Mobile Application Development

Lecture 16
Controllers of View Controllers

Lecture Summary

- Multiple MVCs
- UINavigationController
- Segues
- UITabBarController
- DEMO

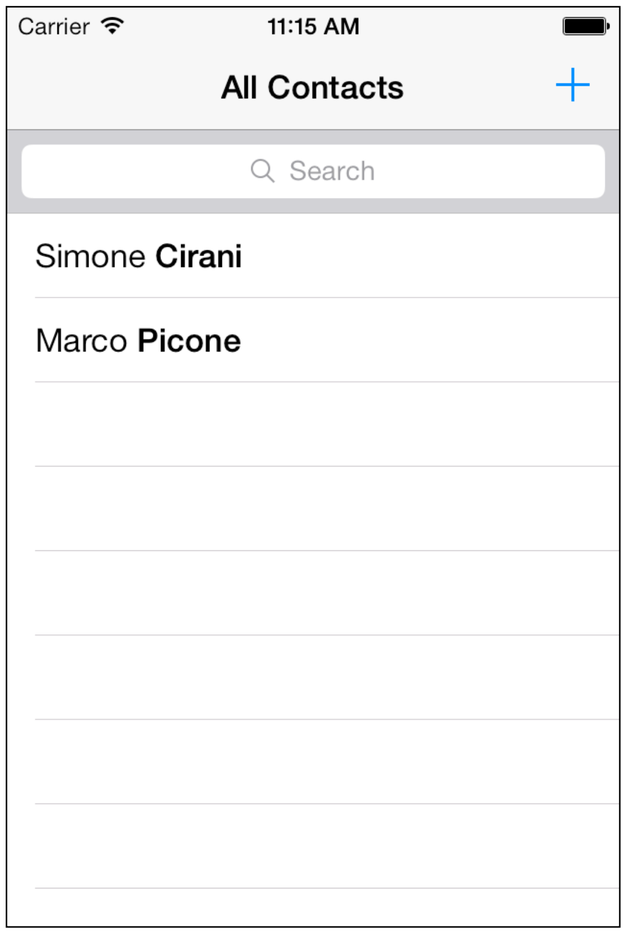
Multiple MVCs

- Complex iOS applications typically rely on multiple views to show content
- For instance, it might not be possible to display all the content inside a single view, so another view might be needed to display additional content
- Multiple views also make the flow of the application more natural and intuitive for the user
- Handling multiple views means that we also have multiple view controllers that must coordinate the flow of the application
- Each view is controlled by its own view controller, thus multiple MVCs come into play in an application

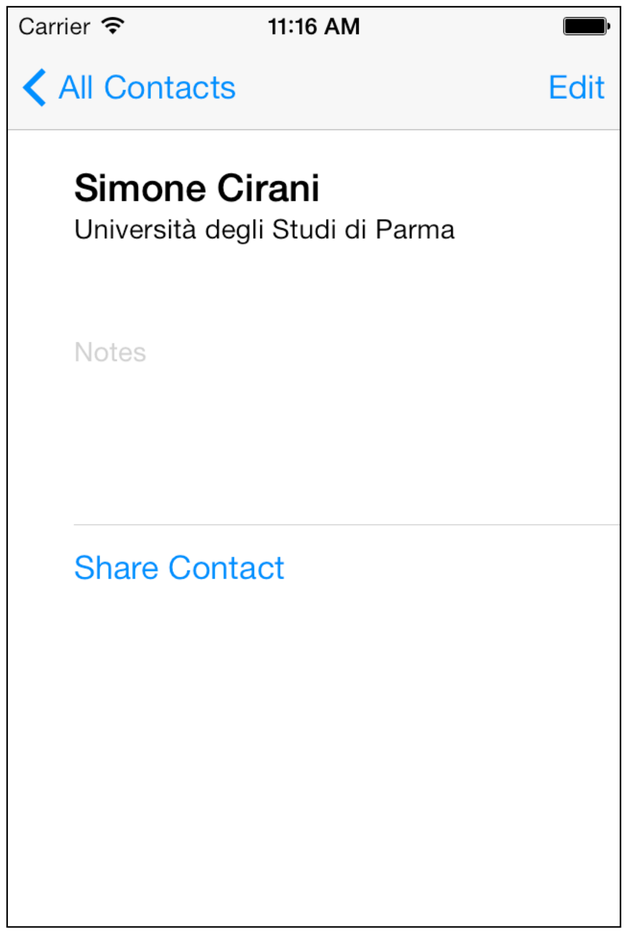
Multiple MVCs

- As in good OOP design, view controllers should be highly specialized and independent from each other
- Each view controller should be responsible to manage a view that display some specific content (e.g. a contact list, a contact details)
- Apple provides great examples of apps with multiple MVCs:
  - Contacts app
  - Calendar app
  - Music app

Multiple MVCs: Contact app

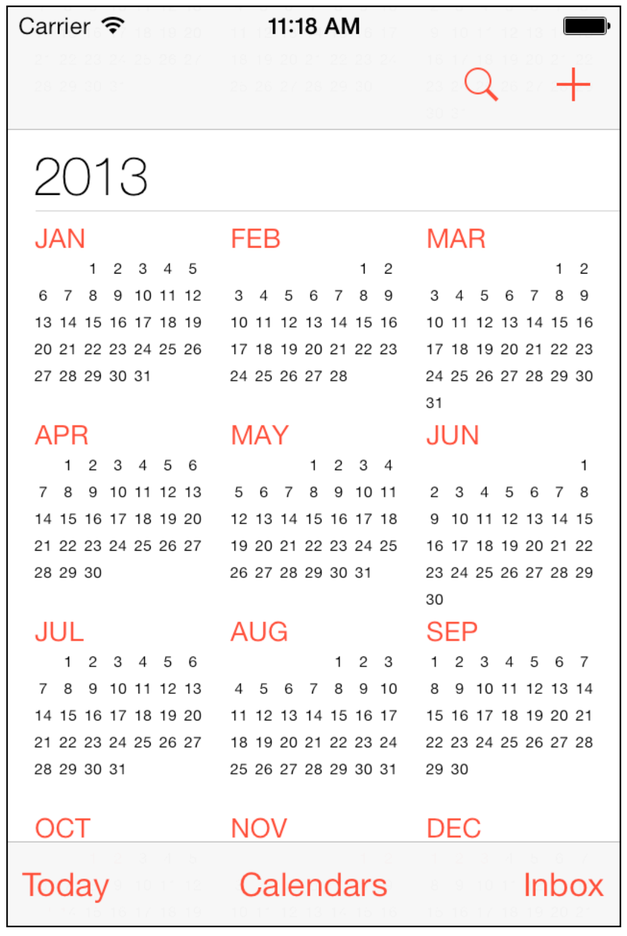


Contact list

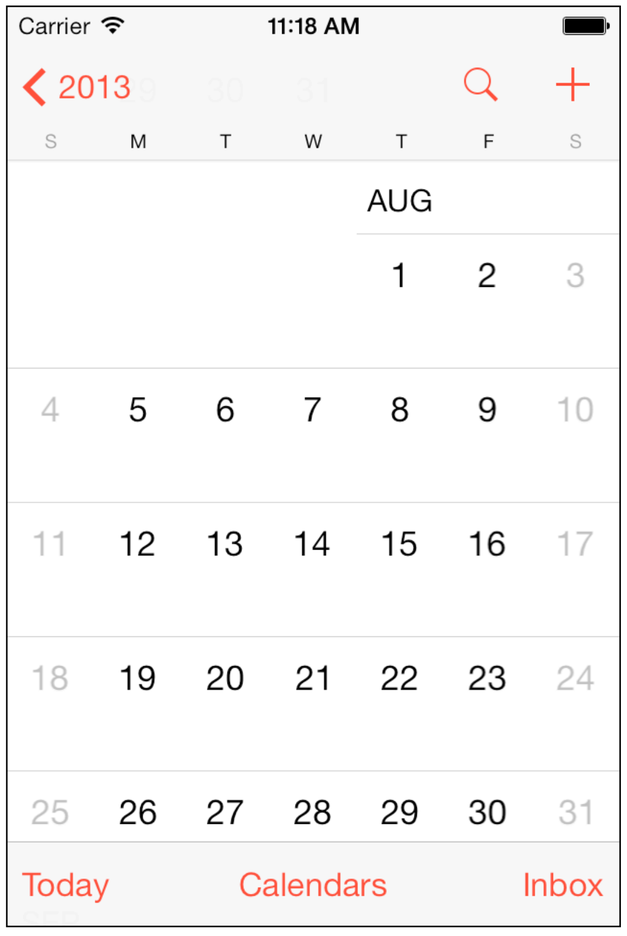


Contact details

Multiple MVCs: Calendar app



Year view



Month view

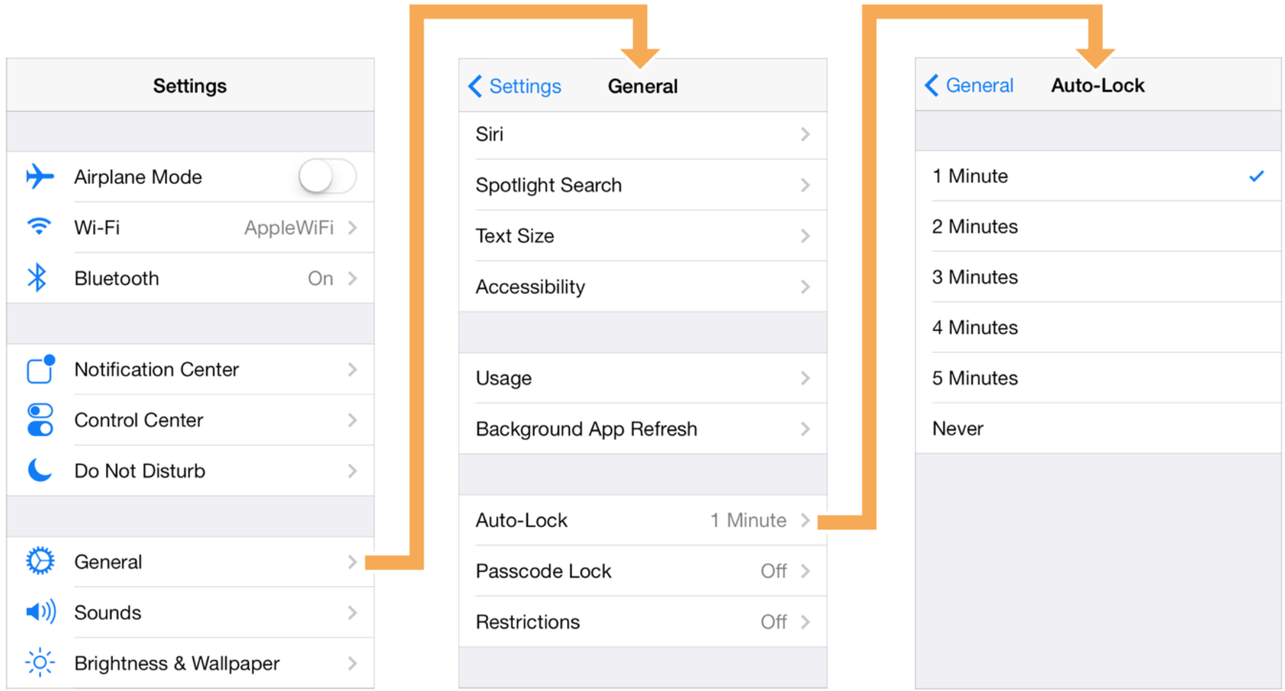
Day view

Multiple MVCs

- Multiple view controllers can be rendered in different ways depending on what content is going to displayed throughout the app
- The management of the transition among different MVCs is provided by dedicated controllers
- Controllers of view controllers:
  - `UINavigationController`
  - `UITabBarController`
- Transitions among MVCs are called **segue**s
- Segues can be triggered by controls in the view or by certain events that might occur in the app, depending on the application logic
- Other view controllers are added to the storyboard:
  1. drag a UIViewController from the object palette
  2. create a subclass of UIViewController using New File menu item
  3. in the Attributes inspector, set the class of the UIViewController to the newly created subclass

