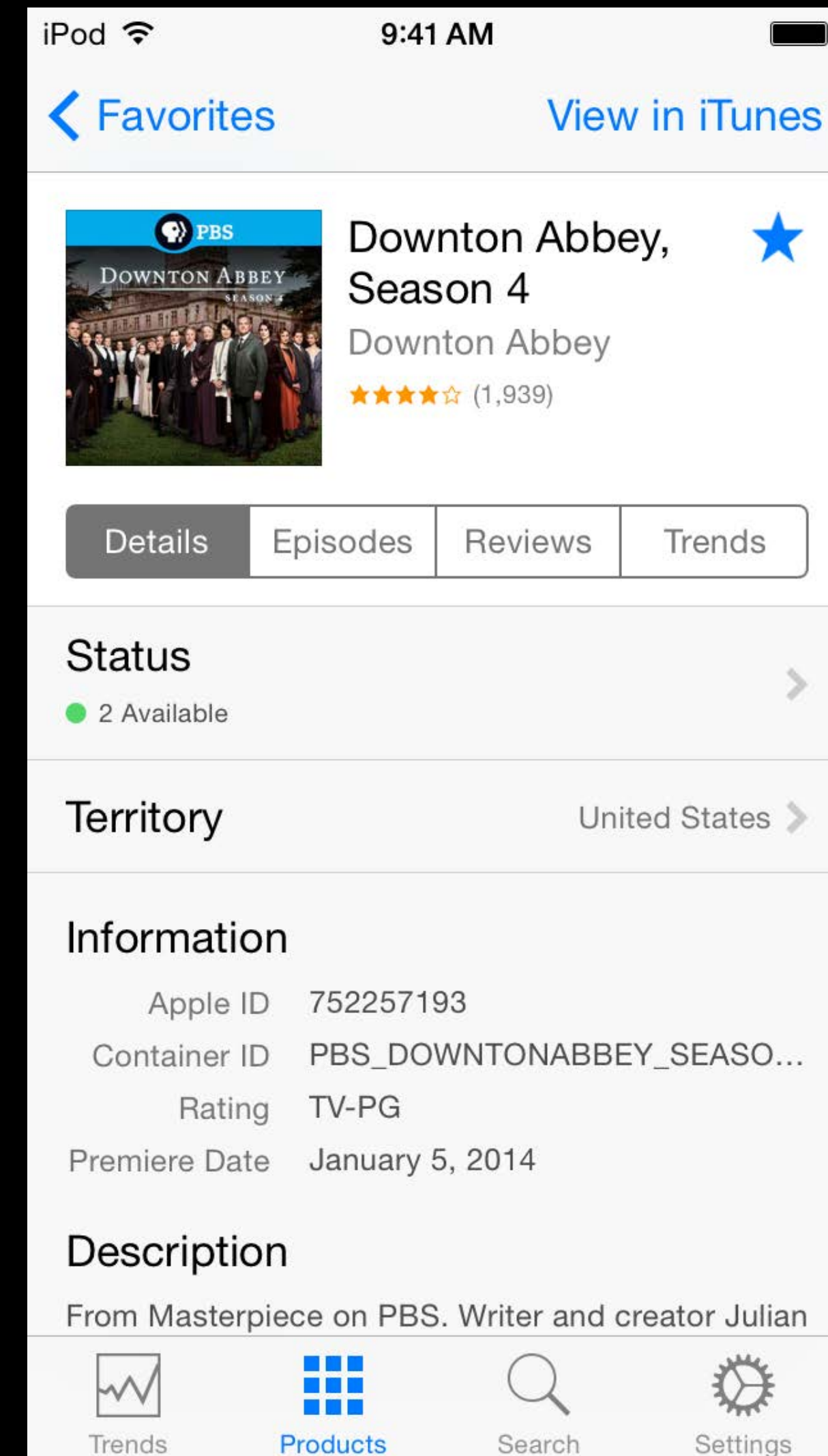
# Segmented Data Source

Details

Episodes

Reviews

Trends





# Composed Data Source

Details

Episodes

Reviews

Trends

The screenshot shows an iPod/iPhone interface with the following elements:

- Top status bar: iPod, signal strength, 9:41 AM, battery level.
- Navigation bar: Back arrow, Favorites, View in iTunes.
- Product card: PBS logo, 'Downton Abbey, Season 4' title, a star icon, a small image of the cast, and a rating of 4.5 stars (1,939 reviews).
- Tab bar: Details (selected), Episodes, Reviews, Trends.
- Status section: 'Status' header, '2 Available' with a green dot, and a right arrow.
- Territory section: 'Territory' header, 'United States' with a right arrow.
- Information section: 'Information' header, followed by fields for Apple ID (752257193), Container ID (PBS\_DOWNTONABBEY\_SEASO...), Rating (TV-PG), and Premiere Date (January 5, 2014).
- Description section: 'Description' header, followed by the text 'From Masterpiece on PBS. Writer and creator Julian'.
- Bottom dock: Trends (line graph icon), Products (grid icon), Search (magnifying glass icon), Settings (gear icon).

# Composed Data Source

## Details

- **Status**

## Episodes

## Reviews

## Trends

The screenshot shows the iTunes app interface on an iPod. At the top, the status bar displays 'iPod', signal strength, '9:41 AM', and battery level. Below the status bar, there is a navigation bar with a back arrow, the text 'Favorites', and a 'View in iTunes' link. The main content area features a card for 'Downton Abbey, Season 4'. The card includes a poster image, the title 'Downton Abbey, Season 4', the network 'PBS', a blue star icon, and a rating of 4.5 stars from 1,939 reviews. Below the card is a tabbed interface with 'Details', 'Episodes', 'Reviews', and 'Trends' tabs. The 'Status' section is highlighted in yellow and shows '2 Available'. The 'Territory' section shows 'United States'. The 'Information' section lists: Apple ID 752257193, Container ID PBS\_DOWNTONABBEY\_SEASO..., Rating TV-PG, and Premiere Date January 5, 2014. The 'Description' section starts with 'From Masterpiece on PBS. Writer and creator Julian'. At the bottom, there is a navigation bar with icons for Trends, Products, Search, and Settings.

# Composed Data Source

## Details

- Status
- **Information**

## Episodes

## Reviews

## Trends

The screenshot shows the iTunes app interface on an iPod. At the top, the status bar displays 'iPod', signal strength, Wi-Fi, and the time '9:41 AM'. Below the status bar, there is a navigation bar with a back arrow, the text 'Favorites', and a 'View in iTunes' link. The main content area features a card for 'Downton Abbey, Season 4'. The card includes a poster image, the title 'Downton Abbey, Season 4', a blue star icon, and a rating of four stars with '(1,939)' reviews. Below the card is a tabbed interface with 'Details', 'Episodes', 'Reviews', and 'Trends' tabs. The 'Status' section shows '2 Available' with a right arrow. The 'Territory' section shows 'United States' with a right arrow. The 'Information' section is highlighted in yellow and contains the following data: Apple ID 752257193, Container ID PBS\_DOWNTONABBEY\_SEASO..., Rating TV-PG, and Premiere Date January 5, 2014. The 'Description' section starts with 'From Masterpiece on PBS. Writer and creator Julian'. At the bottom, there is a navigation bar with icons for Trends, Products, Search, and Settings.



# Composed Data Source

## Details

- Status
- Information
- **Description**

## Episodes

## Reviews

## Trends

The screenshot shows the 'Downton Abbey, Season 4' page in an iTunes-style app. At the top, it says 'iPod' with signal and battery icons, and the time '9:41 AM'. Below the status bar, there are navigation links for 'Favorites' and 'View in iTunes'. The main content area features a poster for 'Downton Abbey, Season 4' with the PBS logo, a star icon, and a rating of 4.5 stars from 1,939 reviews. Below the poster are tabs for 'Details', 'Episodes', 'Reviews', and 'Trends'. The 'Details' section is expanded, showing 'Status' (2 Available), 'Territory' (United States), and 'Information' (Apple ID: 752257193, Container ID: PBS\_DOWNTONABBEY\_SEASO..., Rating: TV-PG, Premiere Date: January 5, 2014). The 'Description' section is highlighted in yellow and contains the text: 'From Masterpiece on PBS. Writer and creator Julian'. At the bottom, there is a navigation bar with icons for Trends, Products, Search, and Settings.

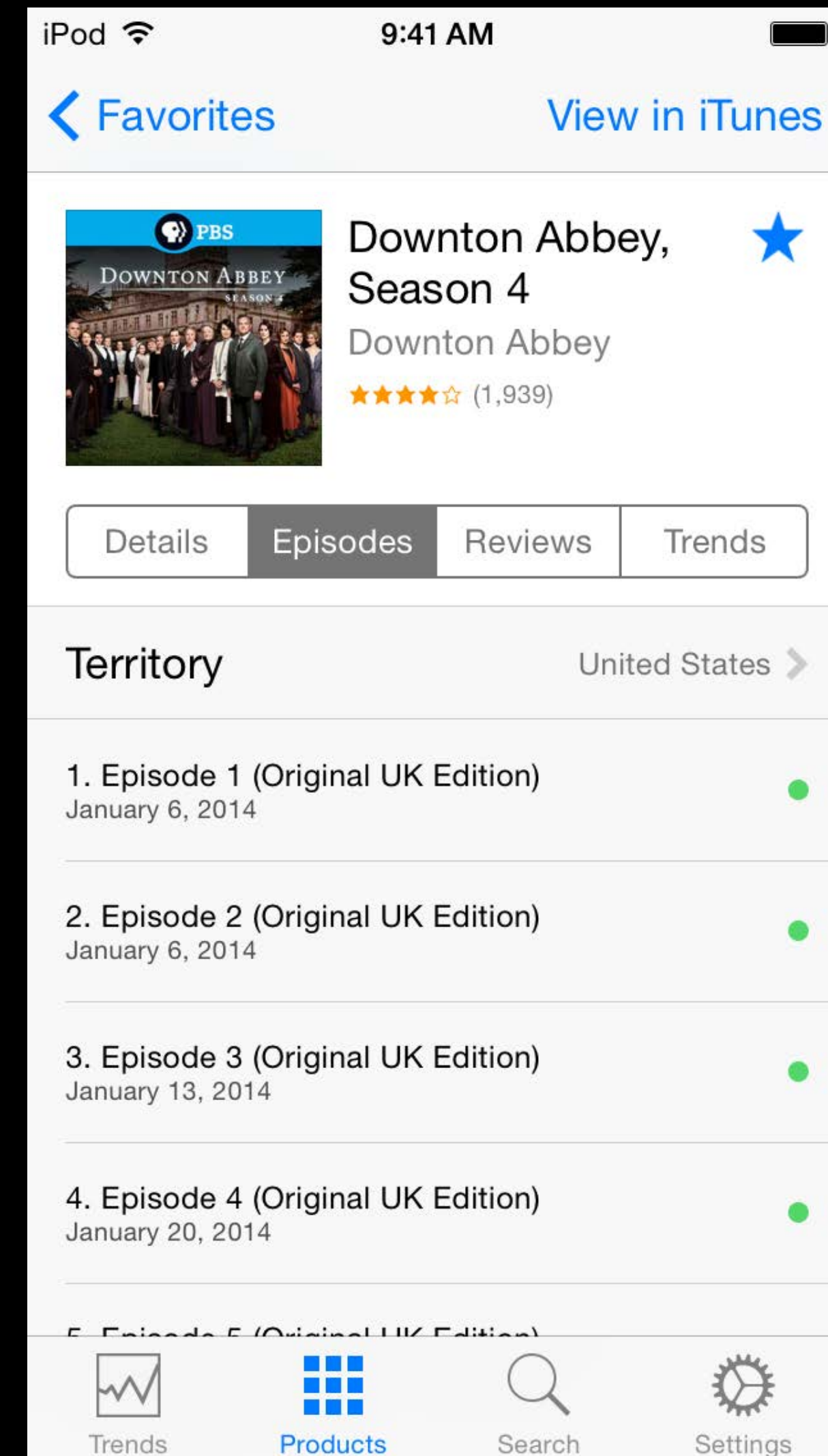
# Basic Data Source

Details

Episodes

Reviews

Trends



# Composed Data Source

Details

Episodes

Reviews

Trends

iPod 9:41 AM

< Favorites View in iTunes

Downton Abbey, Season 4 ★  
Downton Abbey  
★★★★☆ (1,939)

Details Episodes Reviews Trends

Territory United States >

Average Rating ★★★★★ 1552 Ratings

★★★★★  
★★★★★  
★★★★★  
★★★★★  
★★★★★

1. Love it!  
★★★★★ by Abbey fan in Japan on Mar 7, 2014  
I love this show in its entirety. When I first learned of it, I stayed up all night watching seasons 1-3. I love the speech...

Trends Products Search Settings



# Composed Data Source

Details

Episodes

Reviews

• Ratings

Trends

iPod 9:41 AM

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Trends Products Search Settings

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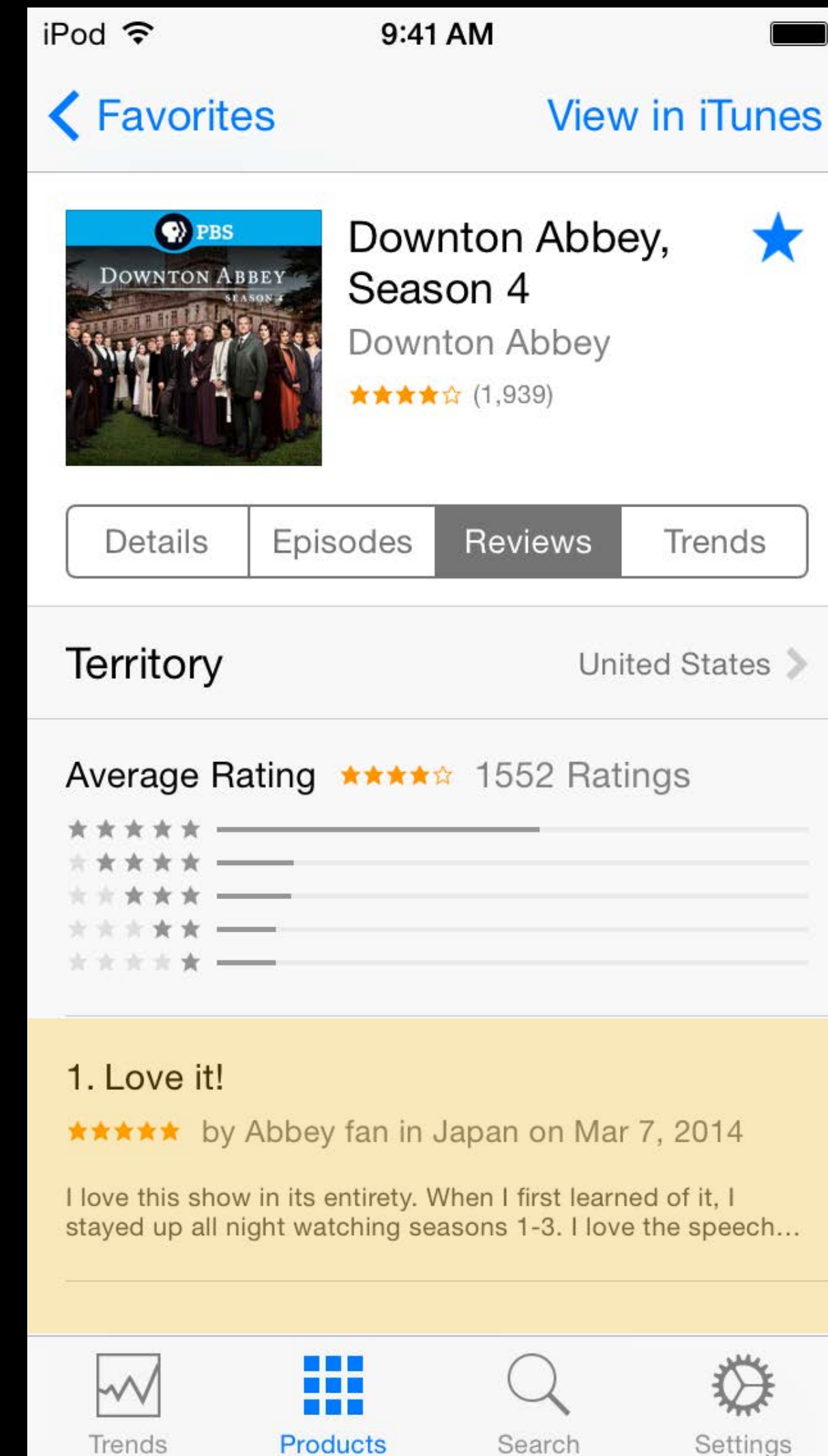
Episodes

Reviews

- Ratings

- **Reviews**

Trends





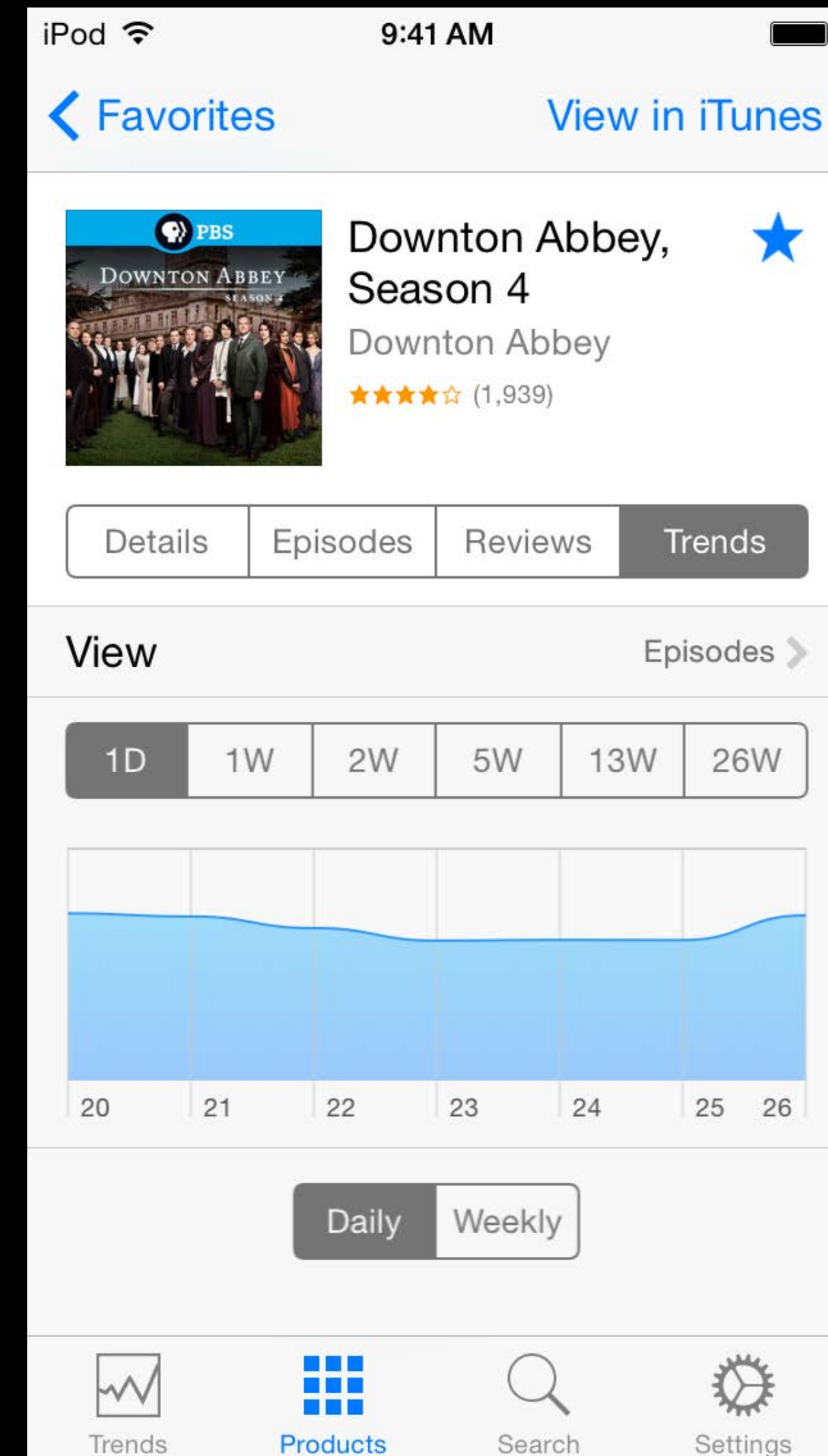
# Custom Data Source

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Episodes

Reviews

Trends



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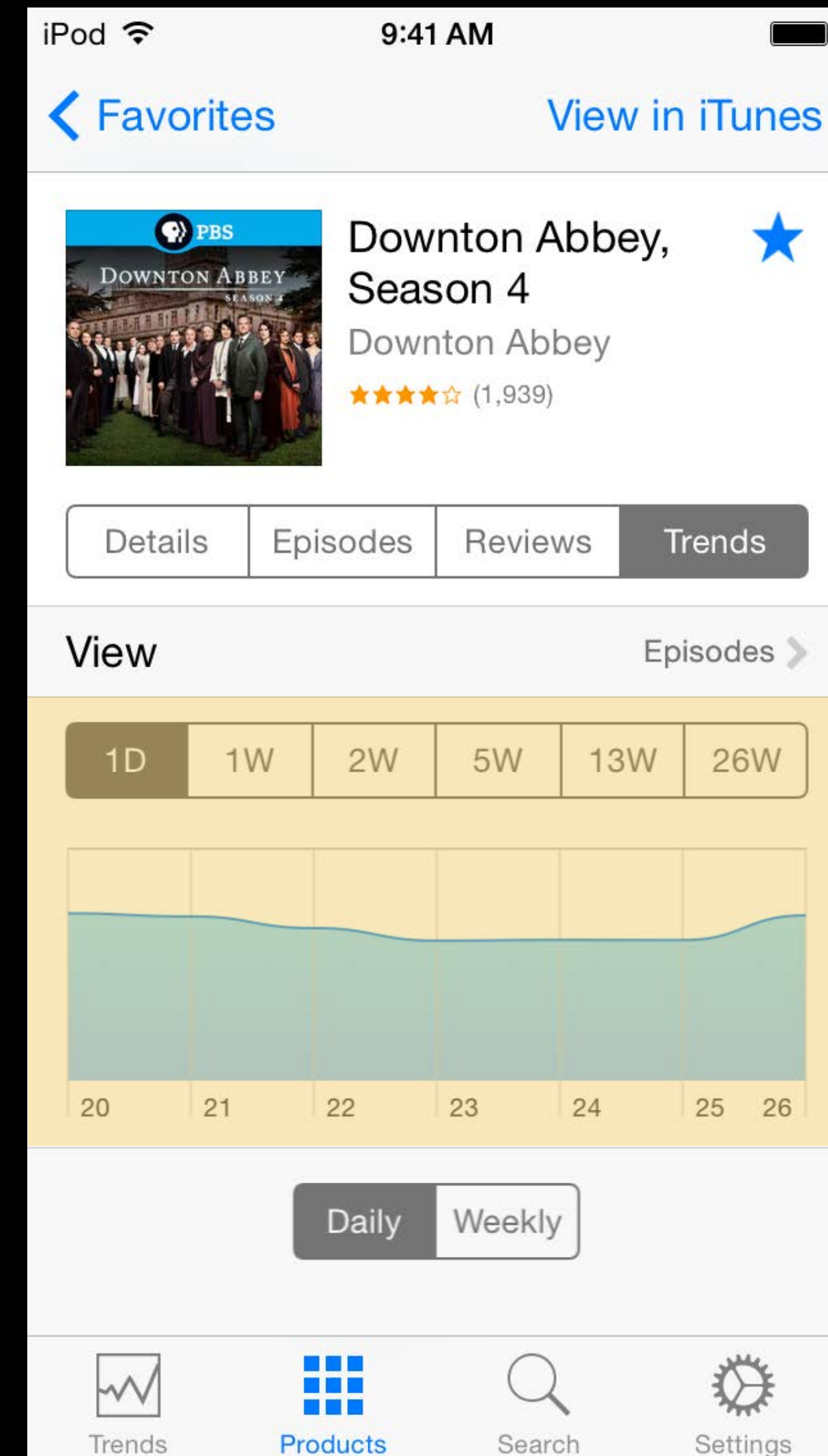
Details

Episodes

Reviews

Trends

- Graph



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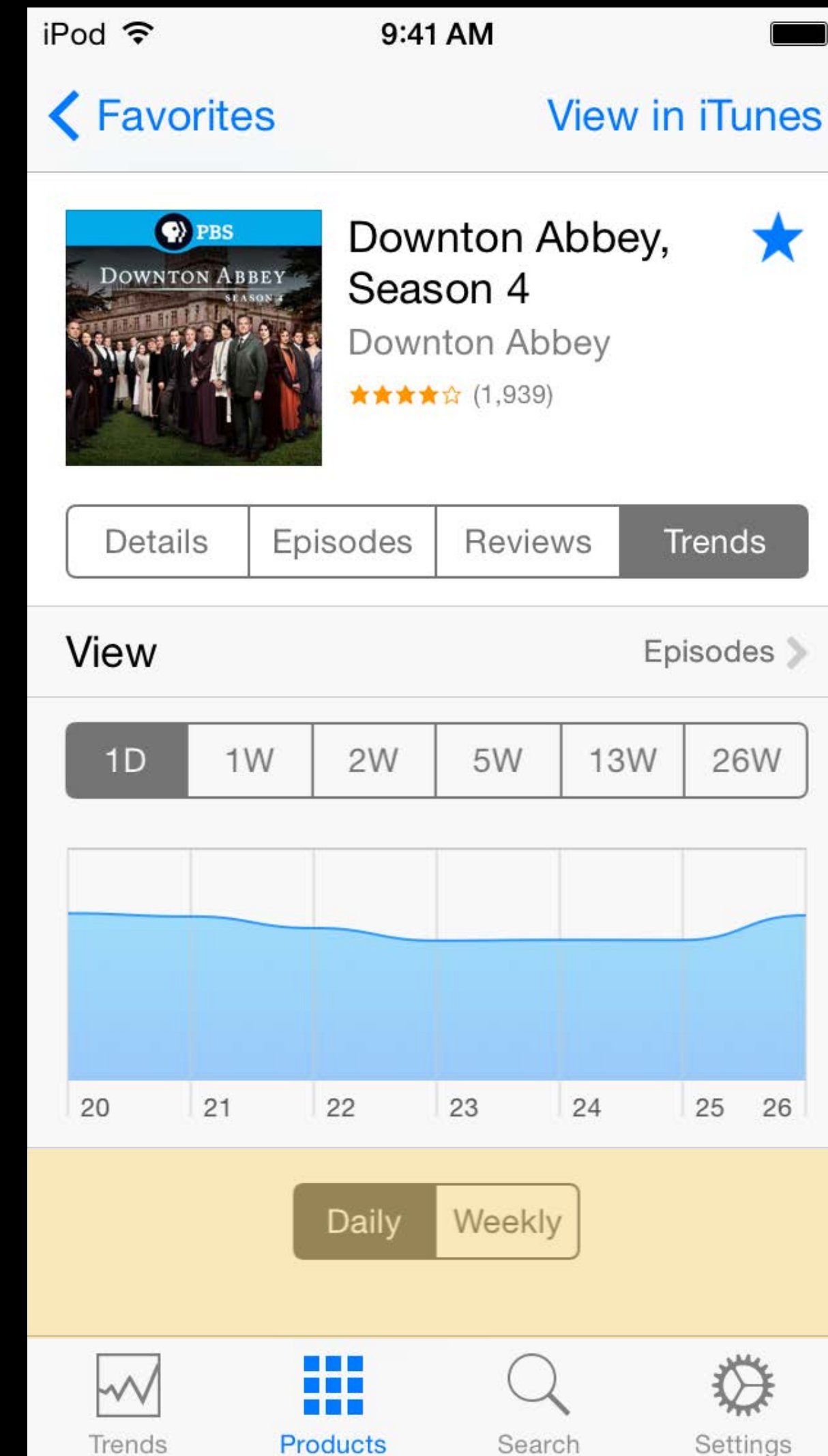
Details

Episodes

Reviews

Trends

- Graph
- **History**



# Single Loading Indicator

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Data source responsible for loading



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Data source responsible for loading

View controller starts fetch in `-viewWillAppear:`

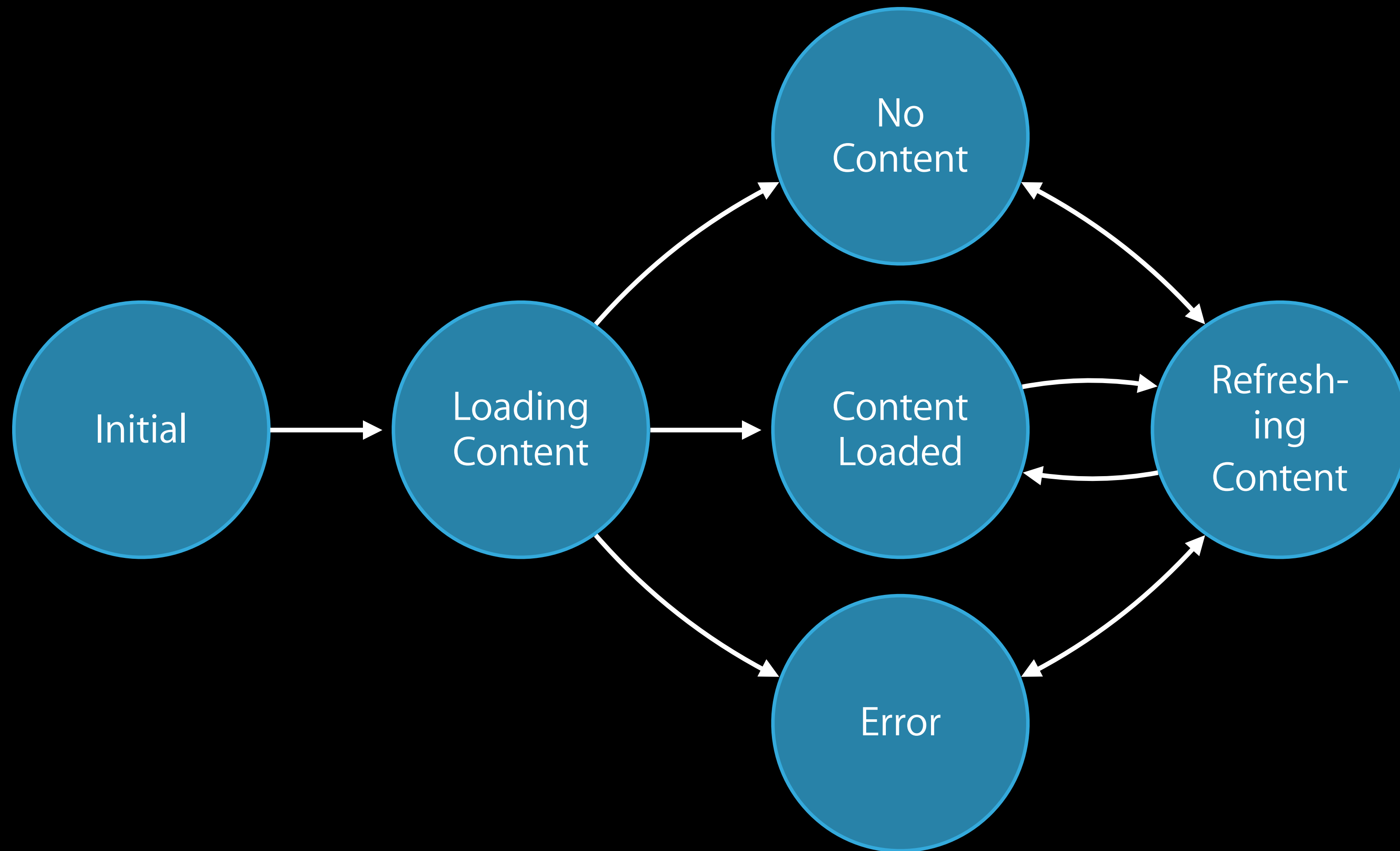
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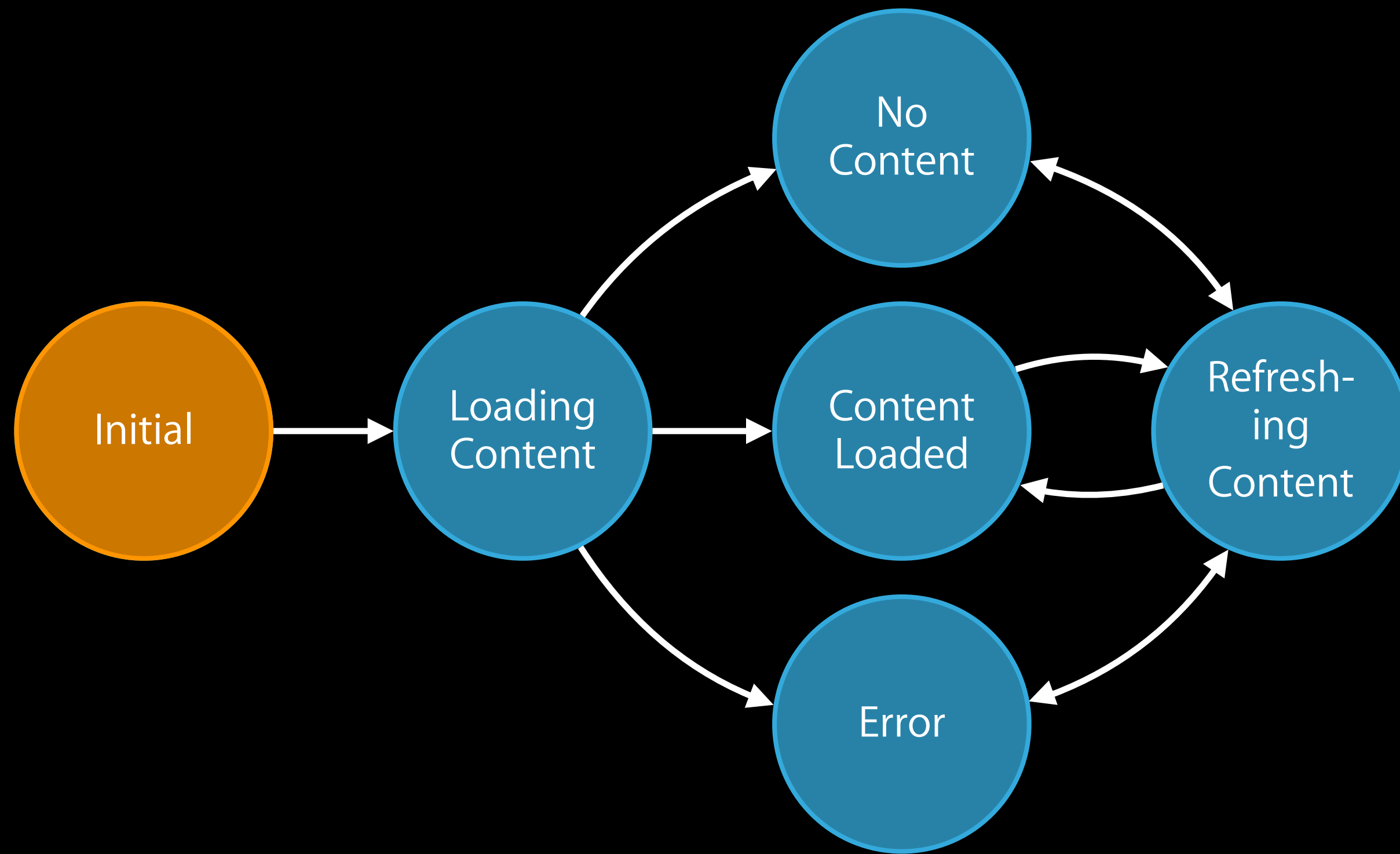
Data source responsible for loading

