iPhone Programming

CMSC 498i – Spring 2010

View Controllers

Lecture #9 – Chuck Pisula

Today's Topics

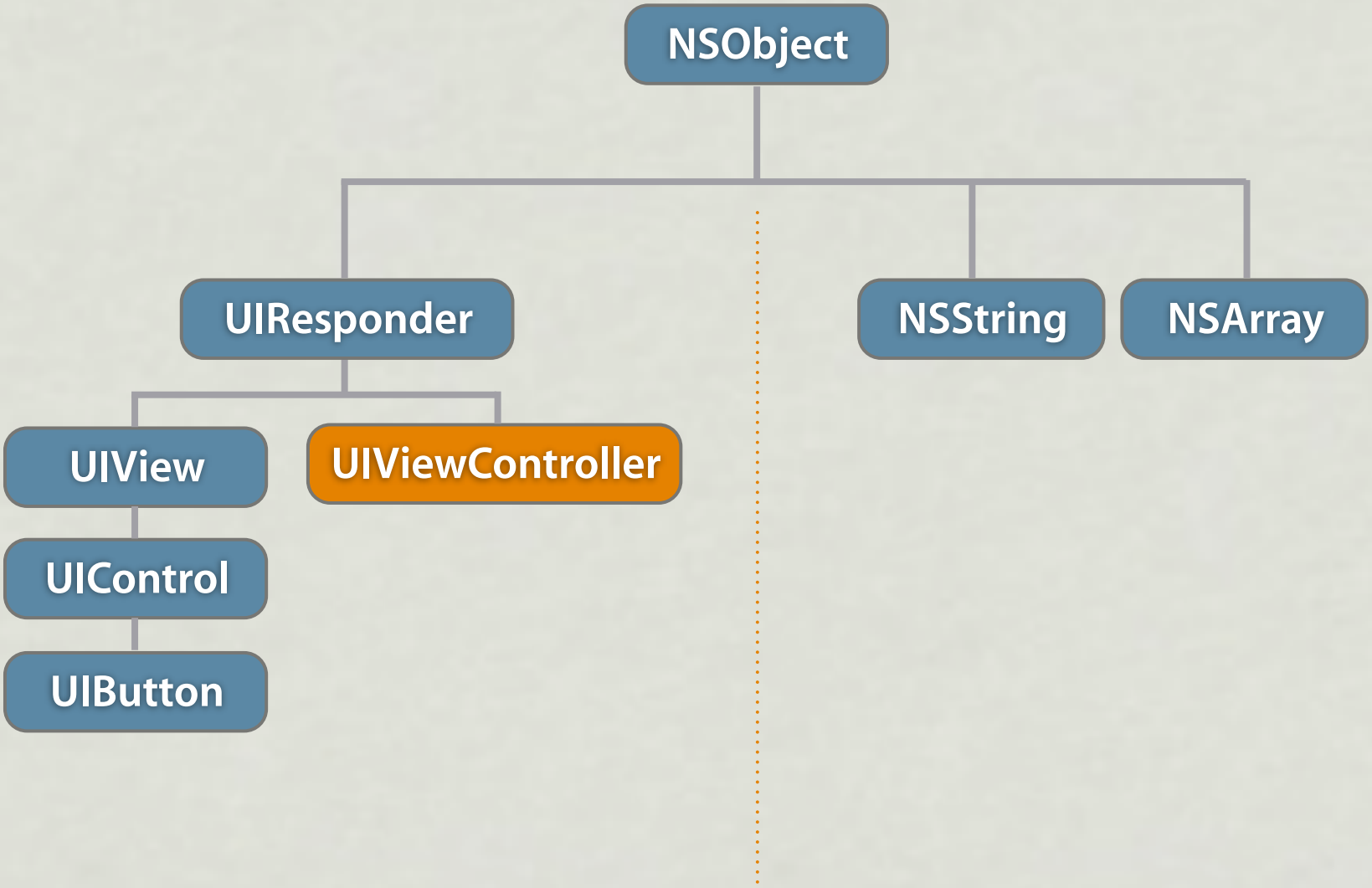
- Using "View Controllers"
- View Controller Feature overview
- Application flow – Chaining view controllers together

- Semester Project – Team Assignments

View Controllers

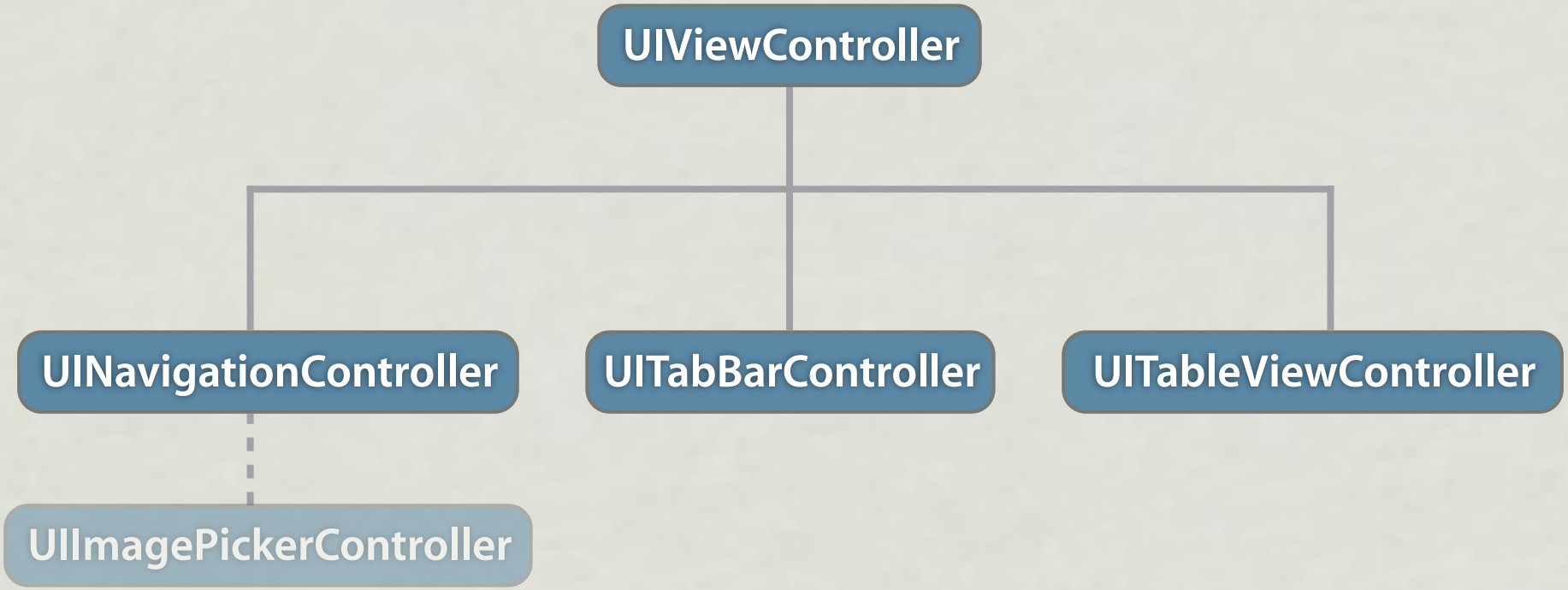
- View Controllers are a specific type of MVC controller
- Provide more than just MVC coordination
  - **View management** – manages screenful of content
  - **Application flow** – makes navigation easy
  - **User experience** – Implement standard behaviors
  - **Override points** – For handling system events
  - **Performance** – Designed with mobile device performance in mind

