Storing Documents in iCloud Using iOS 5

An introduction to UIDocument

Session 116

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Agenda

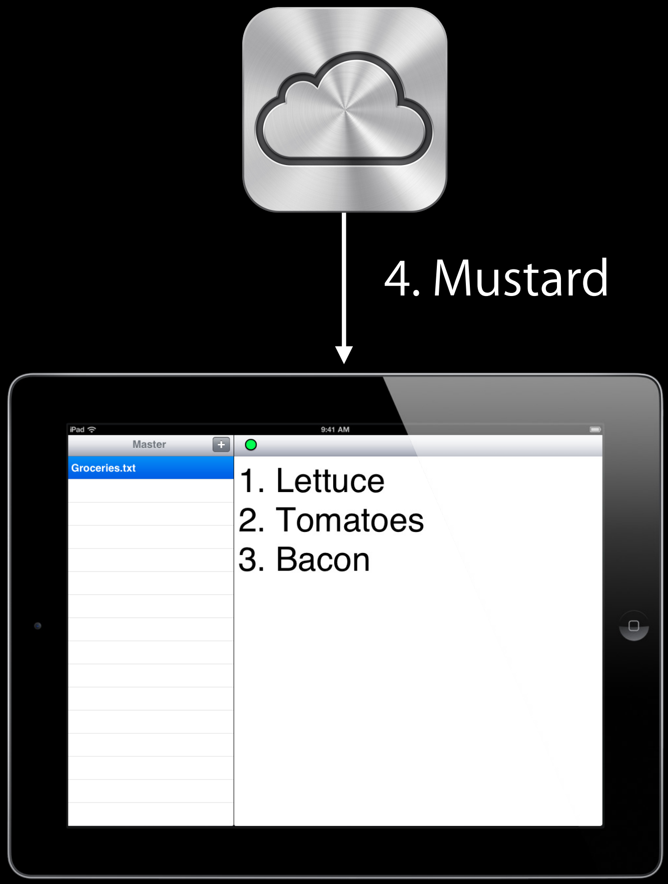
- What we’re trying to solve
- Basic hooks
- Handling edge cases
- Advanced concepts

Building Document Applications

Document-Handling Challenges

- Handling saving and opening
  - Block the main thread?
  - Deal with concurrent threads?
  - When should I save?

iCloud Challenges

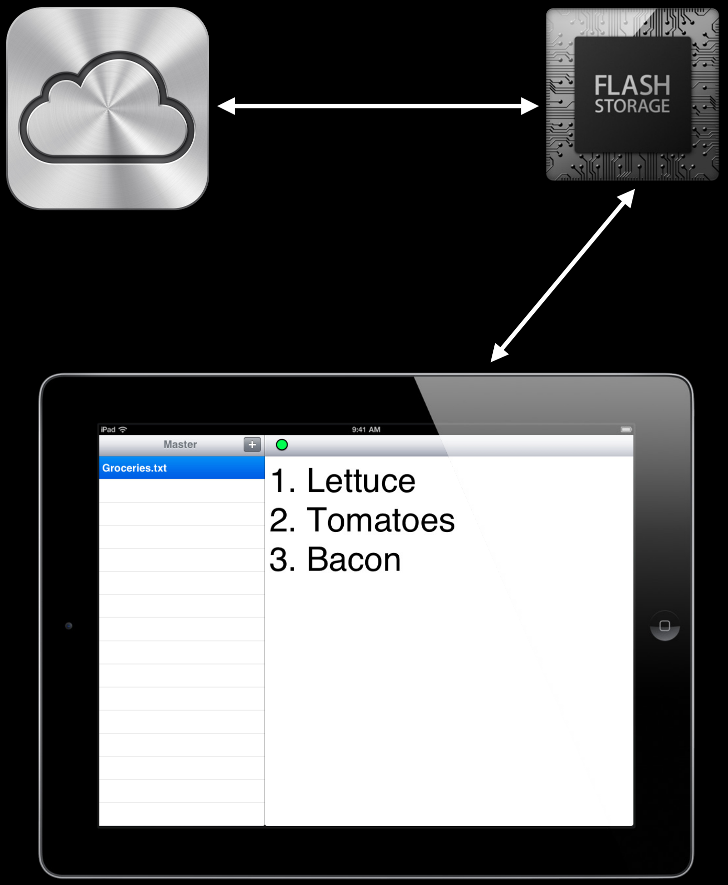


4. Mustard

1. Lettuce
2. Tomatoes
3. Bacon

- Respond to updates from iCloud

iCloud Challenges

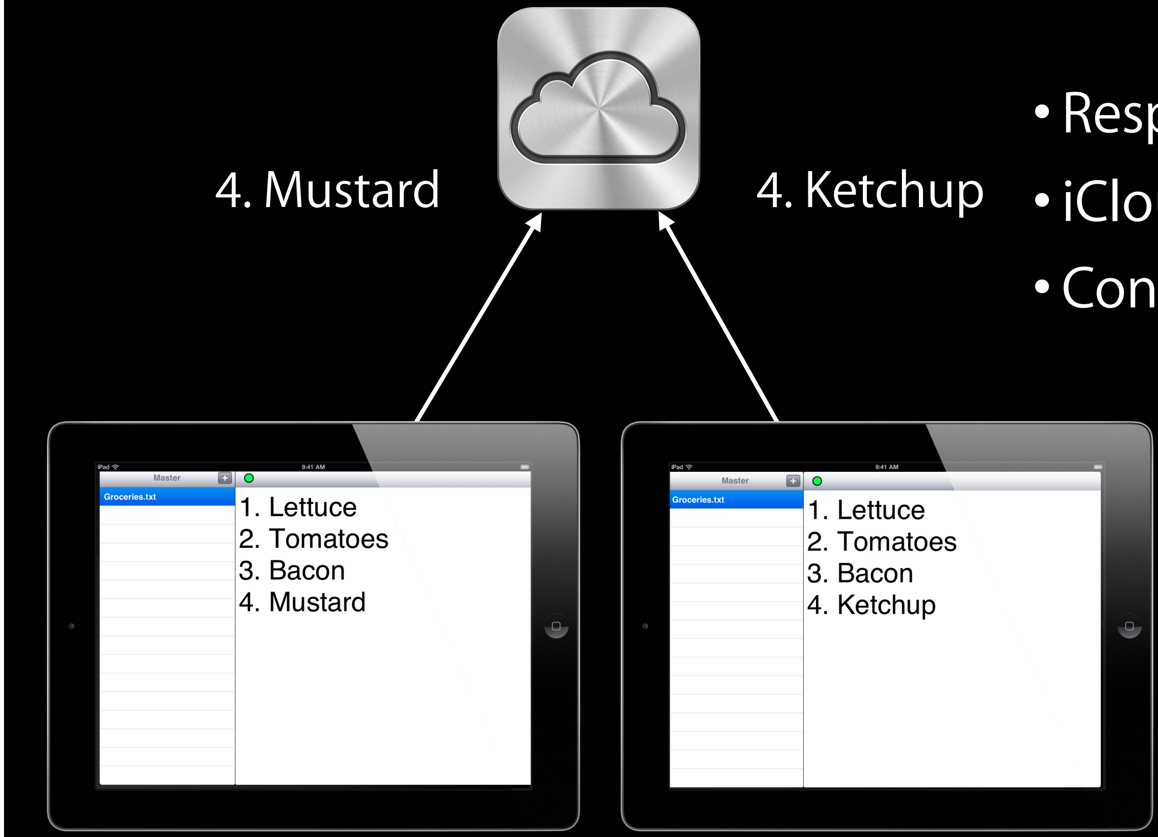


Groceries.txt

1. Lettuce
2. Tomatoes
3. Bacon

- Respond to updates from iCloud
- iCloud-safe reading and writing

iCloud Challenges



4. Mustard

4. Ketchup

1. Lettuce
2. Tomatoes
3. Bacon
4. Mustard

1. Lettuce
2. Tomatoes
3. Bacon
4. Ketchup

- Respond to updates from iCloud
- iCloud-safe reading and writing
- Conflict discovery

The Solution

- UIDocument solves all of these problems!

