Using iCloud with Core Data

Session 227

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Senior Software Engineer

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

Introduction

- Take app from idea to iCloud
- Beyond the API
- Real-world strategies

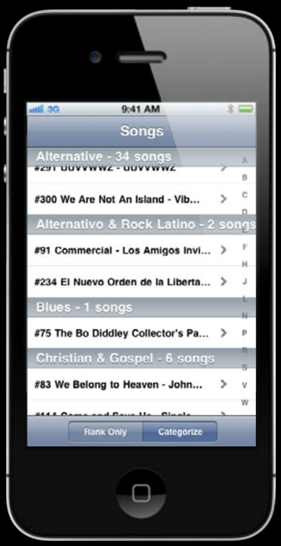
[redacted]

Sample Code

https://developer.apple.com/wwdc/schedule/details.php?id=227

Before We Begin…

Core Data



Alternative - 34 songs

#291 UUVVWWZ - UUVVWWZ

#300 We Are Not An Island - Vib...

Alternativo & Rock Latino - 2 songs

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#234 El Nuevo Orden de la Liberta...

Blues - 1 songs

#75 The Bo Diddley Collector's Pa...

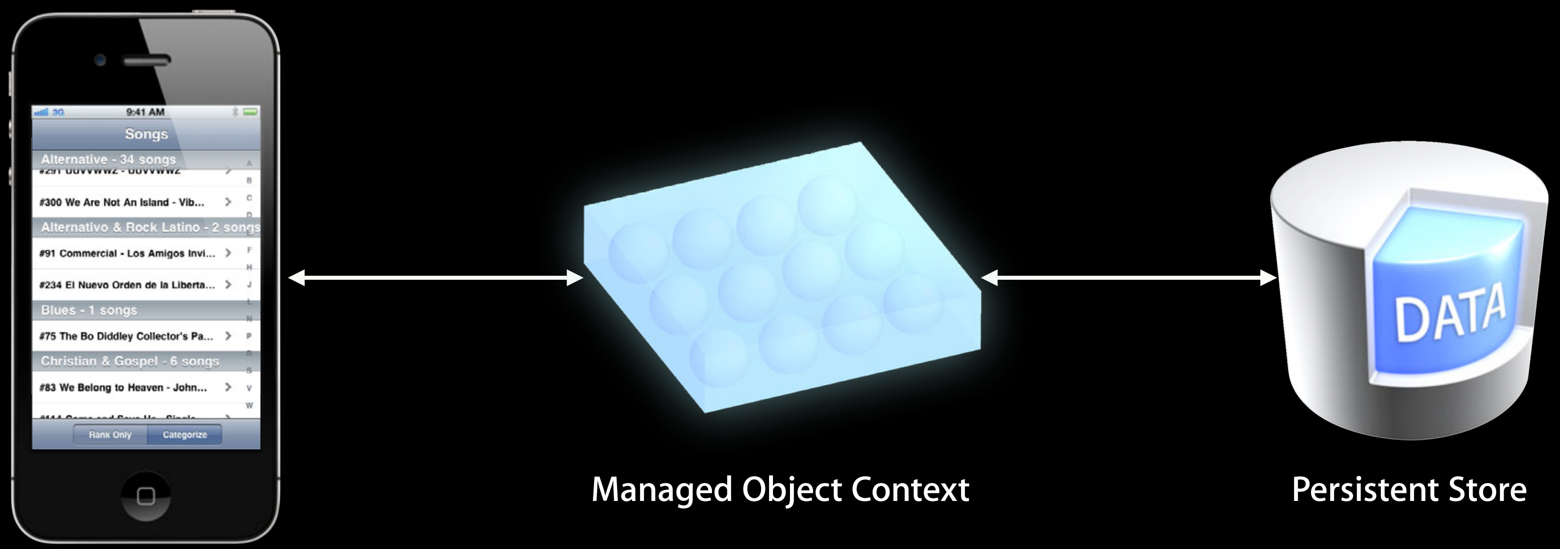
Christian & Gospel - 6 songs

#83 We Belong to Heaven - John...

#114 Come and Save Us - Single

Persistent Store

Core Data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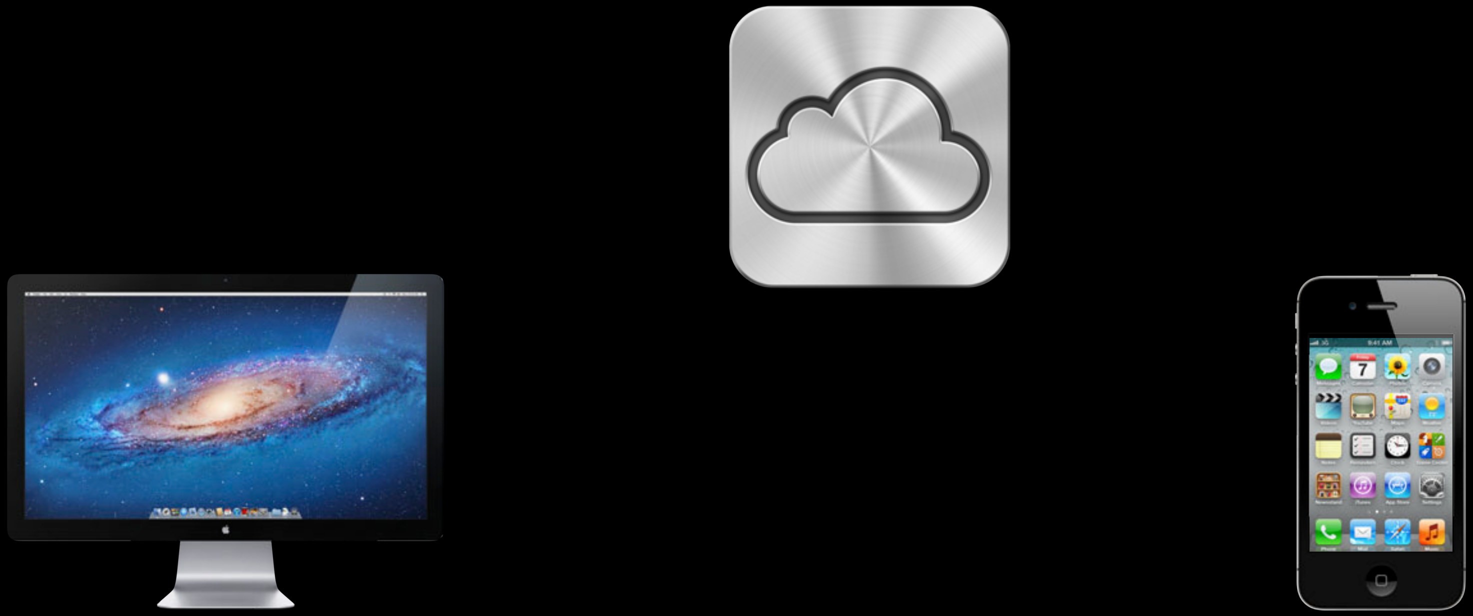
Rank Only
Categorize
DATA

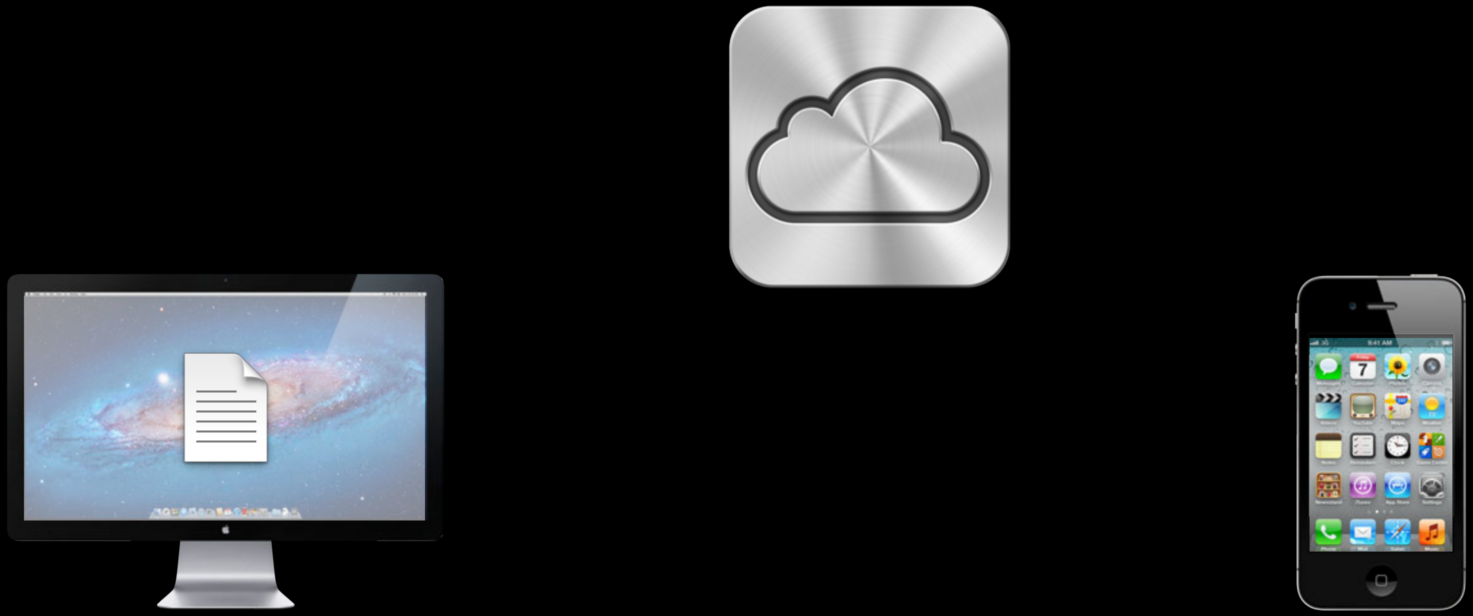
Managed Object Context

Persistent Store

Core Data + iCloud



Core Data + iCloud



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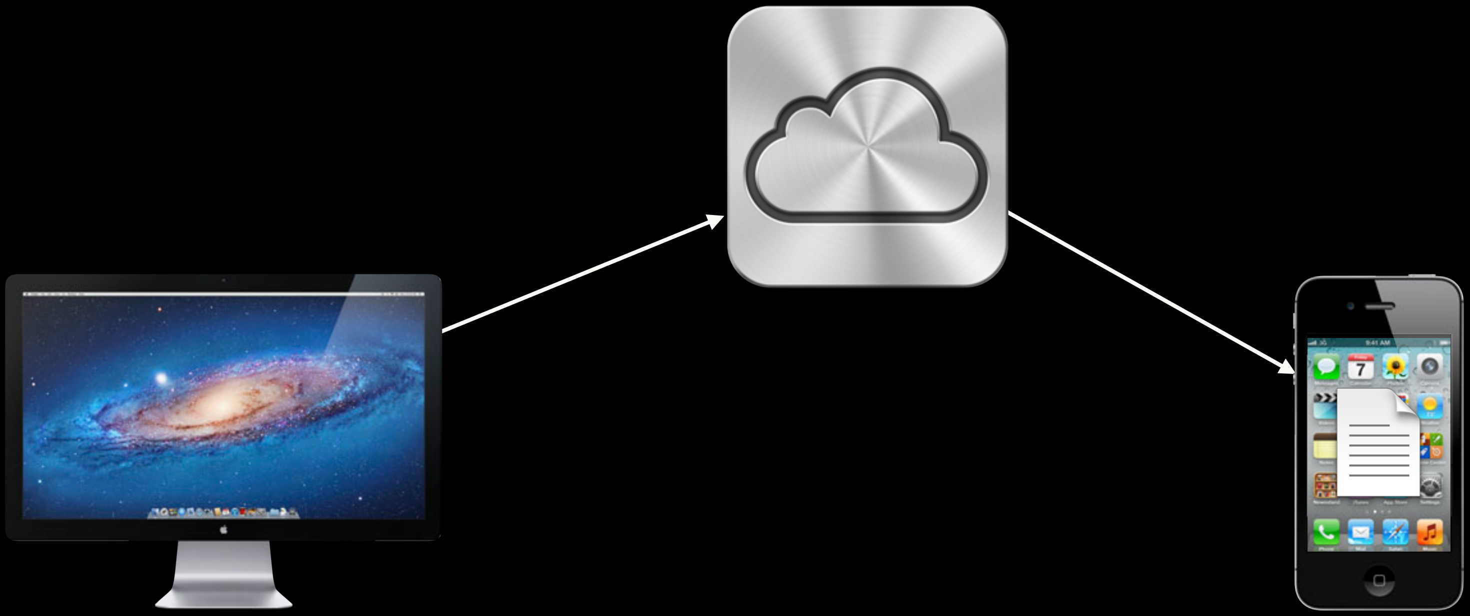


Core Data iCloud Features

- Per record conflict resolution
- Three-way merge

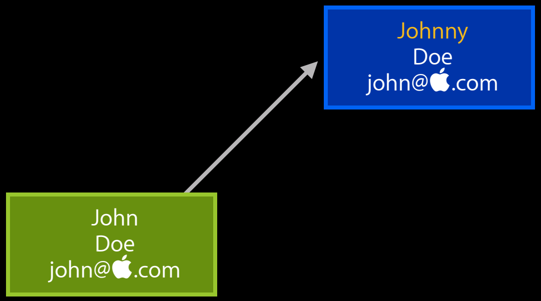
Three-Way Merge

Preserve changes between systems

John
Doe
john@.com

Three-Way Merge

Preserve changes between systems



Johnny
Doe
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Three-Way Merge

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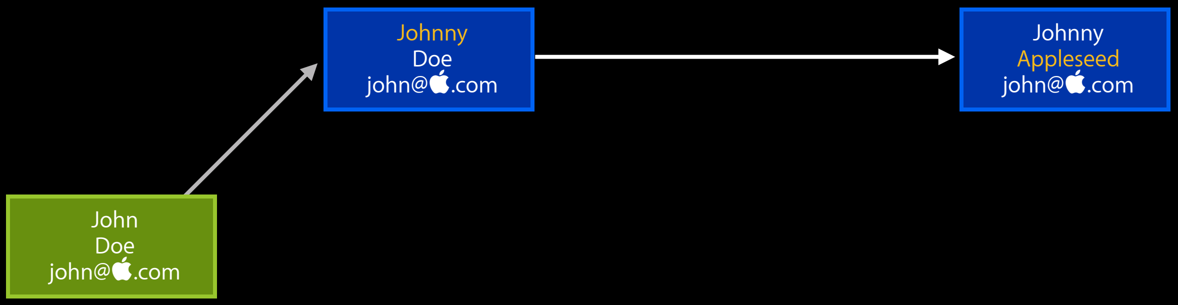

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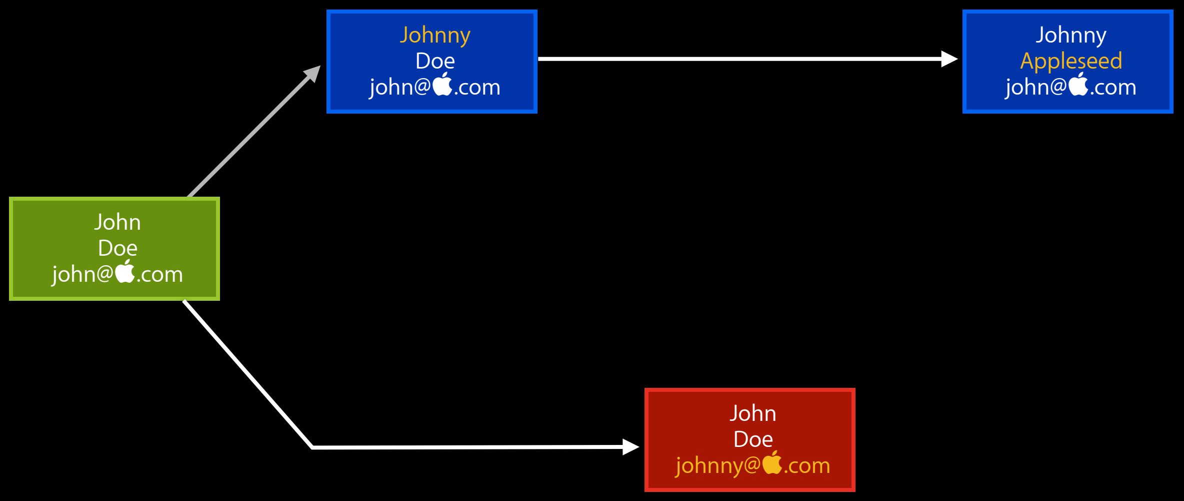

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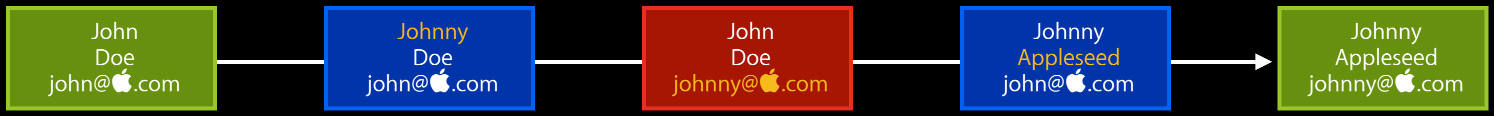

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Core Data iCloud Features

- Transfer incremental changes
- Asynchronous import
- Lightweight schema migration

What You Need

- Xcode and OS X/iOS SDK
  - Core Data project template (or Sample Code)
  - iCloud Entitlements

What You Need

- Xcode and OS X/iOS SDK
  - Core Data project template (or Sample Code)
  - iCloud Entitlements

- Provisioning Portal
  - App ID for iCloud
  - Provisioning Profile

Design

Launch

Lifecycle

Design

Launch

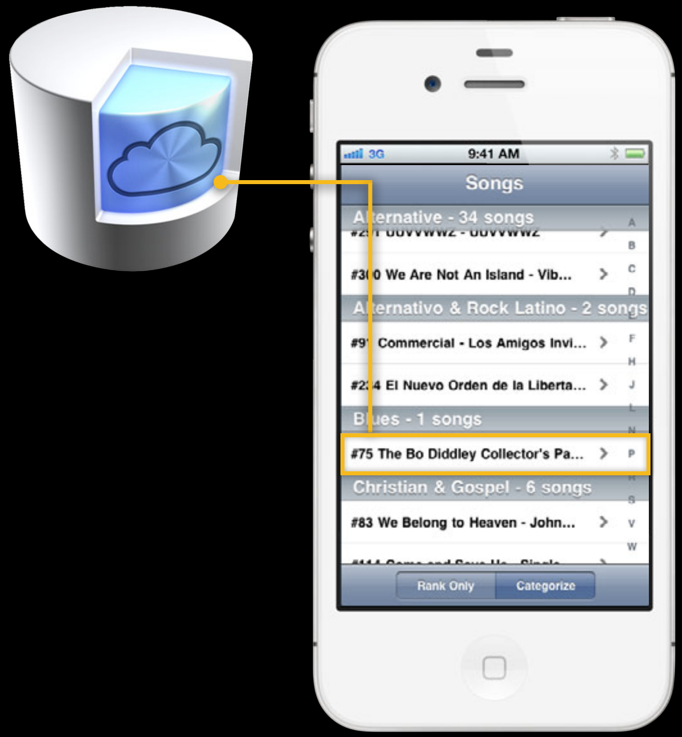
Lifecycle

User Expectations

- What data in iCloud?
- Consider the variables
  - Network
  - Account
  - Data

Where Does the Data Go?

