What's New in State Restoration

Saving and restoring application state on iOS

Session 222

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UIKit iOS Developer

These are confidential sessions—please refrain from streaming, blogging, or taking pictures

Application State Restoration

Agenda

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- Feature highlights

Agenda

- Feature highlights
- What's new in iOS 7

Agenda

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- What's new in iOS 7
- Security/background operation

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- What's new in iOS 7
- Security/background operation
- Tools

What Is State Restoration?

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- Preserve app state

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- Restart is like resuming from the background

What Is State Restoration?

- Preserve app state
- Restart is like resuming from the background
- Based on what the user is doing

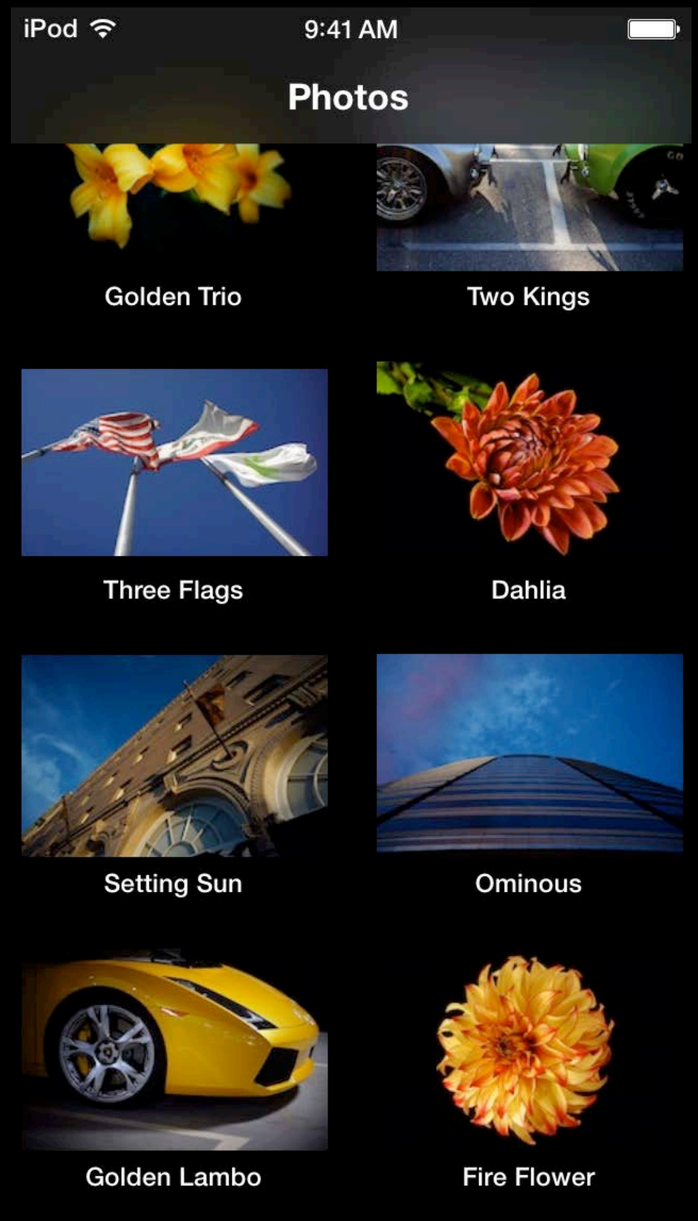
Demo

Image Viewer: implicit restoration

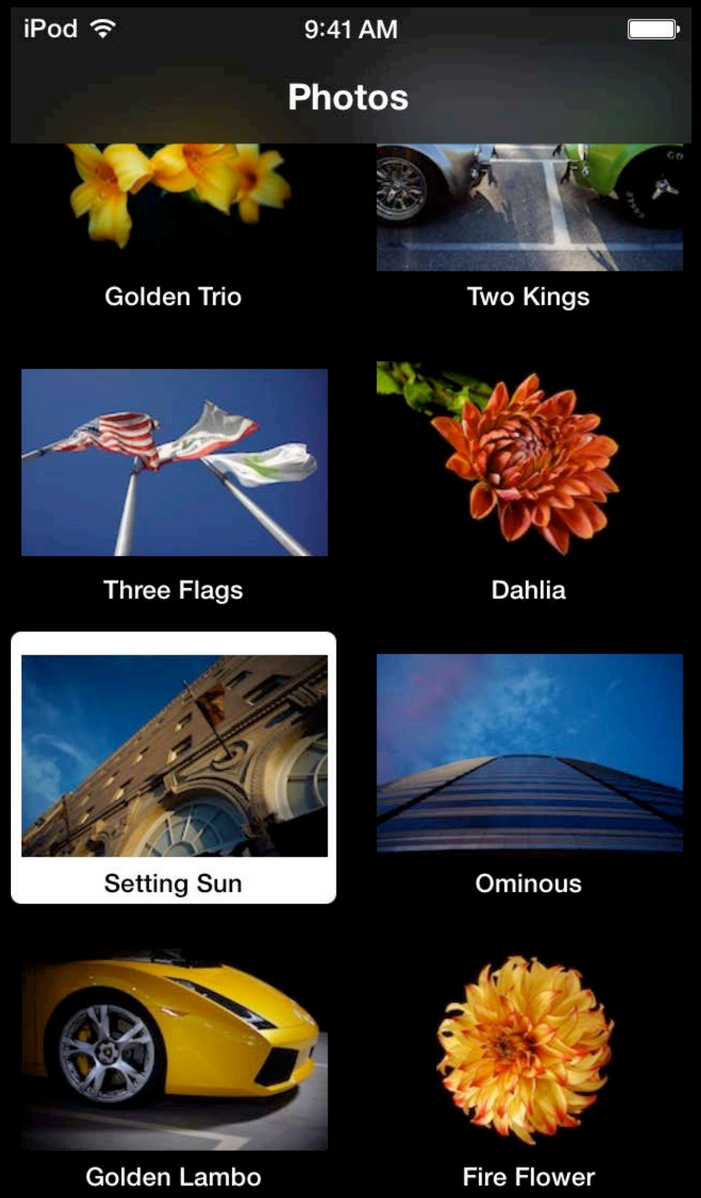
What Was Restored?

What Was Restored?

What Was Restored?

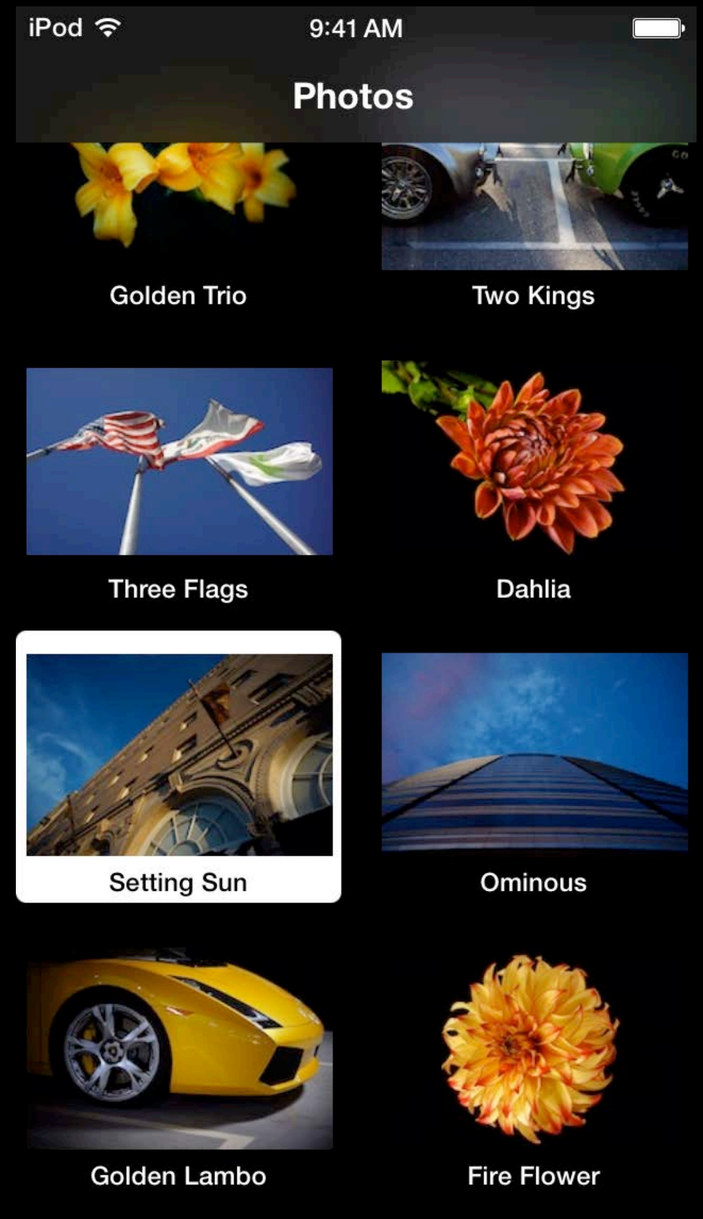


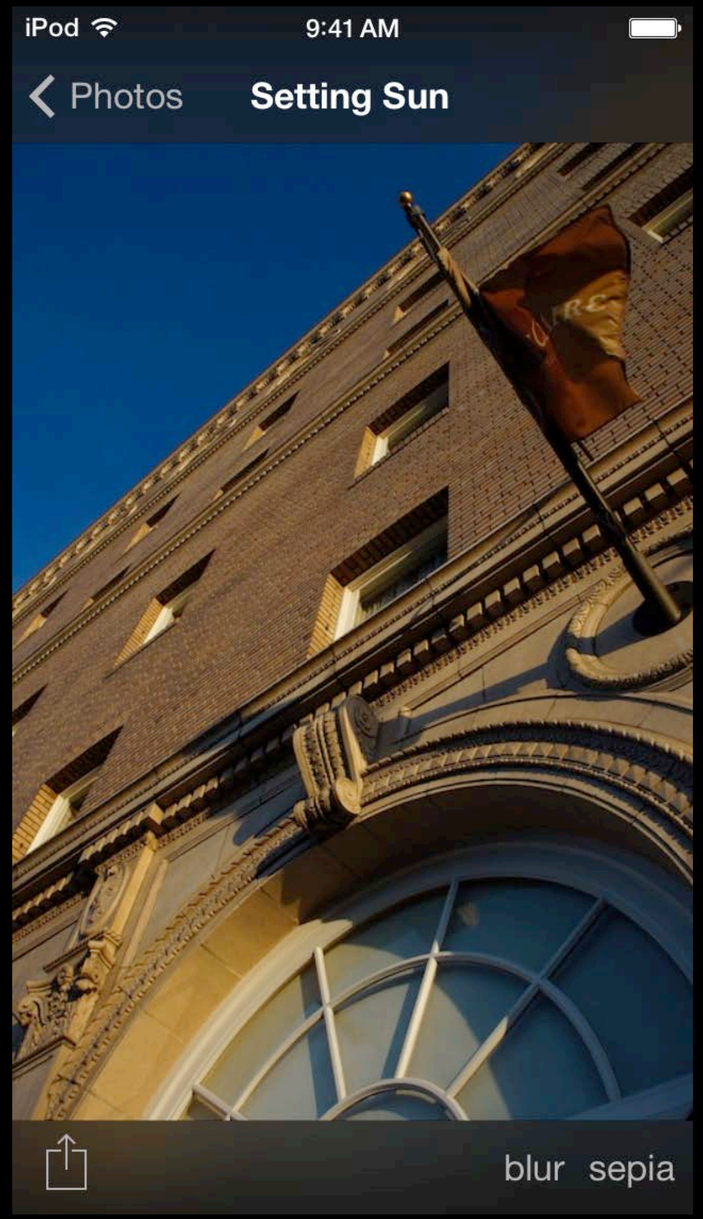
What Was Restored?



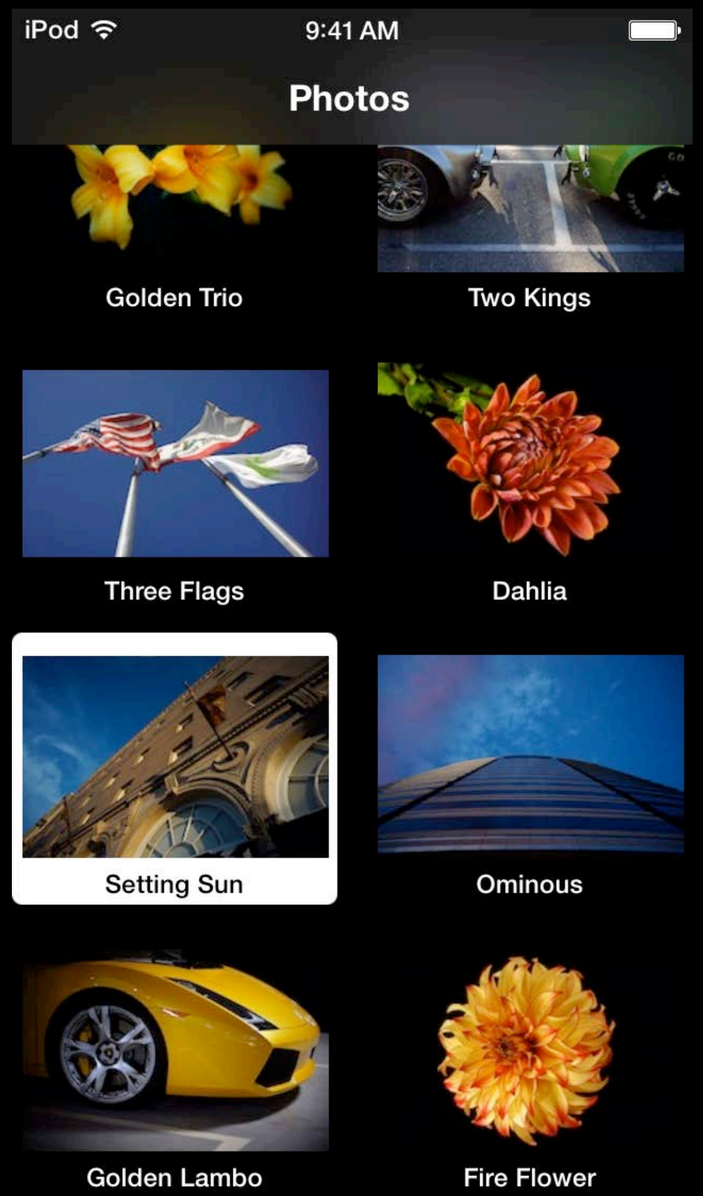
What Was Restored?

Navigation Controller





Segue to Image View Controller



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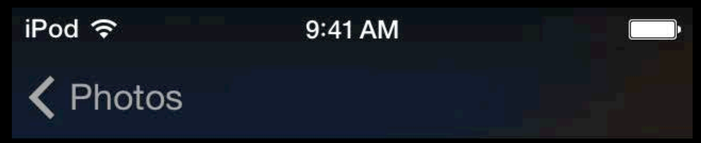

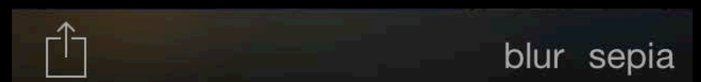

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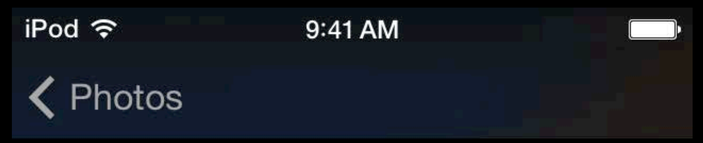
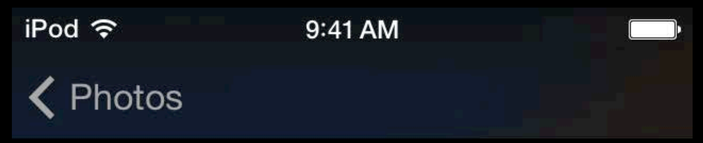


Image

Segue to Image View Controller

Title



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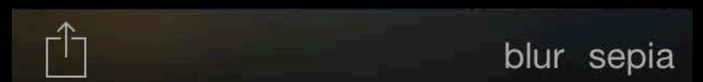

Segue to Image View Controller

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- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
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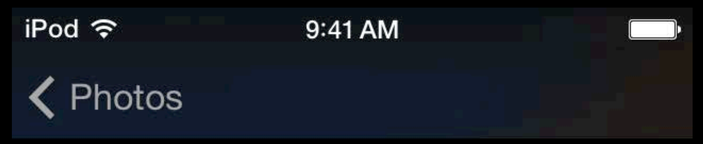

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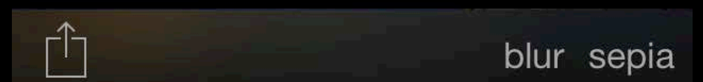

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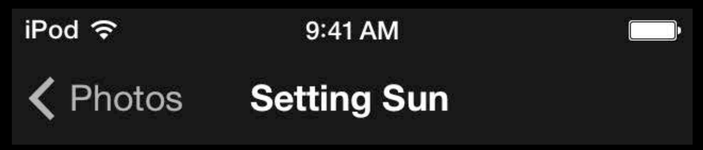


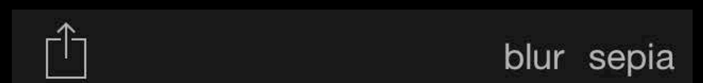
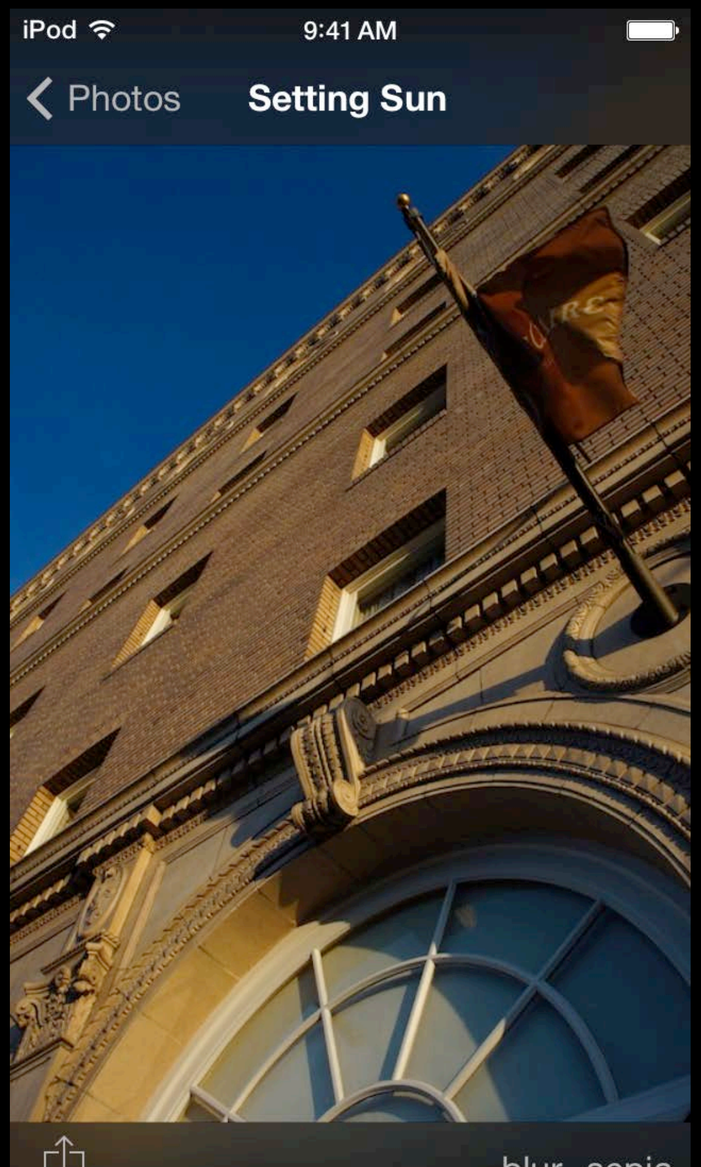


Image Controller Save



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- (void) encodeRestorableStateWithCoder:(NSCoder *)coder
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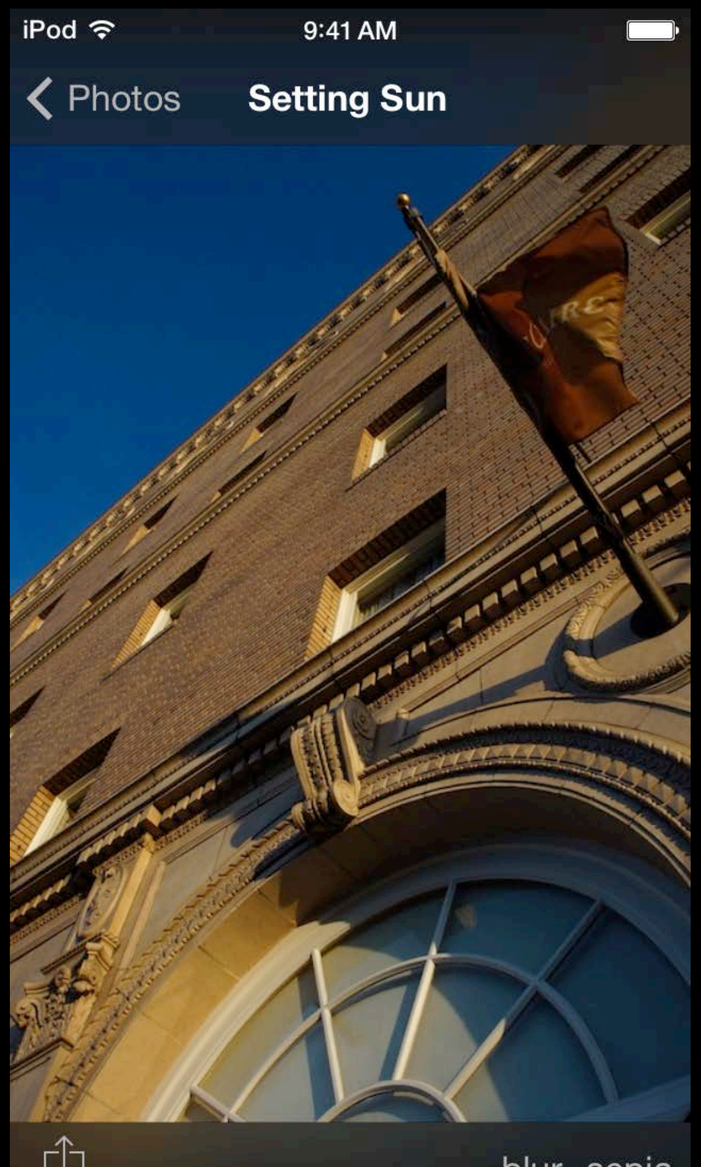

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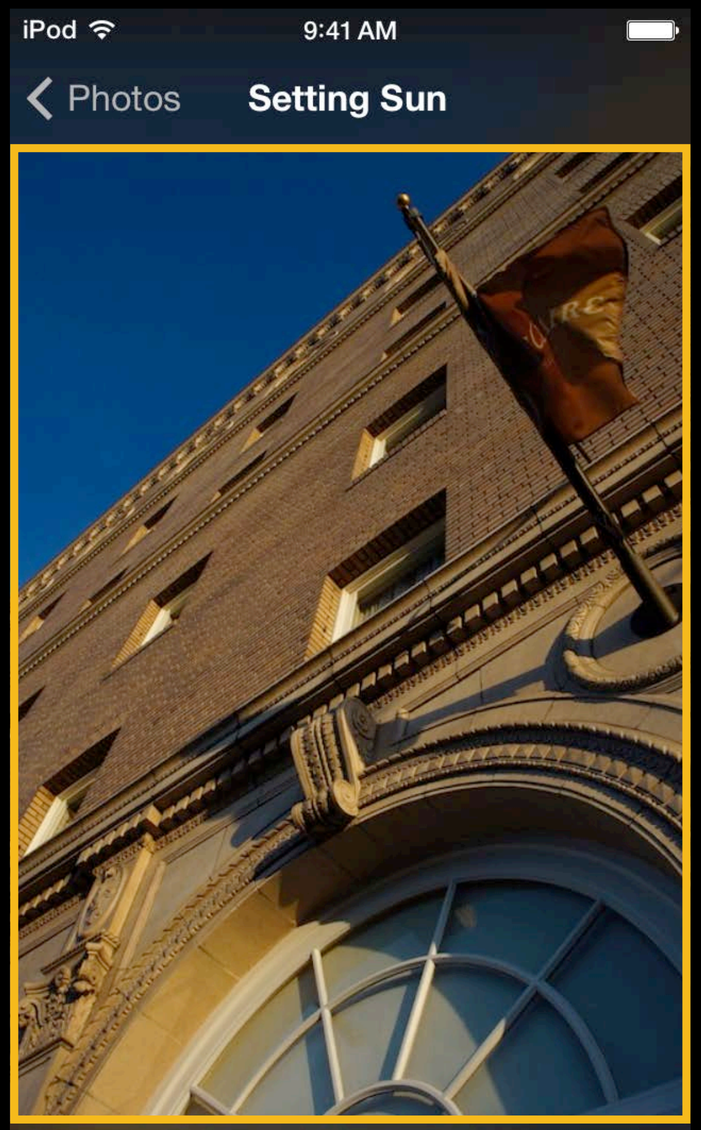

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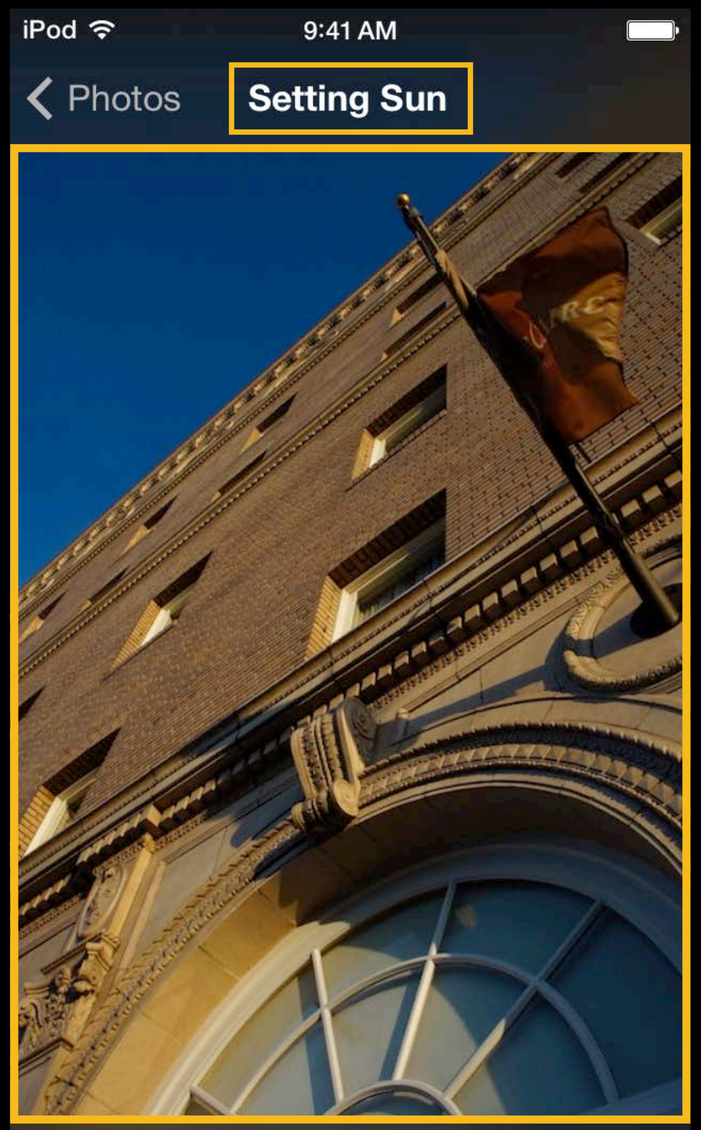

Image Controller Save

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- (void) encodeRestorableStateWithCoder:(NSCoder *)coder
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DataSource Image ID

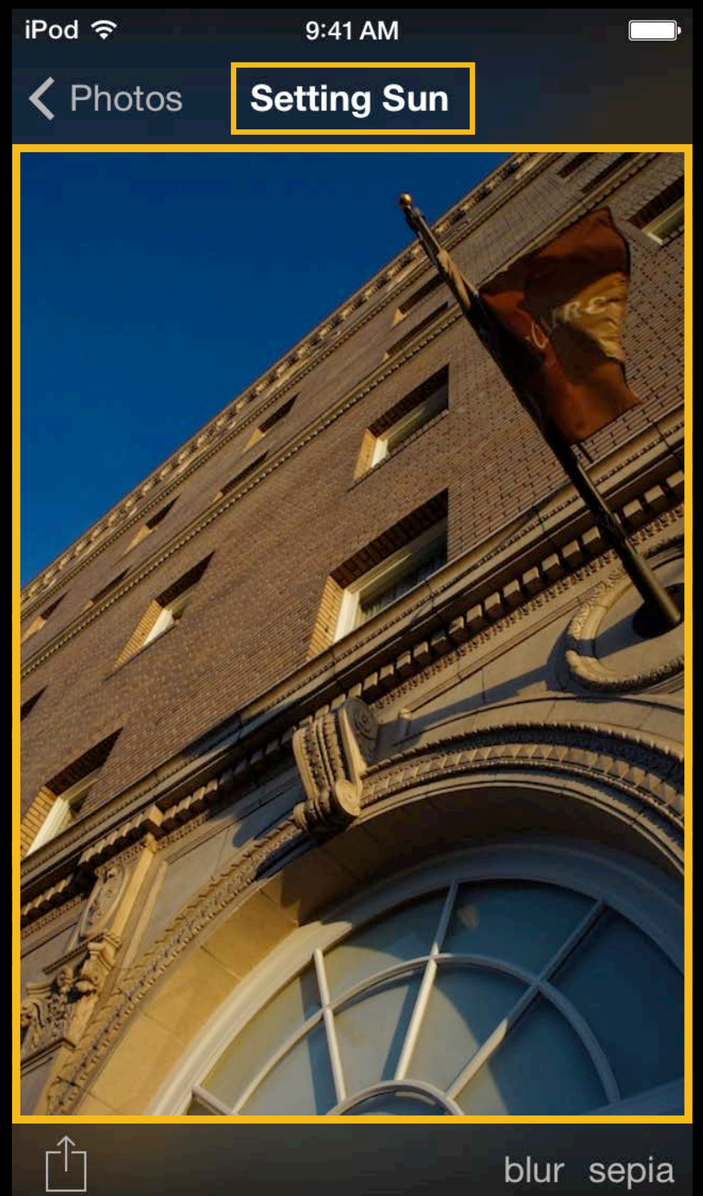
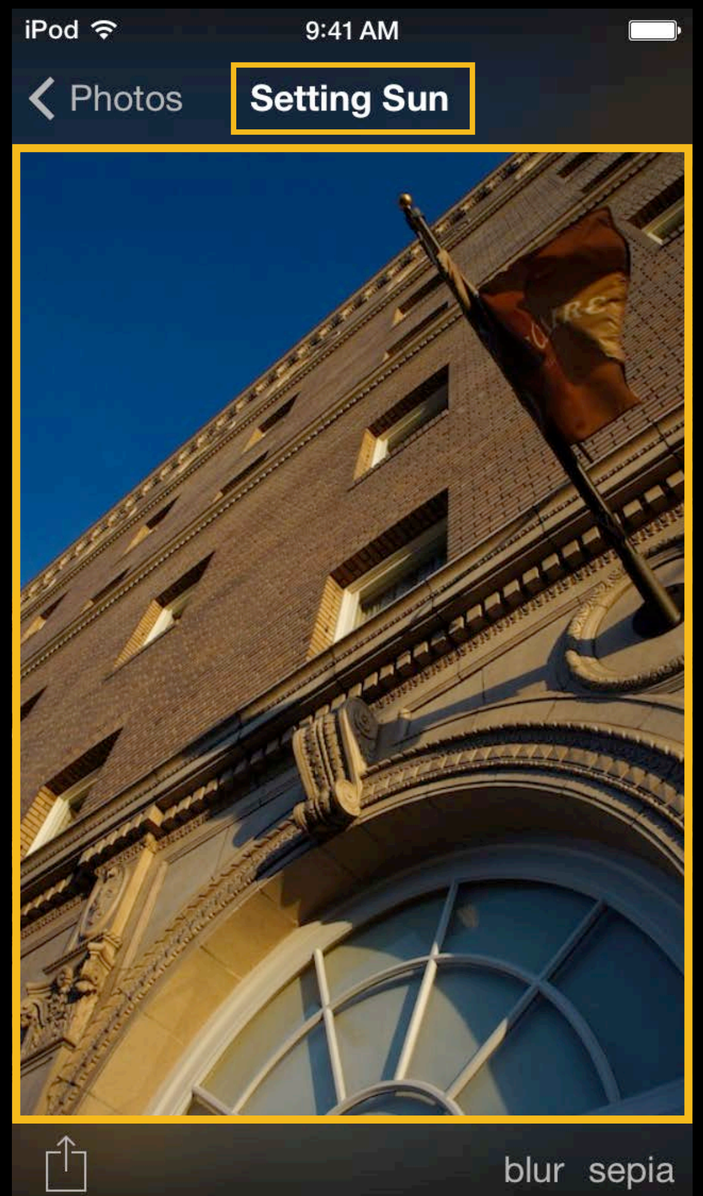


Image Controller Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder
```

DataSource Image ID