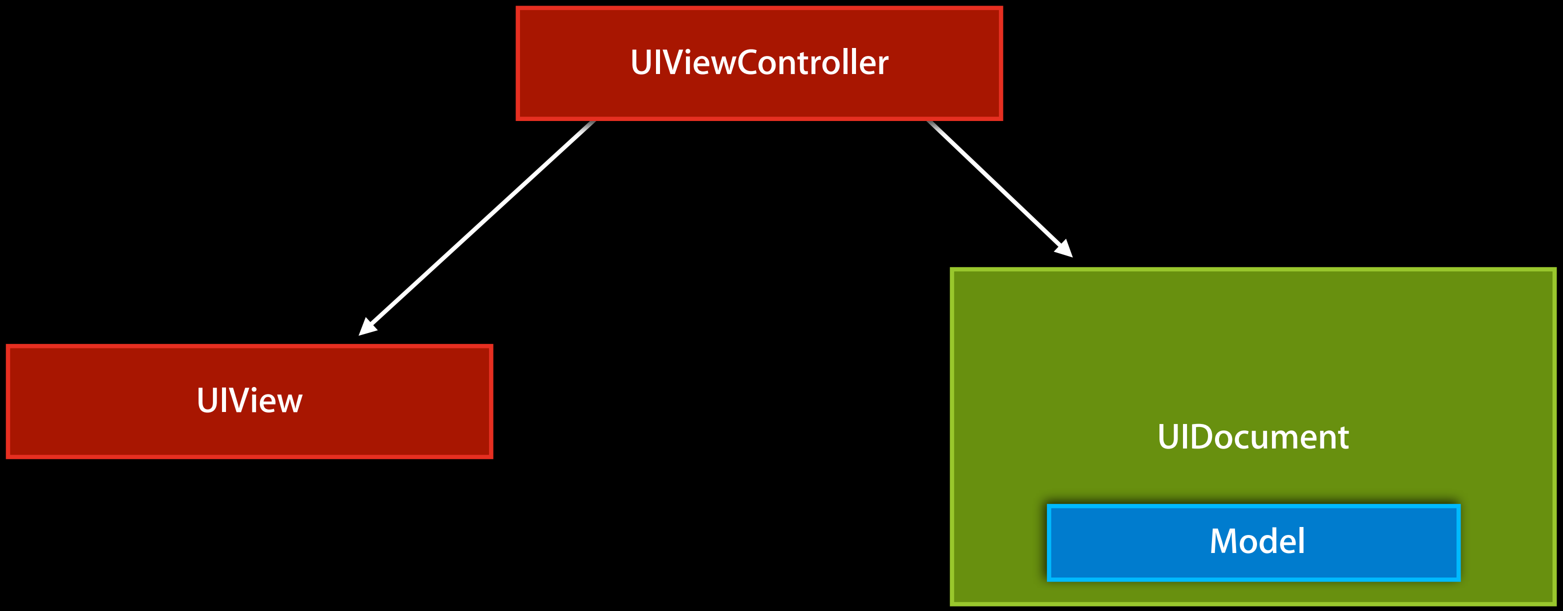
UIDocument Basics

What UIDocument Provides

- Document model base class
- Key document-handling features
    - Concurrent background reading and writing
    - Saveless user model
    - iCloud integration
- UIManagedDocument
    - CoreData integration
    - Optimized for iCloud syncing
    - Automatic conflict resolution

Document Application Architecture

Using UIDocument as a model controller



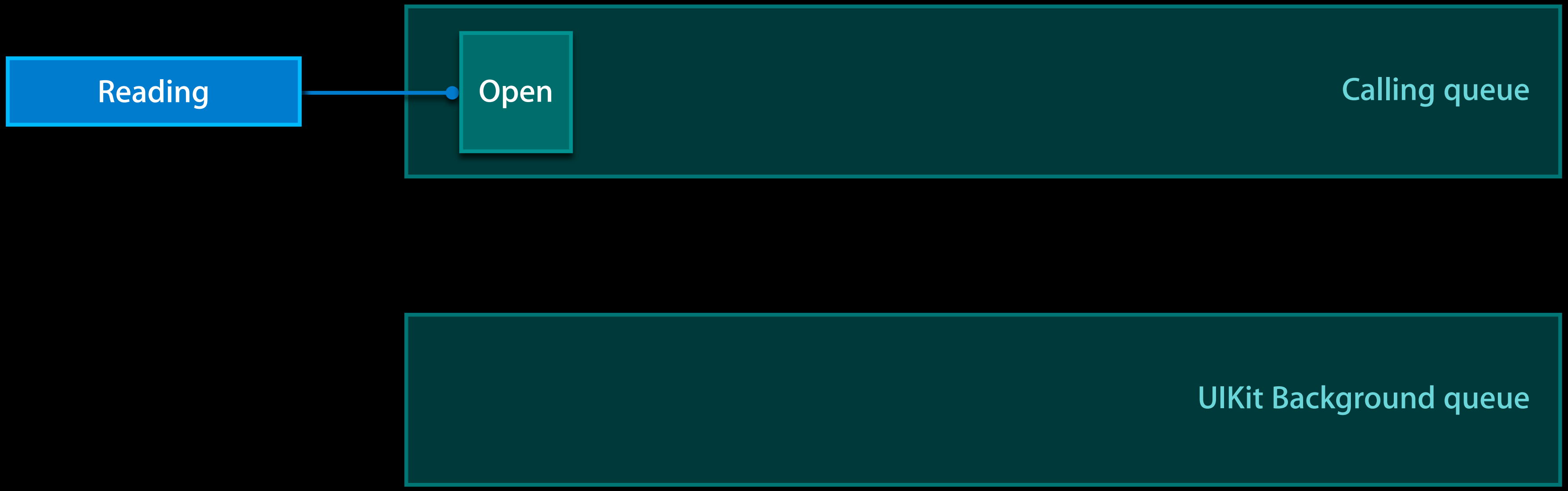
Reading and Writing

The simple story

- Background queue
- Reading triggered by opening or reverting
- Writing triggered by saving
- Automatic handling for NSData and NSFileWrapper