Class Hierarchy

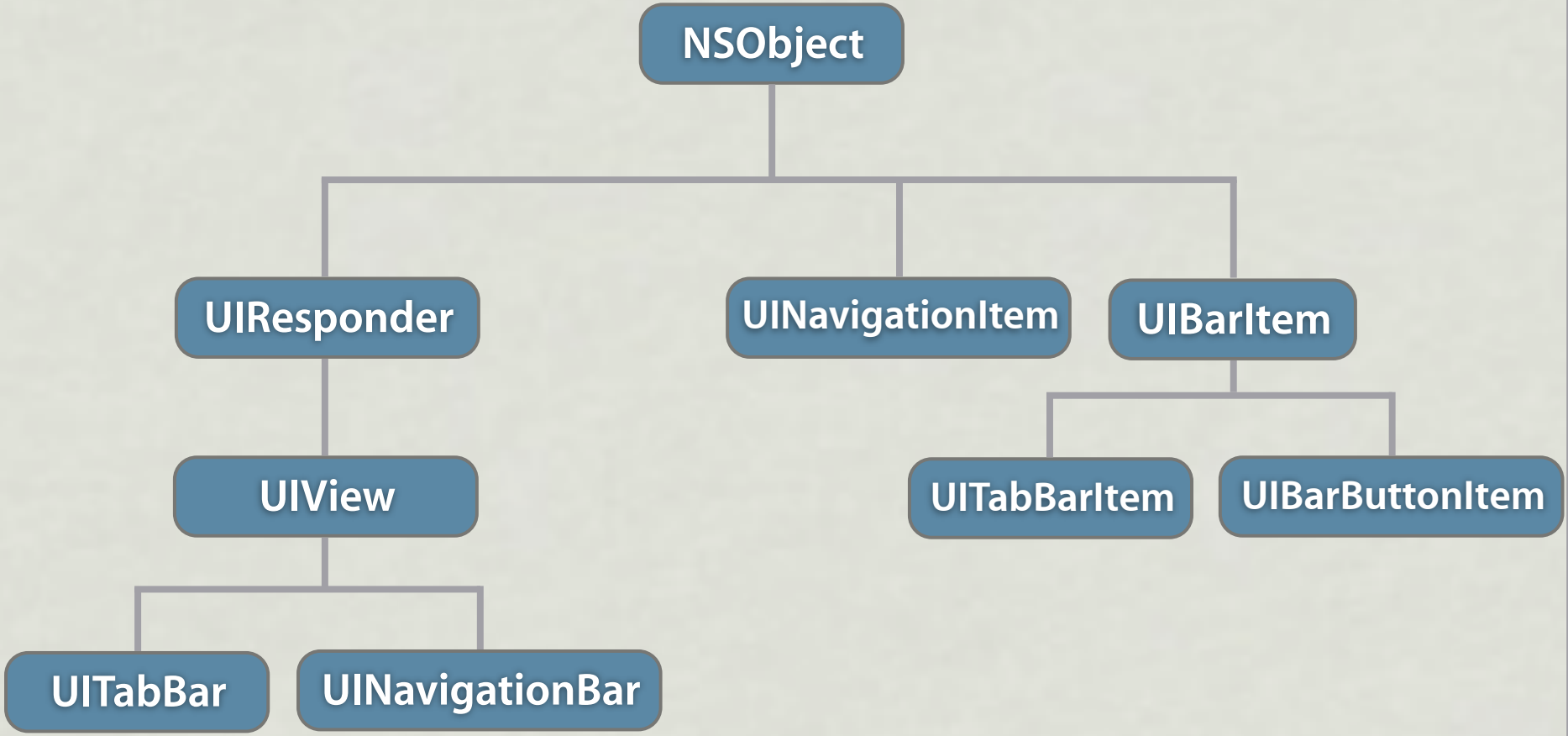


Class Hierarchy

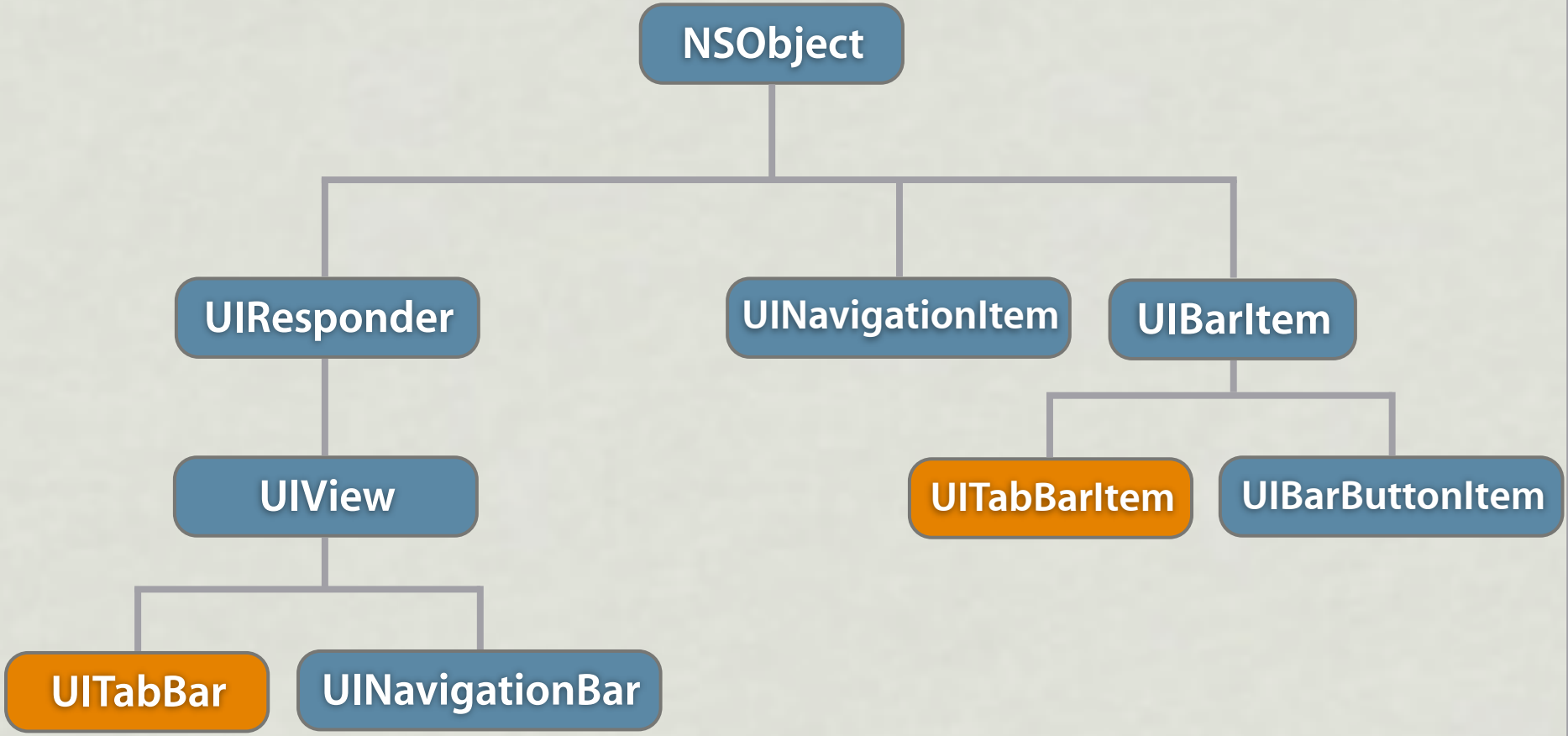
Class Hierarchy



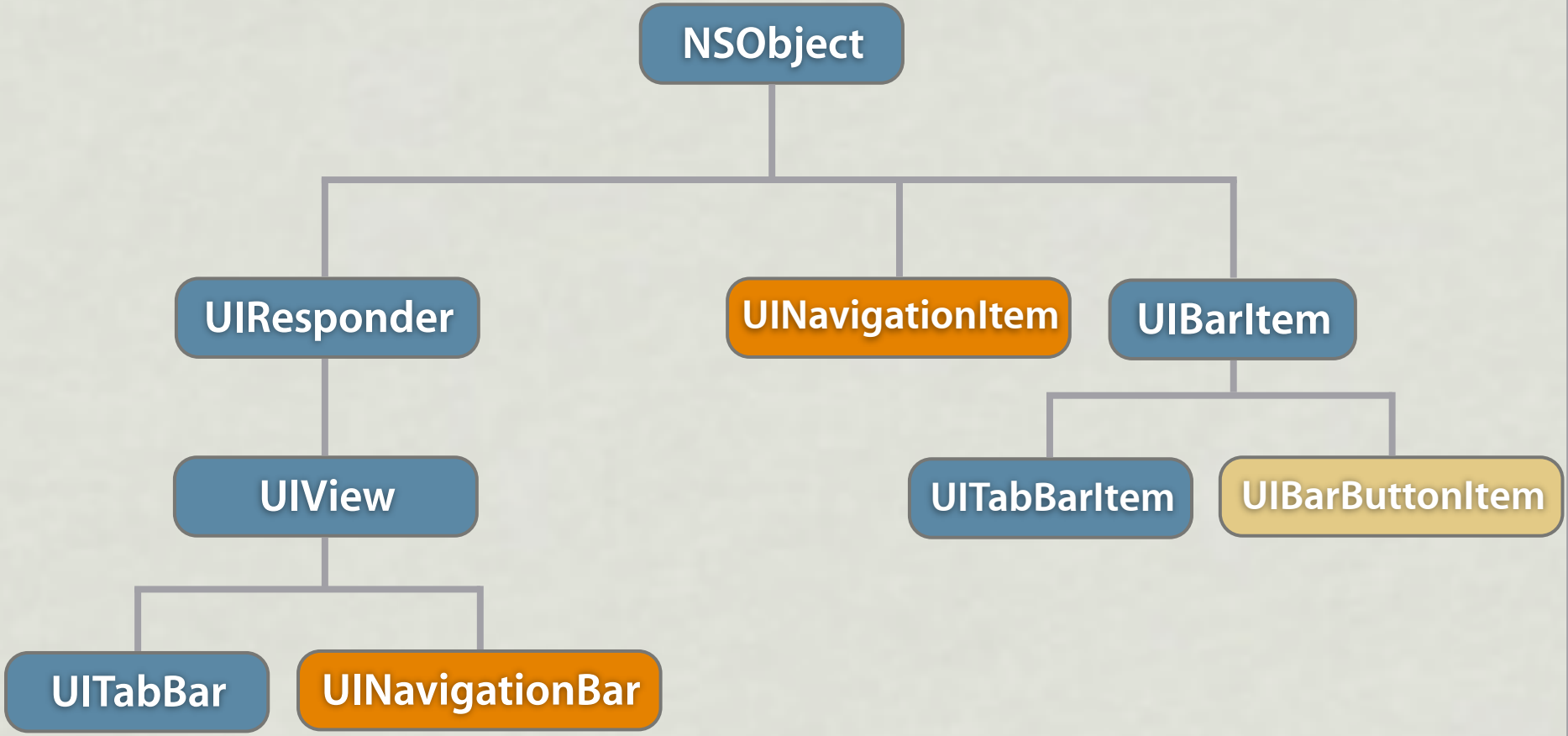
Supporting Classes



Supporting Classes



Supporting Classes



Normal Usage

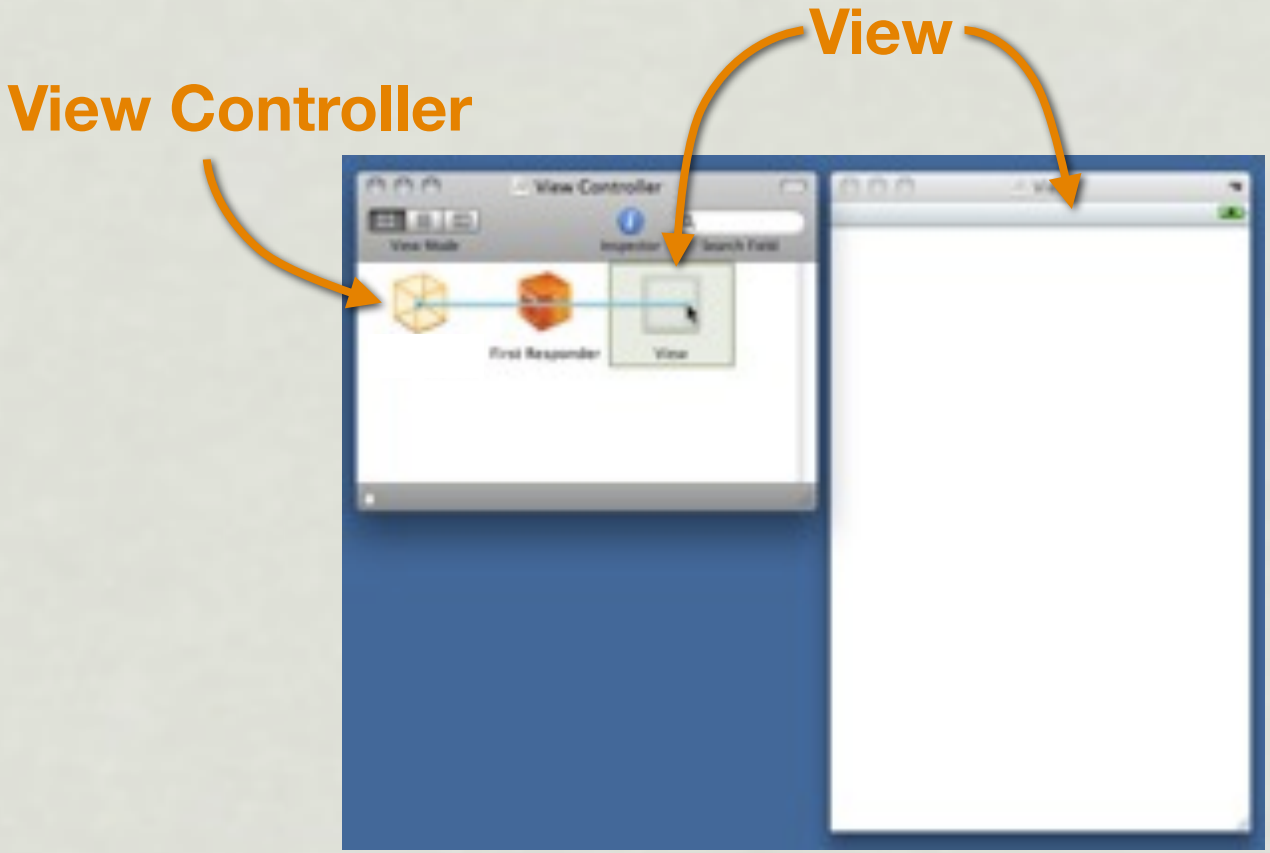
- Custom View Controllers
  - Will have one for each screen
  - You Will Subclass
    - `UIViewController`
    - `UITableViewController`
- Use and compose with others
  - `UITabBarController`
  - `UINavigationViewController`

Overview

Tour of View Controllers

UIViewController

- Manages one view
- Subclass to work with your own UI



UIViewController

- Multiple views contained within a top level view
- Top level view managed by a view controller

Calculator View Controller

UIViewController

- Multiple views contained within a top level view
- Top level view managed by a view controller

UIViewController

- Lazy, on-demand view creation
  - Creates view as needed
  - Deallocates view when possible
- Rotation control and events
- Memory management
  - Low memory warnings
- Editing behavior and override points
- Display related events
- Container controller (tab, navigation) related properties