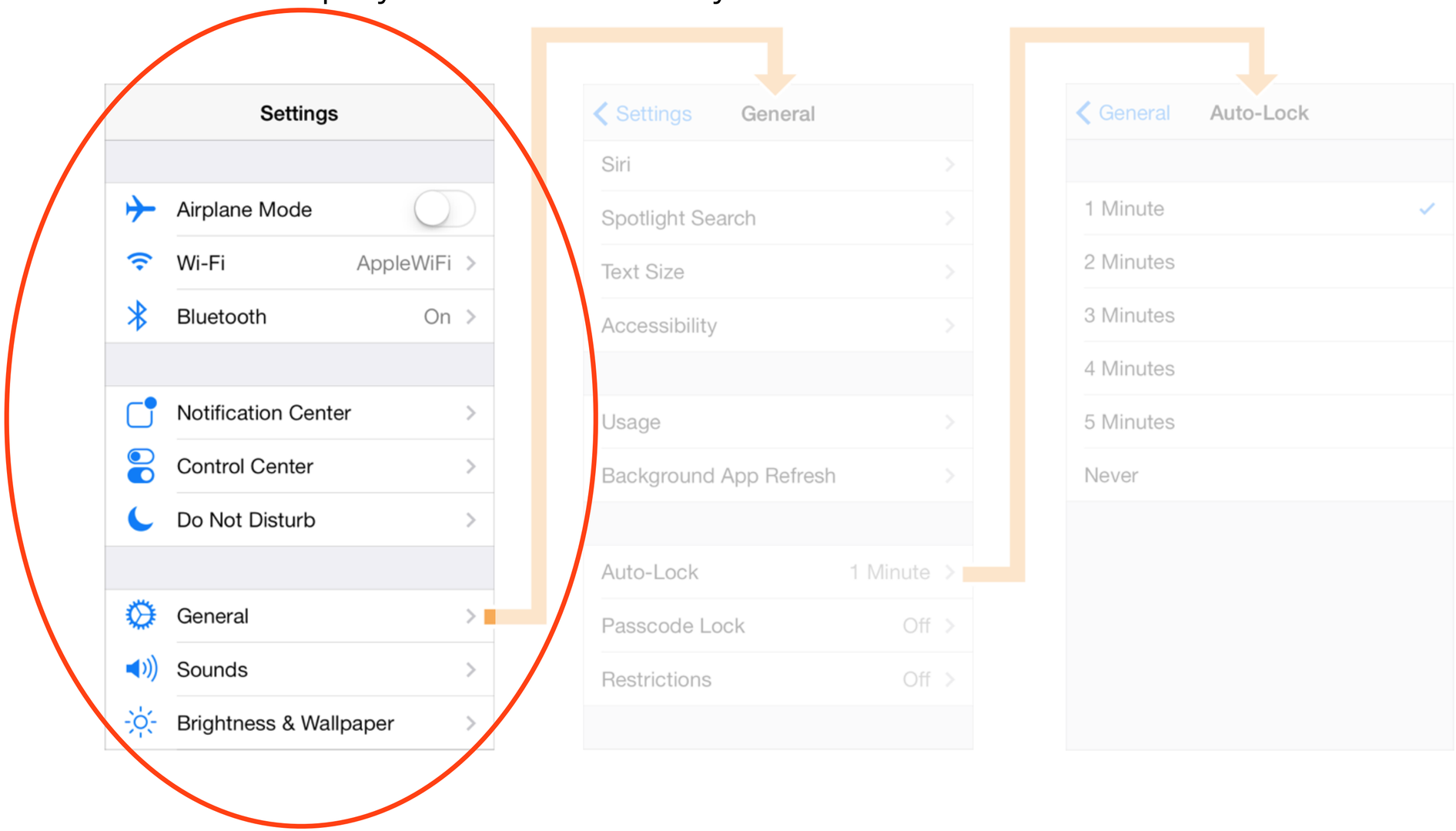
UINavigationController

- `UINavigationController` is a class that implements a specialized view controller that manages the navigation of hierarchical content
- Typical usage: **drill-down to detailed content** (e.g. Calendar app: year → month → day)
- The screens presented by a navigation interface typically mimic the hierarchical organization of data
- Example of a navigation controller-based app: Settings app



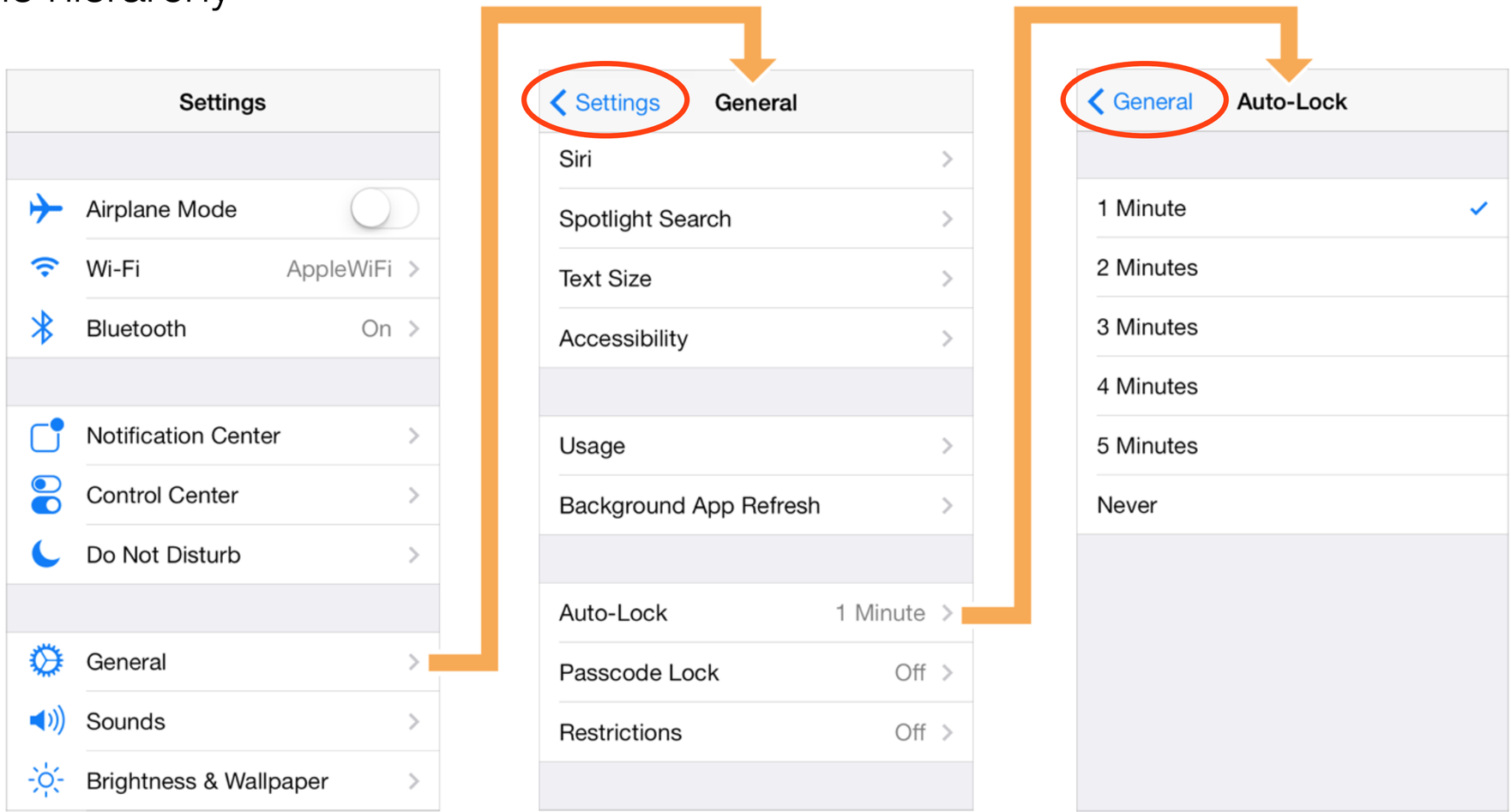
UINavigationController

- The first view to be displayed in the hierarchy is called **root view controller**



UINavigationController

- For all but the root view, the navigation controller provides a back button to allow the user to move back up the hierarchy