```
[coder encodeObject:imageID
      forKey:imageIDKey];
```



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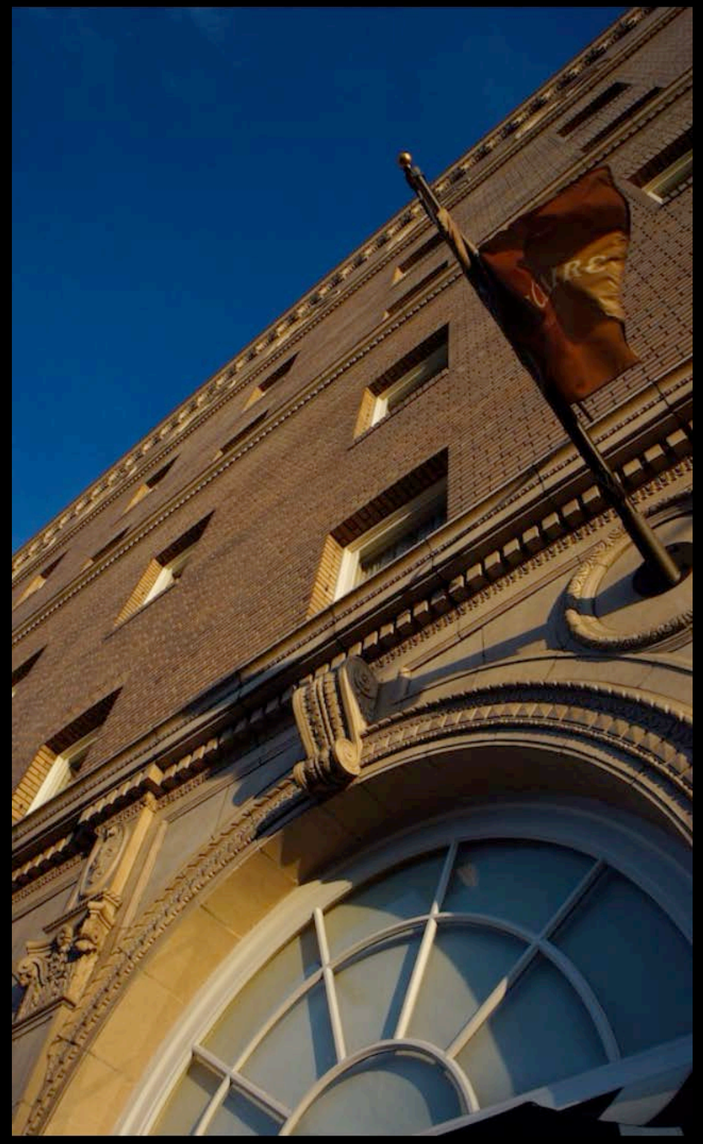
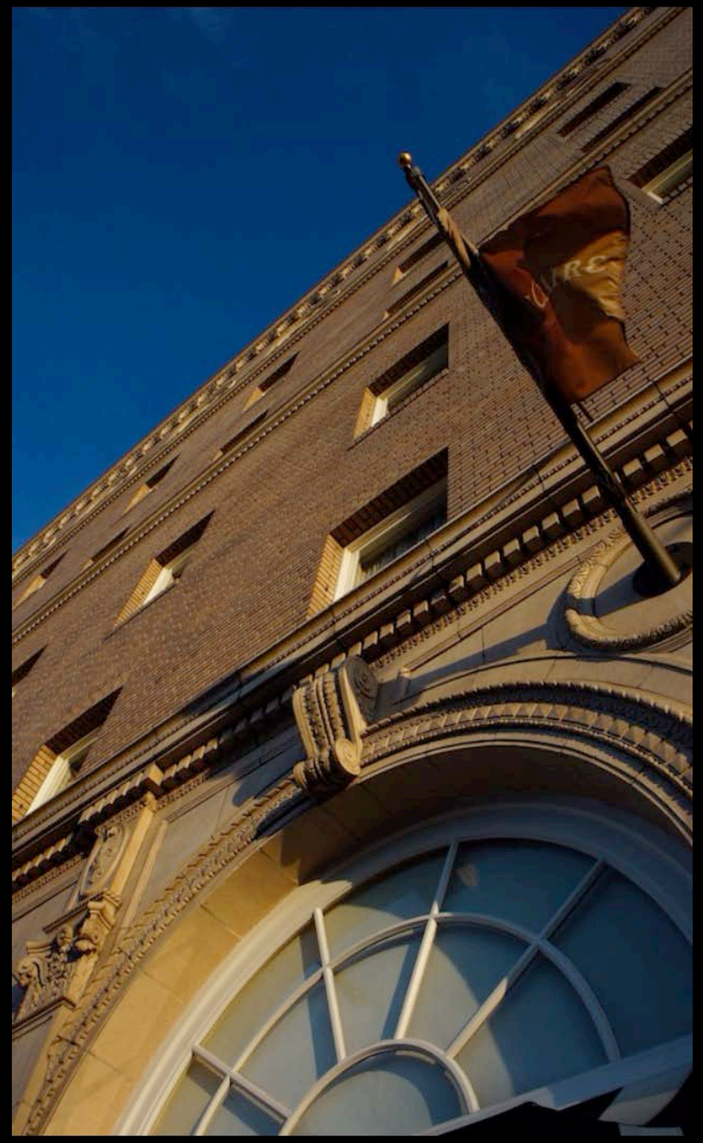


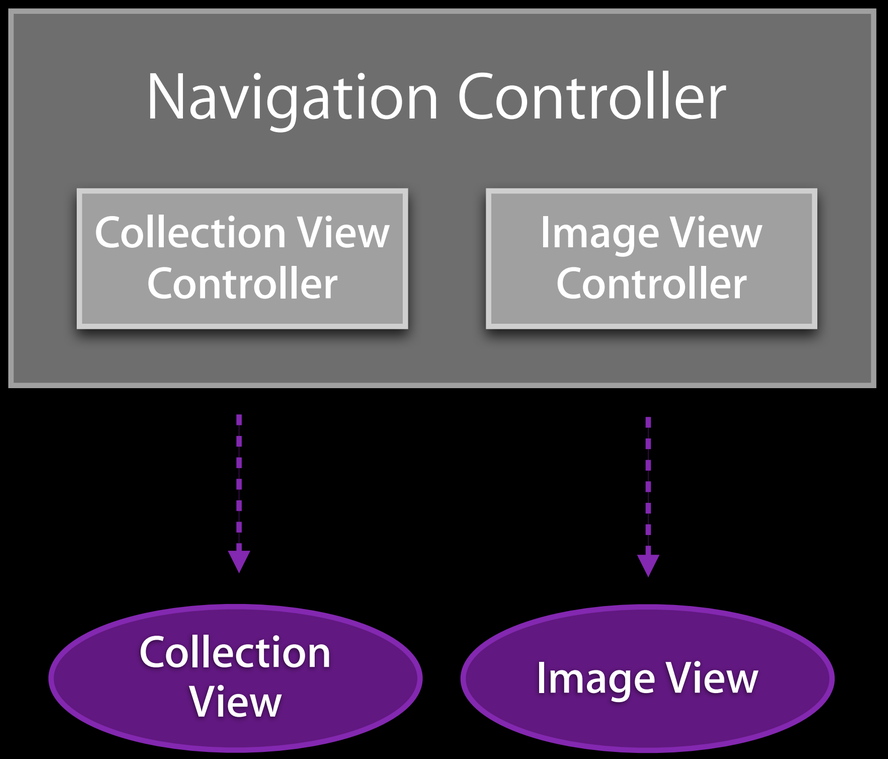
Image Controller Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder
```

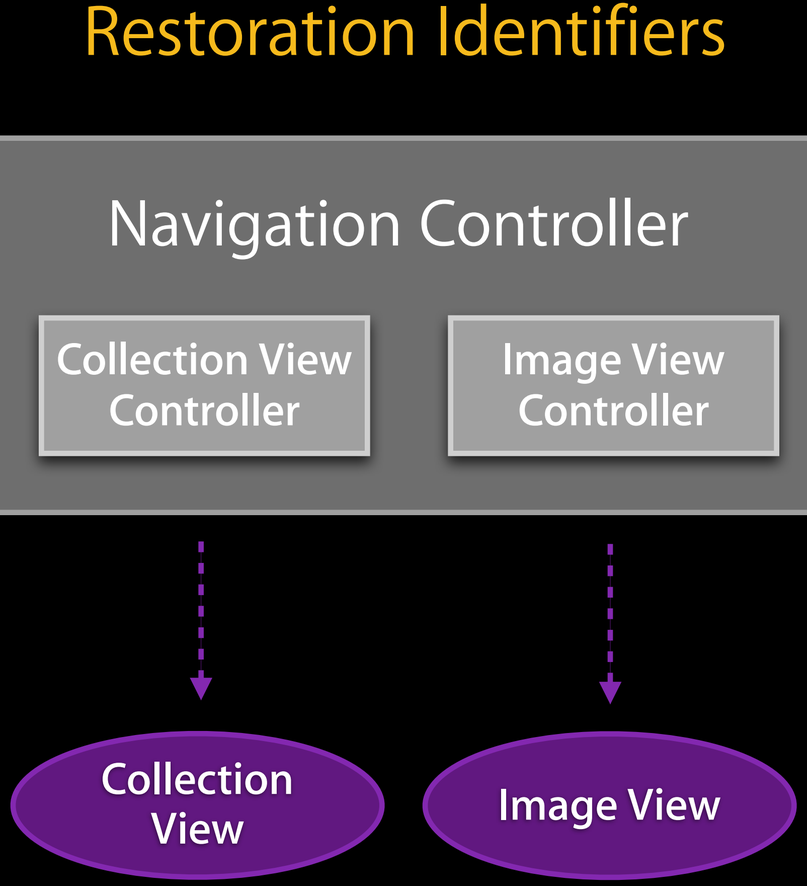
```
[coder encodeBool:showingBars
              forKey:showingBarsKey];
```



Application Structure



Application Structure



Restoring State

Application Delegate Launch

Application Delegate Launch

```
- (BOOL)application:(UIApplication *)application
      willFinishLaunchingWithOptions:(NSDictionary *)launchOptions
```

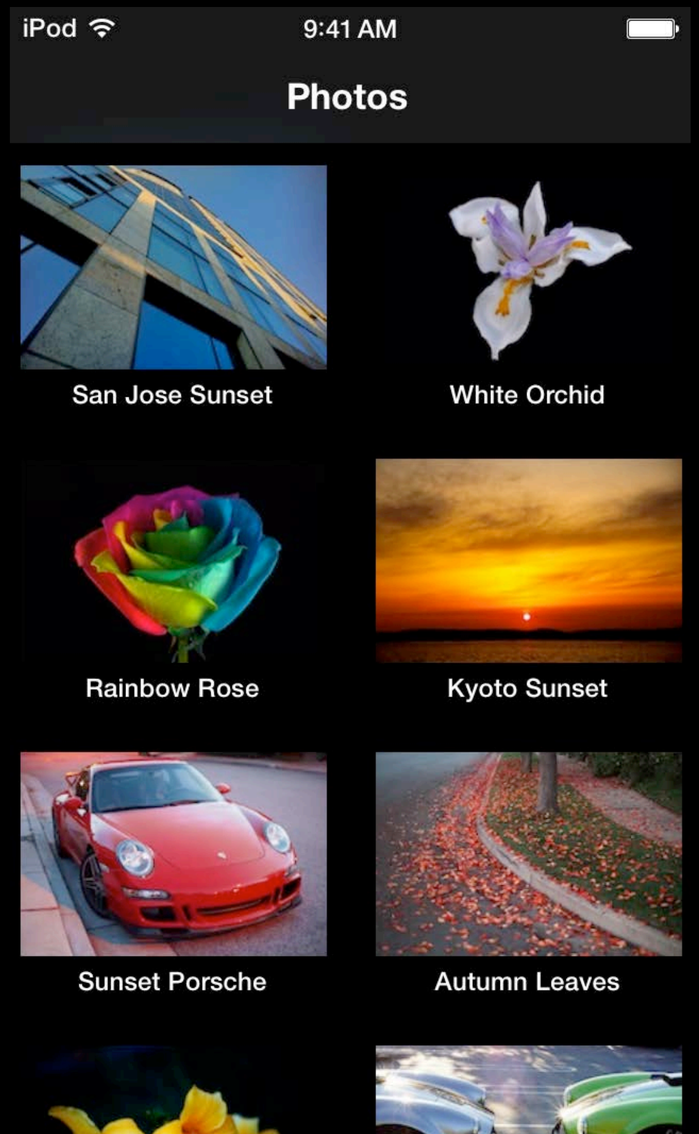
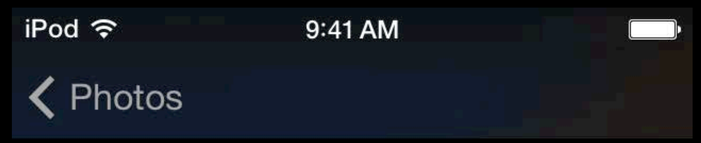


Image Controller Restore

Image Controller Restore



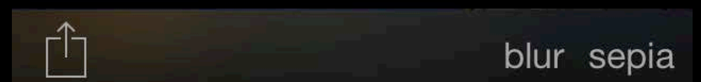
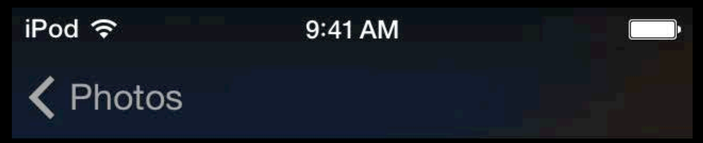


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```



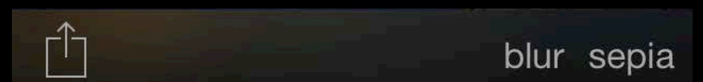


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```

DataSource Image ID

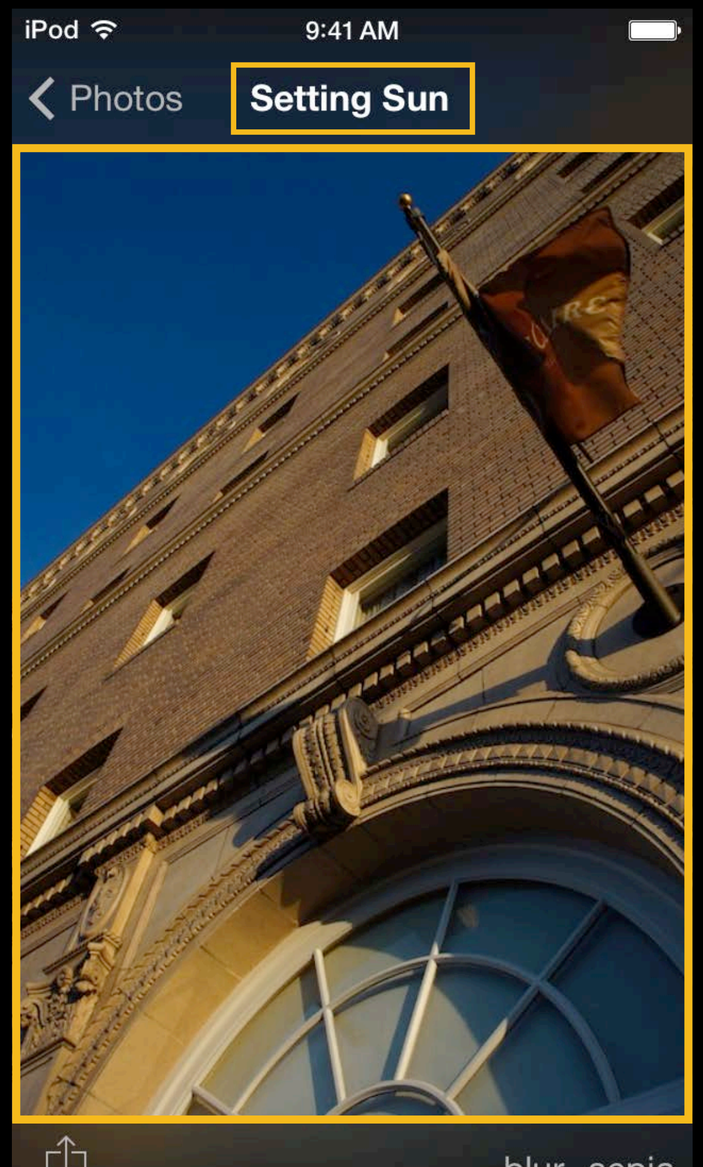
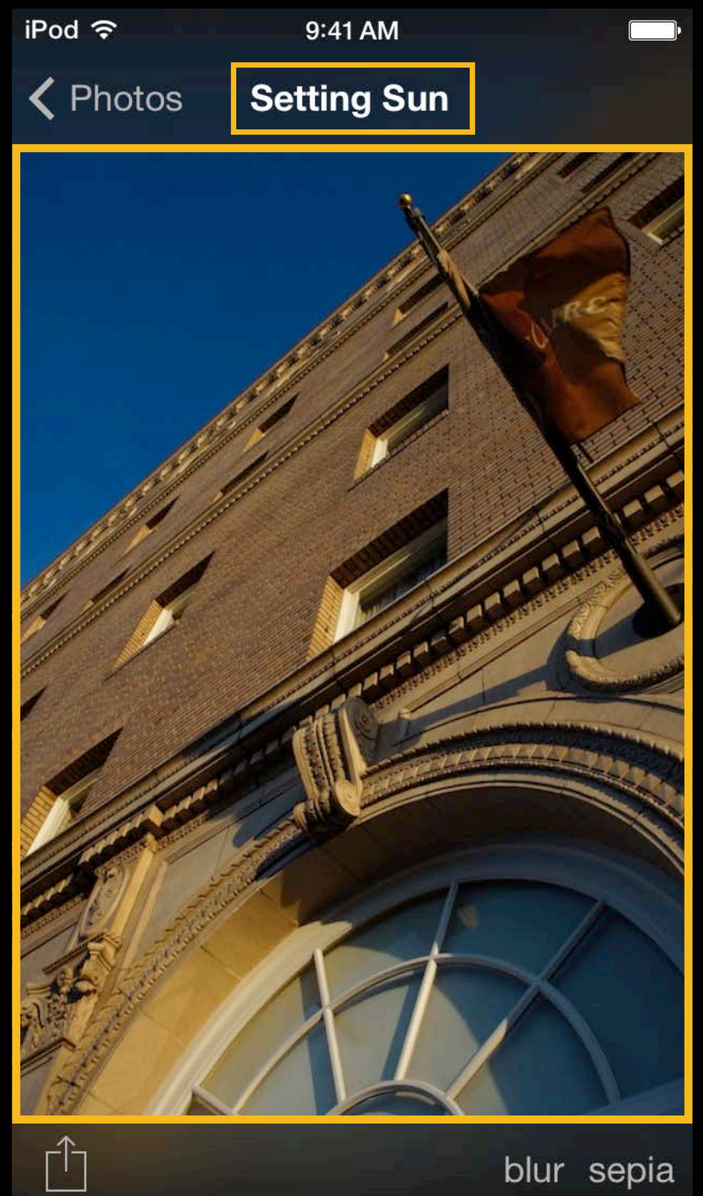


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```

DataSource Image ID

```
imageID =
    [coder decodeObjectForKey:
                imageIDKey];
```



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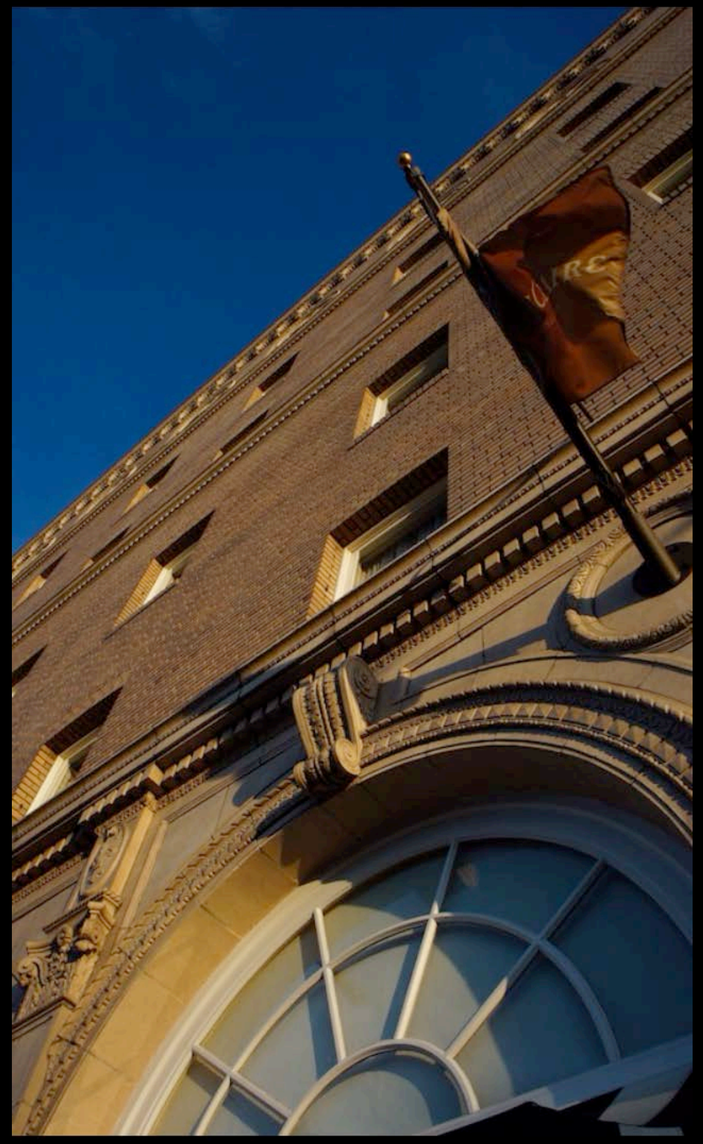
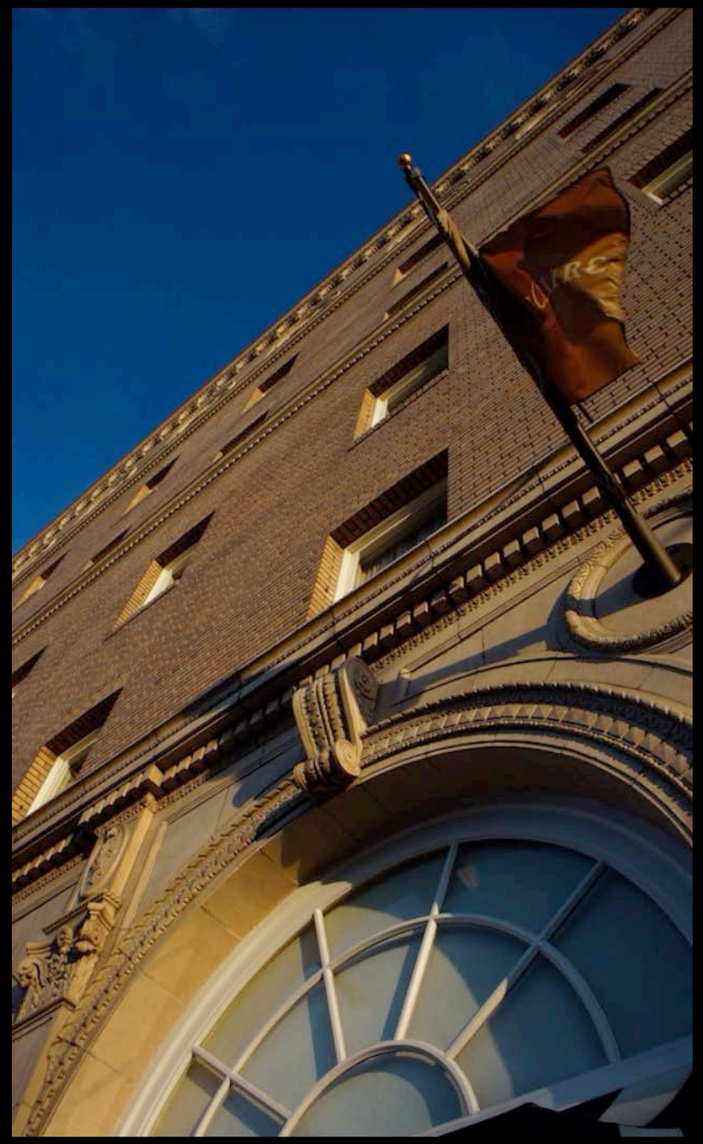


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```

```
showingBars =
    [coder decodeBoolForKey:
            showingBarsKey];
```



Is That All?

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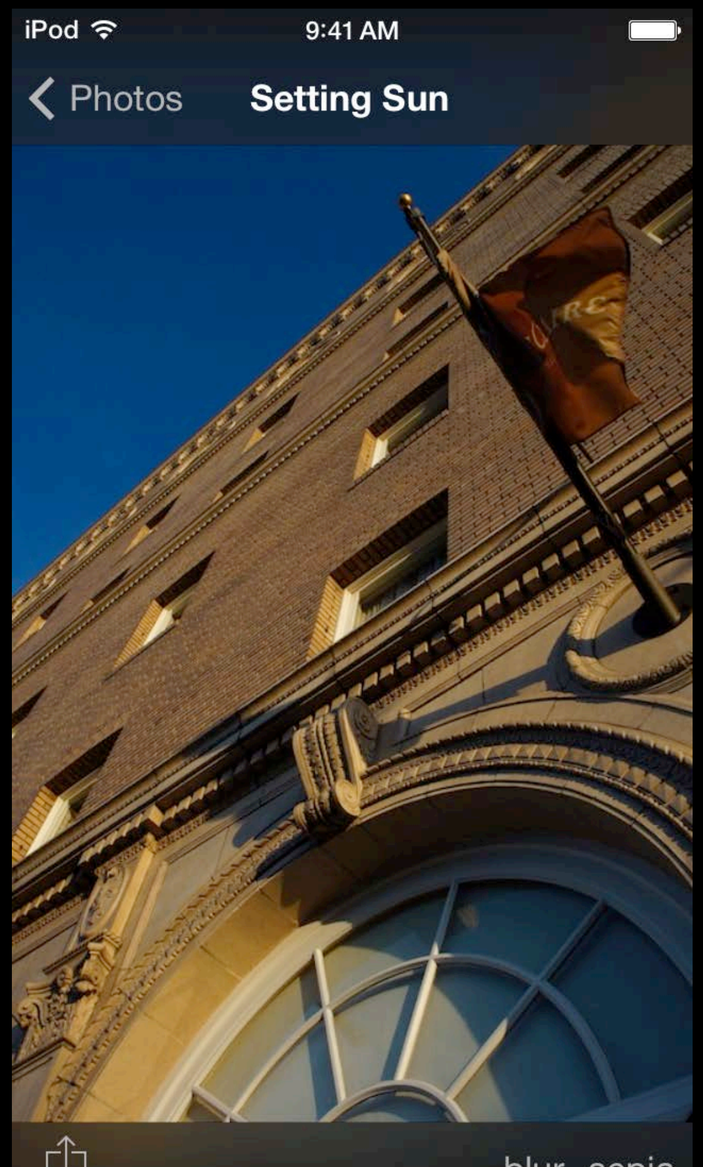
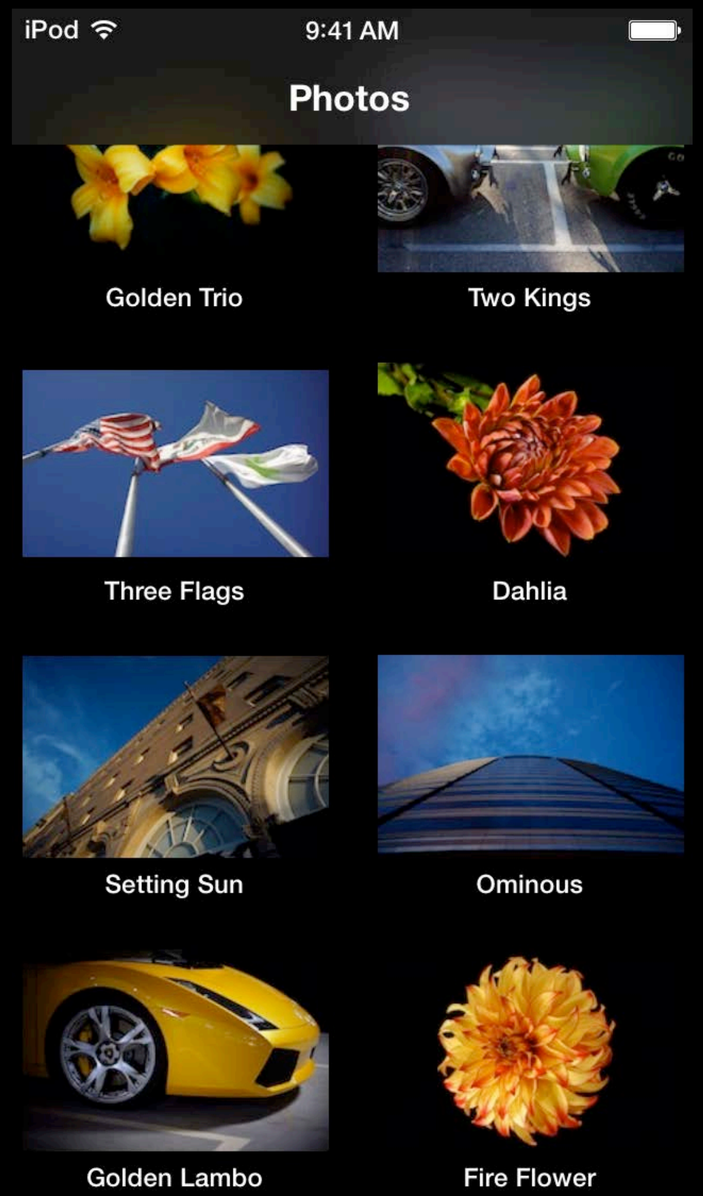
- Navigation stack



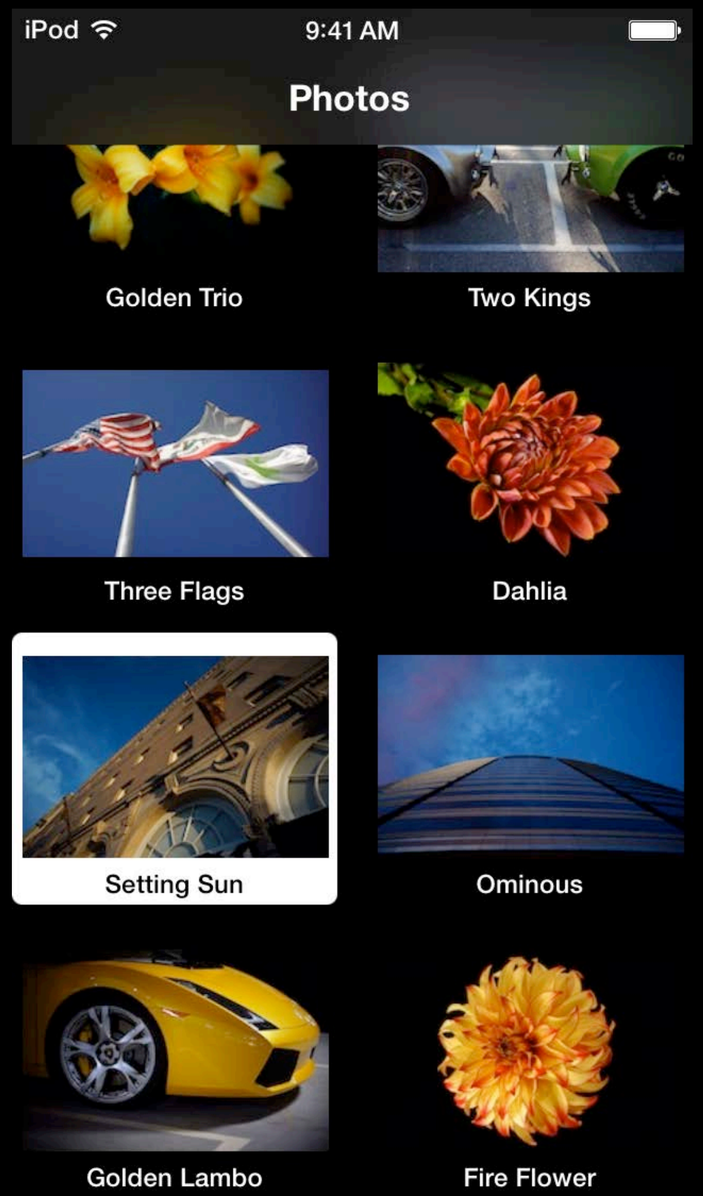
Is That All?

- Navigation stack
- Collection View scroll



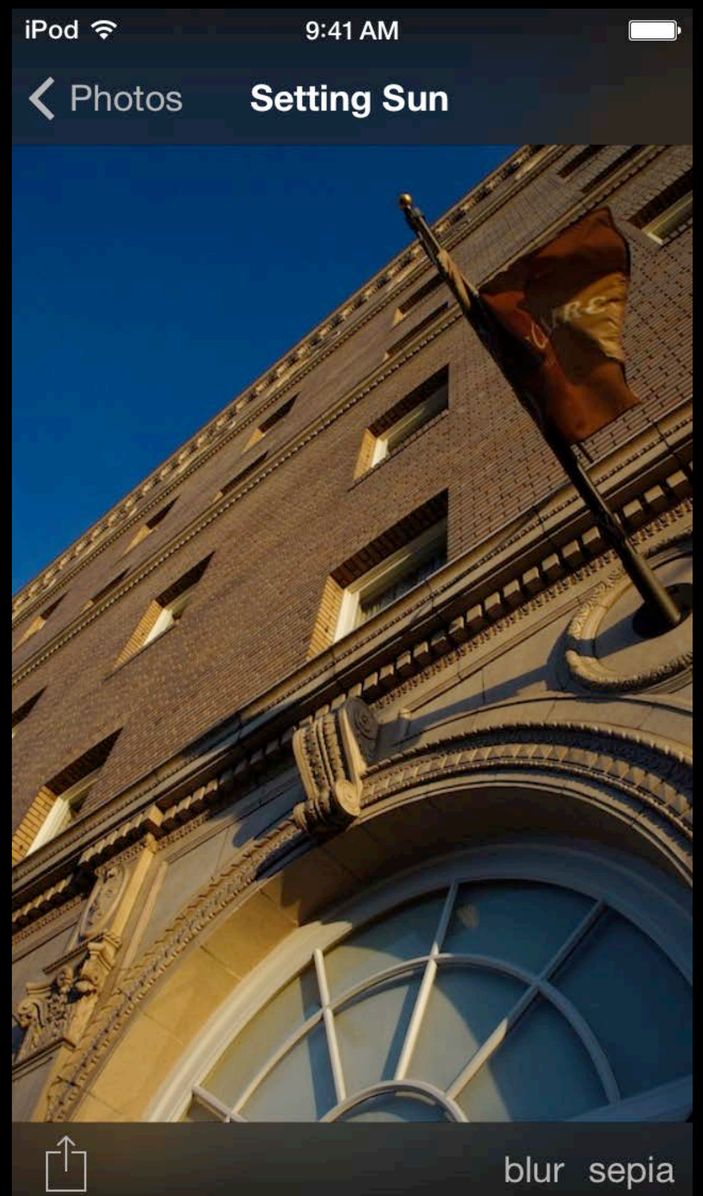
Is That All?

- Navigation stack
- Collection View scroll
- Selected Cell



Is That All?

- Navigation stack
- Collection View scroll
- Selected Cell
- Image Transformation



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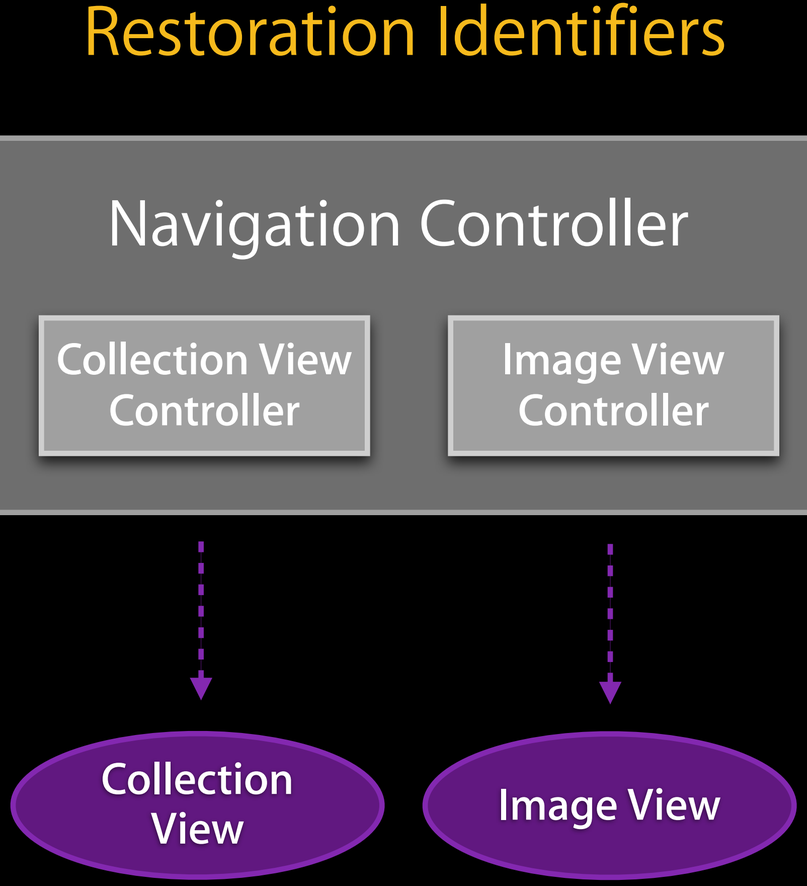

New in iOS 7

What's New?