- Different types of apps
- Where does app data live?
  - All in iCloud
  - Some in iCloud, some local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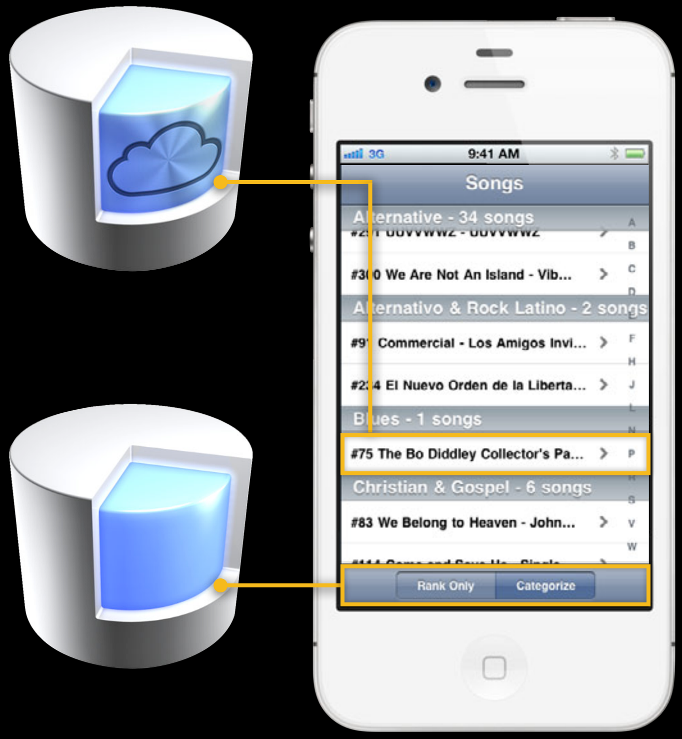
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What Goes into iCloud?

- Data goes into iCloud

Persistent Store

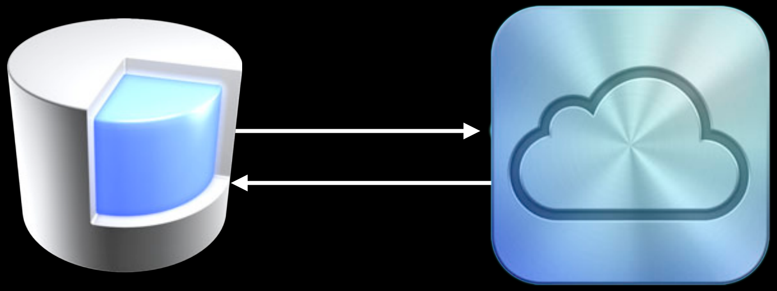
What Goes into iCloud?

- Data goes into iCloud
- Not Persistent Store file!

Never open an
SQLite database in iCloud

What Goes into iCloud?

- Data goes into iCloud
- Not Persistent Store file!
- Data transferred as incremental changes via iCloud



Persistent Store

Persistent Store as Cache

- Data in iCloud
- Access via Persistent Store
- Rebuild from data in iCloud

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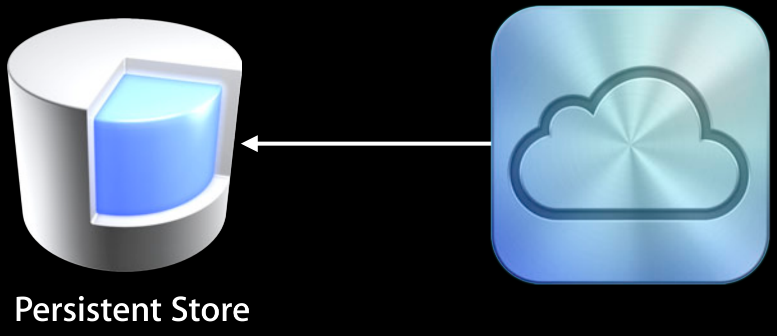
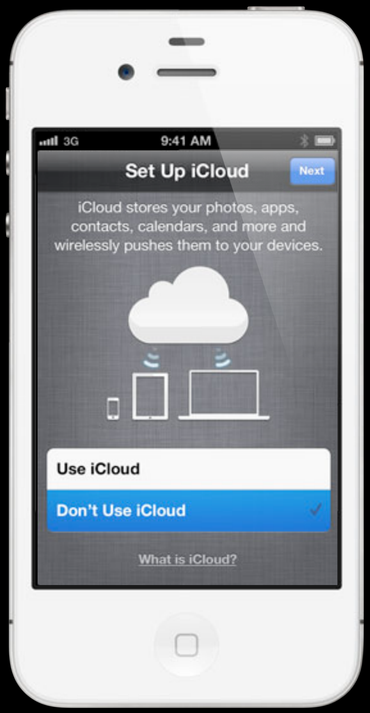


Fallback Store



Set Up iCloud

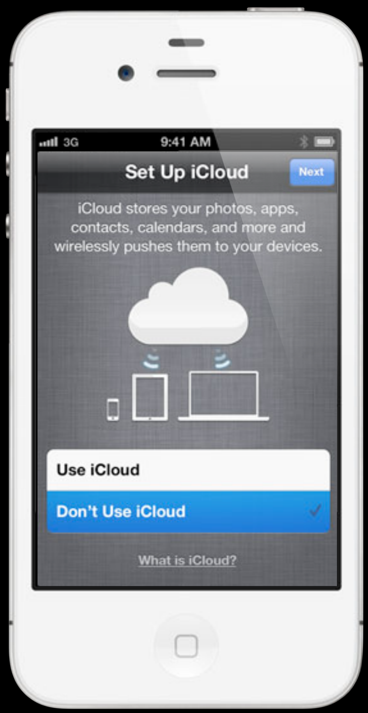
iCloud stores your photos, apps, contacts, calendars, and more and wirelessly pushes them to your devices.

Use iCloud

Don't Use iCloud ✓

Fallback Store

- No iCloud account?
  - Provide seamless app experience
  - Create local ‘fallback’ store



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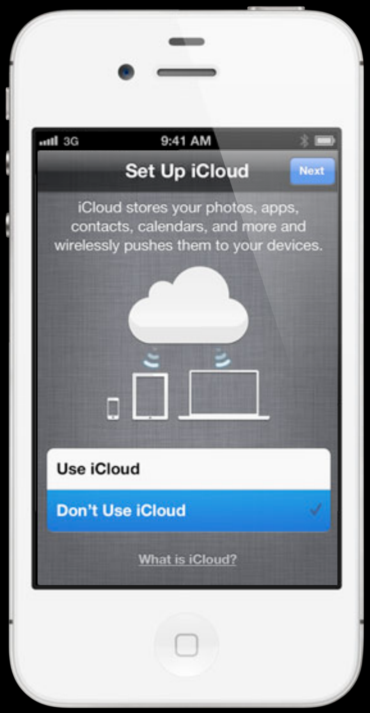
- Existing store (pre-iCloud app version)



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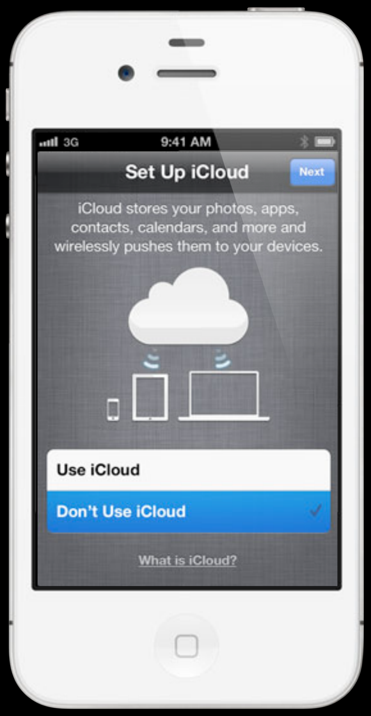
Fallback Store

- No iCloud account?
  - Provide seamless app experience
  - Create local 'fallback' store
- Existing store (pre-iCloud app version)
- Move store data into iCloud when enabled



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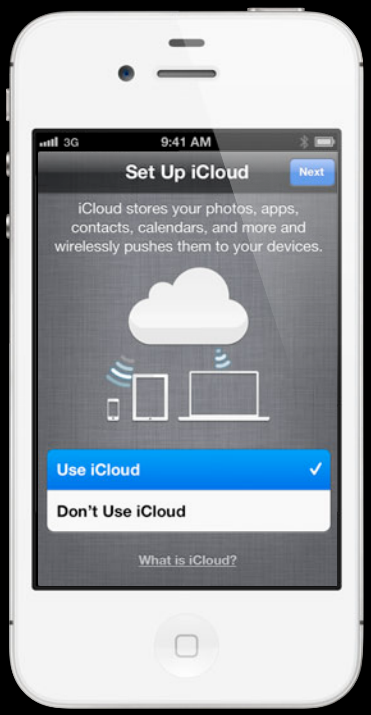
iCloud-Enabled Store Location

- Your decision
- Determined by access needs
  - Access requires iCloud account?
  - Or, allow read-only access without account?



Set Up iCloud

iCloud stores your photos, apps, contacts, calendars, and more and wirelessly pushes them to your devices.

Use iCloud ✓

Don't Use iCloud

Put Store in iCloud Container

Requires iCloud account for access

MyFolder.nosync

Put Store in iCloud Container

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- In container, but .nosync not transferred to iCloud

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- In container, but .nosync not transferred to iCloud
- Removed when the account changes
    - Rebuild store from iCloud data

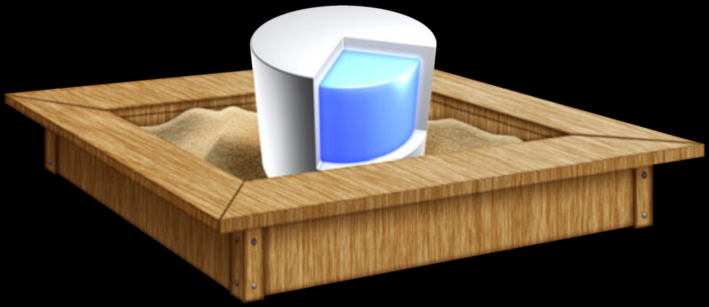
Put Store in iCloud Container

Requires iCloud account for access

- In container, but .nosync not transferred to iCloud
- Removed when the account changes
  - Rebuild store from iCloud data
- Simple
  - Guaranteed to match “ubiquitous content”
  - No iCloud? No store

Keep Store in Sandbox

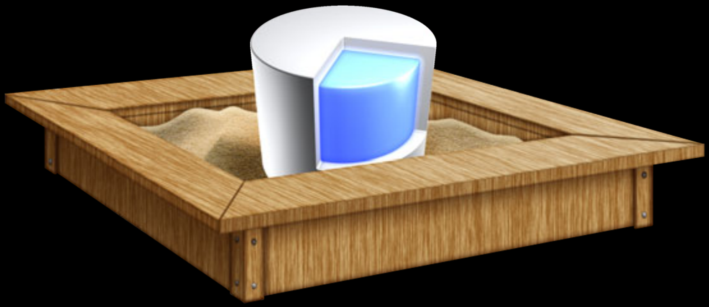
Allows read-only access without account



Keep Store in Sandbox

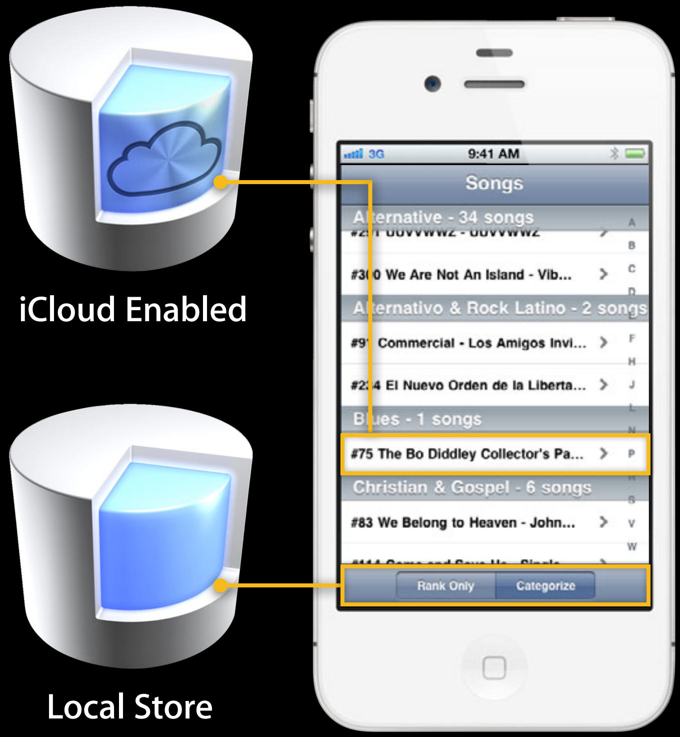
Allows read-only access without account

- Persistent store in App Sandbox, data in iCloud
- Store file survives account changes
- One store per-iCloud account
- Read-only access without account!
  - Use NSReadOnlyPersistentStoreOption
  - Optionally move data to fallback store



Partition Data

- Two Persistent Stores
  - One for local device data
  - One enables data in iCloud
- Use different models or configurations


iCloud Enabled

Local Store

3G
9:41 AM
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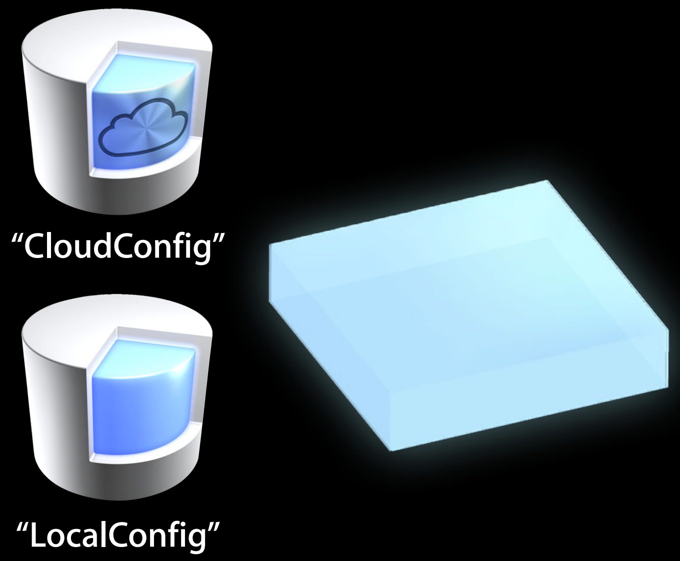
Rank Only
Categorize

Model Configurations

- Subset of entities from a data model
- Create store with configuration
  - Includes only those entities
- One context can access stores with different configurations (based on the same model)



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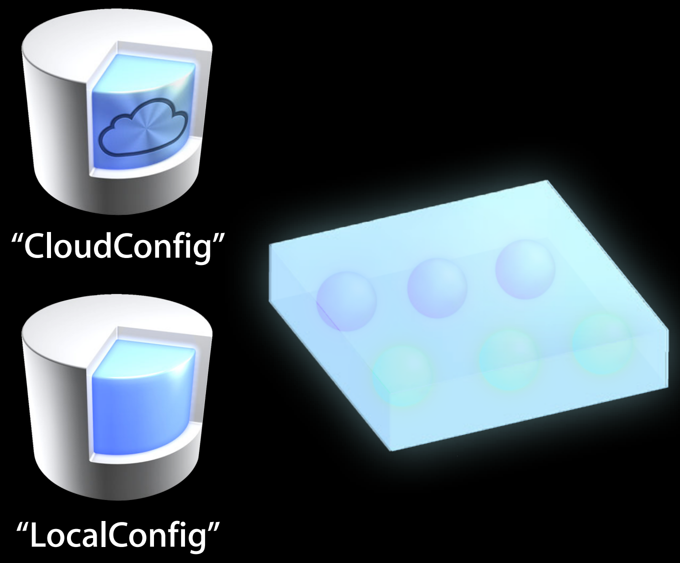
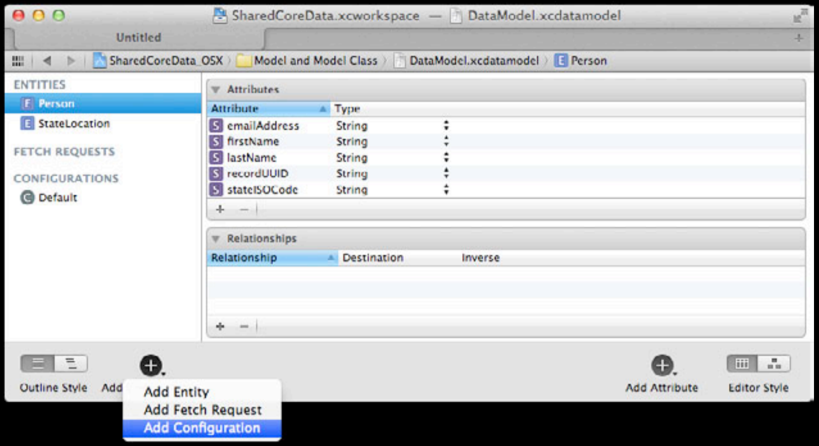


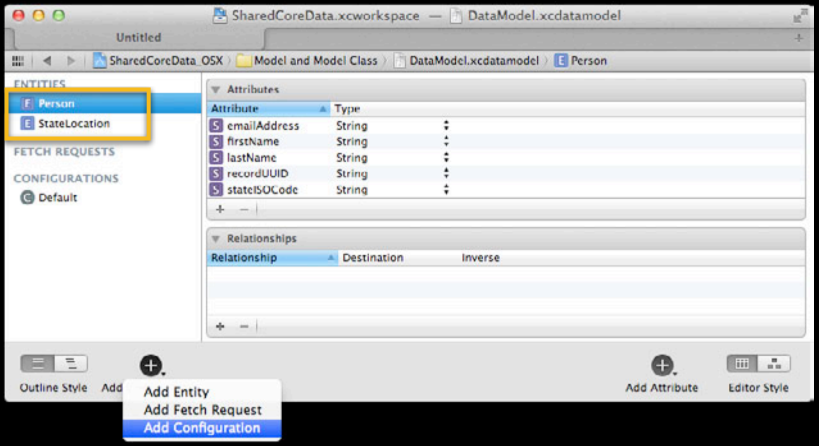
Configurations in Data Model



Attribute	Type
emailAddress	String
firstName	String
lastName	String
recordUUID	String
stateISOCode	String