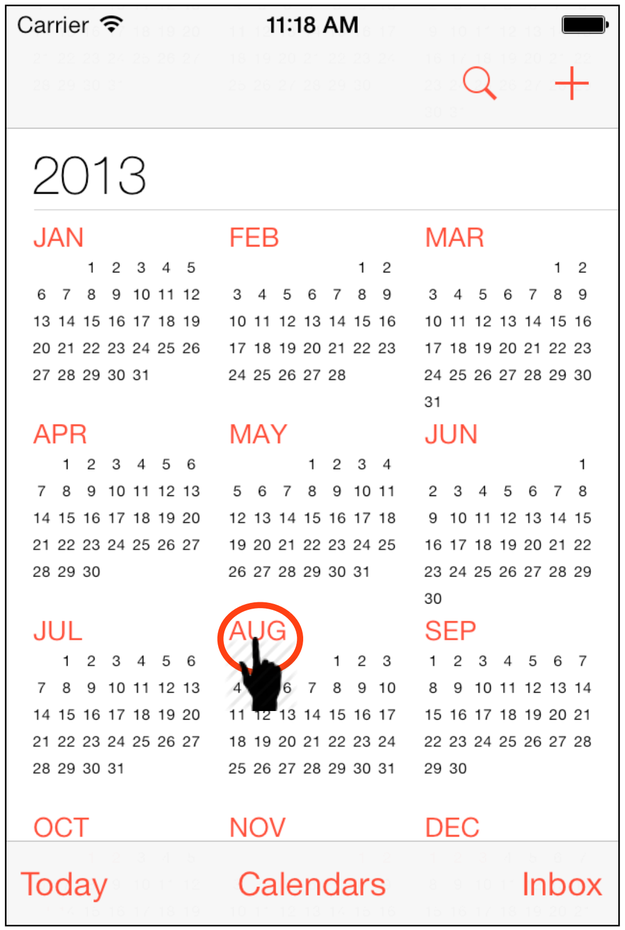


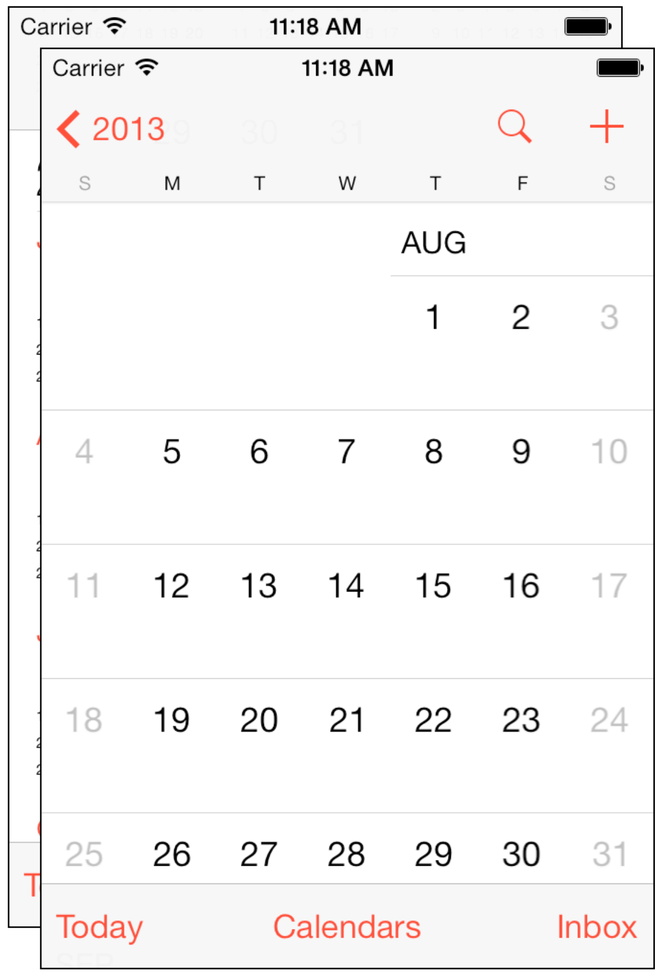
UINavigationController

- The navigation controller manages a **stack of view controllers**

The year view is the root view controller

When a month is tapped, the month view is put at the top of the stack

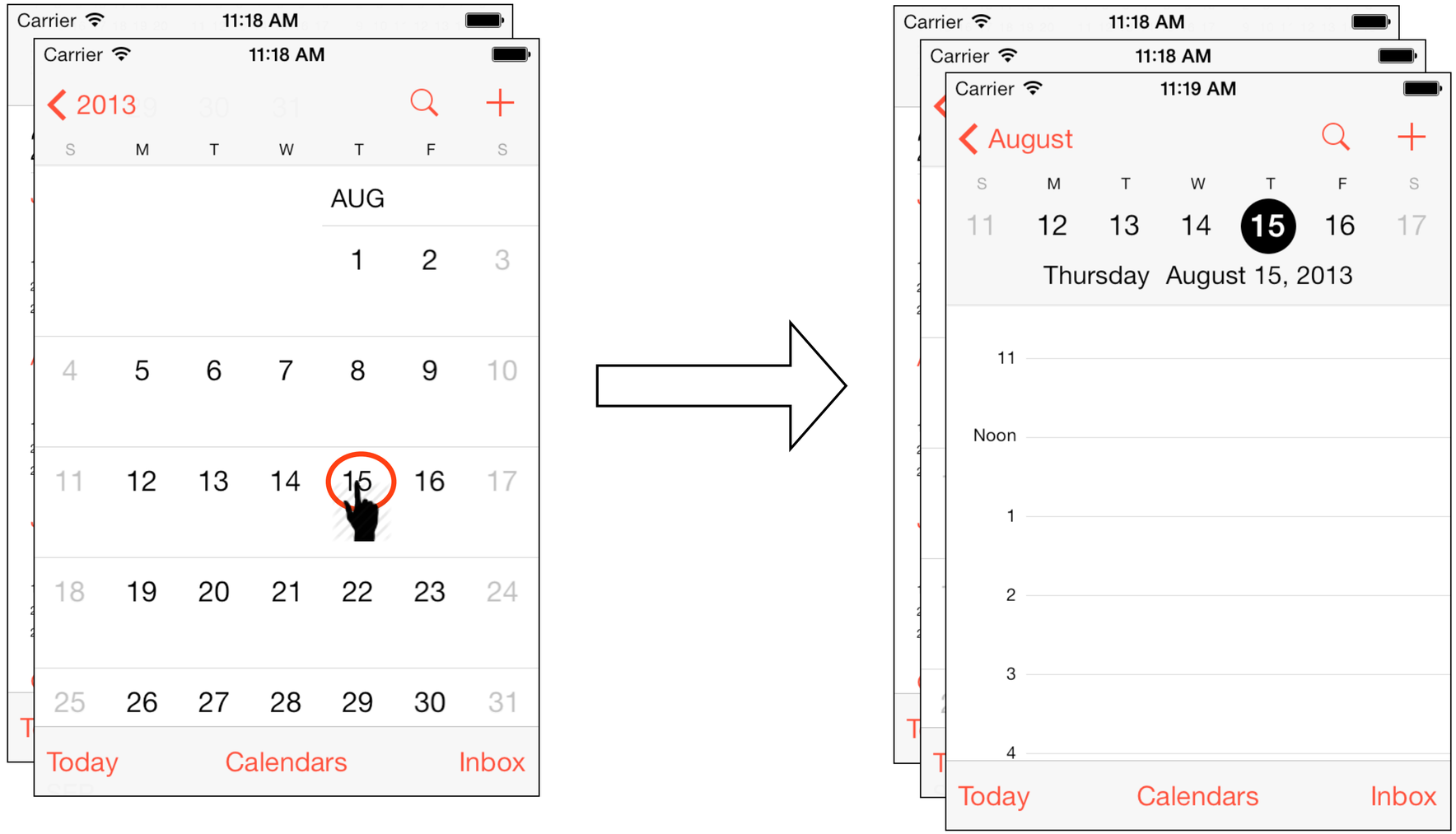




UINavigationController

- The navigation controller manages a **stack of view controllers**

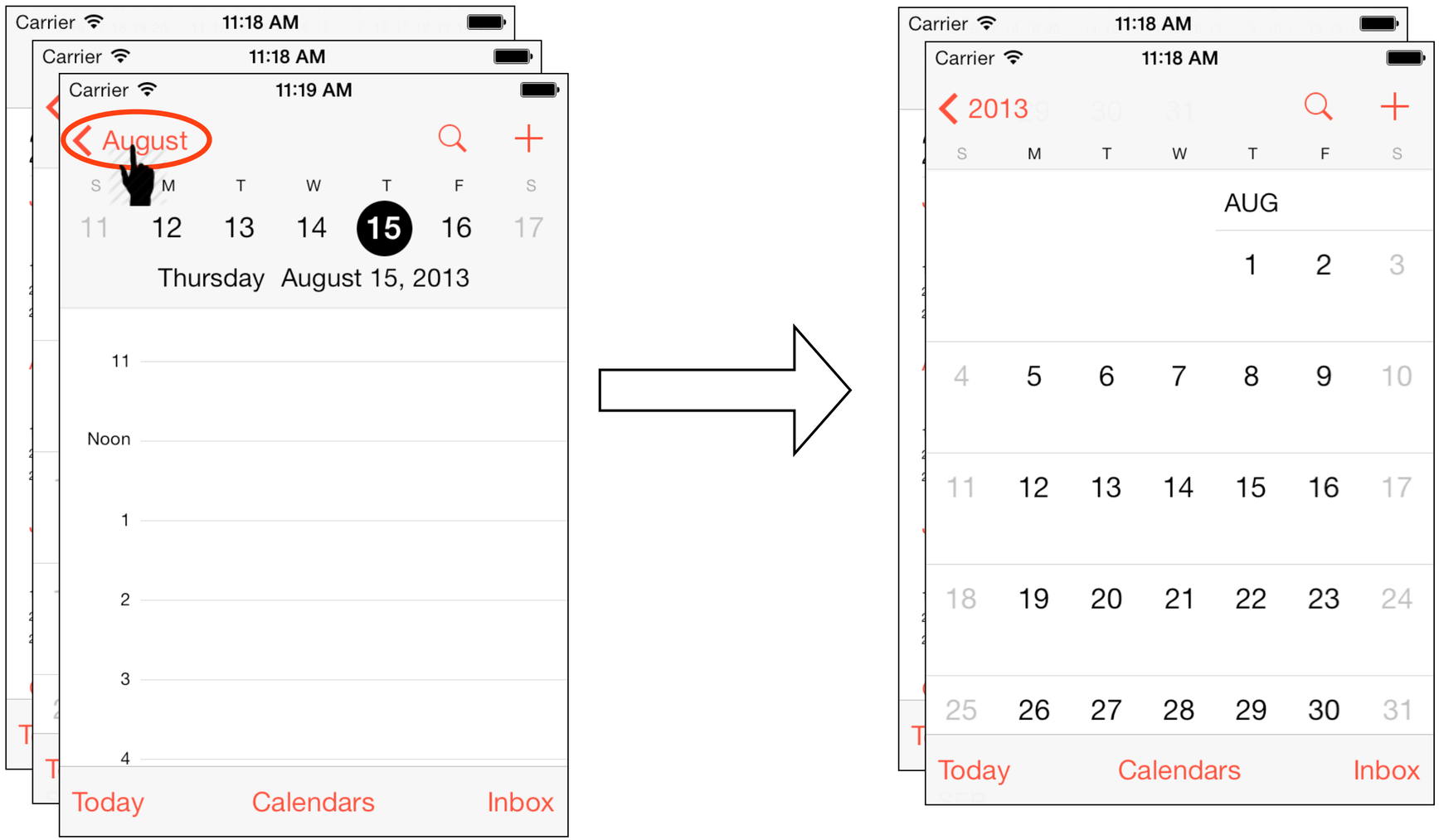
When a day is tapped, the day view is put at the top of the stack



UINavigationController

- The navigation controller manages a **stack of view controllers**

Tapping the back button pops the view from the stack



UINavigationController

- The navigation controller manages a **stack of view controllers**
- The navigation controller object provides methods to modify the stack at runtime:

  `- (void)pushViewController:(UIViewController *)viewController animated:(BOOL)animated` is used to push a view controller at the top of the stack

  `- (UIViewController *)popViewControllerAnimated:(BOOL)animated` is used to pop a view controller from the top of the stack

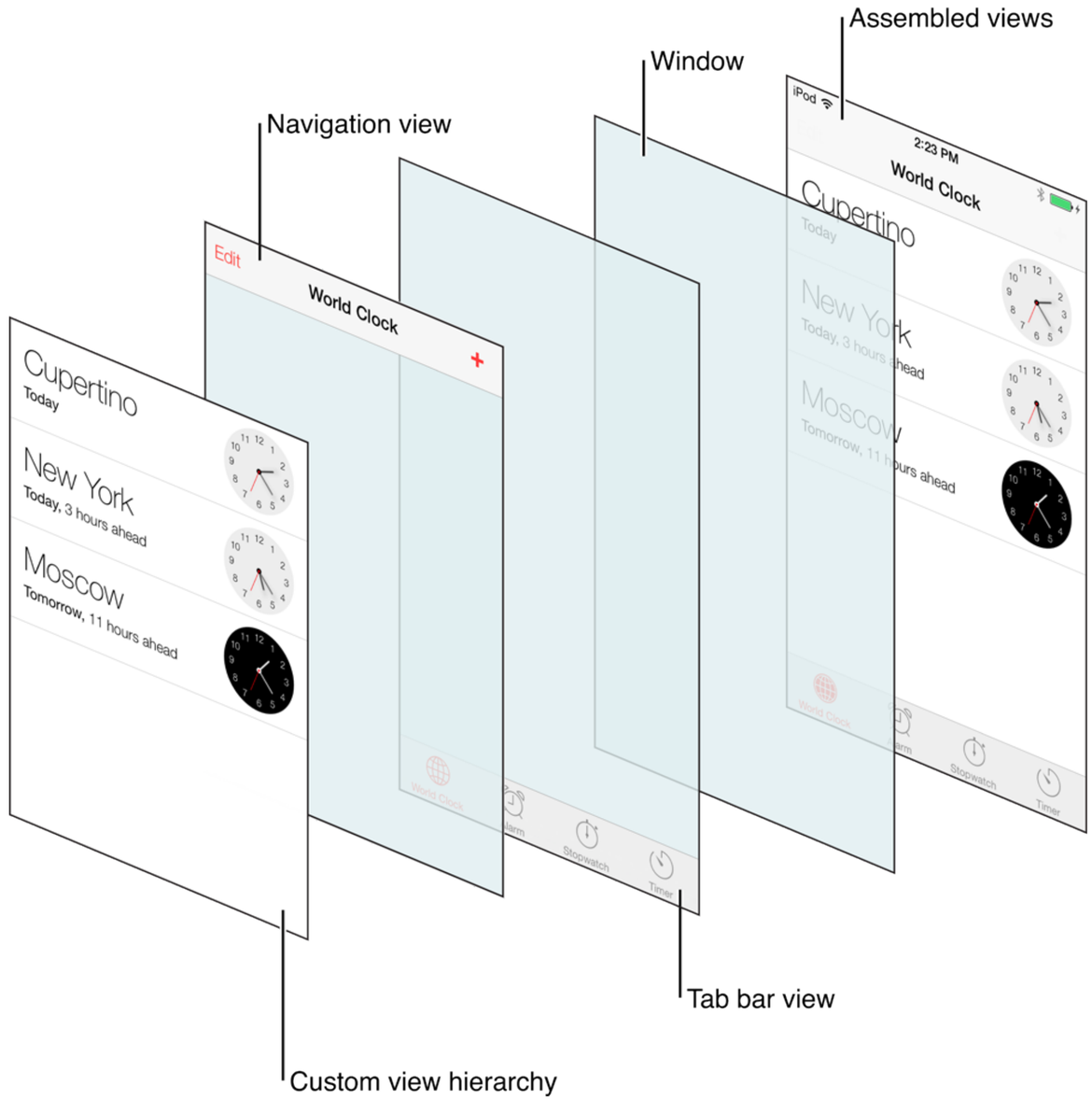
  `- (NSArray *)popToViewController:(UIViewController *)viewController animated:(BOOL)animated` is used to pop all view controllers from the stack until the specified view controller is at the top of the stack

  `- (NSArray *)popToRootViewControllerAnimated:(BOOL)animated` is used to pop all the view controllers on the stack except the root view controller

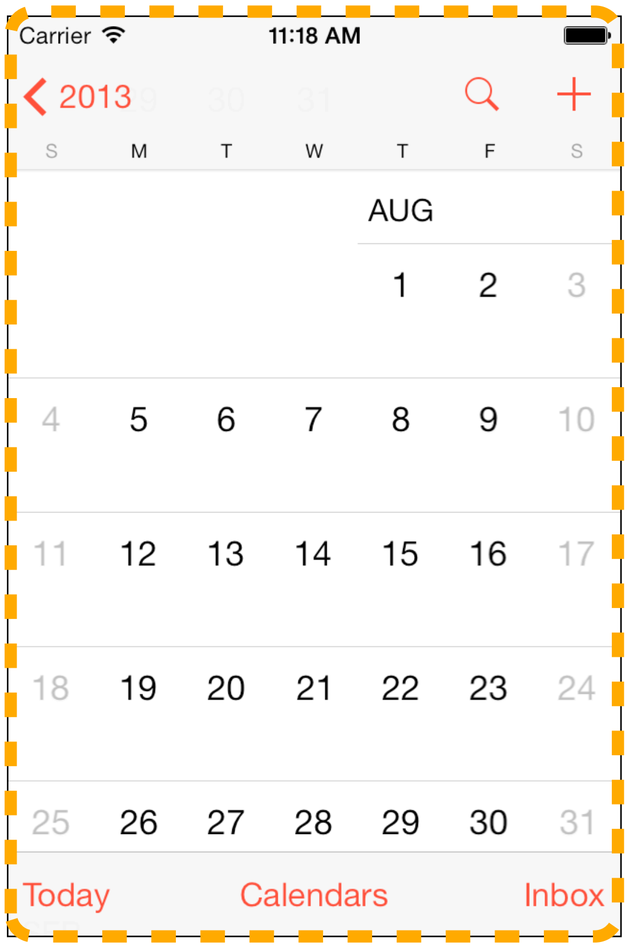
- Every `UIViewController` has a `navigationController` property that can be used to access the `UINavigationController` it is embedded in

UINavigationController

- The view for a navigation controller is just a container for several other views:
  - a navigation bar
  - an optional toolbar
  - the view containing custom content
- When moving from a MVC to another, the content of the custom view changes, as well as of the navigation bar and toolbar
- Only the custom content view changes to reflect the view controller that is at the top of the navigation stack