UITableViewController

- Subclass to work with your data

UITableViewController

- `UITableView` managed by a view controller

Table View Controller

UITableViewController

- `UITableView` managed by a view controller
- View controller contained in chain of other controllers

UITableViewController

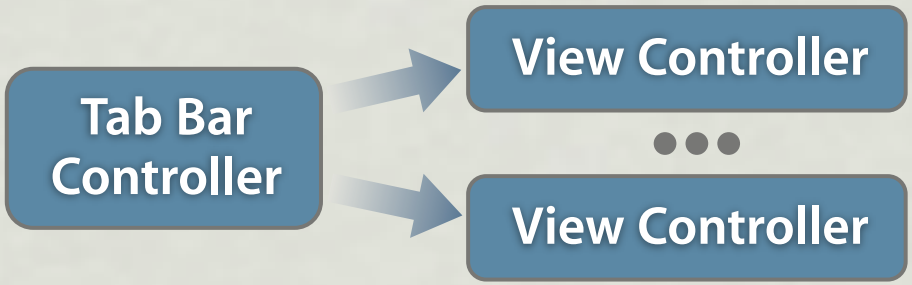
- “view” property expected to be a `UITableView`
- Acts as `data source`, and `delegate` of the table
  - Override by setting the data source, `delegate` property yourself
- Very simple class, provides a couple things
  - Standard user experiences
    - Display “flash” when table first becomes visible
    - Automatically deselect during back navigation
  - Coordinates Editing UI
  - Configures view `autosizing mask` to allow resizing

Mini Summary…

- `UIViewController` and `UITableViewController`
- Meant for subclassing
- Nodes within an application's flow
  - Concerned with data display, not application flow

UITabBarController

- Provides view switching functionality
- Each child view controller has its own view



UITabBarController

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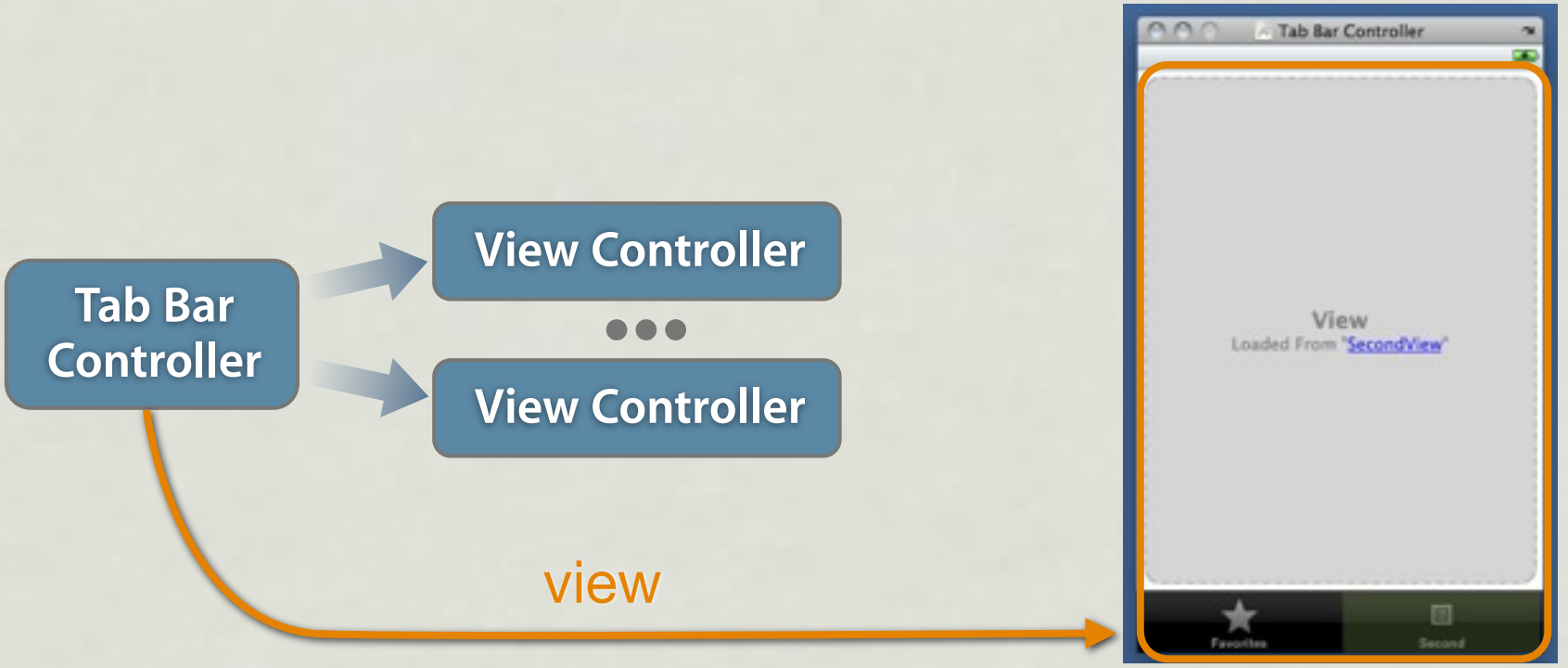