View controller starts fetch in `-viewWillAppear:`

Use state machine

# AAPLLoadableContentStateMachine

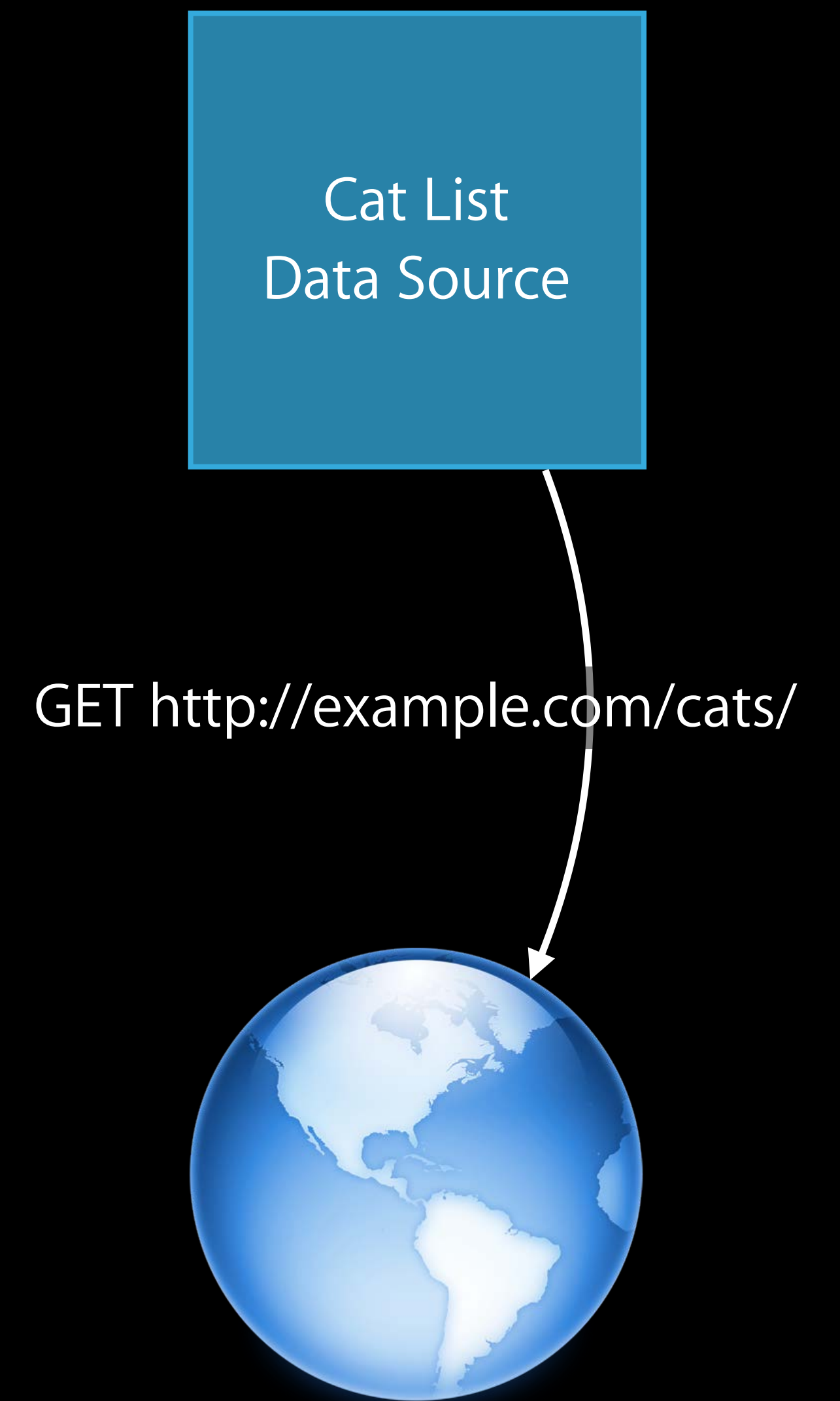
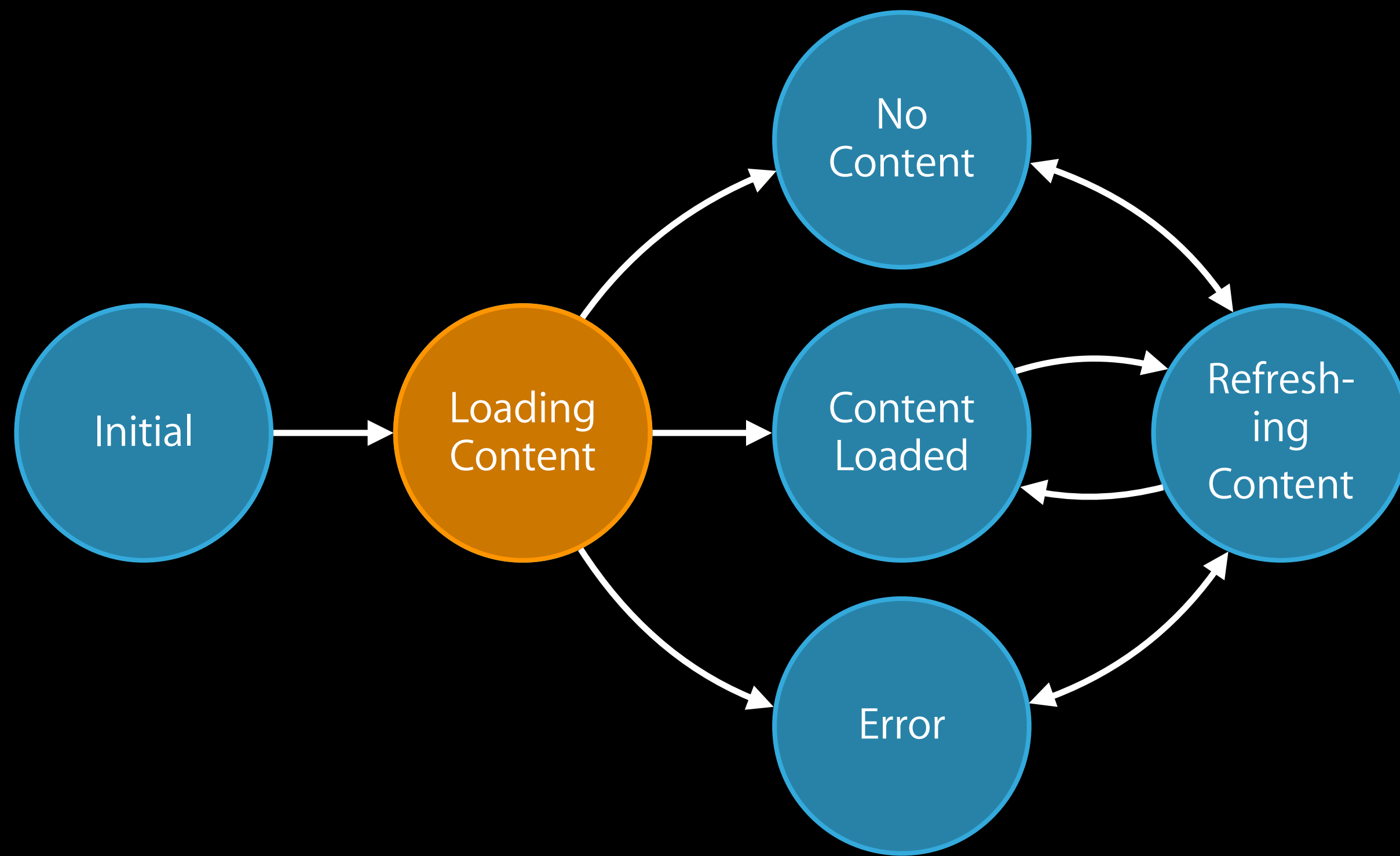


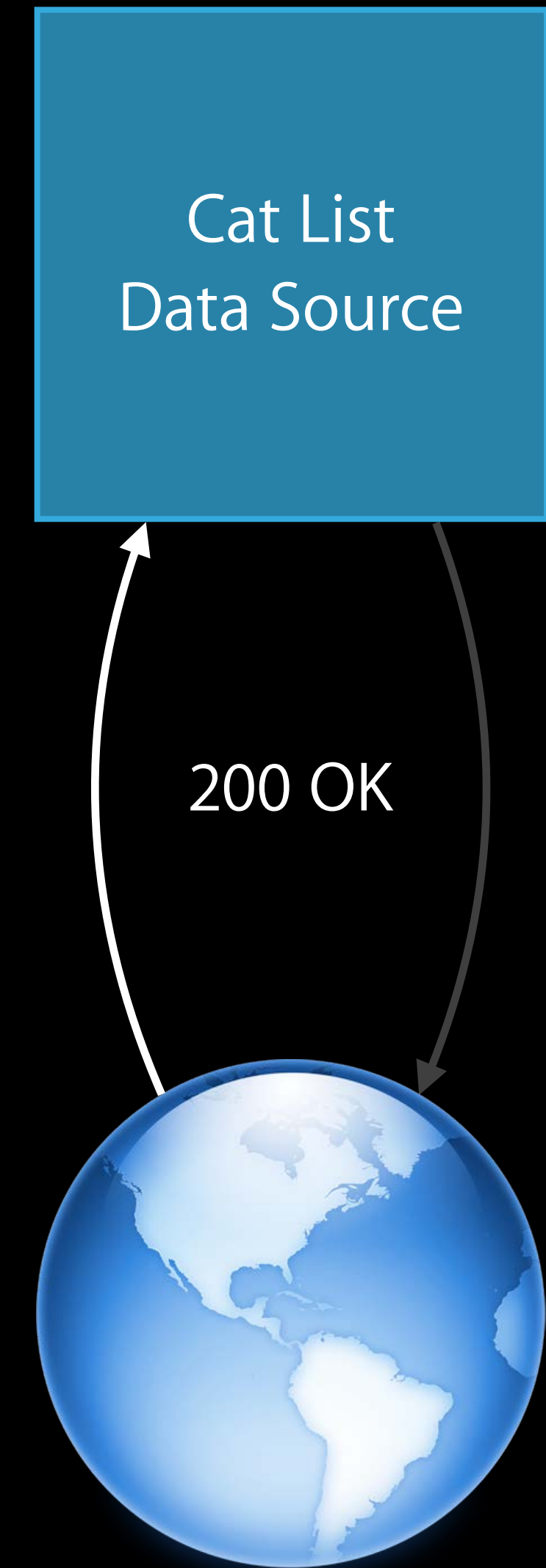
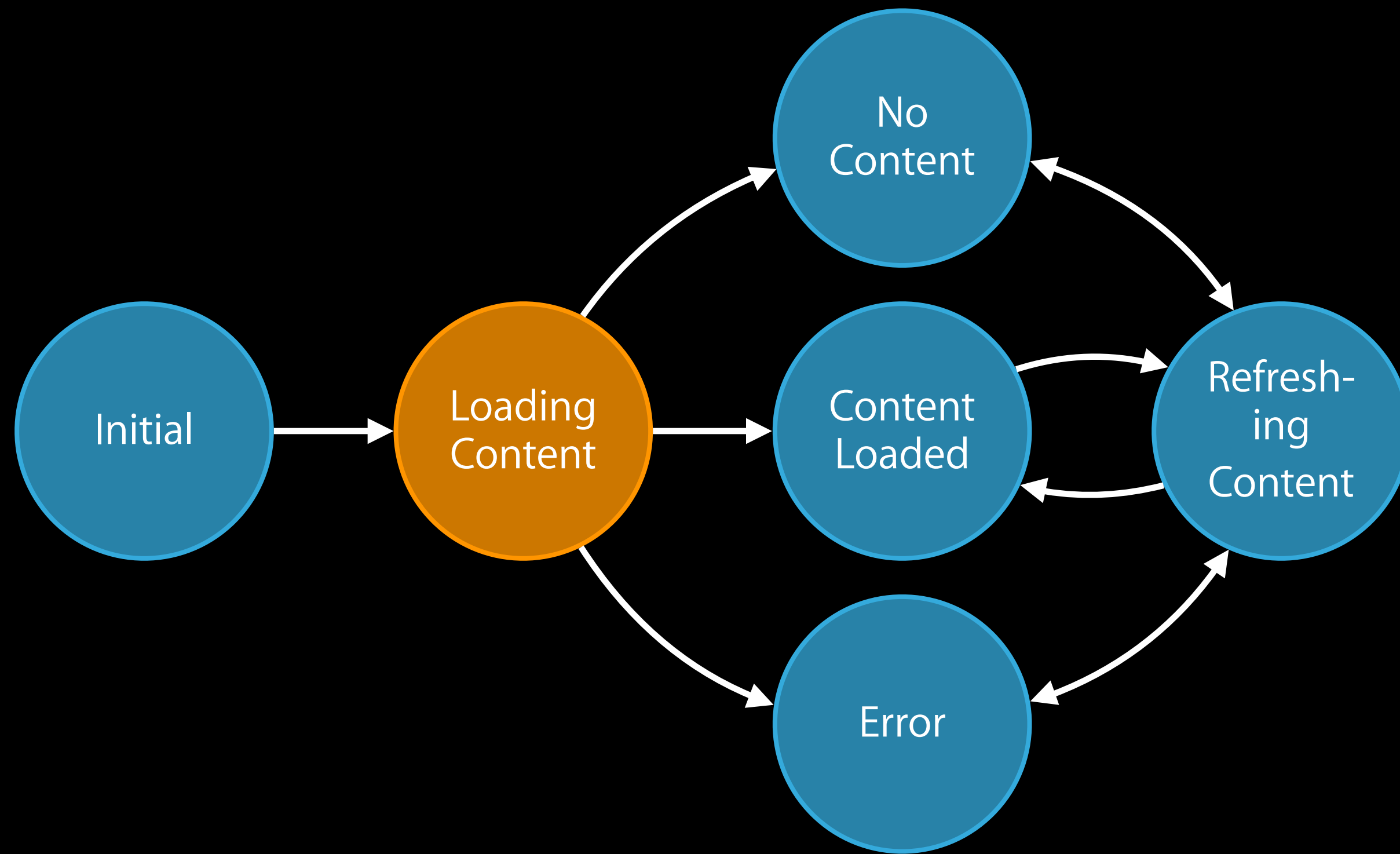


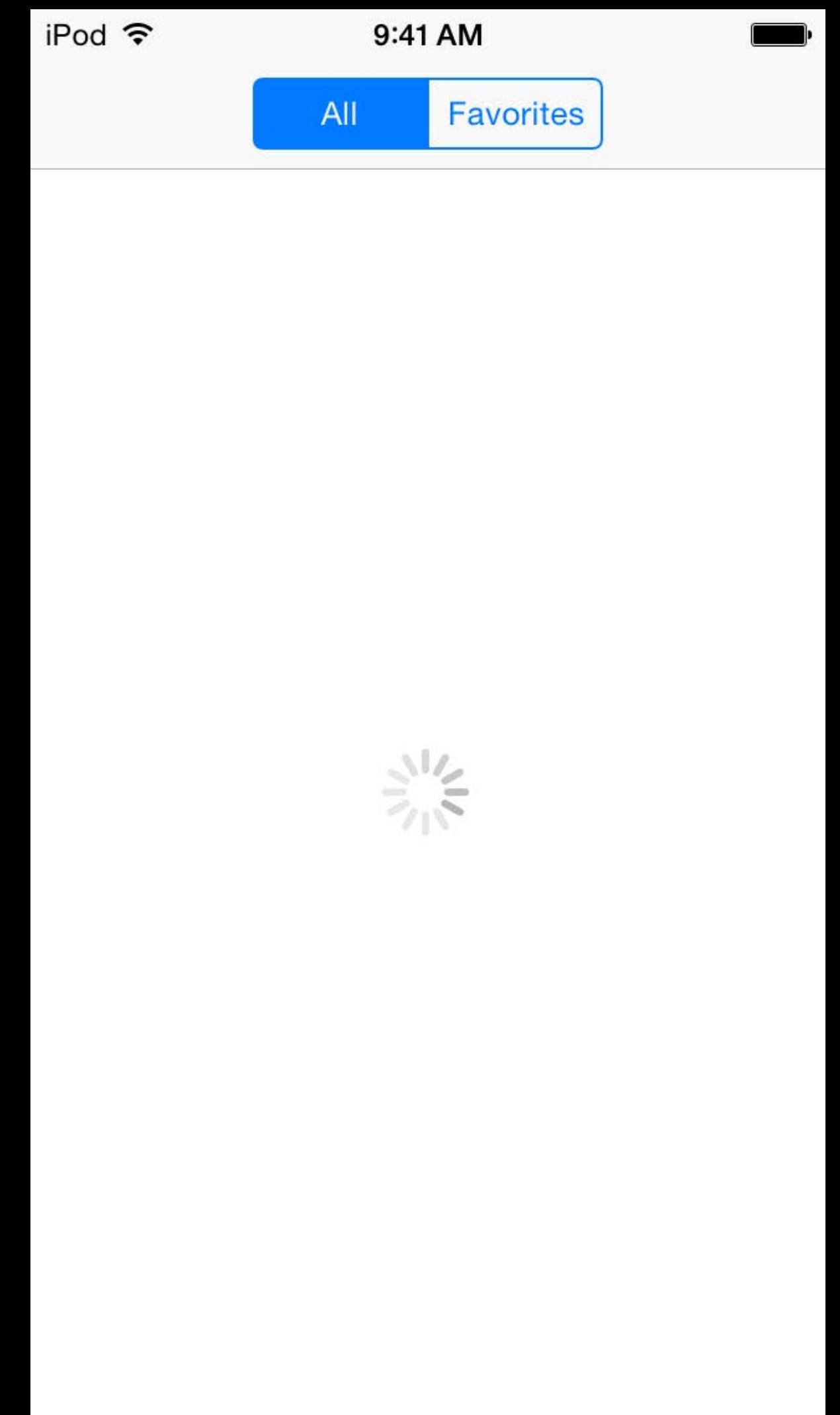
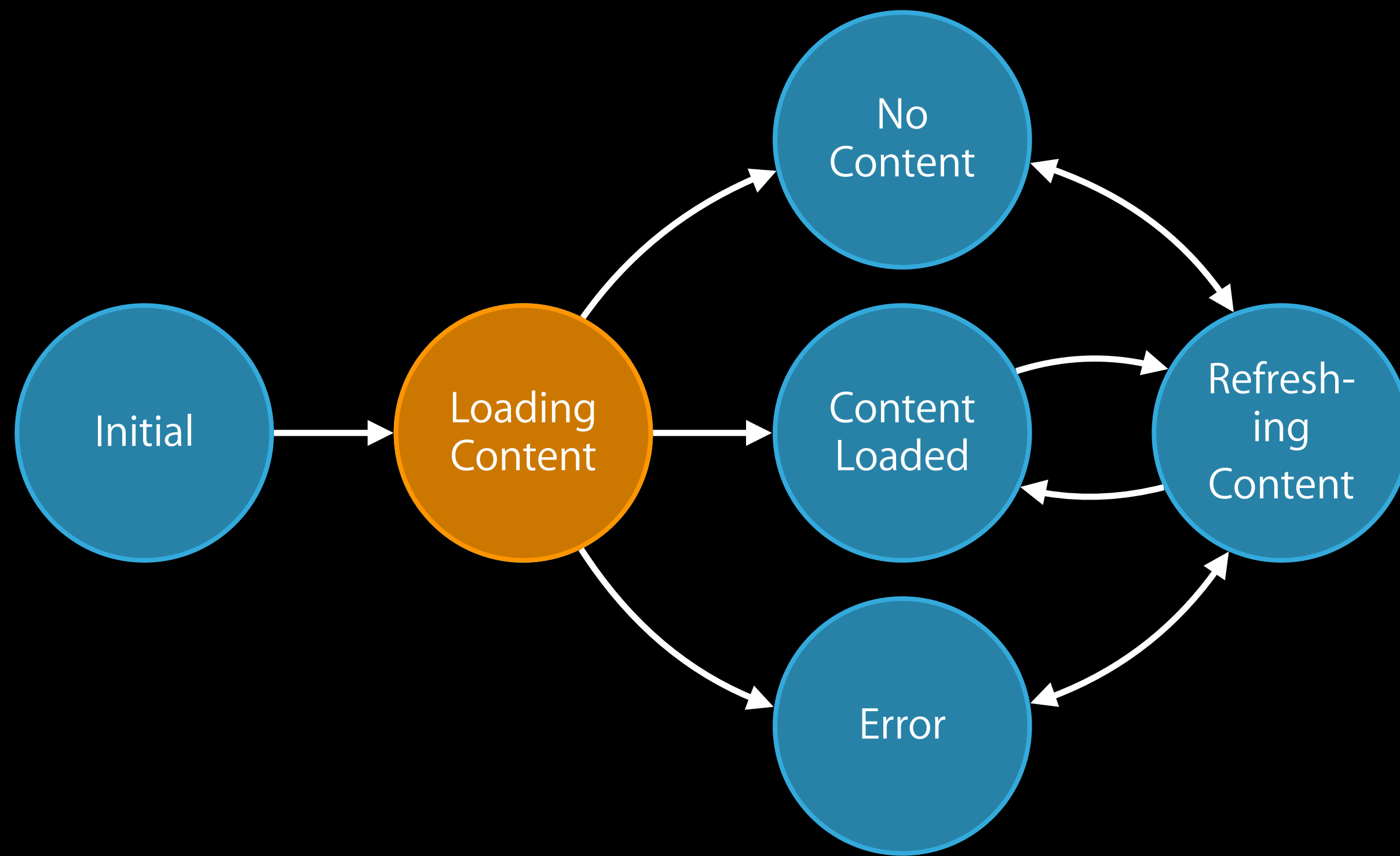
Cat List  
Data Source

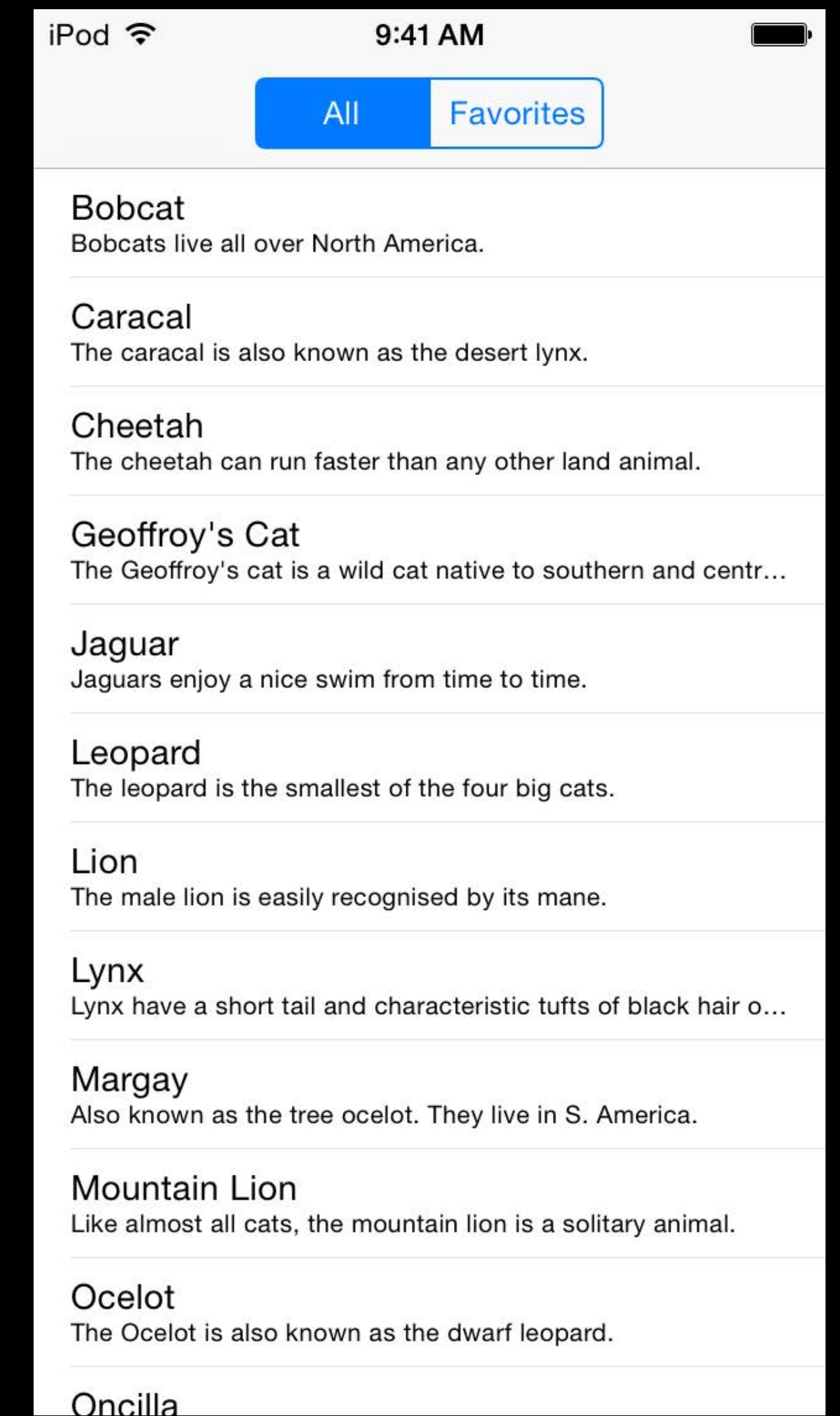
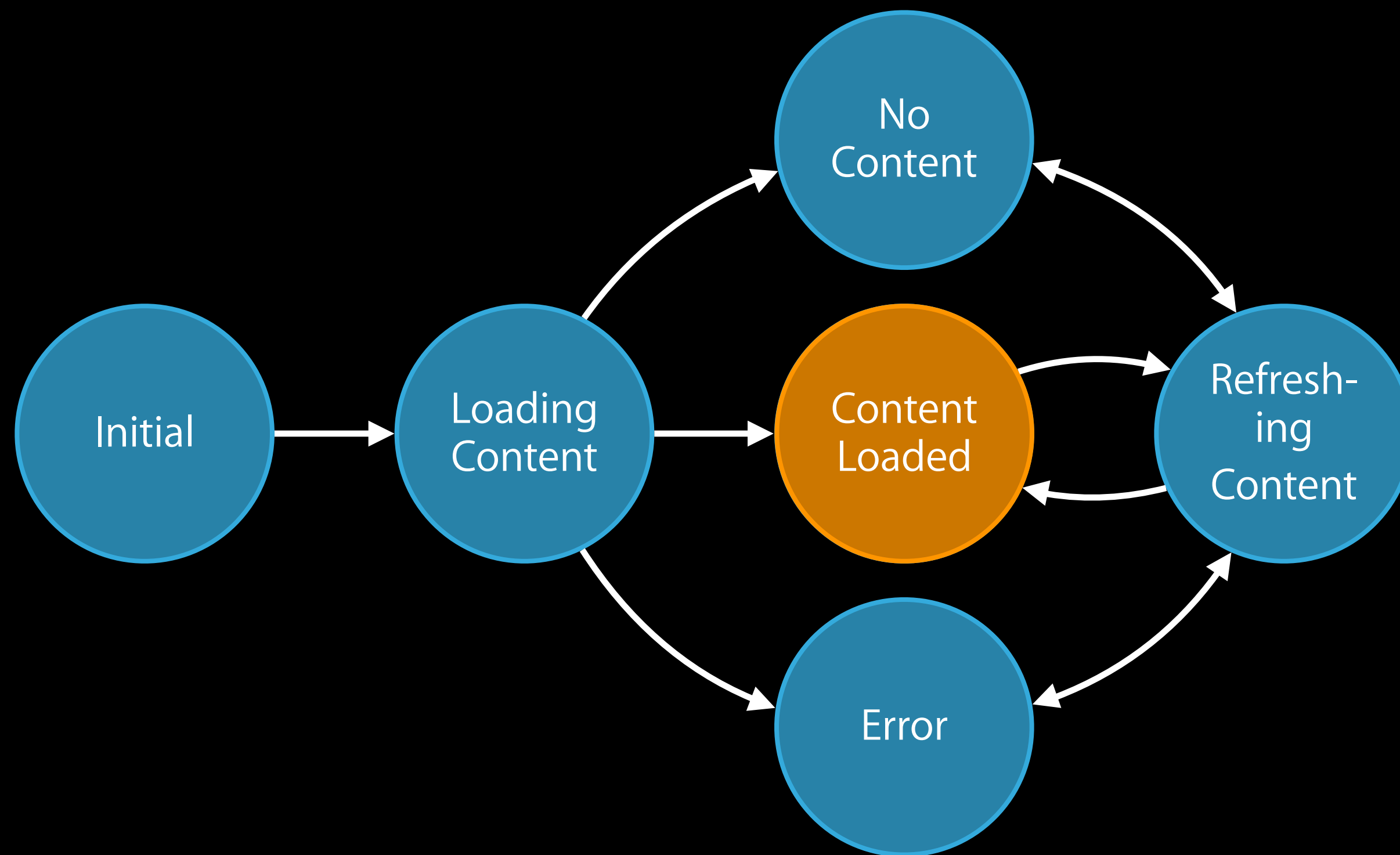