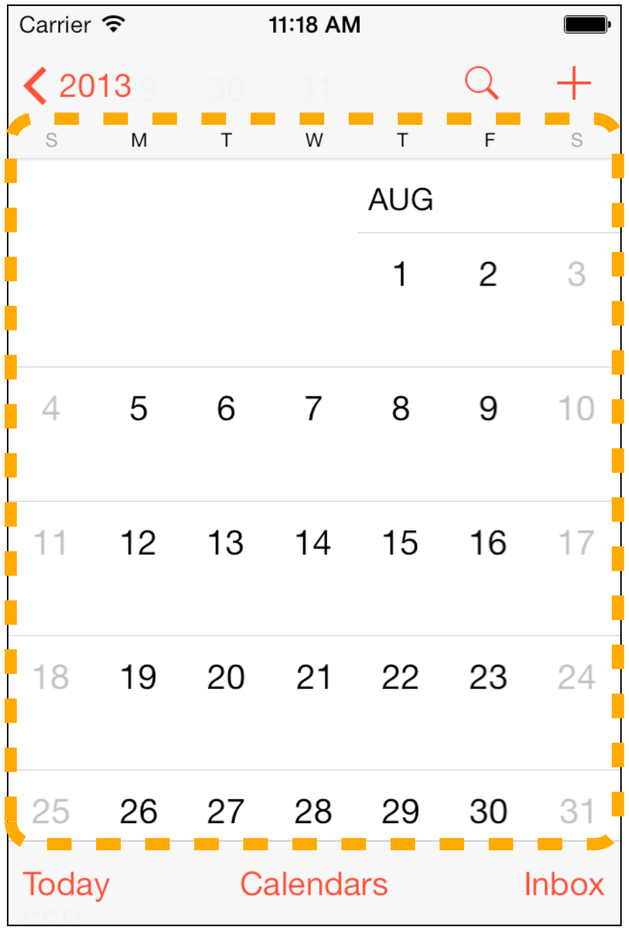


View of a UINavigationController



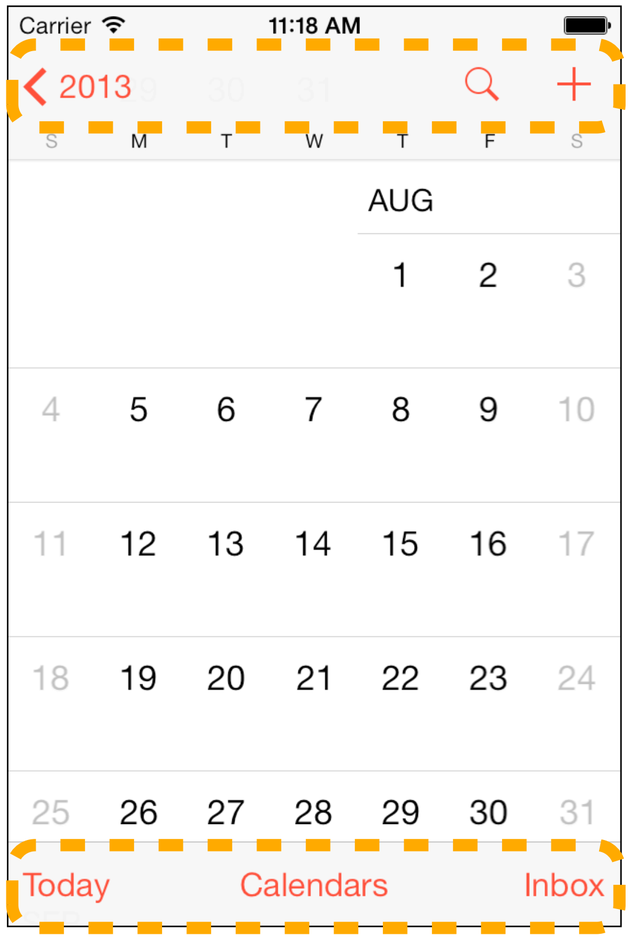
View of the navigation controller

View of a UINavigationController



Custom content of the navigation controller managed by the view controller at the top of the stack

View of a UINavigationController

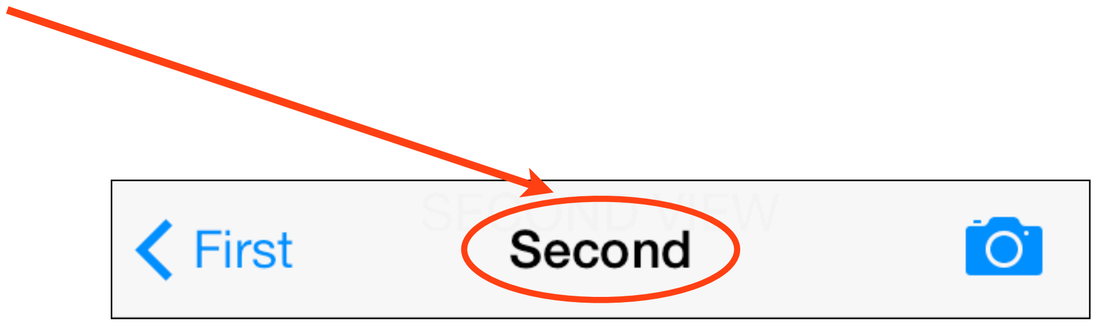


Navigation bar

Navigation toolbar (optional) - `toolbarItems` property of the embedded `UIViewController`

UINavigationBar

- The **`UINavigationBar`** displays:
  - a title for the currently displayed view controller; it can be set using the **`title`** property of the embedded **`UIViewController`**
  - a back button which displays the **`title`** of the previous **`UIViewController`** in the navigation stack
  - an array of **`UIBarButtonItem`** objects (NOT **`UIButton`**!) accessible with the **`UIViewController`** property **`navigationItem.rightBarButtonItems`**



UINavigationBar

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UINavigationBar

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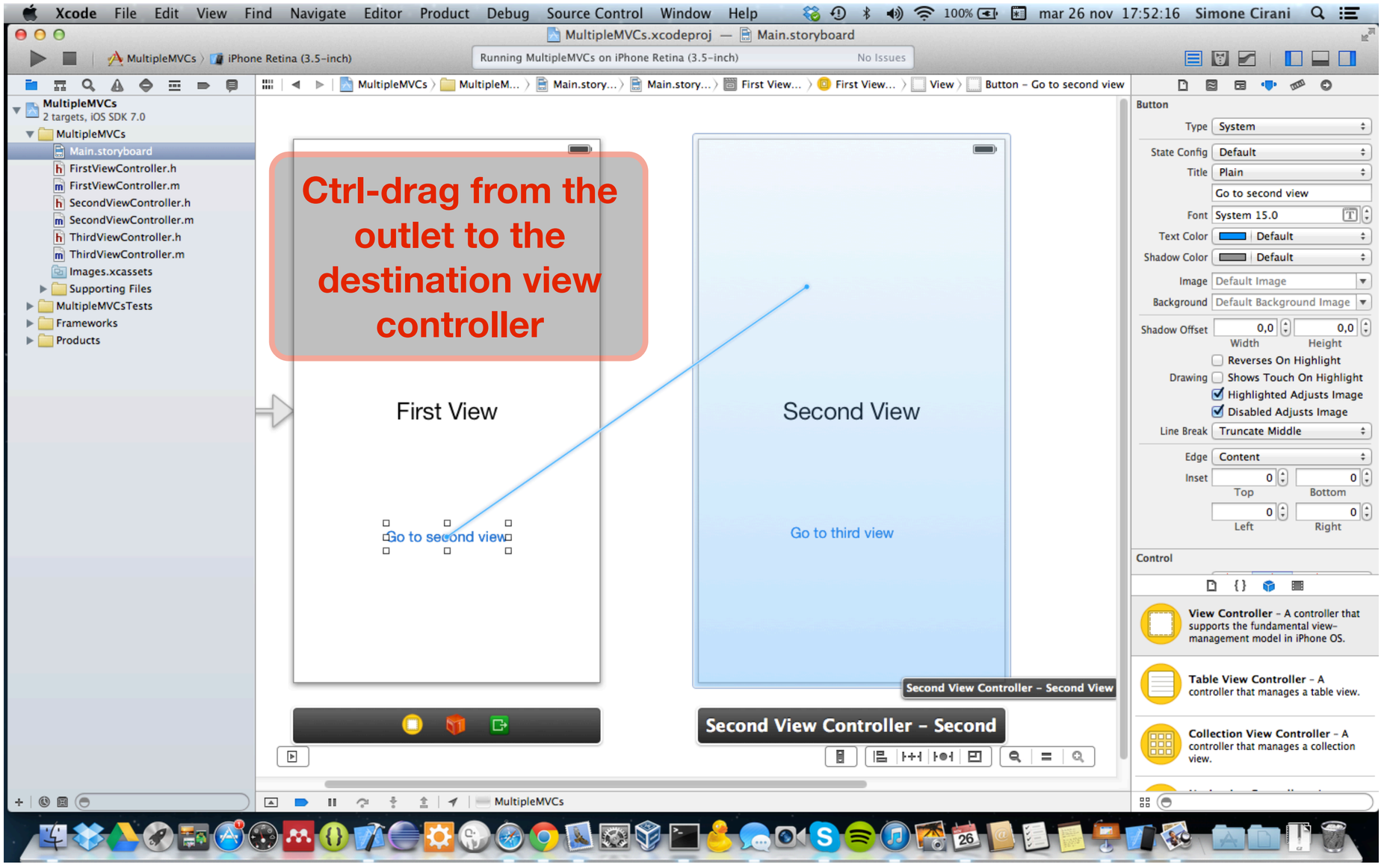
UINavigationController with multiple MVCs

- A `UINavigationController` starts displaying no content
- When the `rootViewController` property of the `UINavigationController` is set, the `UINavigationController` displays the view managed by the view controller
- Segues define the transitions from a view controller to the next one

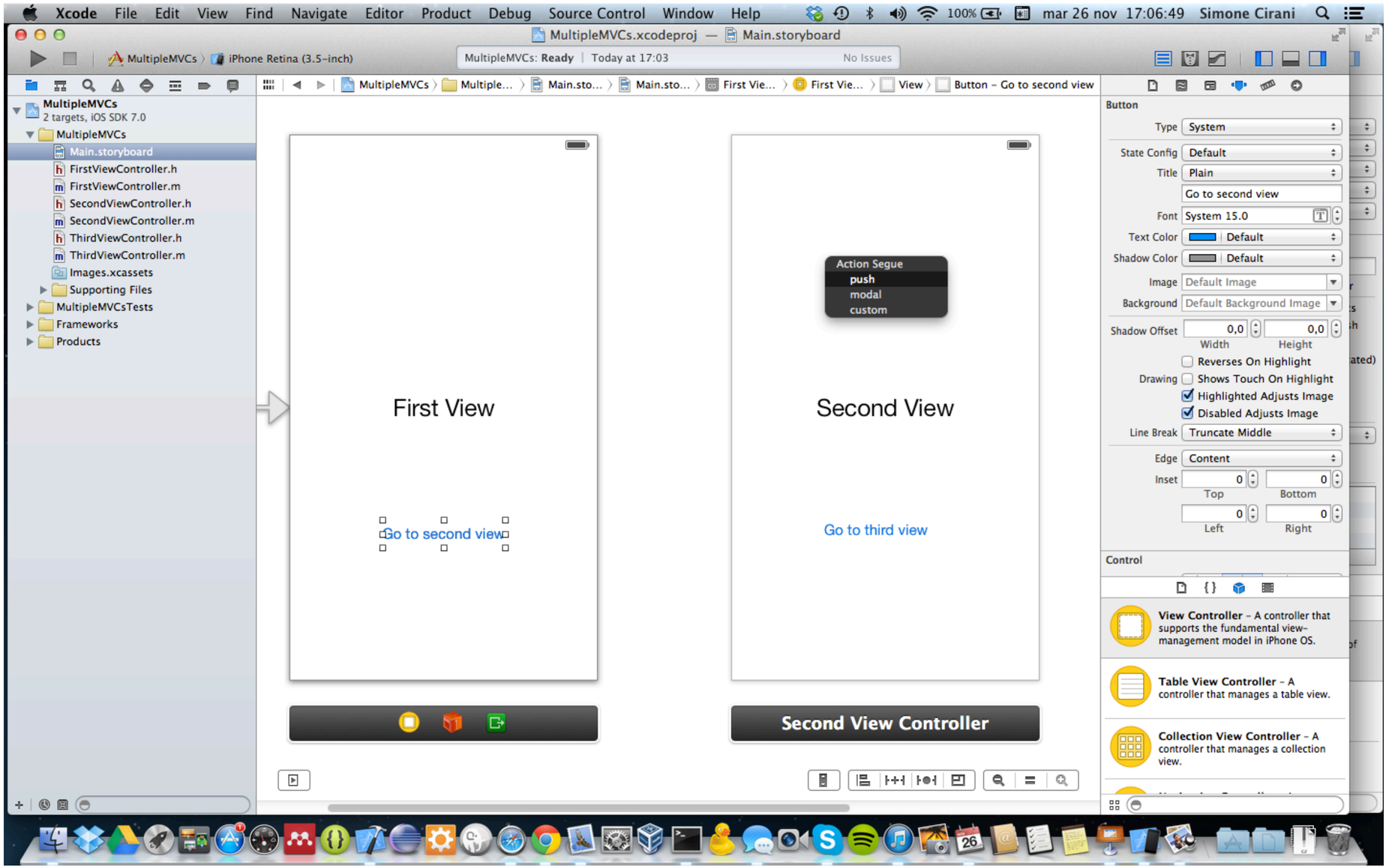
Segues

- Segues are responsible for performing the visual transition between two view controllers
- A transition can be triggered:
  - from an outlet in storyboard (segue)
  - programmatically
- Segues can be of different types:
  - push
  - modal
  - custom