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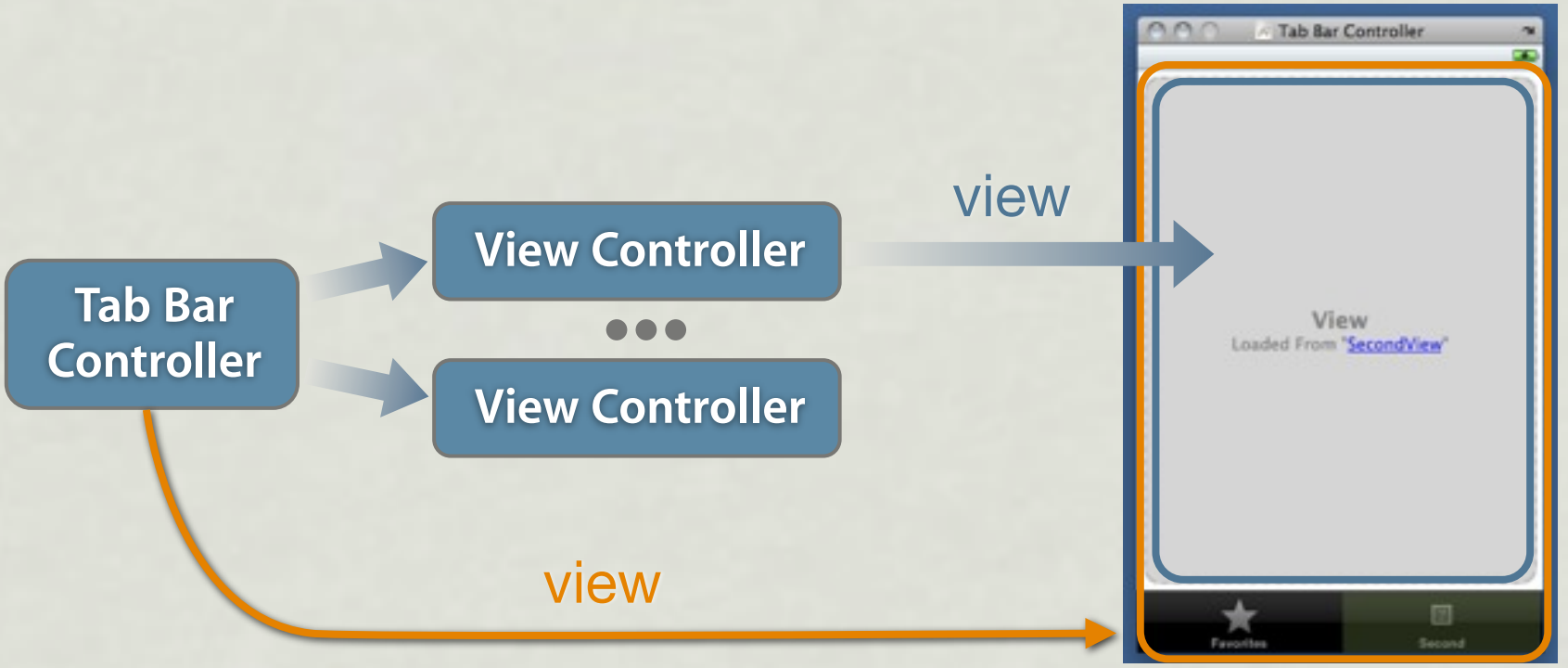

UITabBarController

- Provides view switching functionality
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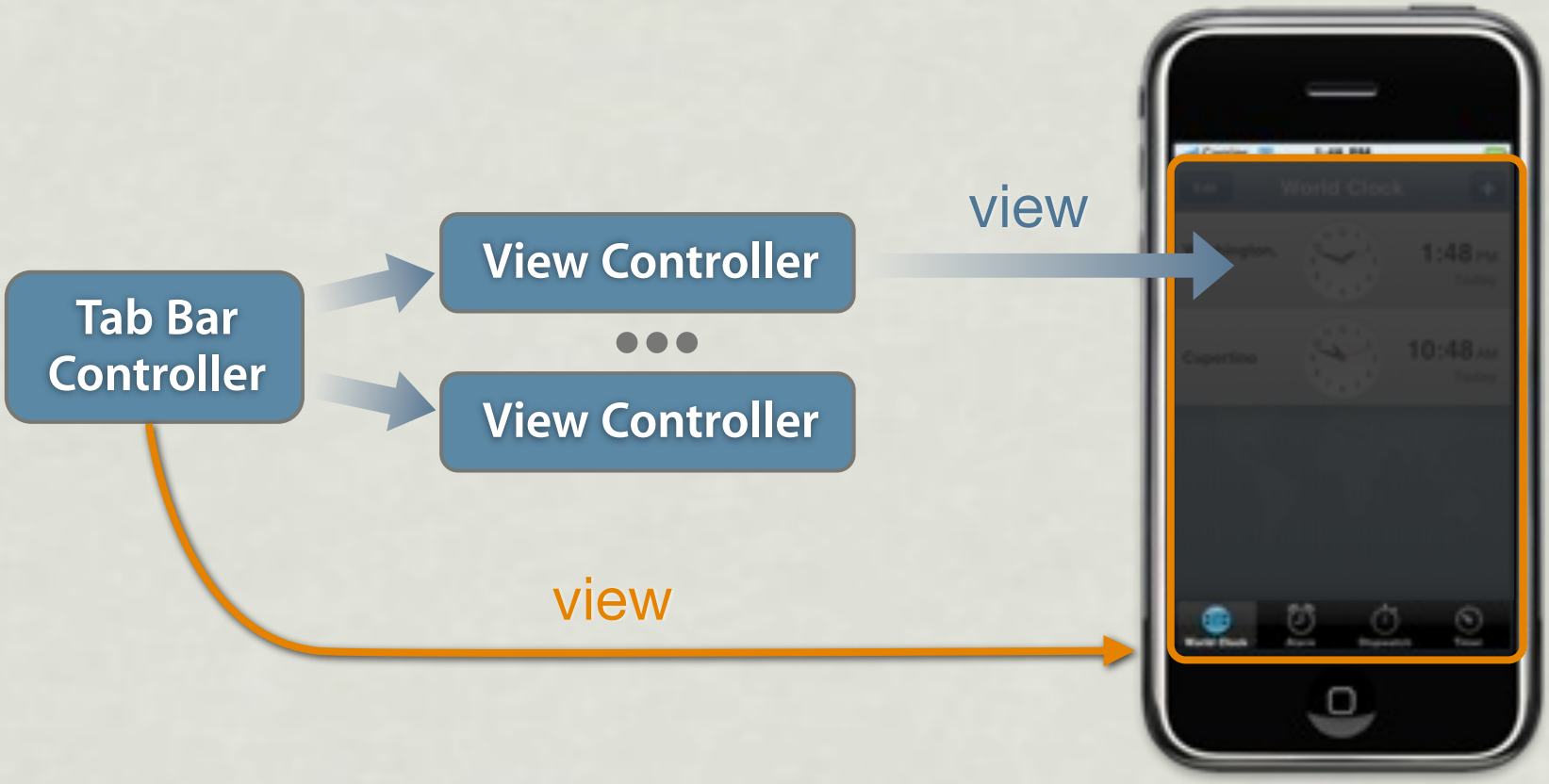
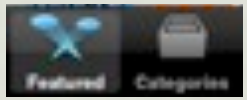


UITabBarController

- View switching
- Automatic “More” list creation for overflow
- Allow user customization of order
- Delegate API to control certain behaviors
  - Selection
  - Customization
- Typically the top level controller in an application
  - Each tab containing either a `UIViewController`, or `UINavigationController`

UITabBarItem

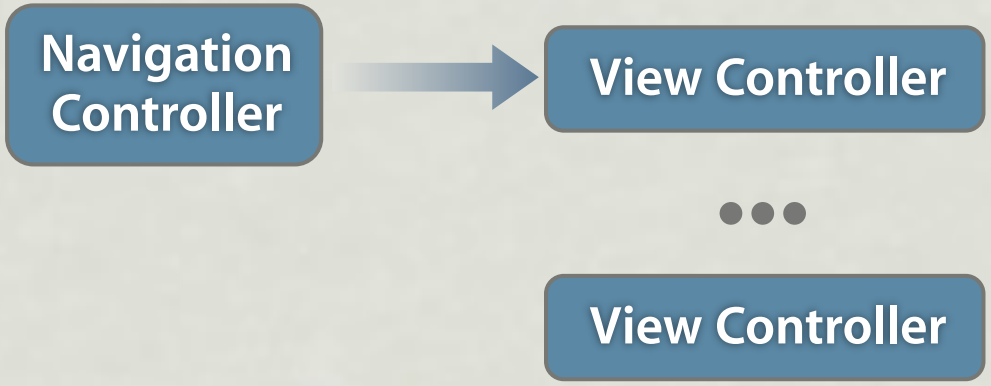


- Information needed to display buttons in tab bar
- Creation
  - System Items – (`UITabBarSystemItemFavorites`, `Contacts`, ...)