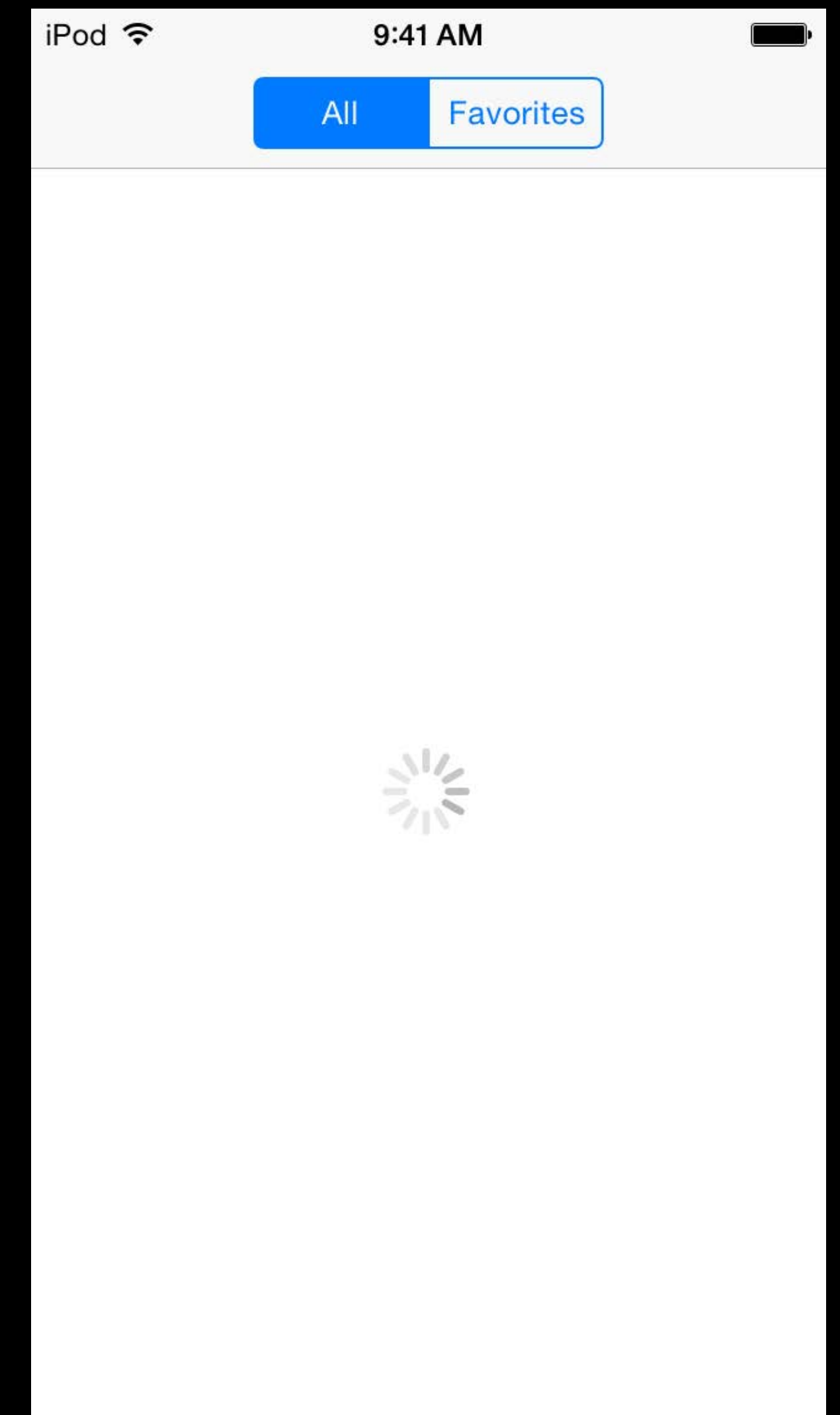
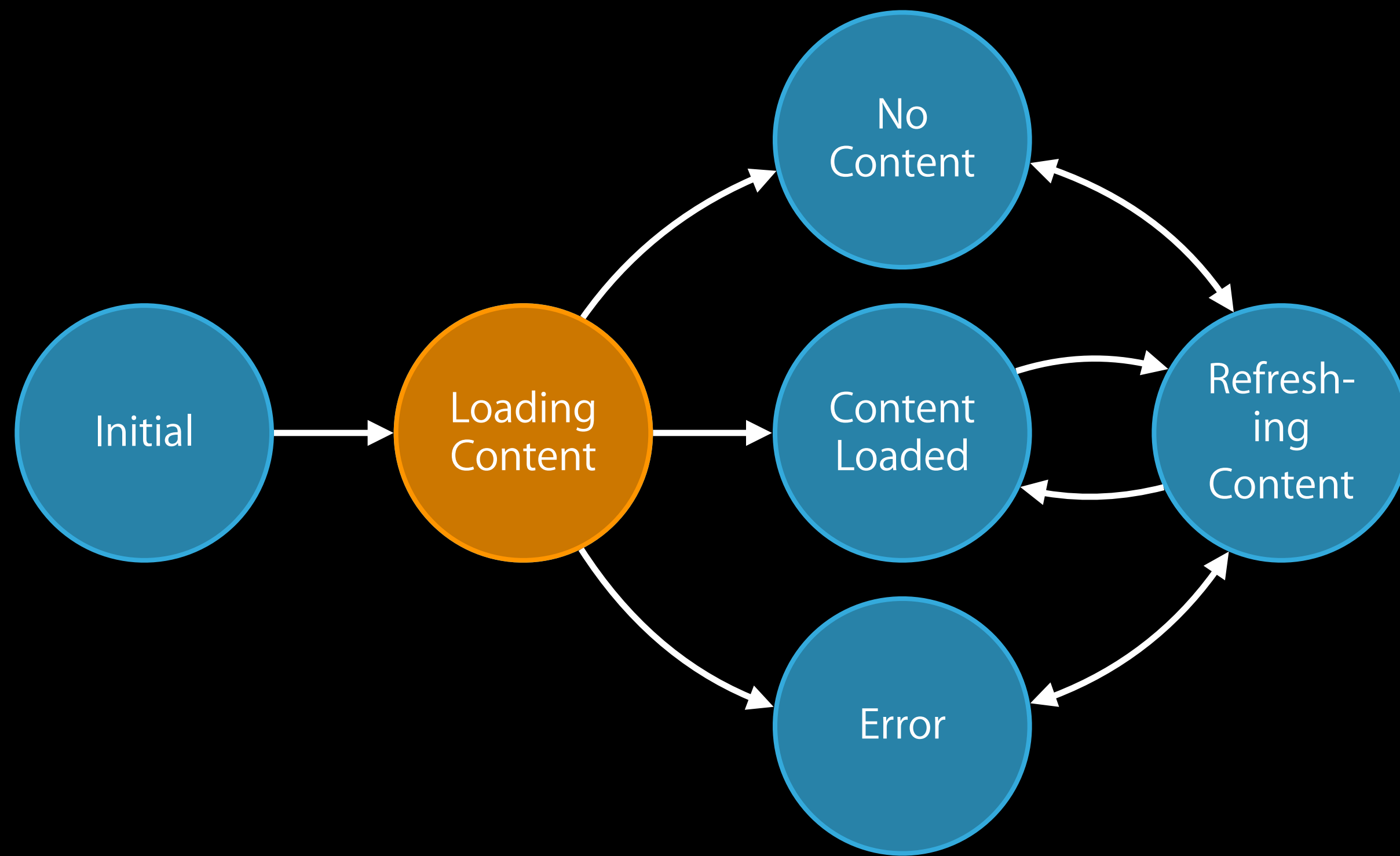


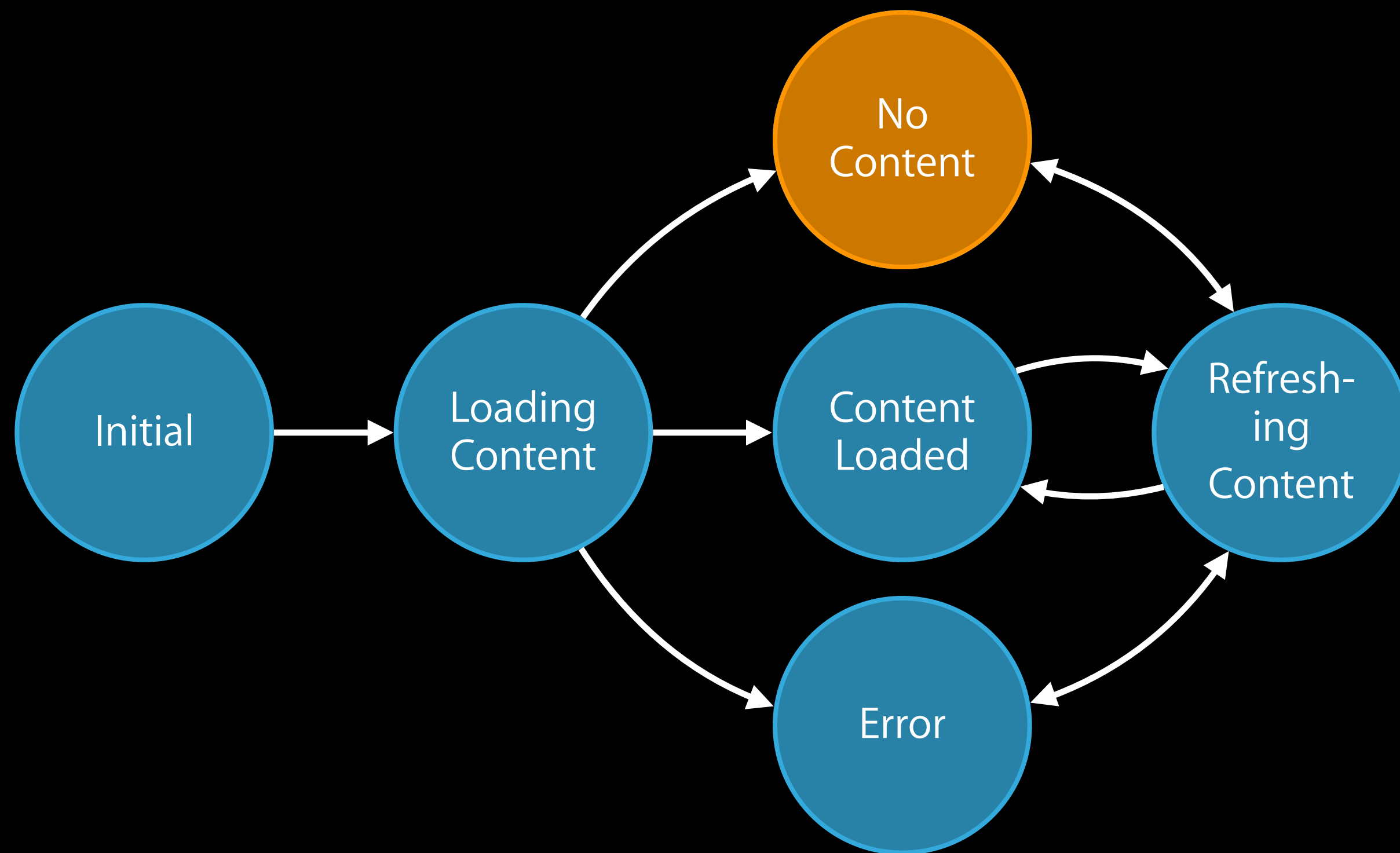


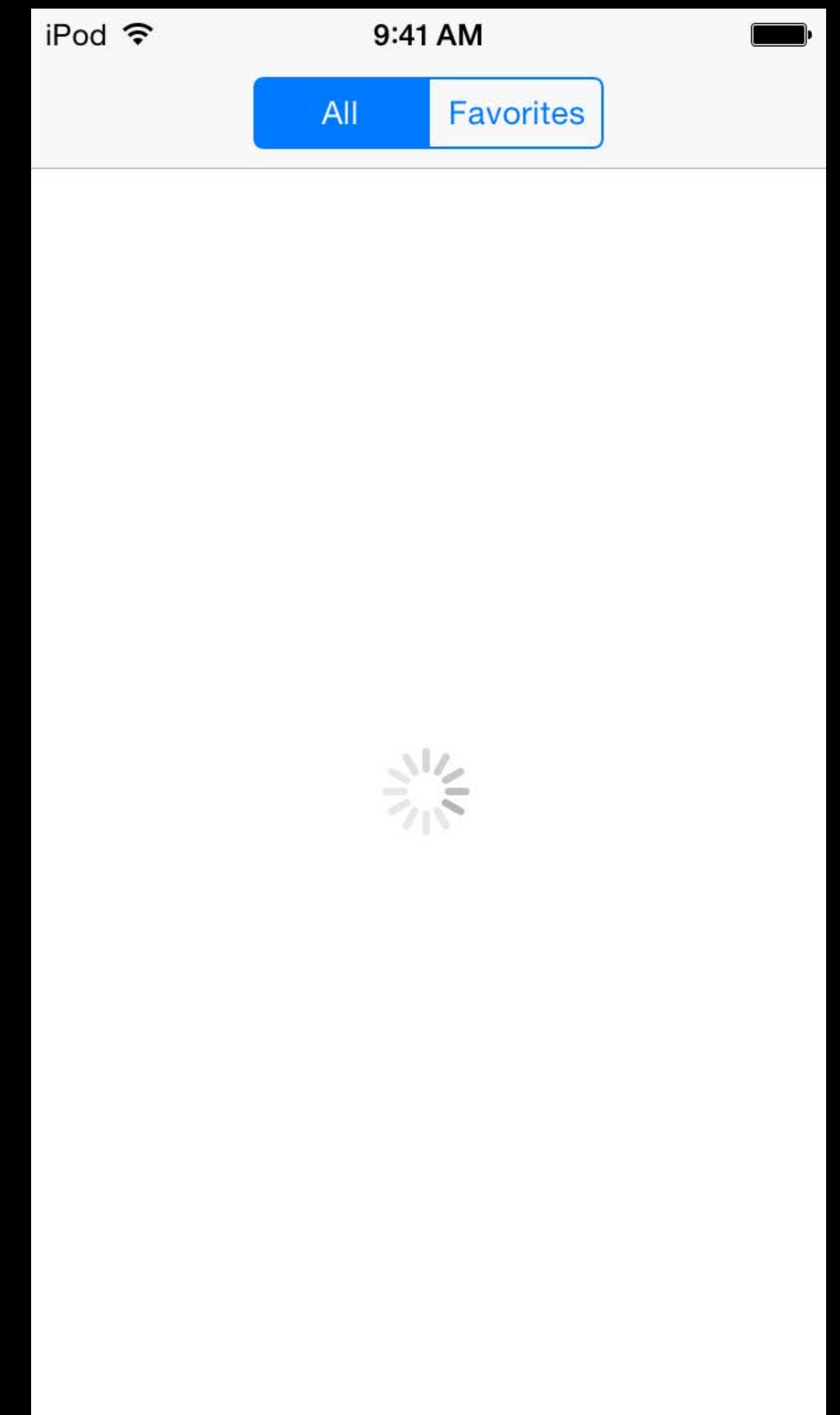
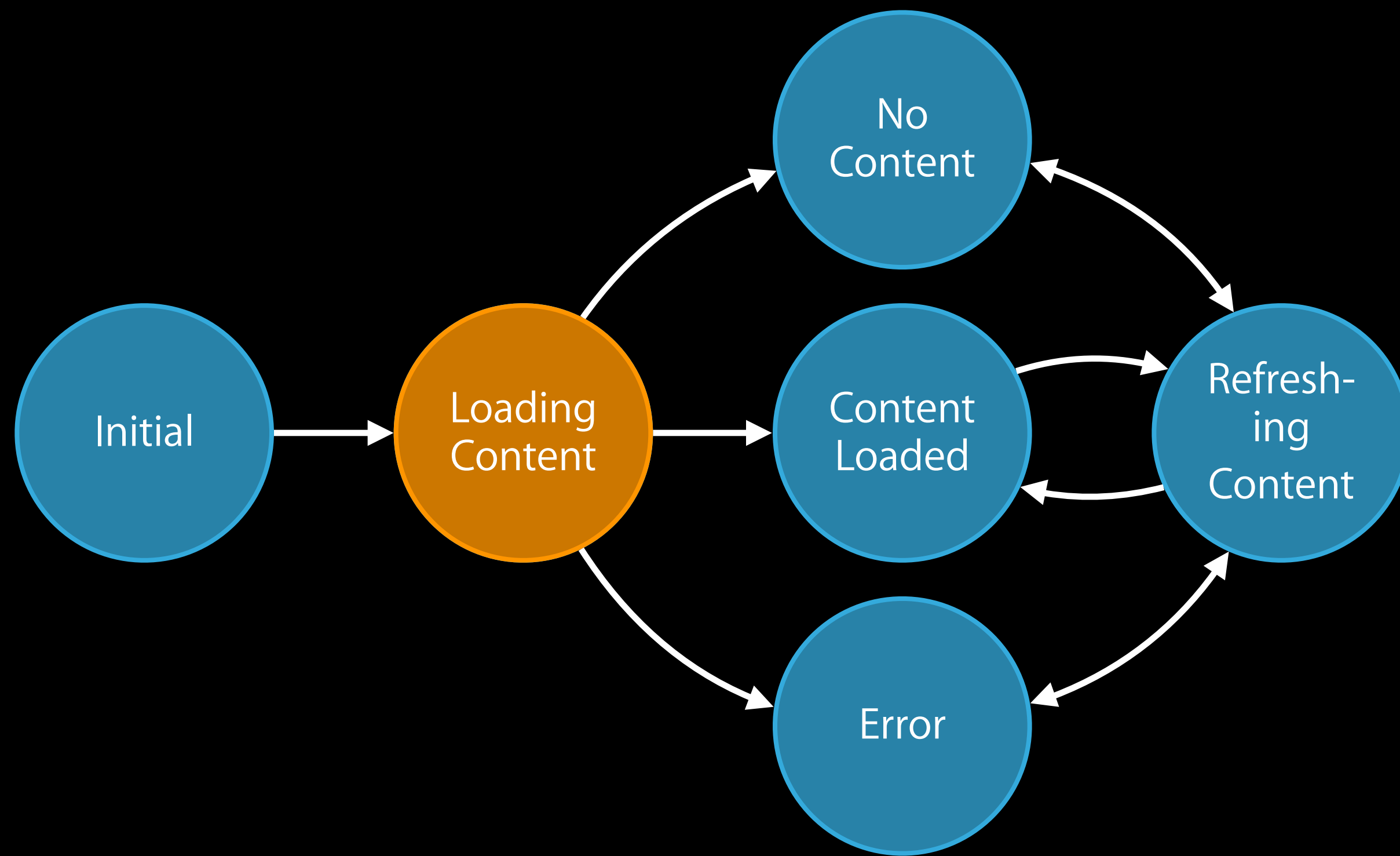


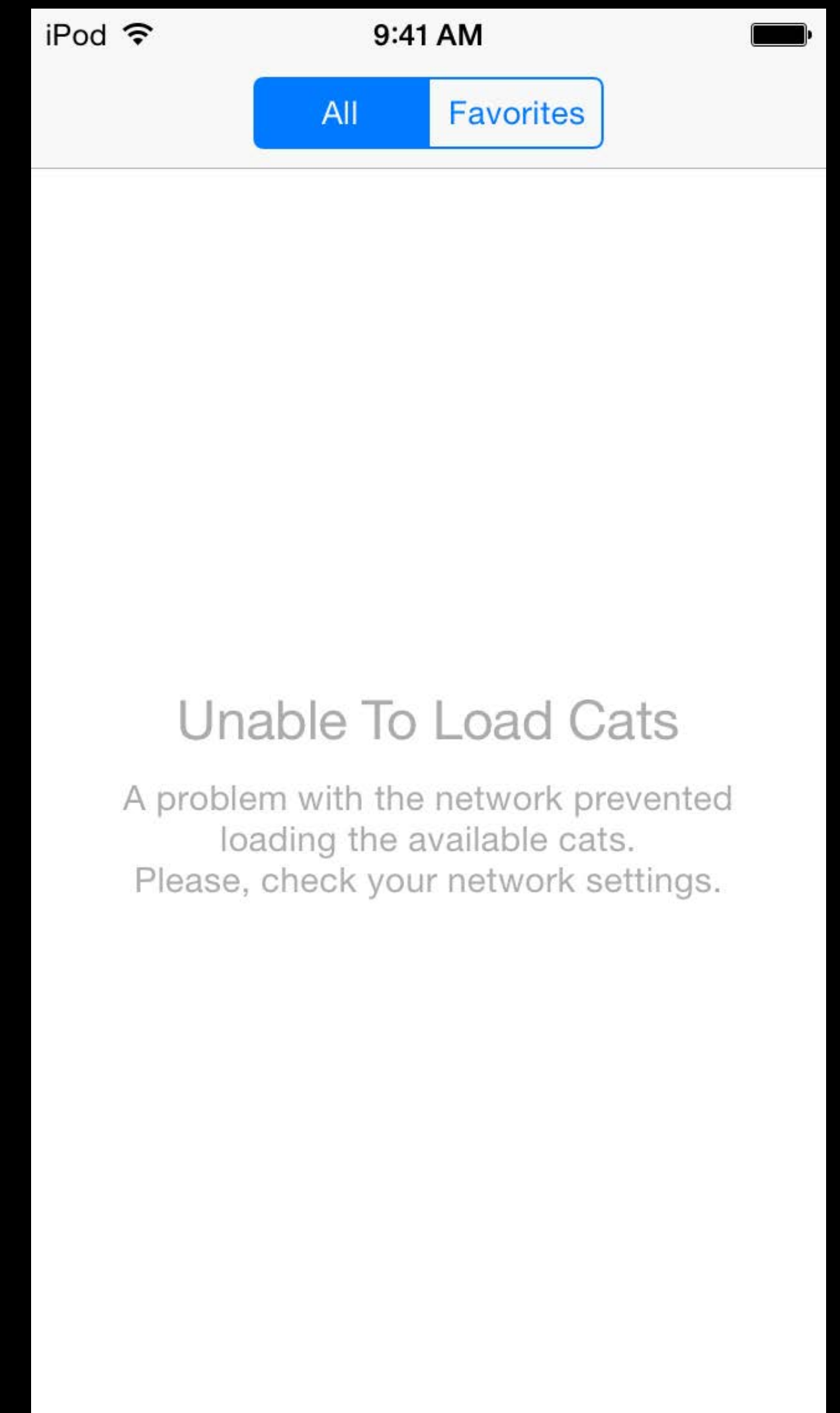
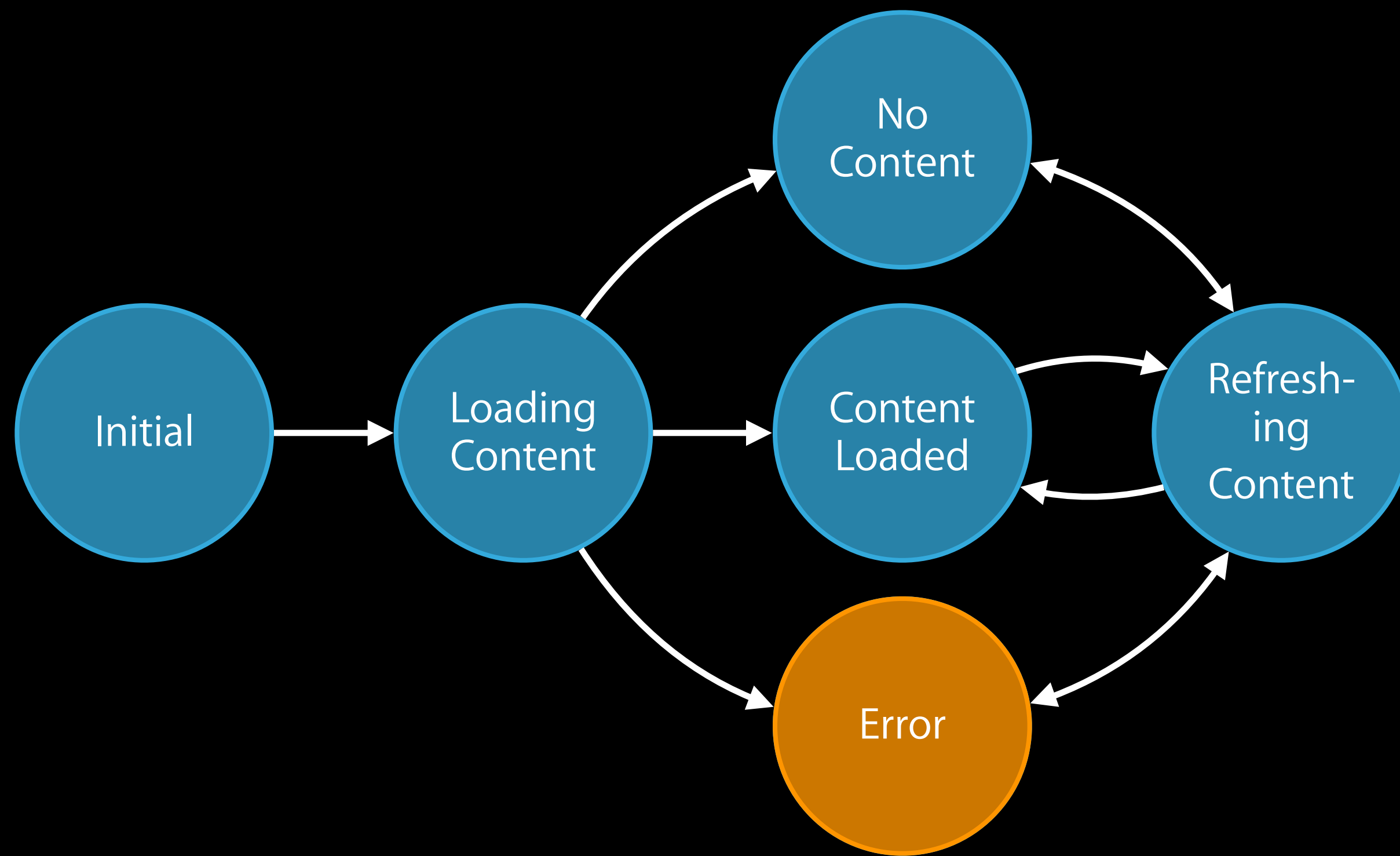