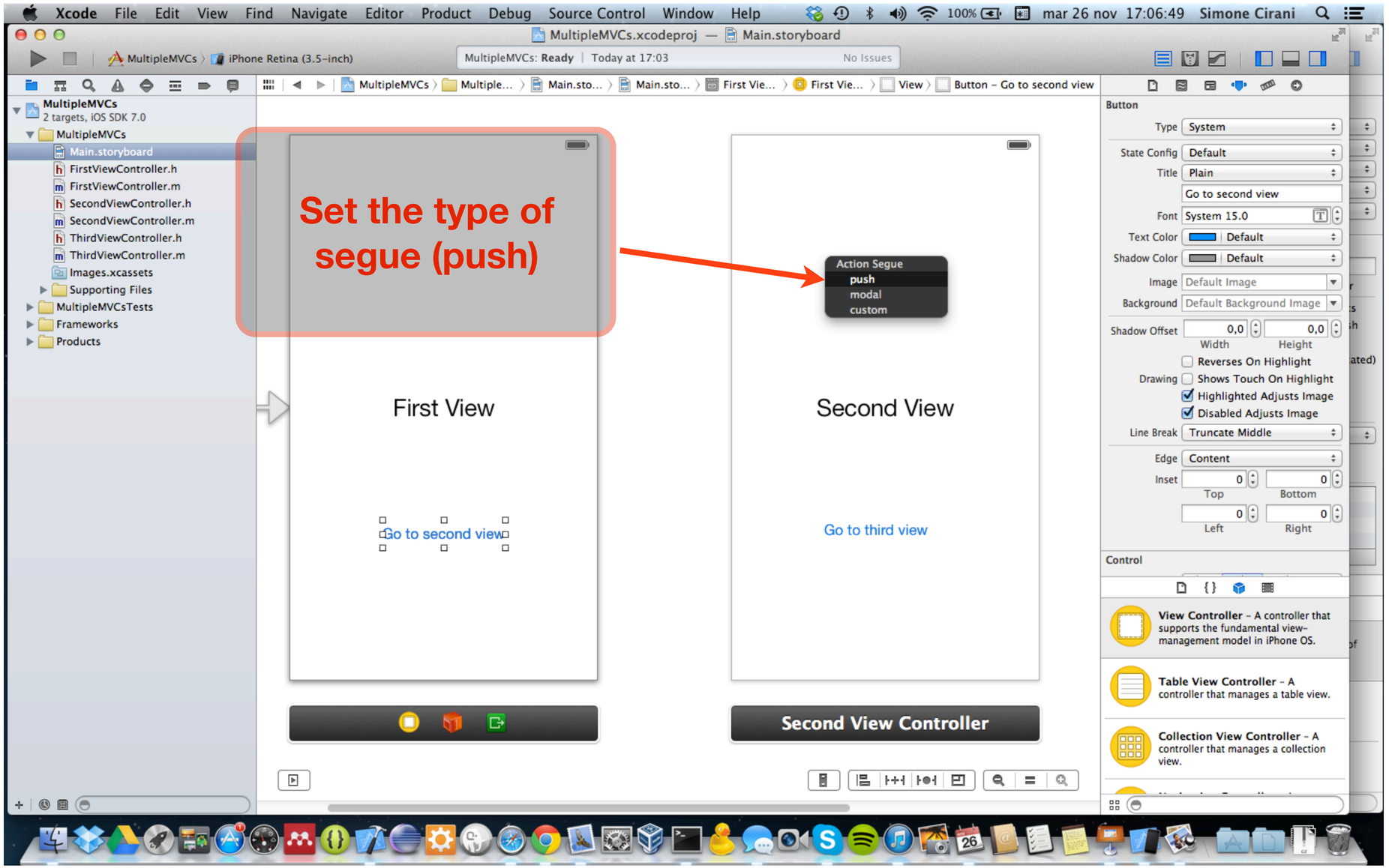
Segues in storyboard



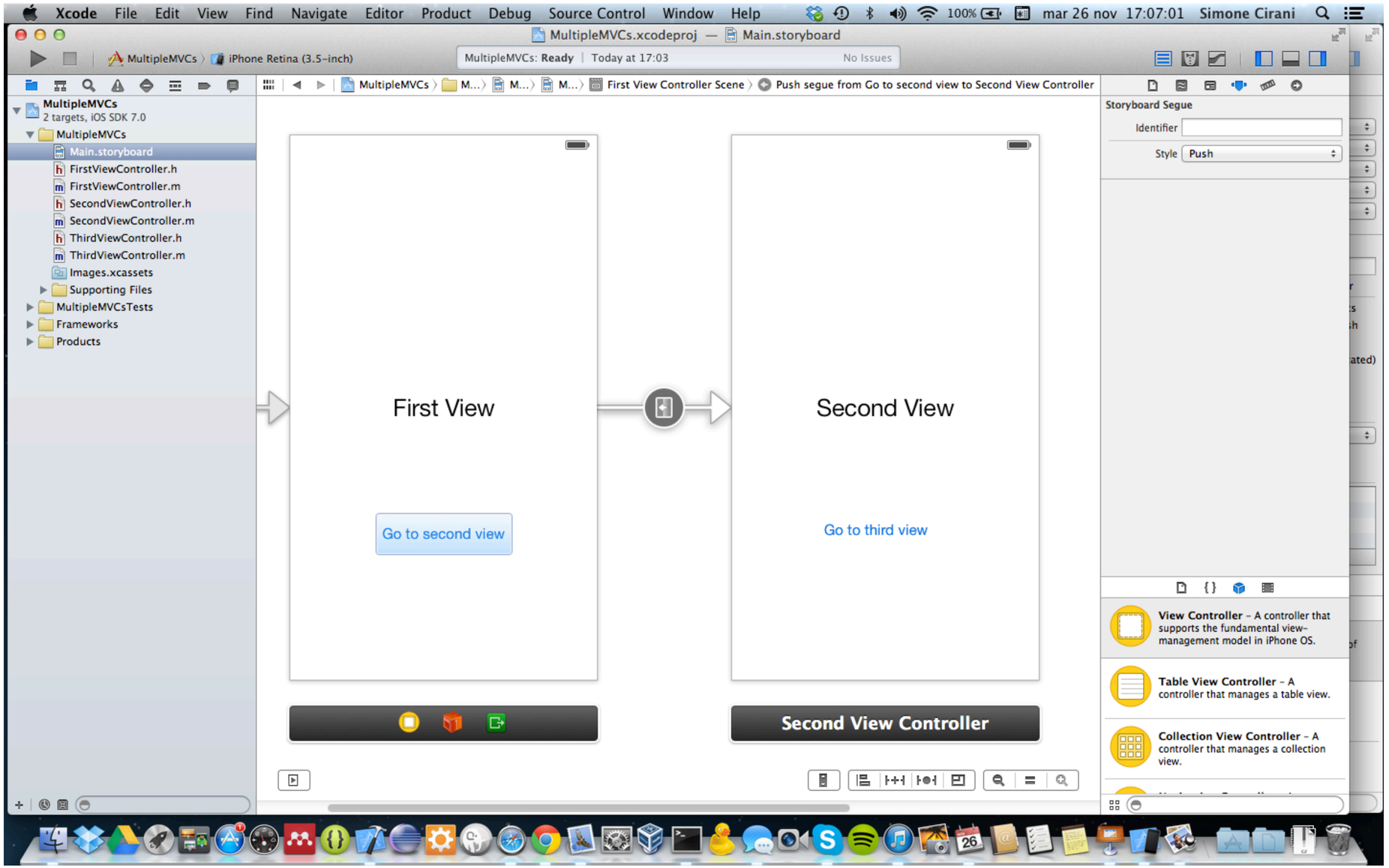
Segues in storyboard



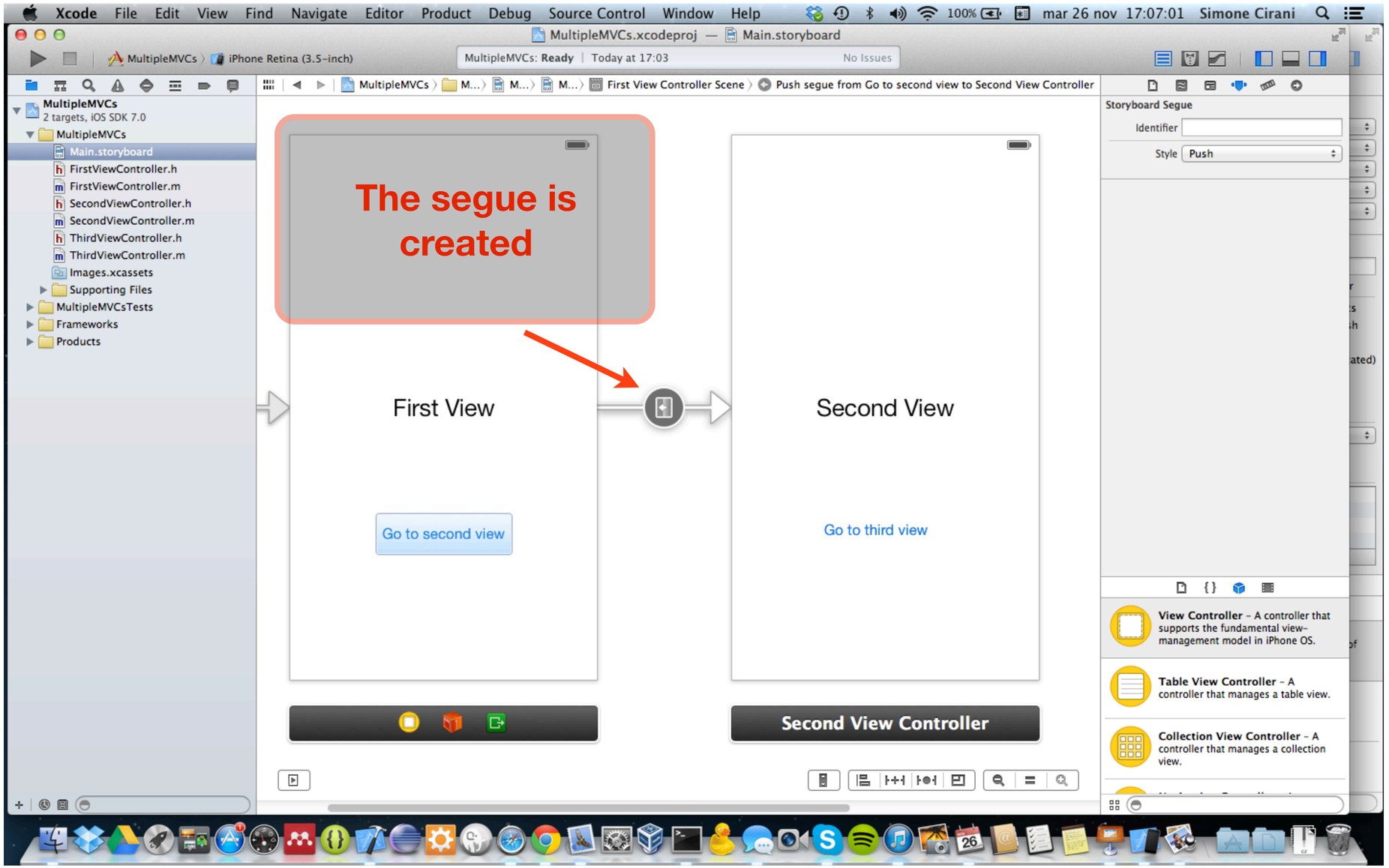
Segues in storyboard



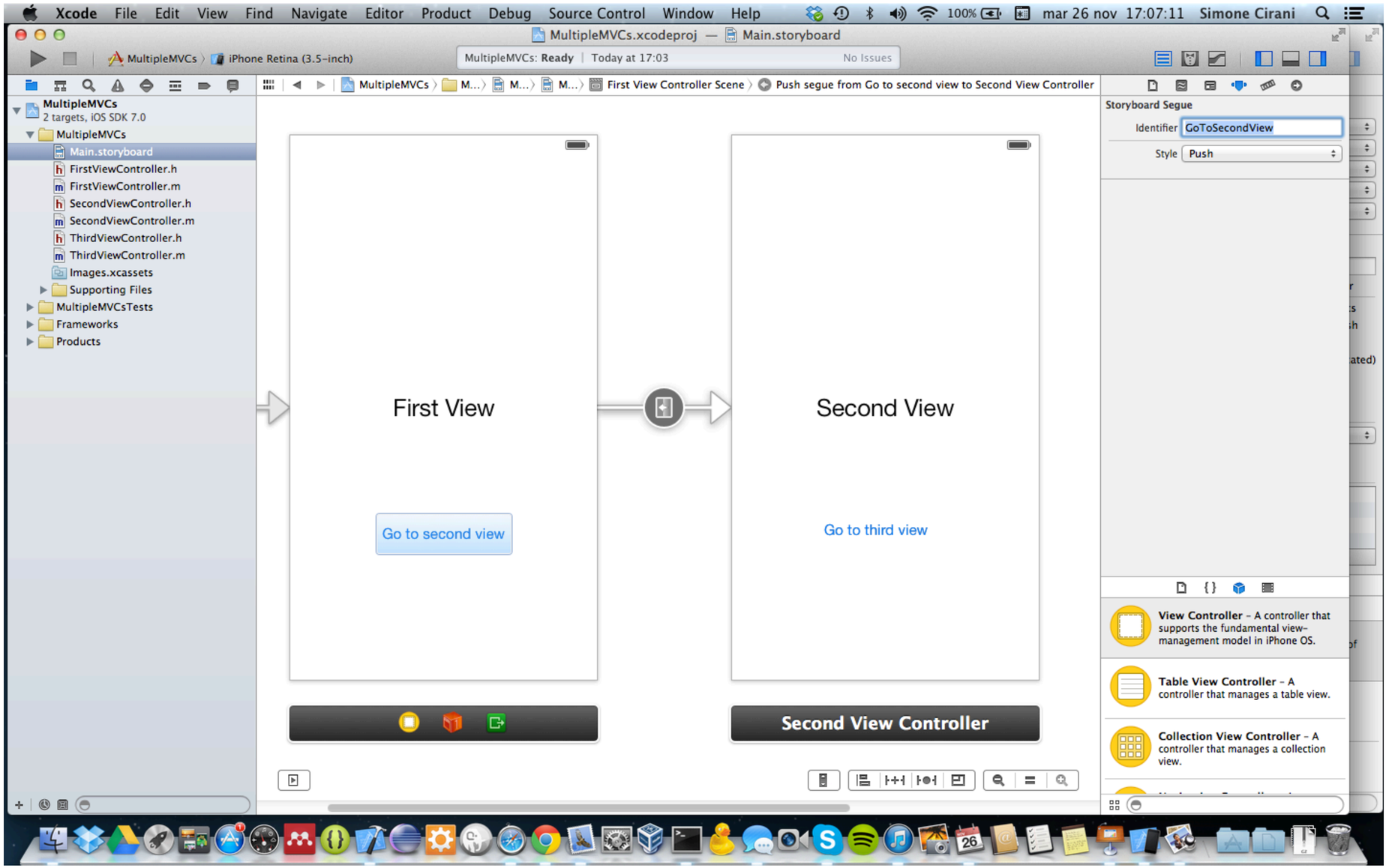
Segues in storyboard



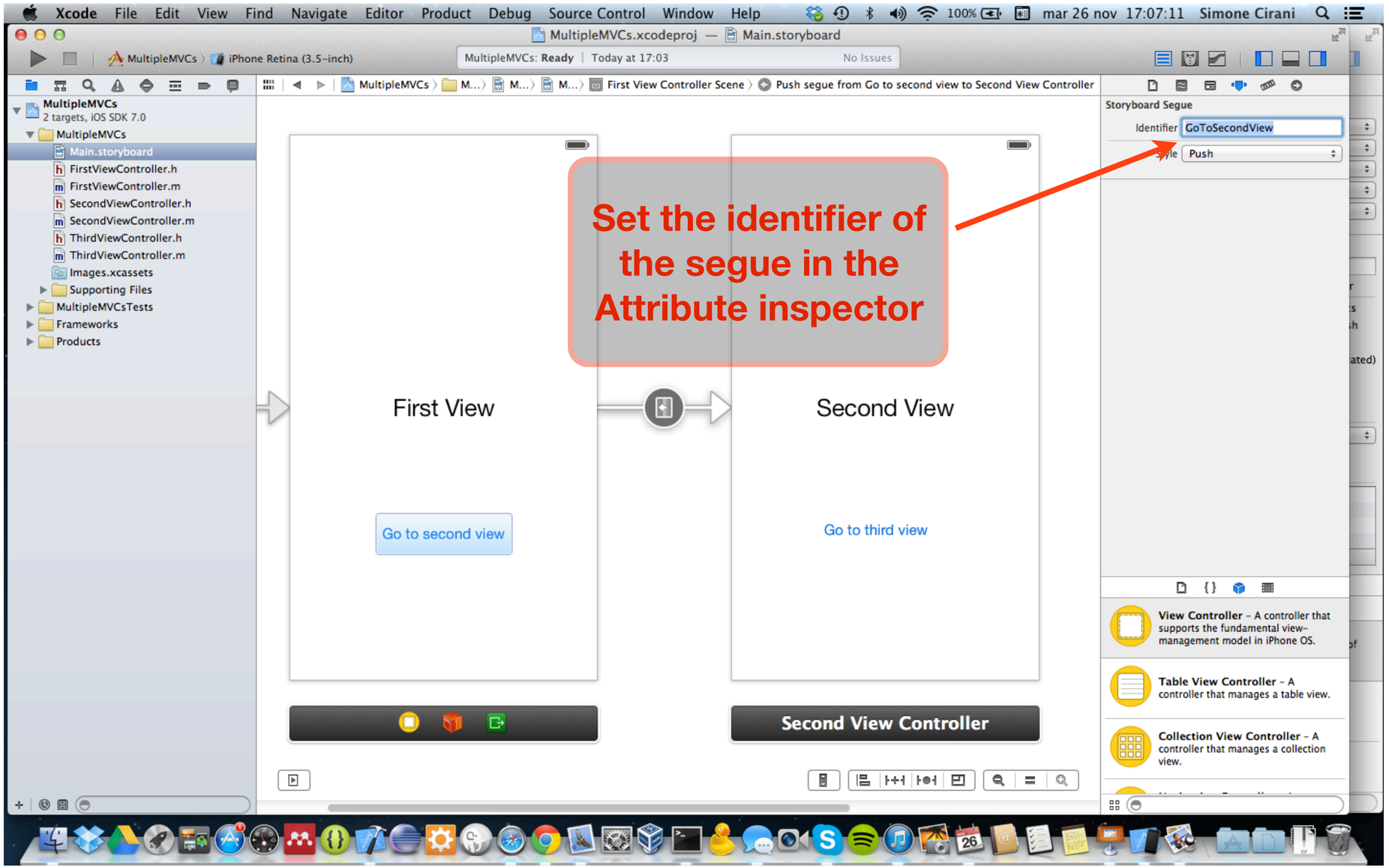
Segues in storyboard



Segues in storyboard



Segues in storyboard



Segues

- A view controller can perform additional setup before performing the segue (it should have the chance to be “prepared”)
- Preparing the view controller to perform the segue should allow to pass important data to the view controller before performing the segue
- Every UIViewController can override the following method to prepare for the segue:

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

- Preparing the view controller to perform the segue should allow to pass important data to the view
- This method is called before the new view controller (`destinationViewController` of the segue) is presented
- The segue that will be executed is passed in as an argument; it can be identified through its `identifier` property (previously set in the Attribute inspector)