  - Using any `UIImage`
    - `UITabBar` automatically creates gray, “shiny” blue versions
- Badges

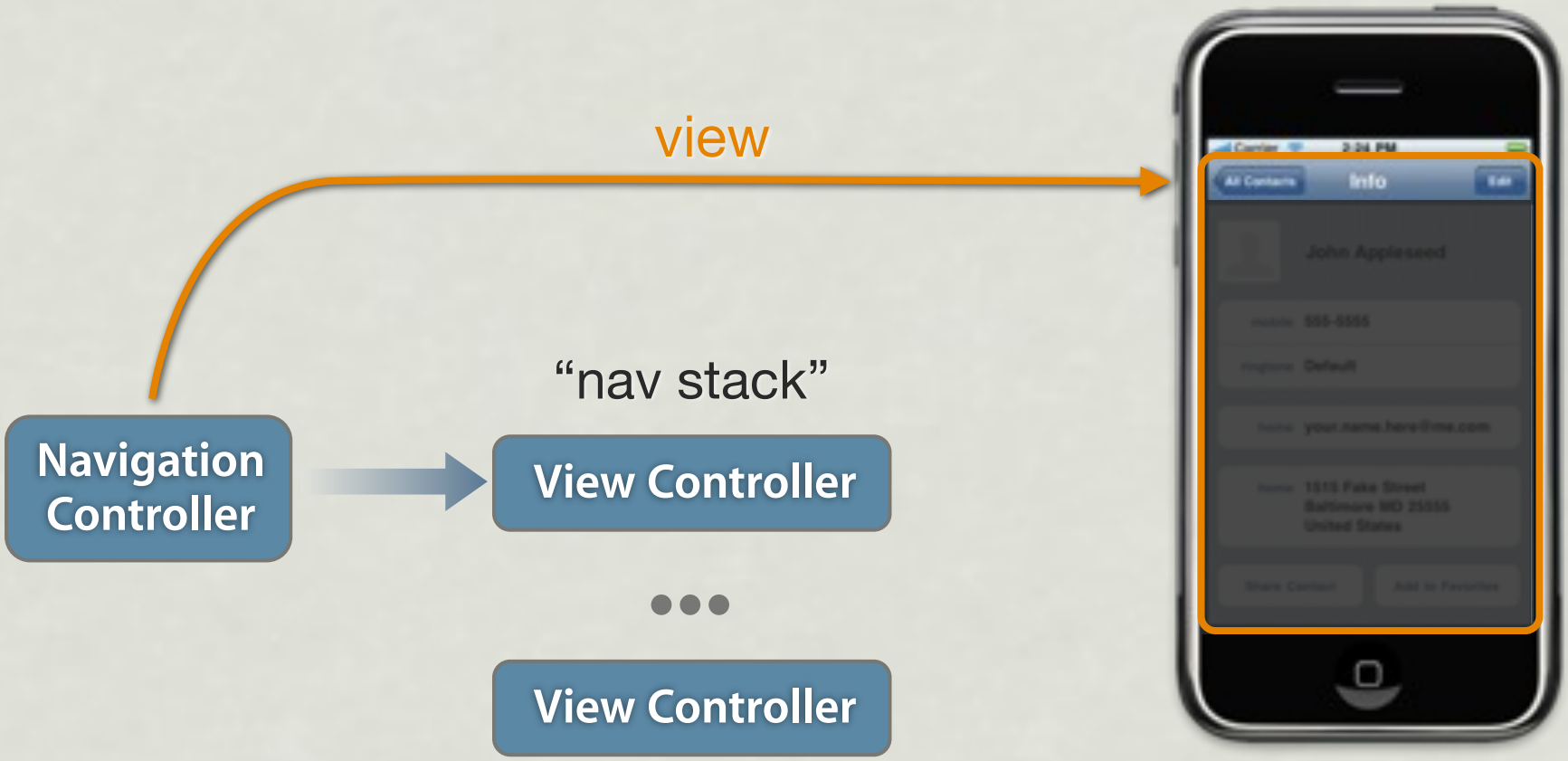
UINavigationController

- Primary application flow – push / pop



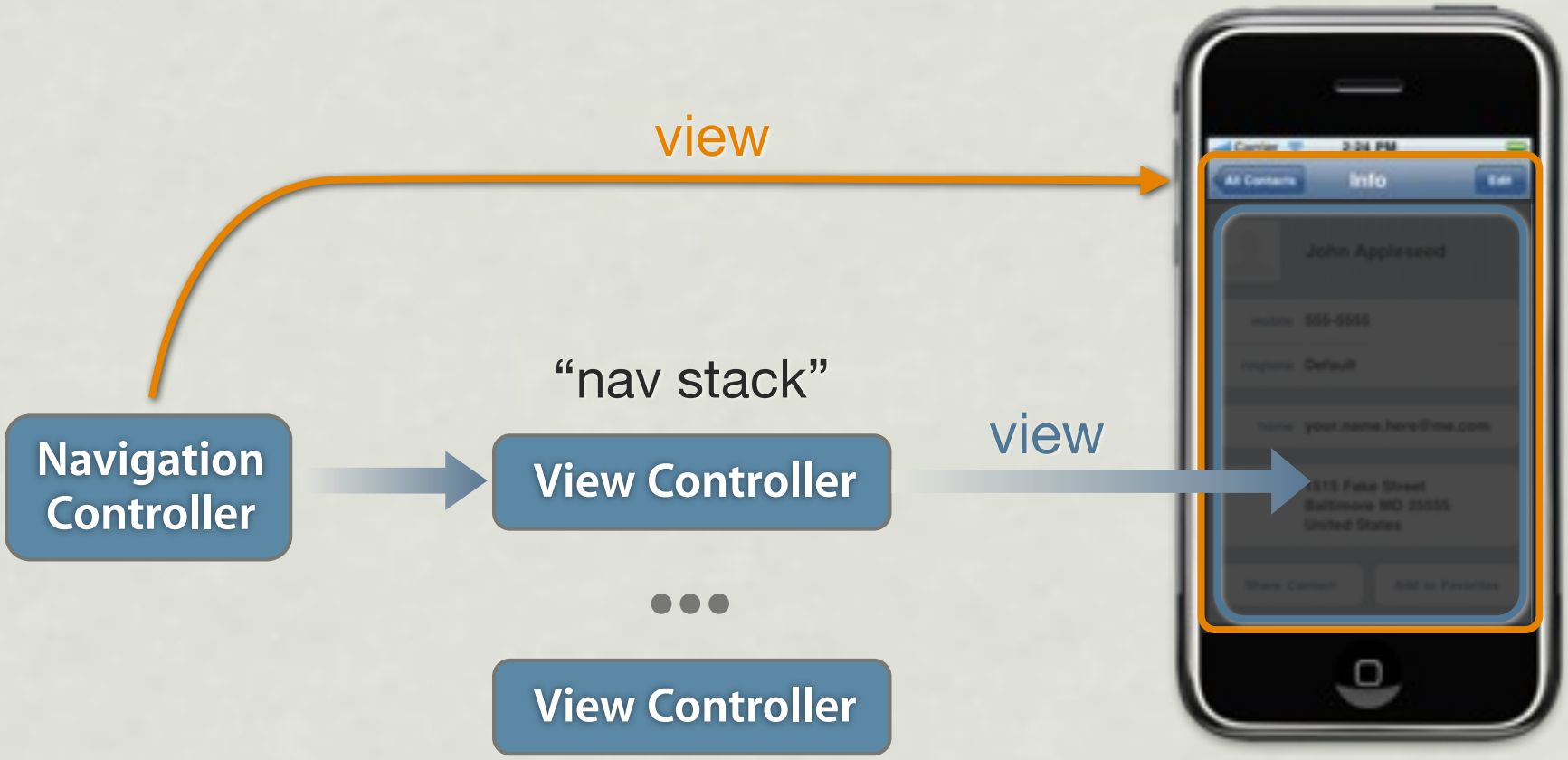
UINavigationController

- Primary application flow – push / pop

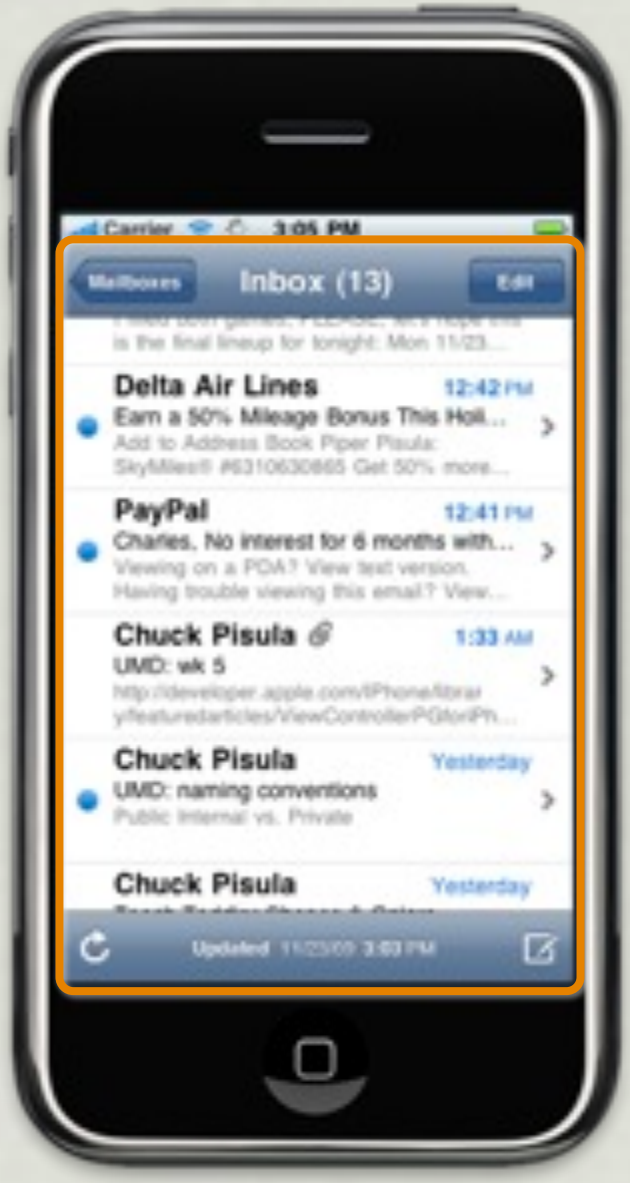


UINavigationController

- Primary application flow – push / pop

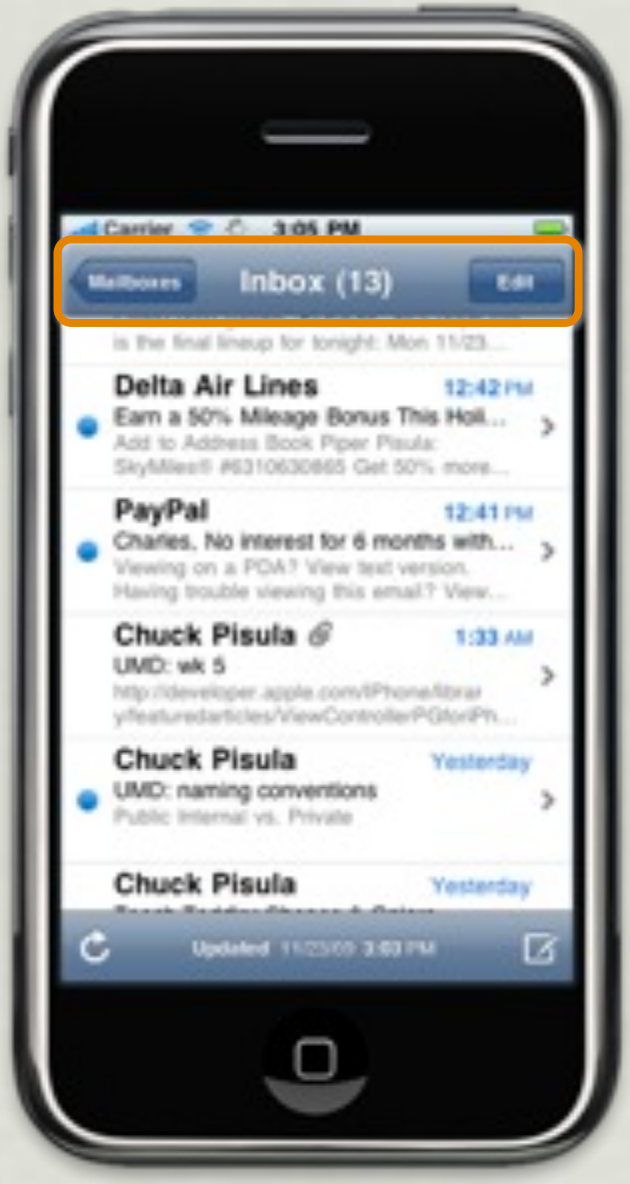


Navigation Parts



Navigation Parts

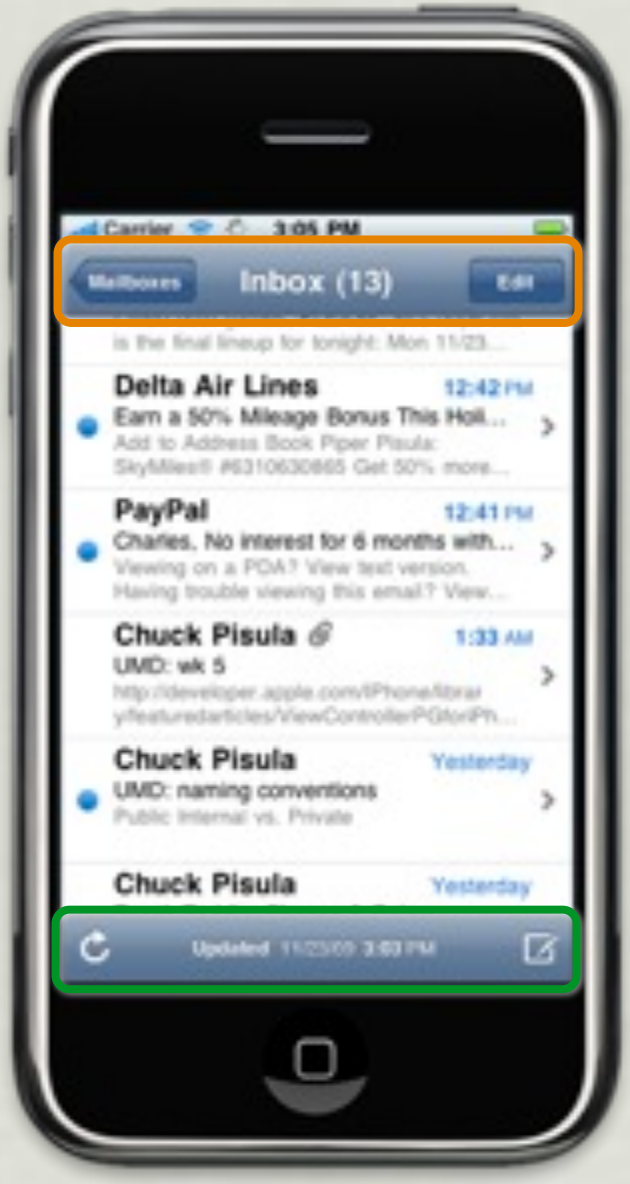
Navigation Bar



Navigation Parts

Navigation Bar

Toolbar

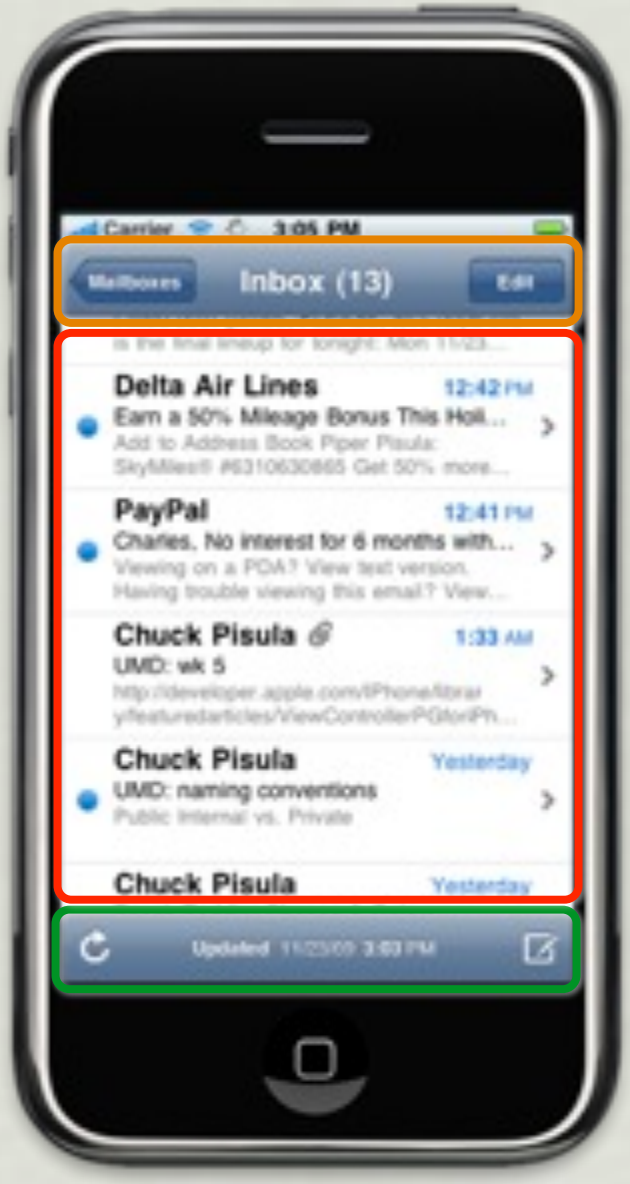


Navigation Parts

Navigation Bar

Top Controller's view

Toolbar



UINavigationController

- Manages hierarchal application flow
  - Usually contained within a `UITabBarController`
- Navigation Stack
  - **Root Controller** - bottom of the stack
  - **Top Controller** - currently show view controller
  - Operations – push, pop, set stack
- Customizable components in navigation / toolbar
- Dynamic per-node toolbar
  - TabBar is fixed and does not change with each selection

UINavigationItem

- Encapsulates navigation bar display information
  - UINavigationController consults to configure its display
- Each `UIViewController` has a `navigationItem`
- By default you don't need to do anything
  - Title automatically configured to match view controller's title
    - Main Title
    - Back Button Title
- Use if you want to customize display
  - Title, left / right buttons

UIBarButtonItem

- Used in `UIToolbar` and `UINavigationBars`
- Creation
  - With any custom view
  - Buttons
    - System Items – (e.g. `UIBarButtonSystemItemEdit`, `Compose`, ...)