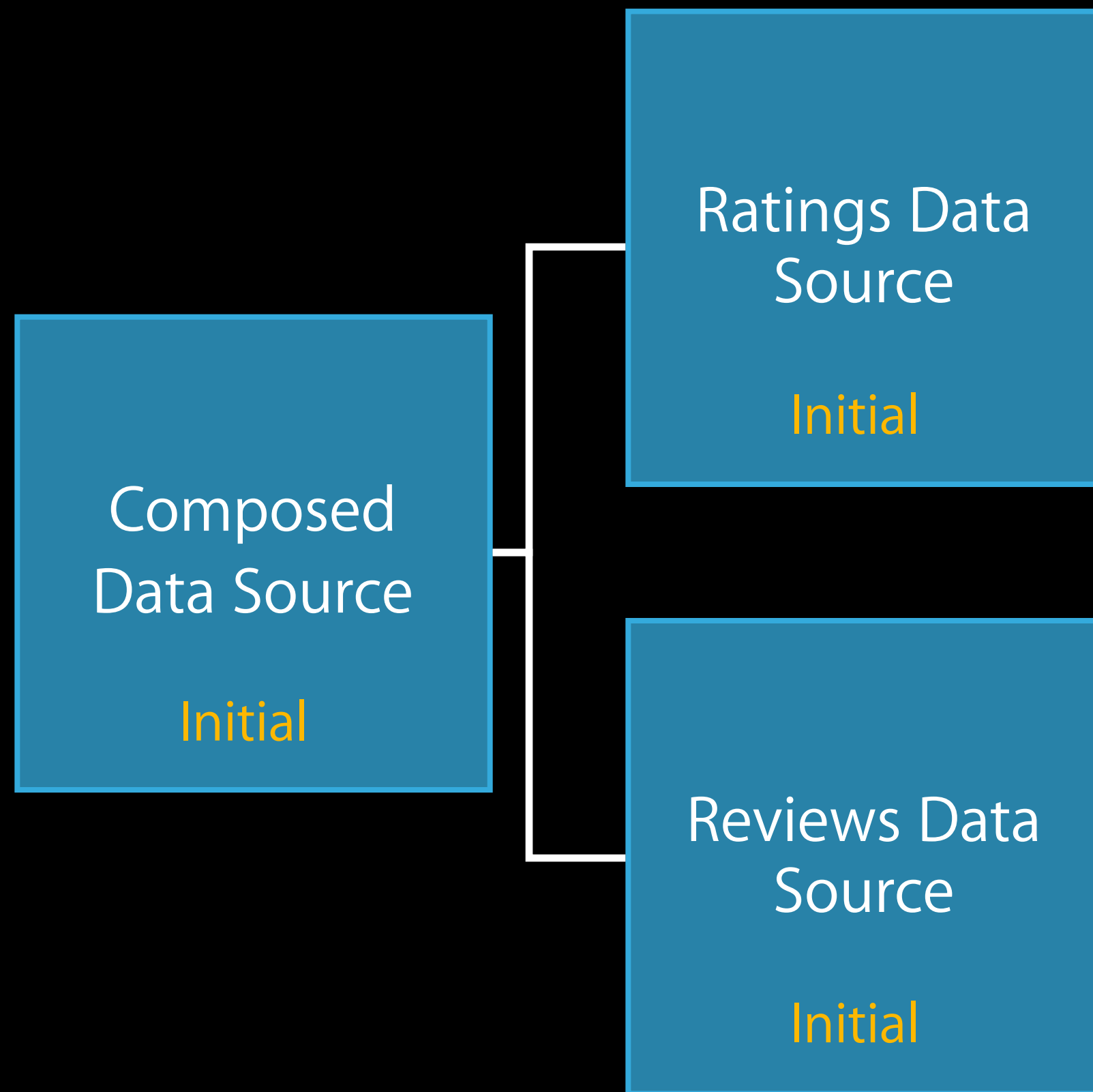




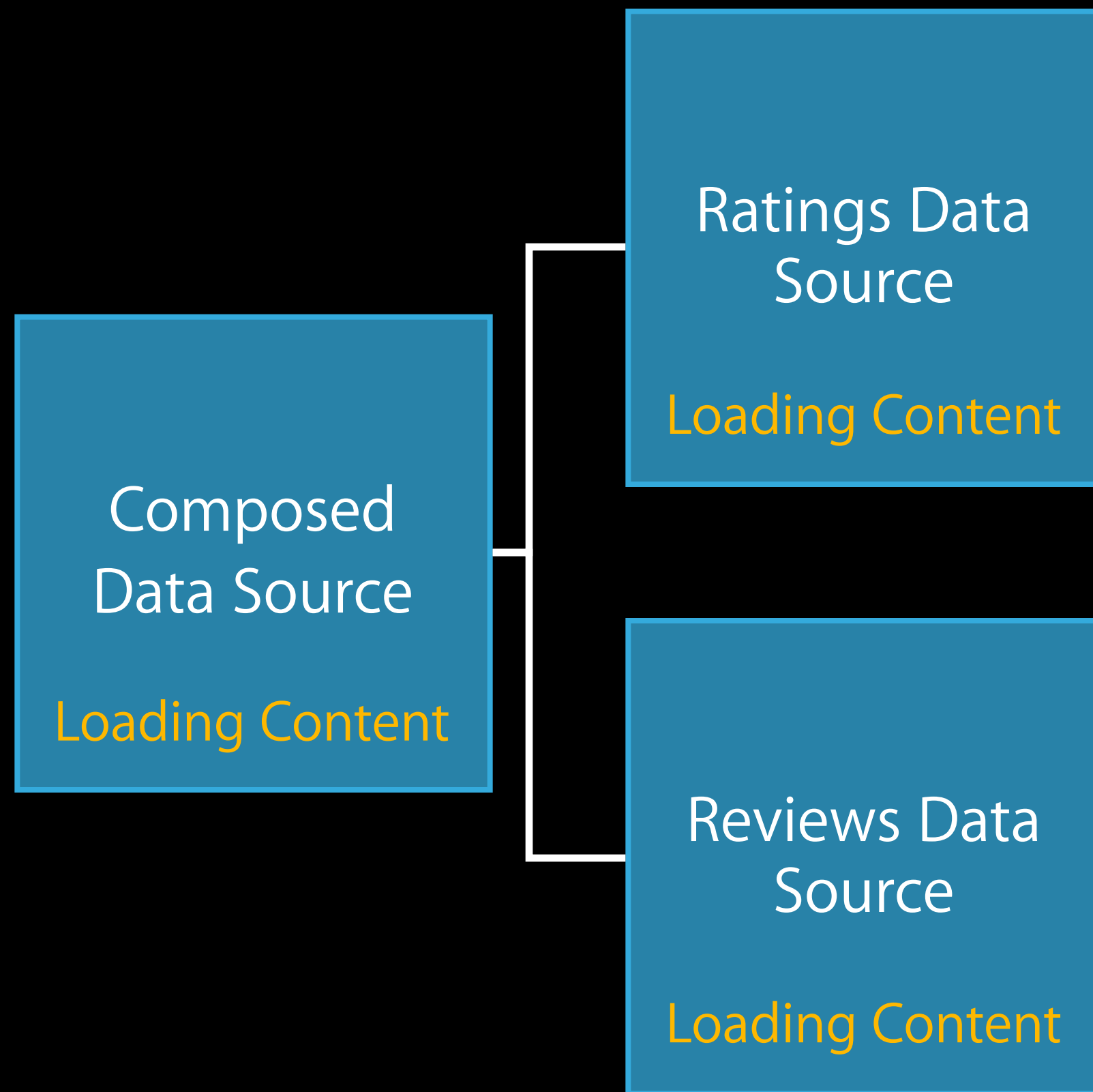




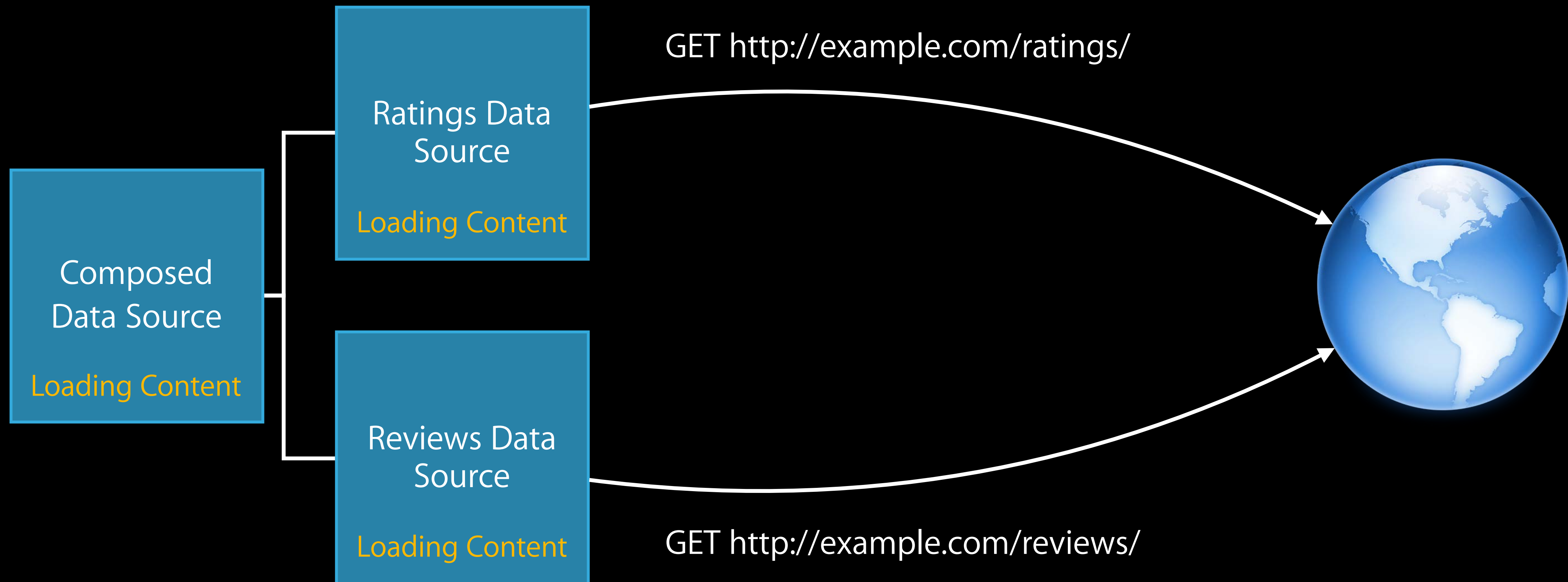
# Aggregate Data Sources



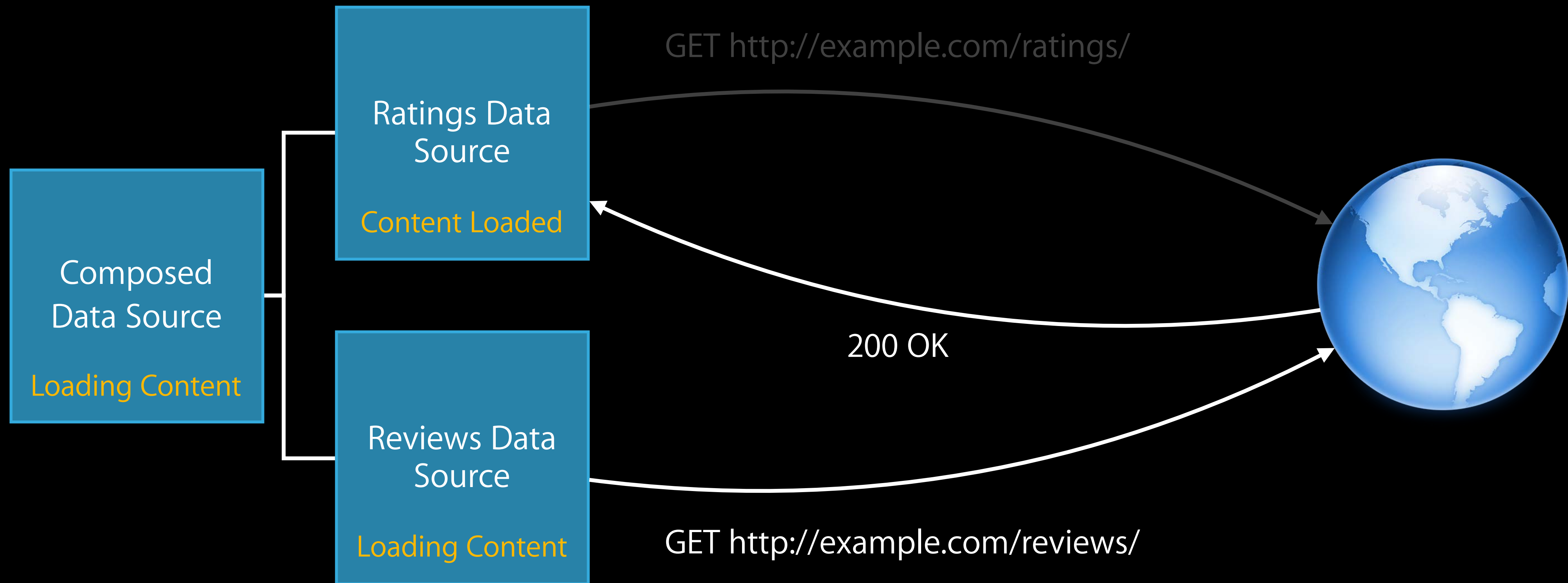
# Aggregate Data Sources



# Aggregate Data Sources

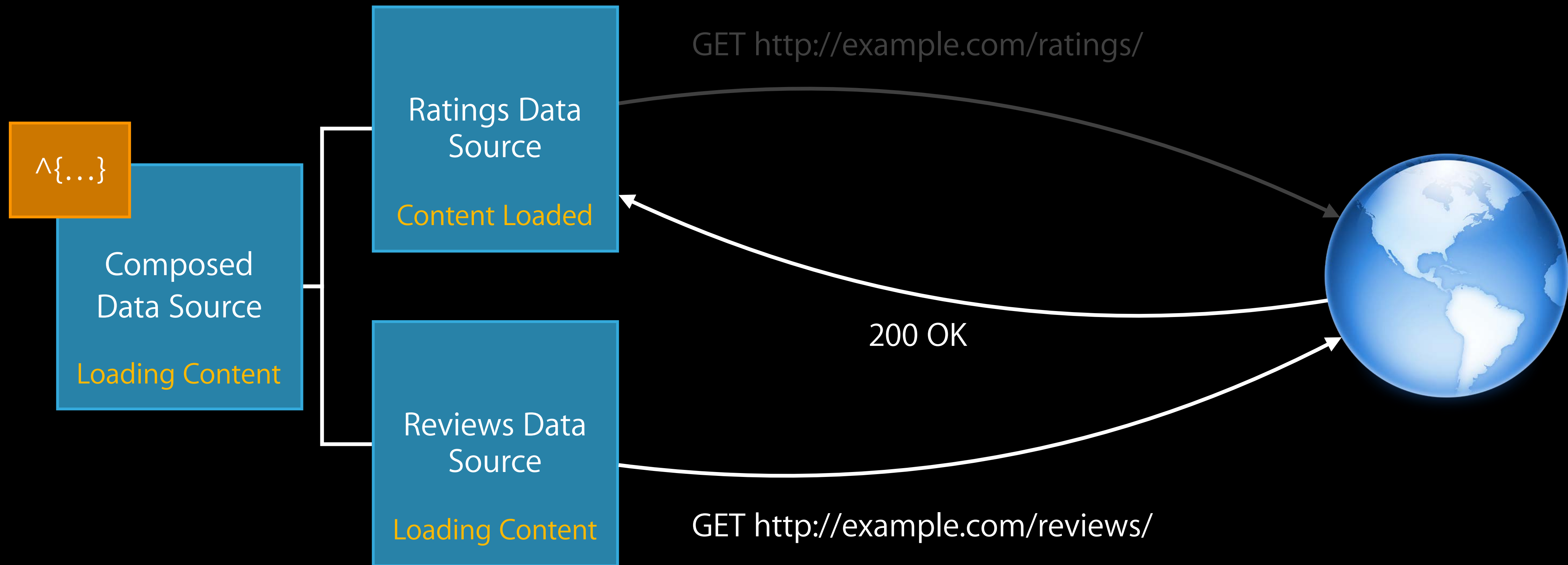


# Aggregate Data Sources

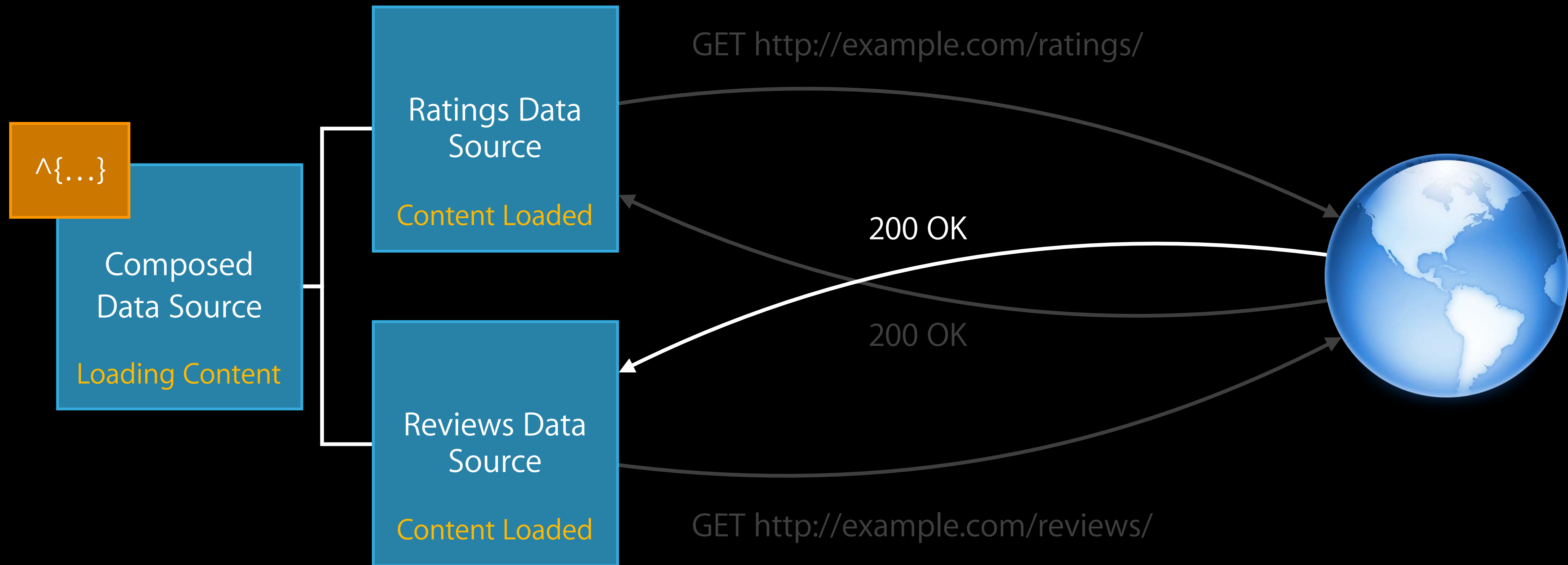




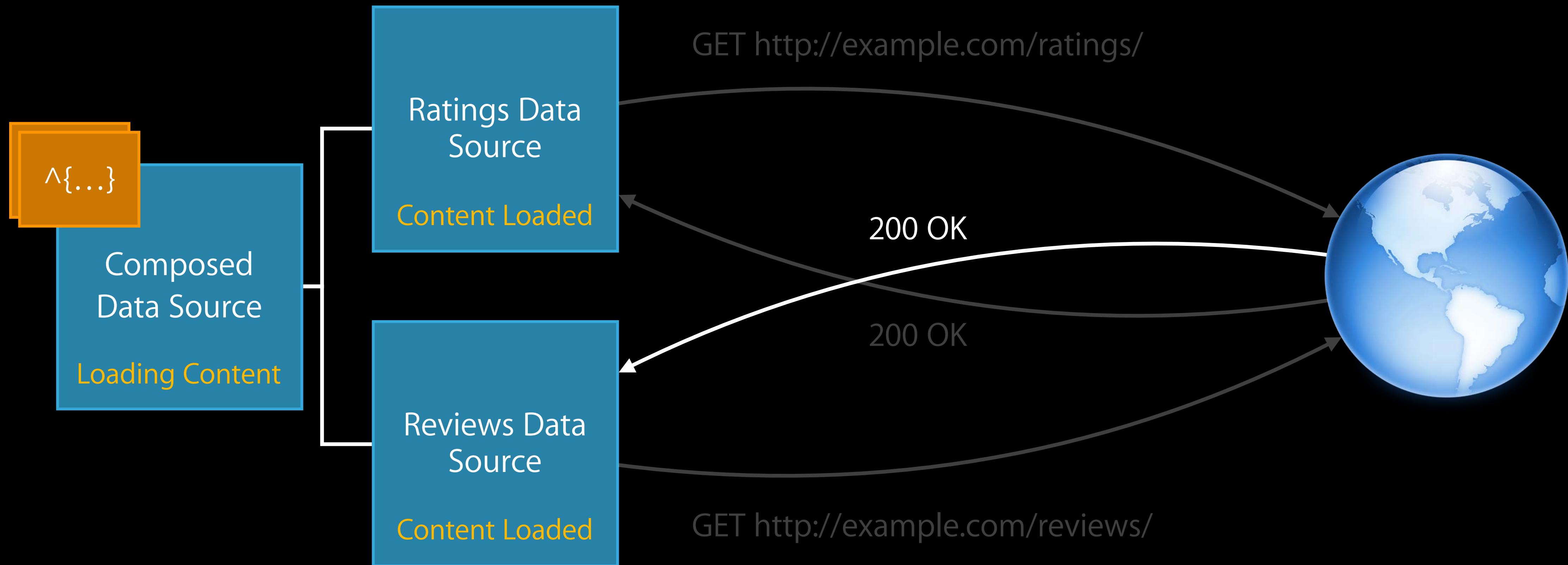
# Aggregate Data Sources



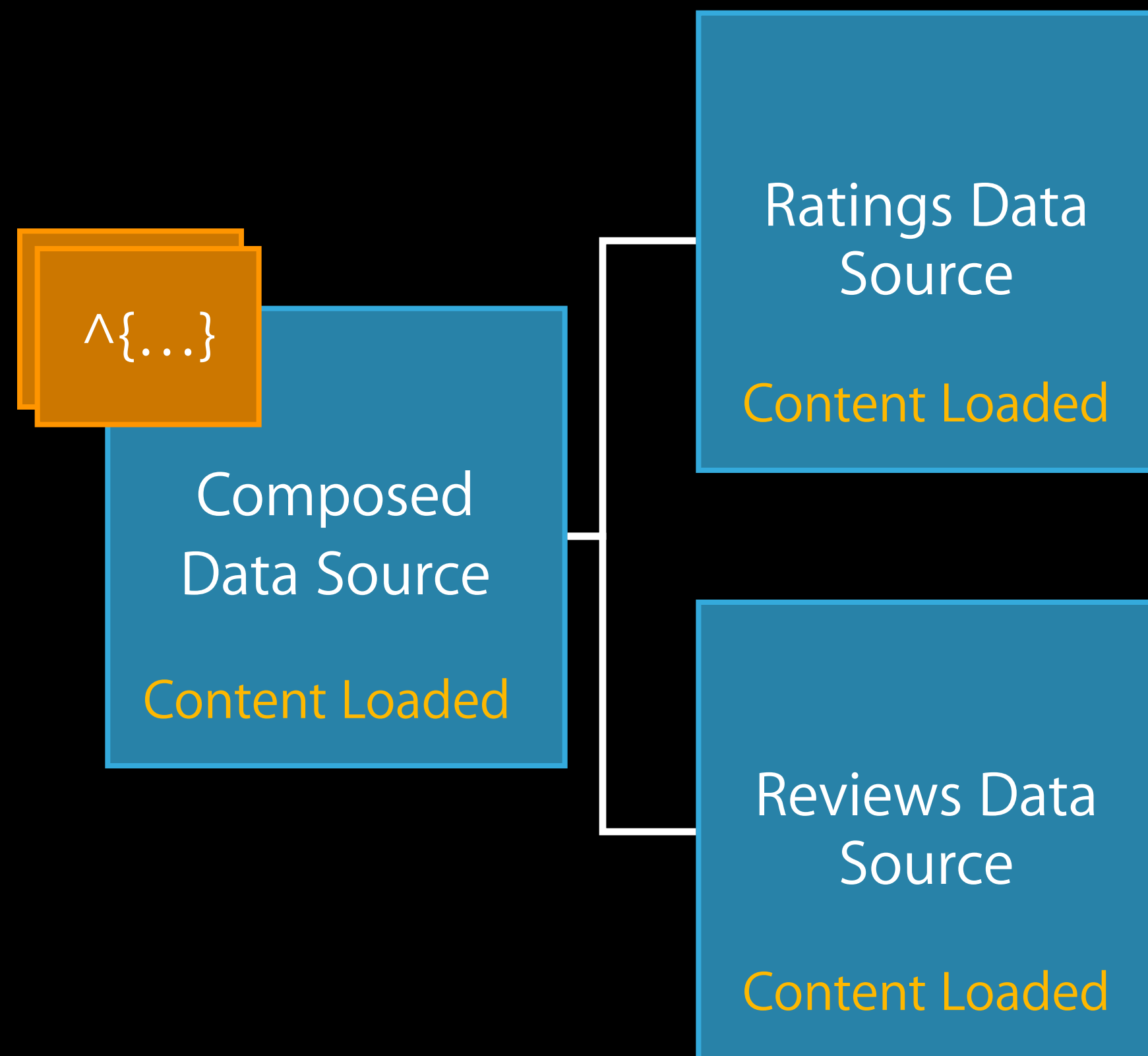
# Aggregate Data Sources



# Aggregate Data Sources



# Aggregate Data Sources

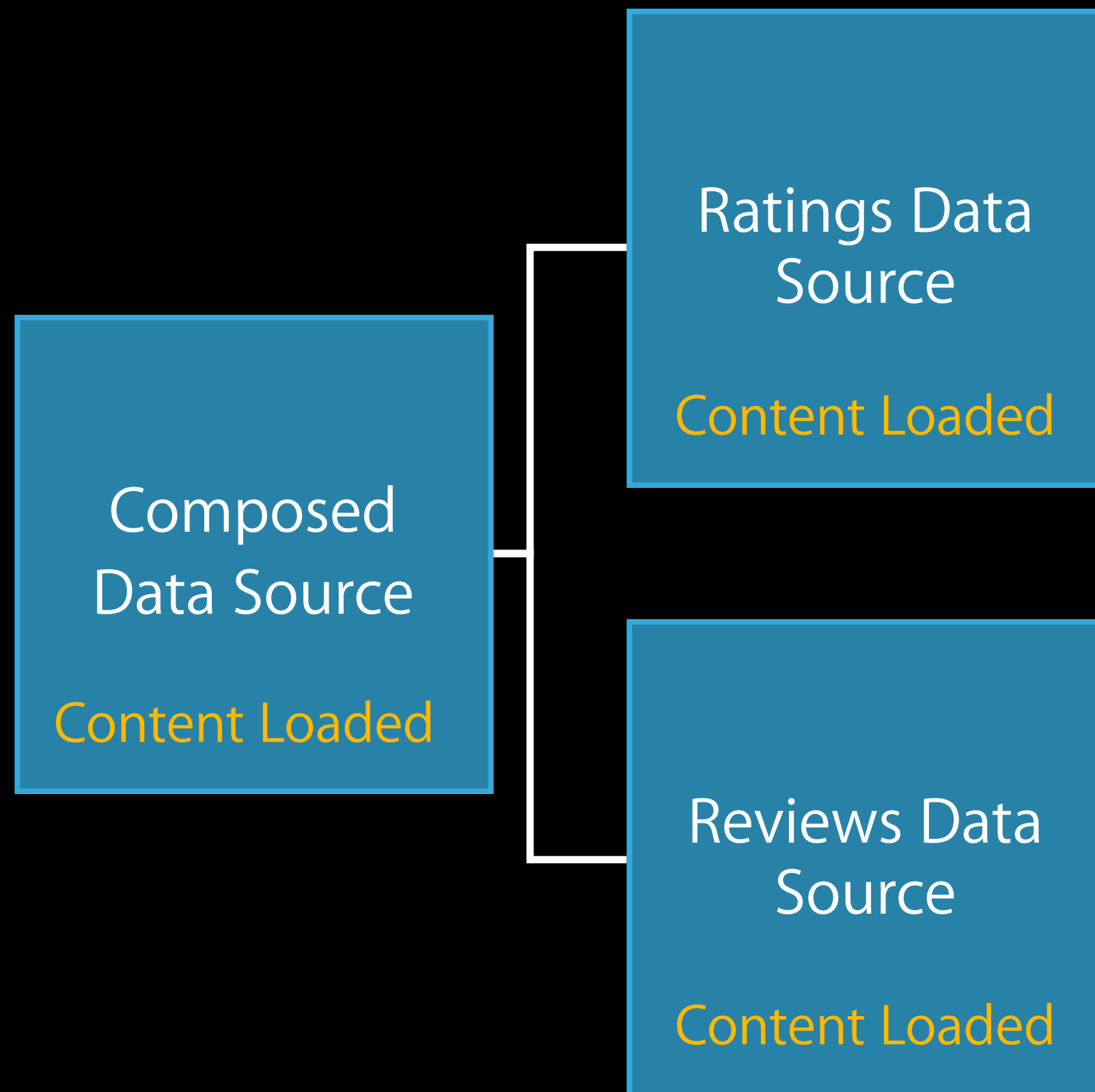


```
[collectionView performBatchUpdates:^{
```

```
} completion:nil];
```



# Aggregate Data Sources



```
[collectionView performBatchUpdates:^{  
    ^{...}  
    ^{...}  
} completion:nil];
```

# Aggregate Data Sources

## Recap

Reduce view controller complexity

Promotes code reuse

Isolates task specific logic

Enables unified loading indicator

# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering

# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering



# Custom UICollectionViewLayout

Complete flexibility and power

# Design Metrics

What information did we need?

- Per section?
- Per header and footer?

Where does it go?

# Section Metrics

## Big Cats

[See All](#)

### Ocelot

The Ocelot is also known as the dwarf leopard.

### Tiger

The tiger is the largest of the cat species.

### Mountain Lion

Like almost all cats, the mountain lion is a solitary animal.

# Section Metrics

rowHeight



## Big Cats

[See All](#)

### Ocelot

The Ocelot is also known as the dwarf leopard.

### Tiger

The tiger is the largest of the cat species.

### Mountain Lion

Like almost all cats, the mountain lion is a solitary animal.

# Section Metrics

rowHeight



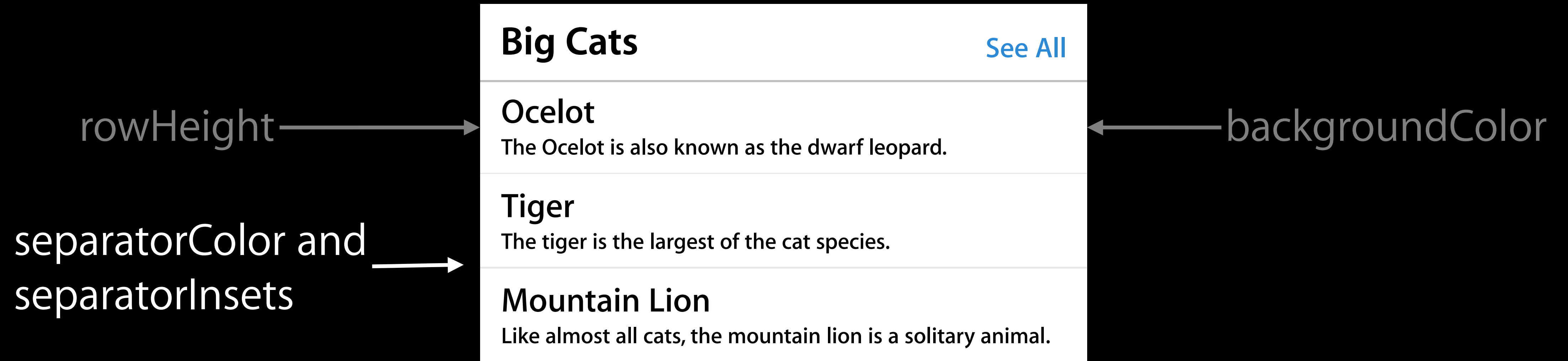
<b>Big Cats</b>	<a href="#">See All</a>
<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	
<b>Tiger</b> The tiger is the largest of the cat species.	
<b>Mountain Lion</b> Like almost all cats, the mountain lion is a solitary animal.	



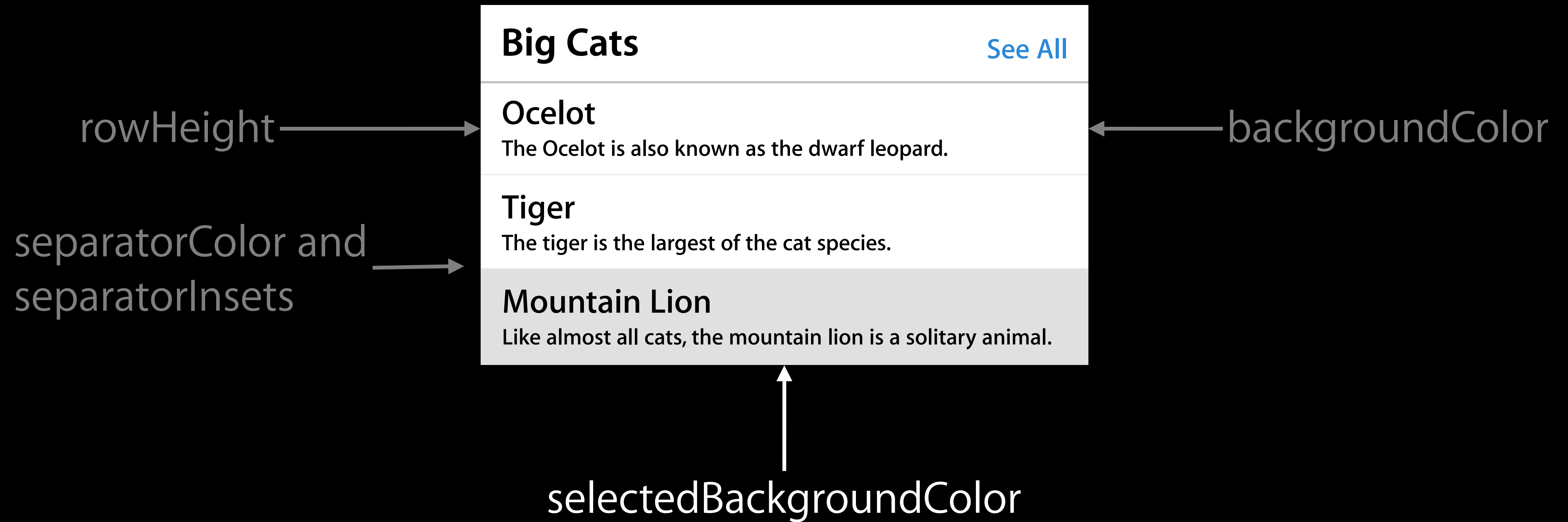
backgroundColor



# Section Metrics



# Section Metrics



# Section Metrics

numberOfColumns



<b>Big Cats</b>		<a href="#">See All</a>
<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	<b>Leopard</b> The leopard is the smallest of the four big cats.	
<b>Tiger</b> The tiger is the largest of the cat species.	<b>Lion</b> The male lion is easily recognized by its mane.	
<b>Mountain Lion</b> Like almost all cats, the mountain lion is a solitary animal.	<b>Cheetah</b> The cheetah can run faster than any other land animal.	

# Section Metrics

numberOfColumns

Big Cats		<a href="#">See All</a>
<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	<b>Leopard</b> The leopard is the smallest of the four big cats.	
<b>Tiger</b> The tiger is the largest of the cat species.	<b>Lion</b> The male lion is easily recognized by its mane.	
<b>Mountain Lion</b> Like almost all cats, the mountain lion is a solitary animal.	<b>Cheetah</b> The cheetah can run faster than any other land animal.	

showsColumnSeparator

# Header and Footer Metrics

## Big Cats

[See All](#)

### Ocelot

The Ocelot is also known as the dwarf leopard.

### Tiger

The tiger is the largest of the cat species.

### Mountain Lion

Like almost all cats, the mountain lion is a solitary animal.



# Header and Footer Metrics

height →

## Big Cats

[See All](#)

### Ocelot

The Ocelot is also known as the dwarf leopard.

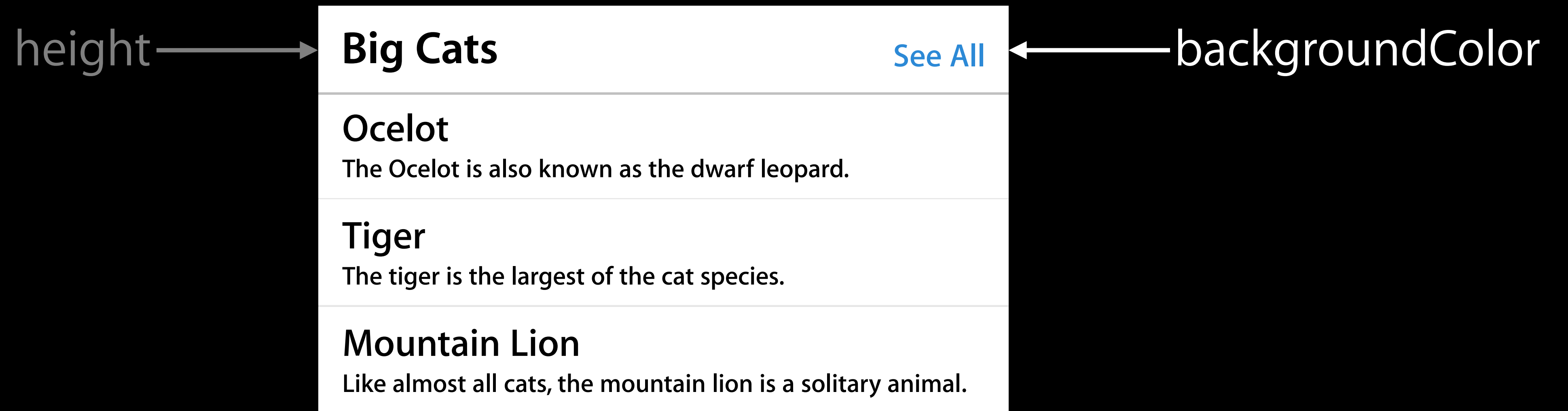
### Tiger

The tiger is the largest of the cat species.