Relationship	Destination	Inverse

Configurations in Data Model



SharedCoreData.xcworkspace — DataModel.xcdatamodel

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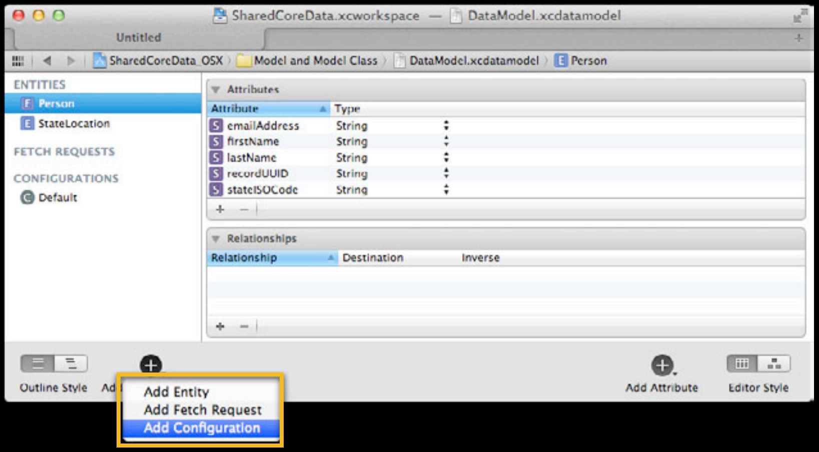

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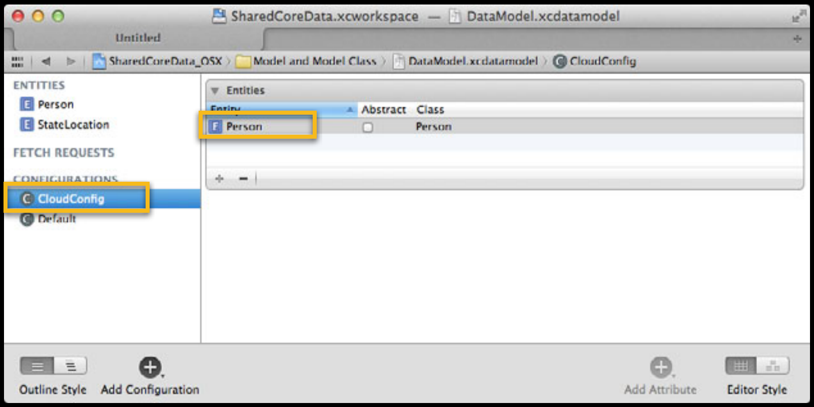
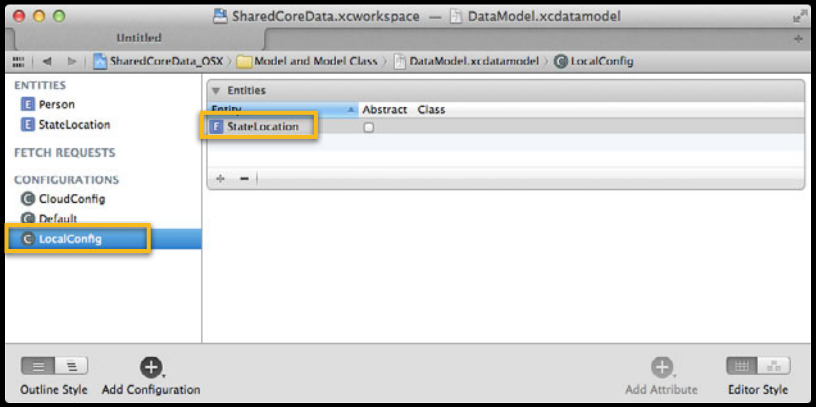


Entity	Abstract	Class
Person	□	Person

Configurations in Data Model



Configurations in Code

```
cloudStore = [psc addPersistentStoreWithType: NSSQLiteStoreType
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                                     options: cloudOptions
                                       error: &error];
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                                       error: &error];
localStore = [psc addPersistentStoreWithType: NSSQLiteStoreType
                               configuration: @”LocalConfig”
                                         URL: localStoreURL
                                     options: localOptions
                                       error: &error];
```

Summary

- User expectations
- Where data goes
- Store location trade-offs

Design

Launch

Lifecycle

Design

Launch

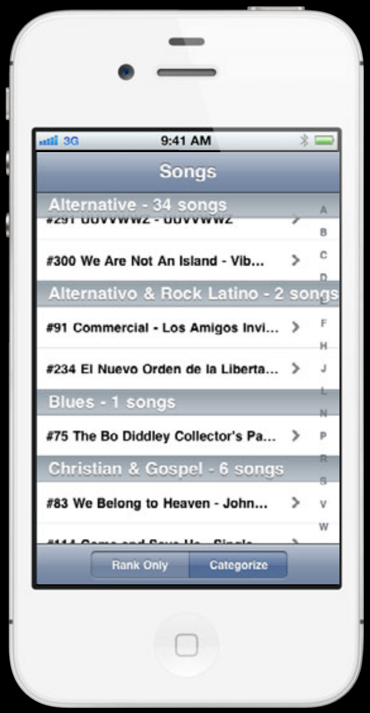
Lifecycle

Launch Steps

- First launch?
- New device, existing data

Goals

- Get to full UI
- Evaluate status
  - Ready to go?
  - Seed?
  - Fallback?
- Stay responsive



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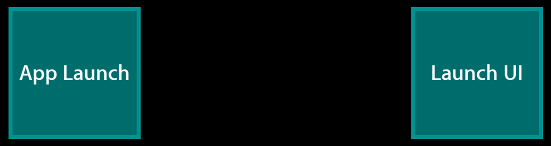
- Launch

- Launch

App Launch

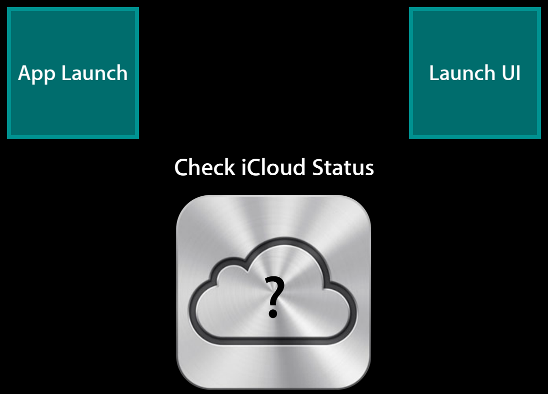
- Launch



App Launch

Launch UI

- Launch

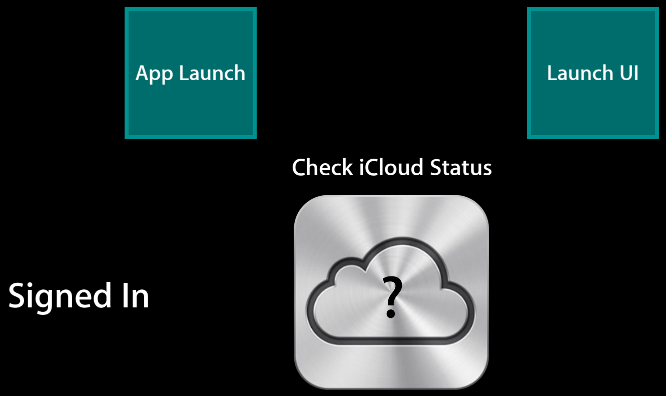


App Launch

Launch UI

Check iCloud Status

- Launch



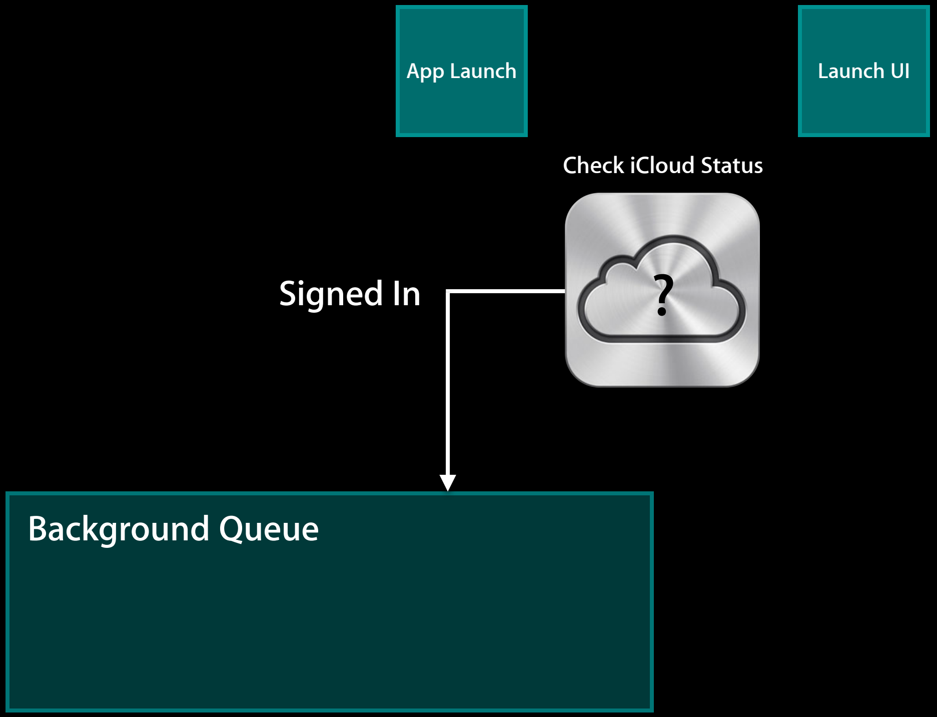
App Launch

Launch UI

Check iCloud Status

Signed In

- Launch



App Launch

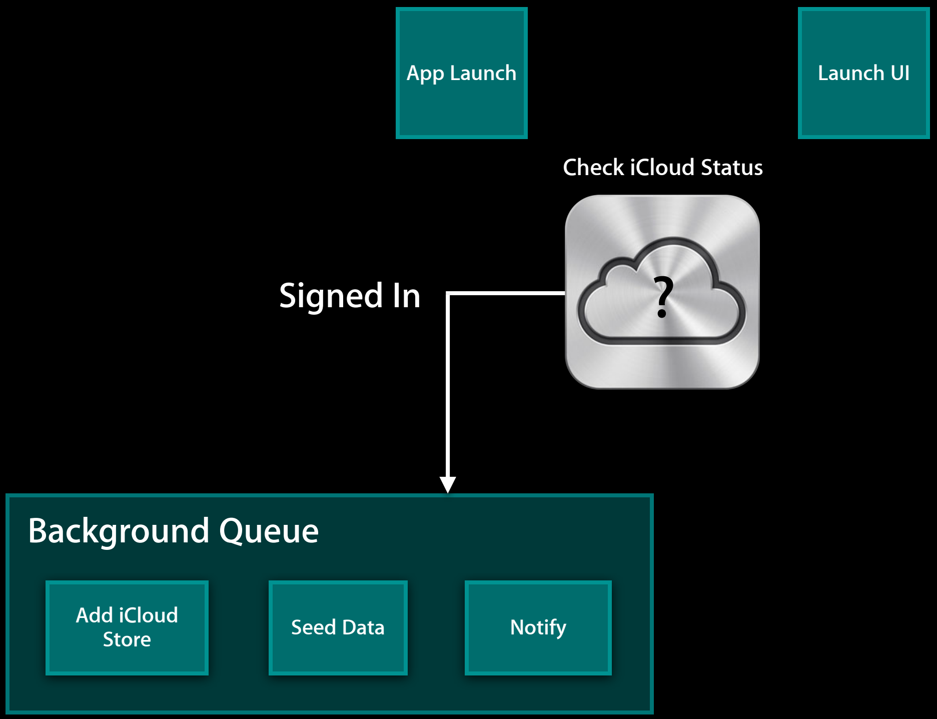
Launch UI

Check iCloud Status

Signed In

Background Queue

- Launch


App Launch

Launch UI

Check iCloud Status

Signed In

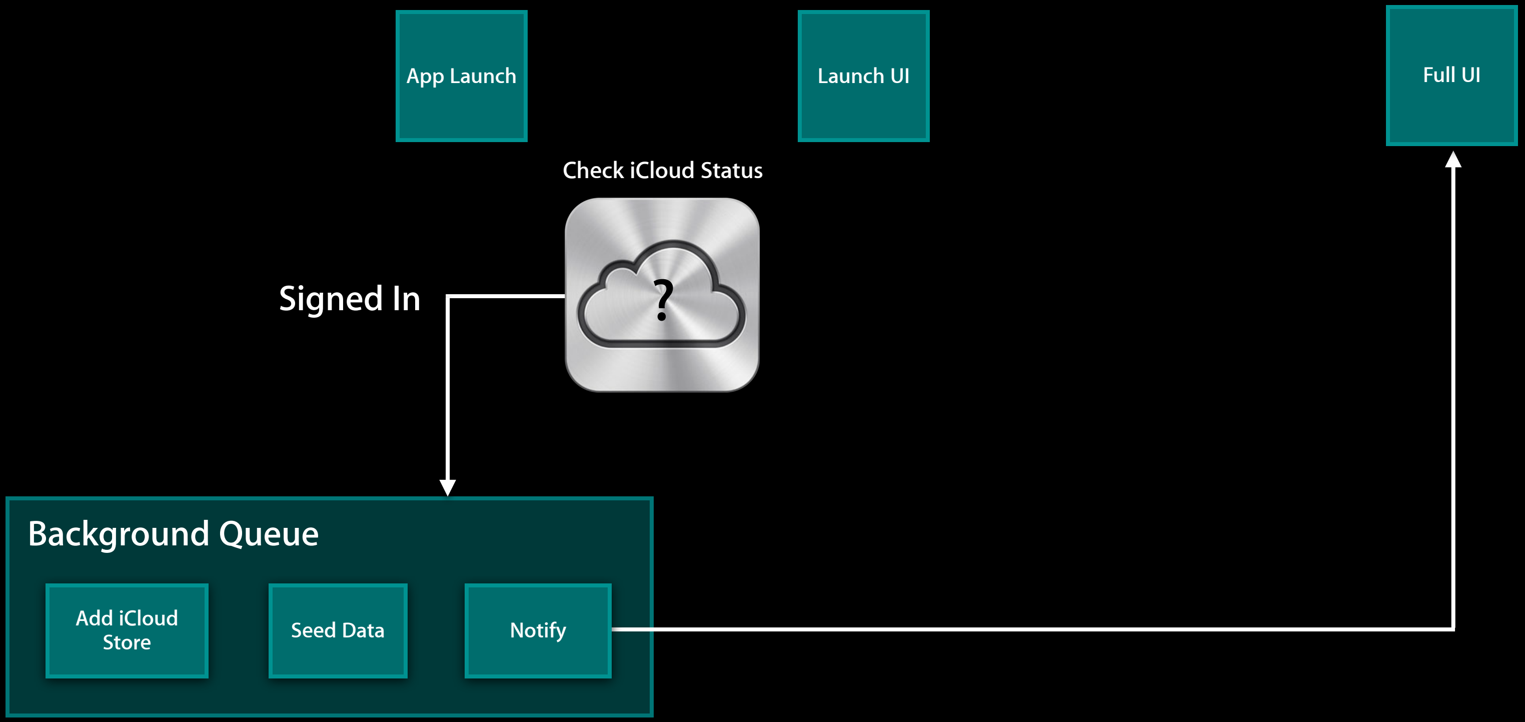
Background Queue

Add iCloud Store

Seed Data

Notify

- Launch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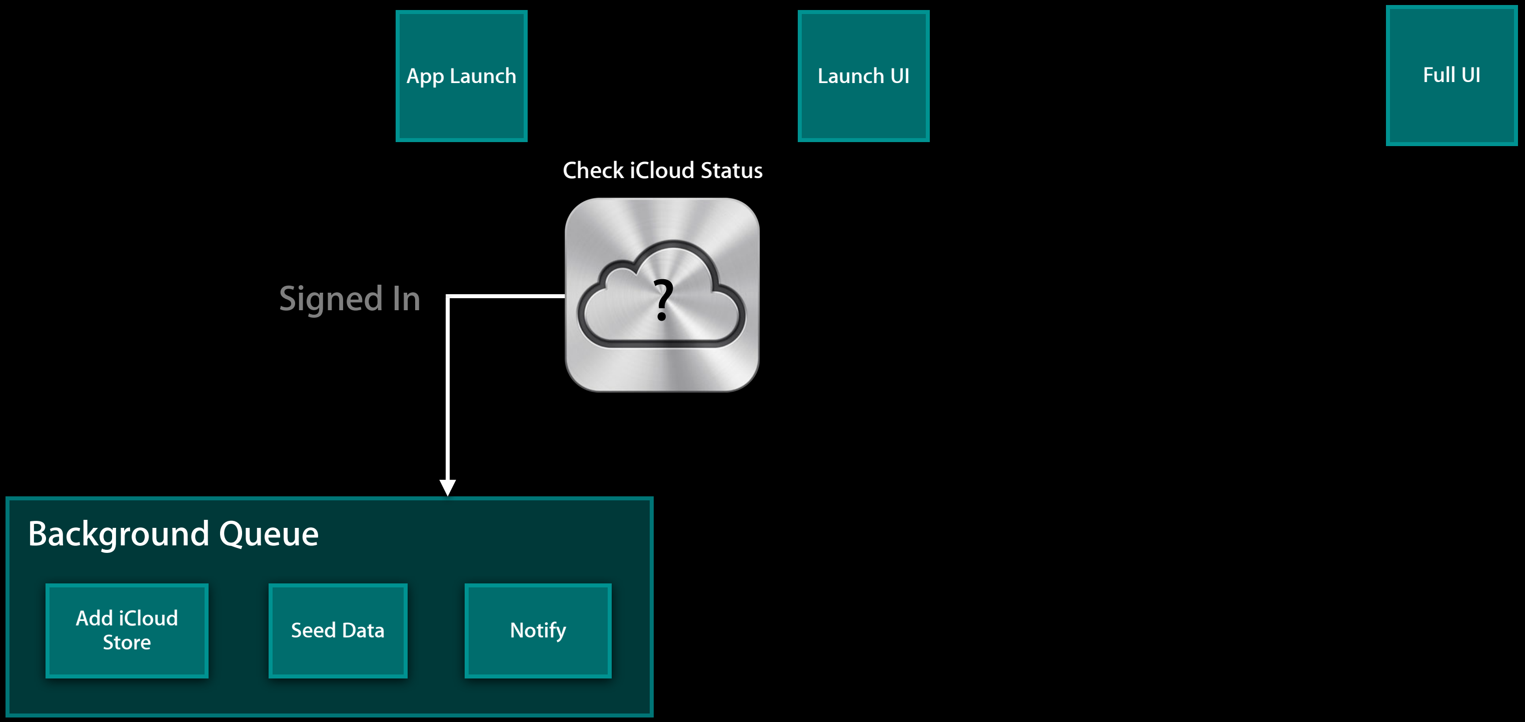