What's New?

- Support for Generalized Objects

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- Easier to apply state

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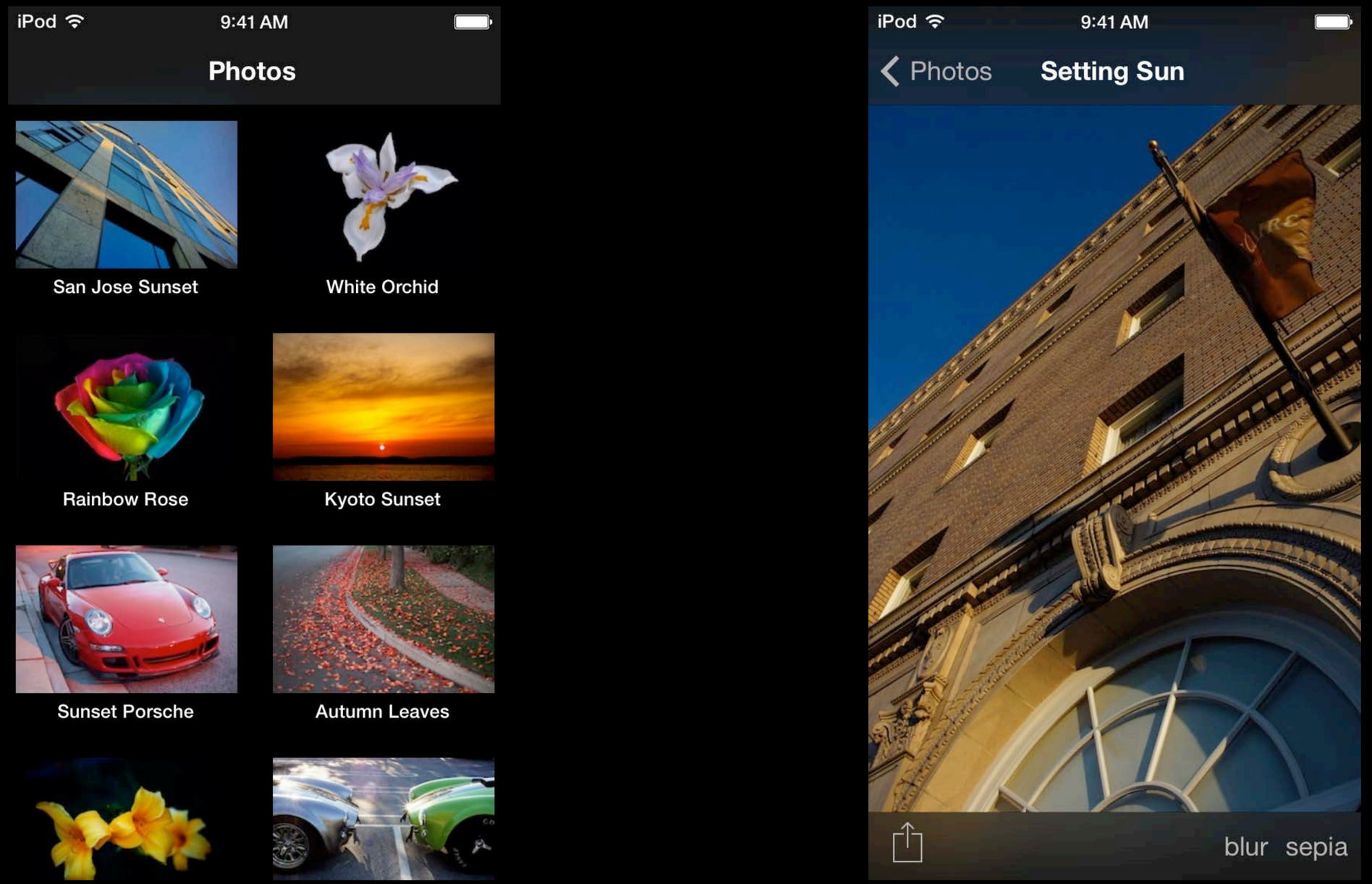
- Improvements to snapshot handling

What's New?

- Support for Generalized Objects
- Easier to apply state
- Improvements to snapshot handling
- Enhancements

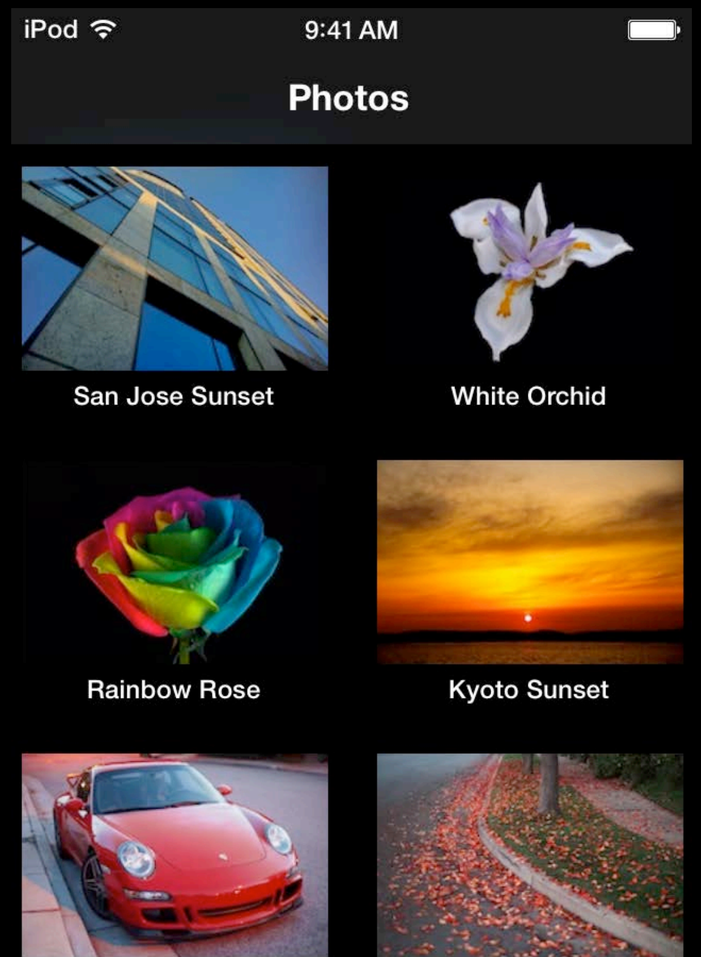
Generalized Objects

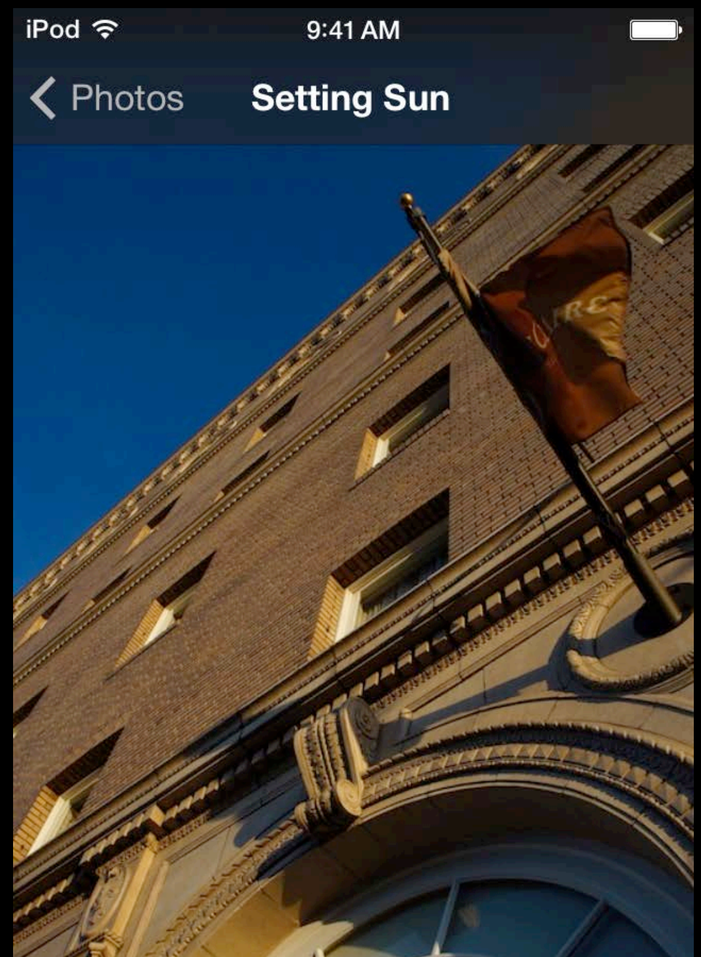
Generalized Objects



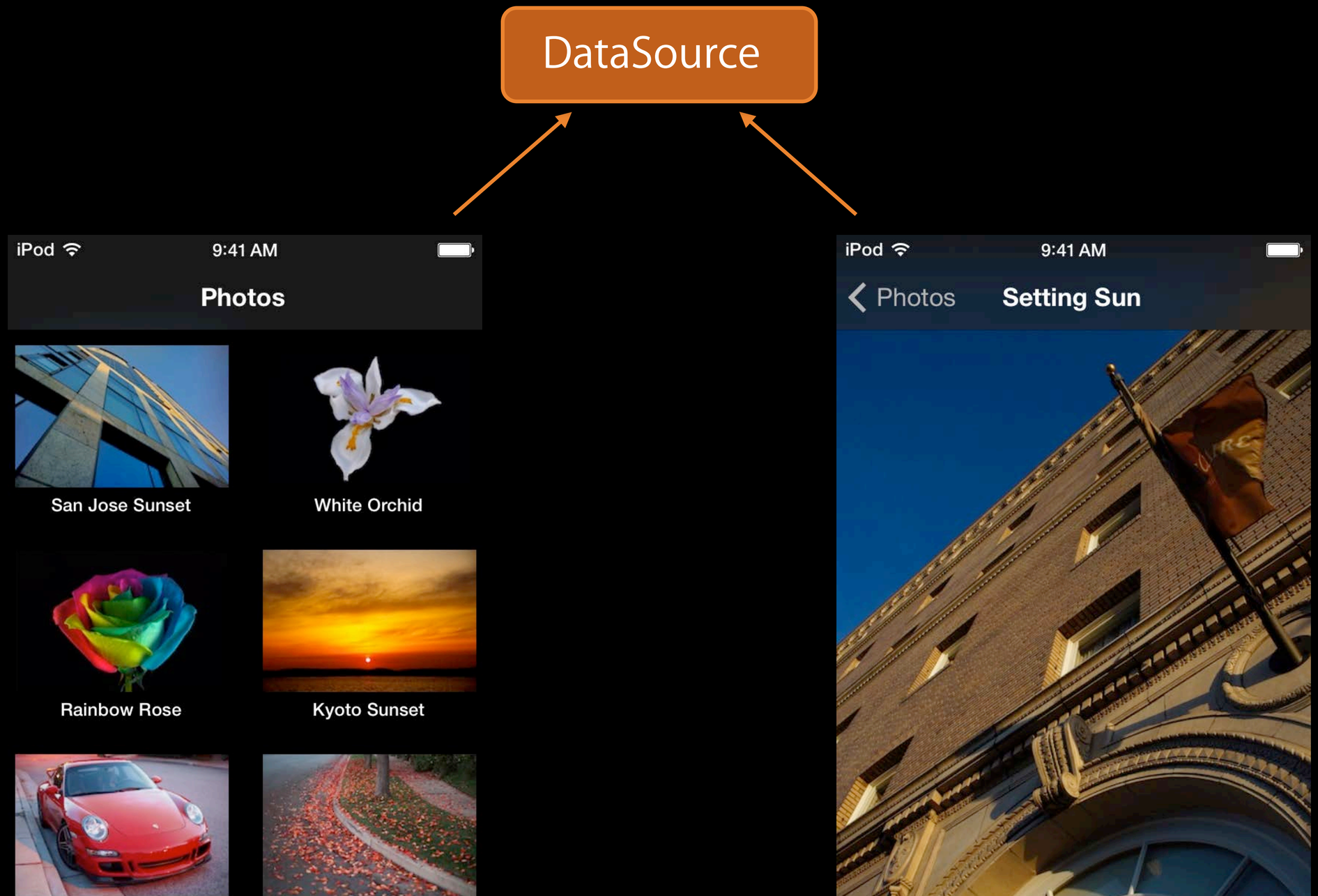
Generalized Objects

DataSource



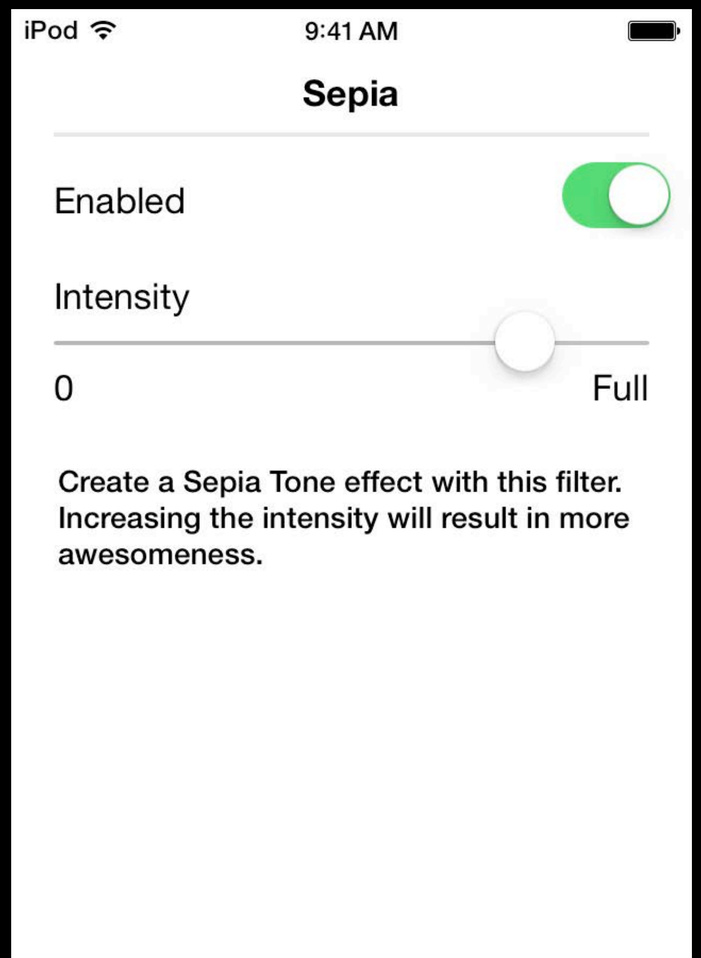


Generalized Objects

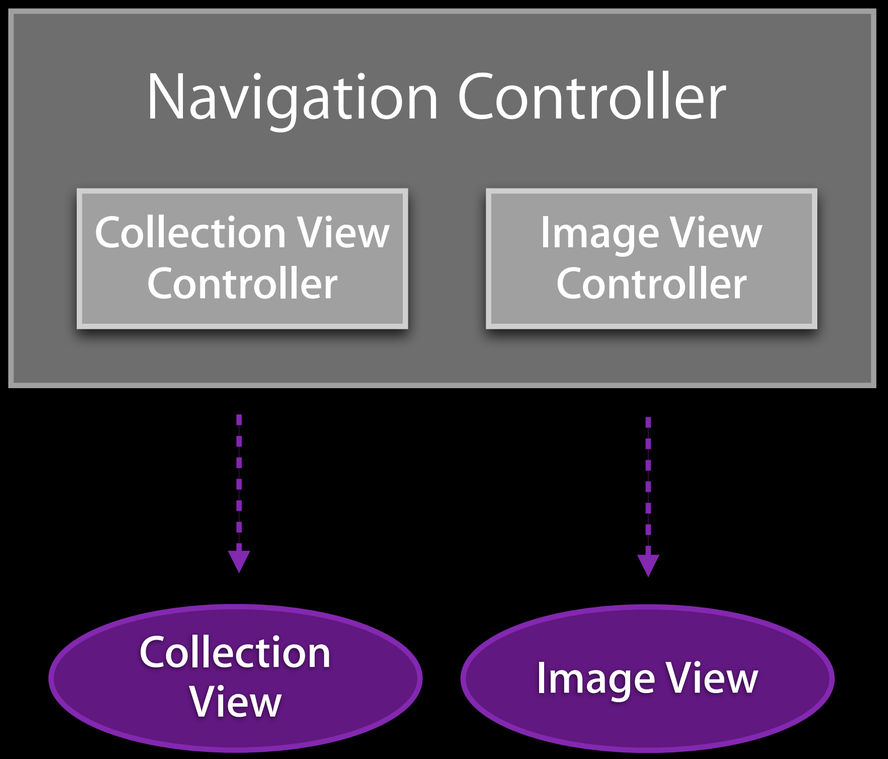


Generalized Objects

Shared Filter



Example Application Structure



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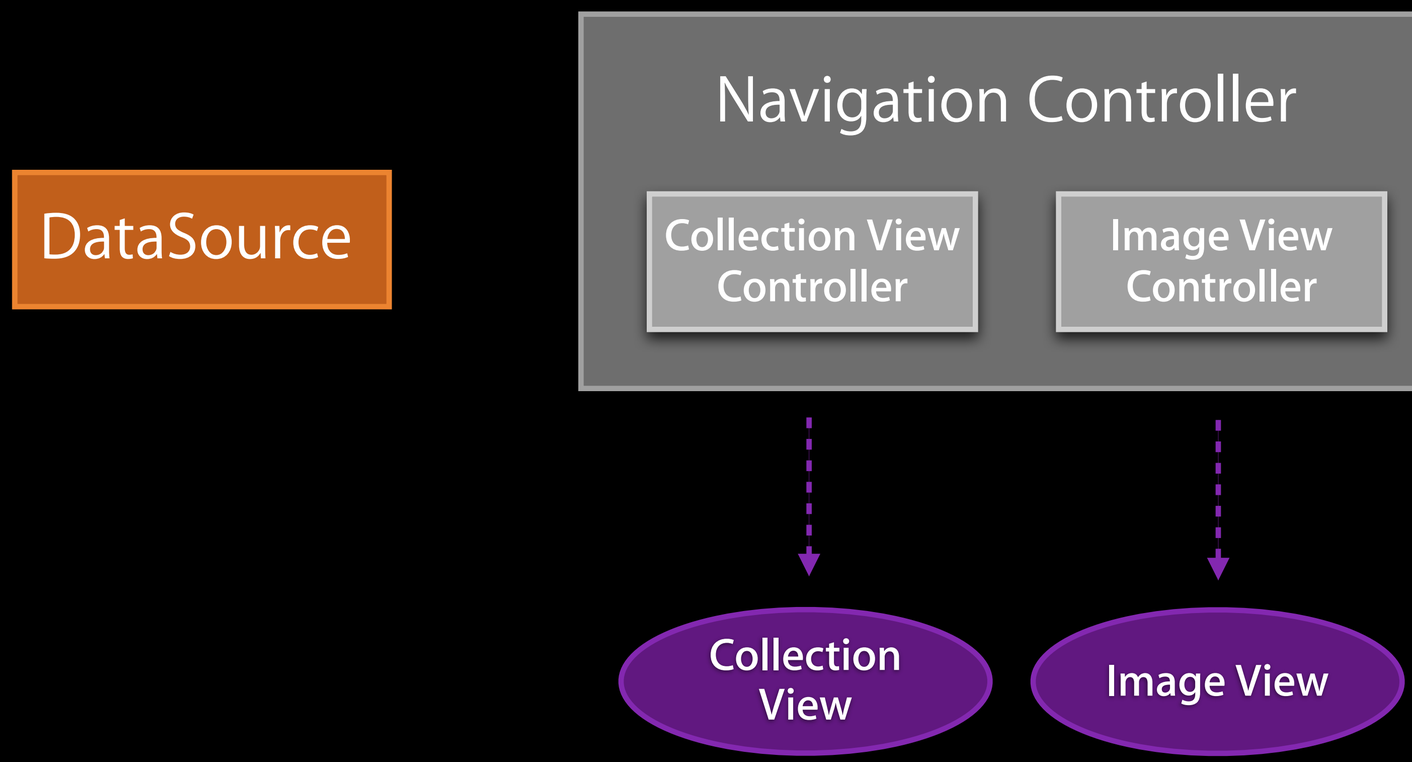

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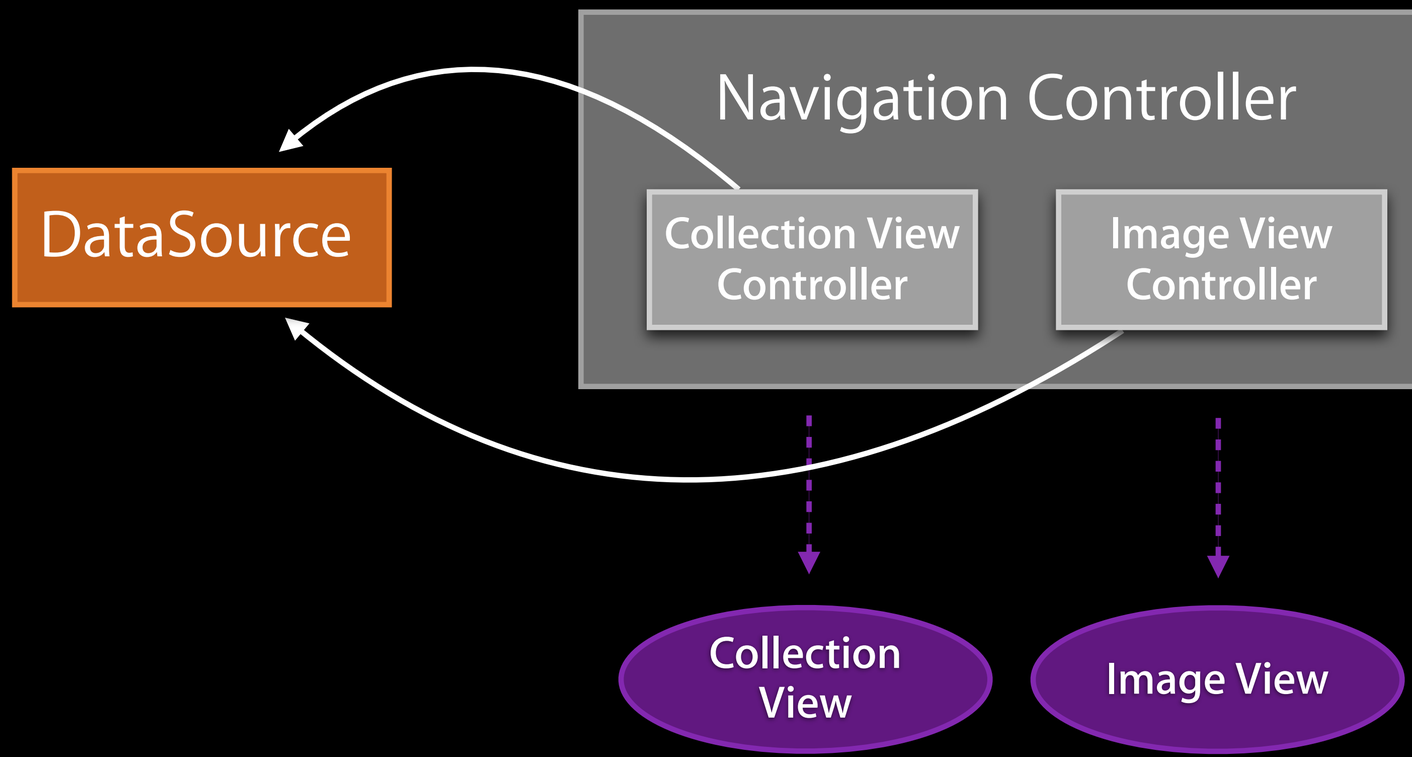

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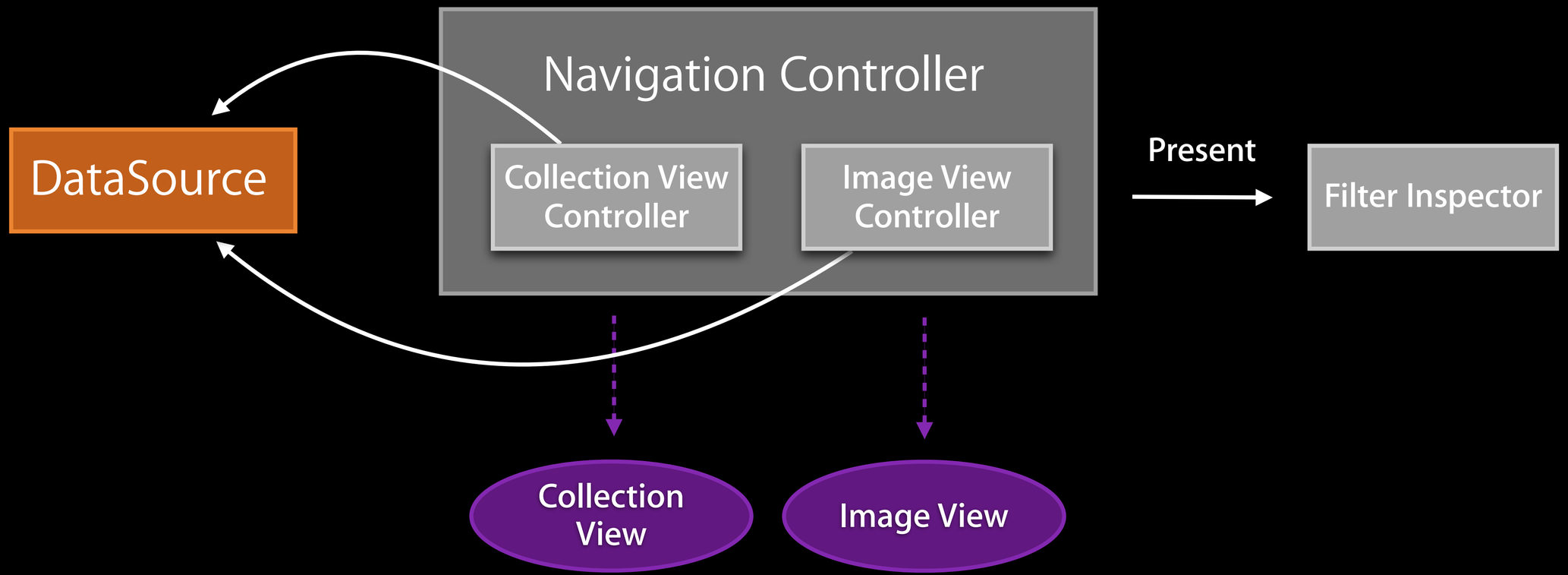

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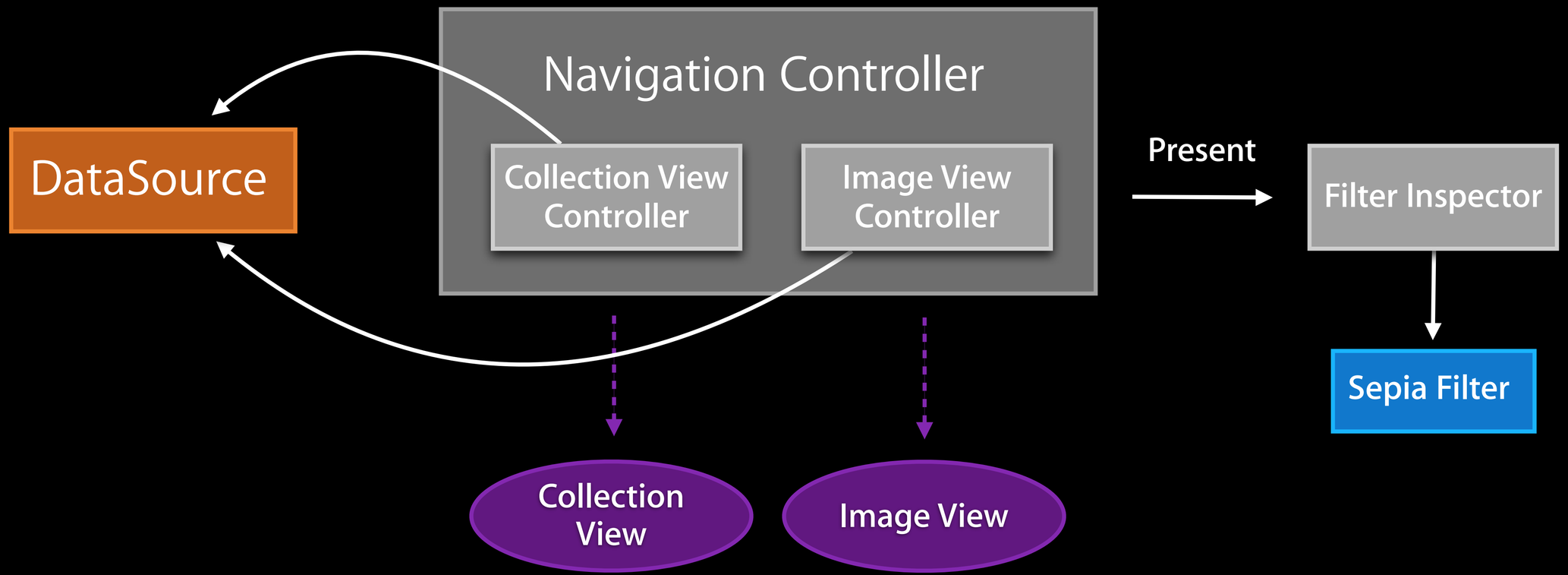

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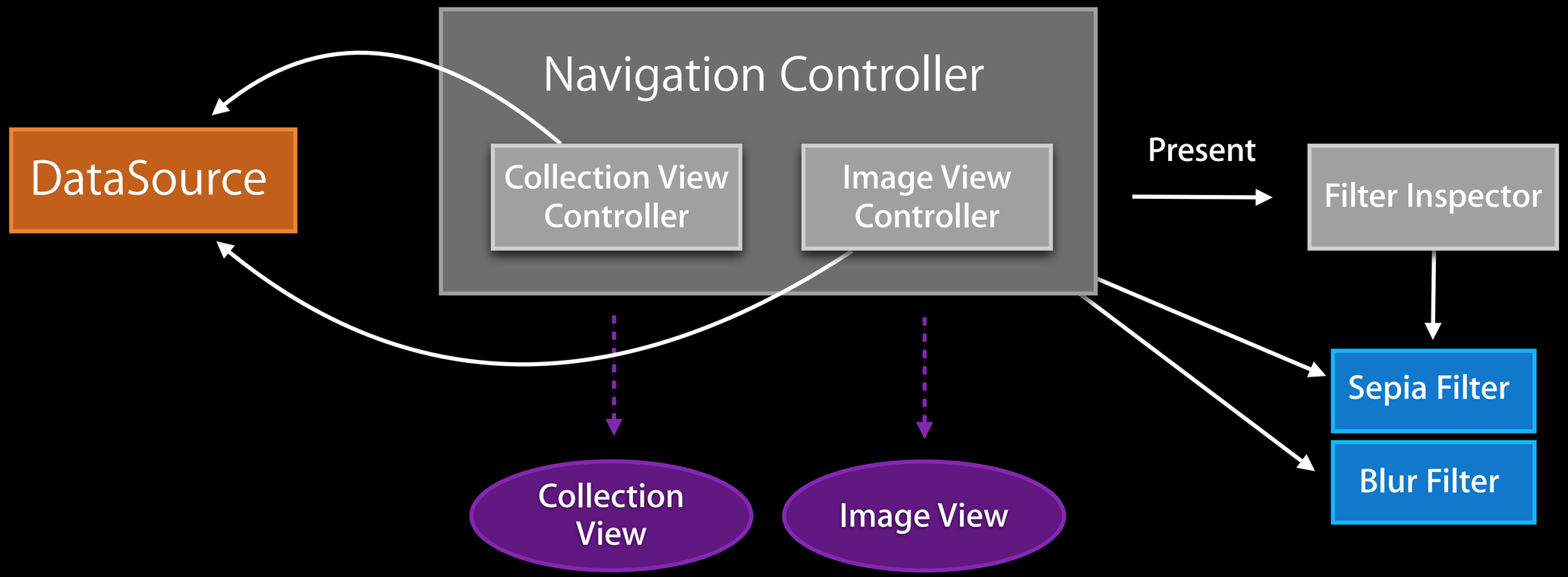
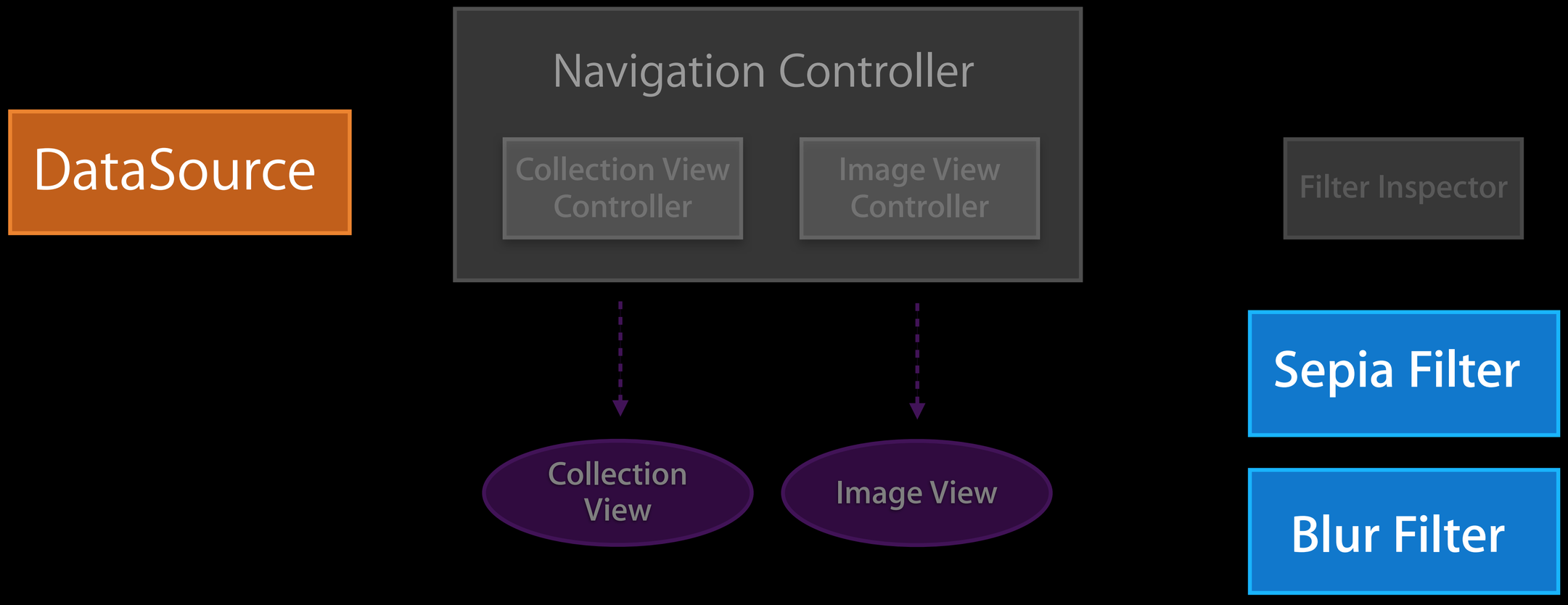