Preparing for a segue

```
- (void)prepareForSegue:(UIStoryboardSegue *)segue sender:(id)sender {
    if([segue.identifier isEqualToString:@"GoToSecondView"]) {
        if([segue.destinationViewController isKindOfClass:[SecondViewController class]]) {
            SecondViewController *sVC = (SecondViewController *)segue.destinationViewController;
            sVC.data = @"Some data";
        }
    }
}
```

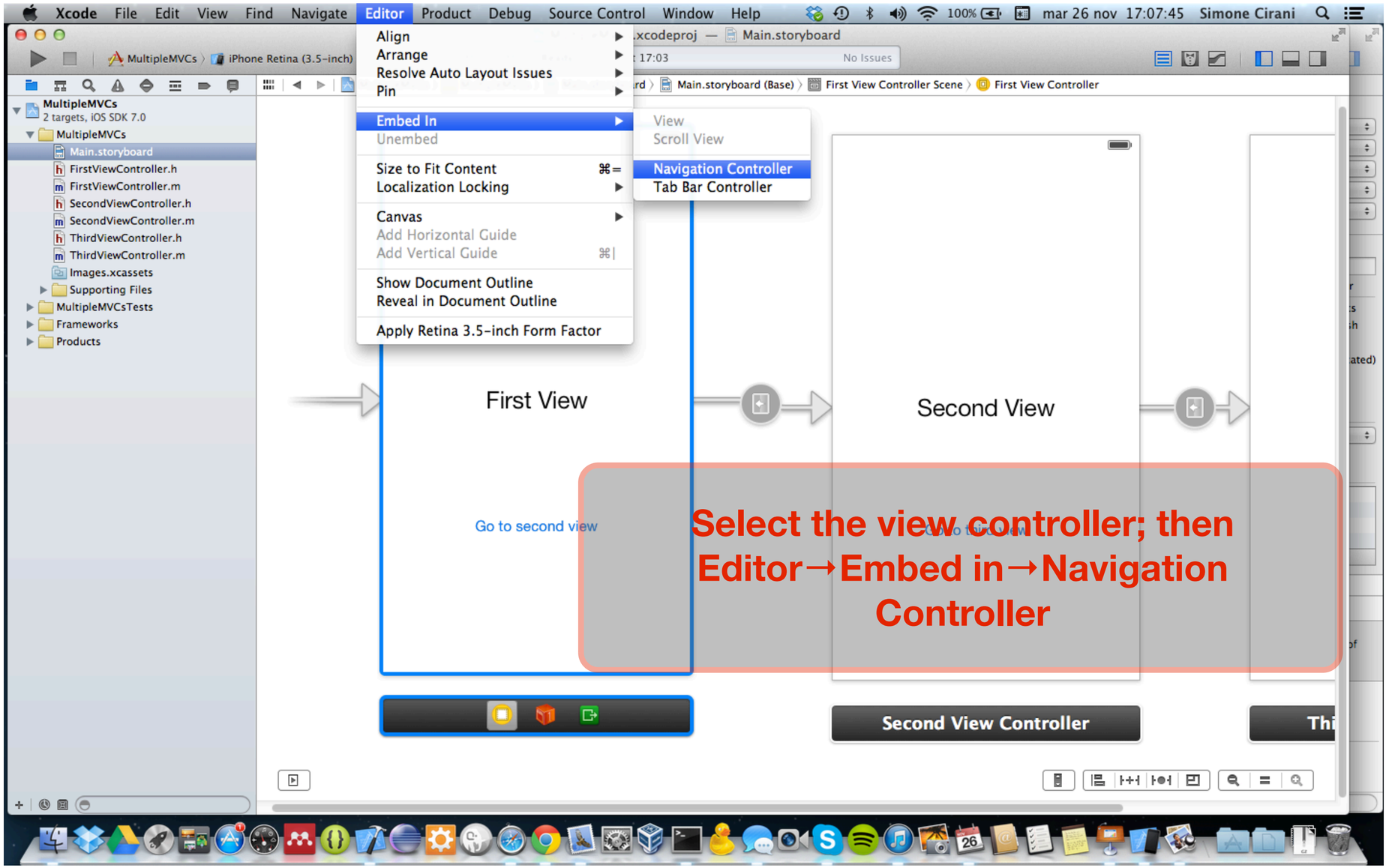
Instantiating view controllers programmatically

- A view controller can be instantiated “by-hand” (not from the storyboard)
- For example, when the type of destination view controller depends on some information that can be resolved only at runtime (e.g. an error screen or a content screen)

```
NSString *vc = @"SecondViewController";
UIViewController *controller = [self.storyboard instantiateViewControllerWithIdentifier:vc];
```

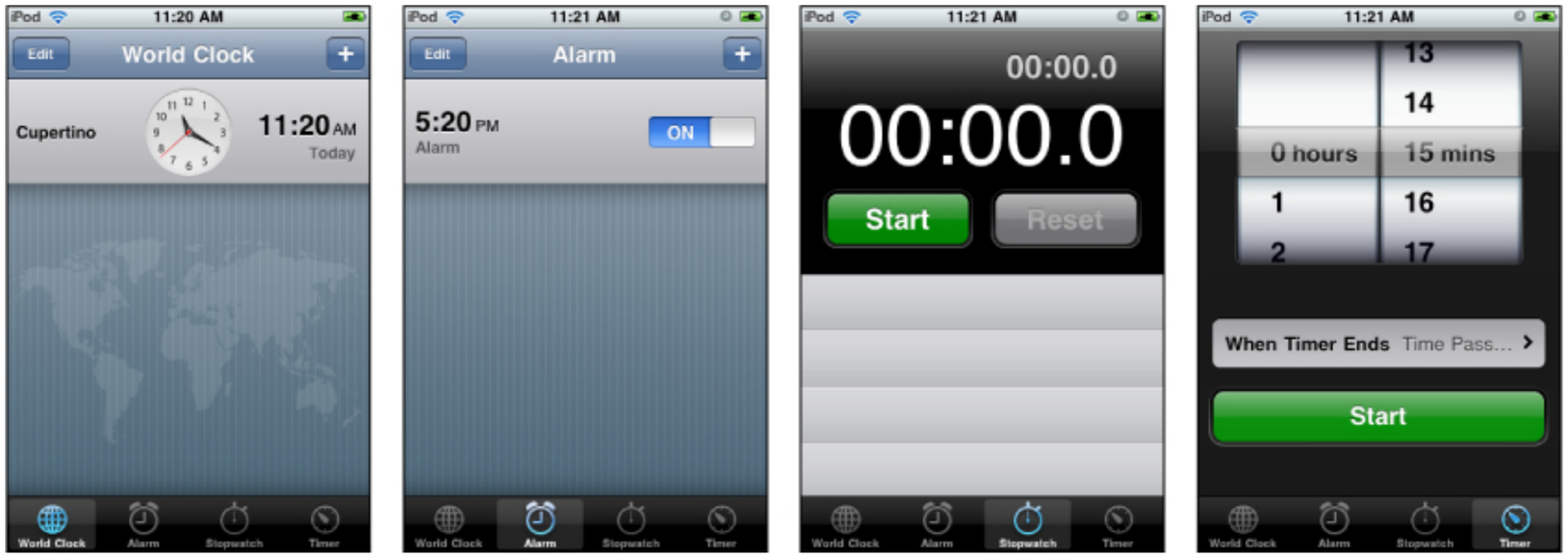
- The view controller is then pushed to the navigation stack with the `pushViewController:animated:` method