Reading

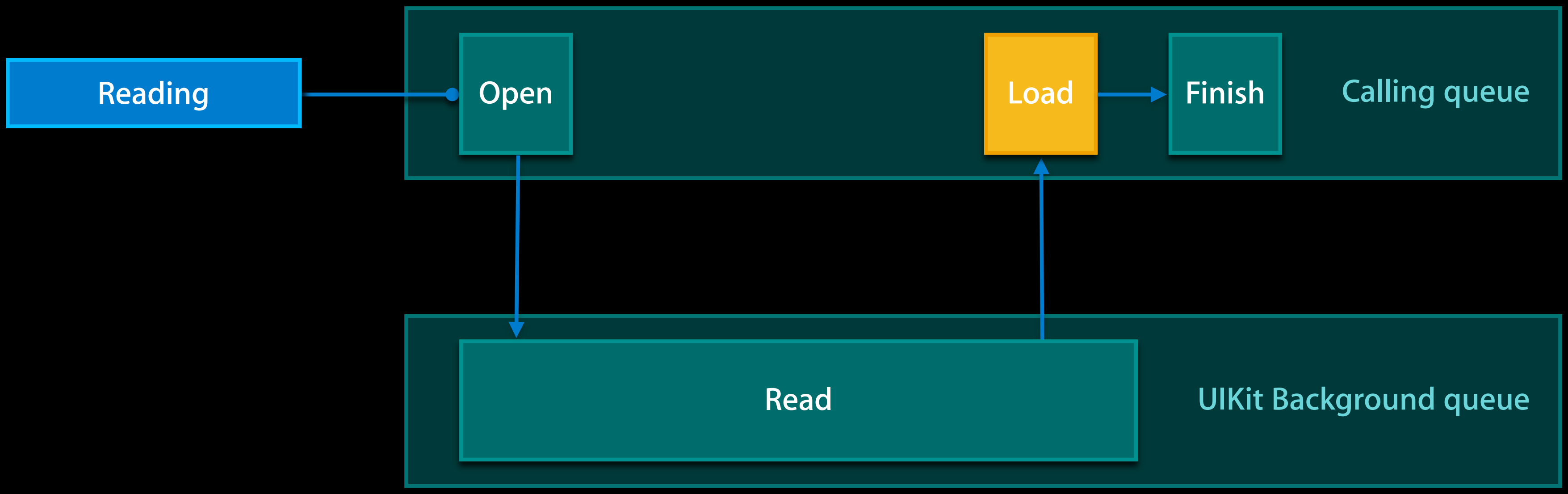
The simple story



```
- (void)openWithCompletionHandler:(void (^)(BOOL success))
completionHandler;
```

Reading

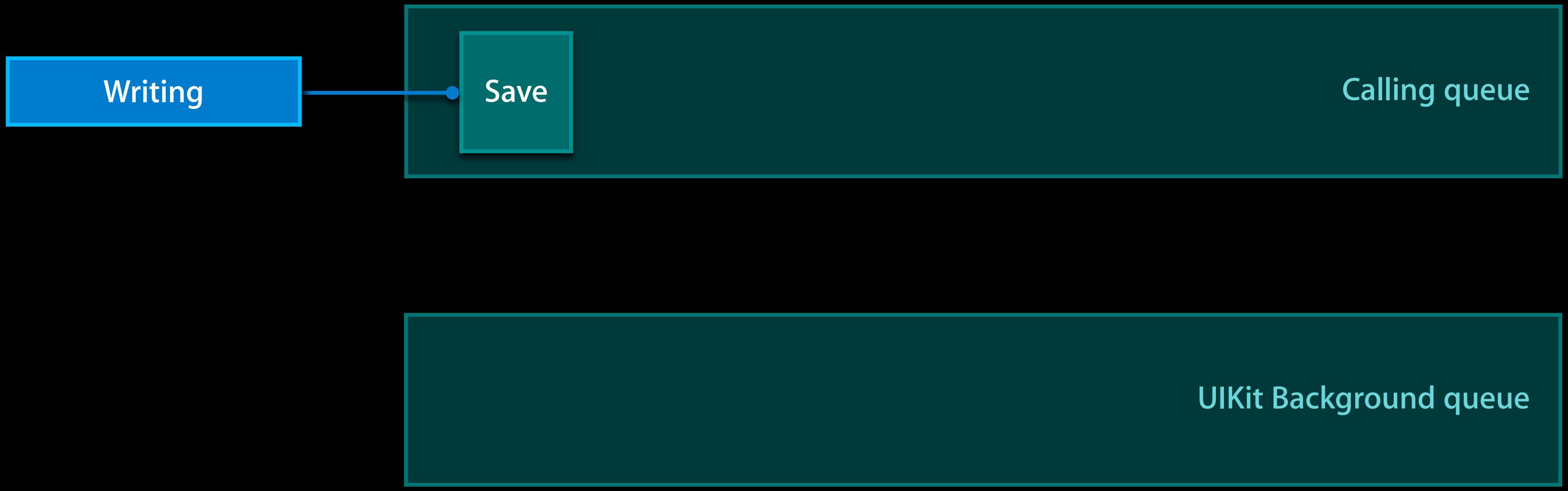
The simple story



```
- (BOOL)loadFromContents:(id)contents
                  ofType:(NSString *)typeName
                   error:(NSError **)outError;
```

Writing

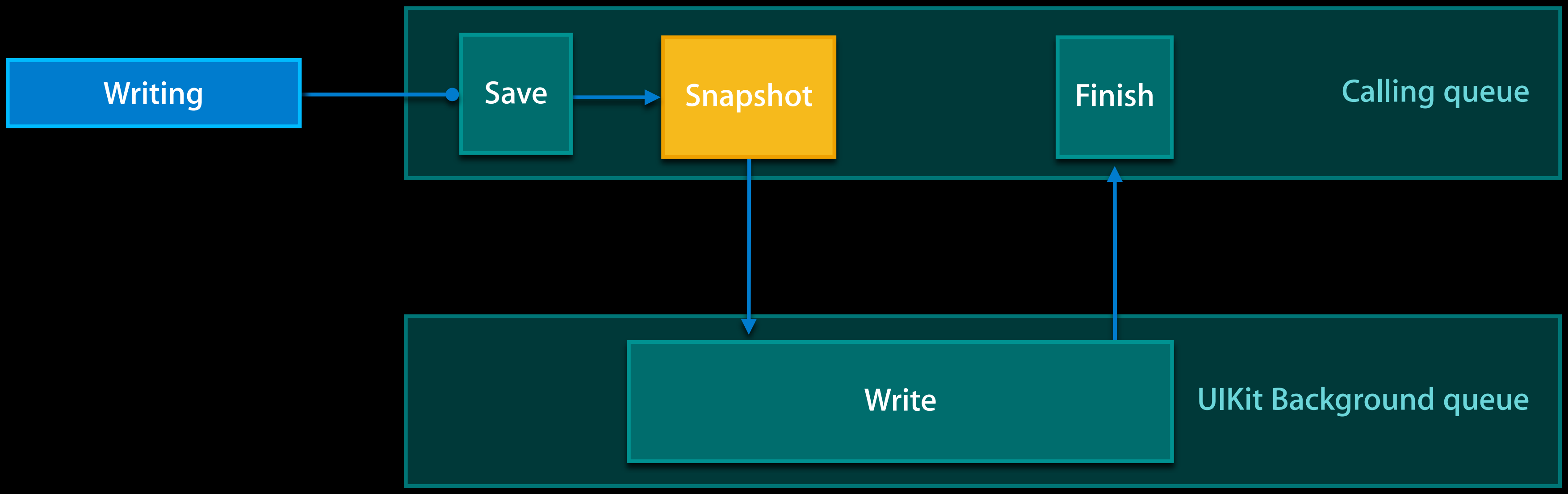
The simple story



```
- (BOOL)saveToURL:(NSURL *)url
 forSaveOperation:(UIDocumentSaveOperation)saveOperation
completionHandler:(void (^)(BOOL success))completionHandler;
```