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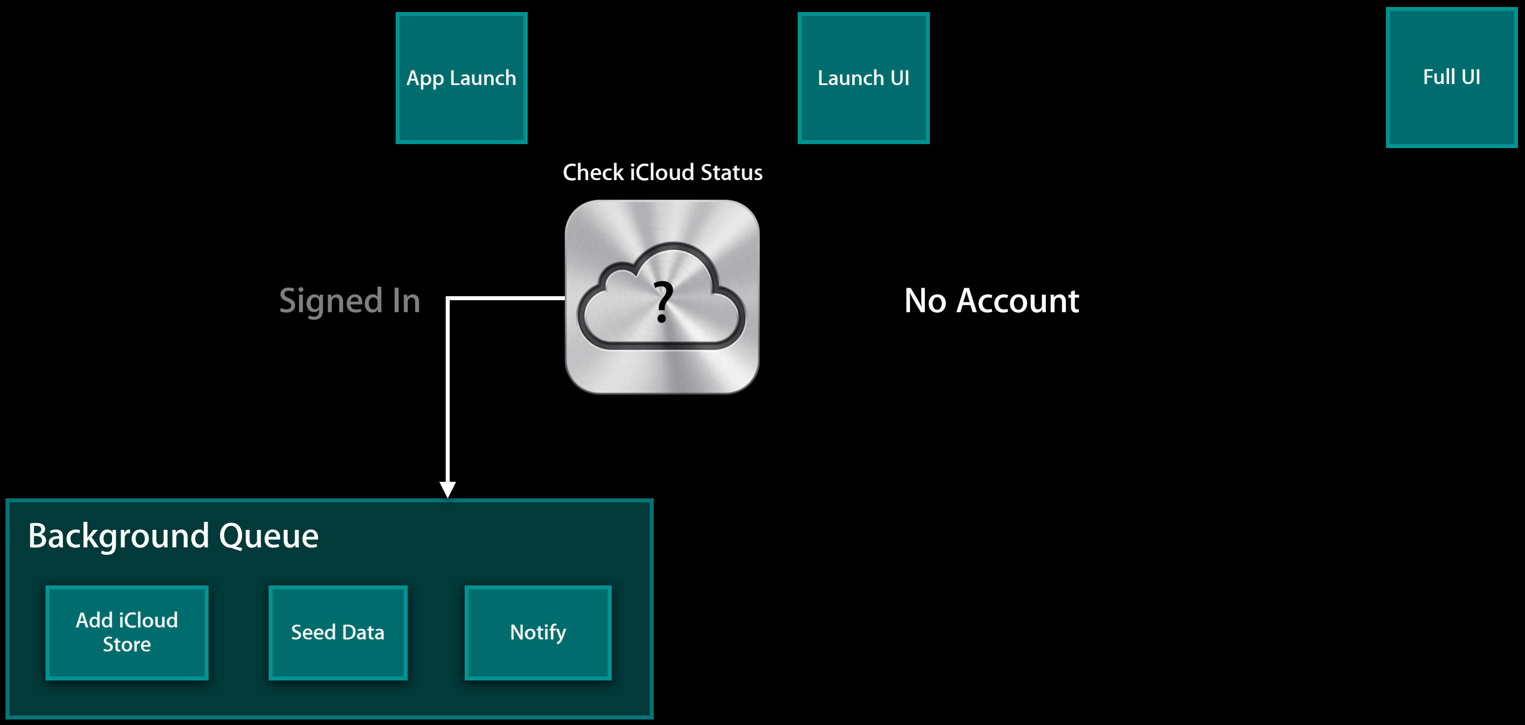


App Launch

Launch UI

Full UI

Check iCloud Status

?

Signed In

No Account

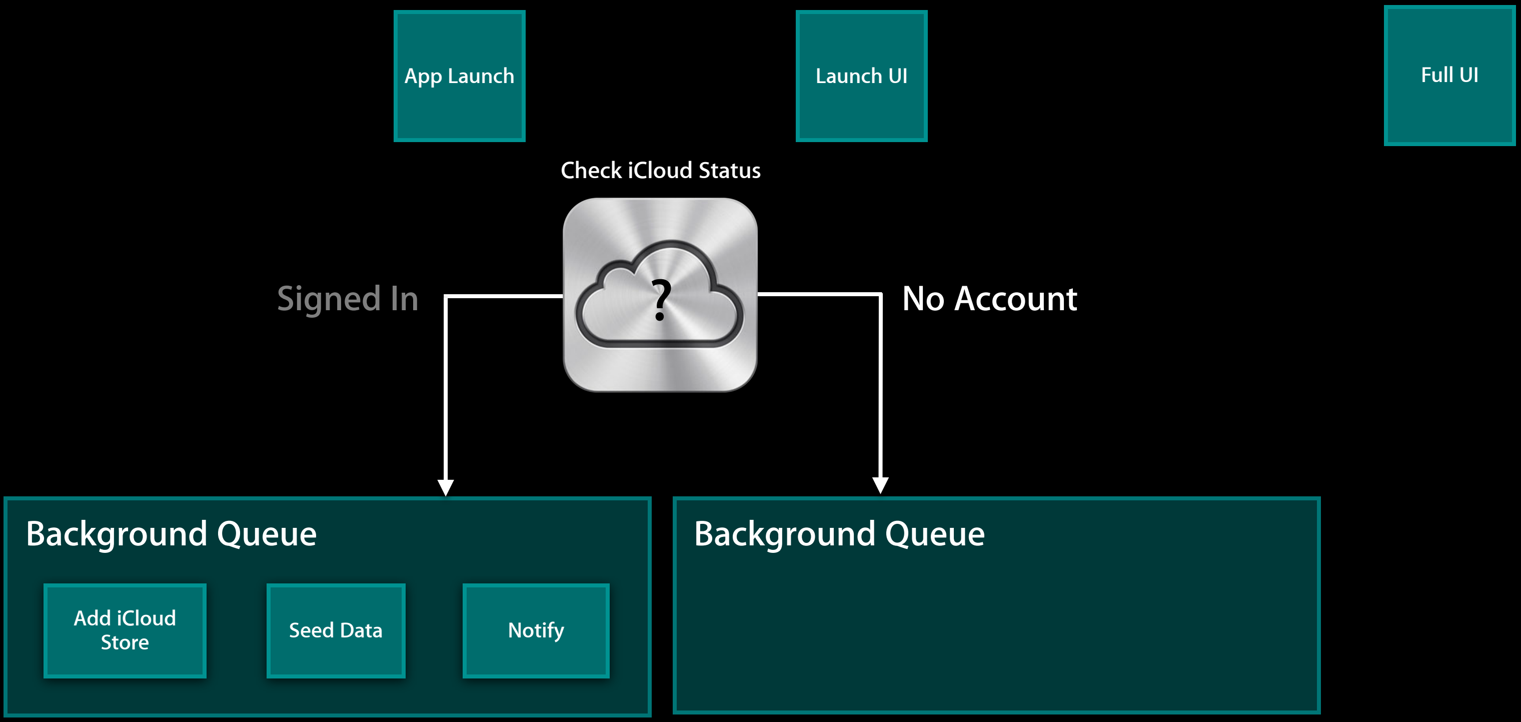
Background Queue

Add iCloud Store

Seed Data

Notify

- Launch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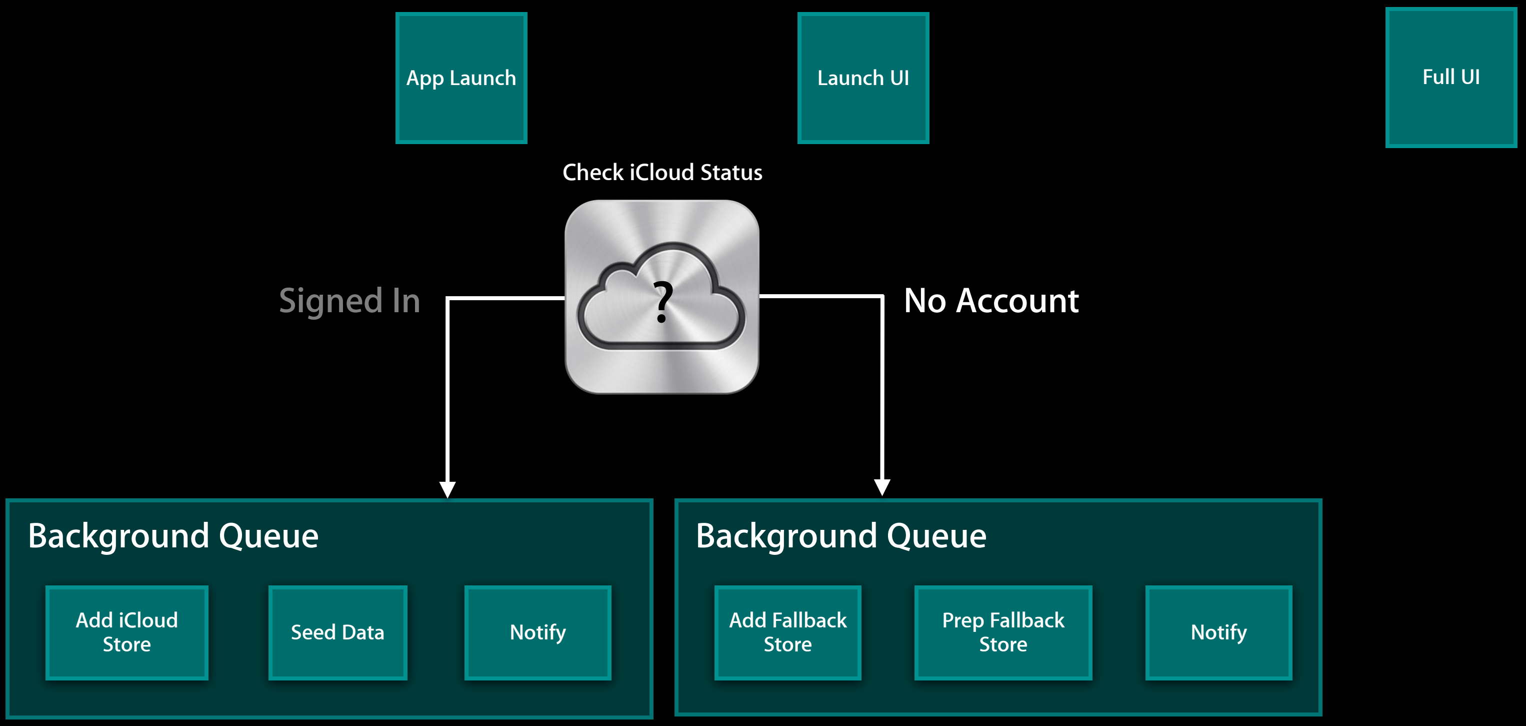


App Launch

Launch UI

Full UI

Check iCloud Status

Signed In

No Account

Background Queue

Add iCloud Store

Seed Data

Notify

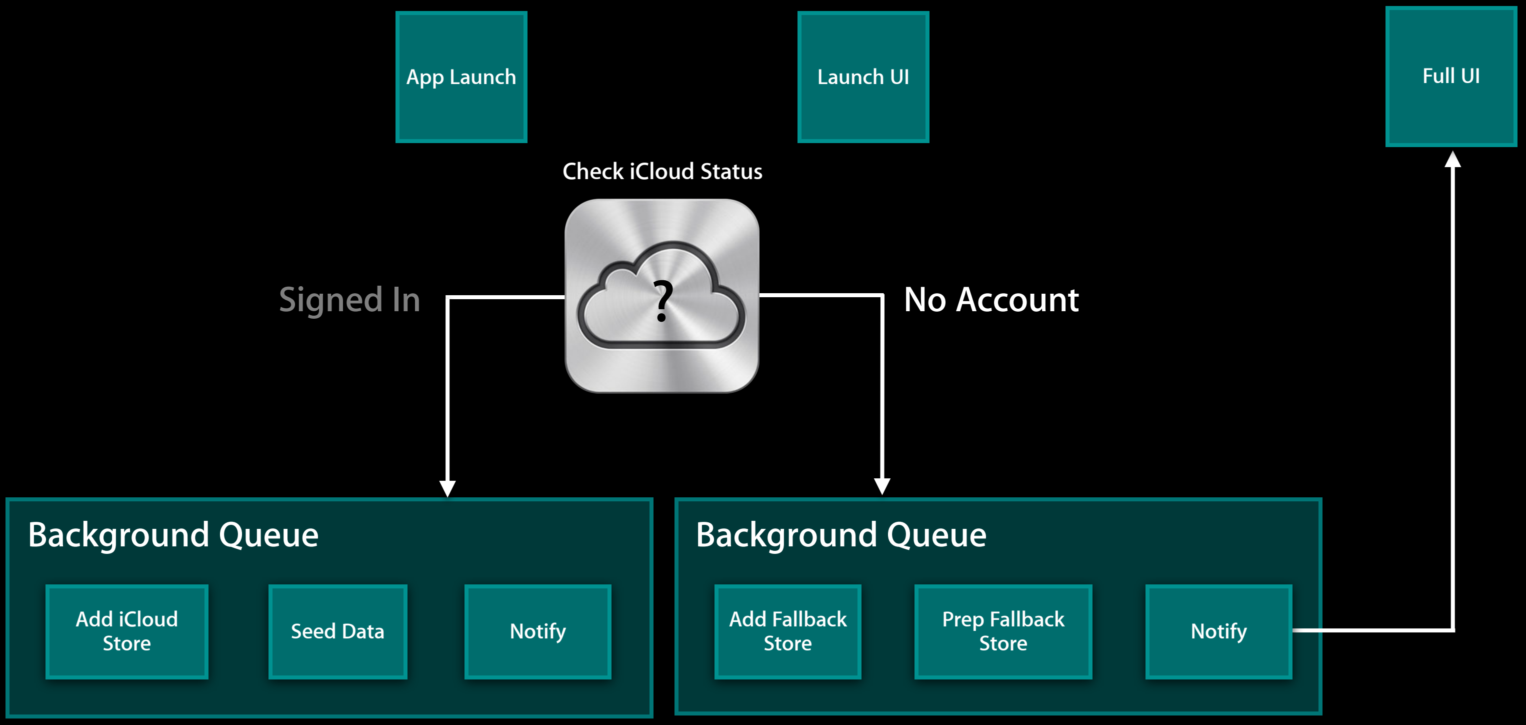
Background Queue

Add Fallback Store

Prep Fallback Store

Notify

- Launch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-init

- Launch
- Check iCloud Status

```
// Get token for iCloud user account
id currentToken = [fileManager ubiquityIdentityToken];
isiCloudSignedIn = (currentToken != nil);
```

–init

- Launch
- Check iCloud Status

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–loadPersistentStores

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (void)loadPersistentStores {

    queue = dispatch_get_global_queue(DISPATCH_QUEUE_PRIORITY_DEFAULT, 0);
    dispatch_async(queue, ^(void) {
       [self asyncLoadPersistentStores];
    });
}
```

-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (BOOL)loadiCloudStore {
    NSFileManager *fm = [[NSFileManager alloc] init];
    _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

    iCloudStoreURL = [self iCloudStoreURL];
    iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
    ...
    NSDictionary *options = @{
      NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
      NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
    [psc addPersistentStoreWithType: NSSQLiteStoreType
                      configuration: @”CloudConfig”
                                URL: iCloudStoreURL
                            options: options
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```

-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

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   NSFileManager *fm = [[NSFileManager alloc] init];
   _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

   iCloudStoreURL = [self iCloudStoreURL];
   iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
   ...
   NSDictionary *options = @{
     NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
     NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
   [psc addPersistentStoreWithType: NSSQLiteStoreType
                     configuration: @”CloudConfig”
                               URL: iCloudStoreURL
                           options: options
                             error: &localError];
```

-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (BOOL)loadiCloudStore {
   NSFileManager *fm = [[NSFileManager alloc] init];
   _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