Example Application Structure



Registering Objects

Registering Objects

- UIApplication class method

Registering Objects

- UIApplication class method
  - `registerObjectForStateRestoration:restorationIdentifier:`

Registering Objects

- UIApplication class method
  - `registerObjectForStateRestoration:restorationIdentifier:`
    `id<UIStateRestoring> object`

Registering Objects

- UIApplication class method
  - `registerObjectForStateRestoration:restorationIdentifier:`

```
id<UIStateRestoring> object
NSString *restorationIdentifier
```

UIStateRestoring Protocol

UIStateRestoring Protocol

- encode/decode methods

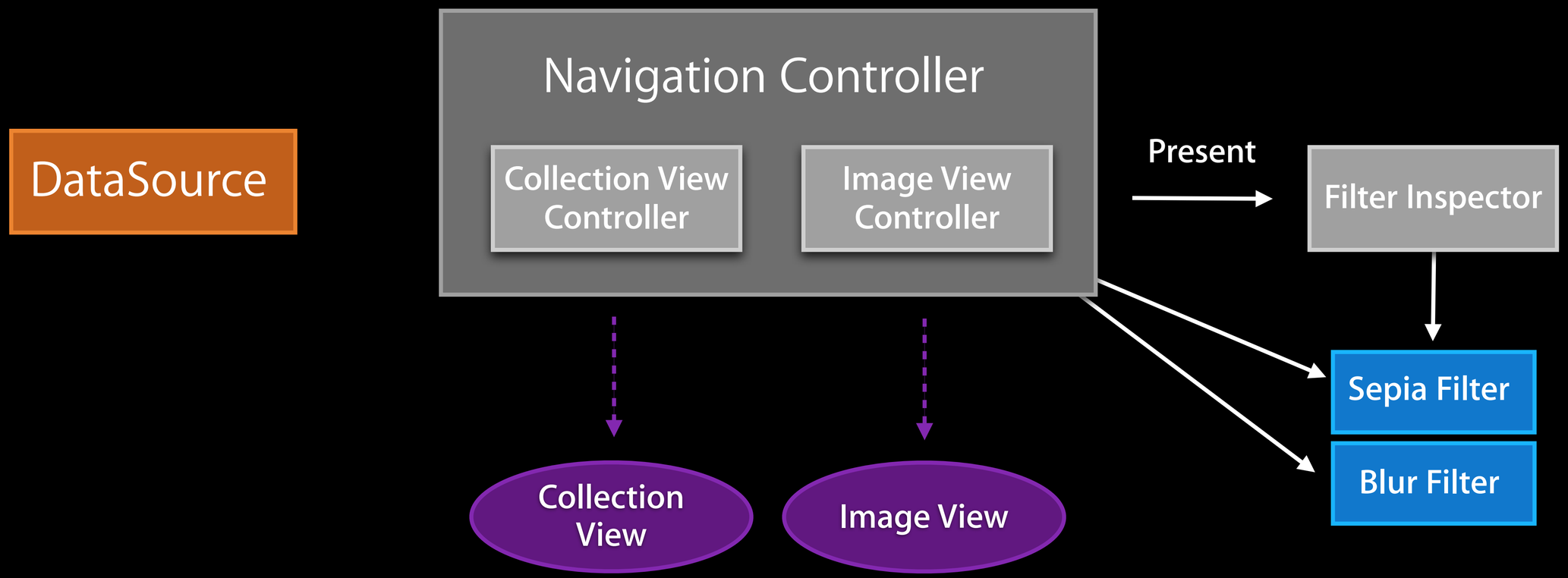
UIStateRestoring Protocol

- encode/decode methods
- restorationParent property

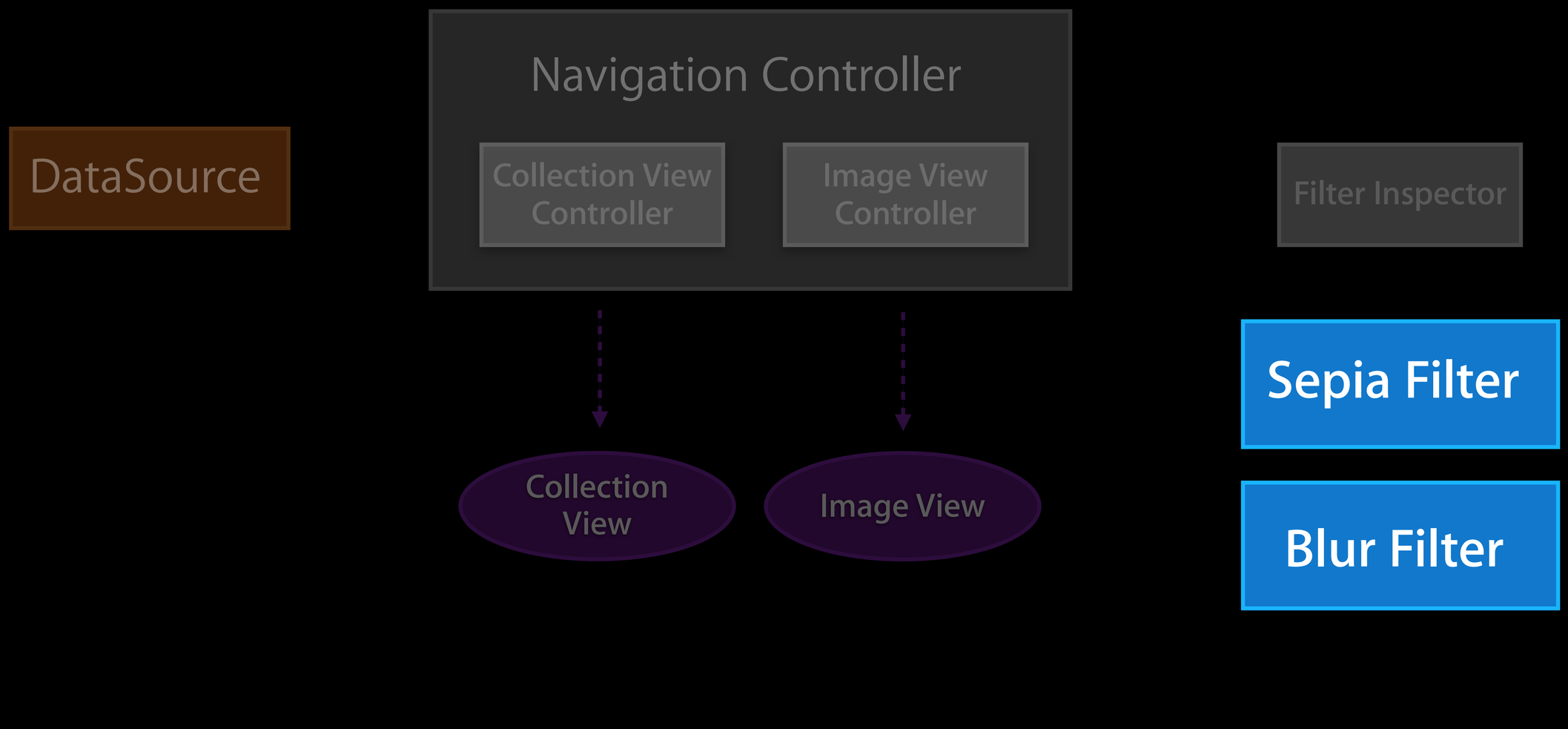
UIStateRestoring Protocol

- encode/decode methods
- restorationParent property
- objectRestorationClass property

Example Application Structure



Example Application Structure



UIObjectRestoration Protocol

UIObjectRestoration Protocol

```
+ objectWithRestorationIdentifierPath:coder:
```

UIObjectRestoration Protocol

```
+ objectWithRestorationIdentifierPath:coder:
     NSArray *identifierComponents
```

UIObjectRestoration Protocol

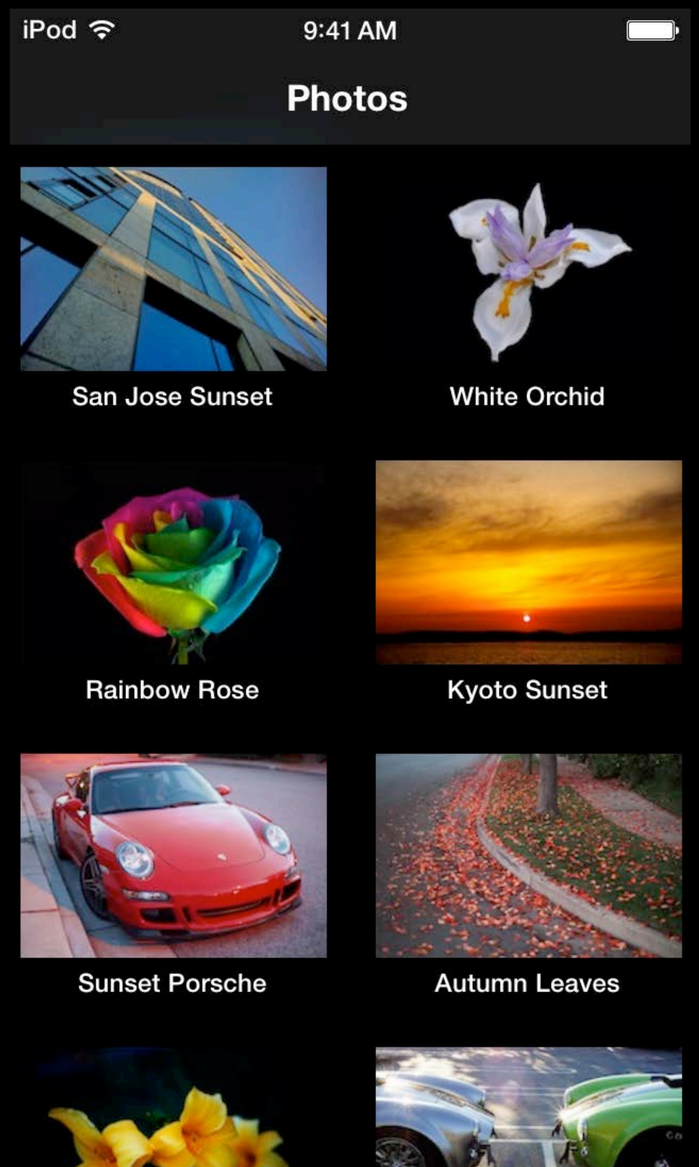
```
+ objectWithRestorationIdentifierPath:coder:
     NSArray *identifierComponents
     NSCoder *coder (NSKeyedUnarchiver)
```

UIObjectRestoration Protocol

```
+ objectWithRestorationIdentifierPath:coder:
    NSArray *identifierComponents
    NSCoder *coder (NSKeyedUnarchiver)
```

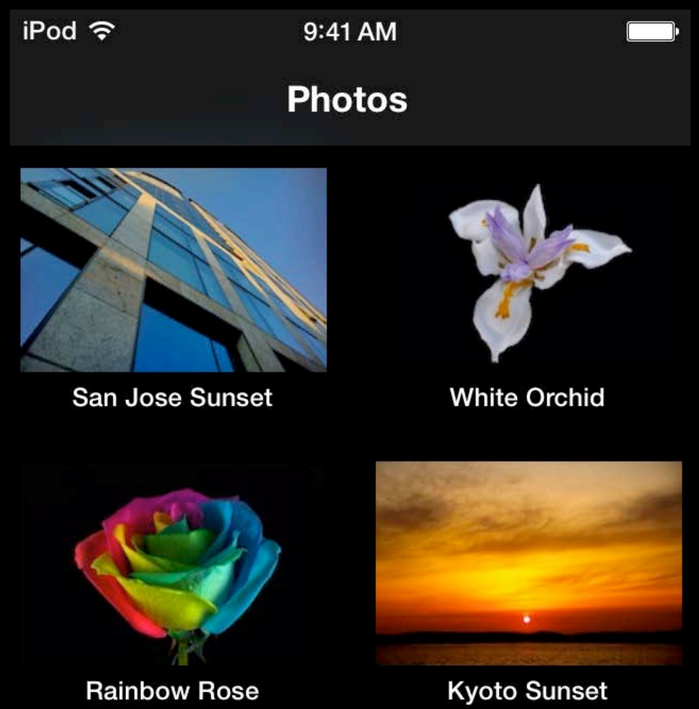
Returns `id<UIStateRestoring>`

Application Delegate Launch



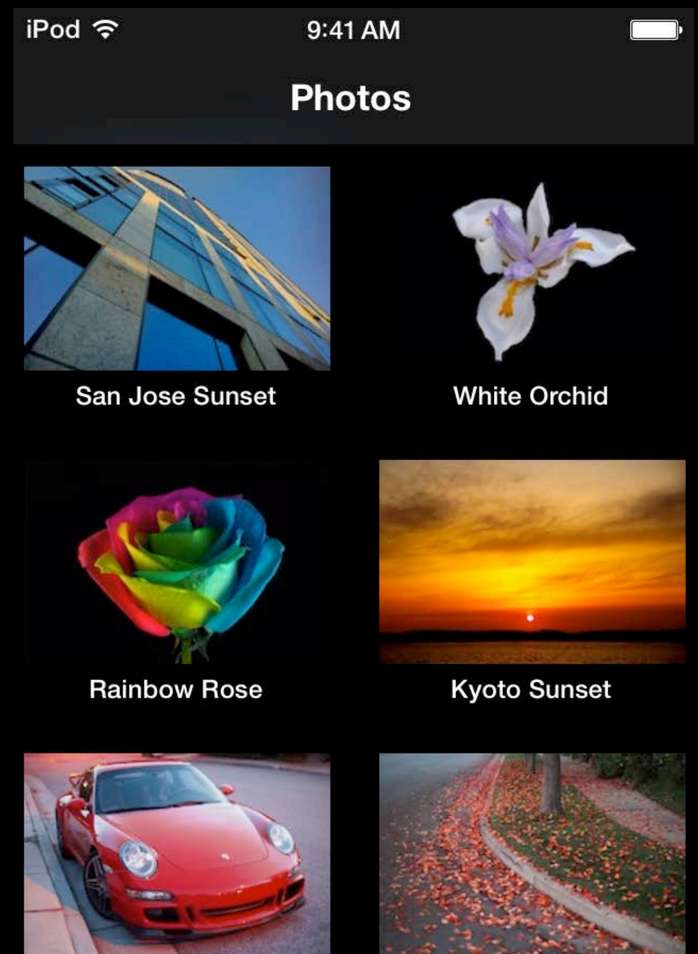
Application Delegate Launch

DataSource



Application Delegate Launch

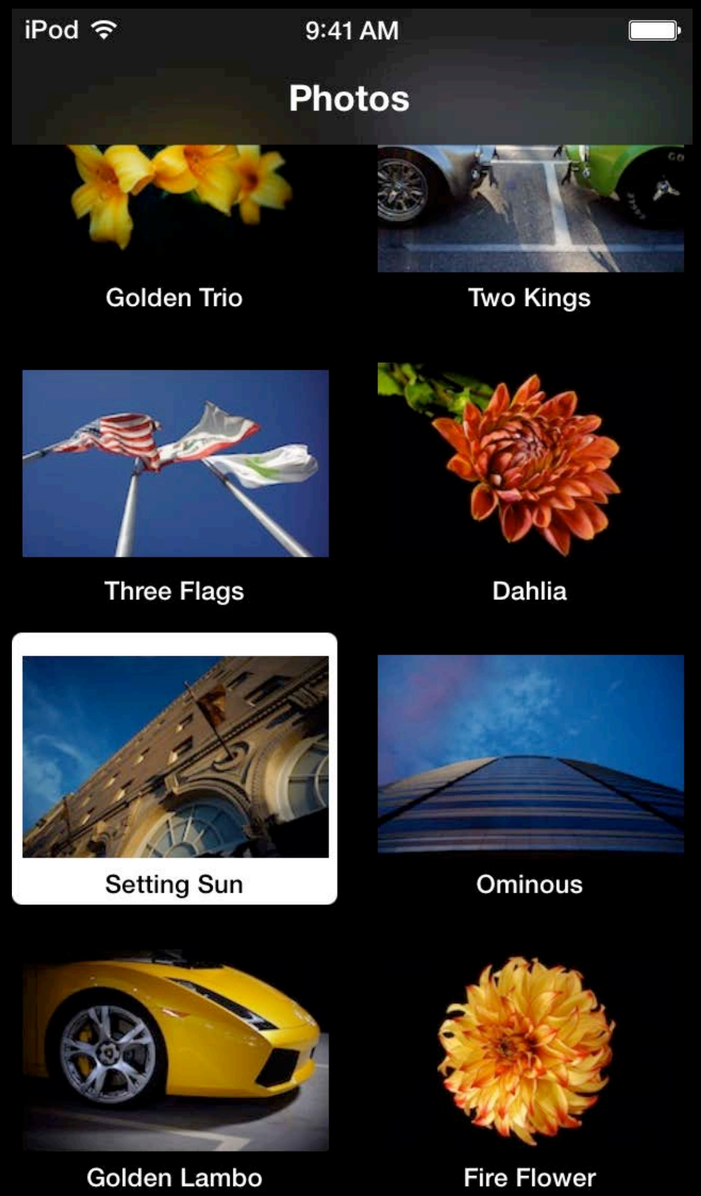
```
- (BOOL)application:(UIApplication *)application
        willFinishLaunchingWithOptions:(NSDictionary *)launchOptions
// ...
  [UIApplication registerObjectForStateRestoration:self.dataSource
                                   restorationIdentifier:@"DataSource"];
// ...
```



DataSource

Segue to Image View Controller

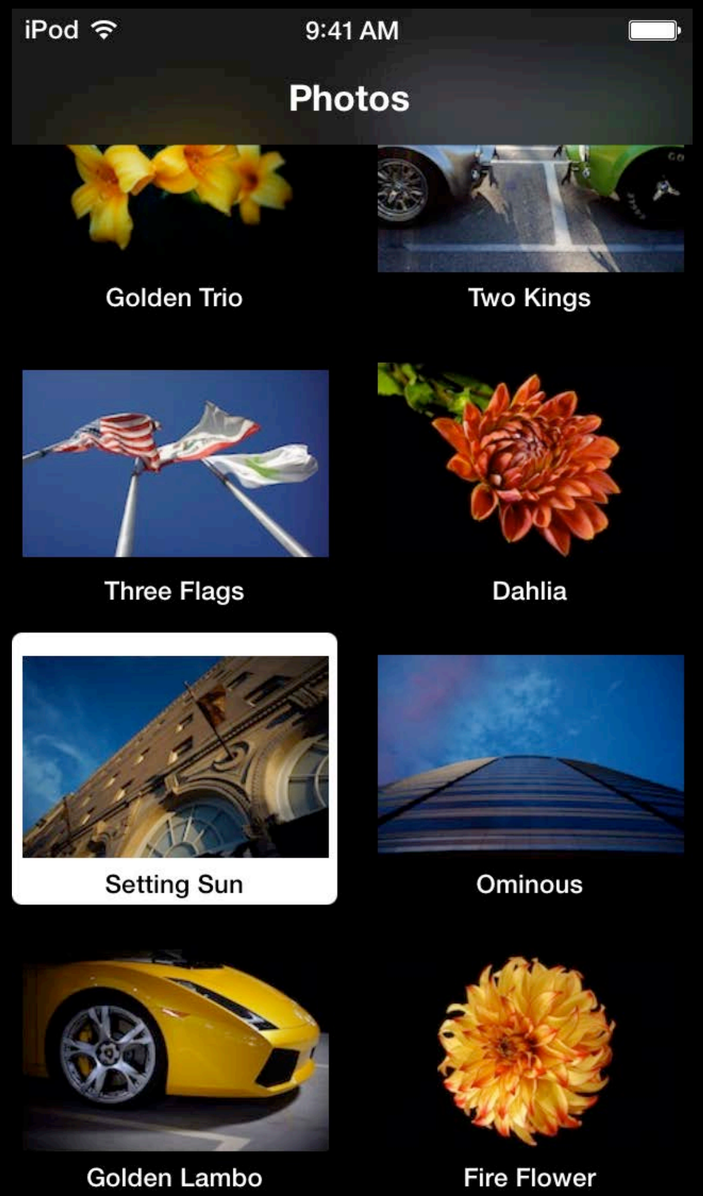
```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
```



Segue to Image View Controller

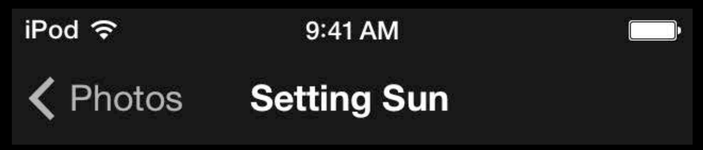
```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
```

DataSource



Segue to Image View Controller

```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
```



DataSource

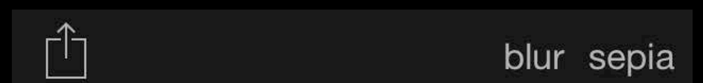


Image Controller Save

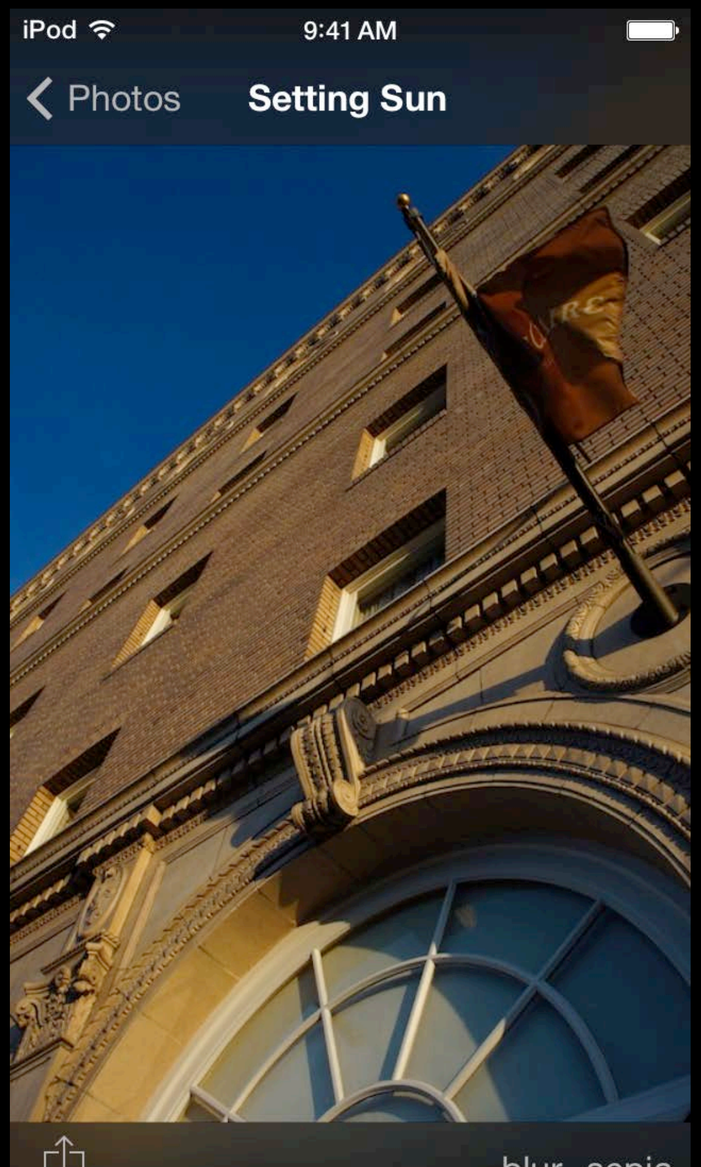


Image Controller Save

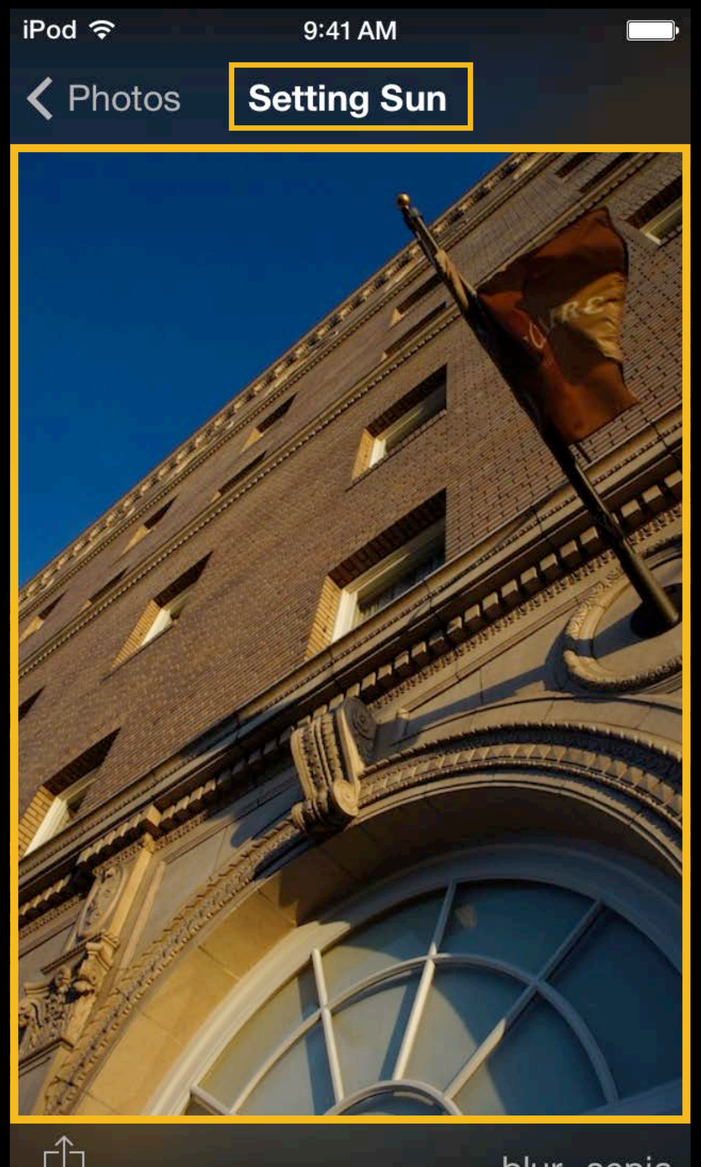


Image Controller Save

DataSource

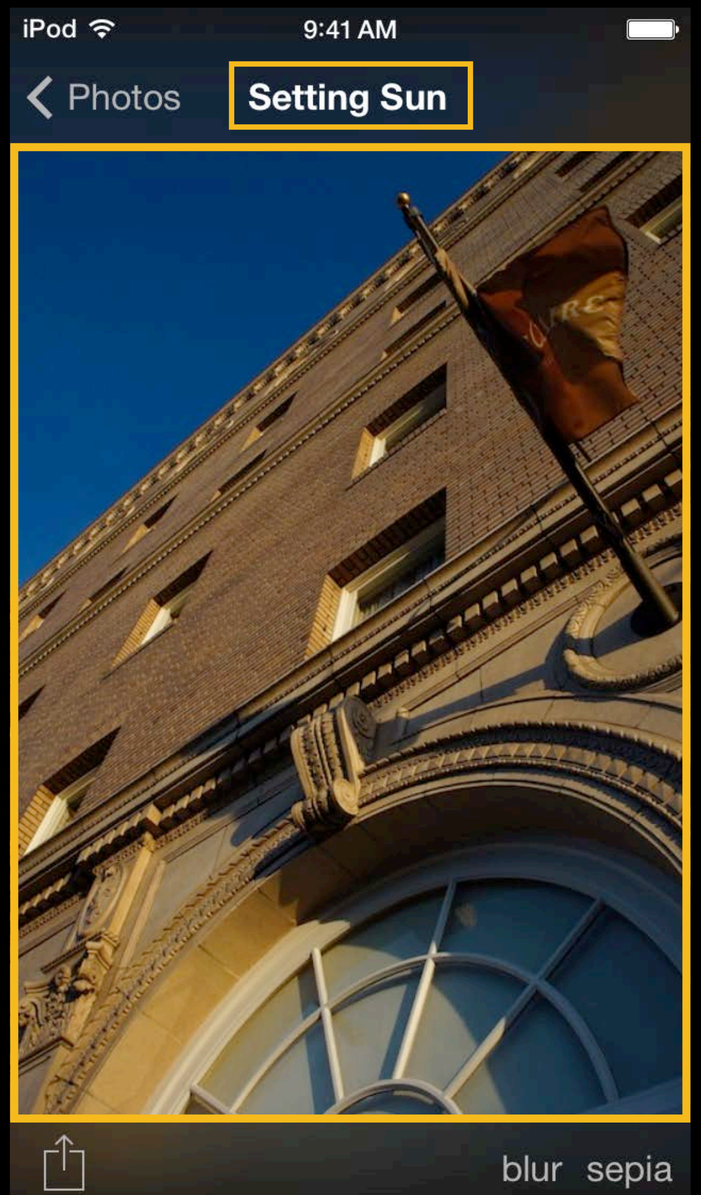


Image Controller Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder
```

DataSource

```
[coder encodeObject:dataSource
      forKey:dataSourceKey];
```

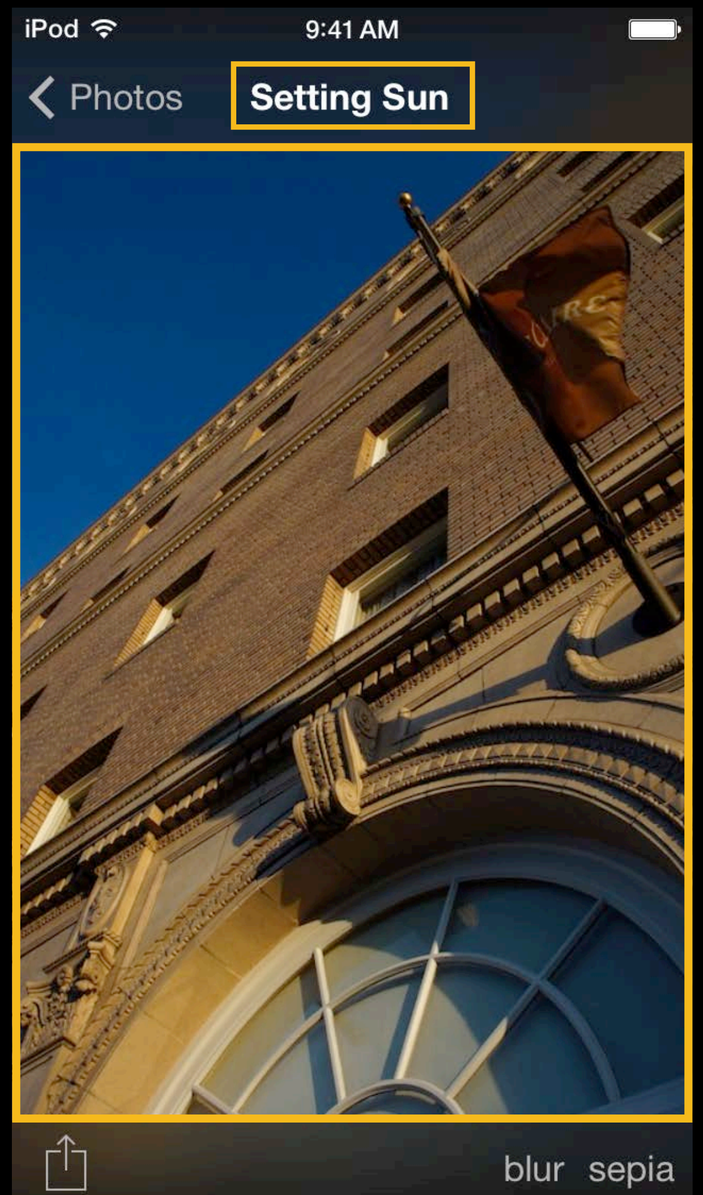


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```

Image Controller Restore

```
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Image Controller Restore

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```

DataSource

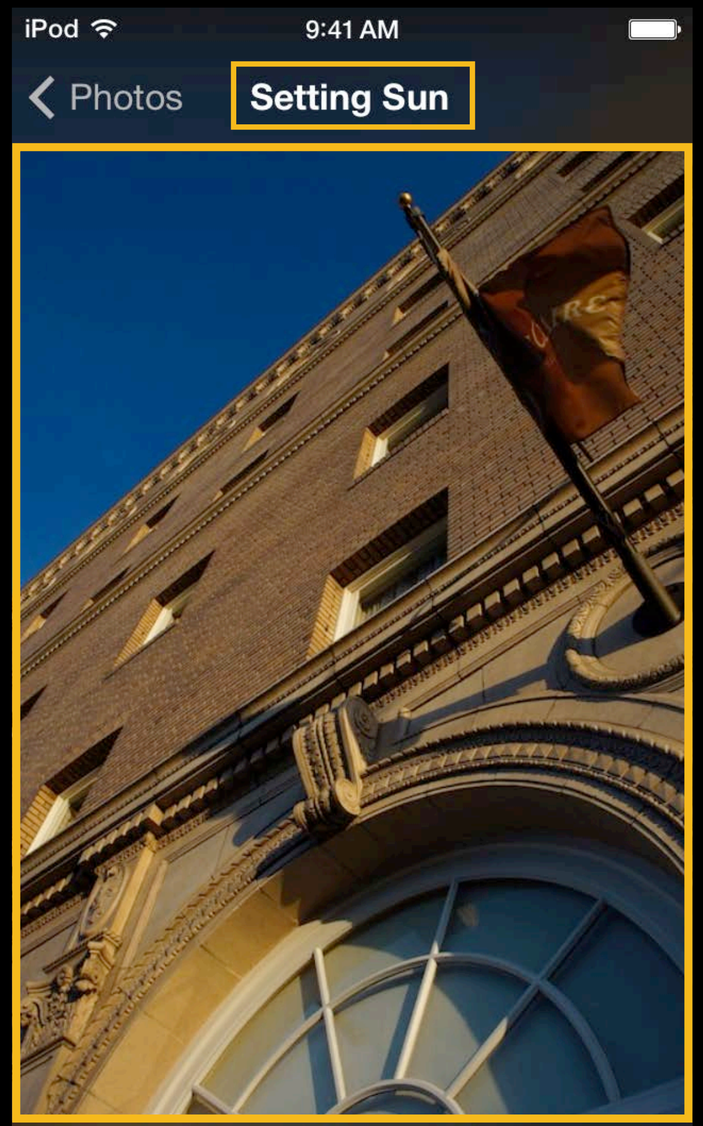
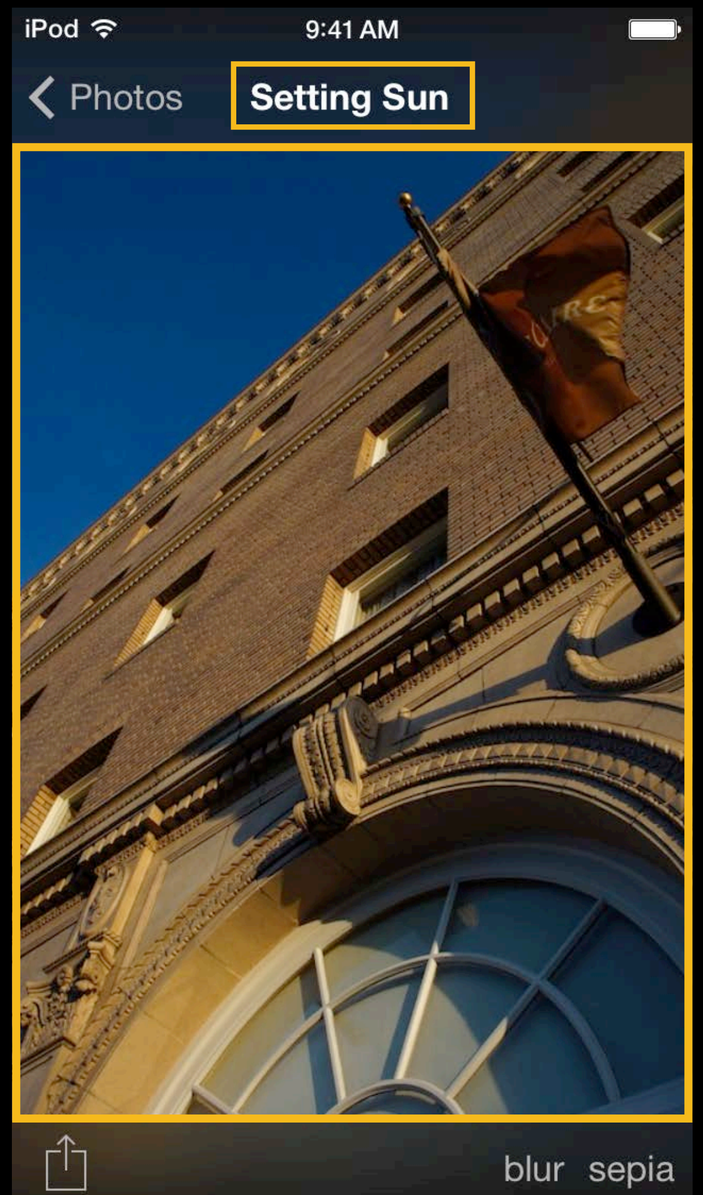


Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder
```

DataSource



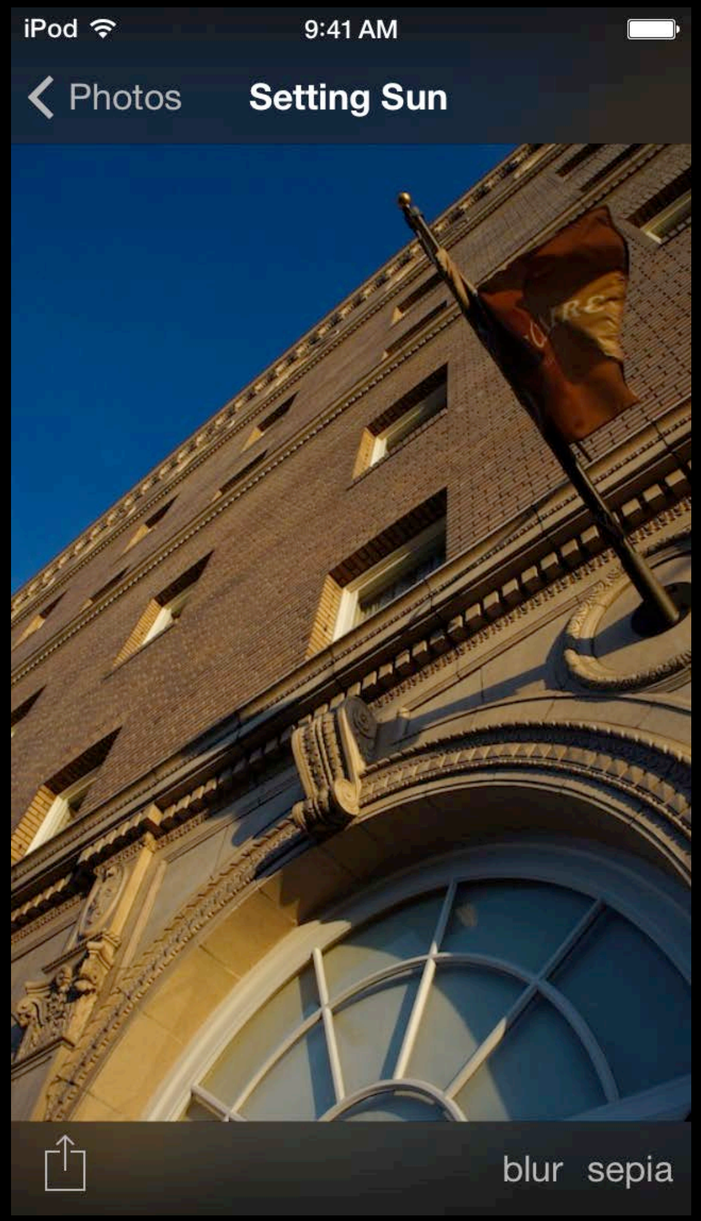

```
dataSource =
  [coder decodeObjectForKey:
         dataSourceKey];
```

Demo

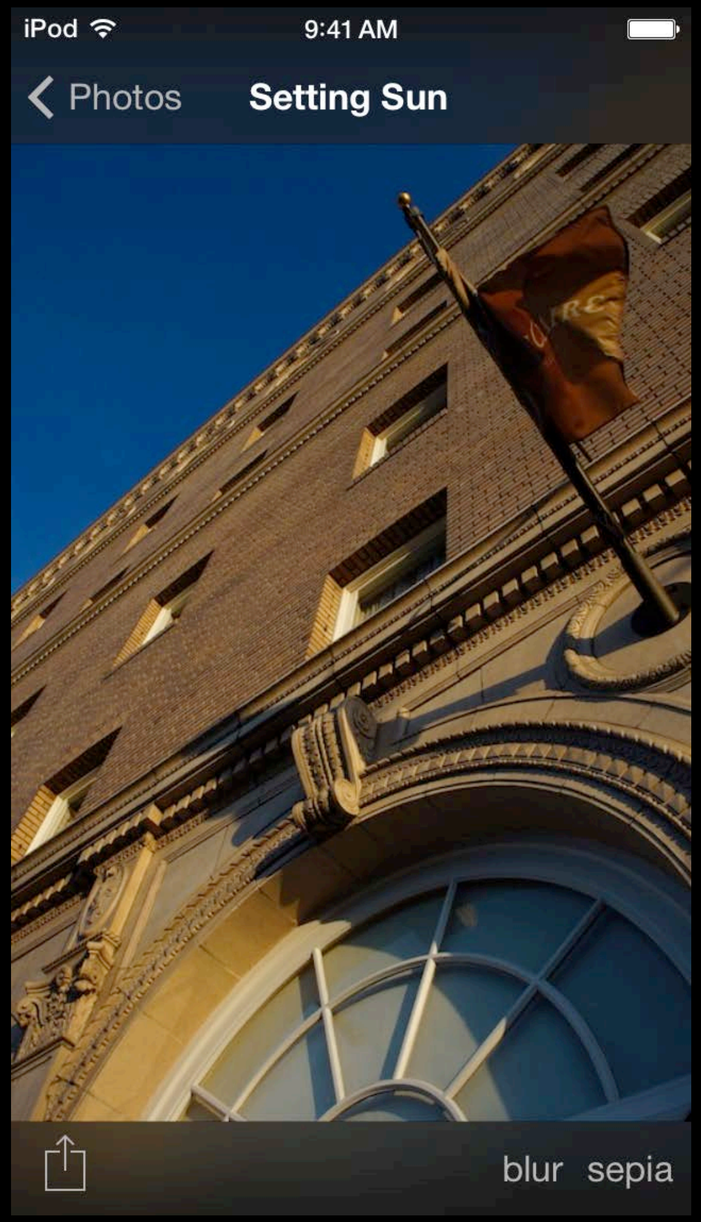
Image Viewer: filters

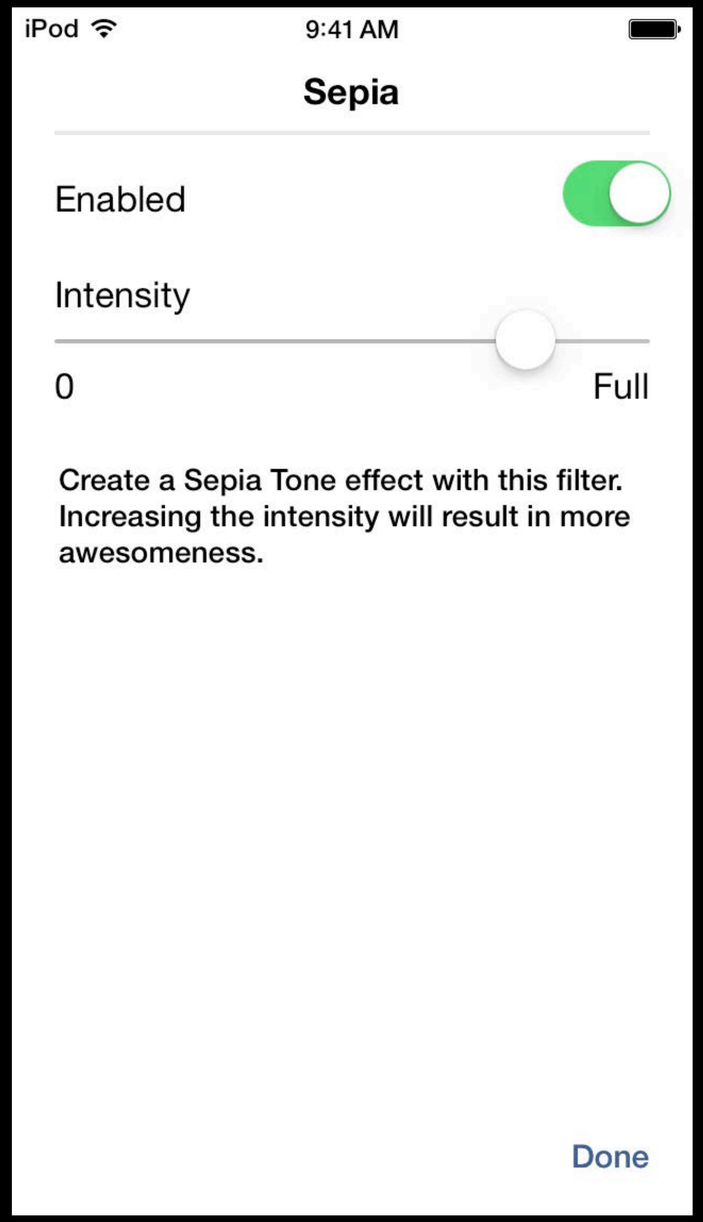
What Was Restored?

What Was Restored?

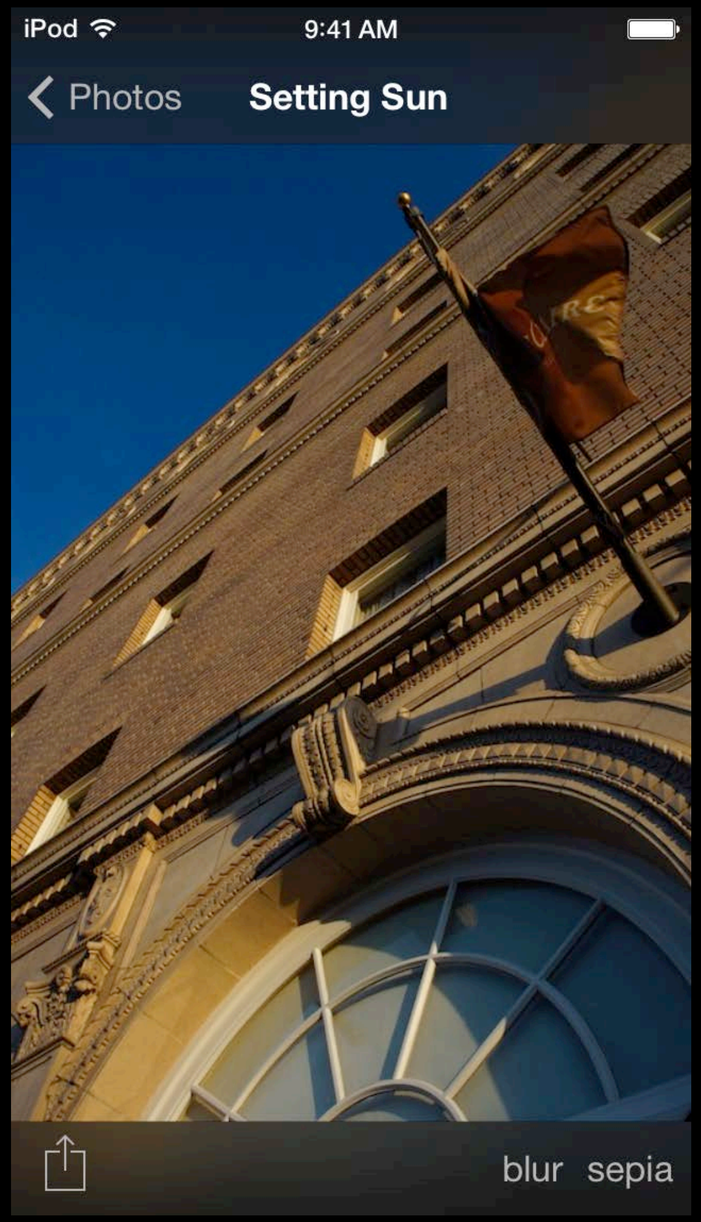


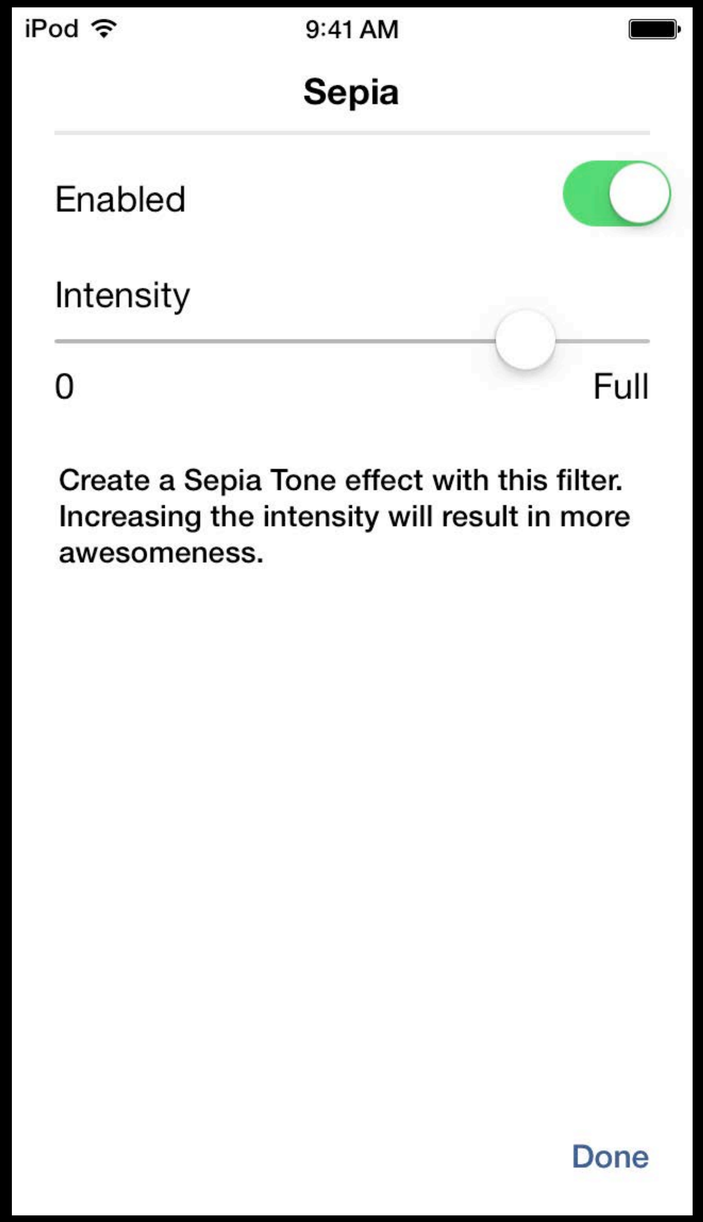
What Was Restored?





What Was Restored?

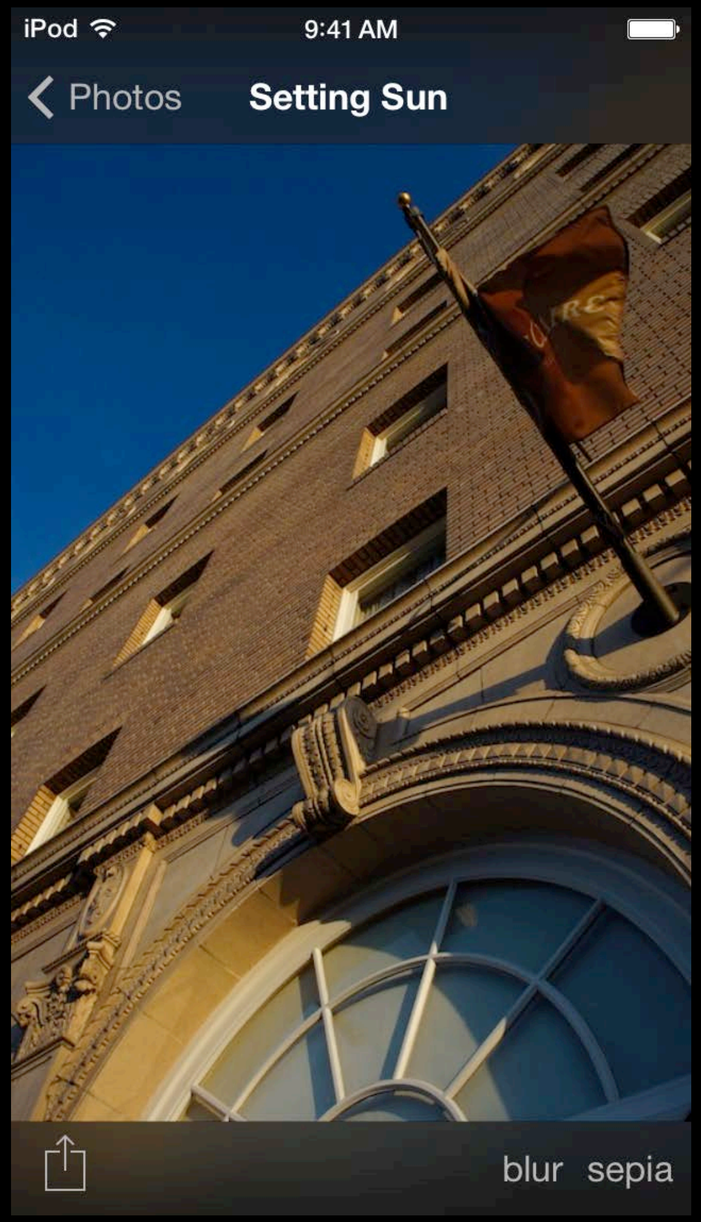


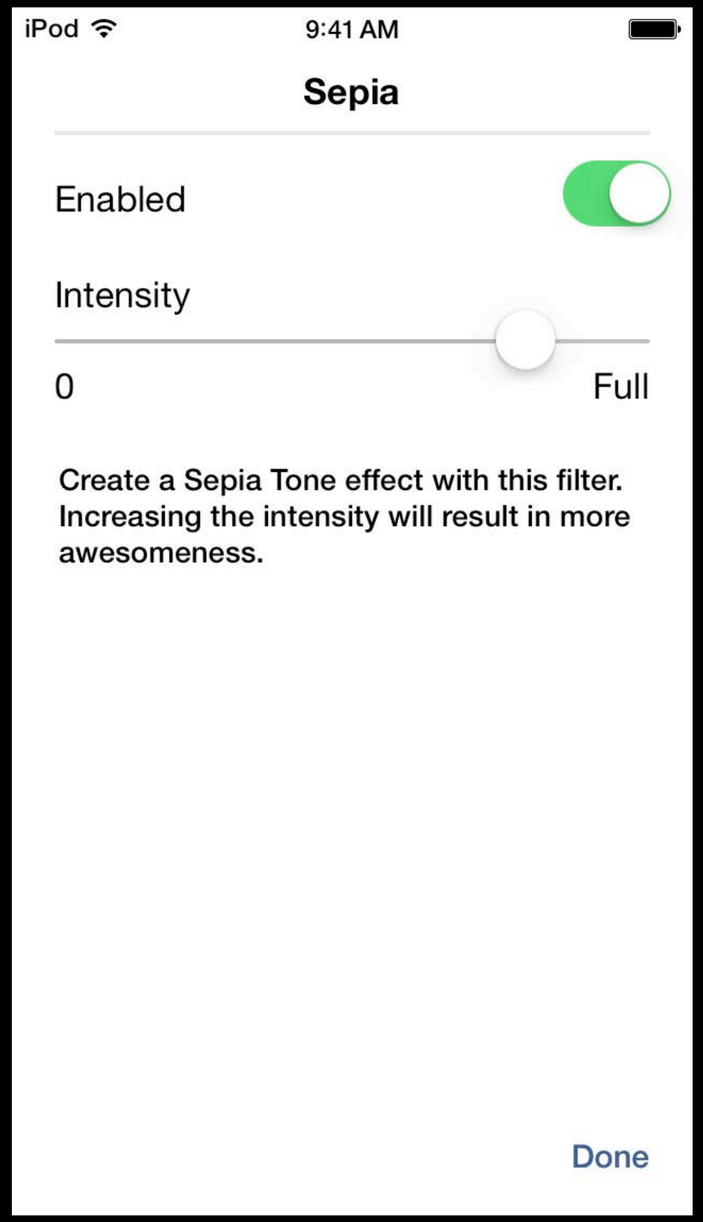


Sepia Filter

Blur Filter

What Was Restored?





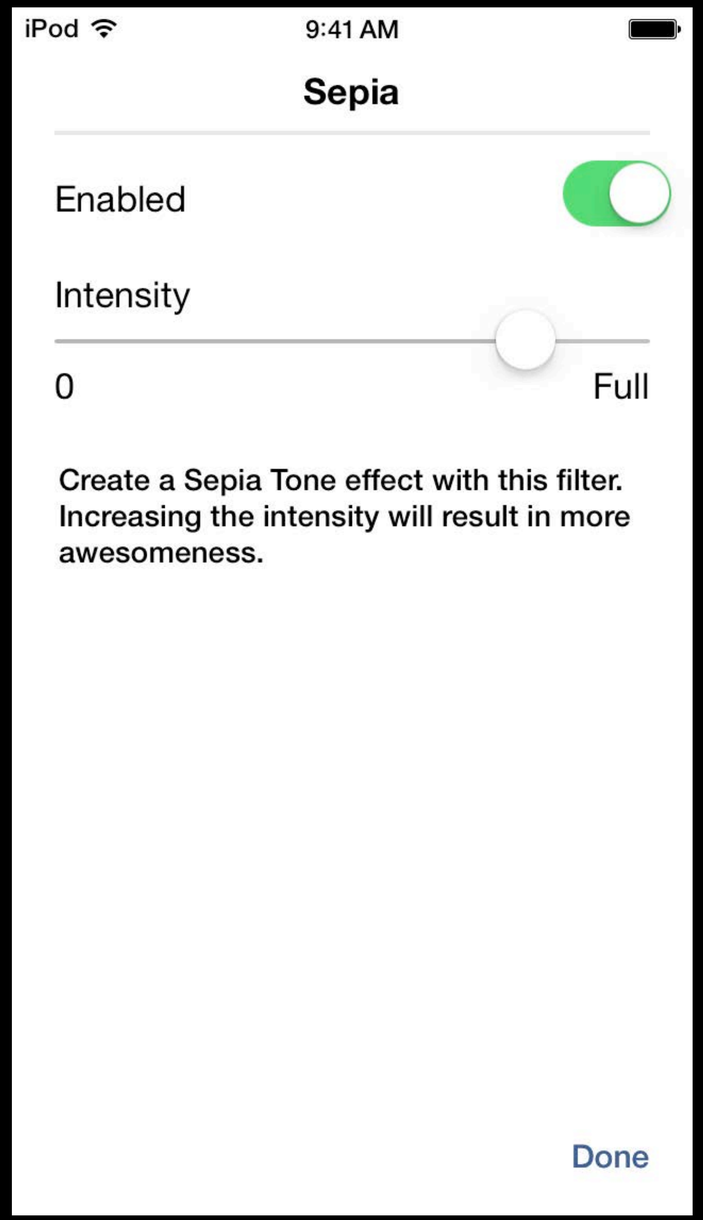
Sepia Filter

Enabled
Intensity

Blur Filter

Enabled
Intensity

What Was Restored?



Sepia Filter

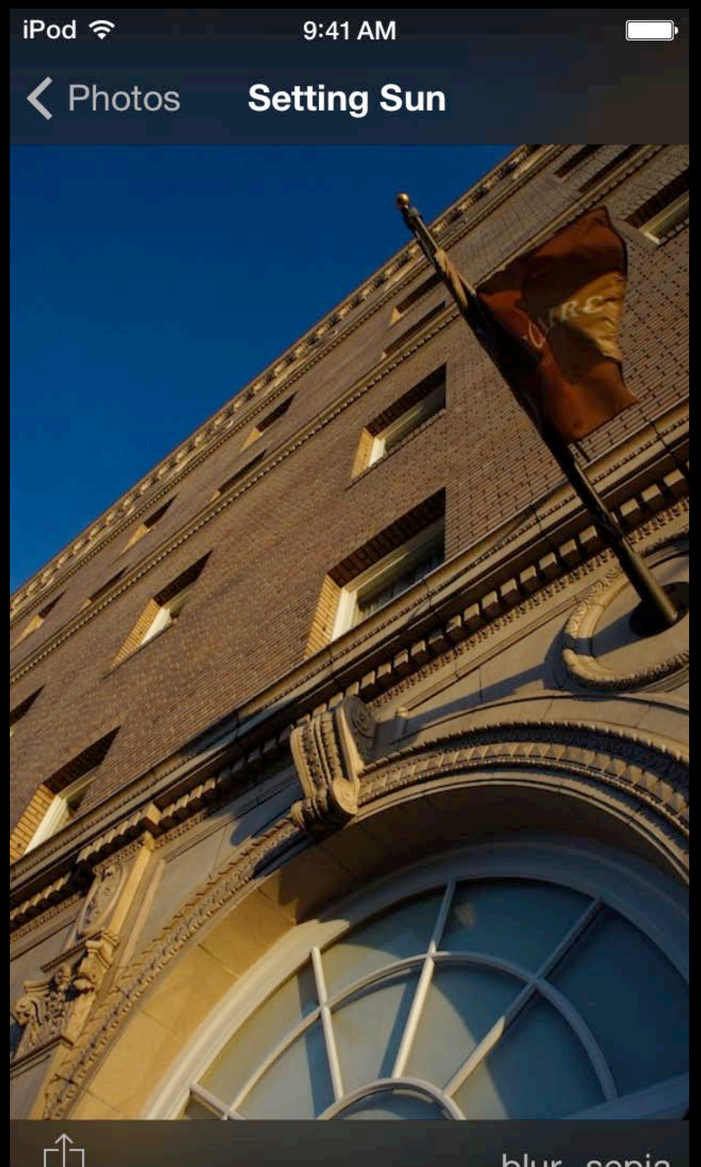
Enabled
Intensity

Blur Filter

Enabled
Intensity

Segue to Filter Inspector

```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
```



Segue to Filter Inspector

```
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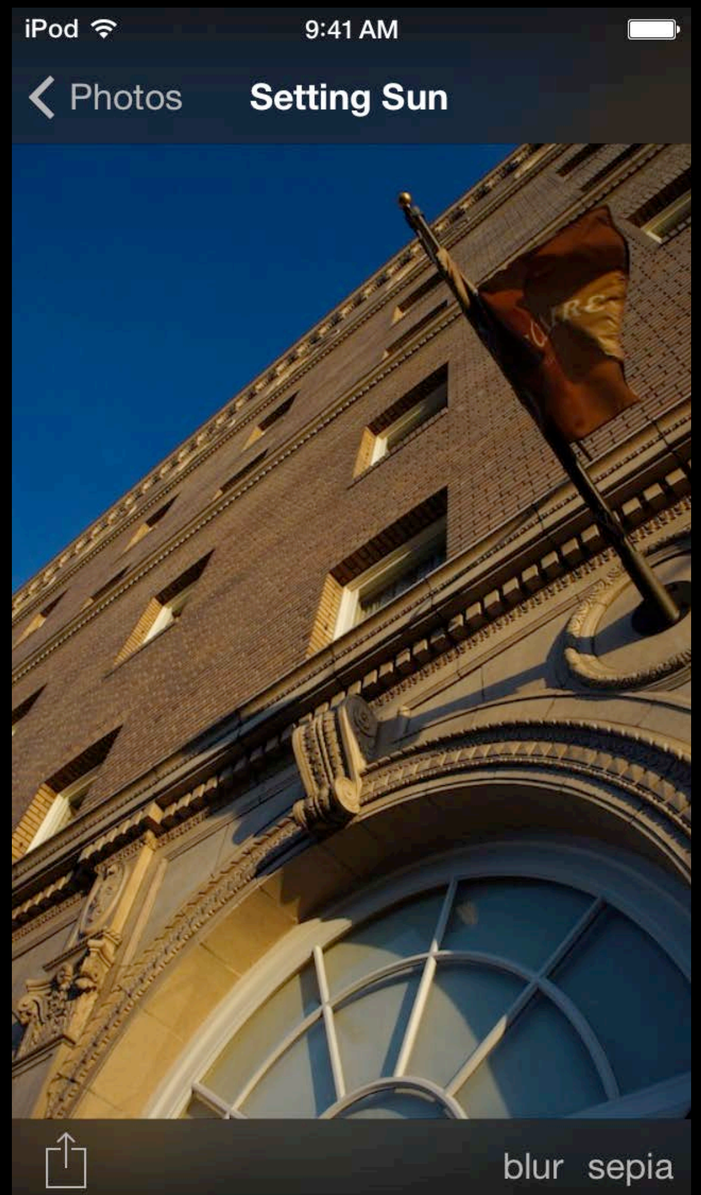
```

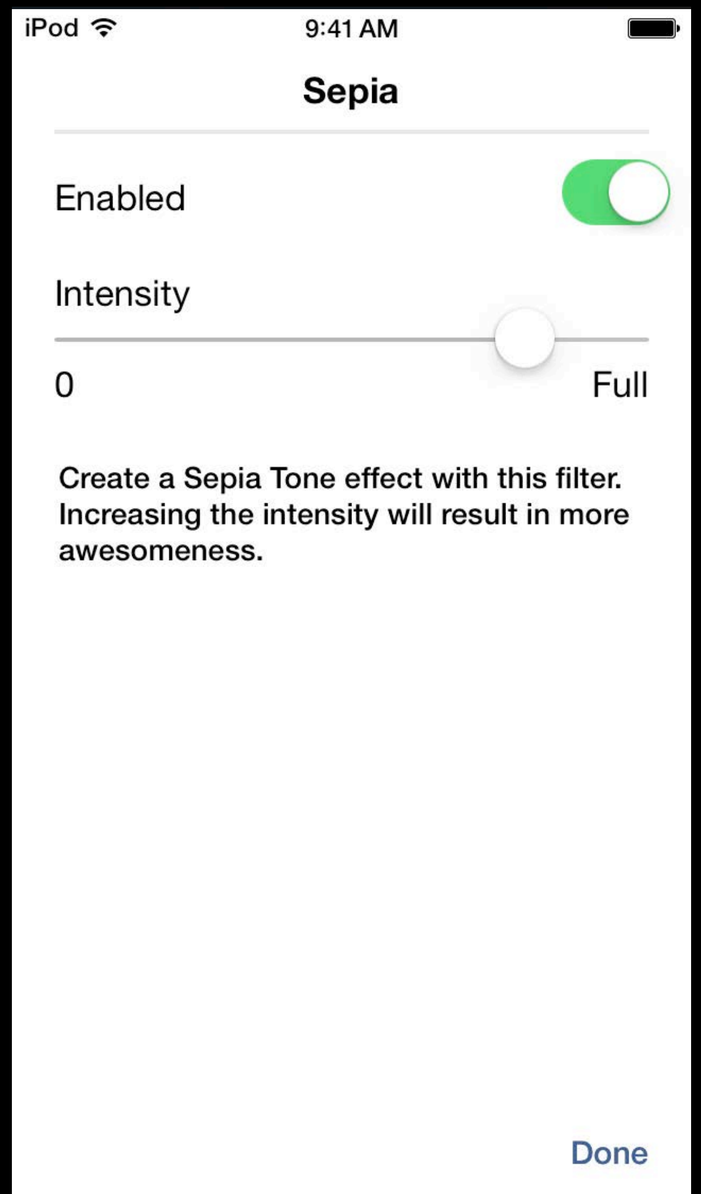
Sepia Filter



Segue to Filter Inspector

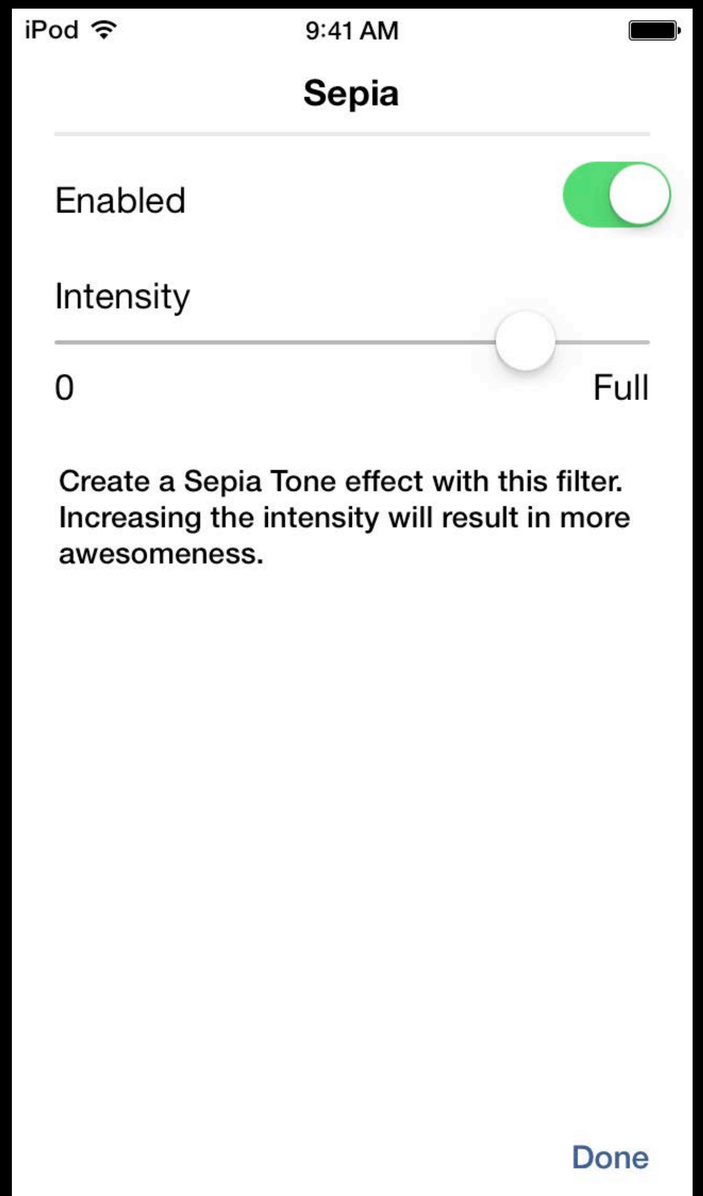
```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender
```

Sepia Filter



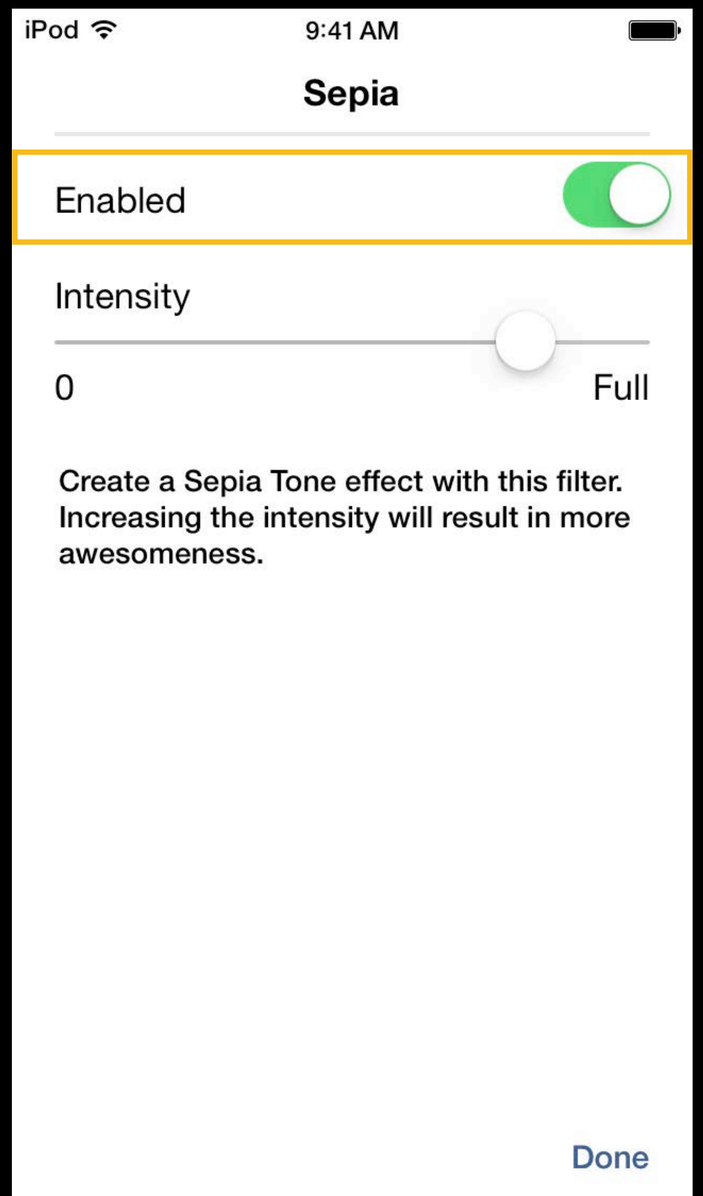
Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```



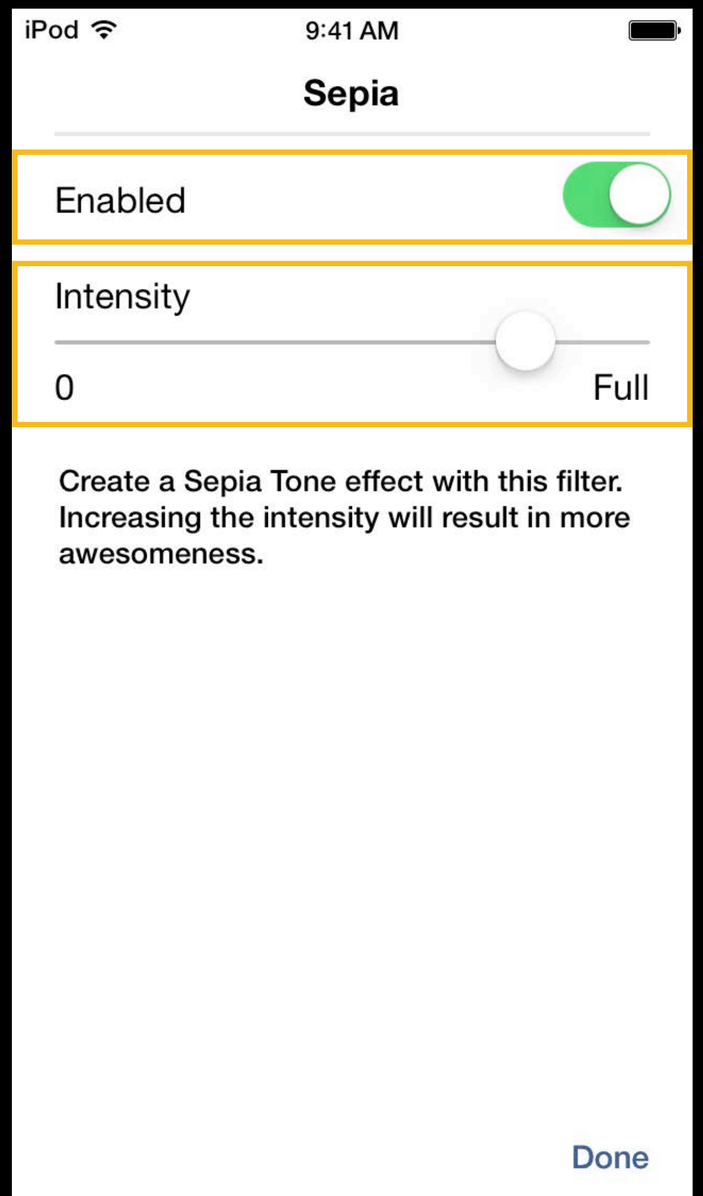
Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```



Filter Save

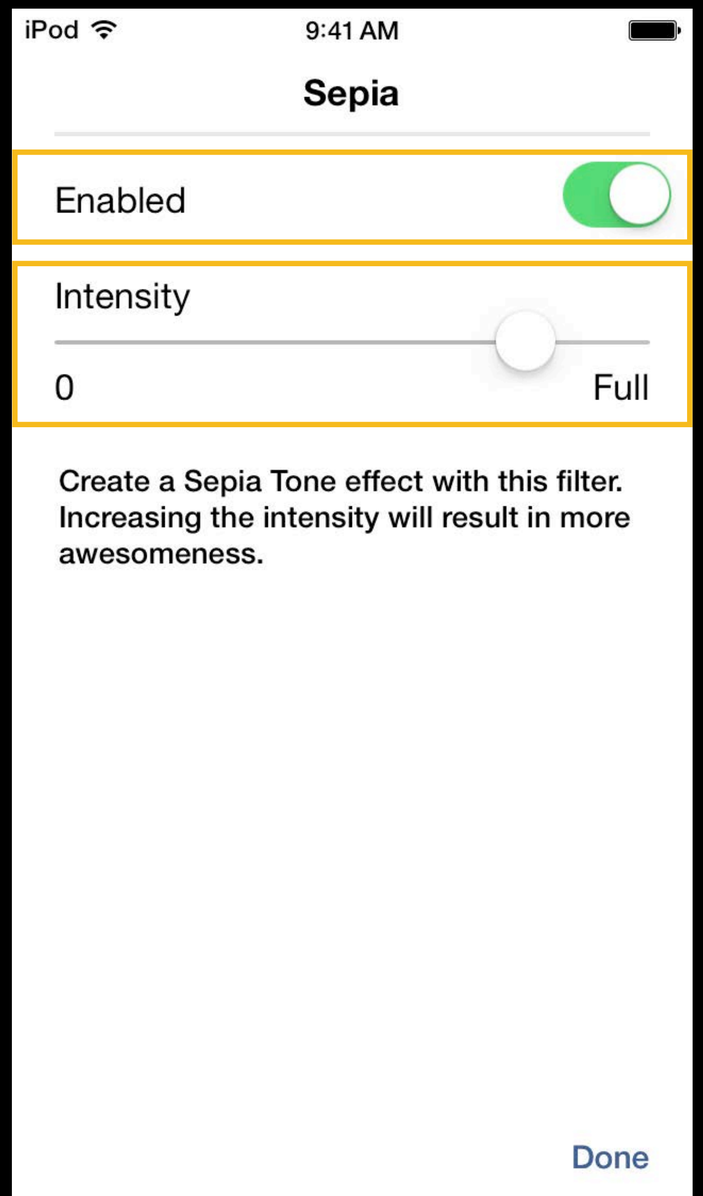
```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```



Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```

Sepia Filter

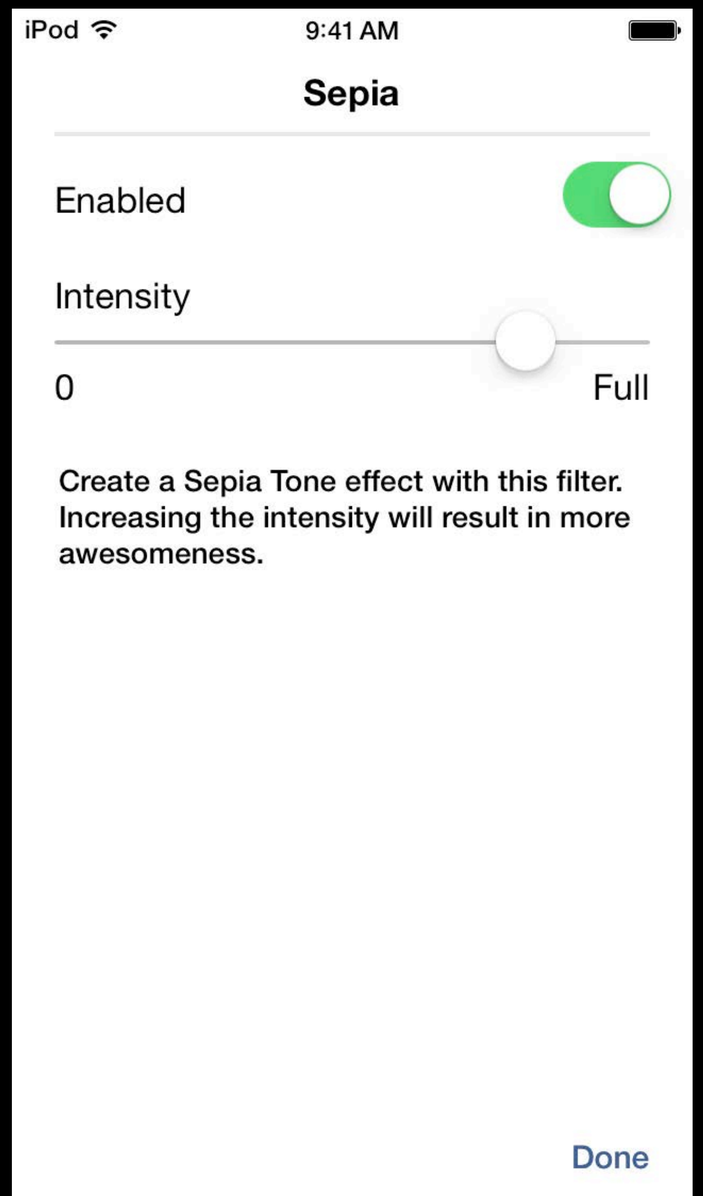


Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```

Sepia Filter

Enabled
Intensity



Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```

Sepia Filter

Enabled
Intensity

Filter Save

```
- (void) encodeRestorableStateWithCoder:(NSCoder *)coder;
```

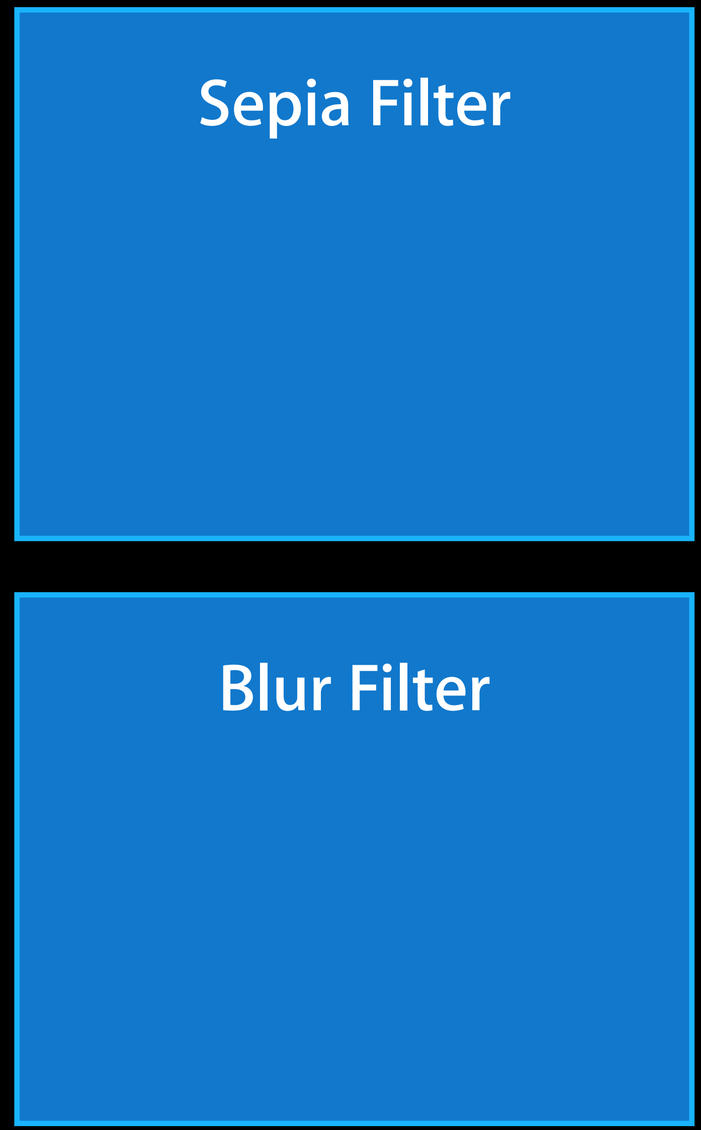
Sepia Filter

Enabled
Intensity

Filter Object is shared

Saving State

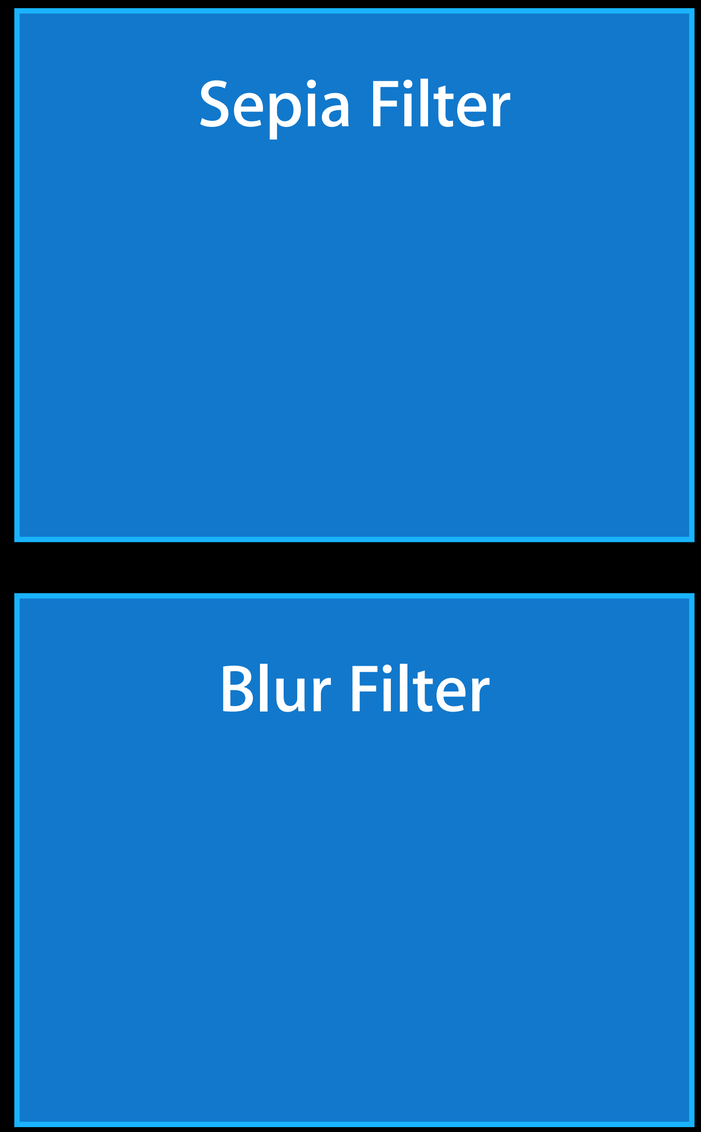
- Register Filters with State Restoration
- Save references to Filters
- Save specific Filter info



Saving State

- Register Filters with State Restoration
- Save references to Filters
- Save specific Filter info

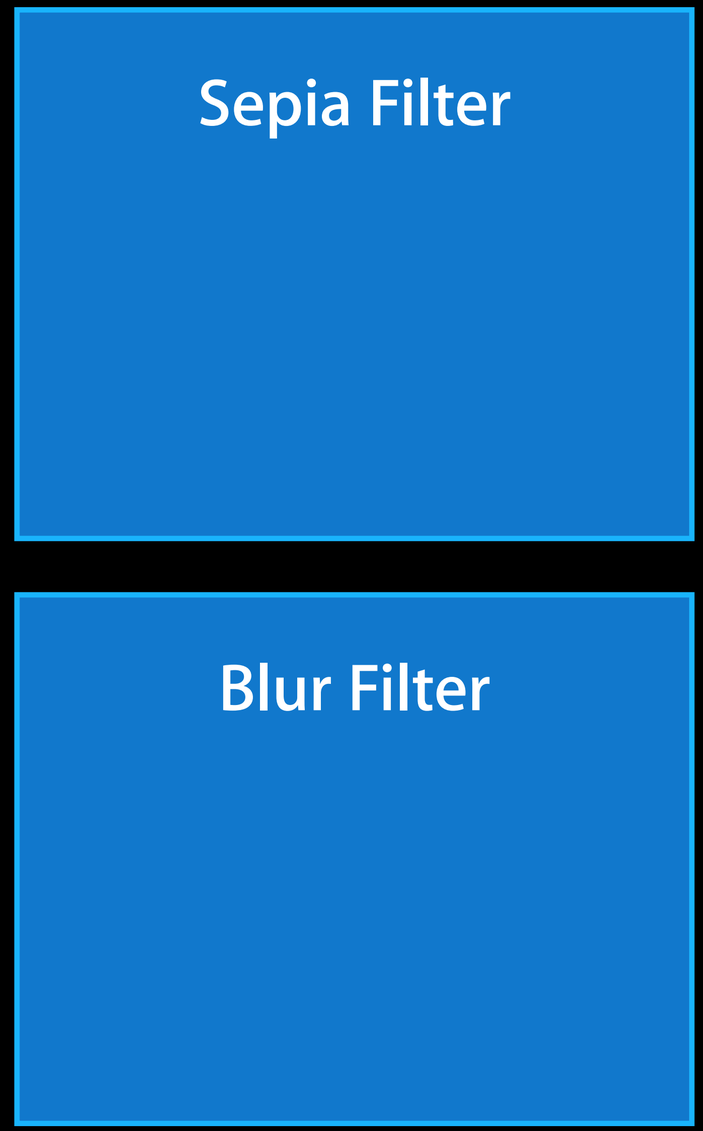
```
Call registerObjectForStateRestoration
```



Saving State

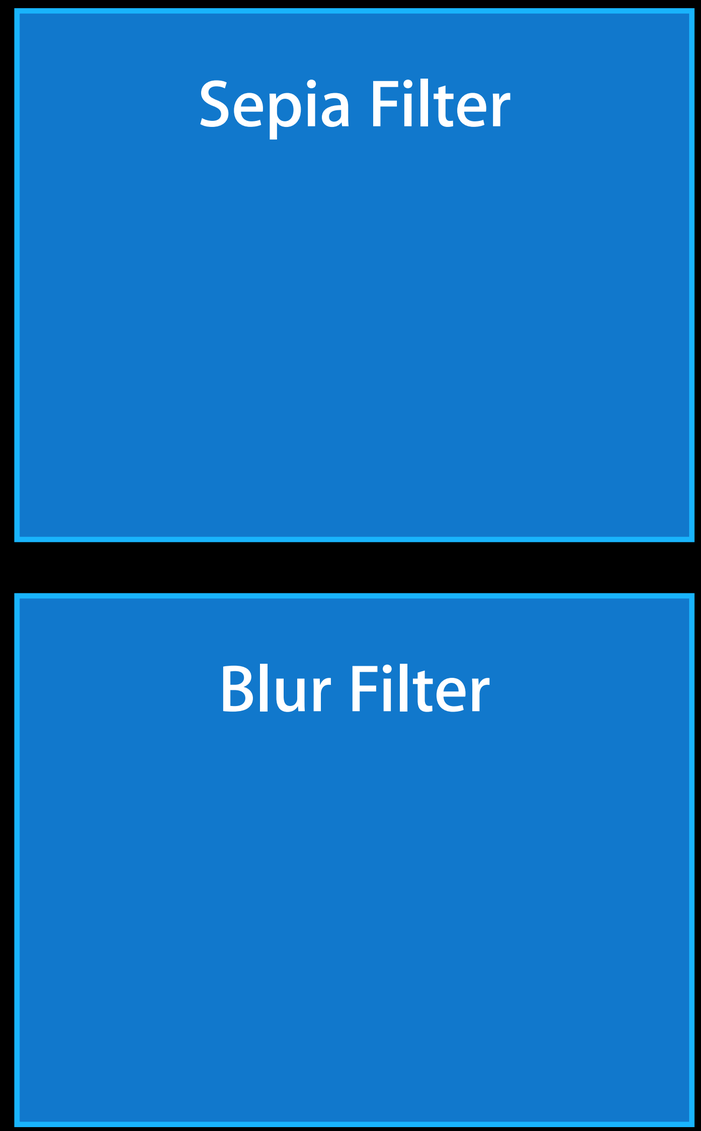
- Register Filters with State Restoration
- Save references to Filters
- Save specific Filter info

```
Call registerObjectForStateRestoration
Set objectRestorationClass property
```



Saving State

- Register Filters with State Restoration
- Save references to Filters



Saving State

- Register Filters with State Restoration
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Saving State

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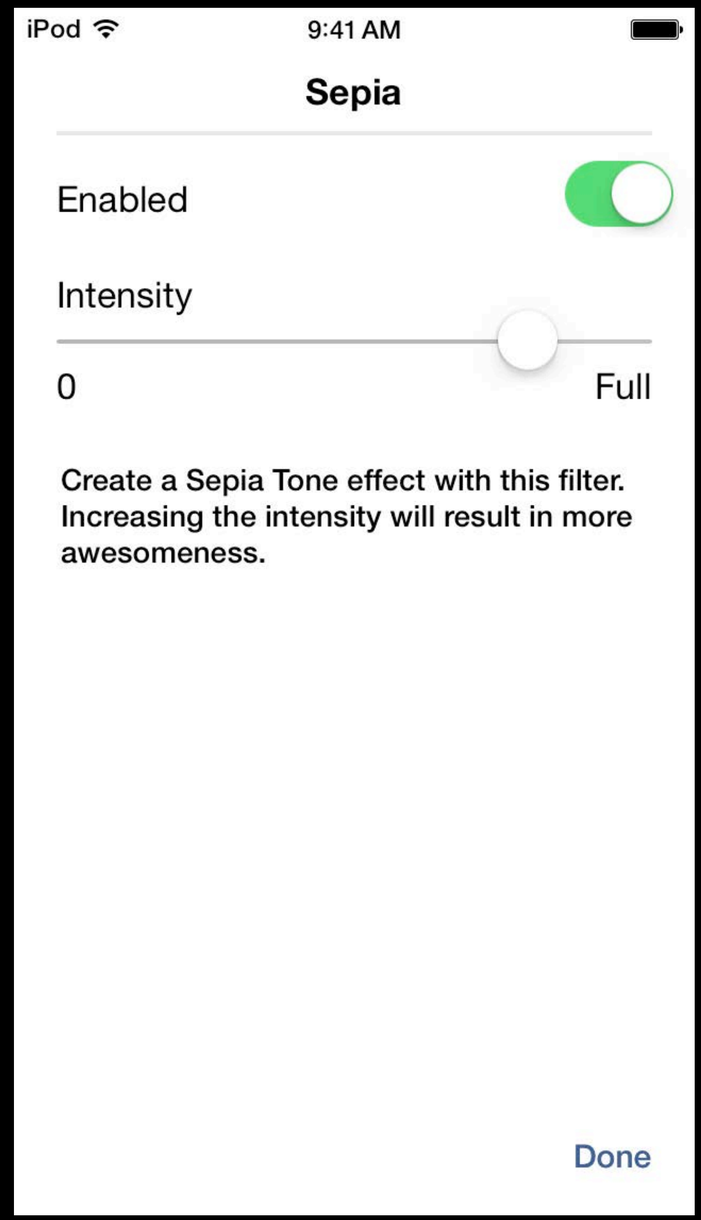
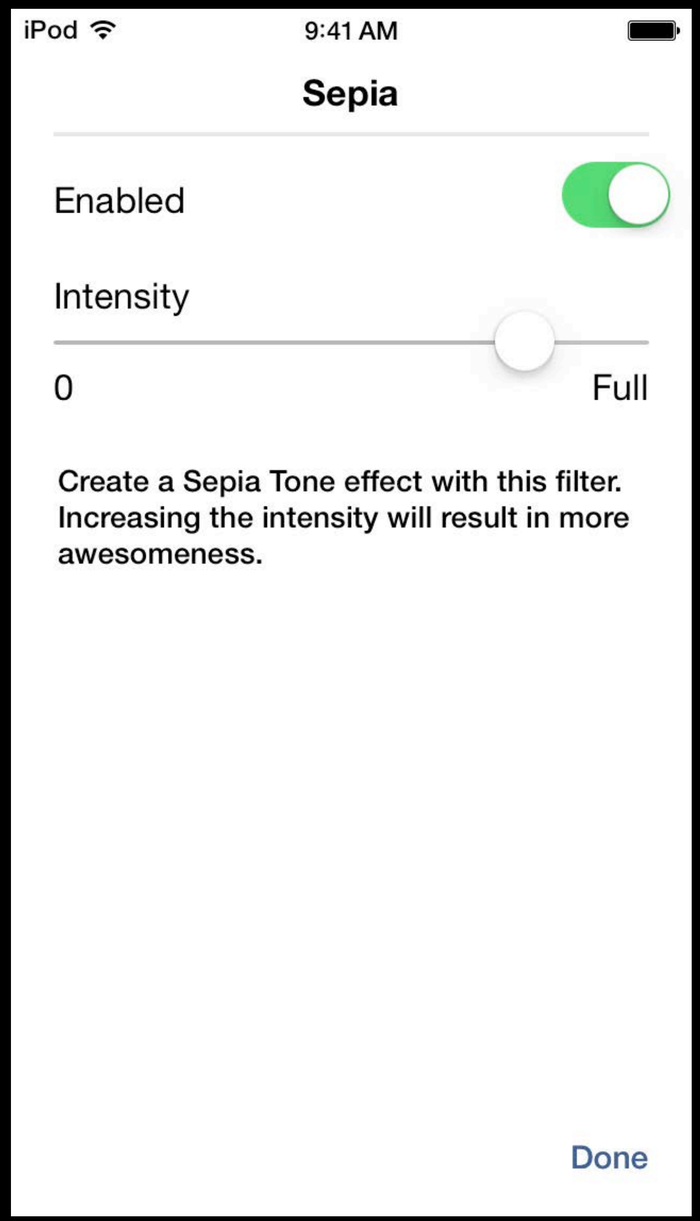


Saving State

- Register Filters with State Restoration
- Save references to Filters
- Save specific Filter info

Sepia Filter

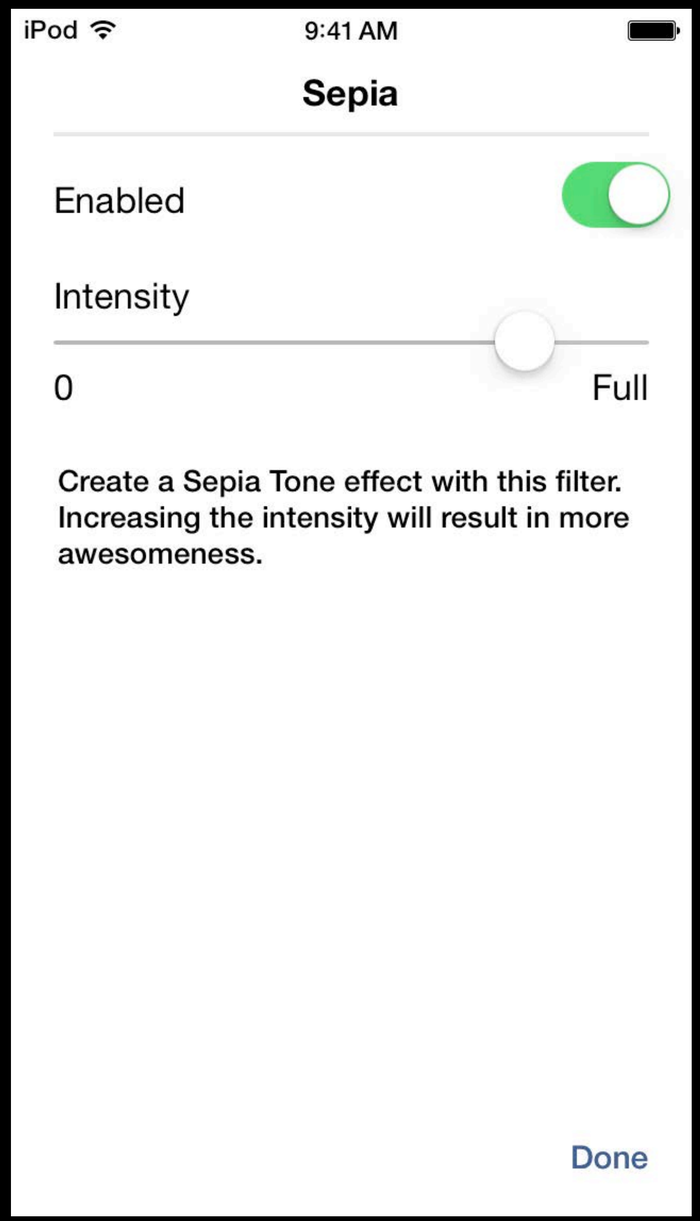


Saving State

- Register Filters with State Restoration
- Save references to Filters
- Save specific Filter info

Sepia Filter

Enabled
Intensity



Restoring State

- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info
- Apply Filters

Restoring State

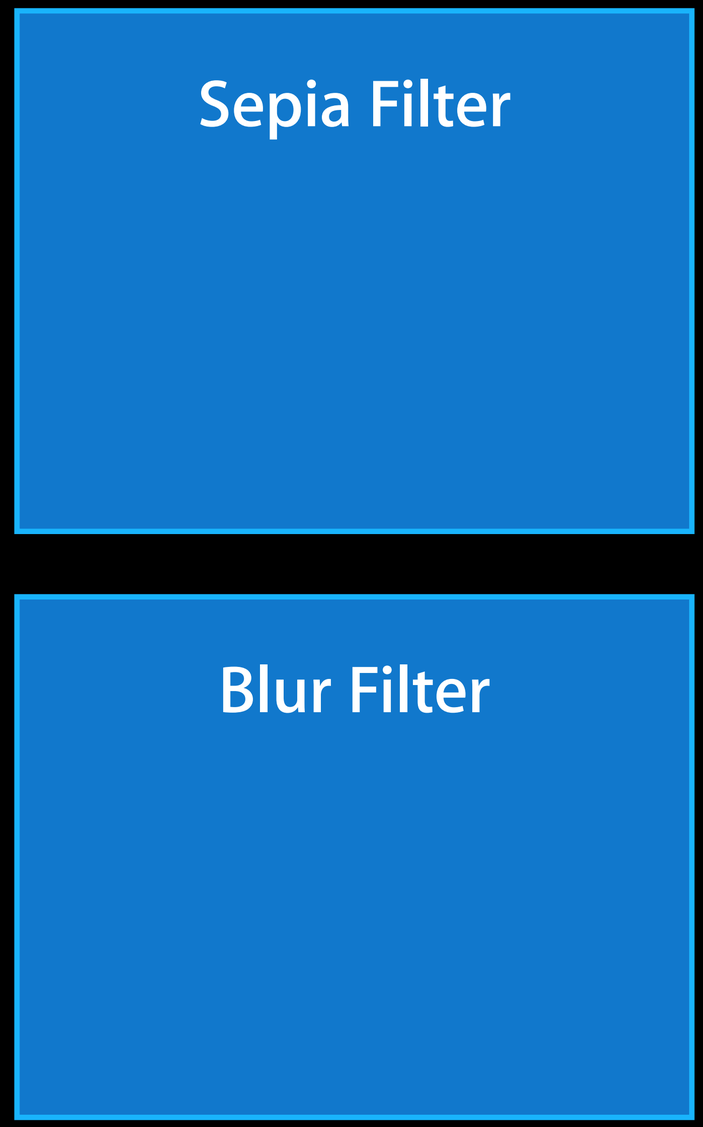
- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info
- Apply Filters

```
objectWithRestorationIdentifierPath
```

Restoring State

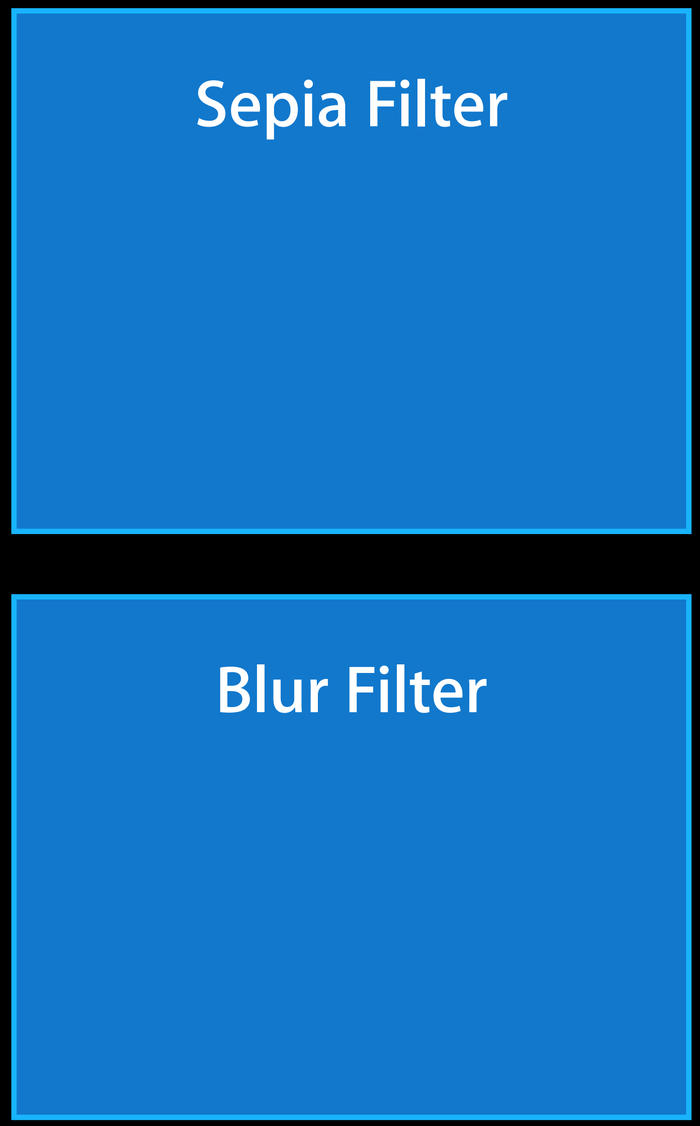
- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info
- Apply Filters

```
objectWithRestorationIdentifierPath
```