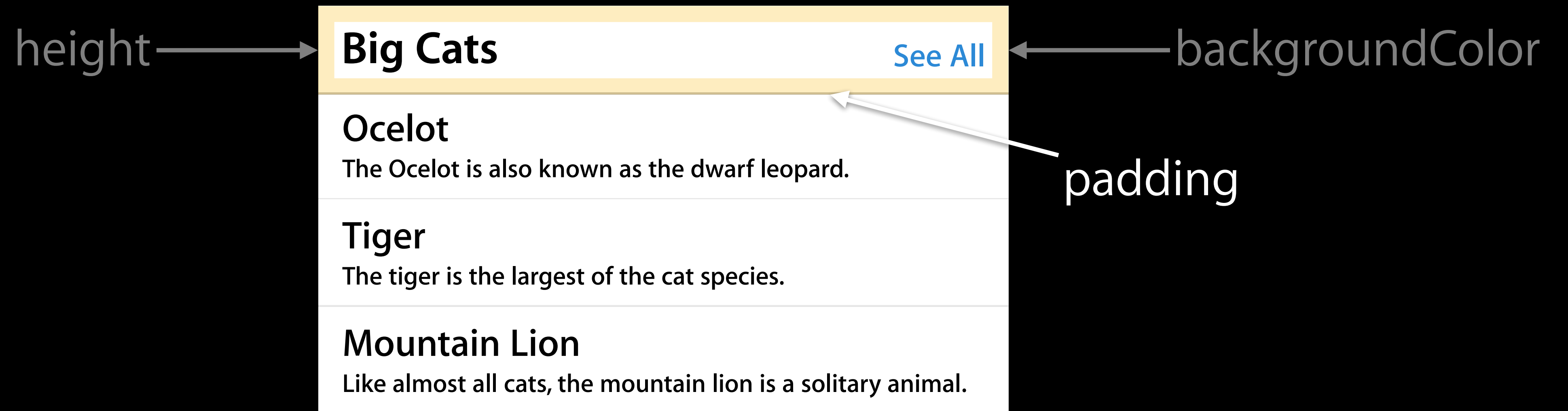
### Mountain Lion

Like almost all cats, the mountain lion is a solitary animal.

# Header and Footer Metrics



# Header and Footer Metrics



# Custom Attributes

backgroundColor

selectedBackgroundColor

padding

pinnedHeader

# Global Headers

NSIndexPath normally has two indexes

- Section
- Item



# Global Headers

NSIndexPath normally has two indexes

- Section
- Item

NSIndexPath with only one index

```
[NSIndexPath indexPathWithIndex:0]
```

# Global Headers

NSIndexPath normally has two indexes

- Section
- Item

NSIndexPath with only one index

```
[NSIndexPath indexPathWithIndex:0]
```

Need to ensure code checks length of index paths

# Build the Layout

if data source changed

    snapshot data source

if collection view width changed or data source changed

    regenerate layout attributes &

    special layout attributes

if collection view origin changed

    update special layout attributes

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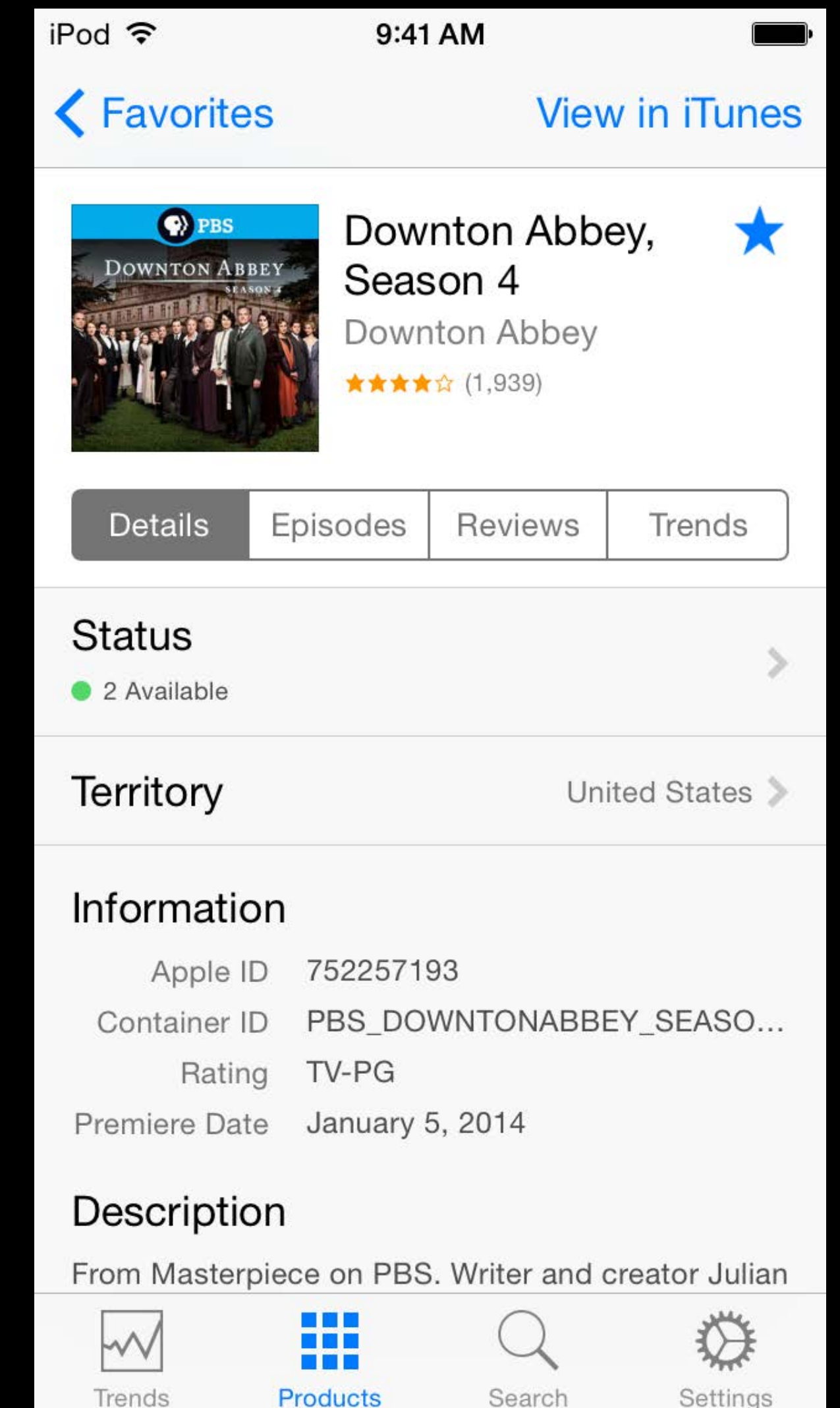
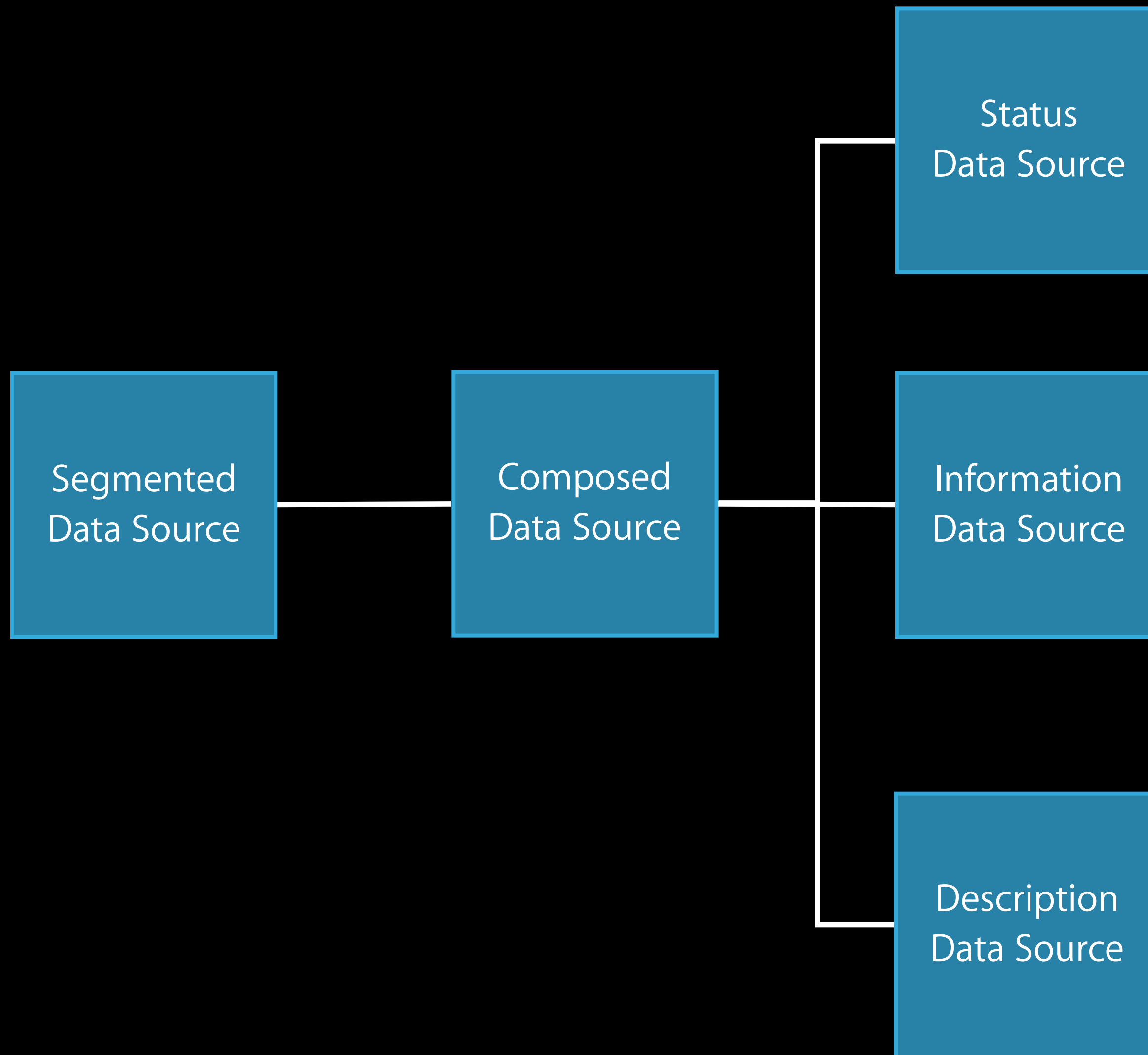
  special layout attributes

if collection view origin changed

  update special layout attributes

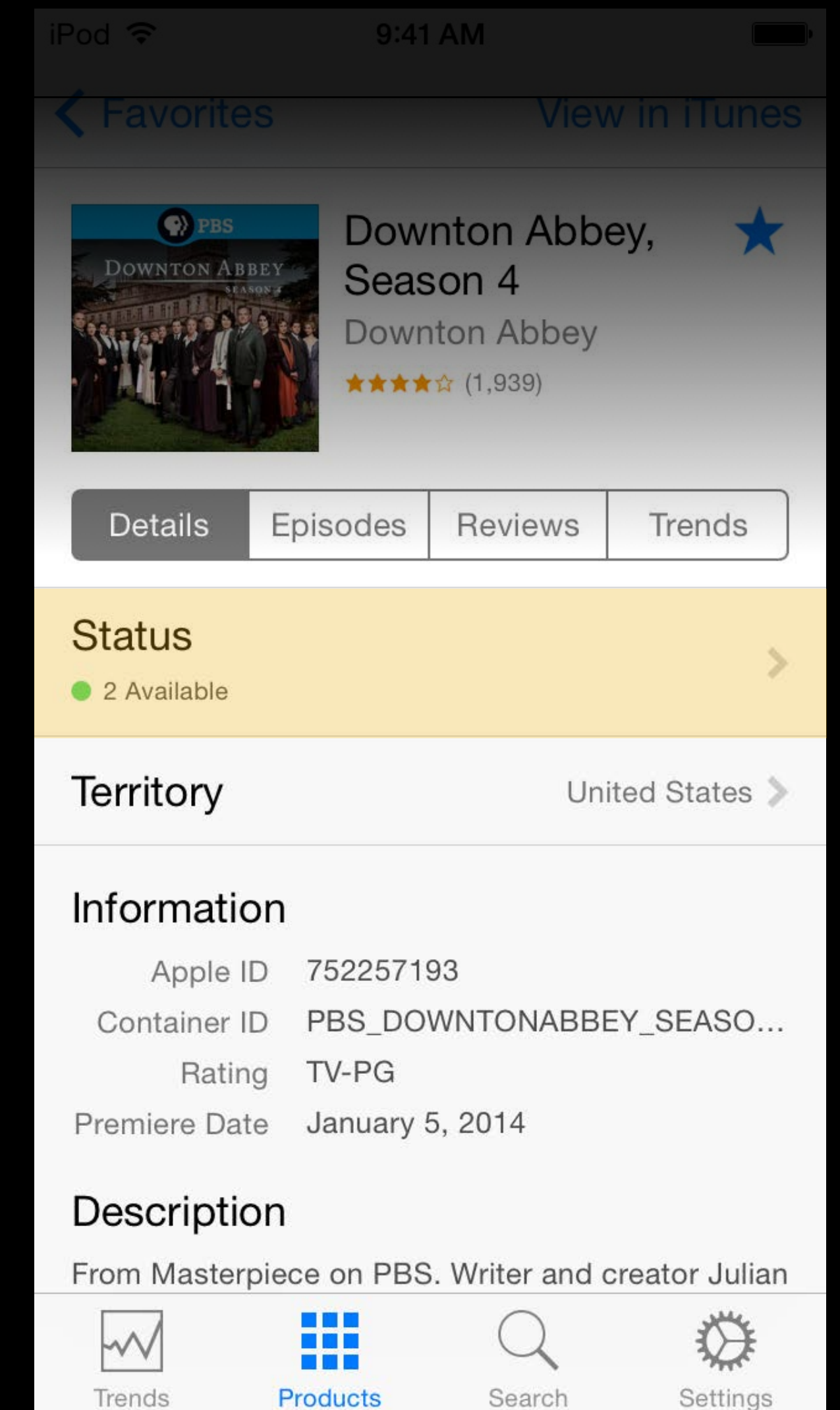
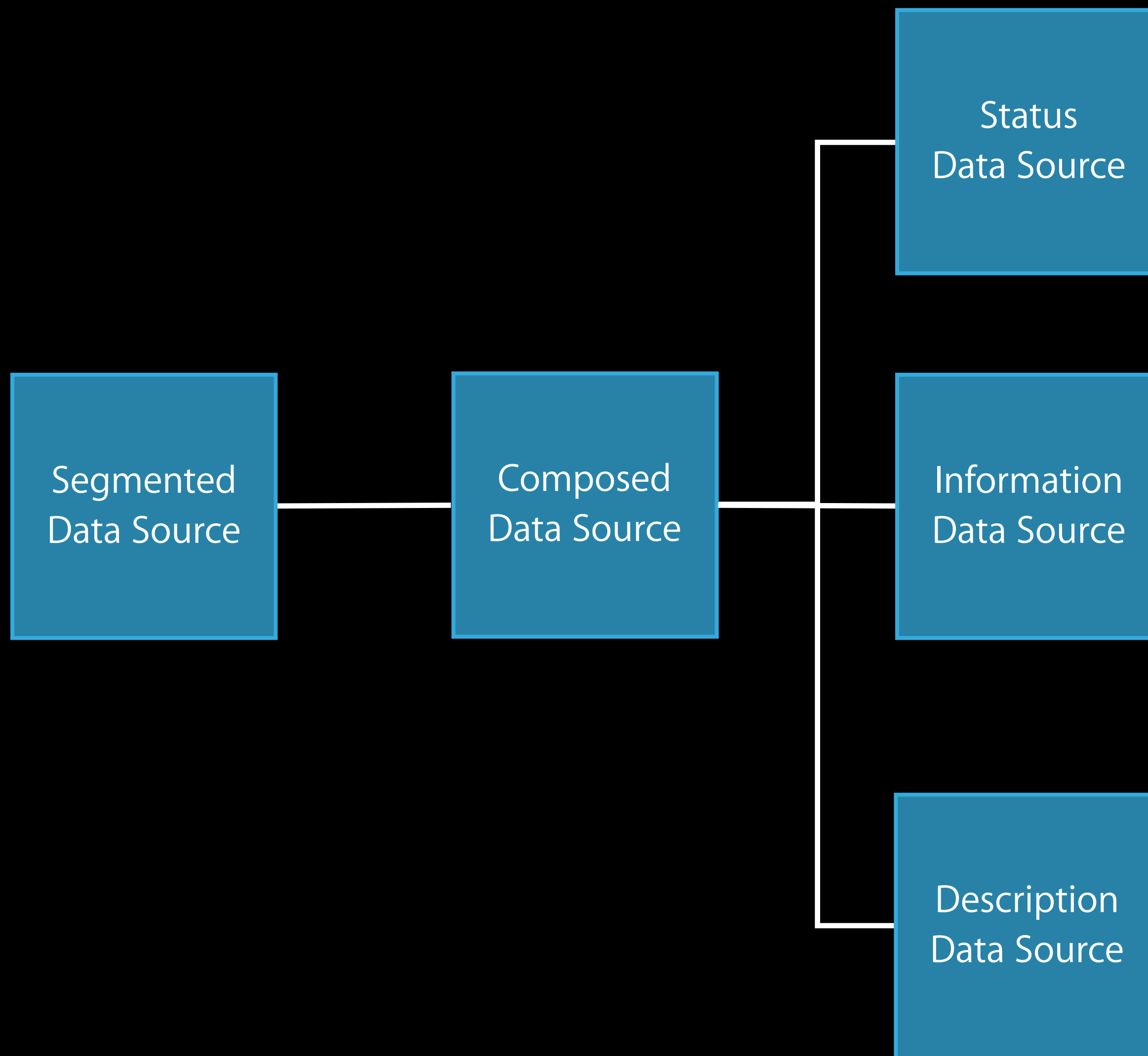


# Snapshot Metrics



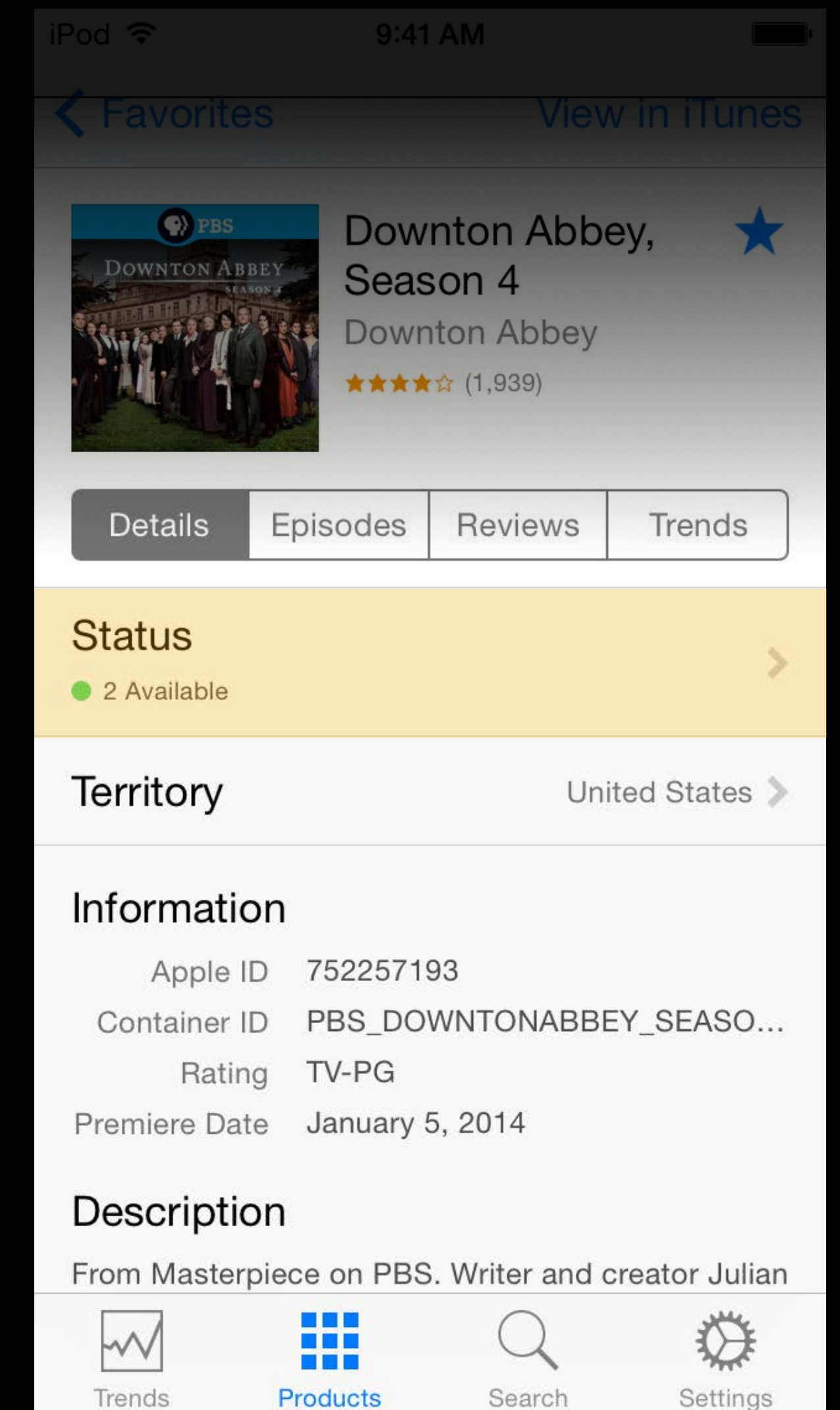
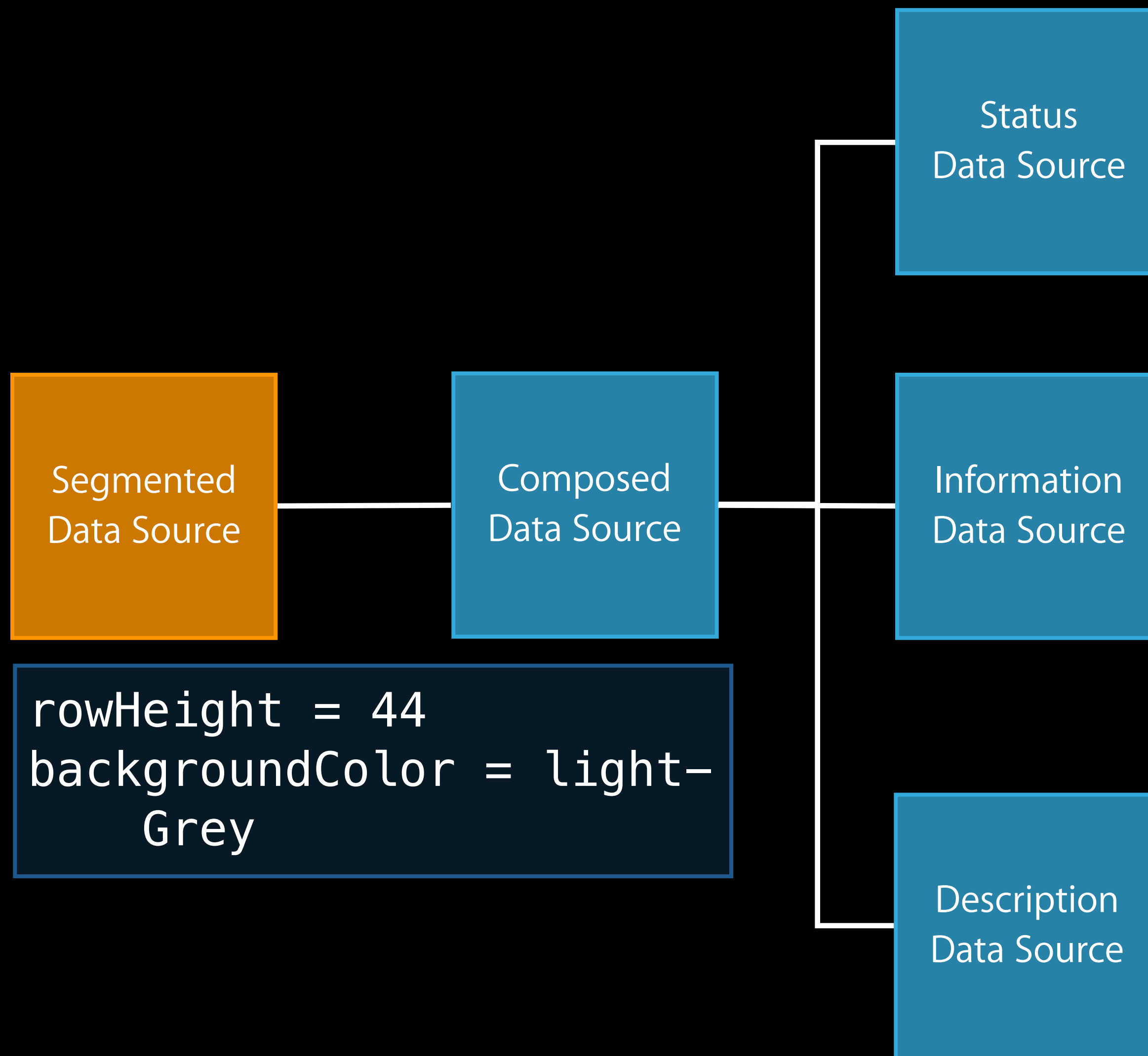
# Snapshot Metrics