Embedding view controllers in a UINavigationController



UITabBarController

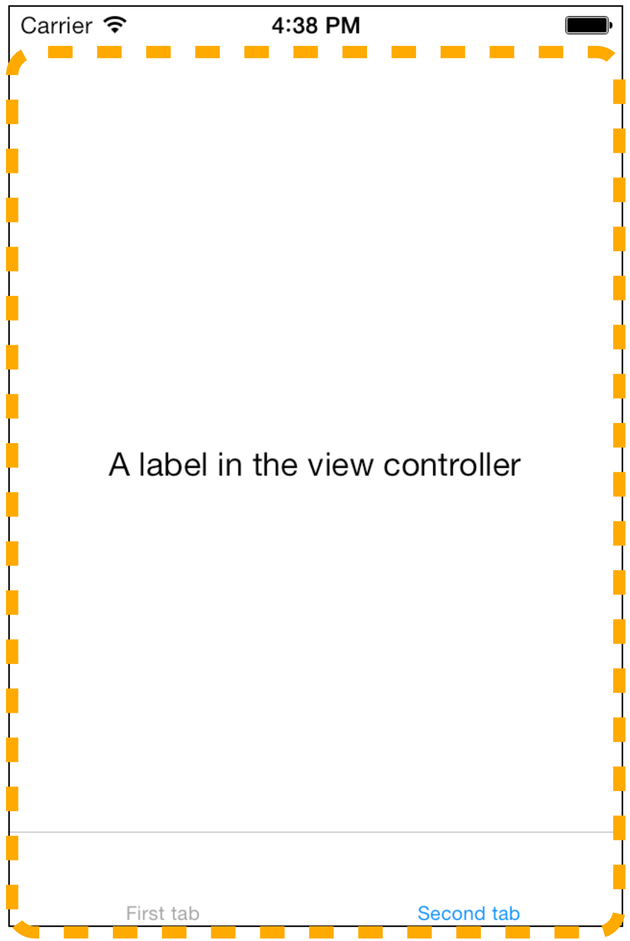
- `UITabBarController` is a class that implements a specialized view controller that manages a radio-style selection interface
- Typical usage: **multiple sections** (e.g. Clock app: Clock, Alarm, Stopwatch, Timer)
- Tabs are displayed at the bottom of the window (tab bar) for selecting between the different modes and for displaying the views for that mode
- Example of a navigation controller-based app: Clock app



UITabBarController

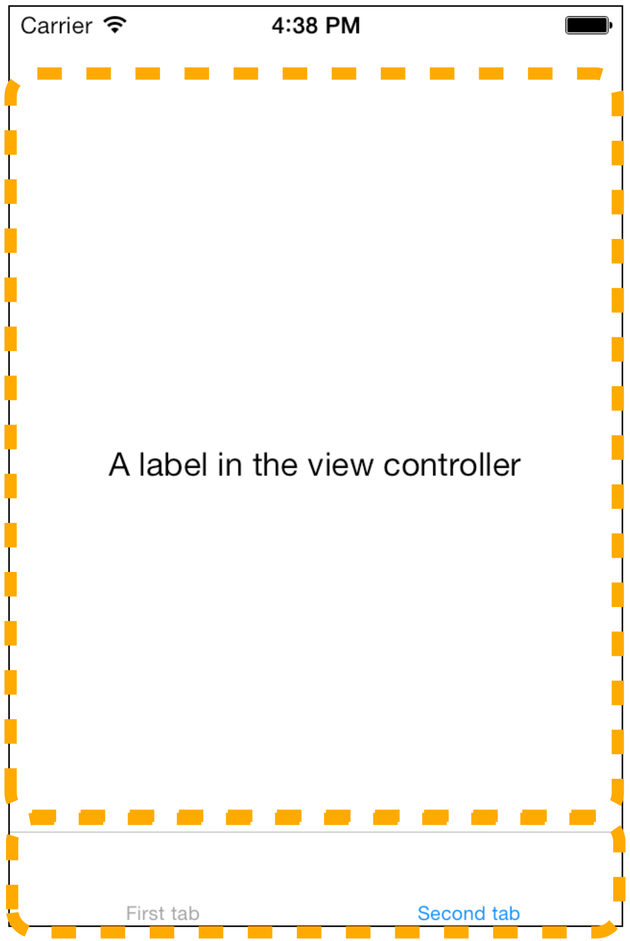
- Each tab of a tab bar controller interface is associated with a custom view controller
- When the user selects a specific tab, the tab bar controller displays the root view of the corresponding view controller, replacing any previous views
- View controllers are assigned to the tab bar controller by setting the `viewControllers` property of the `UITabBarController` (`NSArray` of `UIViewControllers`); order is maintained

Views of a UITabBarController



View of the tab bar controller

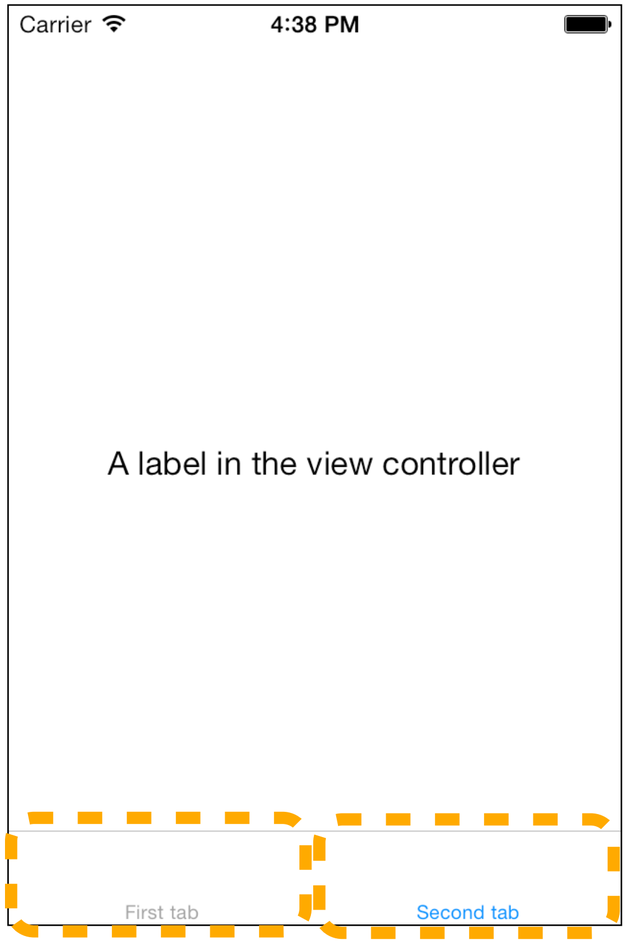
Views of a UITabBarController



Custom content

Tab bar (`UITabBar`)

Views of a UITabBarController



→ Tab bar items (`UITabBarItem`): icon + title

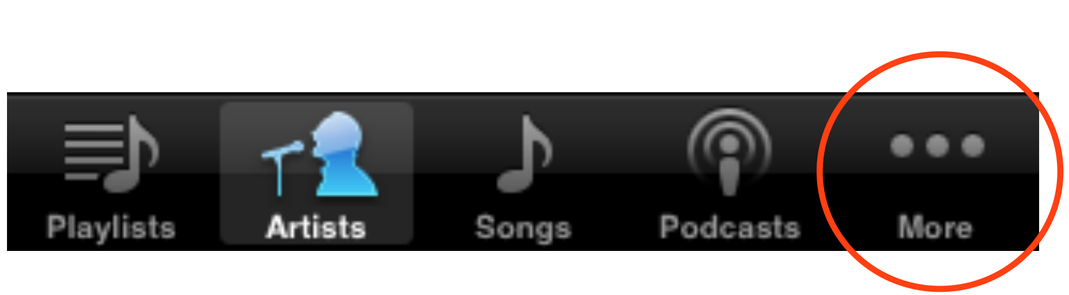
Views of a UITabBarController

- The embedded view controller defines the appearance of its corresponding tab bar item
- The title of the tab bar item for the currently displayed view controller can be set using the `title` property of the embedded `UIViewController` (if there is no instance of `UITabBarItem` associated to the tab bar the title is displayed by default with no image)
- The appearance of the tab bar item (title and icon) can be configured in storyboard
- To associate a custom tab bar item programmatically:

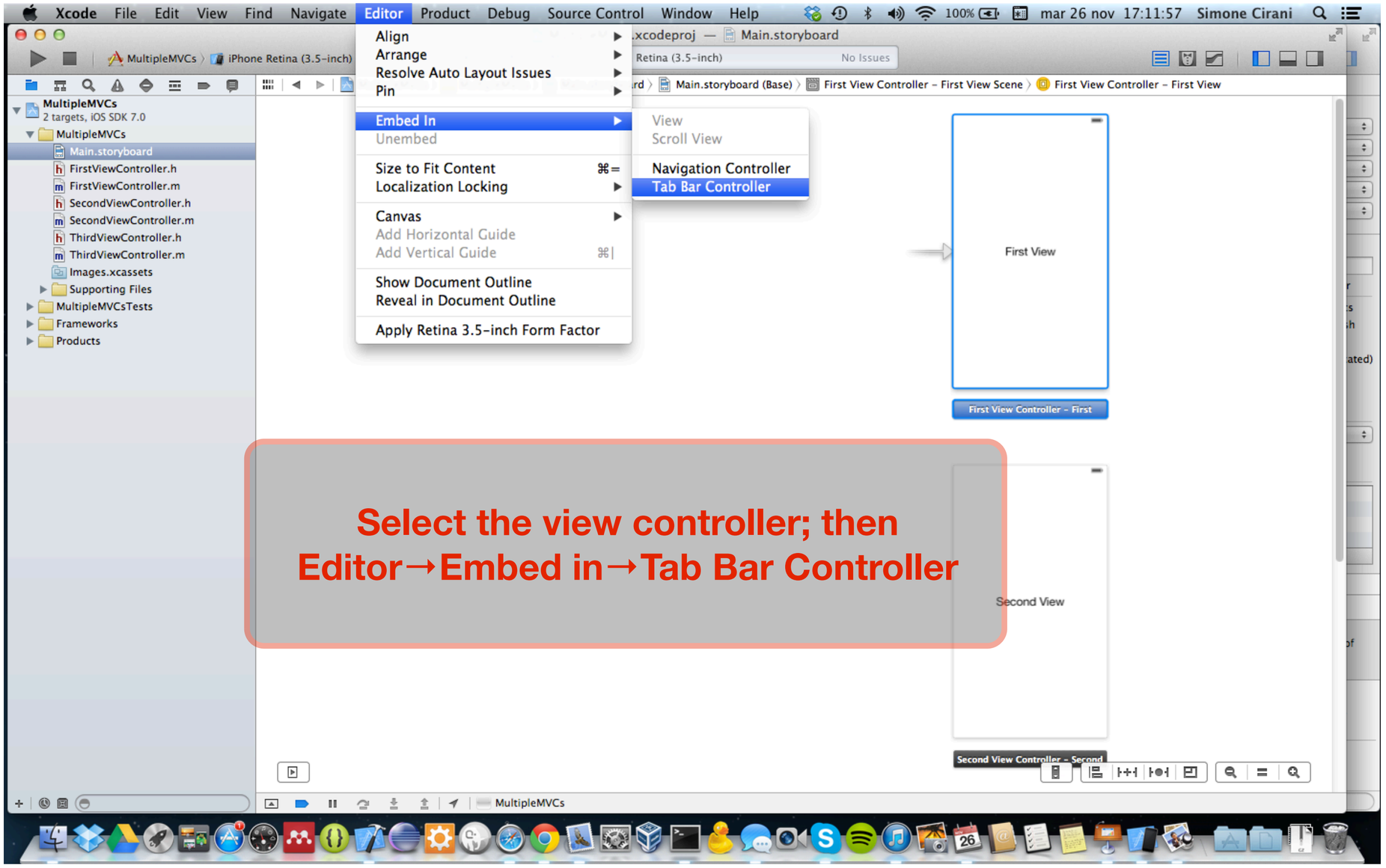
1. create an instance of `UITabBarItem` to configure its title and image
2. set the `tabBarItem` property of the embedded view controller with the created item