Writing

The simple story

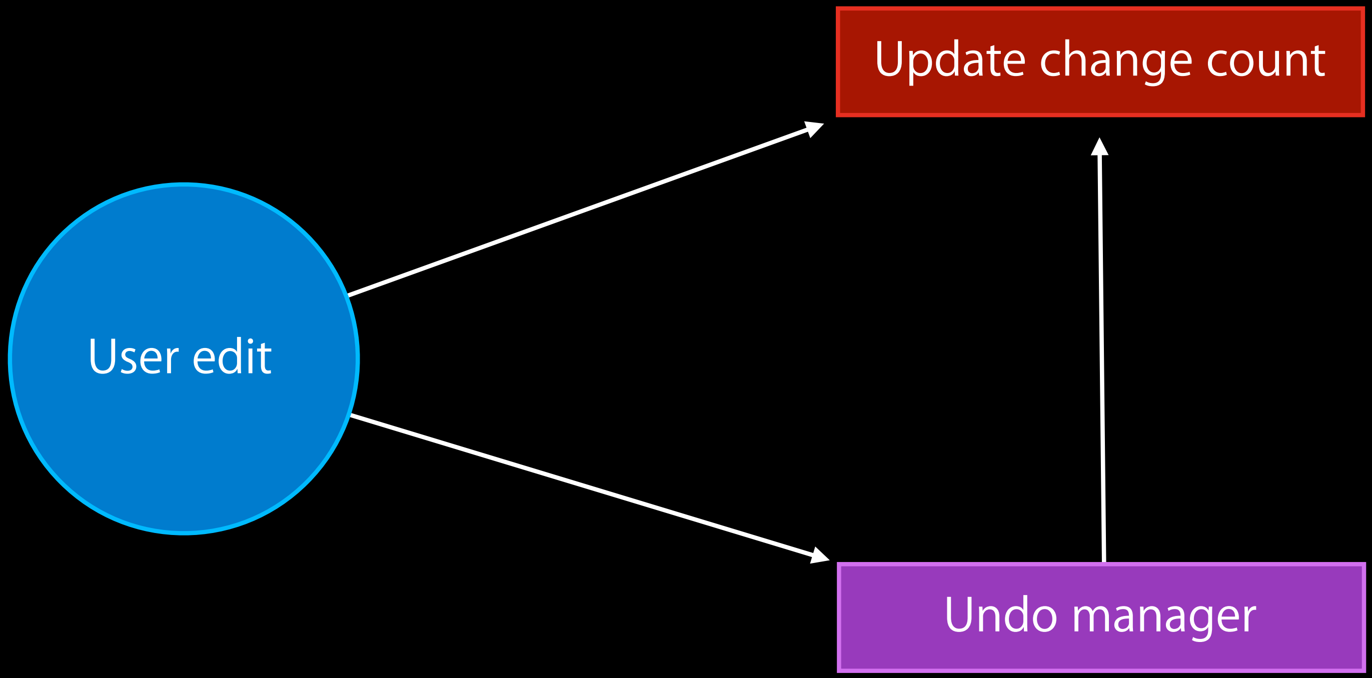


```
- (id)contentsForType:(NSString *)type
                error:(NSError *)error;
```

User Edits and Autosaving

Handling Changes

The simple story



Demo

Handling Conflicts and Errors

Observing Document State

- `documentState` provides information related to when user edits might not be safe
- Observe state changes with `UIDocumentStateChangedNotification`