Section 0



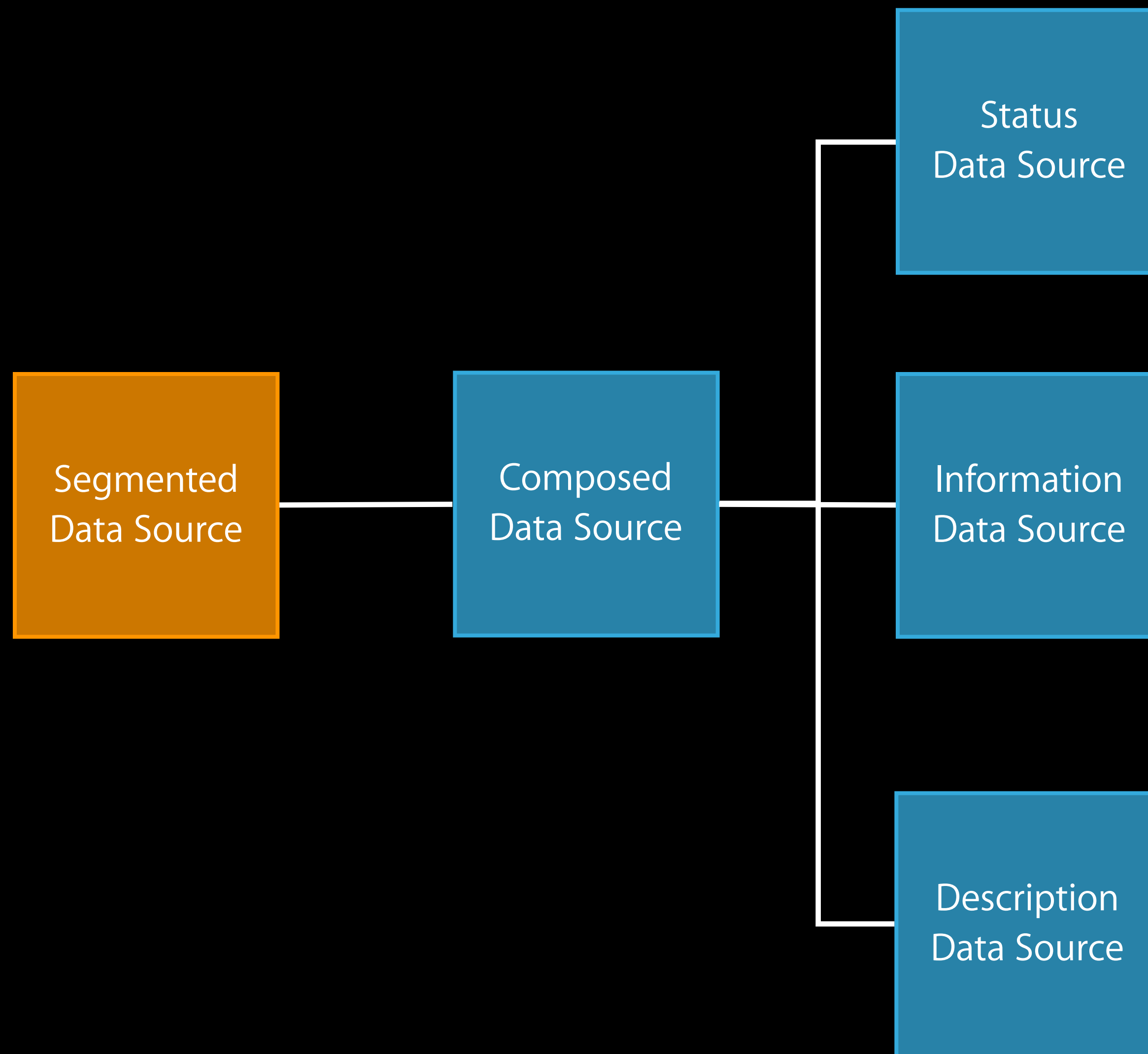
# Snapshot Metrics

Section 0



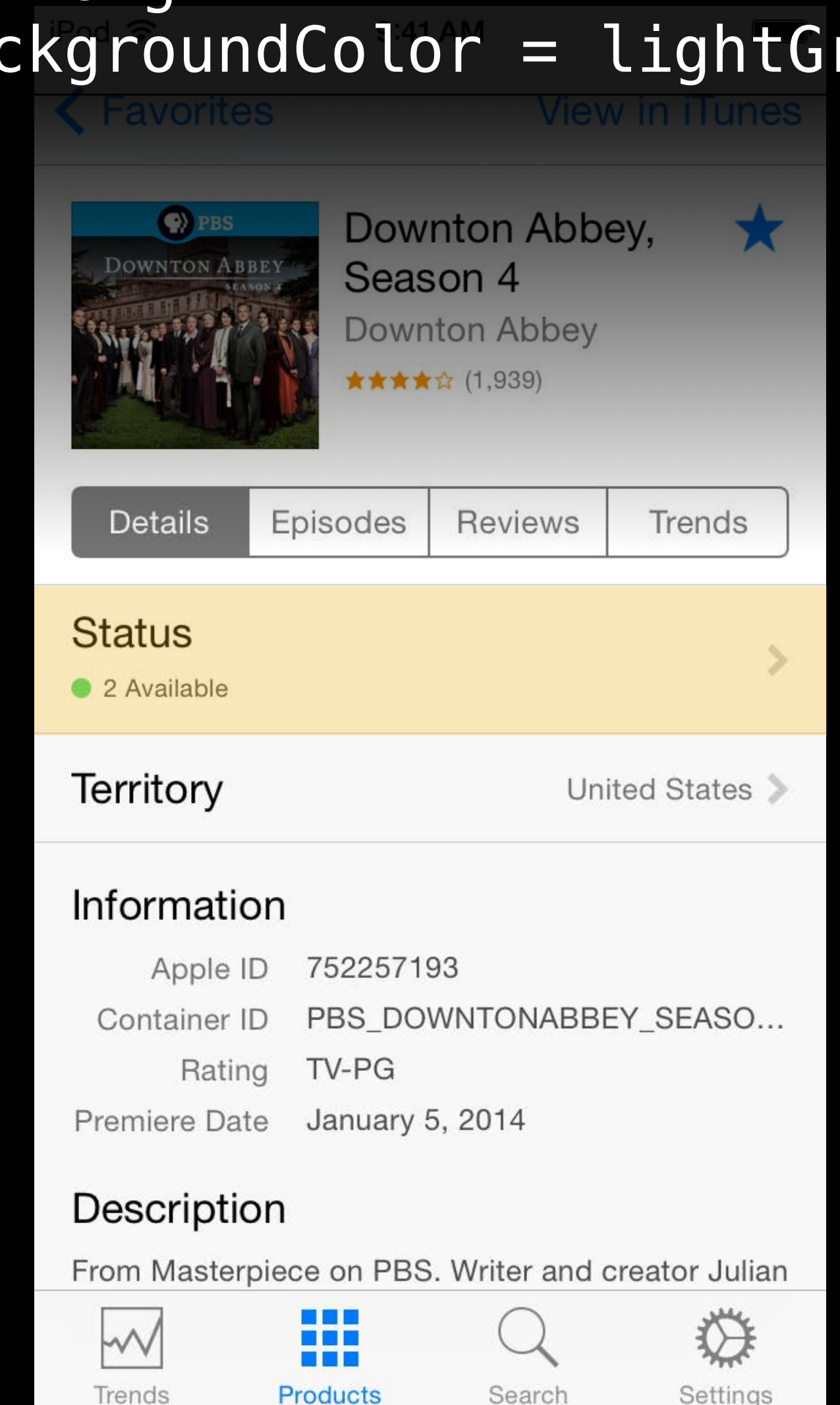


# Snapshot Metrics

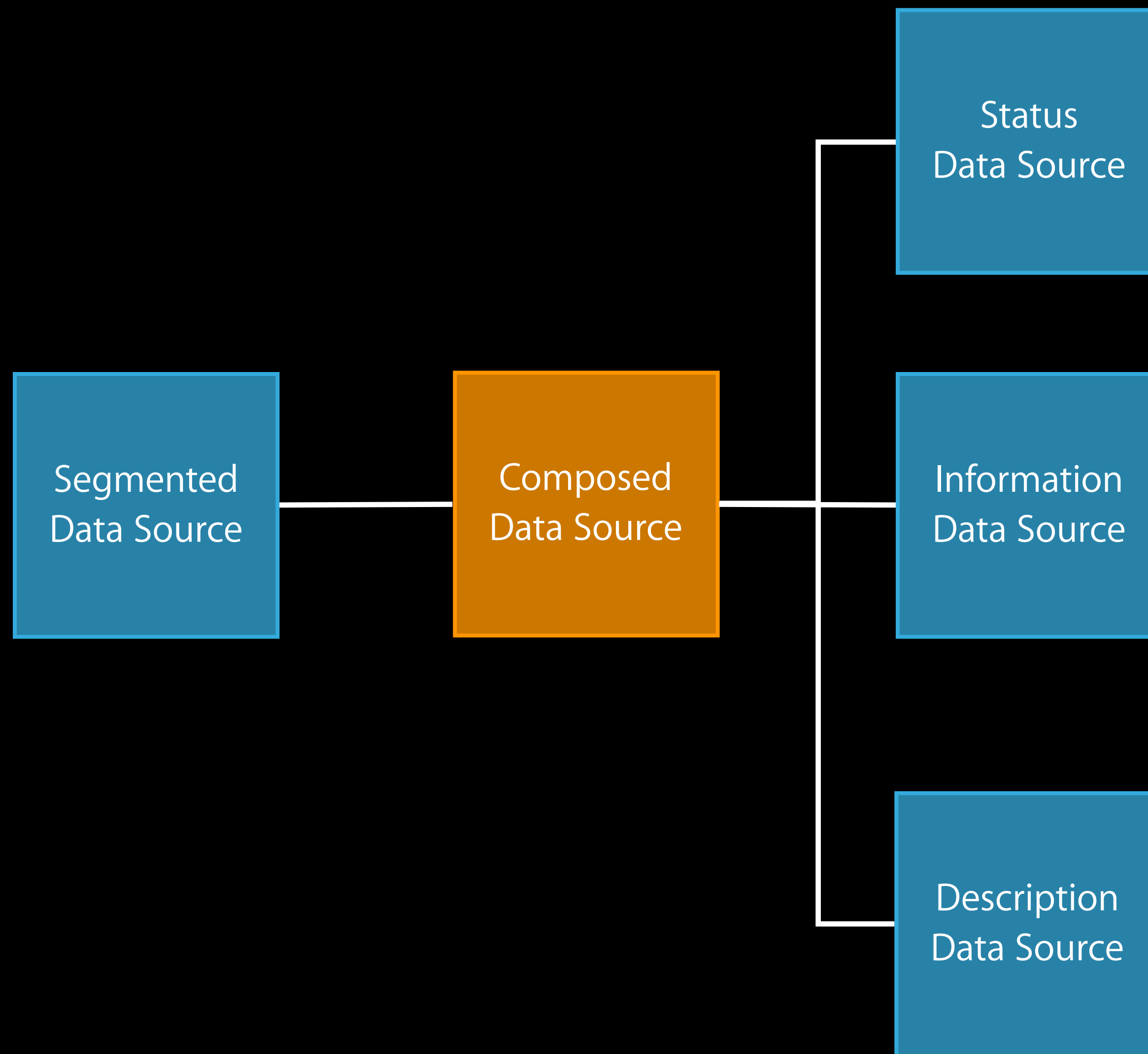


Section 0

rowHeight = 44  
backgroundColor = lightGrey

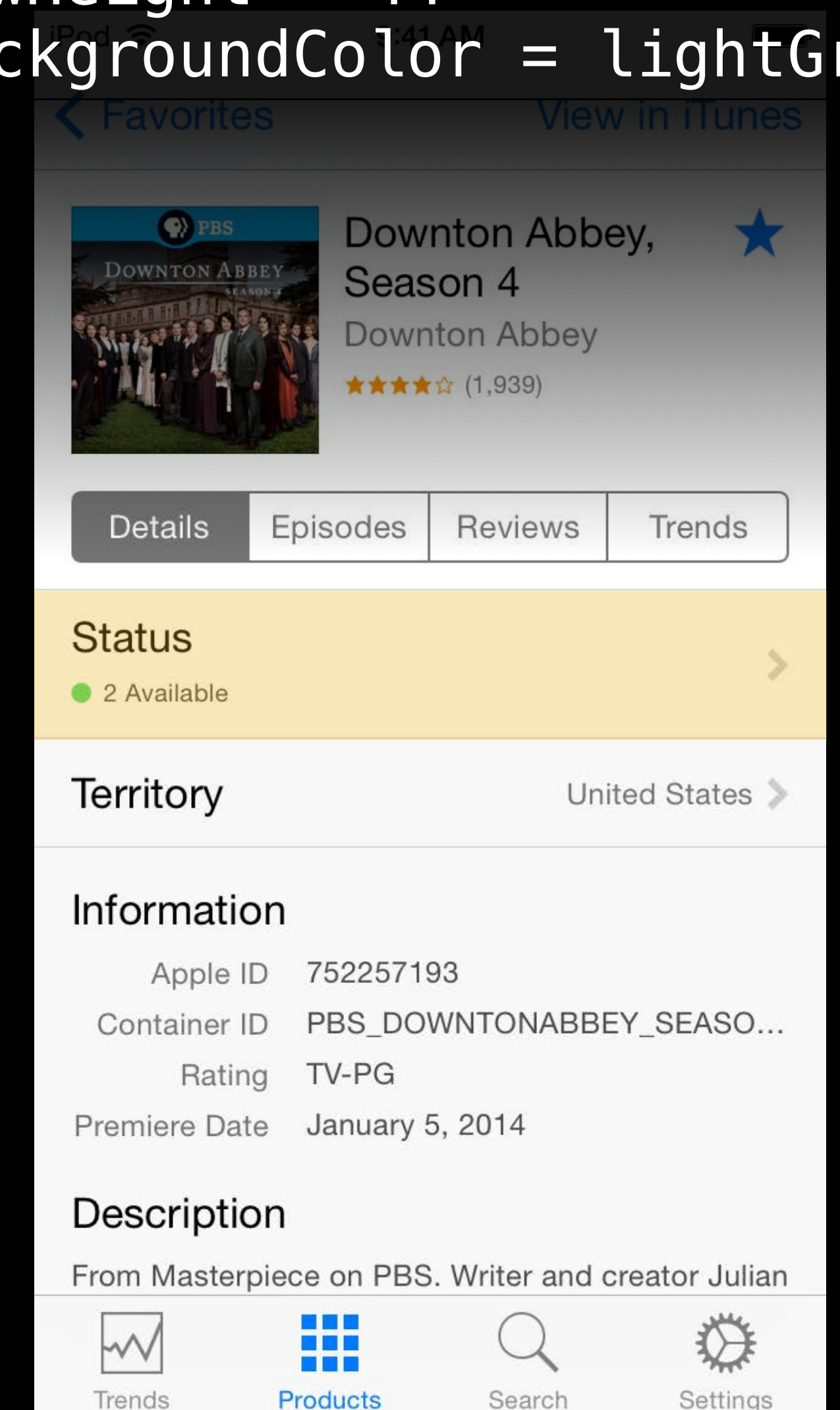


# Snapshot Metrics



Section 0

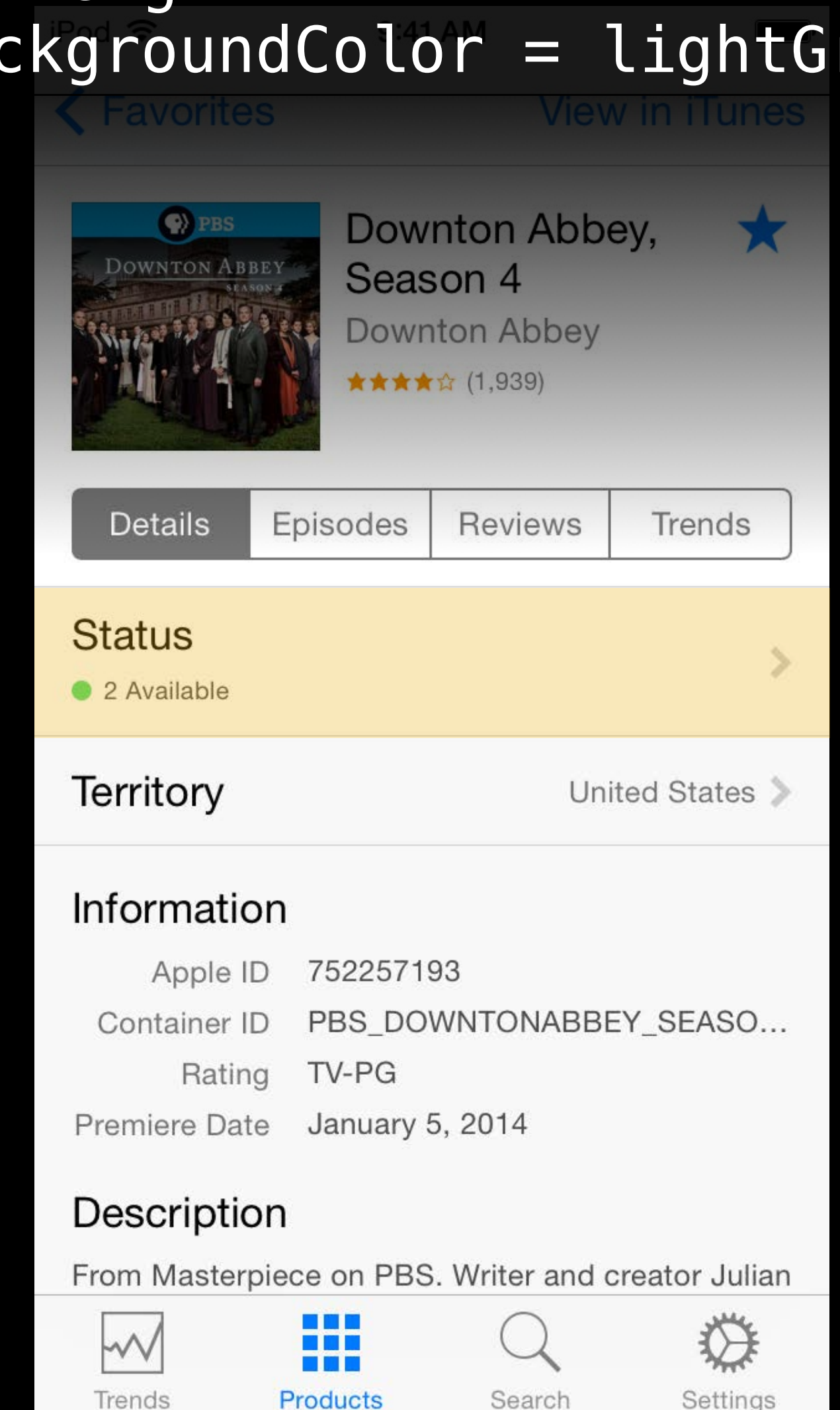
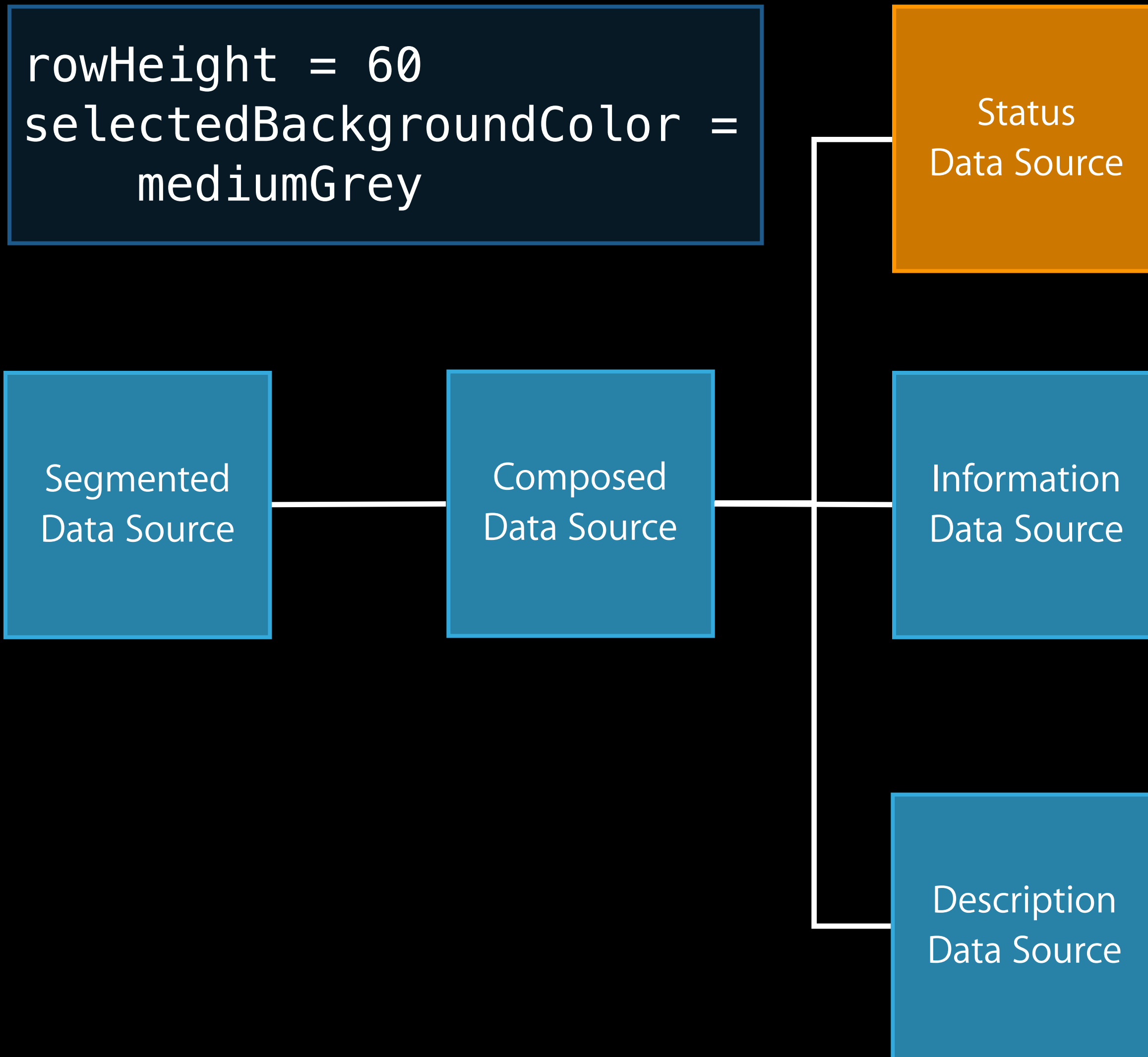
rowHeight = 44  
backgroundColor = lightGrey



# Snapshot Metrics

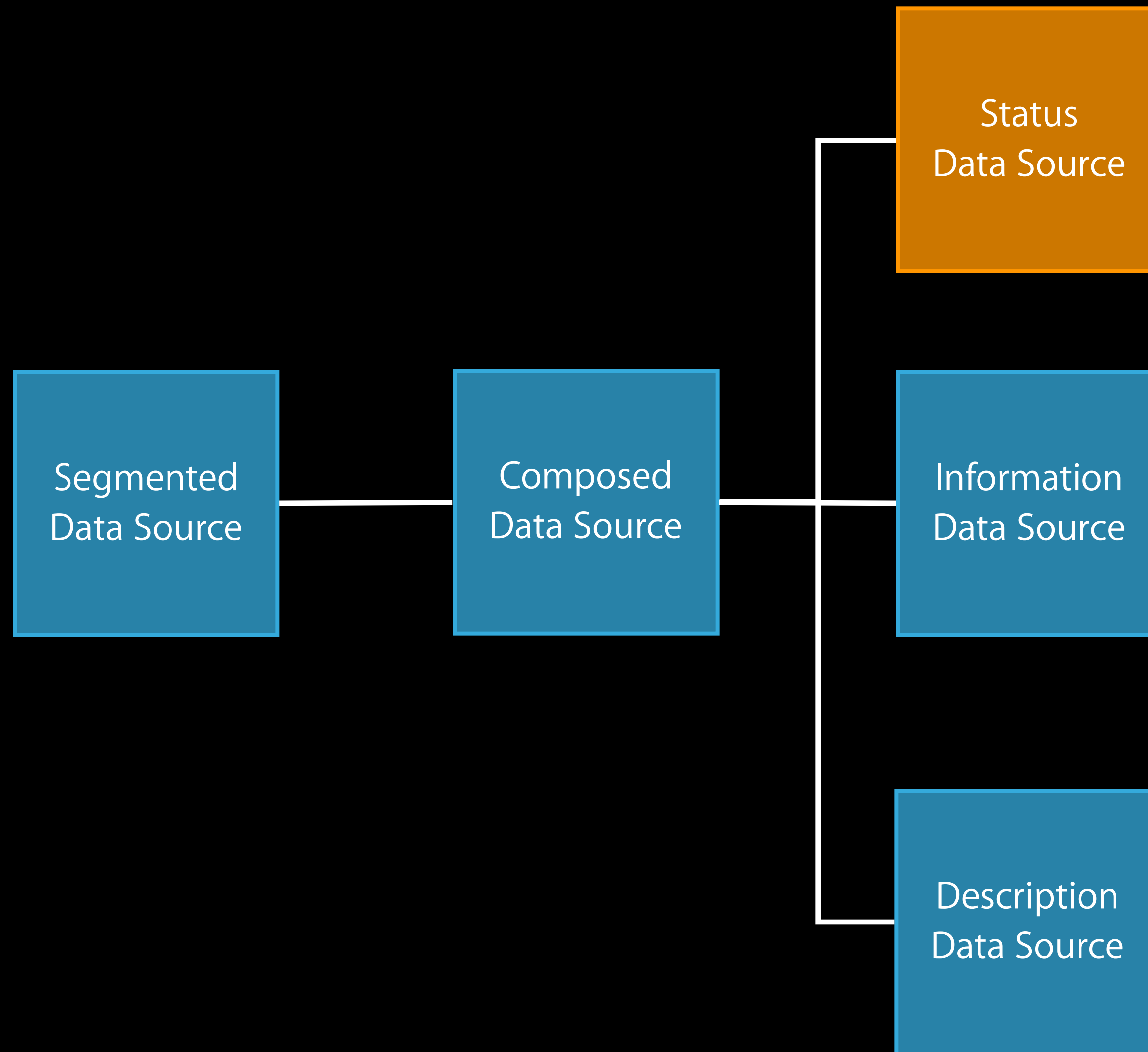
Section 0

rowHeight = 44  
backgroundColor = lightGrey



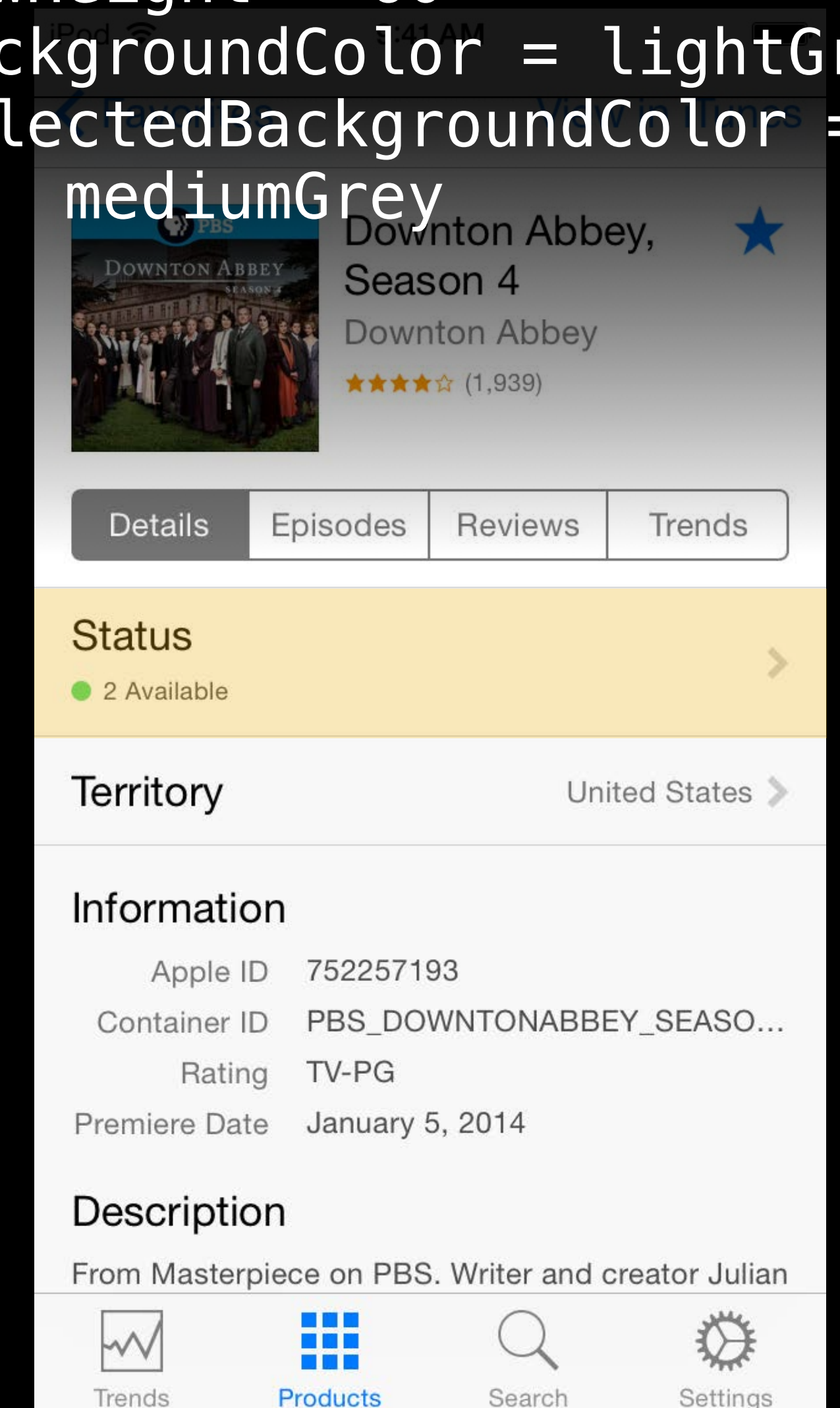


# Snapshot Metrics



Section 0

```
rowHeight = 60  
backgroundColor = lightGrey  
selectedBackgroundColor =  
mediumGrey
```



# Optional Layout Methods

Critical to getting our layout just right

-prepareLayout

-prepareForCollectionViewUpdates:

-targetContentOffsetForProposedContentOffset:

-initialLayoutAttributes\* and -finalLayoutAttributes\*

# Optional Layout Methods

Critical to getting our layout just right

`-prepareLayout`

`-prepareForCollectionViewUpdates:`

`-targetContentOffsetForProposedContentOffset:`

`-initialLayoutAttributes*` and `-finalLayoutAttributes*`

-prepareLayout



-prepareLayout

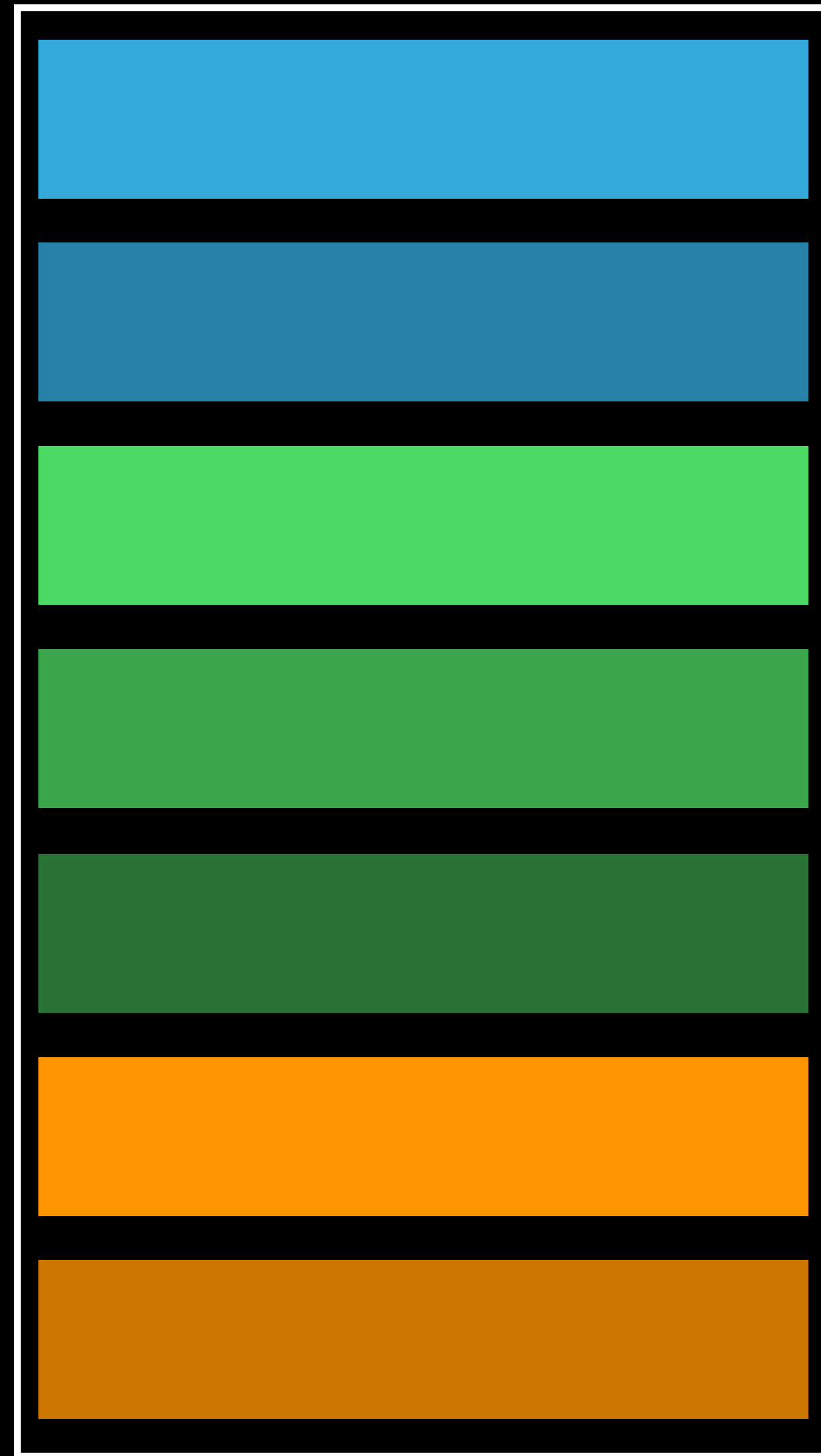


Old

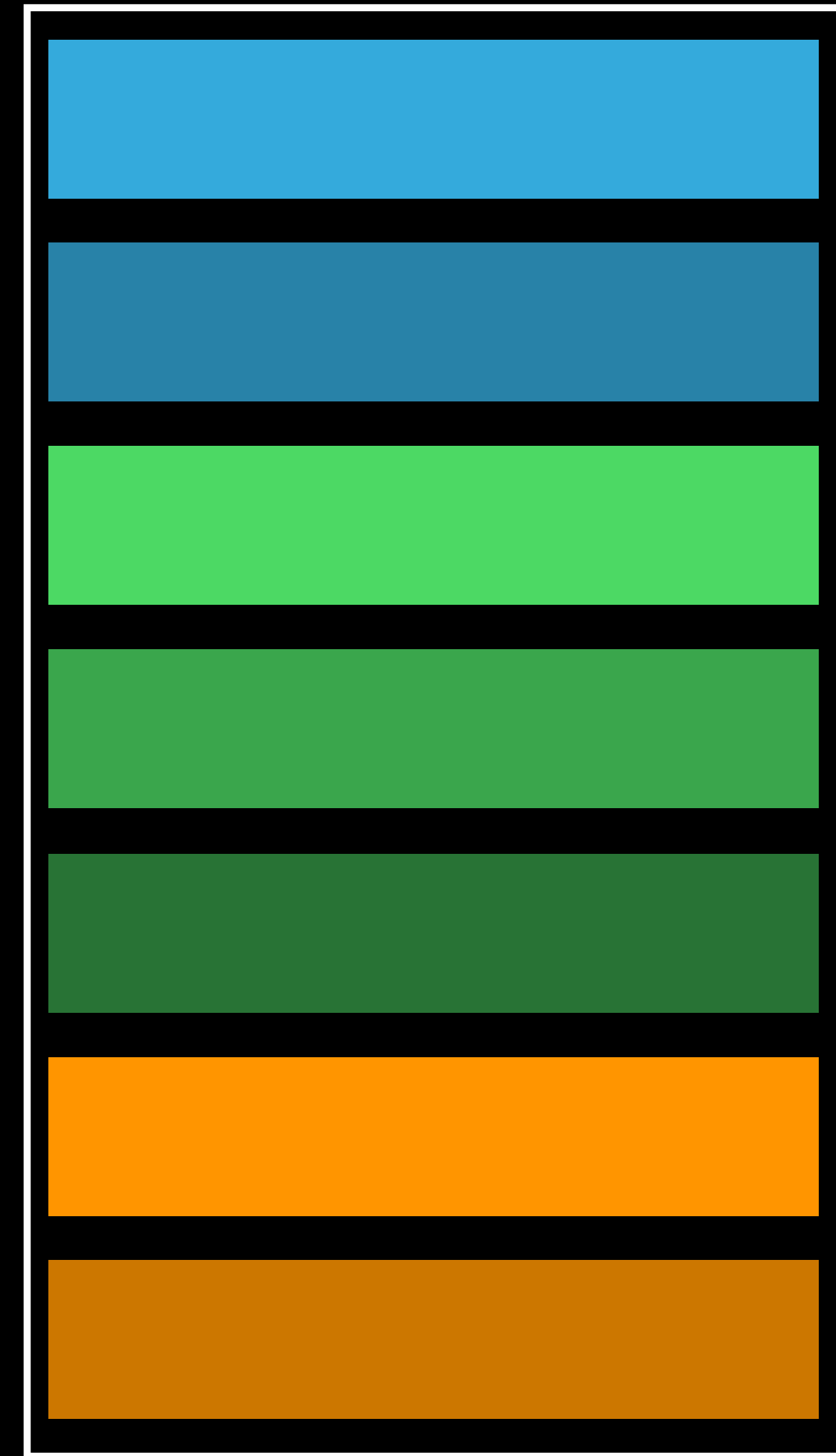
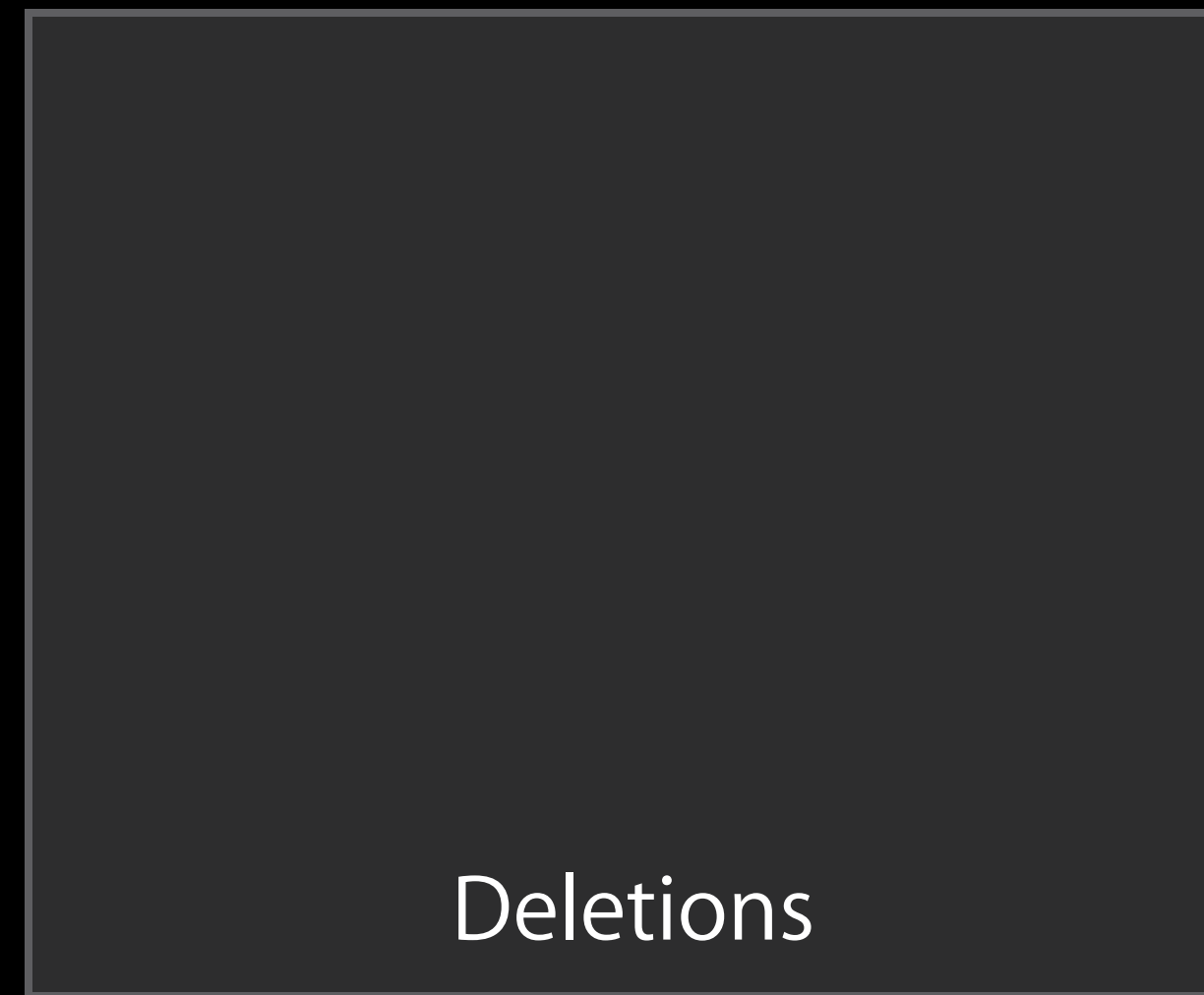