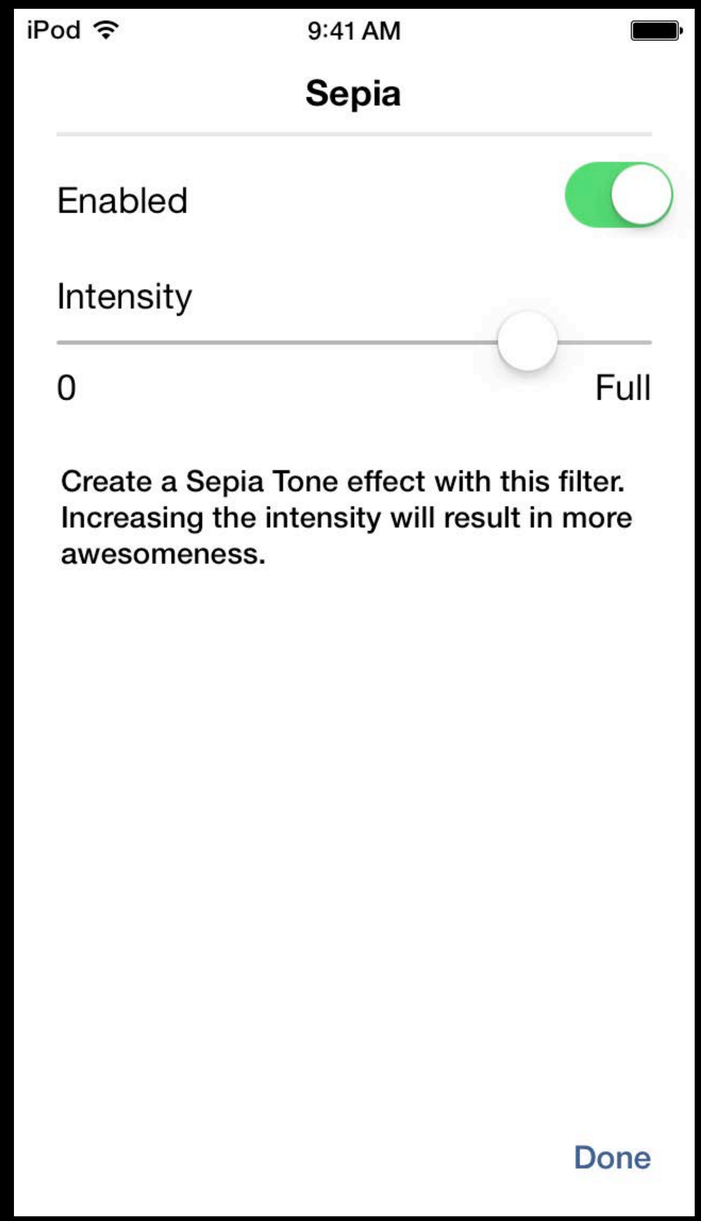
Restoring State

- Recreate Filters as needed
- Restore references to Filters



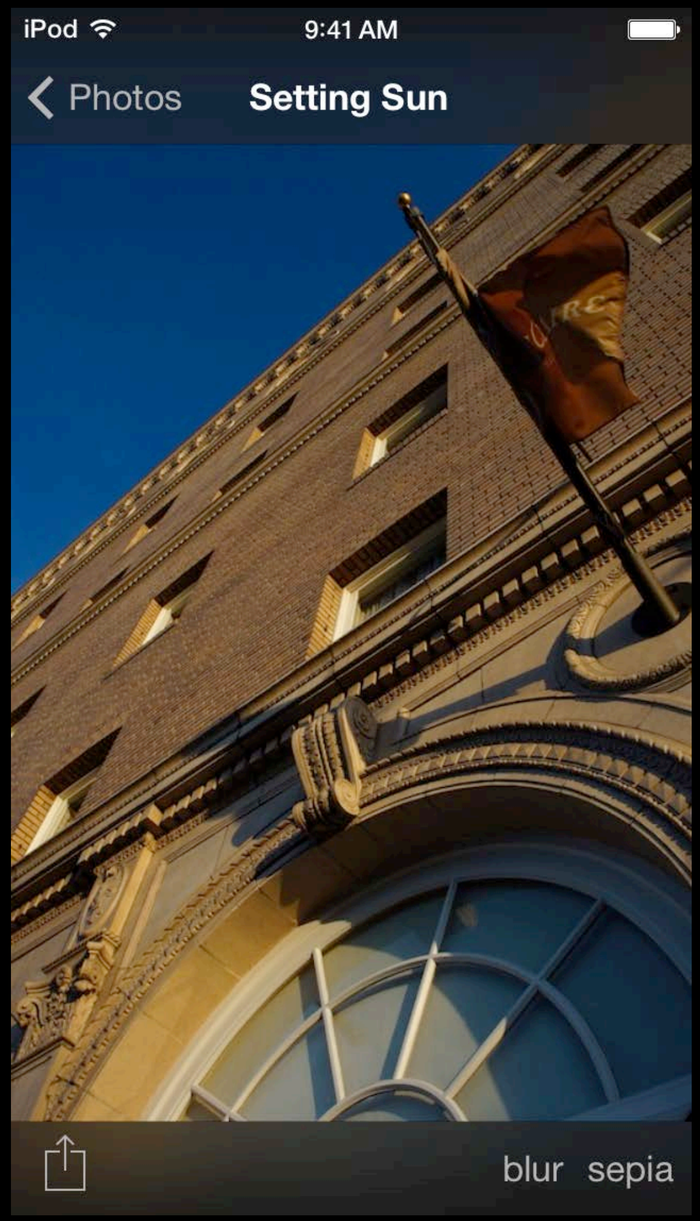
Restoring State

- Recreate Filters as needed
- Restore references to Filters



Restoring State

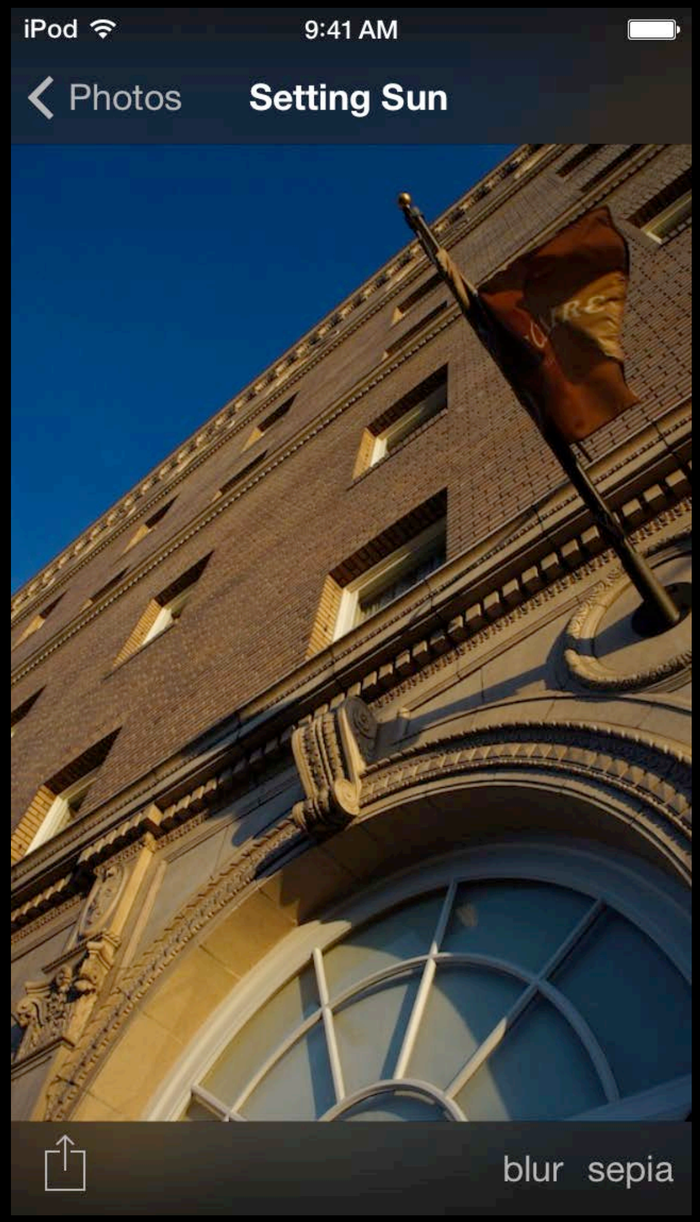
- Recreate Filters as needed
- Restore references to Filters



Restoring State

- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info

Sepia Filter

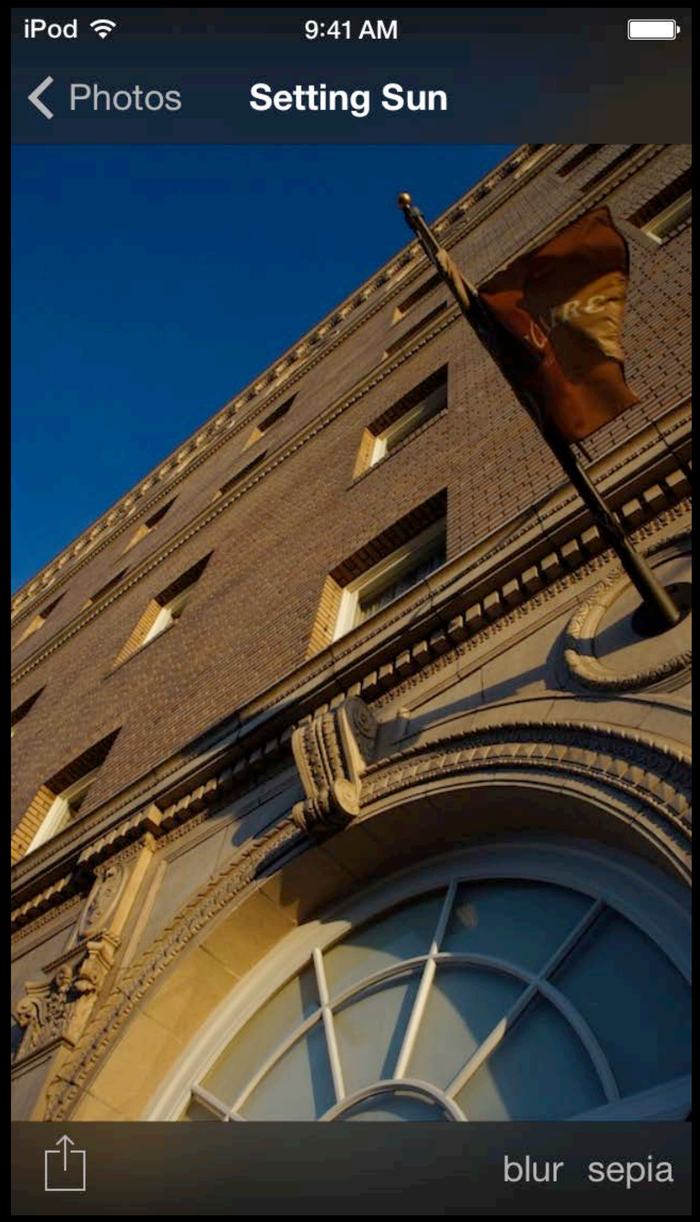


Restoring State

- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info

Sepia Filter

Enabled
Intensity



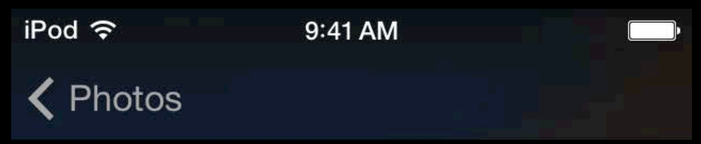
Restoring State

- Recreate Filters as needed
- Restore references to Filters
- Restore Filter info
- Apply Filters

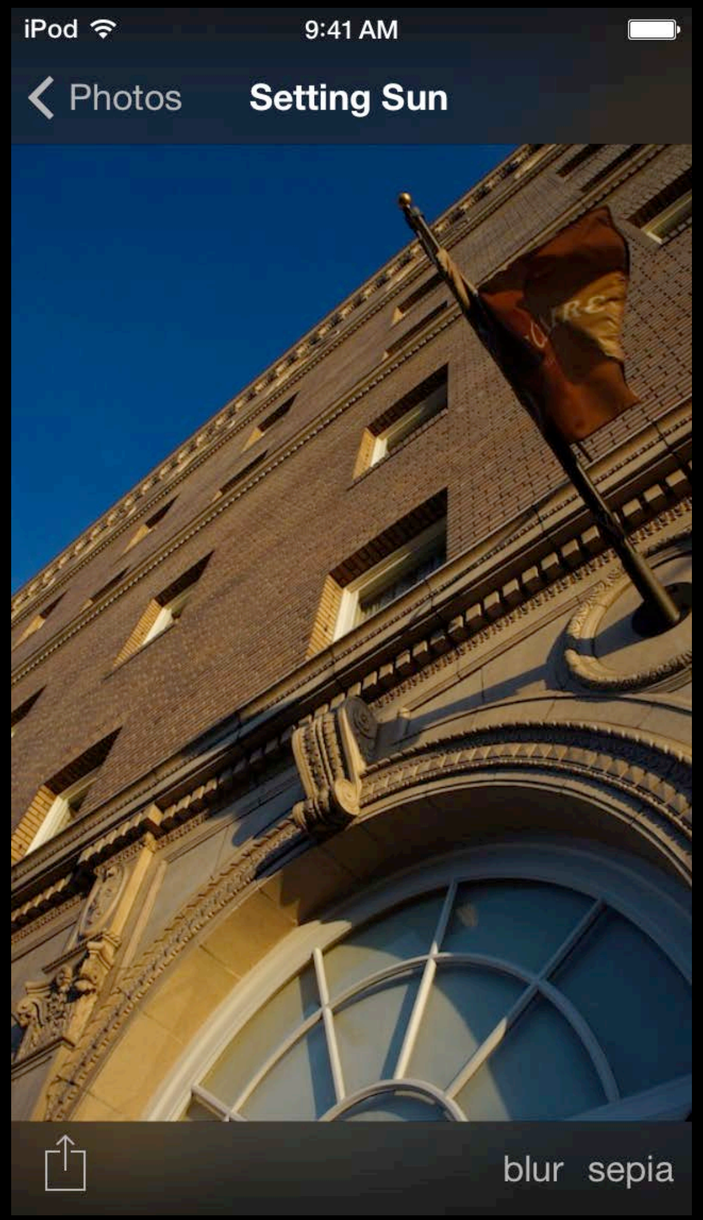
Sepia Filter

Enabled
Intensity

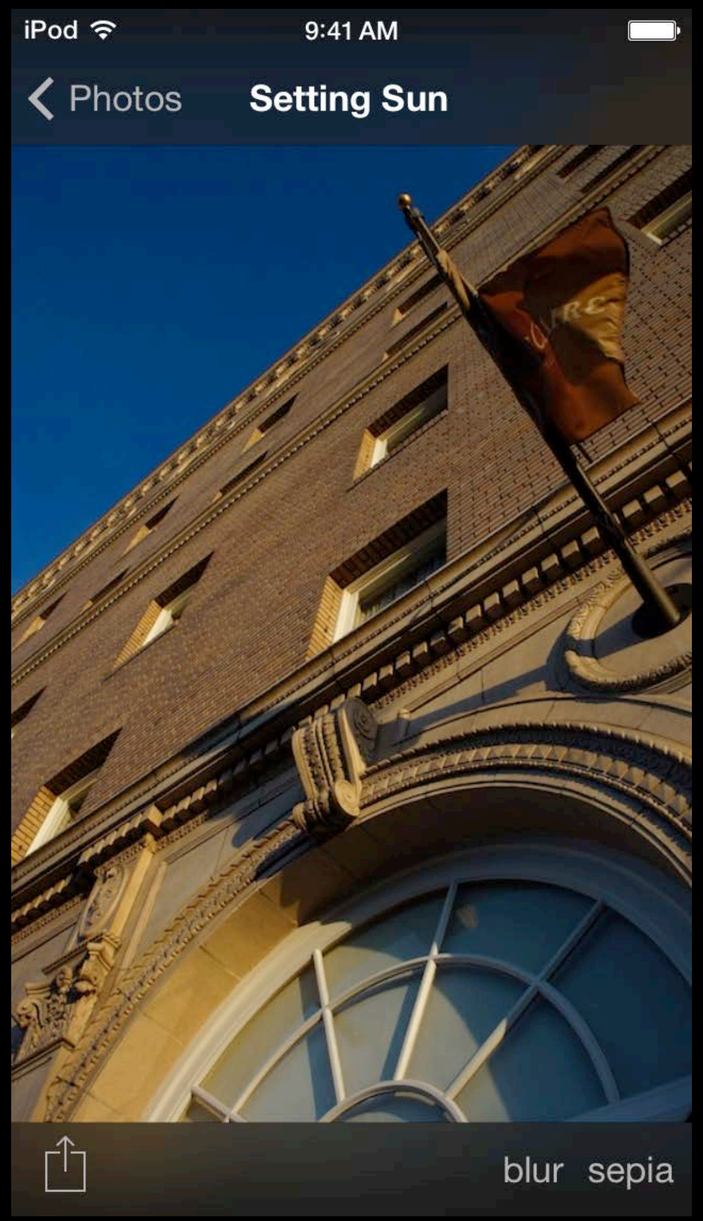
Applying Filter State



Applying Filter State



Applying Filter State



Sepia Filter

Enabled
Intensity

Applying Filter State

Sepia Filter

Enabled
Intensity

Applying Restored State

Applying Restored State

- New method for ViewControllers and UIStateRestoring

Applying Restored State

- New method for ViewControllers and UIStateRestoring

```
– (void) applicationFinishedRestoringState;
```

Image Controller Restore

```
- (void) decodeRestorableStateWithCoder:(NSCoder *)coder {
    // Restore state
    [self updateImage];
}
```

Image Controller Restore

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    [self updateImage];
}
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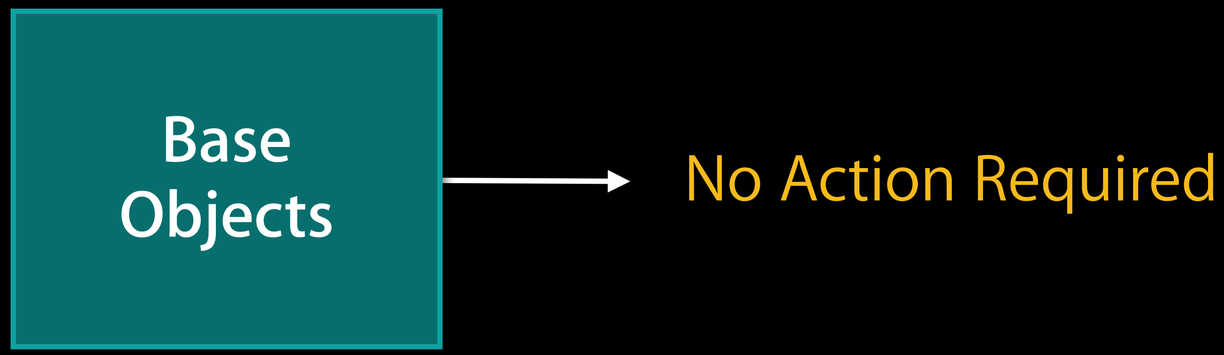
Object Lifecycle

Application Objects

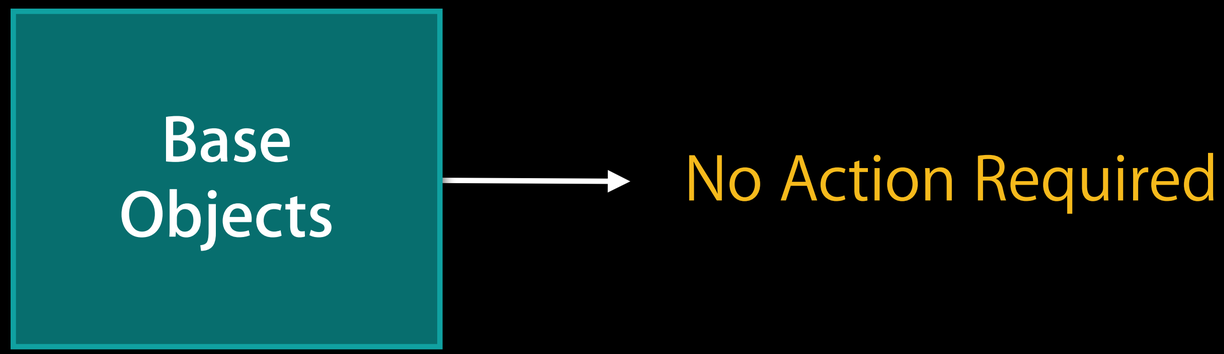
Application Objects

Base
Objects

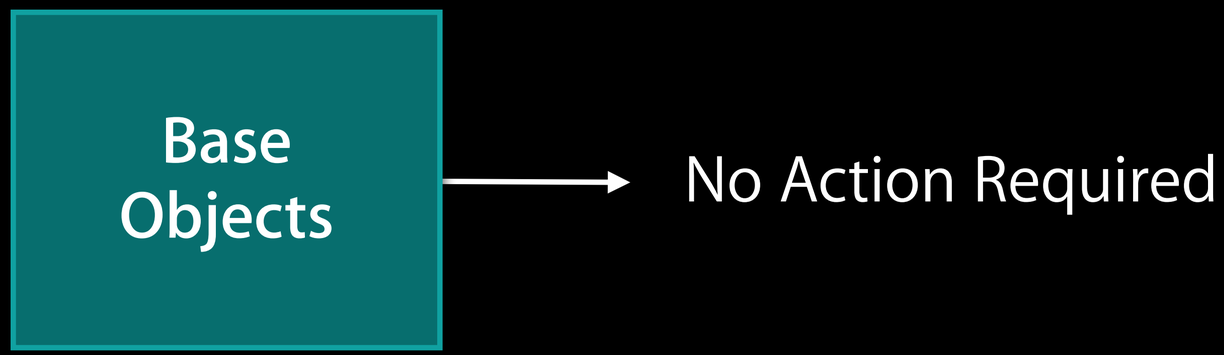
Application Objects

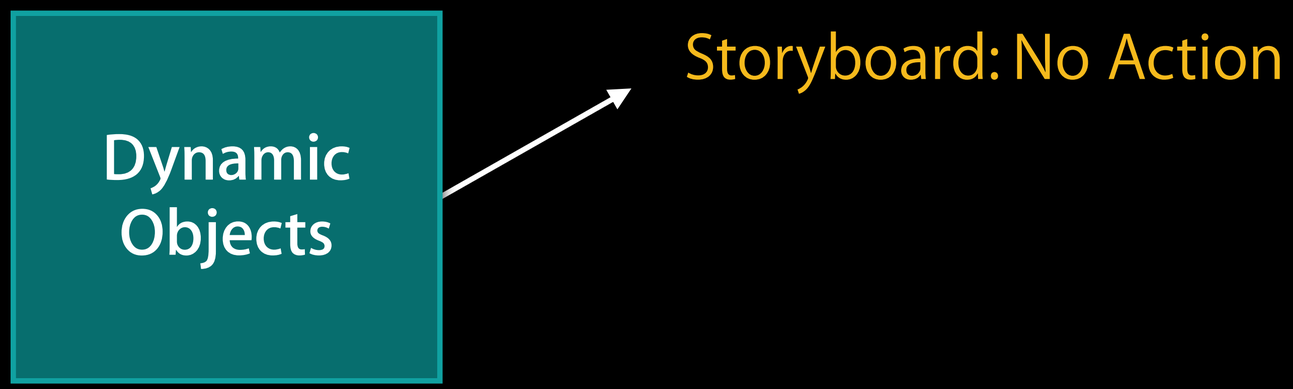


Application Objects

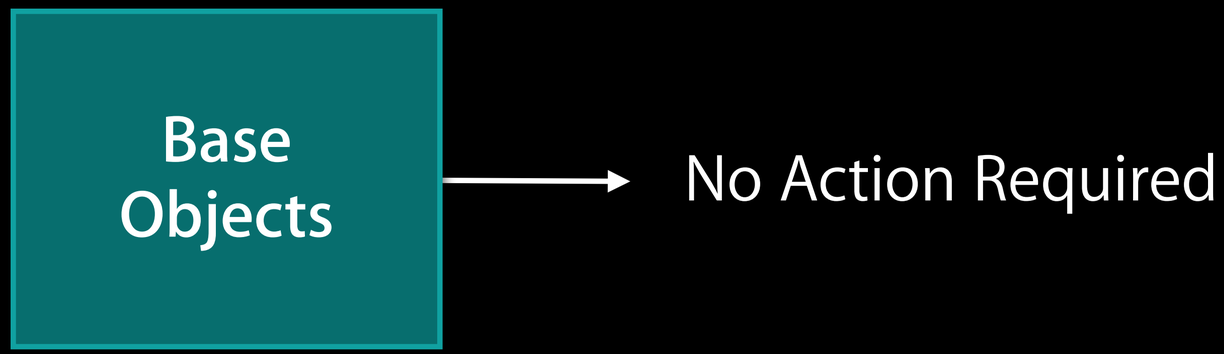


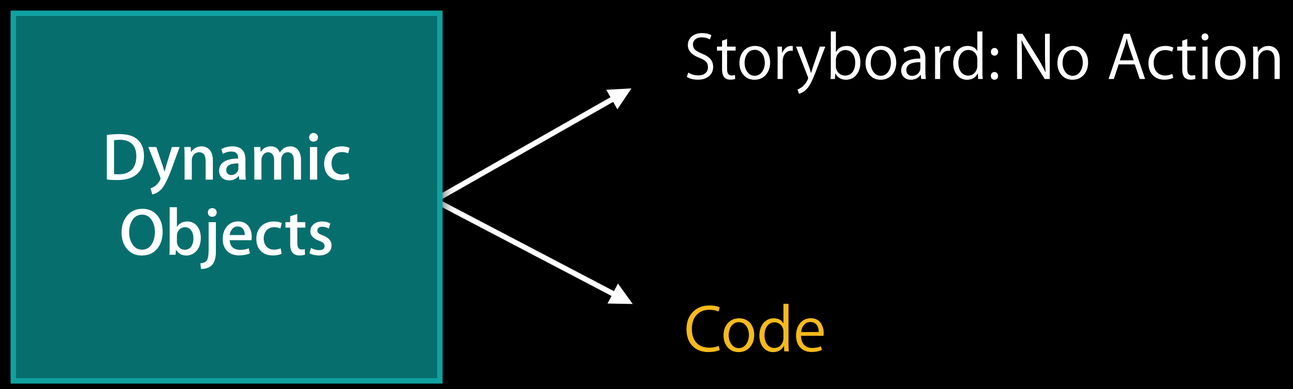
Application Objects



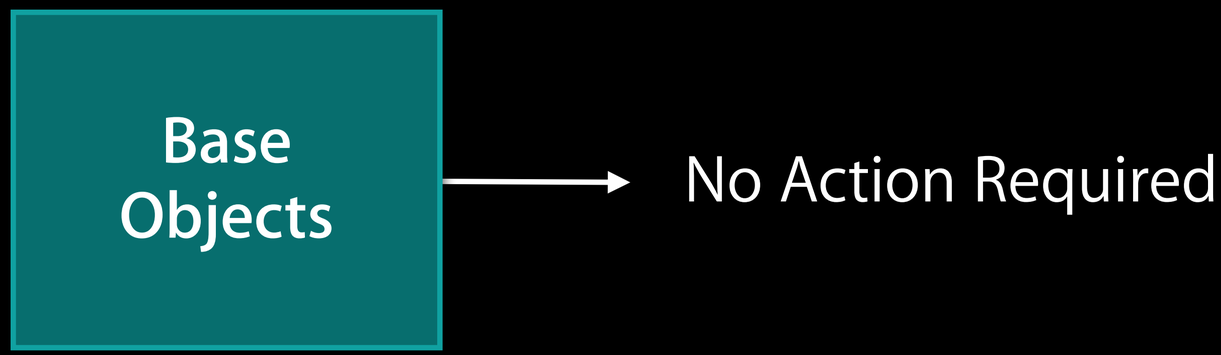


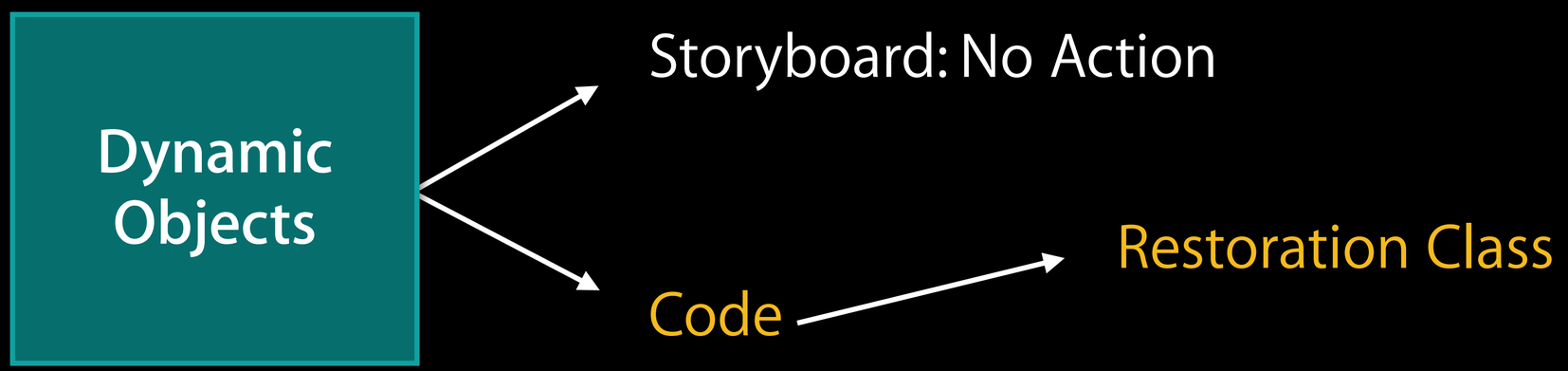
Application Objects



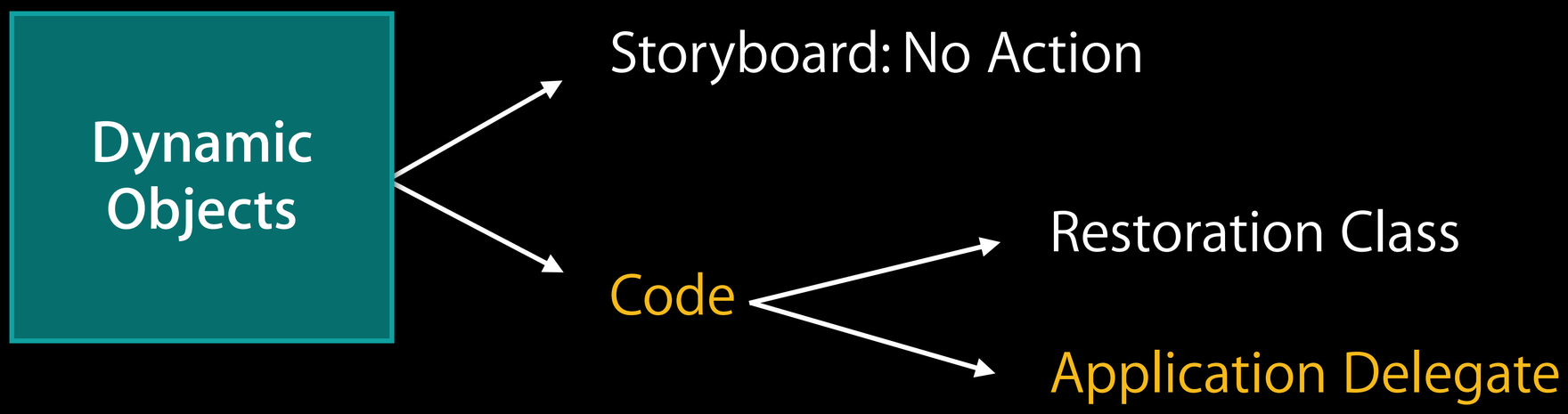


Application Objects





Application Objects

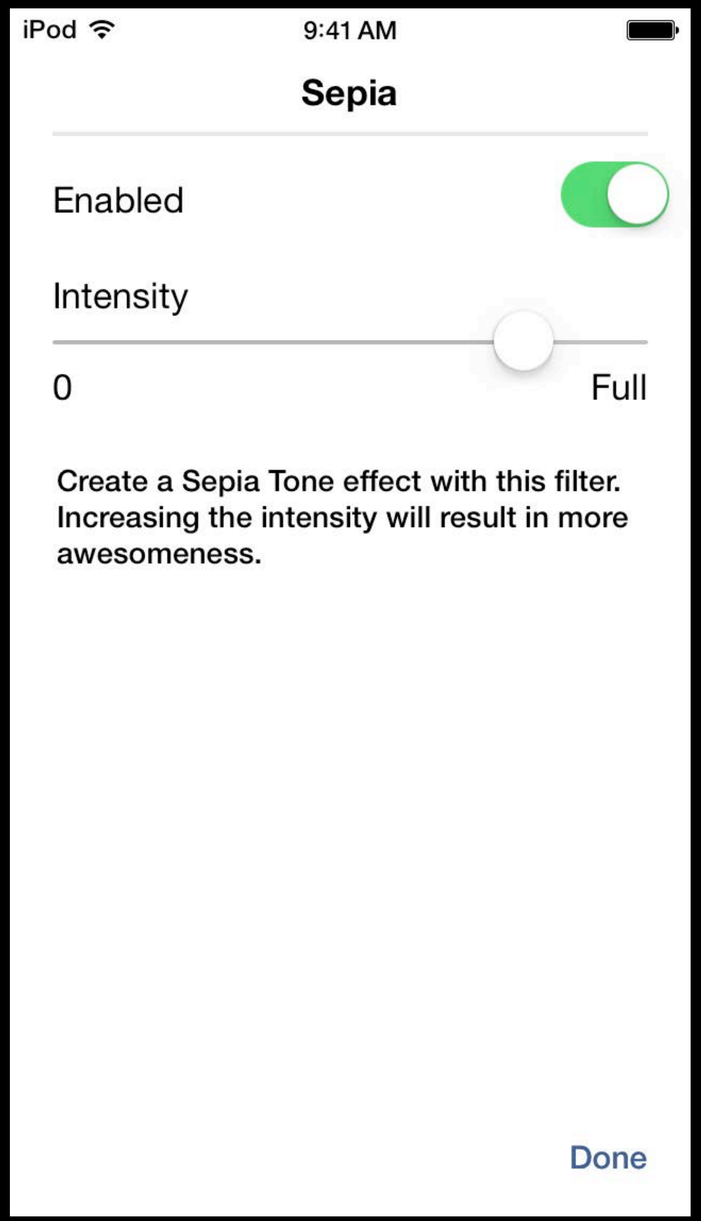


Base Objects

DataSource

Navigation Controller

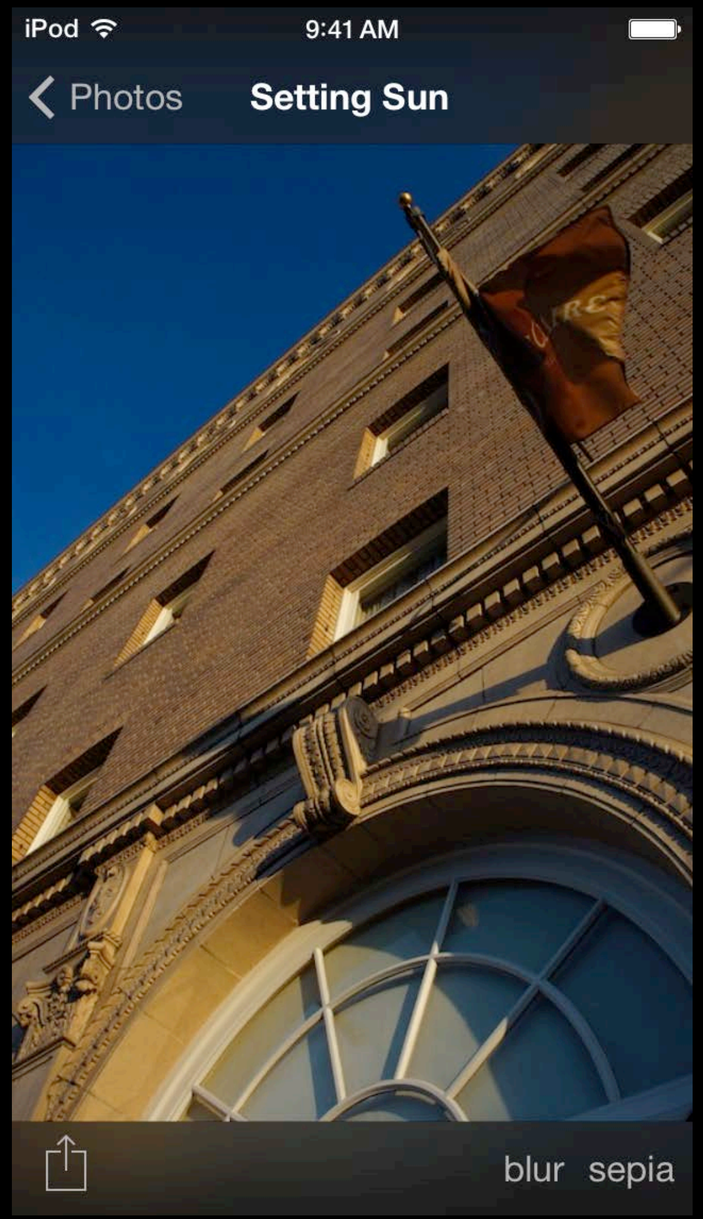
Storyboard Objects



RestorationClass Objects

Blur Filter

Sepia Filter



Snapshot Handling

Snapshot Handling

Snapshot Handling

- Using snapshot more aggressively on launch

Snapshot Handling

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```
- (void)ignoreSnapshotOnNextApplicationLaunch;
```

Snapshot Handling

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```
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```

- When to ignore snapshot

Snapshot Handling

- Using snapshot more aggressively on launch