The Document States

- `UIDocumentStateNormal` = everything is fine
- Nonnormal states

  `UIDocumentStateClosed`

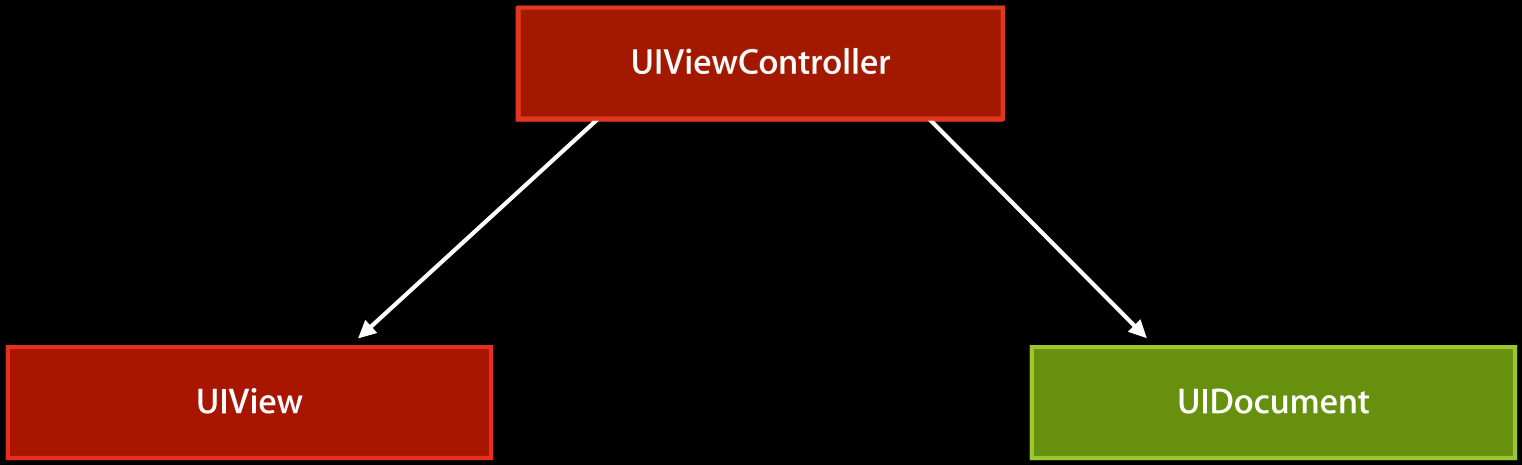
  `UIDocumentStateInConflict`

  `UIDocumentStateSavingError`

  `UIDocumentStateEditingDisabled`

Document Application Architecture

Responding to errors and conflicts



UIViewController

UIView

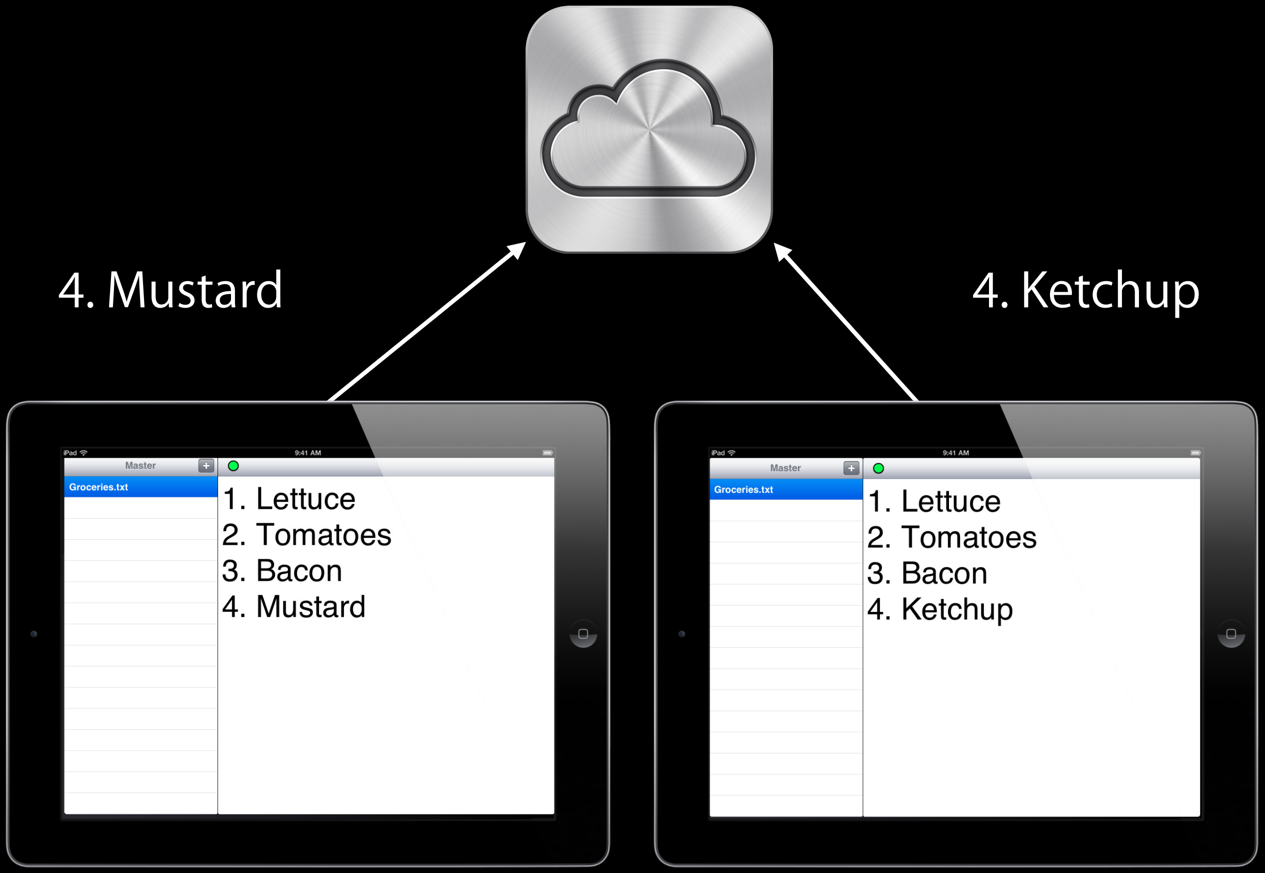
UIDocument

Responding to Saving Errors

- Register for `UIDocumentStateChangedNotification`
- `UIDocumentStateSavingError` will be set
- Show nonmodal UI

Conflict Resolution

Conflict Resolution



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4. Ketchup

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2. Tomatoes
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4. Ketchup

Resolving Conflicts

- What applications need to worry about conflicts?
    - All that use iCloud!
- Discover conflicts with `UIDocumentStateInConflict`
- Use NSFileVersion APIs
- Revert the document if necessary

Conflict-Resolution Strategies

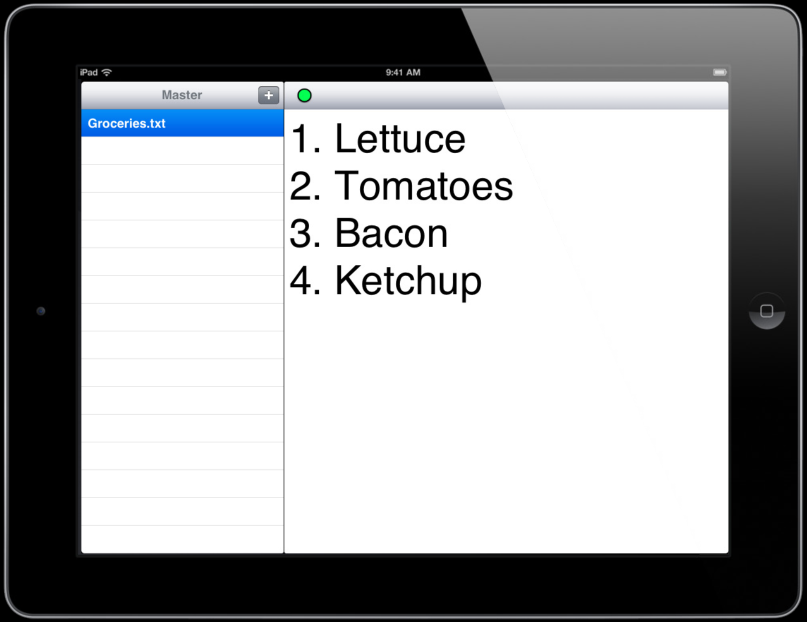
- Automatic merging
- Take the latest
- Prompt user
- Use UIManagedDocument