New

-prepareForCollectionViewUpdates:



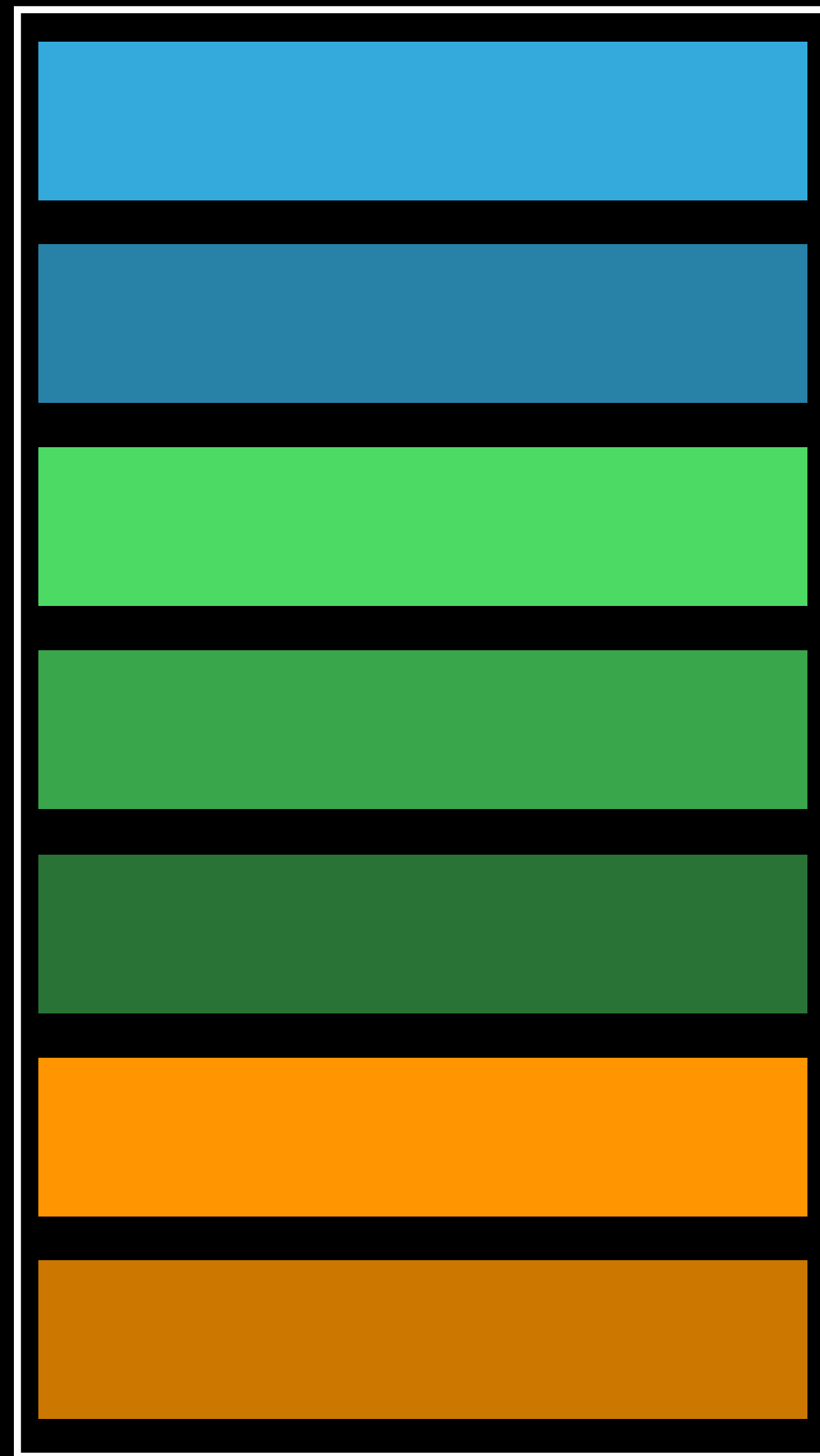
Old



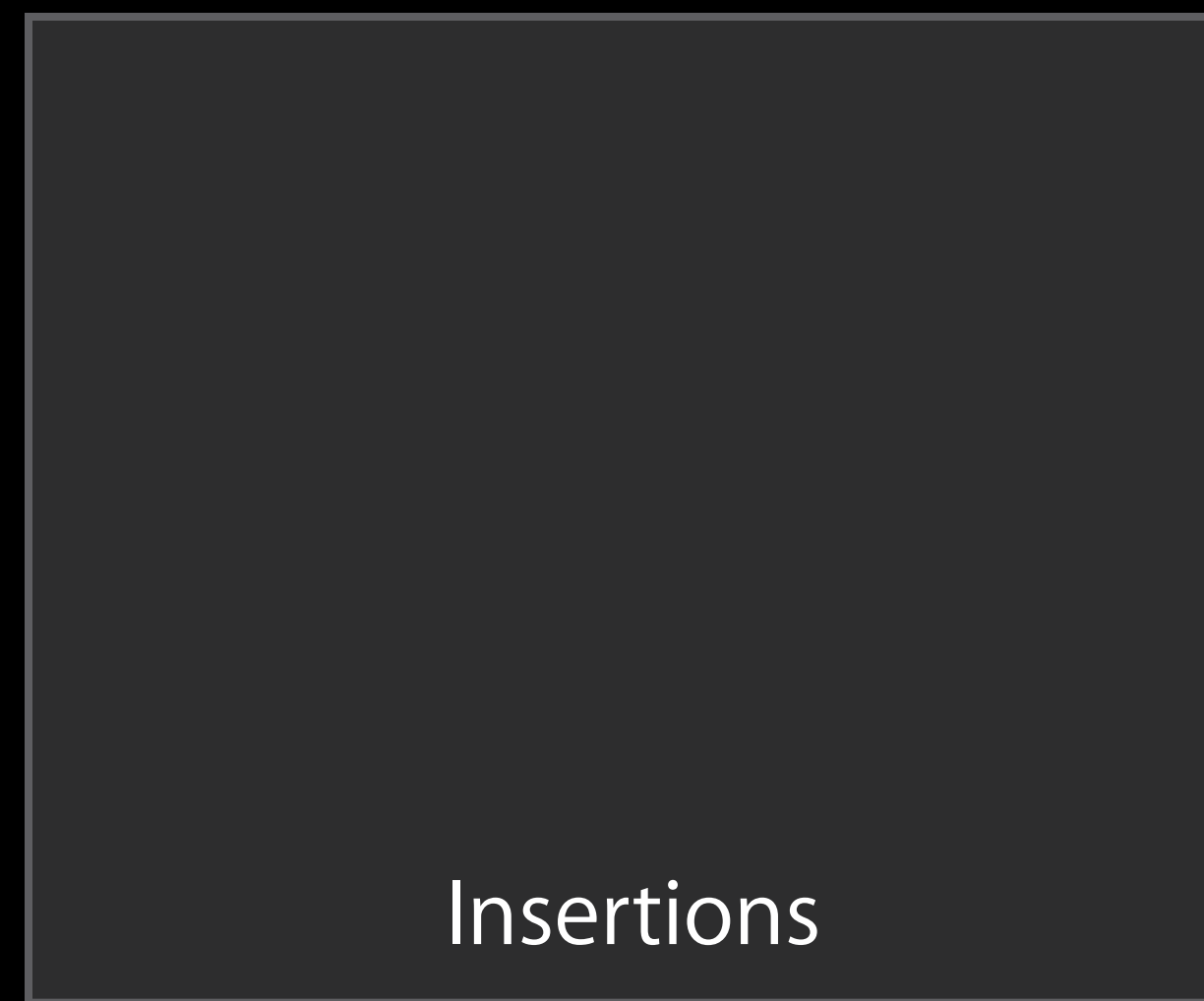
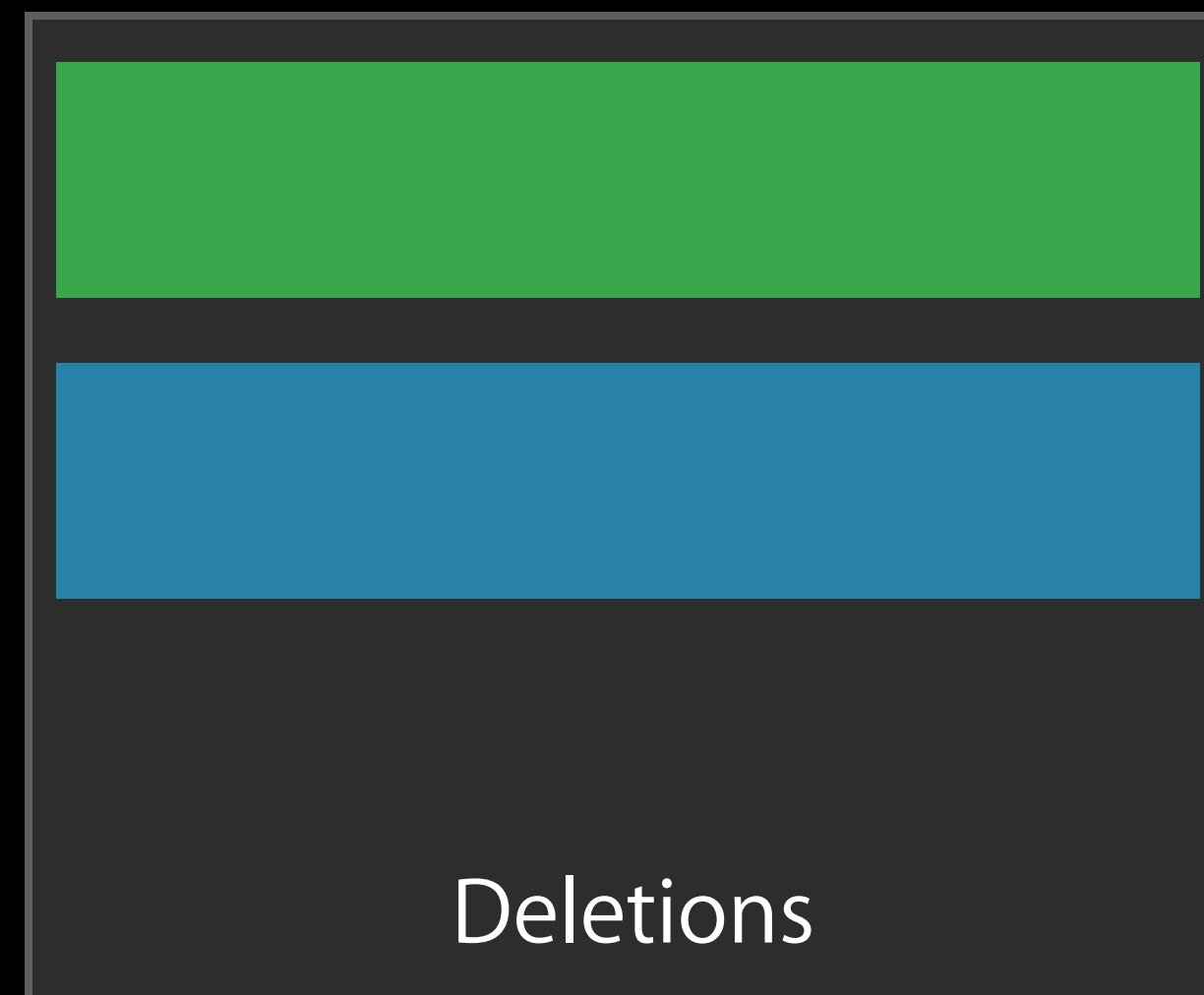
New



-prepareForCollectionViewUpdates:

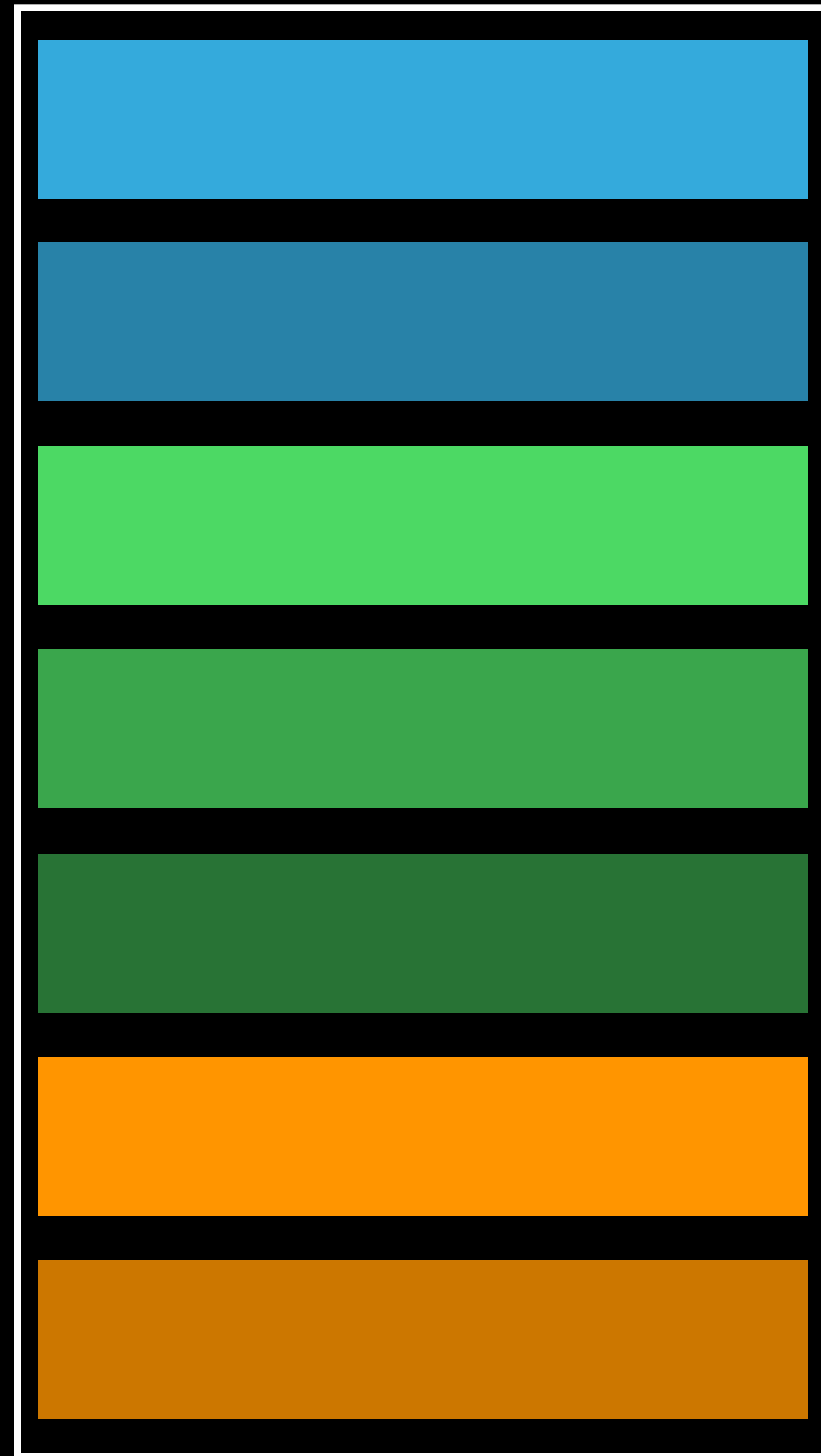


Old

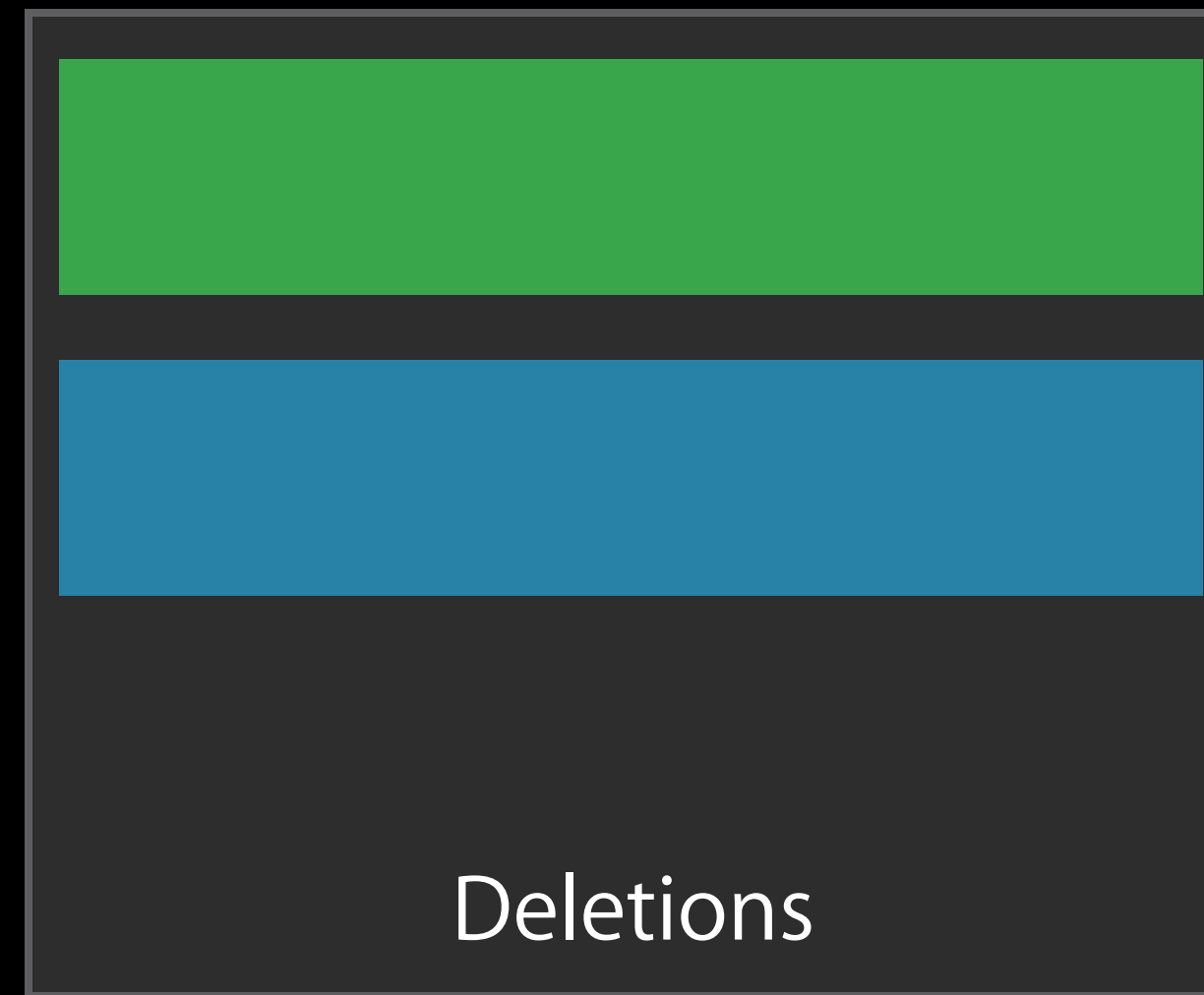


New

-prepareForCollectionViewUpdates:

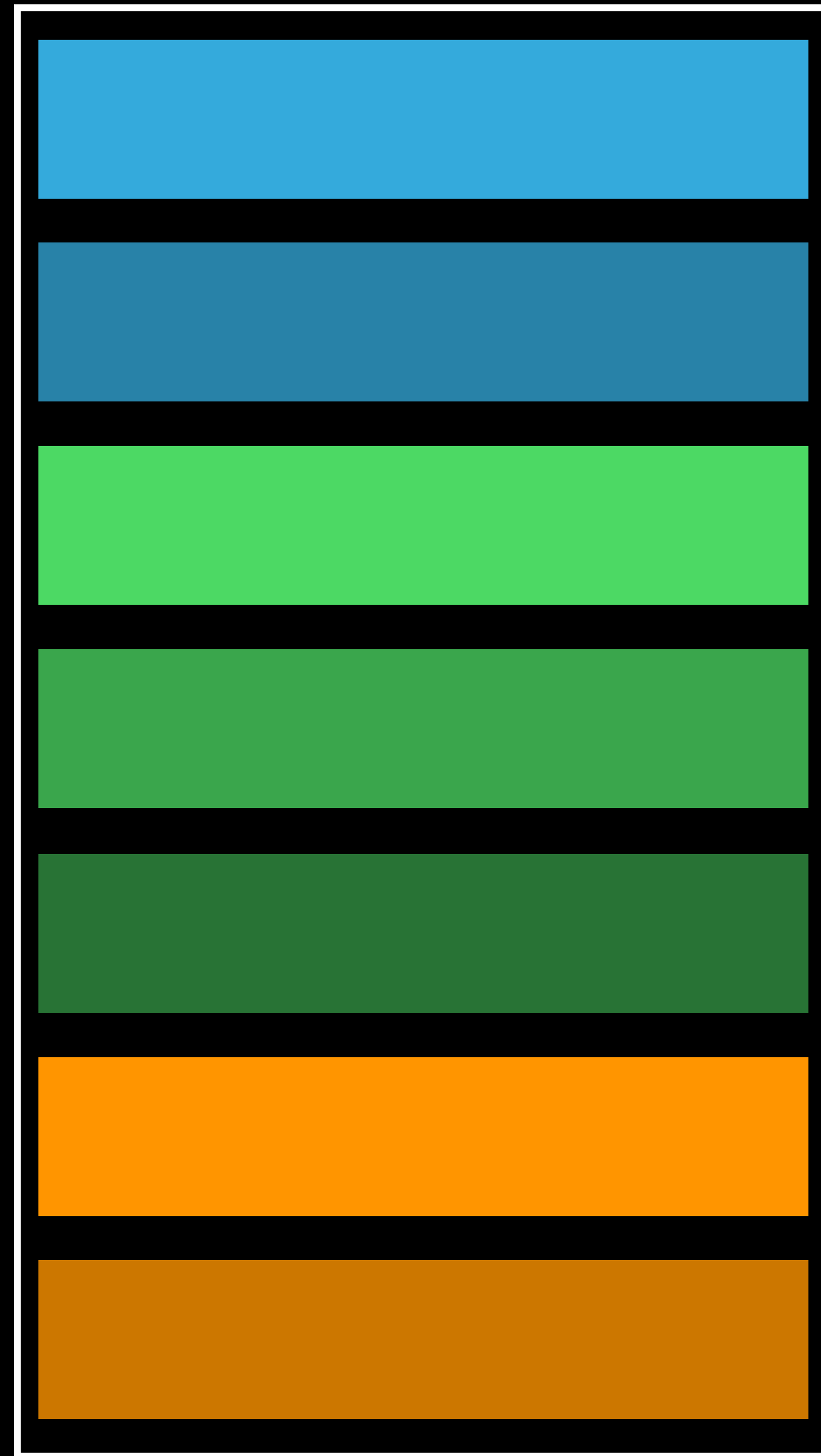


Old

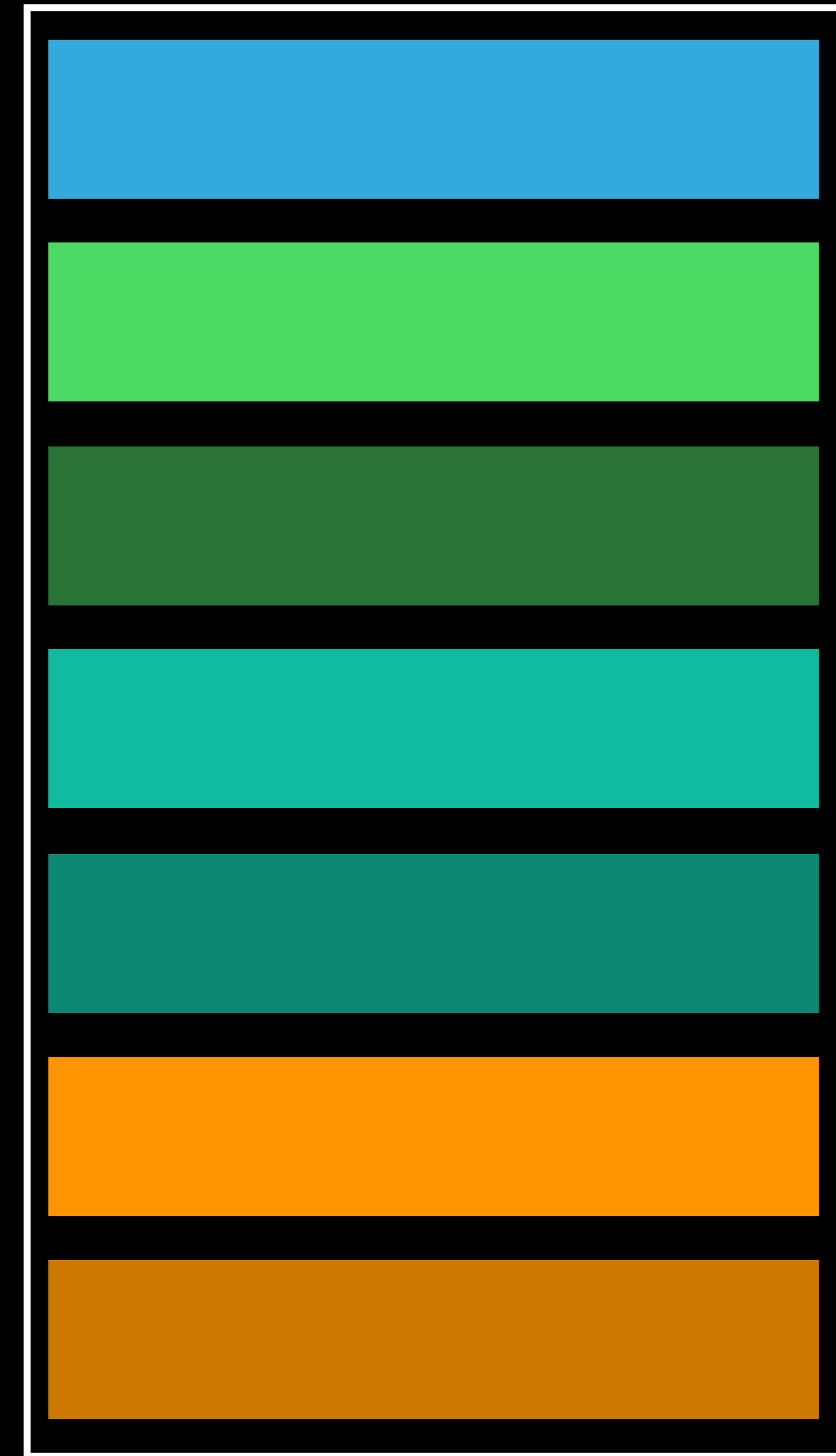
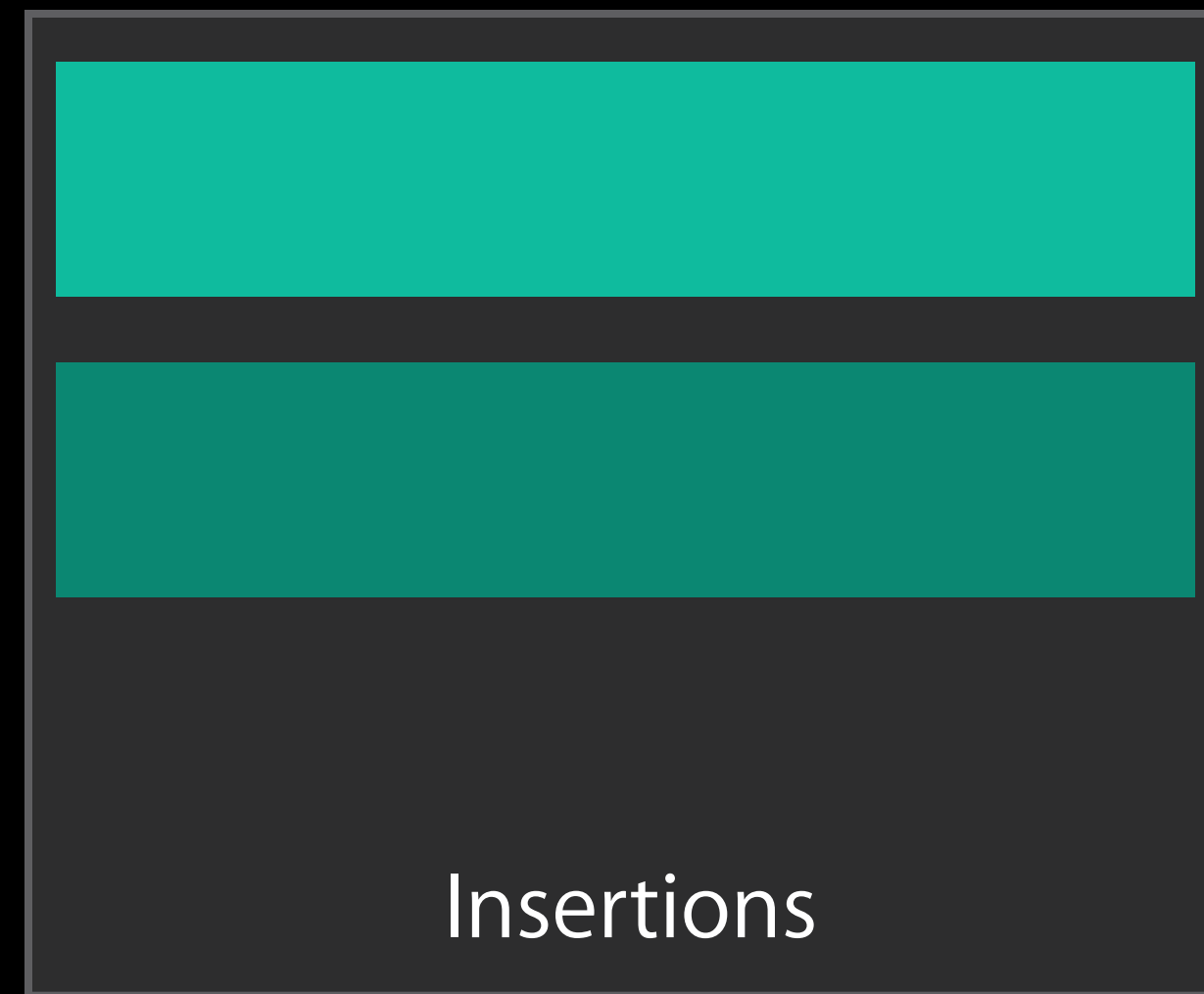
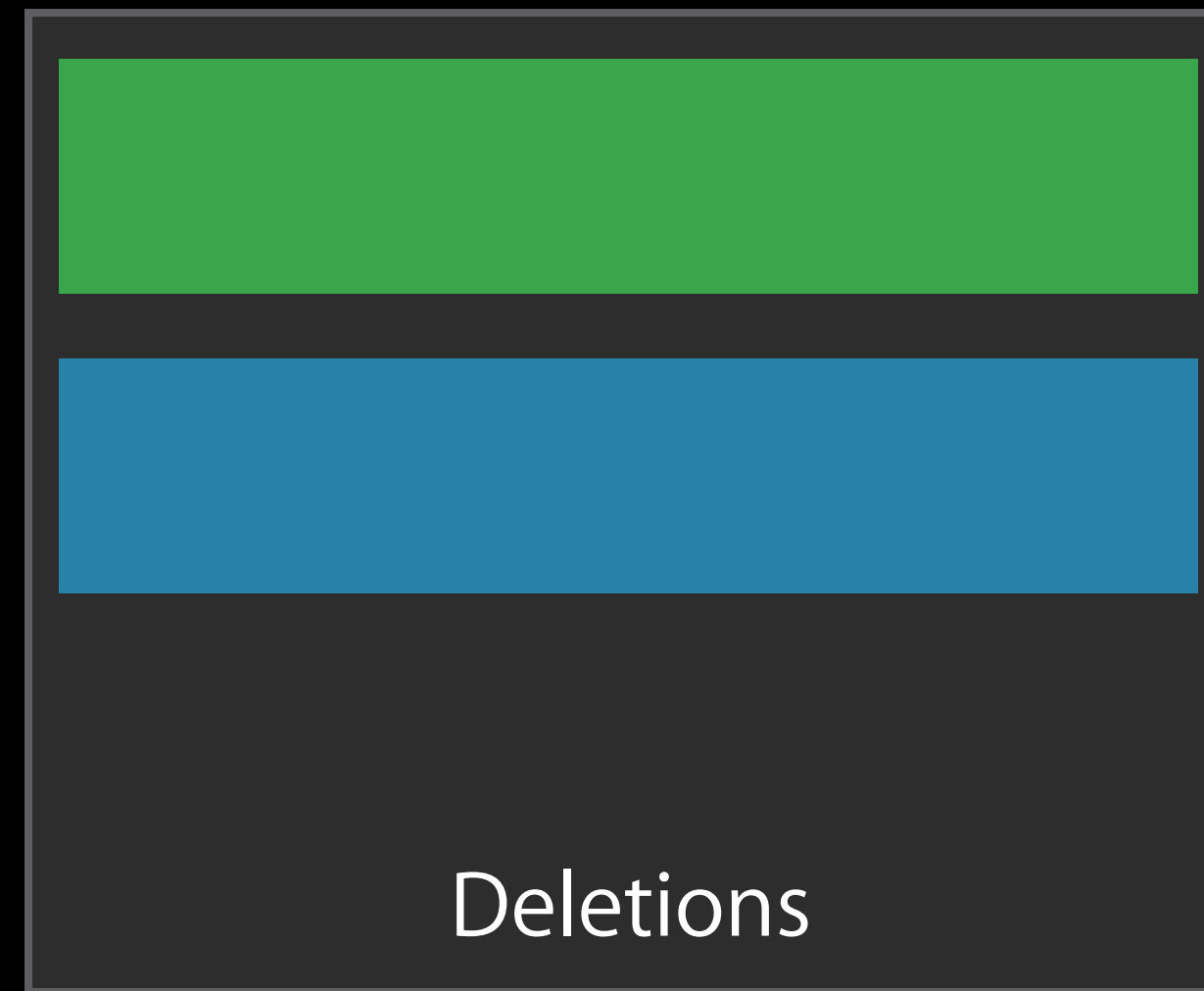