    - Using a `UIImage`
    - With an `NSString` title
- Configurable target, action for buttons

Navigation Bar

- Views provided by `UIBarButtonItem`'s view property
- Title provided as string or custom view

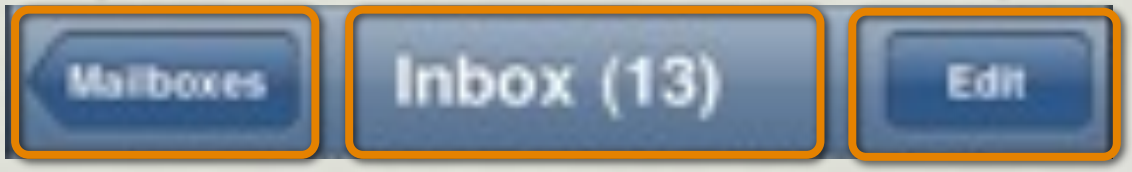
Navigation Bar

- Views provided by `UIBarButtonItem`'s view property
- Title provided as string or custom view

```
UINavigationItem *navItem = someViewController.navigationItem;
```

```
navItem.leftBarButtonItem = ...;
```

```
navItem.rightBarButtonItem = ...;
```




```
navItem.titleView = // some view
```

```
navItem.title = // some string
```

Navigation Bar

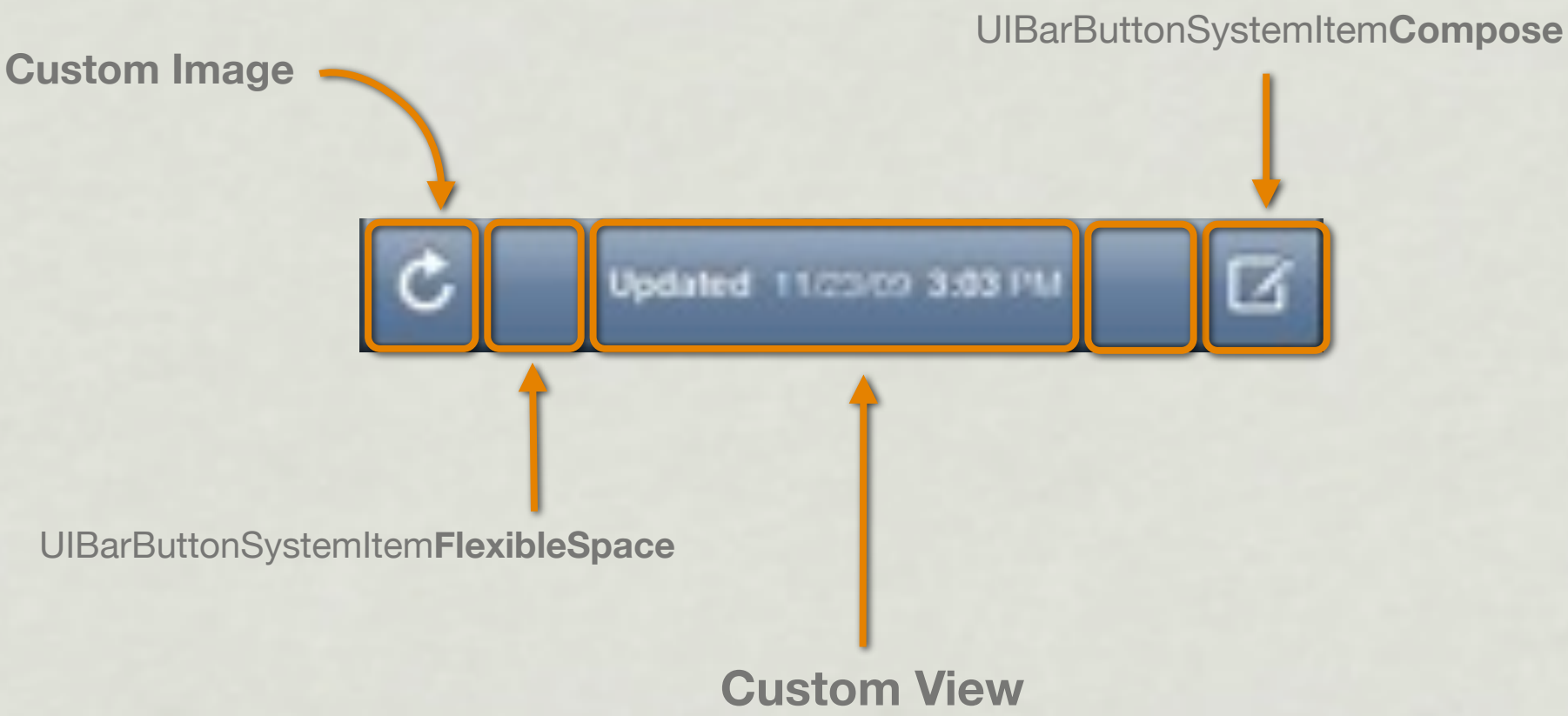
- Current View Controller Provides
  - Left / Right Button
    - Any `UIBarButtonItem` (e.g. edit, save, …)
    - Avoid custom Left Button where “back” buttons may be needed
  - Title Area
    - Typically just a string
    - Can provide a custom view instead (e.g. segmented control...)

Navigation Bar

- Current View Controller Provides
  - Left / Right Button
    - Any `UIBarButtonItem` (e.g. edit, save, …)
    - Avoid custom Left Button where “back” buttons may be needed
  - Title Area
    - Typically just a string
    - Can provide a custom view instead (e.g. segmented control...)
- Previous View Controller Provides
  - Usually a “back button” – title from previous view controller

Toolbar

- Views provided using `UIBarButtonItem`'s view property



Mini Summary…

- `UITabBarController` and `UINavigationController`
- Not meant for subclassing
  - Presence of `delegate` API is often a good indicator of this…

```
// UITabBarController
@property(nonatomic,assign) id<UITabBarControllerDelegate> delegate;
```

```
// UINavigationController
@property(nonatomic, assign) id<UINavigationControllerDelegate> delegate;
```

- Handle most of your application flow
  - View switching
  - Hierarchal navigation

View Autoresizing

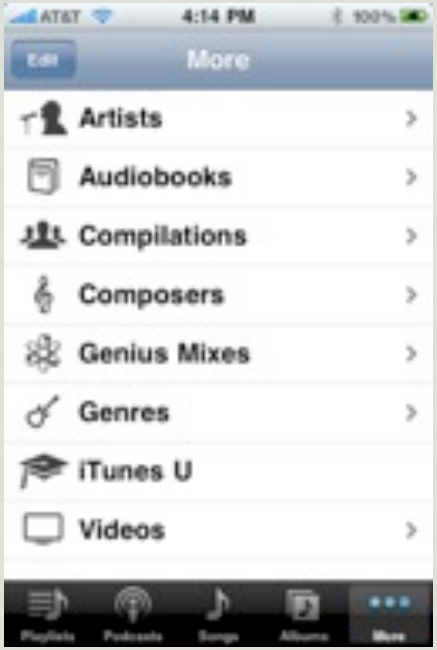
- Reasons a view's height can change
  - Incoming phone call – double height status bar
  - Rotation
- Other reasons to make view size flexible
  - Can install view controller in navigation, or tab bar controller
  - Area available to view controller based on where it lives
    - Navigation bar takes up space
      - Can specify a title prompt and take up even more…
    - Tab bar takes up space

Combinations

Some Standard Configurations

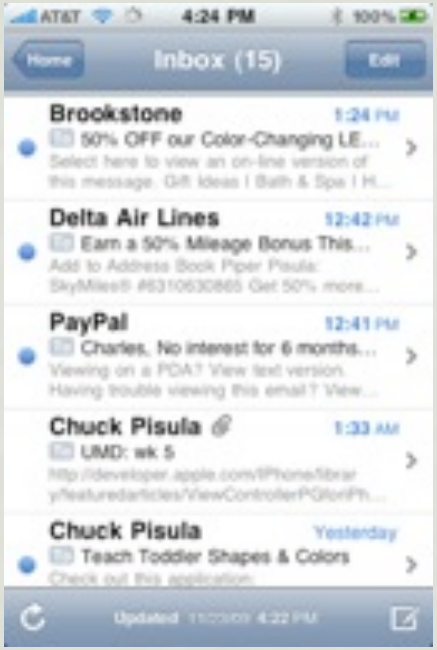
Tab & Navigation

- `UITabBarController` top level item
  - Enough items for “more” button bar item to automatically be created
- Each tab has a `UINavigationController`
- Chain of `UITableViewControllers`



Tab & Navigation

- `UINavigationController` top level item
- Bottom Bar is a `UIToolbar`
  - No `UITabBarController`
- Chain of `UITableViewControllers`
- Leaf node is `UIViewController` managing a custom view that displays email text



Subclassing

Creating View Controllers

Subclassing

- Choose view controller to subclass

```
@interface PersonViewController : UIViewController {
```

- Provide custom methods for data passing

```
- (id)initWithPerson:(Person *)person;

@property (retain, readwrite) Person *person;
```

- IBOutlets and IBActions
  - Hook up outlets to UI, and action to your controller code

Subclassing - XIB Based

- Provide XIB filename when you call

```
- (id)initWithNibName:(NSString *)nibNameOrNil
                bundle:(NSBundle *)nibBundleOrNil;
```

- Or… If a nil filename is passed, `-nibName` is used

```
@property(nonatomic, readonly, copy) NSString *nibName;
```

- Set the title property in Interface Builder
- **DO NOT** implement `-loadView`

Subclassing - XIB Based

```
- (IBAction)someAction:(id)sender {
    controller = [[PersonViewController alloc] initWithPerson:...];
}
```

```
@implementation PersonViewController

- (NSString *)nibName {
    return @"PersonViewController"; // note, no ".xib"
}

- (id)initWithPerson:(Person *)p {
    // Since nil is specified as nibName, -nibName property is used
    if ((self = [self initWithNibName:nil bundle:nil])) {
    }
    return self;
}

- (void)initWithNibName:(NSString *)n bundle:(NSString *)b {
    if ((self = [super initWithNibName:n bundle:b])) {
    }
    return self;
}

@end
```