What’s New in CoreData on iOS

Mission
Tuesday 3:15–4:15PM

Extending CloudNotes

Adding State UI



1. Lettuce
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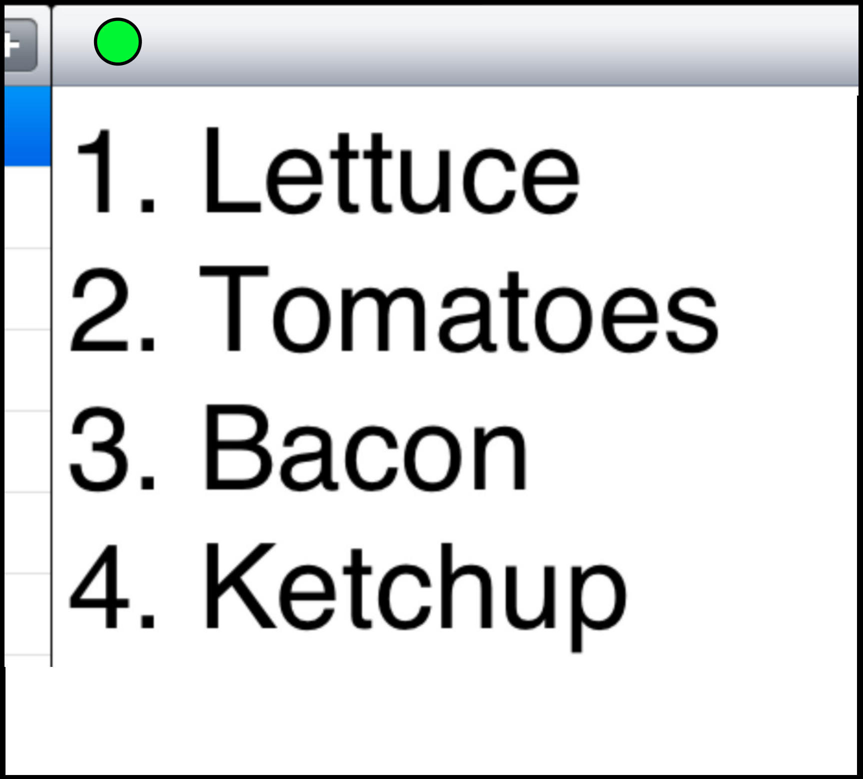
Normal State



1. Lettuce
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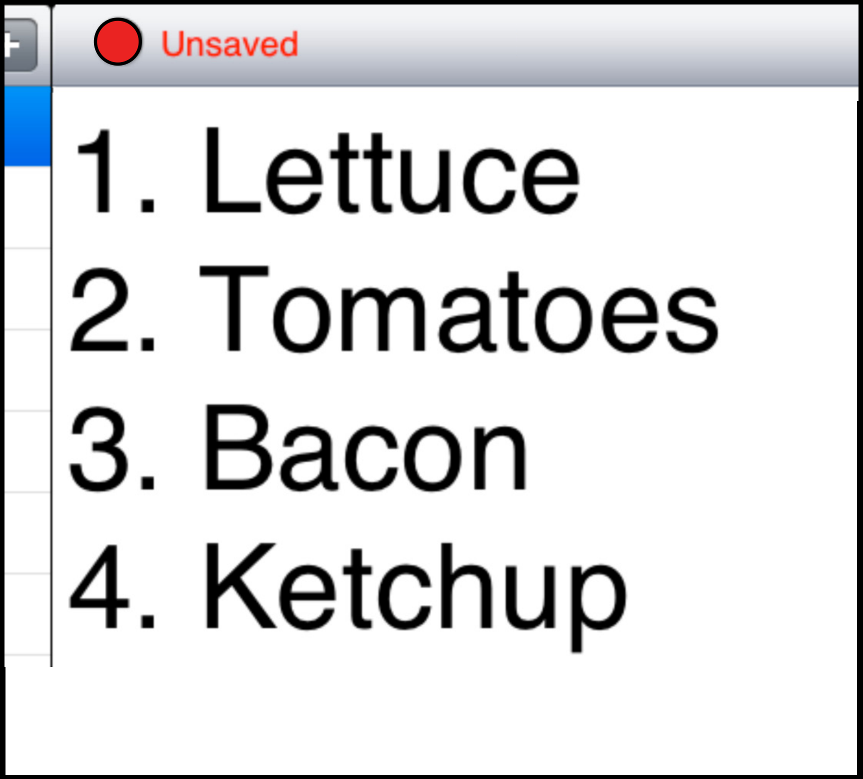
Saving Errors



● Unsaved

1. Lettuce
2. Tomatoes
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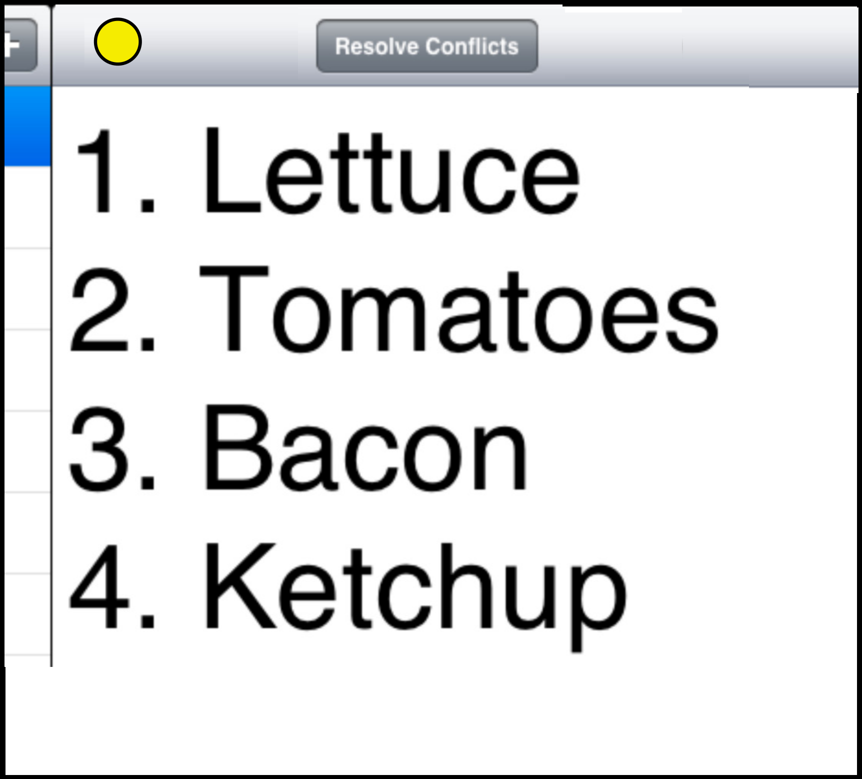
Conflicts



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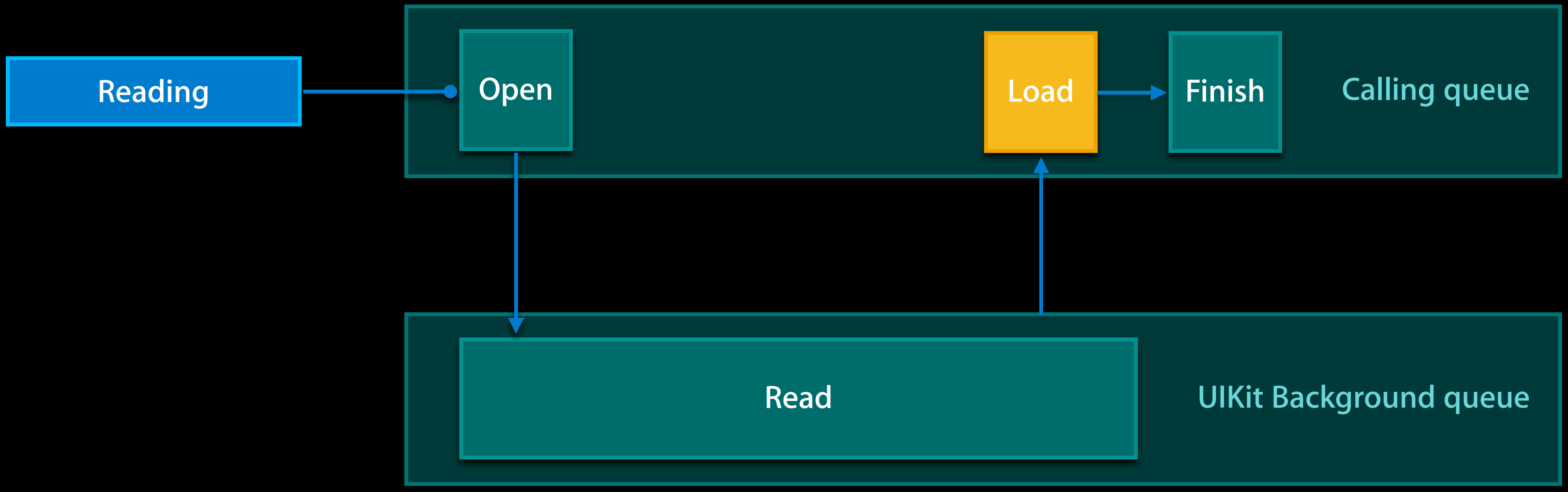
Advanced Concepts