```
– (void)ignoreSnapshotOnNextApplicationLaunch;
```

- When to ignore snapshot
  - Network error presentation

Snapshot Handling

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```
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- When to ignore snapshot
  - Network error presentation
  - Things that can change dynamically

Snapshot Handling

- Using snapshot more aggressively on launch

```
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- When to ignore snapshot
  - Network error presentation
  - Things that can change dynamically
- Implicit cases to ignore snapshot

Snapshot Handling

- Using snapshot more aggressively on launch

```
– (void)ignoreSnapshotOnNextApplicationLaunch;
```

- When to ignore snapshot
  - Network error presentation
  - Things that can change dynamically
- Implicit cases to ignore snapshot
  - No restoration identifier

Snapshot Handling

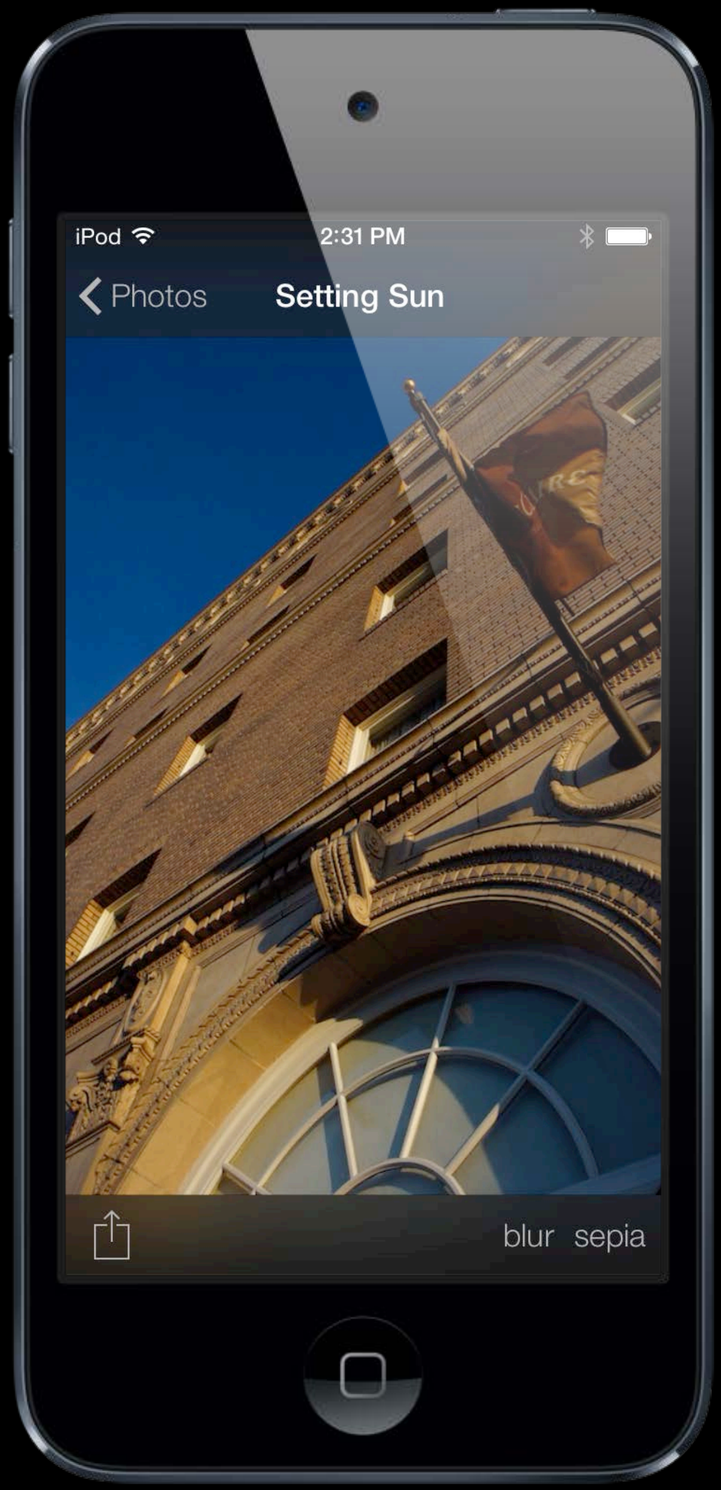
- Using snapshot more aggressively on launch

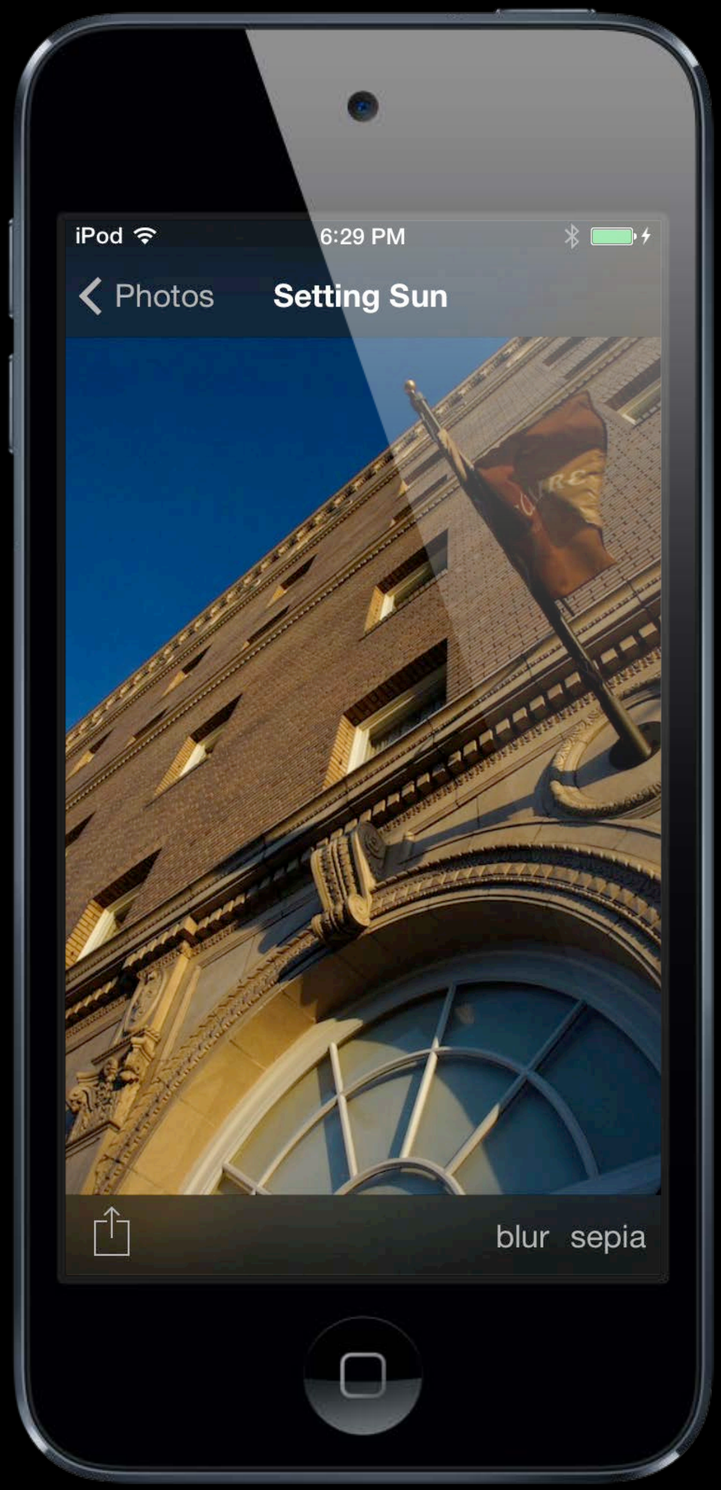
```
– (void)ignoreSnapshotOnNextApplicationLaunch;
```

- When to ignore snapshot
  - Network error presentation
  - Things that can change dynamically
- Implicit cases to ignore snapshot
  - No restoration identifier
  - Things Cocoa Touch doesn’t restore

Demo

Snapshot cases


iPod
2:31 PM
Photos
Setting Sun
blur
sepia


iPod
6:29 PM
Photos
Setting Sun
blur
sepia

iPod
6:30 PM
Messages
Tuesday
4
Calendar
Photos
Camera
Passbook
Stocks
280
Maps
Weather
Videos
iTunes Store
App Store
Settings
Notes
Game Center
News
ART
TRAVEL
SPORTS
Newsstand
Reminders
Podcasts
Clock
iBooks
CollViewSmpl
3
FaceTime
Mail
Safari
Music

iPod
6:30 PM
Messages
Tuesday
4
Calendar
Photos
Camera
Passbook
Stocks
280
Maps
Weather
Videos
iTunes Store
App Store
Settings
Notes
Game Center
News
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Podcasts
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iBooks
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Mail
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Music

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Tuesday
4
Calendar
Photos
Camera
Passbook
Stocks
280
Maps
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Reminders
Podcasts
Clock
iBooks
CollViewSmpl
3
FaceTime
Mail
Safari
Music

Enhancements

Enhancements

- System Version/Timestamp keys

Enhancements

- System Version/Timestamp keys
- Improved UITableView support

Enhancements

- System Version/Timestamp keys
- Improved UITableView support
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Enhancements

- System Version/Timestamp keys
- Improved UITableView support
- UICollectionView support
- Mail Activity Controller

Security Considerations

Security

Security

- State Restoration archive is data protected

Security

- State Restoration archive is data protected
- Why protected?

Security

- State Restoration archive is data protected
- Why protected?
  - Could leak via covert channel

Security

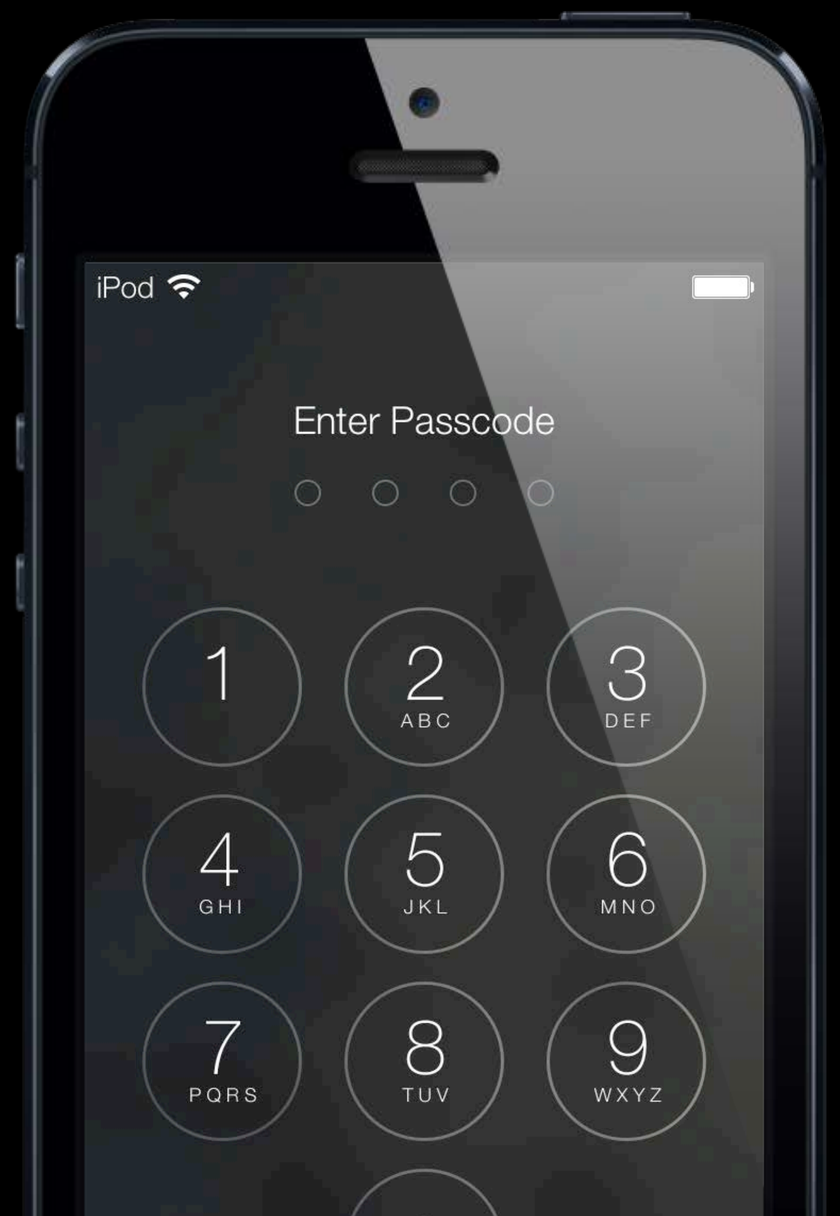
- State Restoration archive is data protected
- Why protected?
  - Could leak via covert channel
  - App could have protected data

Background Operation

Background Operation

Background Operation

Background Operation



Background Operation

Be prepared for app to start up with changes to data

Testing/Diagnosis

State Restoration Archive Tool

State Restoration Archive Tool

```
Restoration class map is {
    SepiaFilter = ImageViewController;
}
Top Level
---------
UIApplicationStateRestorationBundleVersion.........1.1
UIApplicationStateRestorationTimestamp.............2013-05-12 01:22:07 +0000
UIApplicationStateRestorationSystemVersion...7
...
```

State Restoration Archive Tool

```
Restoration class map is {
    SepiaFilter = ImageViewController;
}
Top Level
---------
UIApplicationStateRestorationBundleVersion.........1.1
UIApplicationStateRestorationTimestamp.............2013-05-12 01:22:07 +0000
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---------
UIApplicationStateRestorationBundleVersion.........1.1
UIApplicationStateRestorationTimestamp.............2013-05-12 01:22:07 +0000
UIApplicationStateRestorationSystemVersion...7
...
```

State Restoration Archive Tool

```
Restoration class map is {
    SepiaFilter = ImageViewController;
}
Top Level
---------
UIApplicationStateRestorationBundleVersion.......1.0
UIApplicationStateRestorationTimestamp...........2013-05-12 01:22:07 +0000
UIApplicationStateRestorationSystemVersion...7
...
```

State Restoration Archive Tool

```
Restoration class map is {
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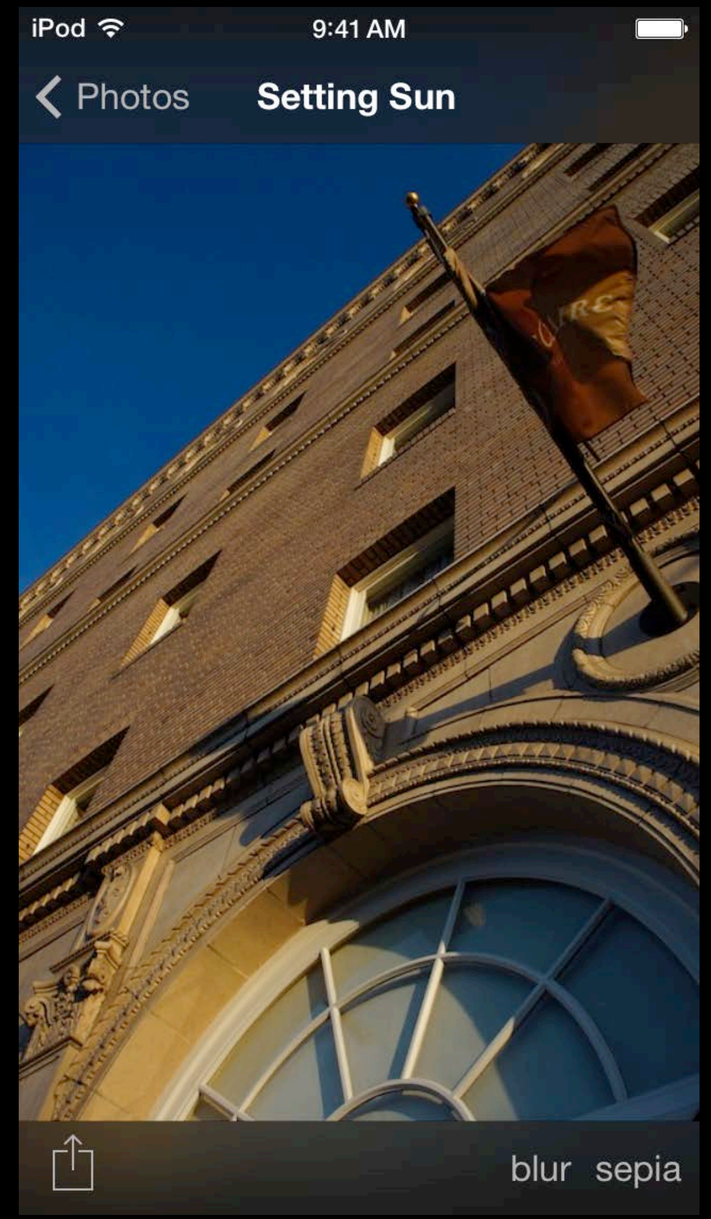
UIApplicationStateRestorationSystemVersion...7
...
```

Archive Tool: Image View Controller

```
[View Controller]
Class: ImageViewController

kDataSourceKey -> Object Identifier Proxy: DataSource
kImageFiltersKey -> {
    BlurFilter = Object Identifier Proxy: BlurFilter;
    ModifyFilter = Object Identifier Proxy: ModifyFilter;
}
kImageIdentifierKey -> 8993-455F-7D5C-2110
```



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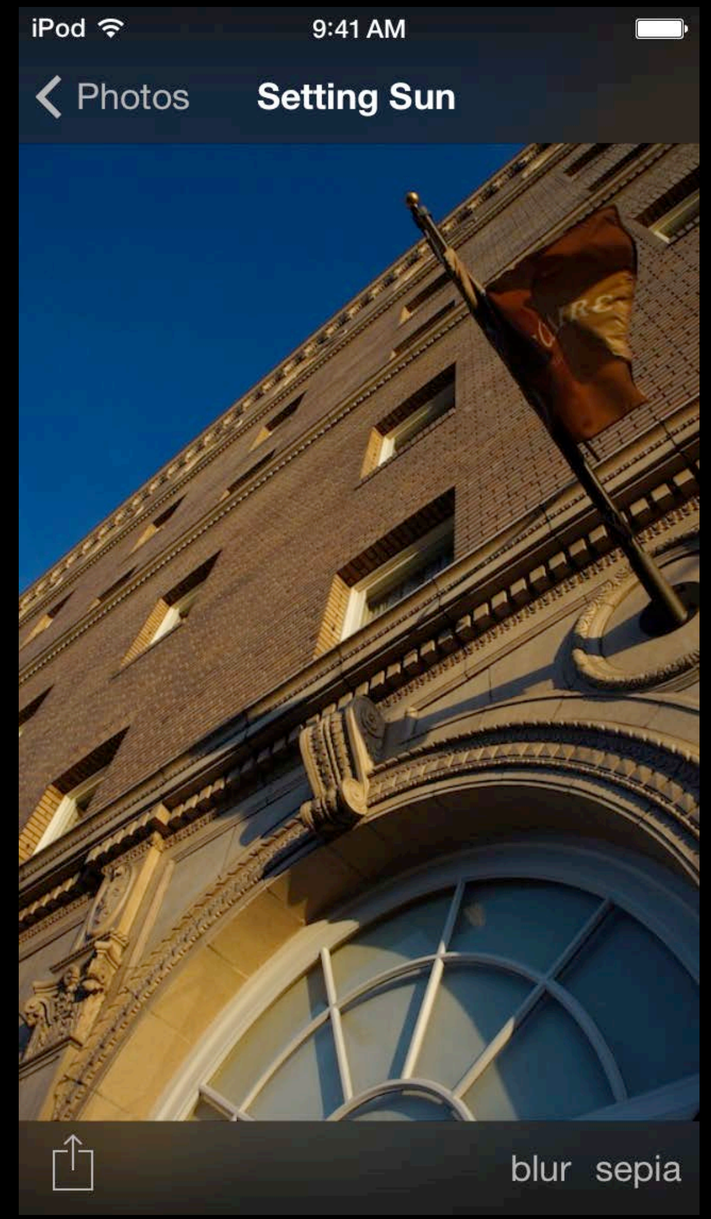

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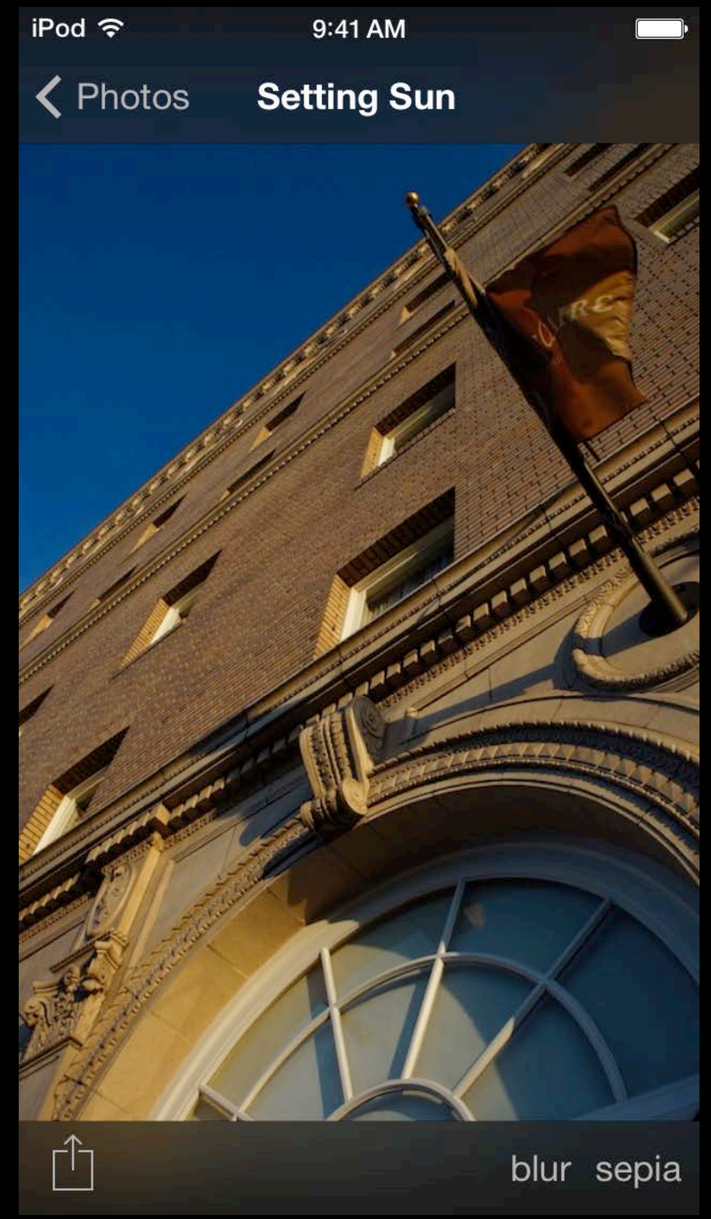

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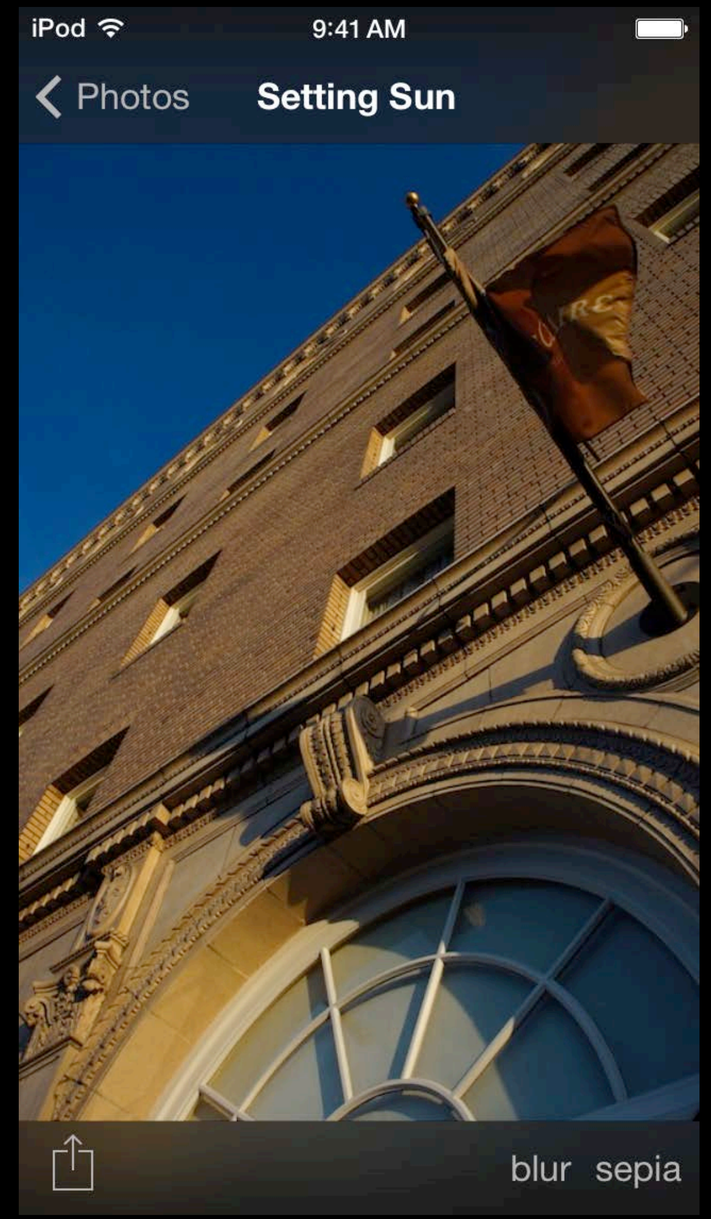

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    ModifyFilter = Object Identifier Proxy: ModifyFilter;
}
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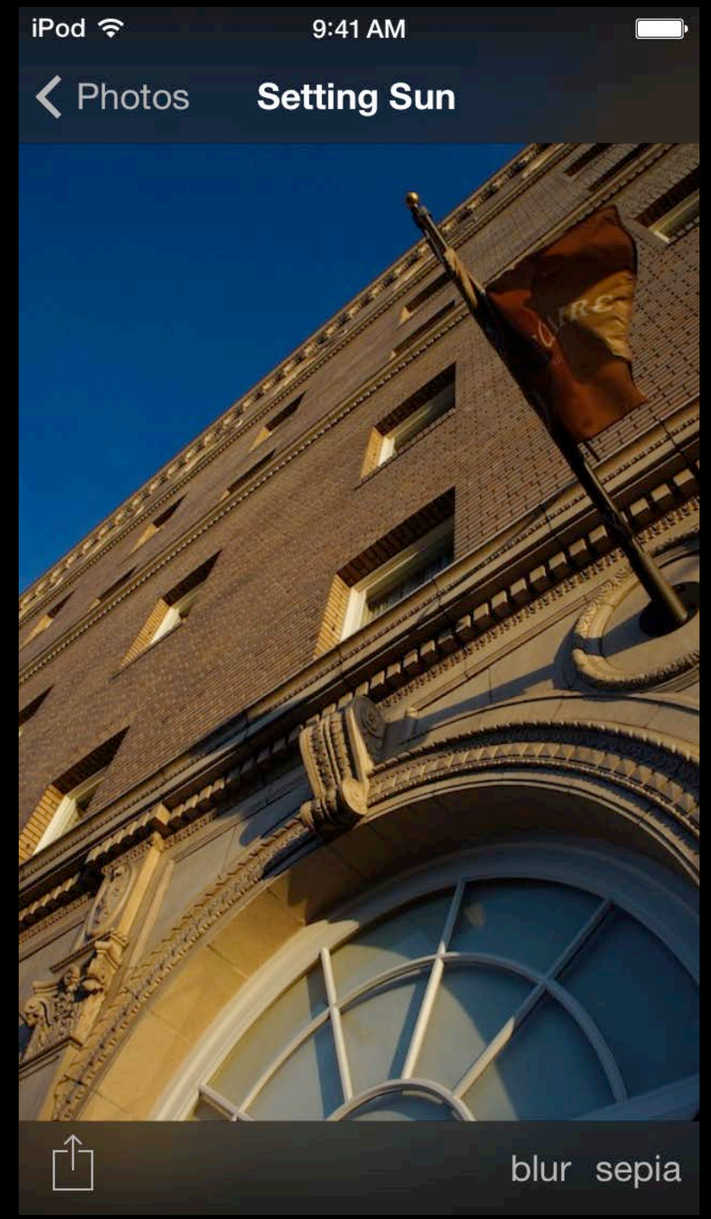
Storyboard: Main Bundle/MainStoryboard
StoryboardIdentifier -> DetailView
```



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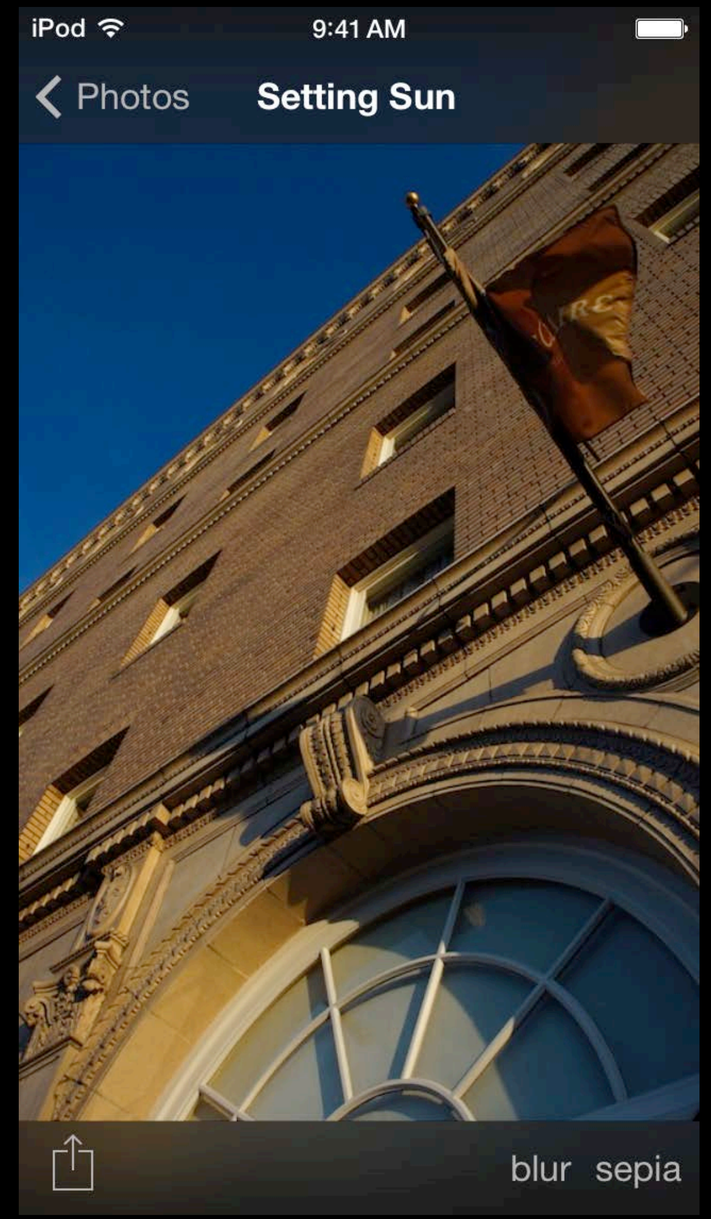

Archive Tool: Sepia Filter

```
[Restorable Object]
Class: SepiaFilter

_____________________________________

ImageFilterActiveKey -> YES
ImageFilterIntensityKey -> 0.8485916
```

Archive Tool: Sepia Filter

```
[Restorable Object]
Class: SepiaFilter

_____________________________________

ImageFilterActiveKey -> YES
ImageFilterIntensityKey -> 0.8485916
```

Archive Tool: Sepia Filter

```
[Restorable Object]
Class: SepiaFilter

_____________________________________

ImageFilterActiveKey -> YES
ImageFilterIntensityKey -> 0.8485916
```

Profiles/Defaults

Profiles/Defaults

- Logging profile/default

Profiles/Defaults

- Logging profile/default
  - Play by play saving/restoring

Profiles/Defaults

- Logging profile/default
  - Play by play saving/restoring
- Developer Mode profile/default

Profiles/Defaults

- Logging profile/default
  - Play by play saving/restoring
- Developer Mode profile/default
  - Doesn’t delete archives on error/kill

Summary

Summary

- Recap

Summary

- Recap
- New features

Summary

- Recap
- New features
- Security for Restoration Archives

Summary

- Recap
- New features
- Security for Restoration Archives
- Background operation

Summary

- Recap
- New features
- Security for Restoration Archives
- Background operation
- Tools

More Information

Jake Behrens
App Frameworks Evangelist
behrens@apple.com

Documentation
iOS App Programming Guide
http://developer.apple.com/

Apple Developer Forums
http://devforums.apple.com

Labs

State Restoration Lab	Frameworks Lab B Thursday 4:30PM	
Cocoa Touch Lab	Frameworks Lab B Friday 9:00AM	

WWDC2013