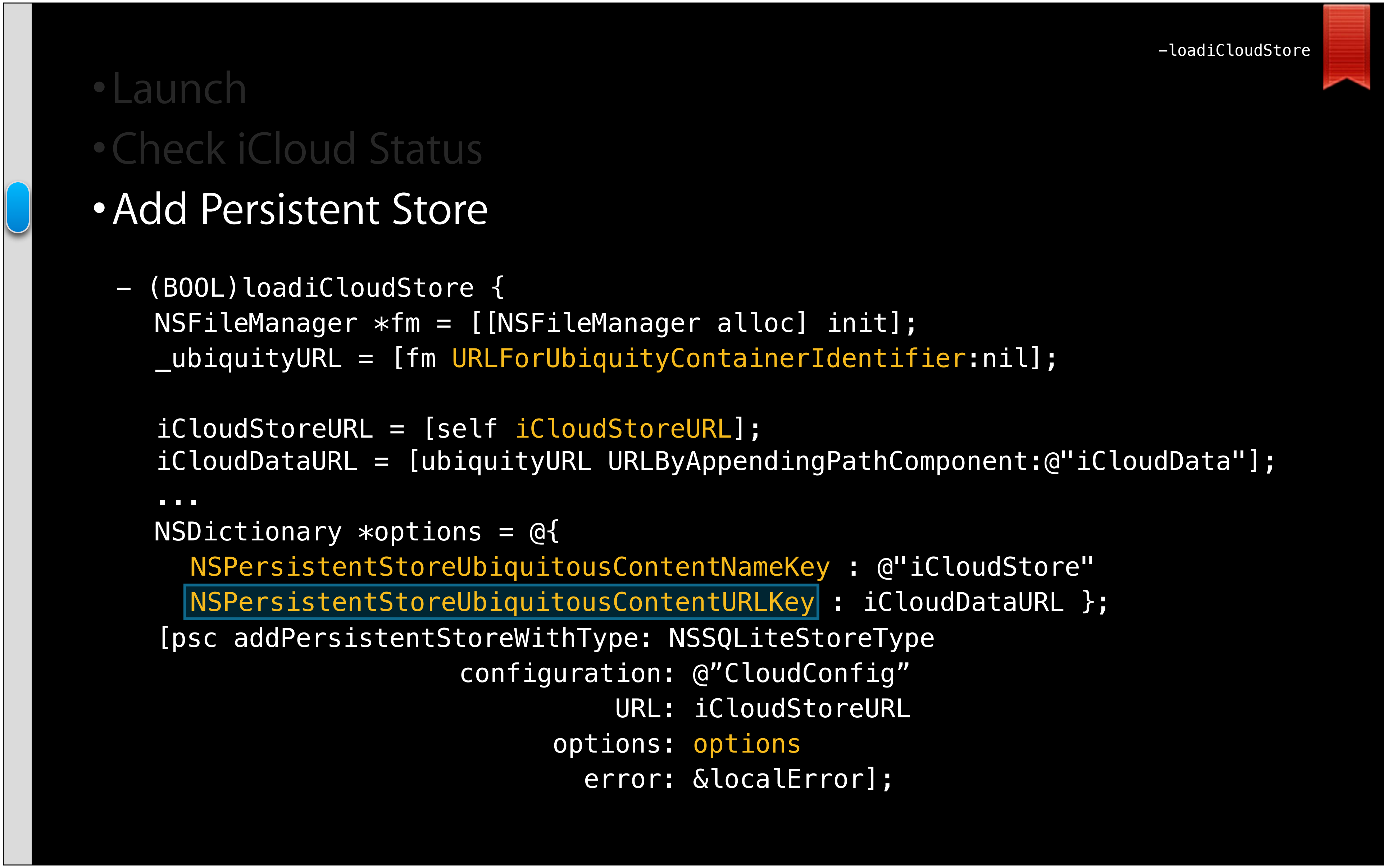
   iCloudStoreURL = [self iCloudStoreURL];
   iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
   ...
   NSDictionary *options = @{
     NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
     NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
   [psc addPersistentStoreWithType: NSSQLiteStoreType
                     configuration: @”CloudConfig”
                               URL: iCloudStoreURL
                           options: options
                             error: &localError];
```

-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (BOOL)loadiCloudStore {
   NSFileManager *fm = [[NSFileManager alloc] init];
   _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

   iCloudStoreURL = [self iCloudStoreURL];
   iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
   ...
   NSDictionary *options = @{
     NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
     NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
   [psc addPersistentStoreWithType: NSSQLiteStoreType
                     configuration: @”CloudConfig”
                               URL: iCloudStoreURL
                           options: options
                             error: &localError];
```



-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (BOOL)loadiCloudStore {
   NSFileManager *fm = [[NSFileManager alloc] init];
   _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

   iCloudStoreURL = [self iCloudStoreURL];
   iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
   ...
   NSDictionary *options = @{
     NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
     NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
   [psc addPersistentStoreWithType: NSSQLiteStoreType
                      configuration: @”CloudConfig”
                                URL: iCloudStoreURL
                            options: options
                              error: &localError];
```

-loadiCloudStore

- Launch
- Check iCloud Status
- Add Persistent Store

```
- (BOOL)loadiCloudStore {
  NSFileManager *fm = [[NSFileManager alloc] init];
  _ubiquityURL = [fm URLForUbiquityContainerIdentifier:nil];

  iCloudStoreURL = [self iCloudStoreURL];
  iCloudDataURL = [ubiquityURL URLByAppendingPathComponent:@"iCloudData"];
  ...
  NSDictionary *options = @{
    NSPersistentStoreUbiquitousContentNameKey : @"iCloudStore"
    NSPersistentStoreUbiquitousContentURLKey : iCloudDataURL };
  [psc addPersistentStoreWithType: NSSQLiteStoreType
                      configuration: @”CloudConfig”
                                URL: iCloudStoreURL
                            options: options
                              error: &localError];
```

-asyncLoadPersistenStores

- Launch
- Check iCloud Status
- Add Persistent Store
- Seed Initial Data

```
- (void)asyncLoadPersistentStores {
    ...

    if ([self loadiCloudStore]) {
       ...
       [self seedPersistentStore:_iCloudStore
        withPersistentStoreAtURL:[self seedStoreURL]
                                error:&error];
    }
}
```

-application:didFinishLaunchingWithOptions:

- Launch
- Check iCloud Status
- Add Persistent Store
- Seed Initial Data
- Notify Store Ready

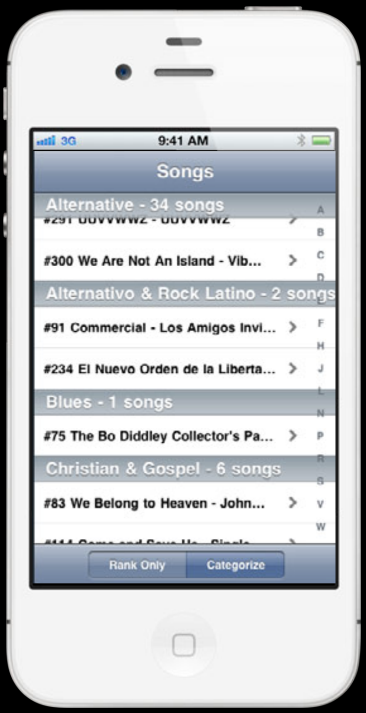
```
[[NSNotificationCenter defaultCenter]
          addObserver: rootViewController
             selector: @selector(reloadFetchedResults:)
                 name: NSPersistentStoreCoordinatorStoresDidChangeNotification
               object: psc];
```

-application:didFinishLaunchingWithOptions:

- Launch
- Check iCloud Status
- Add Persistent Store
- Seed Initial Data
- Notify Store Ready

```
[[NSNotificationCenter defaultCenter]
           addObserver: rootViewController
              selector: @selector(reloadFetchedResults:)
                  name: NSPersistentStoreCoordinatorStoresDidChangeNotification
                object: psc];
```

- Launch
- Check iCloud Status
- Add Persistent Store
- Seed Initial Data
- Notify Store Ready
- Full UI!



Songs

Alternative - 34 songs

#291 UUVVWWZ - UUVVWWZ

#300 We Are Not An Island - Vib...

Alternativo & Rock Latino - 2 songs

#91 Commercial - Los Amigos Invi...

#234 El Nuevo Orden de la Liberta...

Blues - 1 songs

#75 The Bo Diddley Collector's Pa...

Christian & Gospel - 6 songs

#83 We Belong to Heaven - John...

#114 Come and Save Us - Single

Design

Launch

Lifecycle

Design

Launch

Lifecycle

Application Lifecycle + iCloud

Application Lifecycle + iCloud

- Seeding
- Integrate changes
- Responding to User Events
- Performance
- Debugging

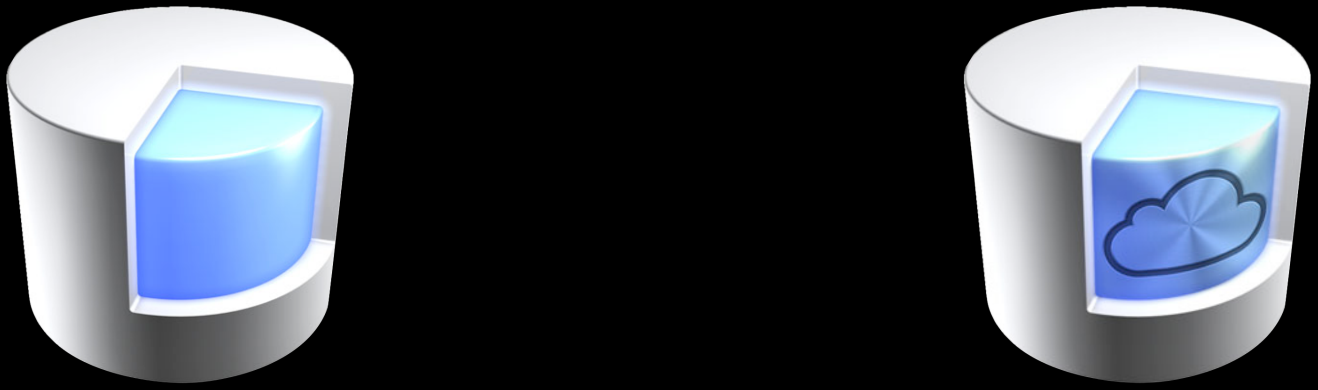
Demo

Sample application

Seeding

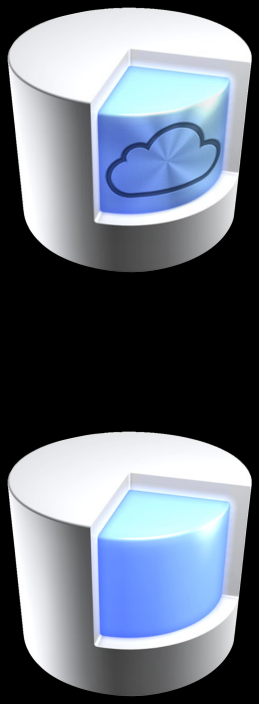
Seeding

Seeding



Seeding

- Add Seed Store



Seeding

- Add Seed Store

```
NSPersistentStoreUbiquitousContentNameKey
NSPersistentStoreUbiquitousContentURLKey
```

Seeding

- Add Seed Store

```
NSPersistentStoreUbiquitousContentNameKey
NSPersistentStoreUbiquitousContentURLKey
```

```
-addPersistentStore:
```

```
NSReadOnlyPersistentStoreOption
```

-seedPersistentStoreStore:
withPersistentStoreAtURL:
error:

Seeding

- Add Seed Store
- Migrate objects

```
NSUInteger batchSize = 500;
[fr setFetchBatchSize:batchSize];

seedObjs = [moc executeFetchRequest:fr error:&error];
```

-seedPersistentStoreStore:
withPersistentStoreAtURL:
error:

Seeding

- Add Seed Store
- Migrate objects

```
NSUInteger batchSize = 500;
[fr setFetchBatchSize:batchSize];

seedObjs = [moc executeFetchRequest:fr error:&error];

for (NSManagedObject *obj in seedObjs) {
    [self addManagedObjectToiCloudStore:obj];

    if (0 == (i % batchSize)) {
        if ([moc save:&error]) {
            [moc reset];
        }
    }

    i++;
}
```

Seeding

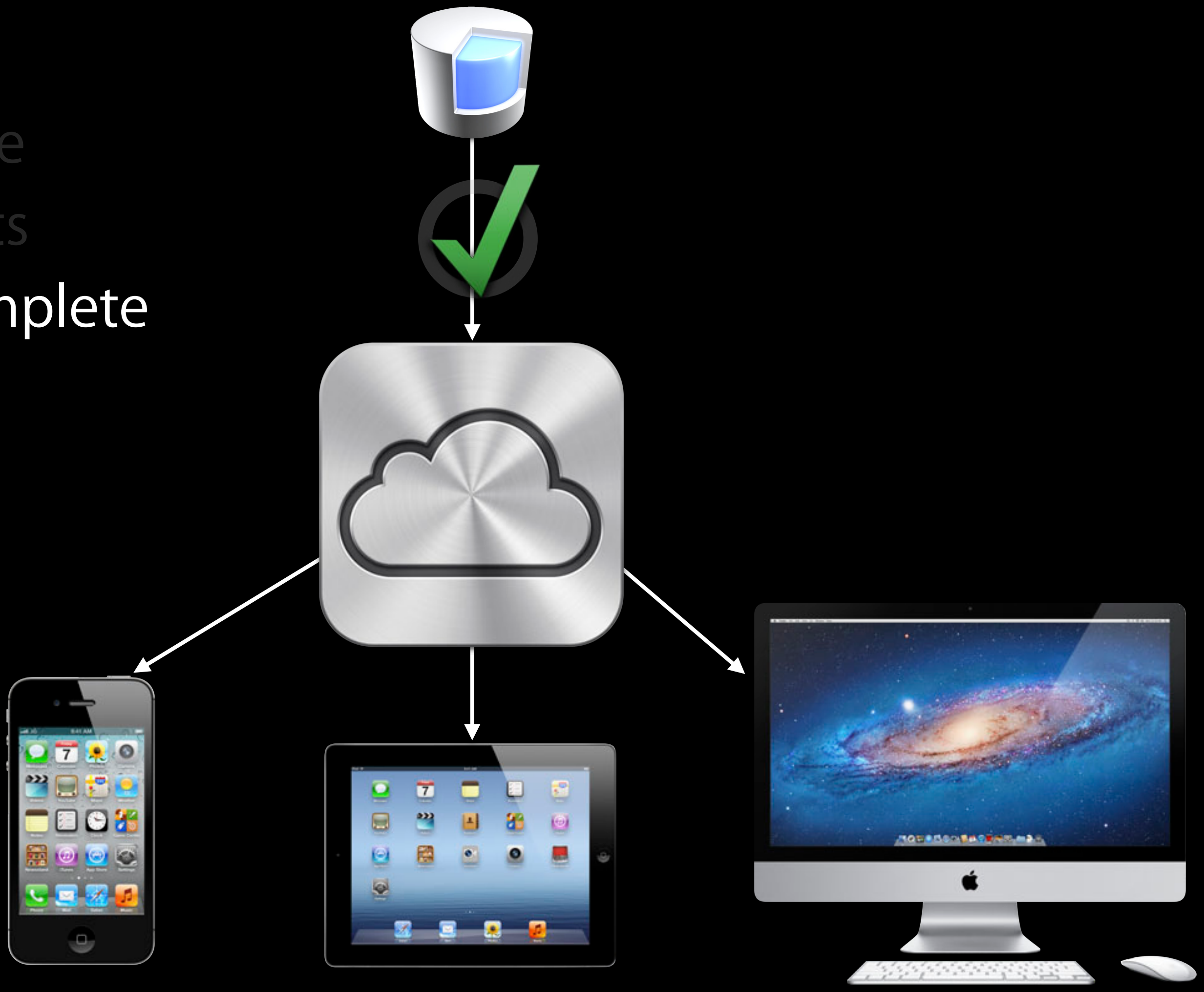
- Add Seed Store
- Migrate objects
- Mark seed complete

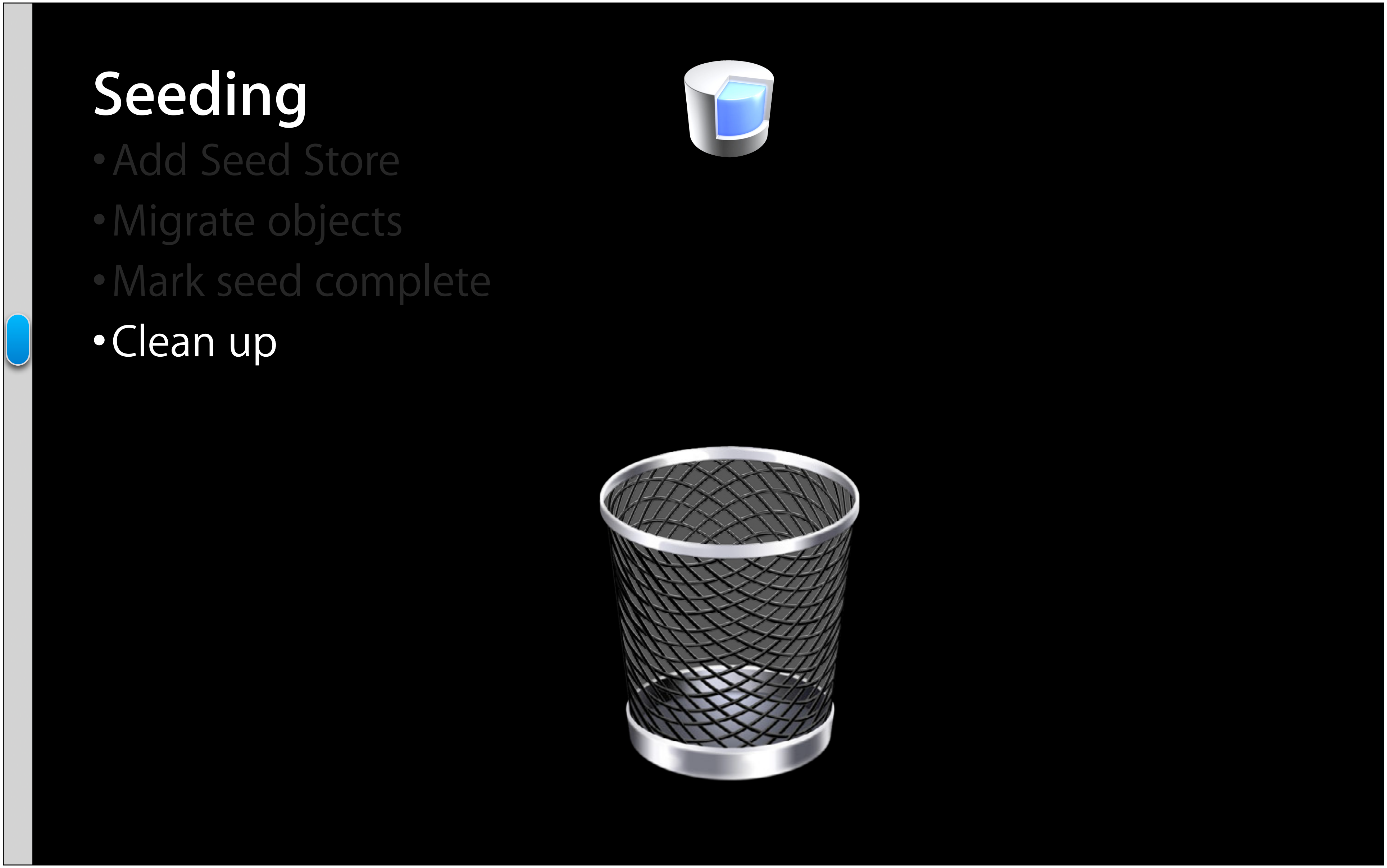
Seeding

- Add Seed Store
- Migrate objects
- Mark seed complete

Seeding

- Add Seed Store
- Migrate objects
- Mark seed complete





Seeding

- Add Seed Store
- Migrate objects
- Mark seed complete
- Clean up

Seeding

- Add Seed Store
- Migrate objects
- Mark seed complete
- Clean up

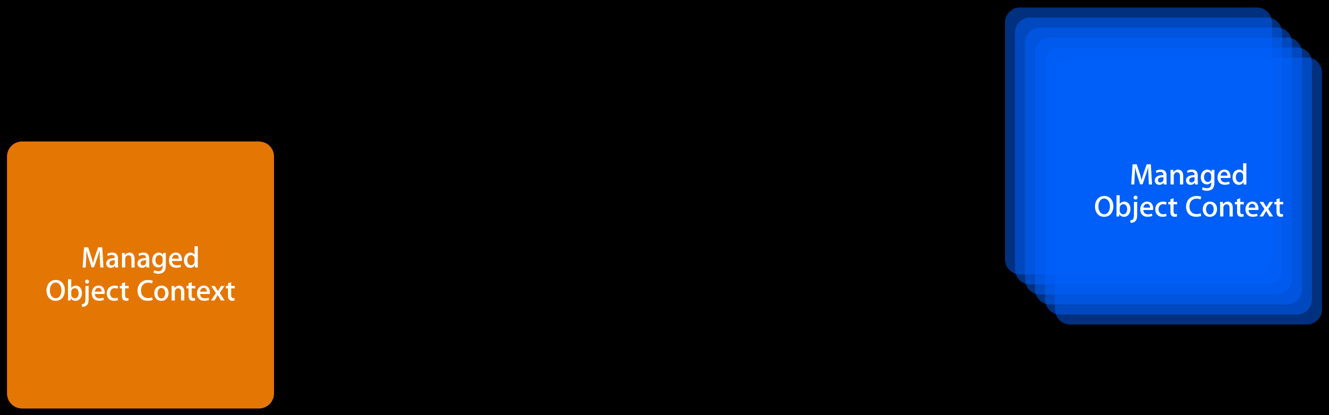
Demo

Seeding

Lifecycle

Integrating Changes

Change Integration

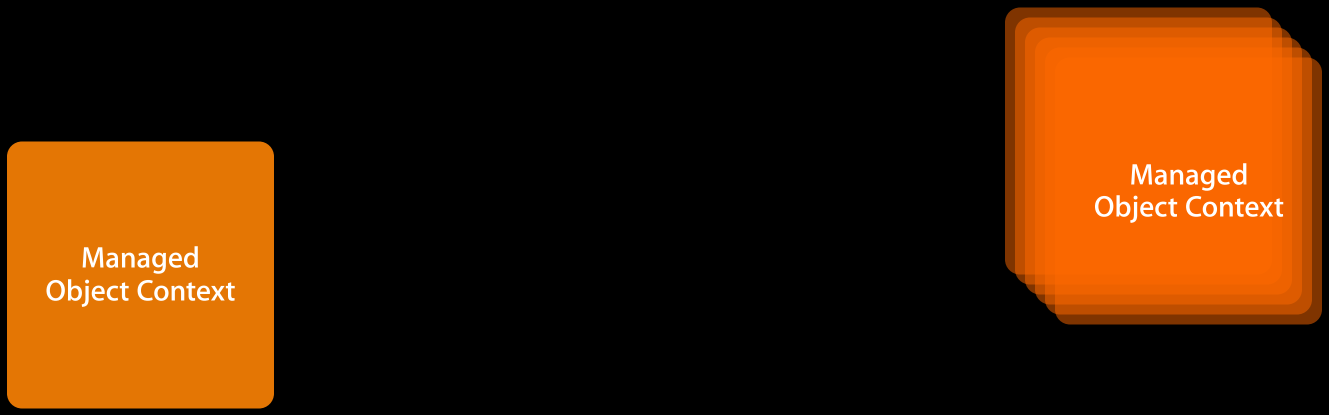


Managed Object Context

Managed Object Context

Change Integration

`NSManagedObjectContextDidSaveNotification`

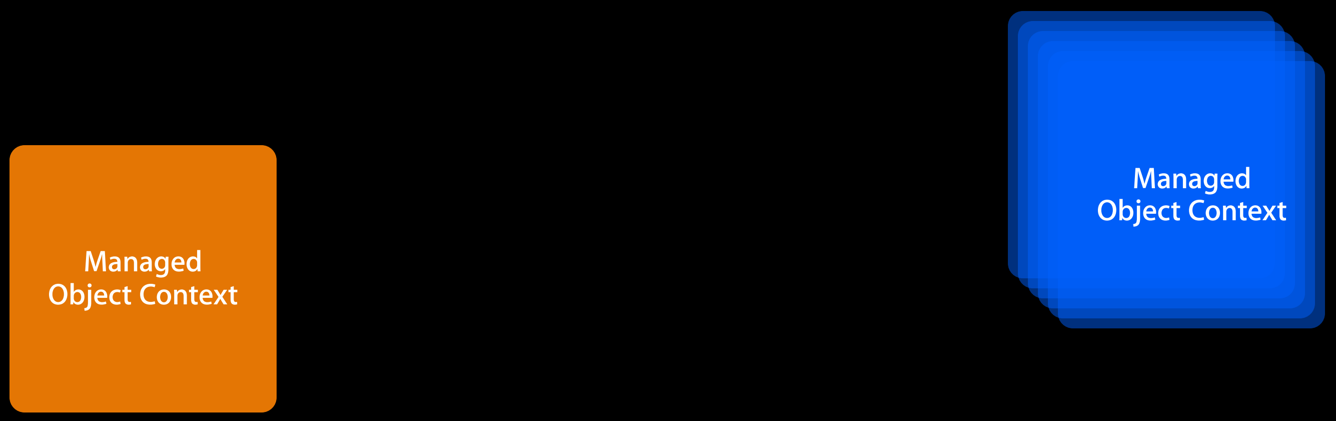


Managed Object Context

Managed Object Context

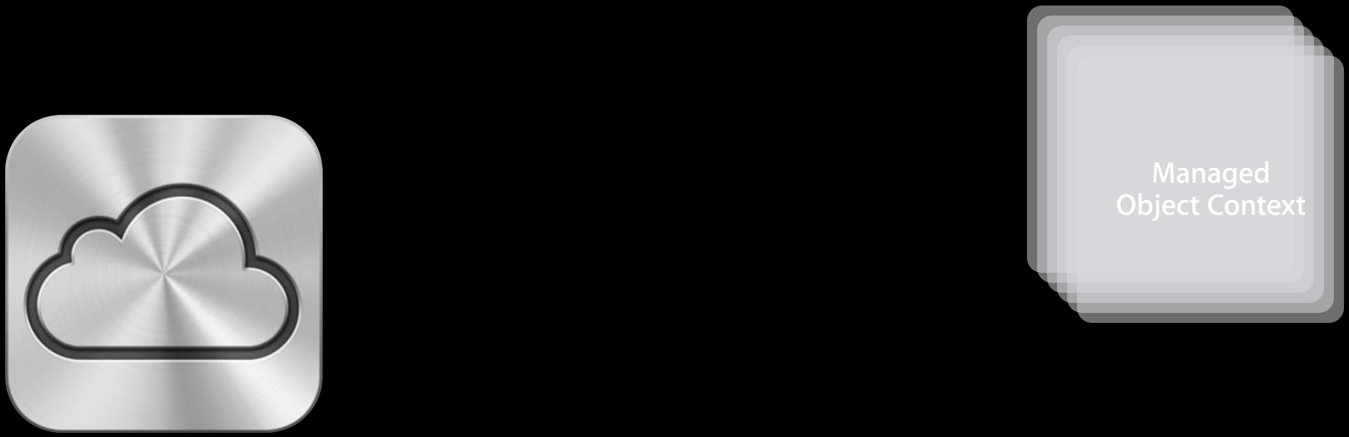
Change Integration

`NSManagedObjectContextDidSaveNotification`



Change Integration