New

-prepareForCollectionViewUpdates:



Old



New

# Target Content Offset

-targetContentOffsetForProposedContentOffset:

Adjusts scroll offset

Used by layout to calculate

- Pinning offset
- Delta to prevent unwanted motion

# Target Content Offset

-targetContentOffsetForProposedContentOffset:

Adjusts scroll offset

Used by layout to calculate

- Pinning offset
- Delta to prevent unwanted motion

Get this calculation correct—use it in many places

# Before

purus massa, vulputate a  
accumsan quis, tempor sed  
sem. In quis turpis enim. In  
gravida, purus at scelerisque  
eleifend, ante augue blandit  
dui, id pulvinar justo nibh  
non dolor. Duis scelerisque  
urna et enim hendrerit  
ullamcorper. Nam porta  
rutrum urna, viverra tincidunt  
velit ultricies mattis. Sed in  
dui sed lorem varius  
sollicitudin. Pellentesque sed  
nunc nunc, varius  
tellus. Sed arcu dolor gravida  
 eget lacus at, posuere  
malesuada dolor. Proin at dui  
gravida dui facilisis  
consectetur sit amet eu  
mauris. Donec sed felis  
facilisis, congue nisl at,  
gravida diam.

contentSize: 320x1000

contentOffset: 0, 432



# Before

hamburger salami bacon tail  
ham pork belly. Short loin  
swine cow ham, venison  
porchetta beef ribs corned  
beef flank. Filet mignon  
ground round andouille tri-  
tip. Kevin andouille pastrami  
jerky ground round, sirloin  
ham hock.

contentSize: 320x645  
contentOffset: 0, 432

# Before

Bacon ipsum dolor sit amet tri-tip beef ribs brisket sirloin turkey venison prosciutto shoulder swine. Jerky pastrami turkey kielbasa, venison pig meatloaf fatback capicola. Cow pancetta swine, ham hock ground round bresaola meatloaf pig spare ribs short ribs short loin beef ribs kielbasa. Frankfurter meatloaf short ribs shank hamburger, corned beef, ham, pork belly, short loin, swine cow ham, venison porchetta beef ribs corned beef flank. Filet mignon ground round andouille tri-tip. Kevin andouille pastrami jerky ground round, sirloin ham hock.

contentSize: 320x645

contentOffset: 0, 165

# After

purus massa, vulputate a  
accumsan quis, tempor sed  
sem. In quis turpis enim. In  
gravida, purus at scelerisque  
eleifend, ante augue blandit  
dui, id pulvinar justo nibh  
non dolor. Duis scelerisque  
urna et enim hendrerit  
ullamcorper. Nam porta  
rutrum urna, viverra tincidunt  
velit ultricies mattis. Sed in  
dui sed lorem varius  
sollicitudin. Pellentesque sed  
nunc nunc, varius  
tellus. Sed arcu dolor gravida  
 eget lacus at, posuere  
malesuada dolor. Proin at dui  
gravida dui facilisis  
consectetur sit amet eu  
mauris. Donec sed felis  
facilisis, congue nisl at,  
gravida diam.

contentSize: 320x1000

contentOffset: 0, 432

# After

hamburger salami bacon tail  
ham pork belly. Short loin  
swine cow ham, venison  
porchetta beef ribs corned  
beef flank. Filet mignon  
ground round andouille tri-  
tip. Kevin andouille pastrami  
jerky ground round, sirloin  
ham hock.

contentSize: 320x645  
contentOffset: 0, 0

# After

Bacon ipsum dolor sit amet tri-tip beef ribs brisket sirloin turkey venison prosciutto shoulder swine. Jerky pastrami turkey kielbasa, venison pig meatloaf fatback capicola. Cow pancetta swine, ham hock ground round bresaola meatloaf pig spare ribs short ribs beef ribs kielbasa, Frankfurter meatloaf short ribs shank hamburger salami bacon tail ham pork belly. Short loin swine cow ham, venison porchetta beef ribs corned beef flank. Filet mignon ground round andouille tri-tip. Kevin andouille pastrami jerky ground round, sirloin ham hock.

contentSize:320x645

contentOffset: 0, 0

# Initial and Final Layout Attributes

-initialLayoutAttributes\* and -finalLayoutAttributes\*

-initialLayoutAttributes\*: called if the view **will** be on screen after the update

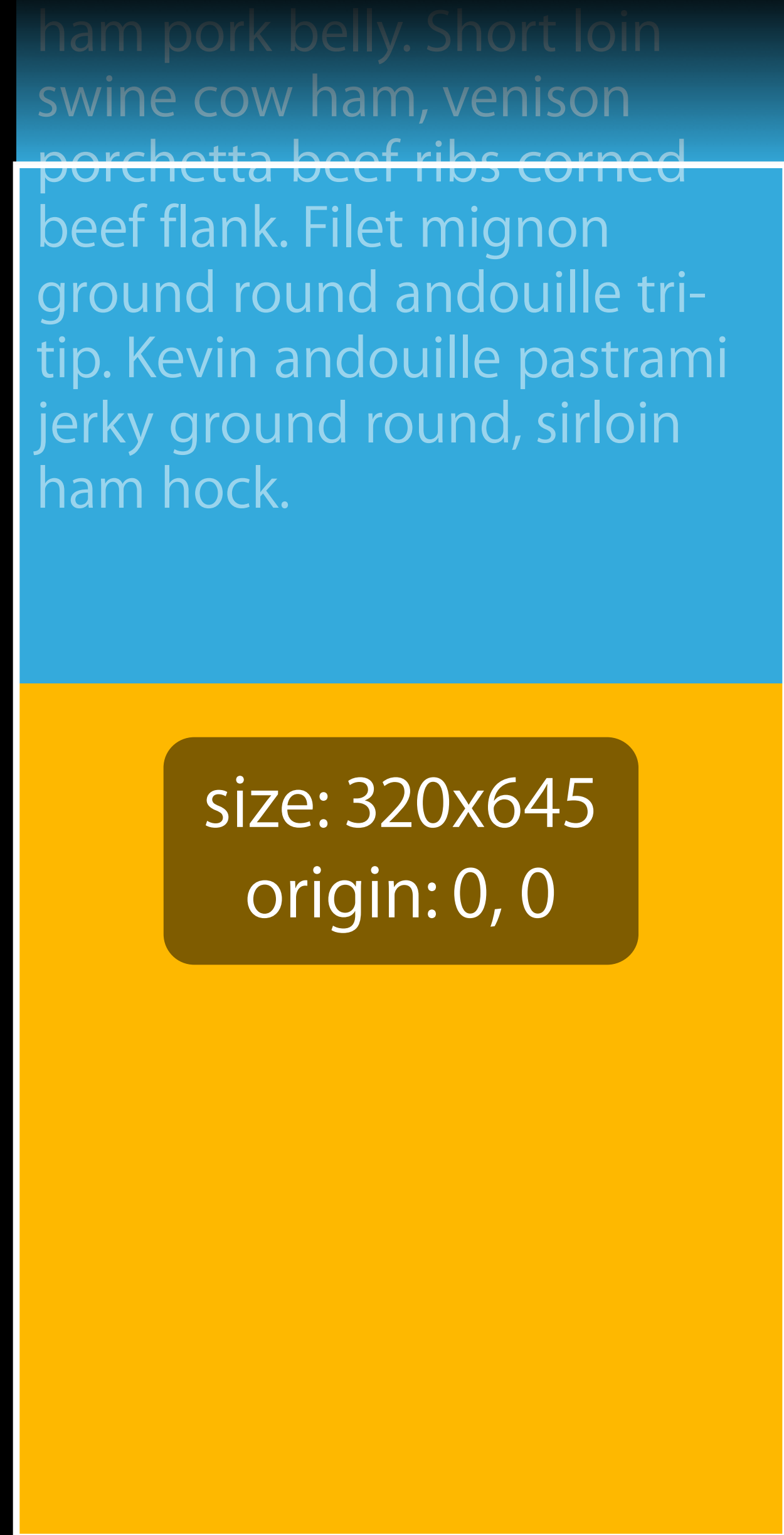
-finalLayoutAttributes\*: called if the view **was** on the screen before the update

Both methods will be called for a view that remains on screen

Simple once update information processed



# Without Initial Layout Attributes



# Without Initial Layout Attributes

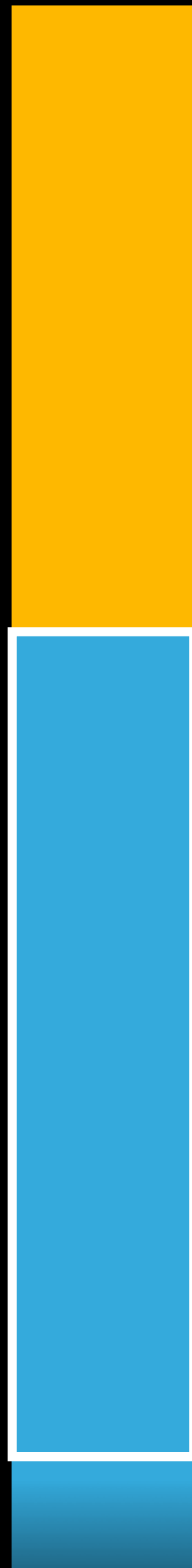


Bacon ipsum dolor sit amet tri-tip beef ribs brisket sirloin turkey venison prosciutto shoulder swine. Jerky pastrami turkey kielbasa, venison pig meatloaf fatback capicola. Cow pancetta swine, ham hock ground round bresaola meatloaf pig spare ribs short ribs beef ribs kielbasa, Frankfurter meatloaf short ribs shank hamburger salami bacon tail ham pork belly. Short loin swine cow ham, venison porchetta beef ribs corned beef flank. Filet mignon ground round andouille tri-tip. Kevin andouille pastrami jerky ground round, sirloin ham hock

size:320x645

origin:0,0

# With Initial Layout Attributes



Bacon ipsum dolor sit amet tri-tip beef ribs brisket sirloin turkey venison prosciutto shoulder swine. Jerky pastrami turkey kielbasa, venison pig meatloaf fatback capicola. Cow pancetta swine, ham hock ground round bresaola meatloaf pig spare ribs short ribs beef ribs kielbasa, Frankfurter meatloaf short ribs shank hamburger salami bacon tail ham pork belly. Short loin swine cow ham, venison porchetta beef ribs corned beef flank. Filet mignon ground round andouille tri-tip. Kevin andouille pastrami jerky ground round, sirloin ham hock.

size: 320x645

origin: 0, 432

# With Initial Layout Attributes



Bacon ipsum dolor sit amet tri-tip beef ribs brisket sirloin turkey venison prosciutto shoulder swine. Jerky pastrami turkey kielbasa, venison pig meatloaf fatback capicola. Cow pancetta swine, ham hock ground round bresaola meatloaf pig spare ribs short ribs beef ribs kielbasa, Frankfurter meatloaf short ribs shank hamburger salami bacon tail ham pork belly. Short loin swine cow ham, venison porchetta beef ribs corned beef flank. Filet mignon ground round andouille tri-tip. Kevin andouille pastrami jerky ground round, sirloin ham hock.

size: 320x645

origin: 0, 0

## -initialLayoutAttributesForAppearingItemAtIndexPath:

```
NSInteger section = indexPath.section;
```

```
AAPLCollectionViewGridLayoutAttributes *result =  
    [self.indexPathToItemAttributes[indexPath] copy];
```

```
BOOL inserted = [self.insertedSections containsIndex:section] ||  
    [self.insertedIndexPaths containsObject:indexPath];
```

```
BOOL reloaded = [self.reloadedSections containsIndex:section];
```

```
...
```

# -initialLayoutAttributesForAppearingItemAtIndexPath:

```
NSInteger section = indexPath.section;
```

```
AAPLCollectionViewGridLayoutAttributes *result =  
    [self.indexPathToItemAttributes[indexPath] copy];
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BOOL inserted = [self.insertedSections containsIndex:section] ||  
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```

```
BOOL reloaded = [self.reloadedSections containsIndex:section];
```

```
...
```



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```

```
...
```

## -initialLayoutAttributesForAppearingItemAtIndexPath:

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NSInteger section = indexPath.section;
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AAPLCollectionViewGridLayoutAttributes *result =  
    [self.indexPathToItemAttributes[indexPath] copy];
```

```
BOOL inserted = [self.insertedSections containsIndex:section] ||  
    [self.insertedIndexPaths containsObject:indexPath];
```

```
BOOL reloaded = [self.reloadedSections containsIndex:section];
```

```
...
```

-initialLayoutAttributesForAppearingItemAtIndexPath:

```
...  
  
if (inserted)  
    result.alpha = 0;  
  
if (reloaded && !self.oldIndexPathToItemAttributes[indexPath])  
    result.alpha = 0;  
  
results.frame = CGRectOffset(results.frame,  
    -self.contentOffsetDelta.x, -self.contentOffsetDelta.y);  
return results;
```

# -initialLayoutAttributesForAppearingItemAtIndexPath:

```
...  
  
if (inserted)  
    result.alpha = 0;  
  
if (reloaded && !self.oldIndexPathToItemAttributes[indexPath])  
    result.alpha = 0;  
  
results.frame = CGRectOffset(results.frame,  
    -self.contentOffsetDelta.x, -self.contentOffsetDelta.y);  
return results;
```

# -initialLayoutAttributesForAppearingItemAtIndexPath:

```
...  
  
if (inserted)  
    result.alpha = 0;  
  
if (reloaded && !self.oldIndexPathToItemAttributes[indexPath])  
    result.alpha = 0;  
  
results.frame = CGRectOffset(results.frame,  
    -self.contentOffsetDelta.x, -self.contentOffsetDelta.y);  
return results;
```

# UICollectionViewLayout

## Recap

Book keeping is critical

Optional methods make a big difference



# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering

# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering

# Swipe to Edit and Drag Reordering

Just a little something extra

# Swipe to Edit

Add AAPLAction instances to cells

```
NSString *favoriteTitle = NSLocalizedString(@"★", @"Favorite action");
NSString *deleteTitle = NSLocalizedString(@"Delete", @"Delete action");

cell.editActions = @[
    [AAPLAction actionWithTitle:favoriteTitle
                        selector:@selector(makeFavorite:)],
    [AAPLAction destructiveActionWithTitle:deleteTitle
                        selector:@selector(swipeToDeleteCell:)]
];
```

# Additional Custom Attributes

columnIndex

editing

movable

# Swipe to Edit

One column

## Ocelot

The Ocelot is also known as the dwarf leopard.

## Tiger

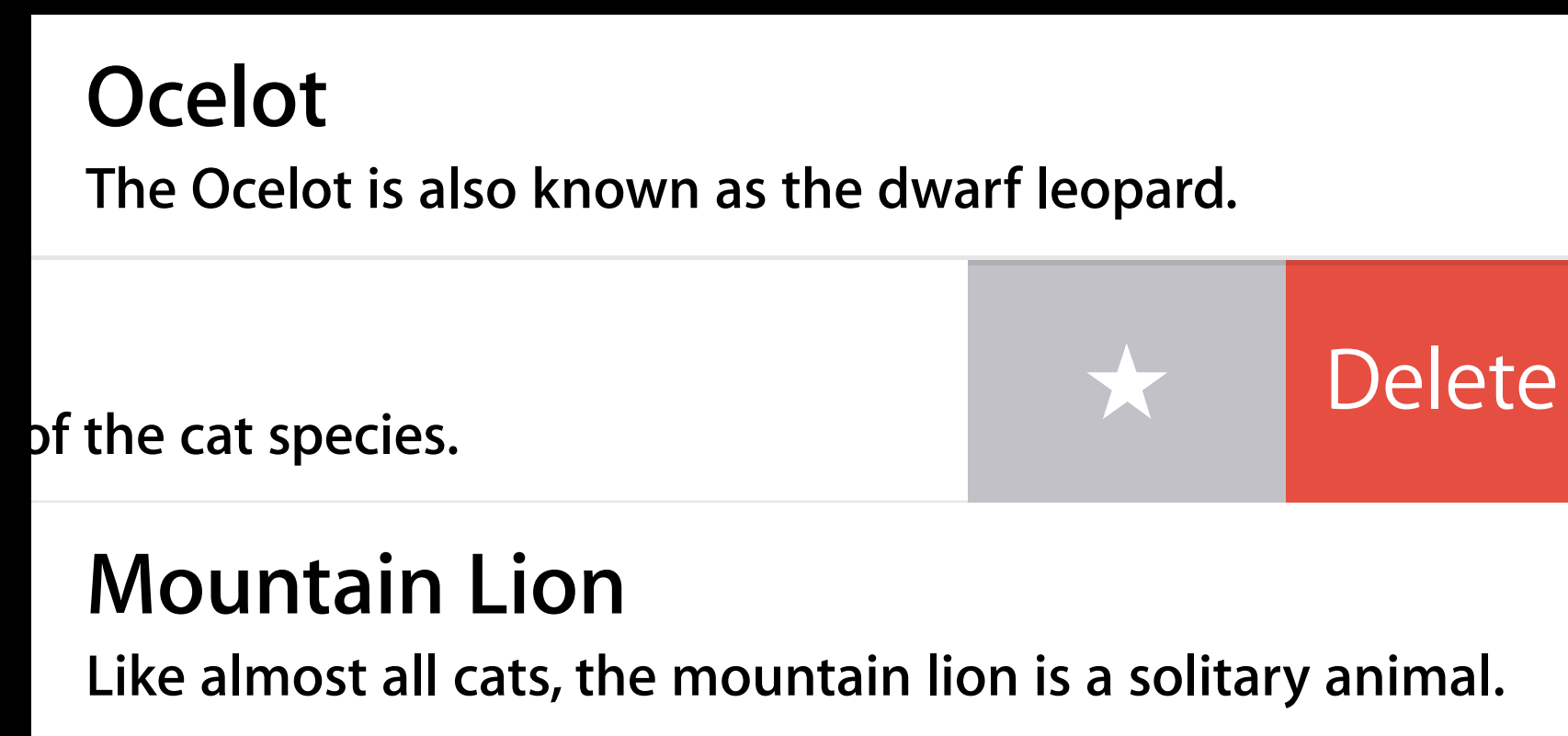
The tiger is the largest of the cat species.

## Mountain Lion

Like almost all cats, the mountain lion is a solitary animal.

# Swipe to Edit

One column






# Swipe to Edit

## Two column

<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	<b>Leopard</b> The leopard is the smallest of the four big cats.
<b>Tiger</b> The tiger is the largest of the cat species.	<b>Lion</b> The male lion is easily recognized by its mane.
<b>Mountain Lion</b> Like almost all cats, the mountain lion is a solitary animal.	<b>Cheetah</b> The cheetah can run faster than any other land animal.

# Swipe to Edit

## Two column

<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	<b>Leopard</b> The leopard is the smallest of the four big cats.
<b>Tiger</b> The tiger is the largest of the cat species.	recognized by its mane.  <b>Delete</b>
<b>Mountain Lion</b> Like almost all cats, the mountain lion is a solitary animal.	<b>Cheetah</b> The cheetah can run faster than any other land animal.

# Batch Editing

editing = NO

## Ocelot

The Ocelot is also known as the dwarf leopard.

## Tiger







The tiger is the largest of the cat species.

## Lion

The male lion is easily recognized by its mane.







# Batch Editing

editing = YES

	<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	
	<b>Tiger</b> The tiger is the largest of the cat species.	
	<b>Lion</b> The male lion is easily recognized by its mane.	

← movable = YES

# Batch Editing

	<b>Ocelot</b> The Ocelot is also known as the dwarf leopard.	
	<b>Tiger</b> The tiger is the largest of the cat species.	
	<b>Lion</b> The male lion is easily recognized by its mane.	

# Batch Editing

The screenshot displays a list of items with a batch editing interface. The first item is "Ocelot" with the description "The Ocelot is also known as the dwarf leopard." and a red minus icon on the left and a hamburger menu icon on the right. Below this item, a horizontal bar contains a hamburger menu icon, a grey star icon, and a red "Delete" button. The second item is "Lion" with the description "The male lion is easily recognized by its mane." and a red minus icon on the left and a hamburger menu icon on the right. The text "est of the cat species." is partially visible between the two items.

**Ocelot**  
The Ocelot is also known as the dwarf leopard.

est of the cat species.

**Lion**  
The male lion is easily recognized by its mane.

Delete

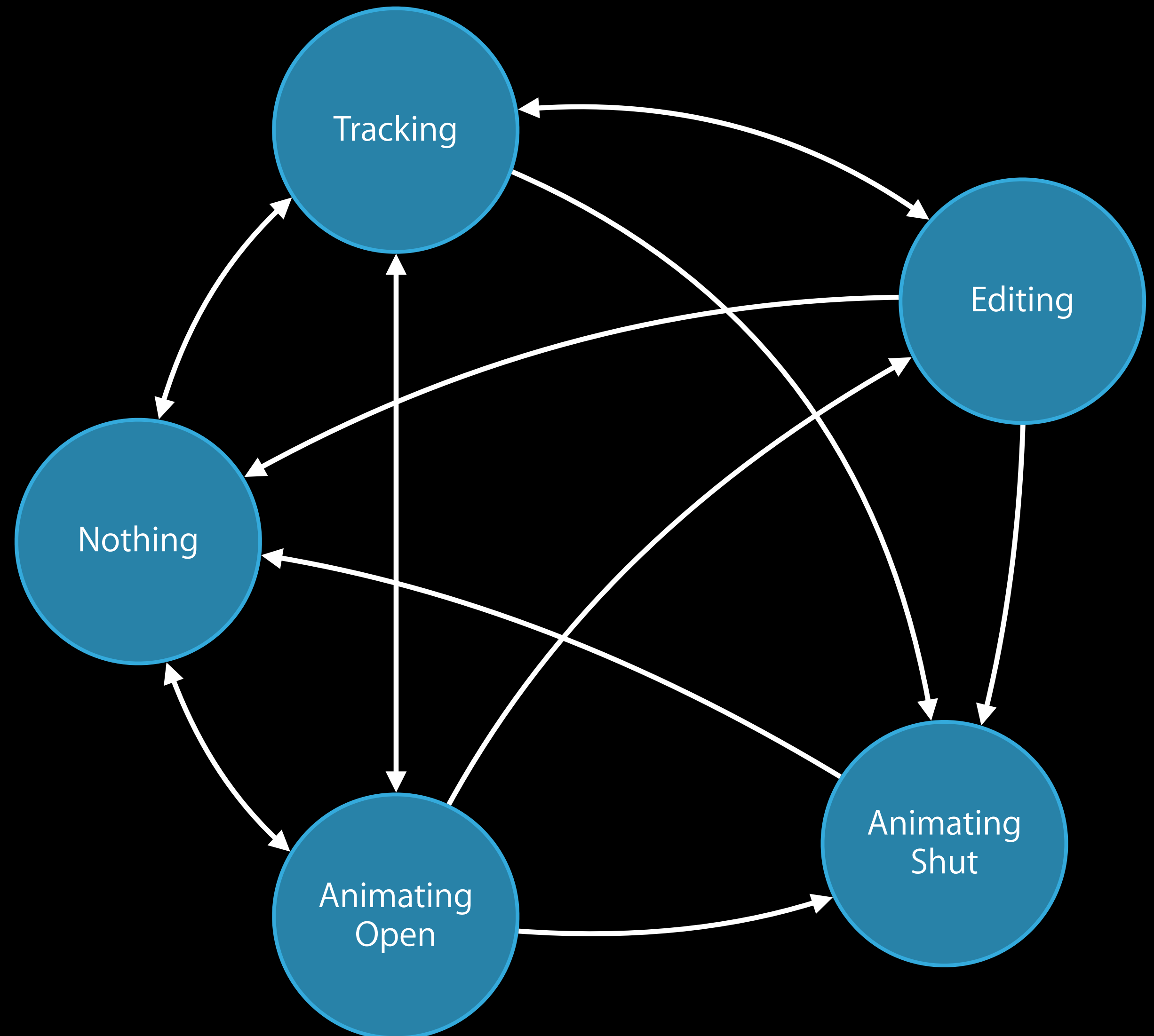
# AAPLSwipeToEditStateMachine

Manages gesture recognizers

- UIPanGestureRecognizer
- UILongPressGestureRecognizer

States are somewhat complex

Works with our layout and cells





# Drag to Reorder

## Required layout changes

- Layout gap
- Hidden cells
- Fast layout calculation

## Requires data source support

- Can move item at indexPath?
- May move item from indexPath to indexPath?
- Move item at indexPath to indexPath



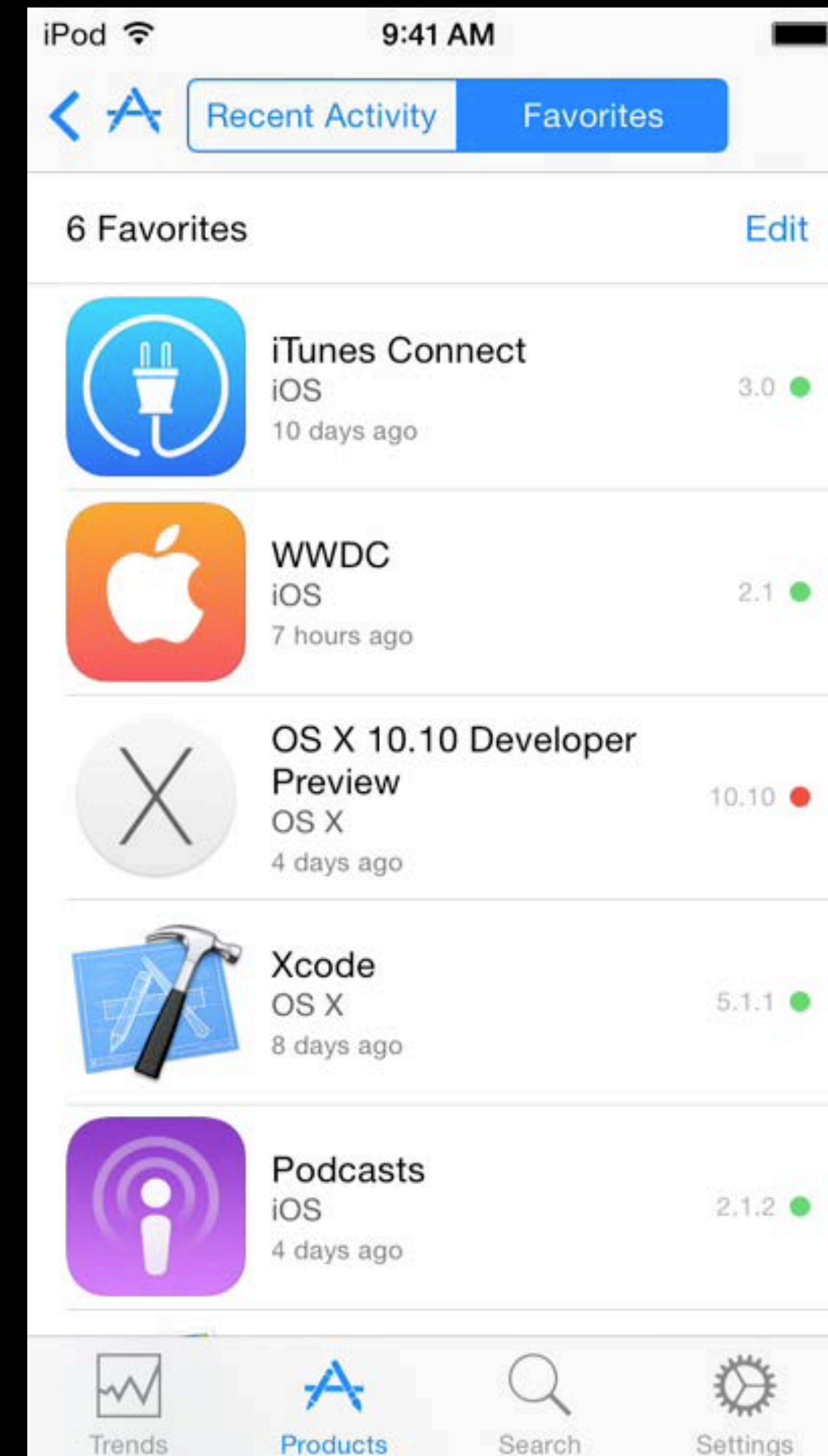
# Drag to Reorder

## Required layout changes

- Layout gap
- Hidden cells
- Fast layout calculation

## Requires data source support

- Can move item at indexPath?
- May move item from indexPath to indexPath?
- Move item at indexPath to indexPath



# Our Requirements

Complex data sources

Single loading indicator

Looked like UITableView

Multiple columns on iPad

Global headers

Pinning headers

Swipe to edit

Batch edit

Drag reordering

# Summary

Aggregate data sources simplify complex designs

Proper bookkeeping makes UICollectionViewLayout easy

Swipe to Edit and Drag Reordering are incremental additions

# More Information

Jake Behrens

App Frameworks Evangelist

[behrens@apple.com](mailto:behrens@apple.com)

Documentation

Collection View Programming Guide for iOS

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

Apple Developer Forums

<http://devforums.apple.com>

# Related Sessions

- 
- What's New in Table and Collection Views Presidio Thursday 10:15AM
-

# Labs

- 
- Table View and Collection View Lab Frameworks Lab A    Thursday 11:30AM
-



 WWDC14