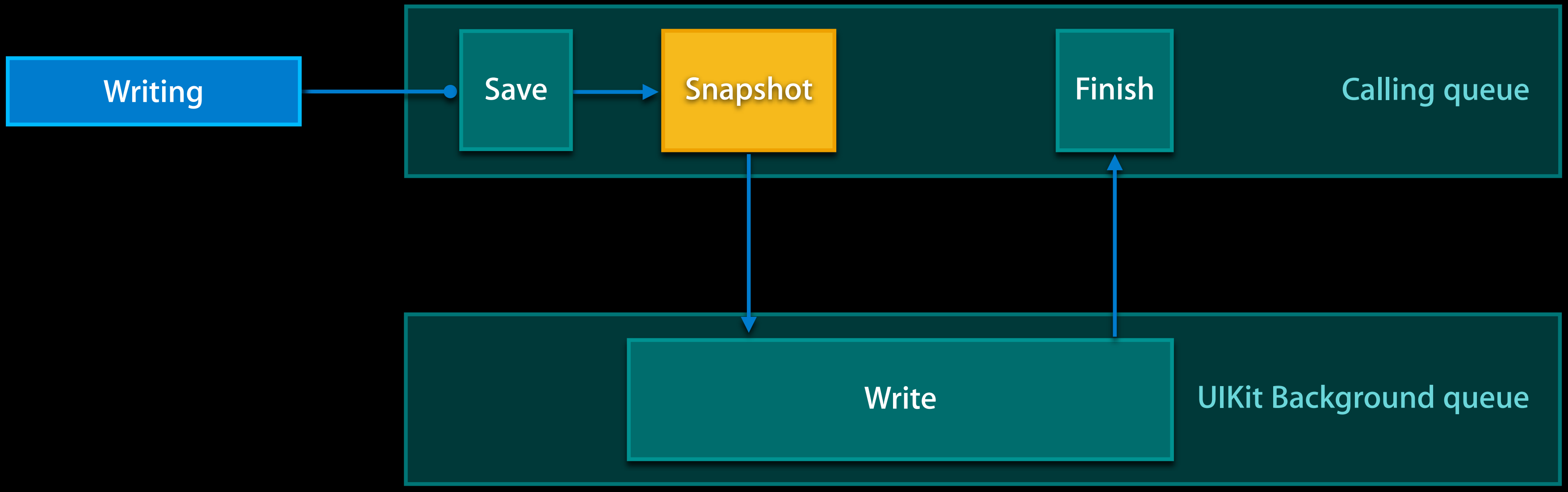
Reading

Revisiting the queue model



Writing

Revisiting the queue model



Calling into the Background Queue

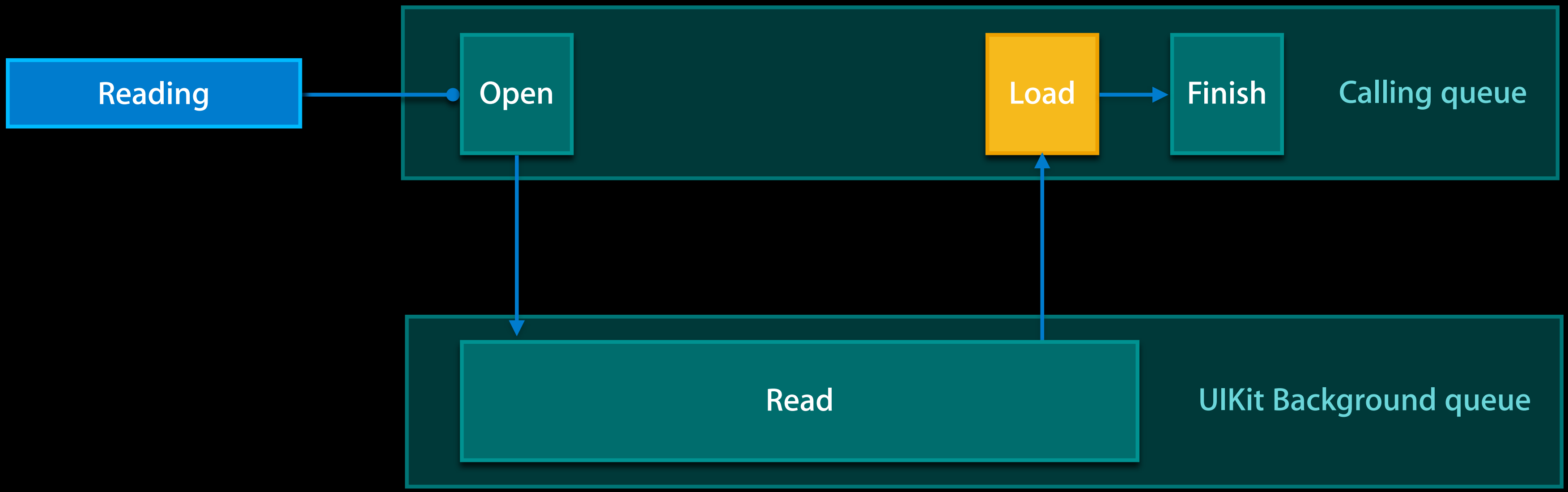
```
- (void)performAsynchronousFileAccessUsingBlock:(void (^)(void))block;
```

- NSFileCoordinator

Taking Advantage of File Coordination

Pacific Heights
Tuesday 4:30–5:30PM

Incremental Reading



Reading

Open

Load

Finish

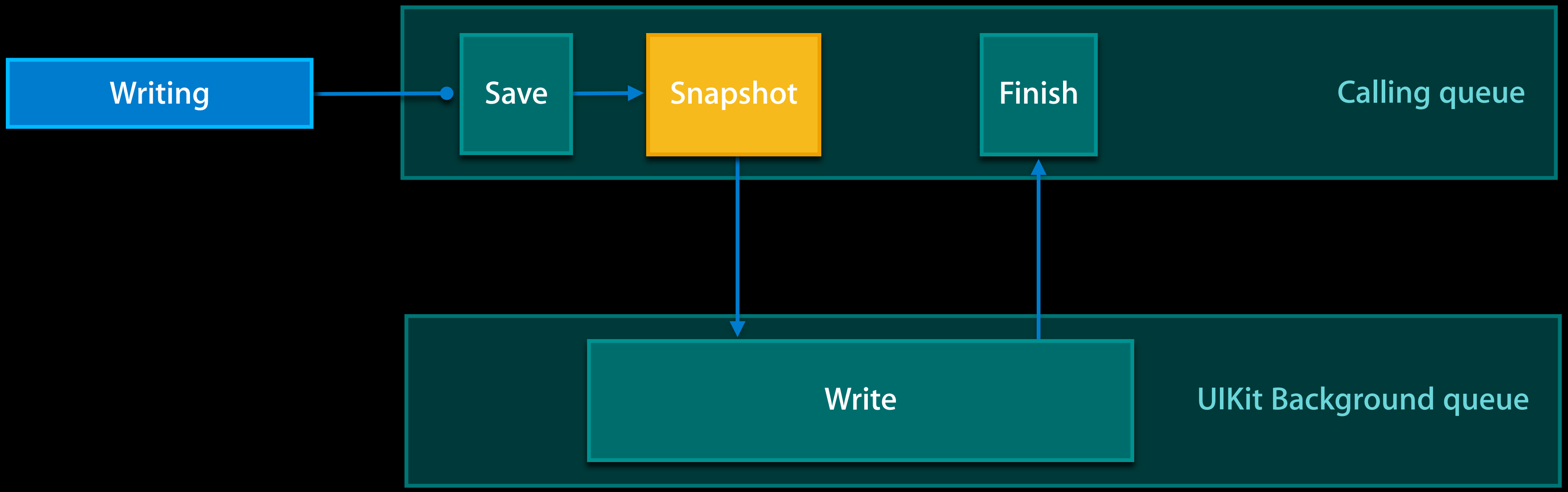
Calling queue

Read

UIKit Background queue

```
- (BOOL)readFromURL:(NSURL *)url
              error:(NSError **)error;
```