```
NSManagedObjectContextDidSaveNotification
NSPersistentStoreDidImportUbiquitousContentChangesNotification
```



Change Integration

Change Integration

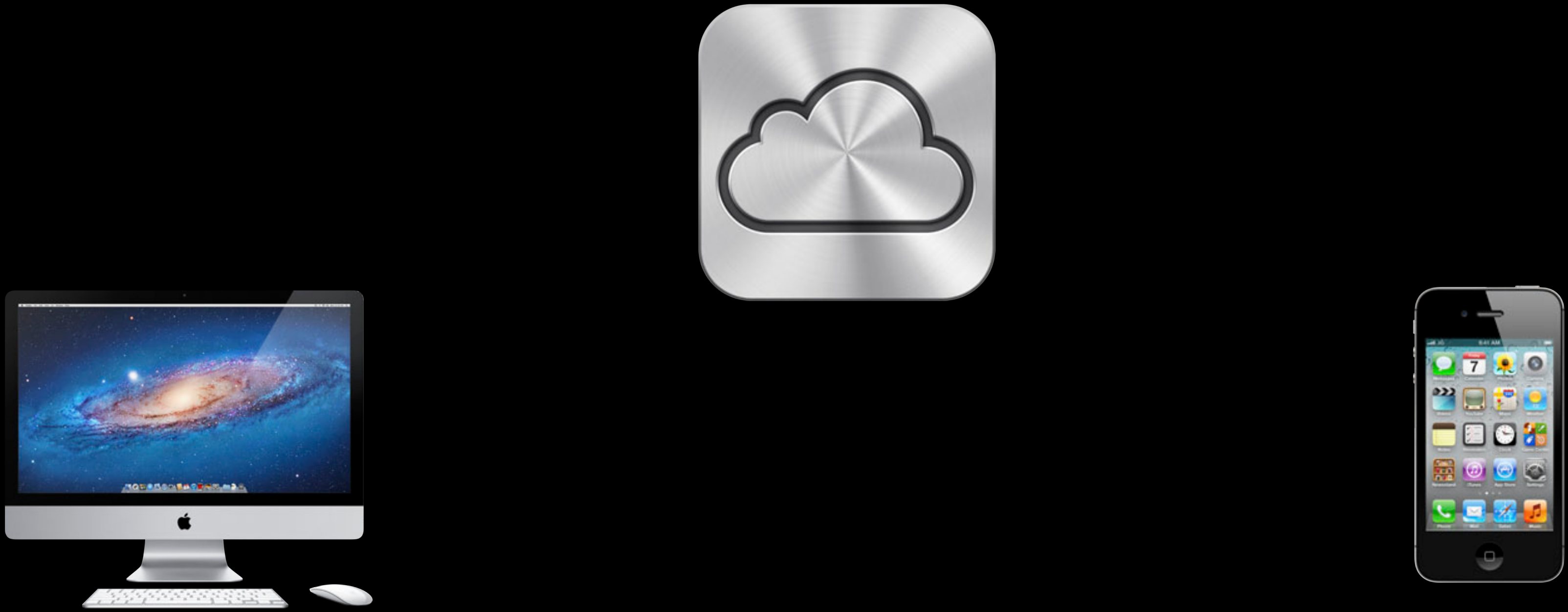
- `NSManagedObjectContextDidSaveNotification`
    - `NSManagedObjects`

Change Integration

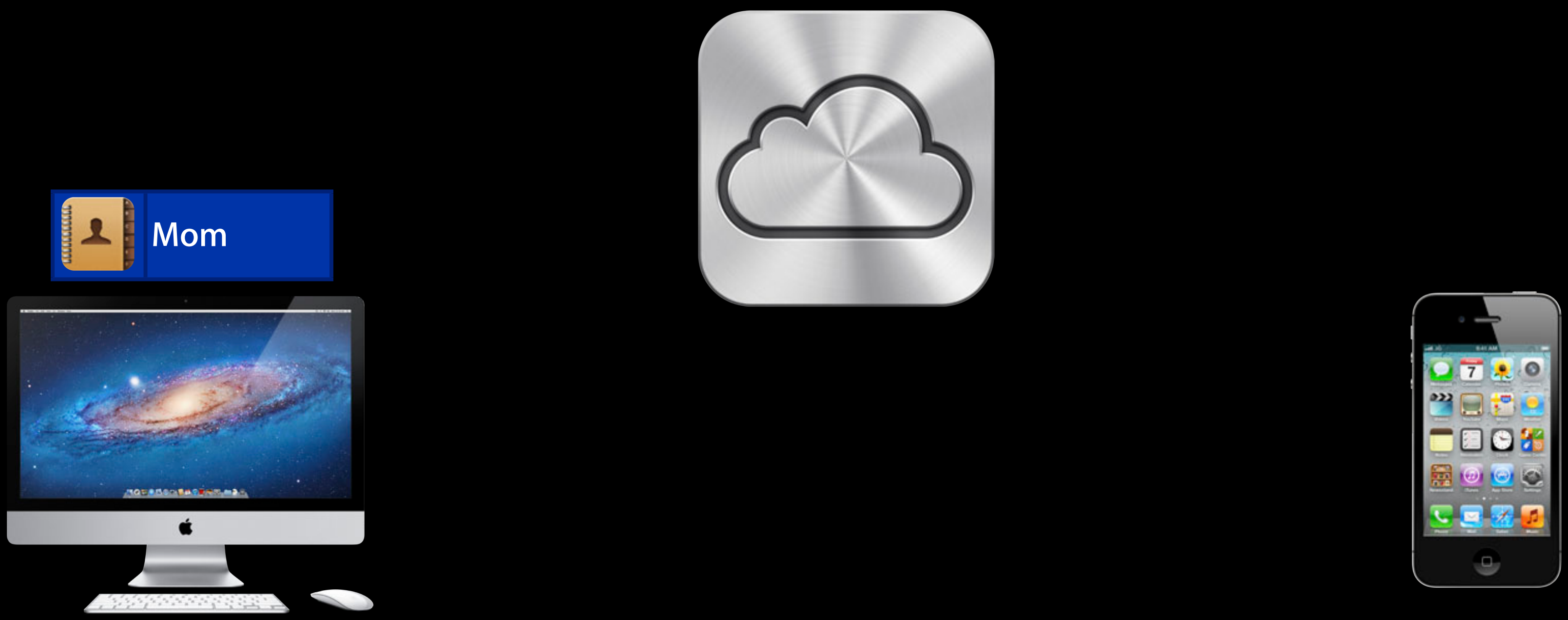
- NSManagedObjectContextDidSaveNotification
    - NSManagedObjects
- NSPersistentStoreDidImportUbiquitousContentChangesNotification
    - NSManagedObjectIDs

Integrating Changes

Integrating Changes

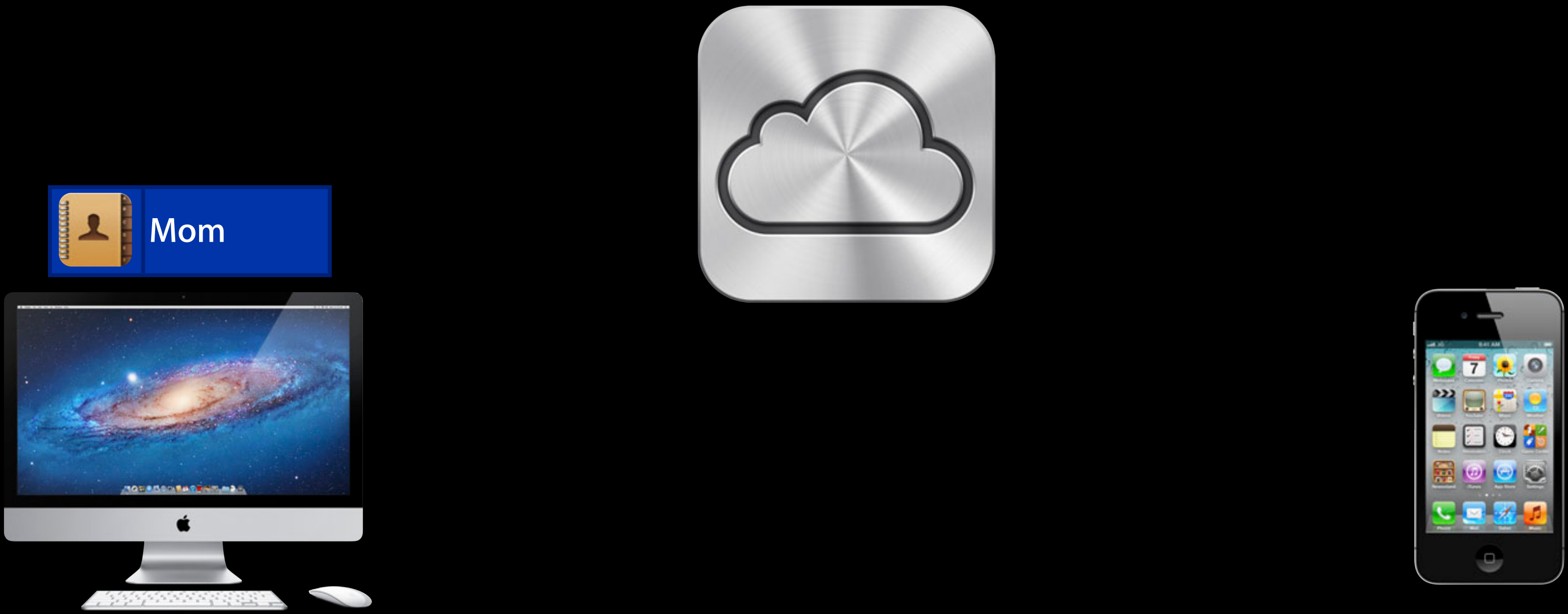


Integrating Changes

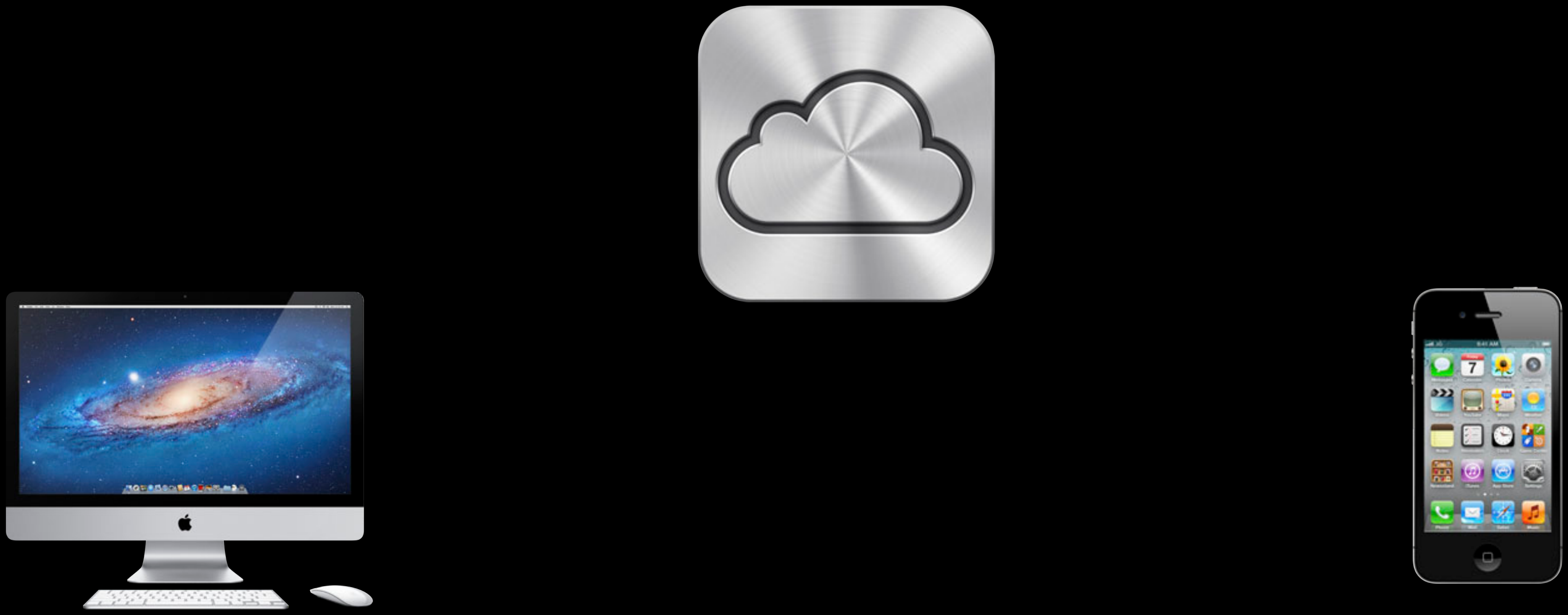


Mom

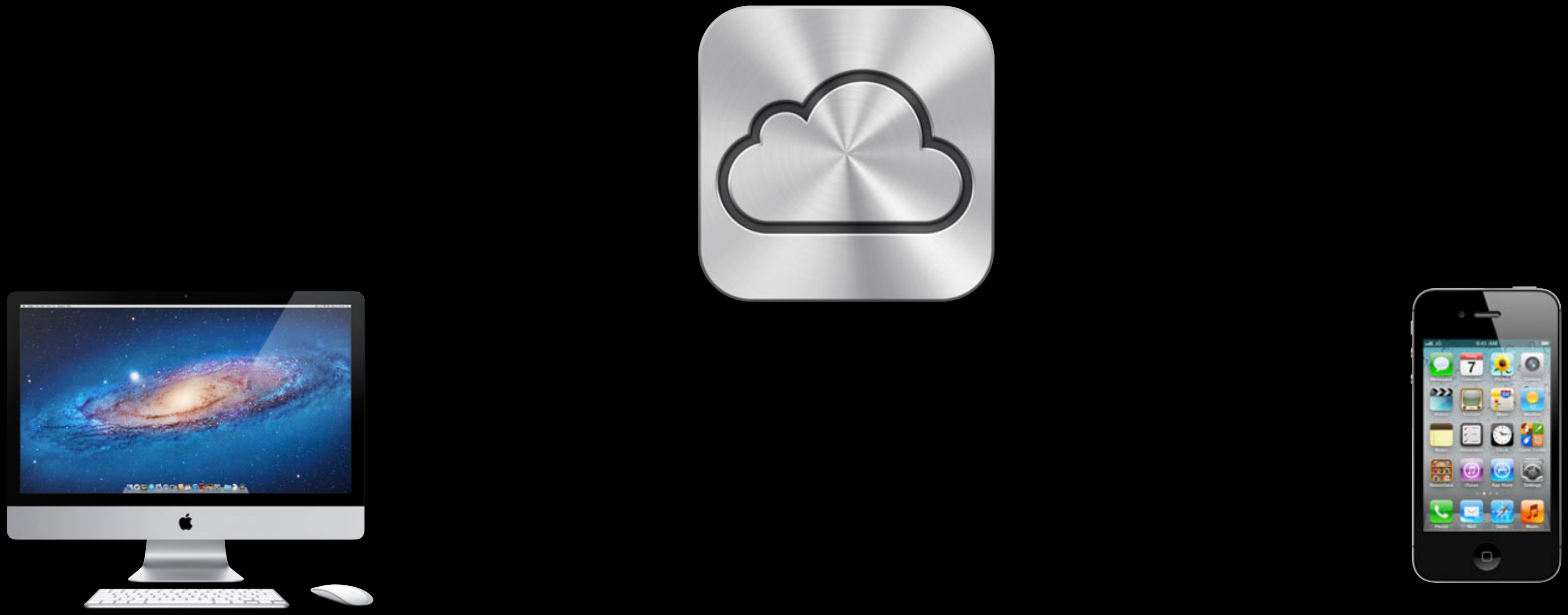
Integrating Changes



Integrating Changes



Integrating Changes



Integrating Changes

PK	Contact
1	Mom
2	Mom

Uniquing

- Find the Duplicates

-deDupe:

Uniquing

- Find the Duplicates