Nib Loading Details

- First, some review…

Review

Application Delegate

Manage application lifecycle and events

ToDoListViewController

Provide cells for table
Manage array of events

Review

```
@implementation iNeedToDoAppDelegate

- (void)applicationDidFinishLaunching:(UIApplication *)app {
    [window addSubview:[navigationController view]];
    [window makeKeyAndVisible];
}
....
@end
```

Application Delegate

Manage application lifecycle and events

ToDoListViewController

Provide cells for table
Manage array of events

Review

```
    [window addSubview:[navigationController view]];
    [window makeKeyAndVisible];
}
....
@end
```

```
@implementation UINavigationController

- (UIView *)view {
    if (!_view) {
       [self loadView];
    }
    return _view;
}

- (void)loadView {
    // Create top level container view with nav bar
    rootController = // set to ToDoListViewController in NIB
    [topView addSubview:[rootController view]];
}

@end
```

Application Delegate

Manage application lifecycle and events

ToDoListViewController

Provide cells for table
Manage array of events

Review

```
    rootController = // set to ToDoListViewController in NIB
    [topView addSubview:[rootController view]];
}

@end
```

```
@implementation UIViewController

// ToDoListViewController is a UIViewController!
- (void)loadView {
    [NSBundle loadNibNamed: [self nibName]
                     owner: self
                   options:nil];
}

@end
```

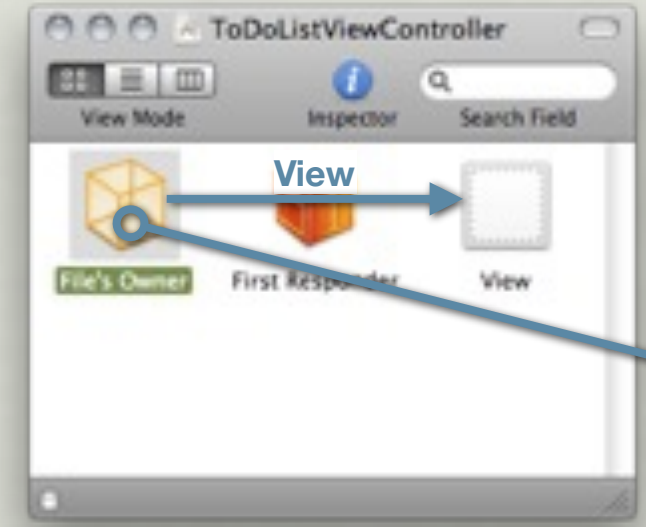
Application Delegate

Manage application lifecycle and events

ToDoListViewController

Provide cells for table
Manage array of events

Review



Application Delegate

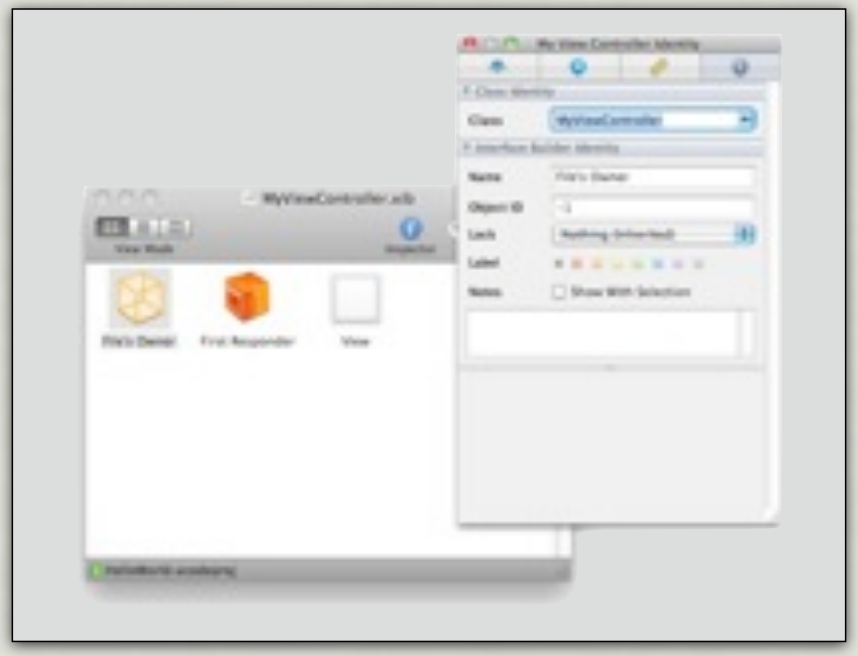
Manage application lifecycle and events

ToDoListViewController

Provide cells for table
Manage array of events

File's Owner

- Interface Builder proxy object
  - Already exists! Other objects are instantiated by NIB loading
  - `File's Owner` is an external reference passed to IB that is dynamically connected later



Nib Loading Details

- Object initialized by NIB loading are sent `-awakeFromNib`
- “Proxy” objects like **file’s owner** are **NOT** sent `-awakeFromNib`
  - Need to figure out your own place…
  - `UIViewController` subclasses should use `-viewDidLoad`

```
@implementation PersonViewController

- (void)initWithNibName:(NSString *)n bundle:(NSString *)b {
    if ((self = [super initWithNibName:n bundle:b])) {
        // IBOutlets will be *nil* here!  NIBs are loaded lazily!
        // -loadView will call -viewDidLoad when done...
    }
    return self;
}

- (void)viewDidLoad {
    // Yay, my IBOutlets are all connected!
}

@end
```

Subclassing – No XIB

- Don't
  - Pass a XIB filename to `-initWithNibName:`
  - Return a value from `-nibName`
    - You could, but should return nil…
- Do
  - Create your view in `- (void)loadView`
  - Set the `title` property
    - Call setter or override `-title`

Subclassing - No XIB

```
@implementation PersonViewController

- (id)initWithPerson:(Person *)p {
    // Since nil is specified as nibName, -nibName property is used
    if ((self = [self initWithNibName:nil bundle:nil])) {
    }
    return self;
}
```

Subclassing - No XIB

```
@implementation PersonViewController

- (id)initWithPerson:(Person *)p {
    // Since nil is specified as nibName, -nibName property is used
    if ((self = [self initWithNibName:nil bundle:nil])) {
    }
    return self;
}
```

```
- (void)initWithNibName:(NSString *)n bundle:(NSString *)b {
    // nibName better be *nil* !!!
    if ((self = [super initWithNibName:n bundle:b])) {
        self.title = @”Info”;
    }
    return self;
}

- (void)loadView {
    // Create the view, and the set the view controller’s view property
    SomeAwesomeView *sav = [[SomeAwesomView alloc] initWithFrame];
    self.view = sav;
}

@end
```

Subclassing

Standard Overrides

Subclassing - Overrides

- `-viewWillAppear:`
  - Perform tasks associated with presenting your view
  - E.g. update a display value, coordinate status bar look, etc.
- `-viewDidAppear:`
  - Called when the view has been fully transitioned onto the screen
  - E.g. `UITableView` flashes its scroll bars

Subclassing - Overrides

- `-viewDidDisappear:`
  - Your view is dismissed, covered or hidden
  - Should stop timers, display updates, etc…
- `-viewWillDisappear:`
  - May want to stop timers and updates at this point
  - May want to save state to disk

Subclassing Overrides

- `-viewDidLoad`
  - Called after a view is loaded from XIB, or by `-loadView`
- `-viewDidUnload`
  - Called whenever UIKit deems it necessary to release the view without deallocating the controller
  - You can release any data easily recreated
  - If your data is expensive to recreate (often the case with caches), maybe wait until `-didReceiveMemoryWarning` to release

Laziness…

- Notice, view creation is very “lazy”
  - Requires some coordination because of laziness
  - Benefit is memory saving

```
- (UIView *)view {
   if (!view_) {
       // load the “view_”
       [self loadView];
   }
   return view_;
}
```

Laziness…

- Notice, view creation is very “lazy”
  - Requires some coordination because of laziness
  - Benefit is memory saving

```
- (NSMutableDictionary *)mapTable {
   if (!mapTable_) {
      mapTable_ = [[NSMutableDictionary alloc] init];
   }
   return mapTable_;
}
```

Lazy Loading

- Example – `UITabViewController`
  - tab view created and set up with list of view controllers
  - however, only one view exists
  - view is created on demand when switching to selected tab
- Example – `UINavigationController`
  - Only views on screen must be kept around
  - For good performance, visited items views are kept around
  - …Unless a “memory notification” comes in…

Demo

View Controllers

Next Lecture

- View Controllers In Depth
  - Application Flow
    - Implementing common use cases
    - Code showing how to setup a chain of view controller
  - `UINavigationController` bells and whistles
  - “Modal” view controllers
  - Other advanced features

Reading

- "View Controller Programming Guide For iPhone OS"
  - ViewControllerPGforiPhoneOS.pdf
  - Read "About View Controllers" – p.11 - 20
  - Read "Custom View Controllers" – p.21 - 52
- iPhone OS Reference Library
  - UIViewController Class Reference

Term Project

Team Assignments

Term Projects

- 10 minutes to meet now
- Get organized and plan times to meet
  - Begin brainstorming ideas
  - **Proposal Due**: March 12th, 11:59 pm