Safe Writing



Writing

Save

Snapshot

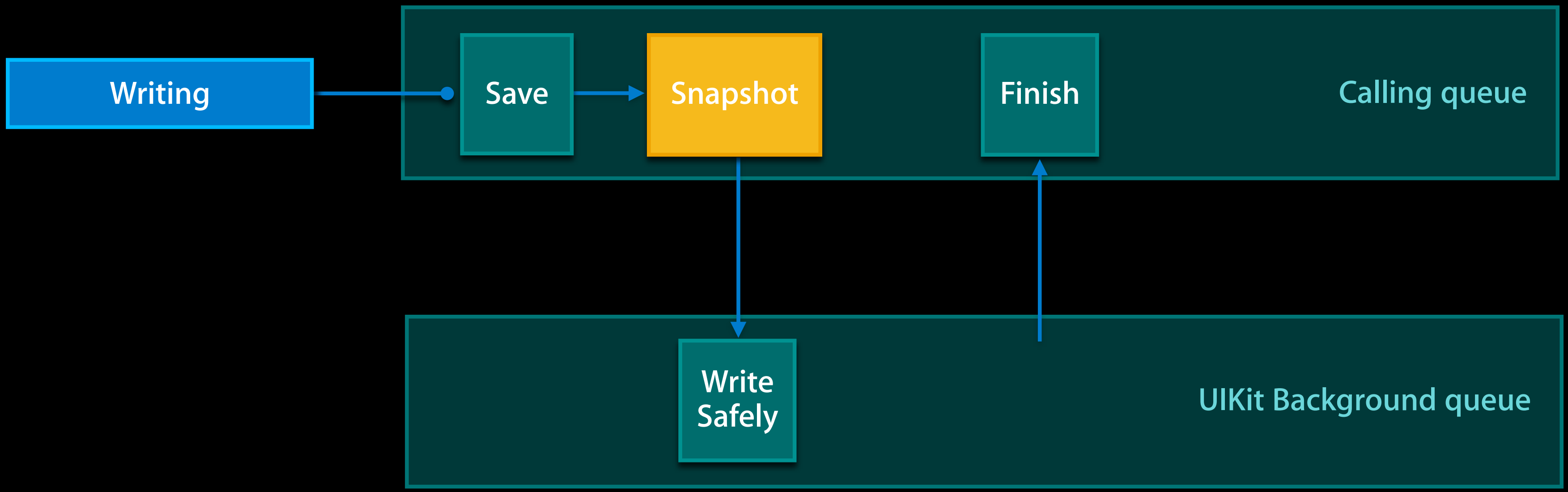
Finish

Calling queue

Write

UIKit Background queue

Safe Writing



Writing

Save

Snapshot

Finish

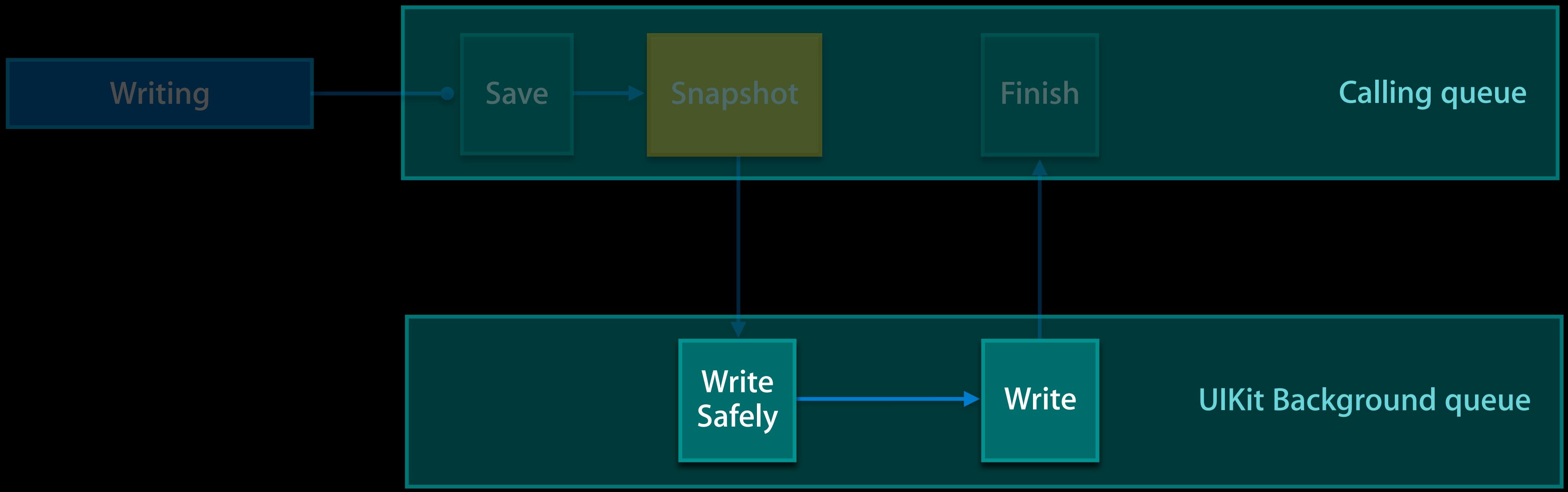
Calling queue

Write Safely

UIKit Background queue

```
- (BOOL)writeContents:(id)contents
        andAttributes:(NSDictionary *)additionalFileAttributes
          safelyToURL:(NSURL *)url
     forSaveOperation:(UIDocumentSaveOperation)saveOperation
                error:(NSError **)outError;
```

Writing a Custom Snapshot



```
- (BOOL)writeContents:(id)contents
        andAttributes:(NSDictionary *)additionalFileAttributes
          safelyToURL:(NSURL *)url
     forSaveOperation:(UIDocumentSaveOperation)saveOperation
                error:(NSError **)outError;
```

Changing the File Type

```
- (NSString *)savingFileType;

- (NSString *)fileNameExtensionForType:(NSString *)typeName
                        saveOperation:(UIDocumentSaveOperation)saveOperation;
```

Conclusion

Conclusion

- Be simple
- Register changes
- Use iCloud
- Resolve conflicts

Other Sessions and Lab

Taking Advantage of File Coordination	Pacific Heights Tuesday 4:30–5:30PM
What’s New in CoreData on iOS	Mission Tuesday 3:15–4:15PM
iCloud Storage Overview	Presidio Tuesday 11:30–12:30PM
UIDocument Lab	Application Frameworks Lab D Thursday 9:00–11:15AM

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