```
select zemailaddress, count(zemailaddress)
from zperson group by zemailaddress;
```

Uniquing

- Find the Duplicates

```
select zemailaddress, count(zemailaddress)
from zperson group by zemailaddress;
```

zemailddress	count(zemailaddress)
cd@wwdc.com	1
core@data.com	1
moc@save.com	256

Uniquing

- Find the Duplicates

Uniquing

- Find the Duplicates

```
NSExpression *countExpr = [NSExpression expressionWithFormat:@"count:(emailAddress)"];
```

-deDupe:

Uniquing

- Find the Duplicates

```
NSExpression *countExpr = [NSExpression expressionWithFormat:@"count:(emailAddress)"];

NSAttributeDescription *emailAttr;
NSFetchRequest *fr;
[fr setPropertiesToFetch:[NSArray arrayWithObjects:emailAttr, countExpr, nil]];
[fr setPropertiesToGroupBy:[NSArray arrayWithObject:emailAttr]];
```

-deDupe:

Uniquing

- Find the Duplicates

```
NSExpression *countExpr = [NSExpression expressionWithFormat:@"count:(emailAddress)"];

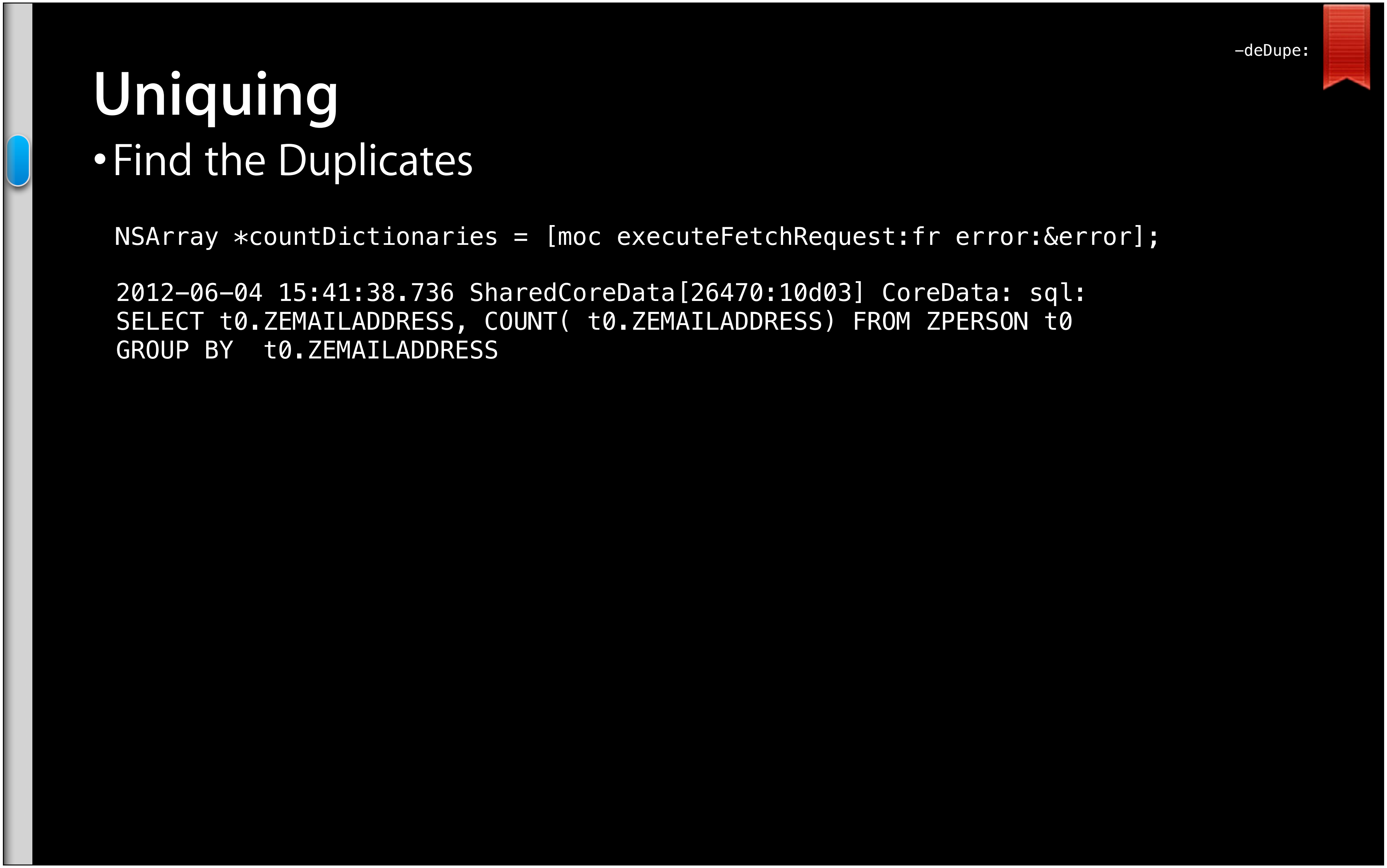
NSAttributeDescription *emailAttr;
NSFetchRequest *fr;
[fr setPropertiesToFetch:[NSArray arrayWithObjects:emailAttr, countExpr, nil]];
[fr setPropertiesToGroupBy:[NSArray arrayWithObject:emailAttr]];

[fr setResultType:NSDictionaryResultType];
```

-deDupe:

Uniquing

- Find the Duplicates



-deDupe:

Uniquing

- Find the Duplicates

```
NSArray *countDictionaries = [moc executeFetchRequest:fr error:&error];

2012-06-04 15:41:38.736 SharedCoreData[26470:10d03] CoreData: sql:
SELECT t0.ZEMAILADDRESS, COUNT( t0.ZEMAILADDRESS) FROM ZPERSON t0
GROUP BY  t0.ZEMAILADDRESS
```

Uniquing

- Find the Duplicates

```
NSArray *countDictionaries = [moc executeFetchRequest:fr error:&error];

2012-06-04 15:41:38.736 SharedCoreData[26470:10d03] CoreData: sql:
SELECT t0.ZEMAILADDRESS, COUNT( t0.ZEMAILADDRESS) FROM ZPERSON t0
GROUP BY  t0.ZEMAILADDRESS

(lldb) po countDictionaries
(NSArray *) $2 = 0x07c0cb80 <_PFArray 0x7c0cb80>(
{
    count = 1;
    emailAddress = "cd@wwdc.com";
},
{
    count = 256;
    emailAddress = "moc@save.com";
},
{
    count = 1;
    emailAddress = "core@data.com";
})
```

-deDupe:

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects

-deDupe:

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects

```
p = [NSPredicate predicateWithFormat:@"emailAddress IN (%@)", emailsWithDupes];
[fr setPredicate:p];
```

-deDupe:

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects

```
p = [NSPredicate predicateWithFormat:@"emailAddress IN (%@)", emailsWithDupes];
[fr setPredicate:p];

emailSort = [NSSortDescriptor sortDescriptorWithKey:@"emailAddress"
                                          ascending:YES];
[fr setSortDescriptors:[NSArray arrayWithObject:emailSort]];

NSArray *dupes = [moc executeFetchRequest:fr error:&error];
```

-deDupe:

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects
- Choose a winner

`-deDupe:`

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects
- Choose a winner
    - Ensure consistent merges across peers

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects
- Choose a winner
  - Ensure consistent merges across peers
  - Use a record UUID or timestamp

-deDupe:

Uniquing

- Find the Duplicates
- Fetch Duplicate Objects
- Choose a winner
  - Ensure consistent merges across peers
  - Use a record UUID or timestamp

```
for (NSManagedObject *dupe in duplicates) {
    //choose winner
    if (0 == (i % batchSize)) {
        [moc save:&error];
    }
    i++;
}
```

Demo

Uniquing

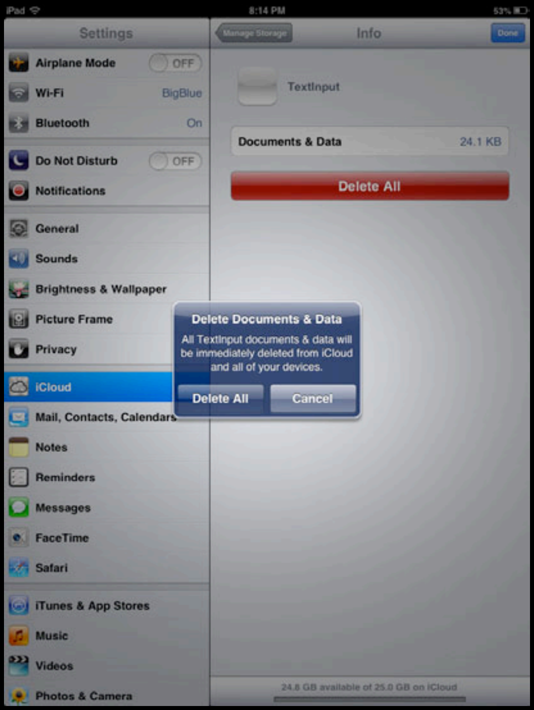
Lifecycle

User Events

User Events

User Events

- Delete from Documents & Data



Airplane Mode OFF

Wi-Fi BigBlue

Bluetooth On

Do Not Disturb OFF

TextInput

Documents & Data 24.1 KB

Delete Documents & Data

All TextInput documents & data will be immediately deleted from iCloud and all of your devices.

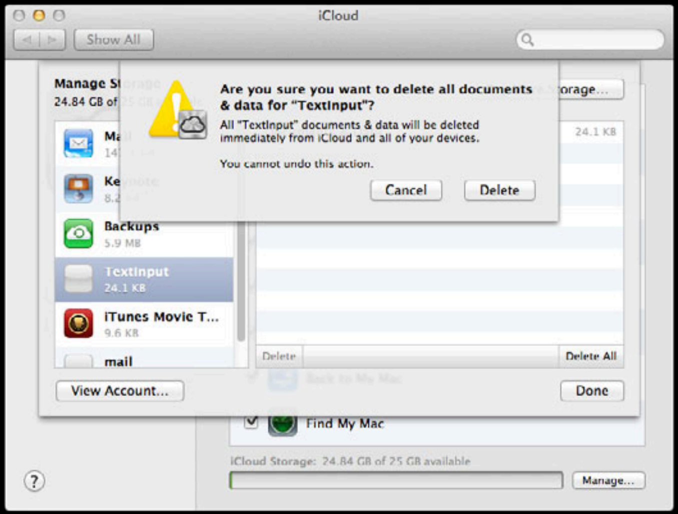
24.8 GB available of 25.0 GB on iCloud

User Events

- Delete from Documents & Data

User Events

- Delete from Documents & Data



Are you sure you want to delete all documents & data for "TextInput"?

All "TextInput" documents & data will be deleted immediately from iCloud and all of your devices.

You cannot undo this action.

User Events

- Delete from Documents & Data

User Events

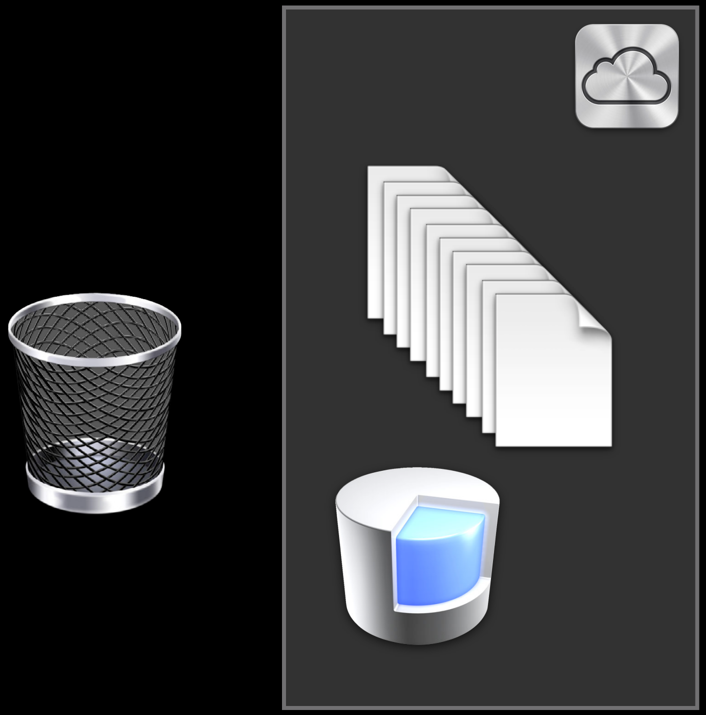
- Delete from Documents & Data

User Events

- Delete from Documents & Data

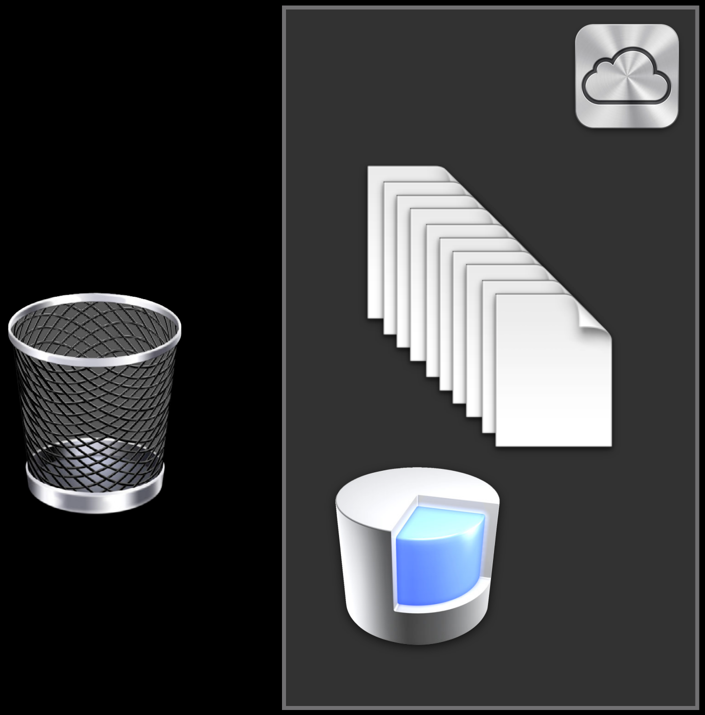
User Events

- Delete from Documents & Data



User Events

- Delete from Documents & Data



User Events

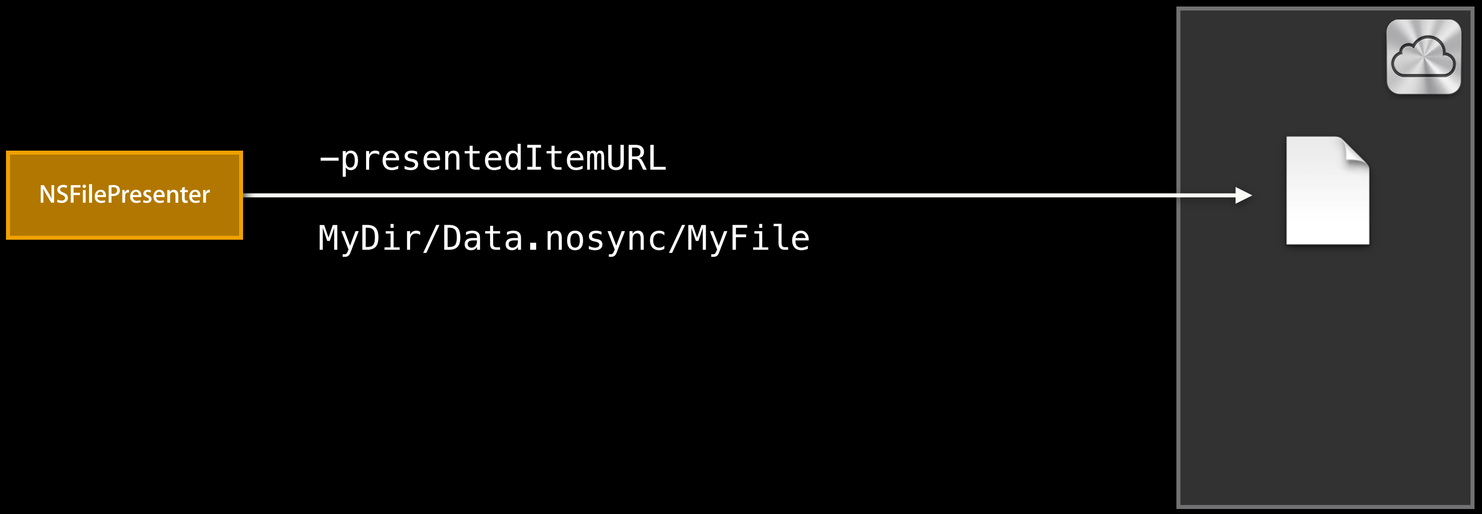
- Delete from Documents & Data

User Events

Documents & Data

User Events

Documents & Data



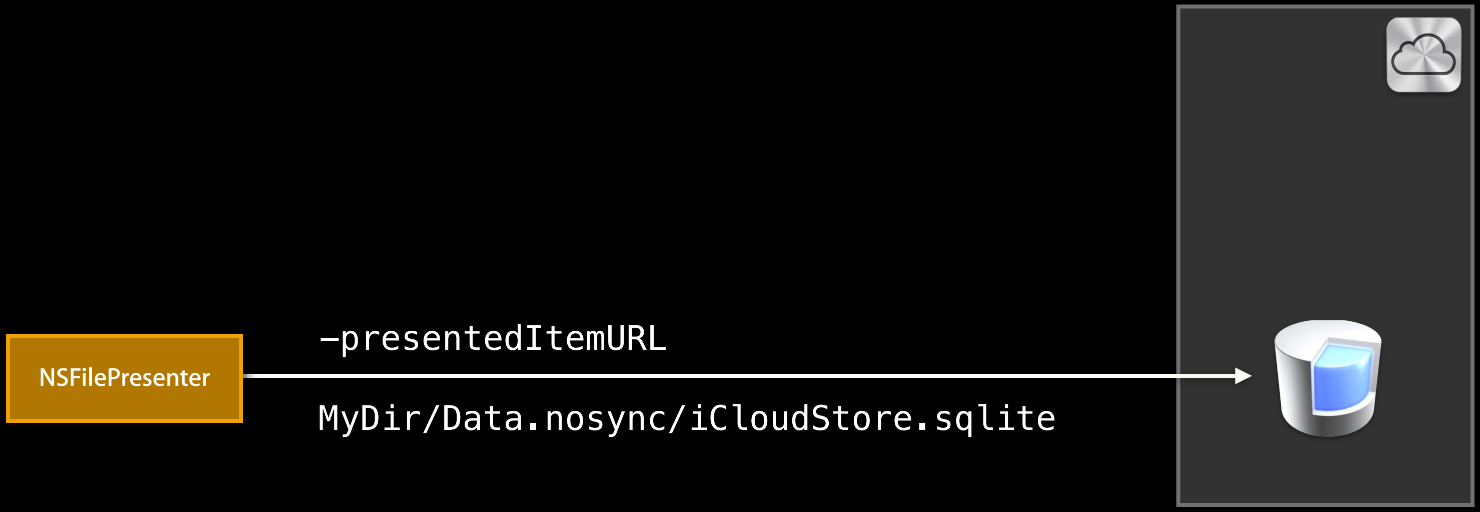
NSFilePresenter

`-presentedItemURL`

`MyDir/Data.nosync/MyFile`

User Events

Documents & Data



NSFilePresenter

`-presentedItemURL`

`MyDir/Data.nosync/iCloudStore.sqlite`

User Events

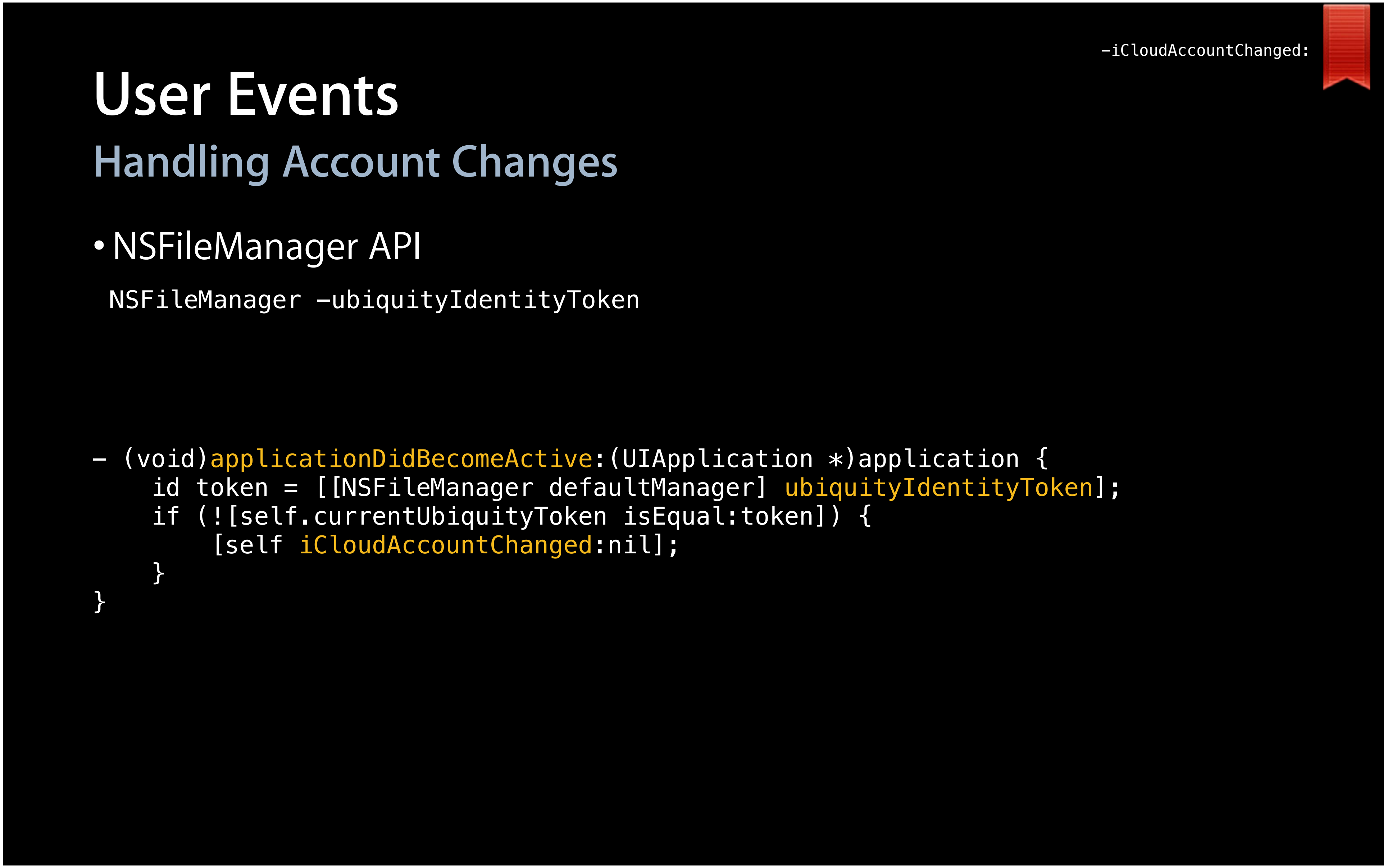
Handling Account Changes

`-iCloudAccountChanged:`

User Events

Handling Account Changes

- NSFileManager API



-iCloudAccountChanged:

User Events

Handling Account Changes

- NSFileManager API

`NSFileManager -ubiquityIdentityToken`

```
- (void)applicationDidBecomeActive:(UIApplication *)application {
    id token = [[NSFileManager defaultManager] ubiquityIdentityToken];
    if (![self.currentUbiquityToken isEqual:token]) {
        [self iCloudAccountChanged:nil];
    }
}
```

-iCloudAccountChanged:

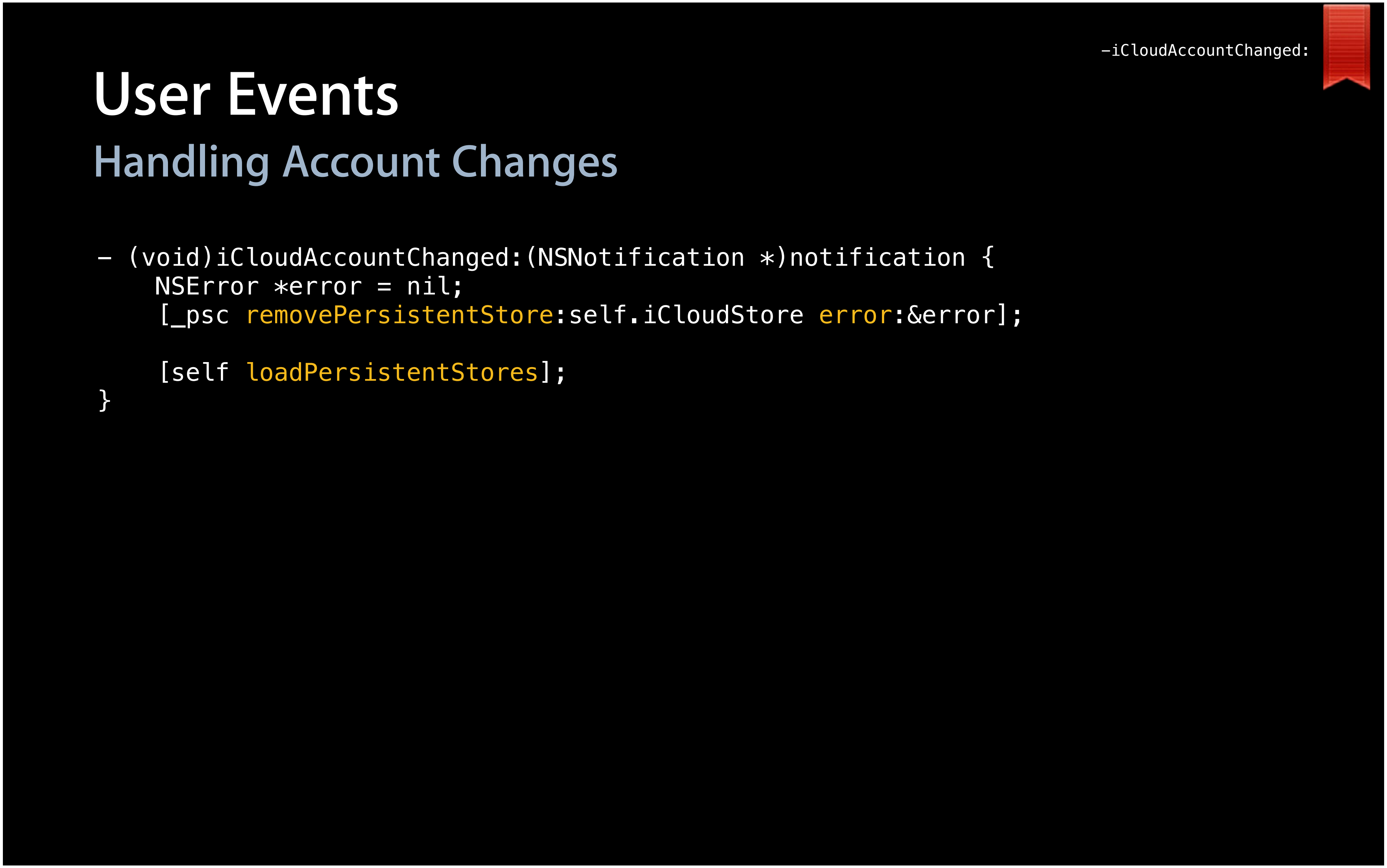
User Events

Handling Account Changes

- NSFileManager API

```
NSFileManager -ubiquityIdentityToken
NSUbiquityIdentityDidChangeNotification
```

```
[notificationCenter addObserver:self
                       selector:@selector(iCloudAccountChanged:)
                           name:NSUbiquityIdentityDidChangeNotification
                         object:nil];
```



-iCloudAccountChanged:

User Events

Handling Account Changes

```
- (void)iCloudAccountChanged:(NSNotification *)notification {
    NSError *error = nil;
    [_psc removePersistentStore:self.iCloudStore error:&error];

    [self loadPersistentStores];
}
```

Demo

User events

Lifecycle

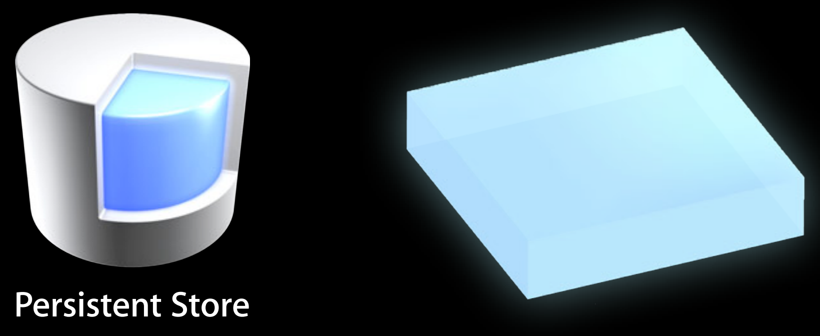
Performance and Debugging

Performance

Performance

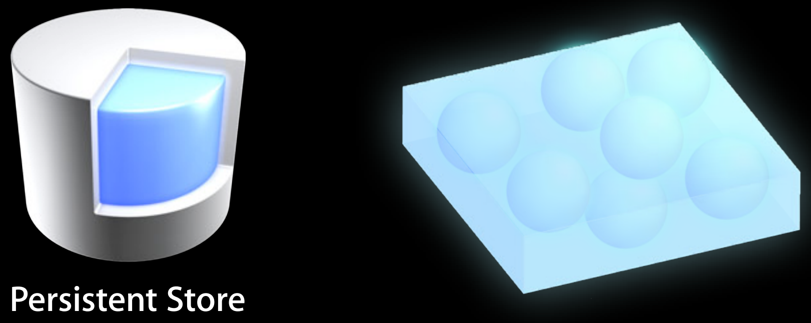
- -save:
- Coalesce changes as appropriate
- Avoid storing raw sensor data
    - CoreLocation @ 60Hz!

Performance



Performance

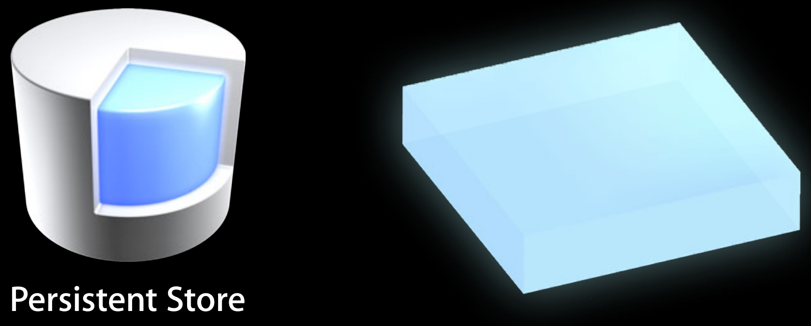
- Memory Pressure



Performance

- Memory Pressure

```
NSFetchRequest -setFetchBatchSize:
NSManagedObjectContext -save:
NSManagedObjectContext -reset
```



Debugging

Debugging

- Macs are greedy peers
    - Run at least one iCloud-enabled app (TextEdit)

Debugging

- Macs are greedy peers
  - Run at least one iCloud-enabled app (TextEdit)
- Removing data
  - Coordinated write to delete every file inside container
  - Be patient, it might take a while to propagate to all your devices

Debugging

- Macs are greedy peers
  - Run at least one iCloud-enabled app (TextEdit)
- Removing data
  - Coordinated write to delete every file inside container
  - Be patient, it might take a while to propagate to all your devices
- File great bugs

Debugging

Filing great bugs

Debugging

Filing great bugs

- Sample Application
- Ubiquity Container
- Console logs
    - -com.apple.coredata.ubiquity.logLevel # (1,2,3)

Demo

Debugging

More Information

Michael Jurewitz
Technology Evangelist
jury@apple.com

Cocoa Feedback
cocoa-feedback@apple.com

Core Data Documentation
Programming Guides, Examples, Tutorials
http://developer.apple.com/

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

Related Sessions

iCloud Storage Overview	Pacific Heights Tuesday 4:30PM
Core Data Best Practices	Mission Wednesday 9:00AM
Advanced iCloud Document Storage	Marina Thursday 3:15PM

Labs

Core Data Lab	Developer Tools Lab A Thursday 9:00AM
iCloud Storage Lab	Essentials Lab B Thursday 4:30PM
Core Data Lab	Essentials Lab B Friday 9:00AM
iCloud Storage Lab	Essentials Lab B Friday 11:30AM

WWDC2012

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