More navigation controller

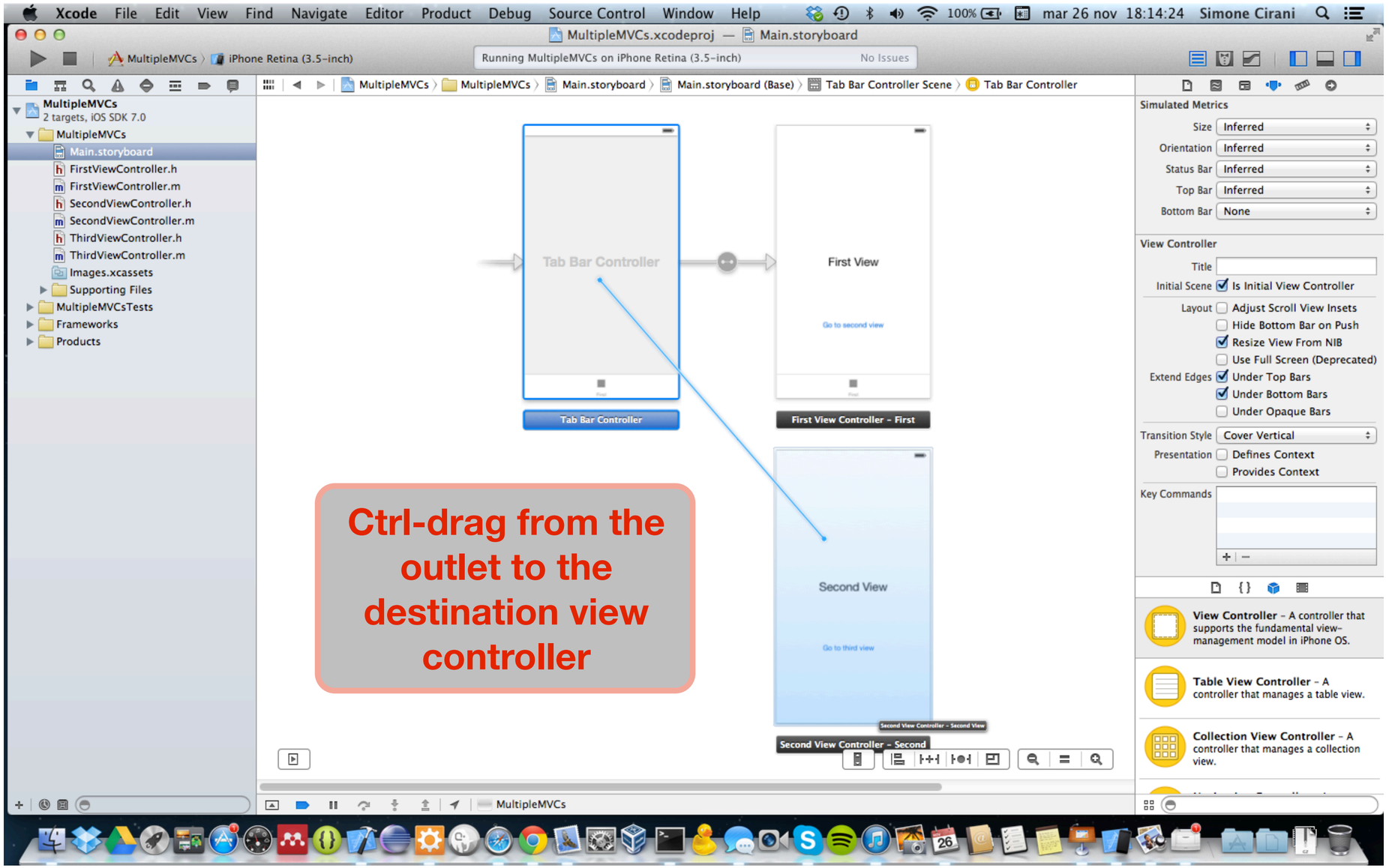
- The tab bar offers limited space to render tab items
- If 6 or more custom view controllers are added to a tab bar controller, the tab bar controller displays only the first four items plus the standard “More” item on the tab bar
- When the “More” tab is selected a view with all the remaining tabs is shown (automatically)



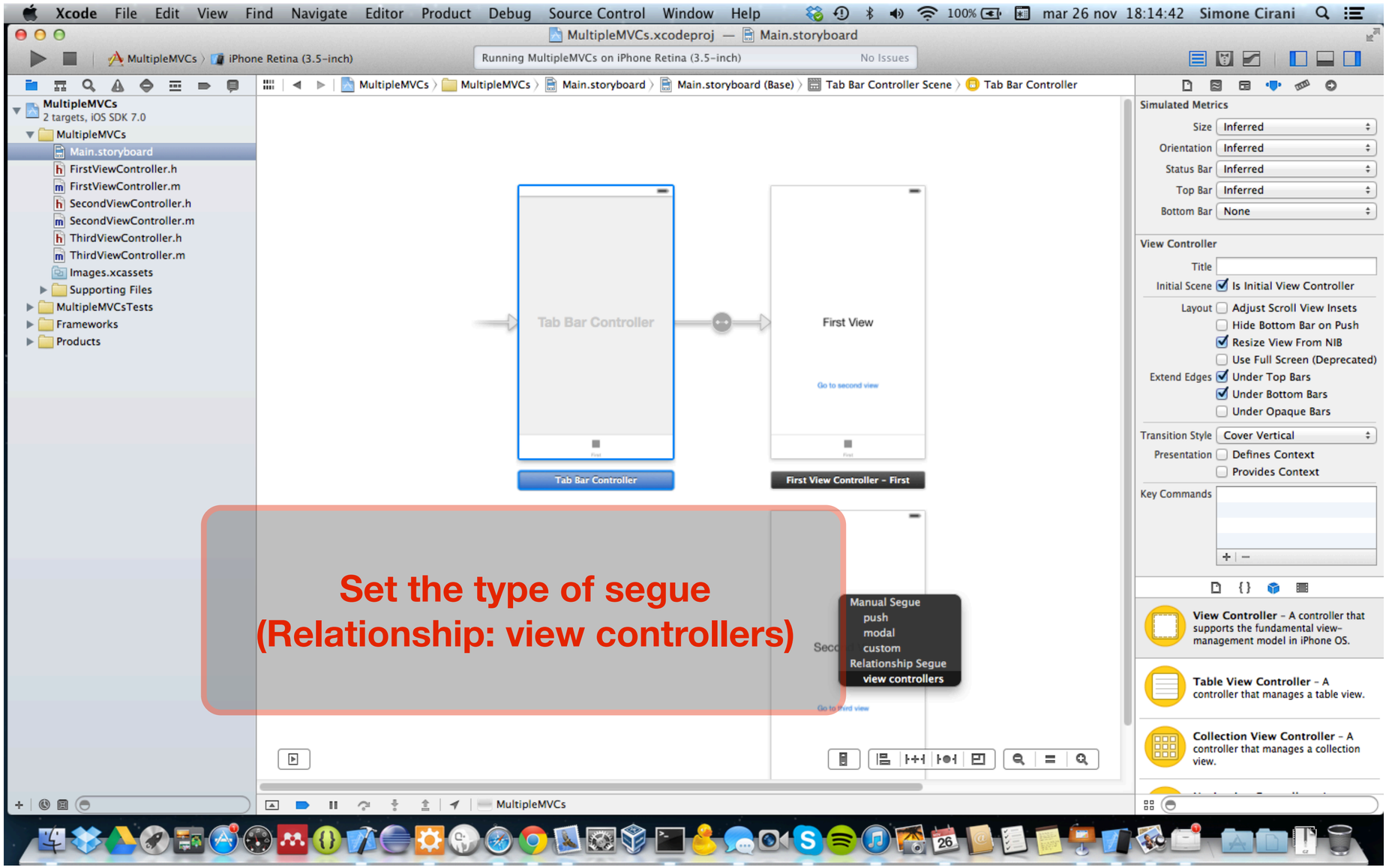
Embedding view controllers in a UITabBarController



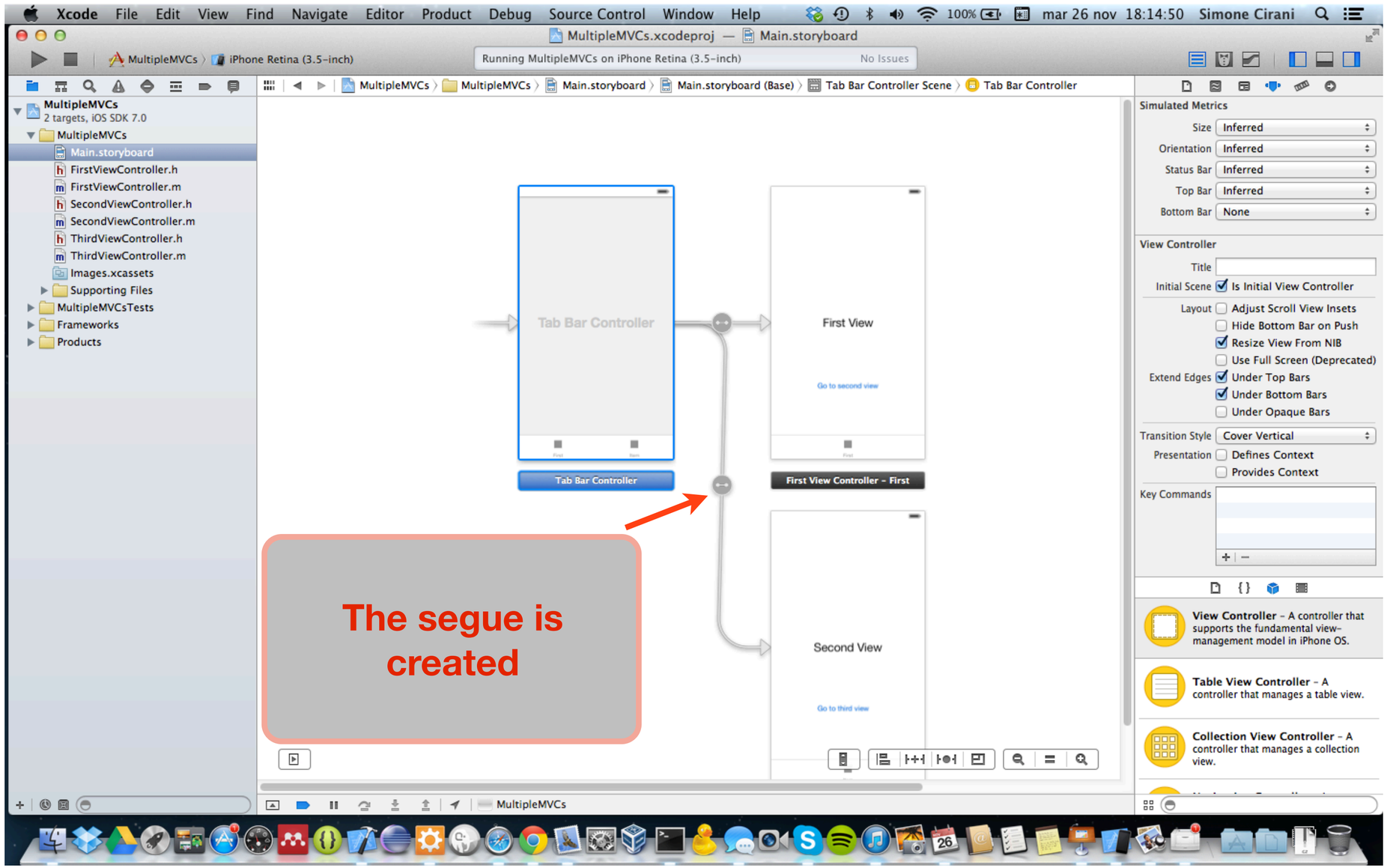
Adding view controllers to a UITabBarController



Adding view controllers to a UITabBarController

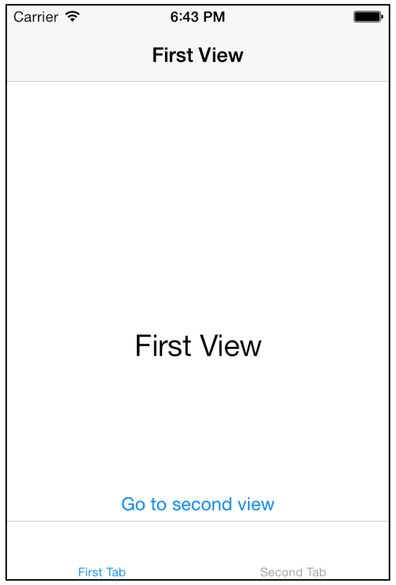


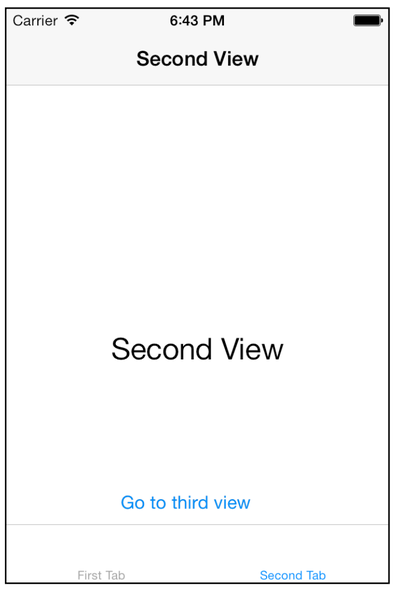
Adding view controllers to a UITabBarController

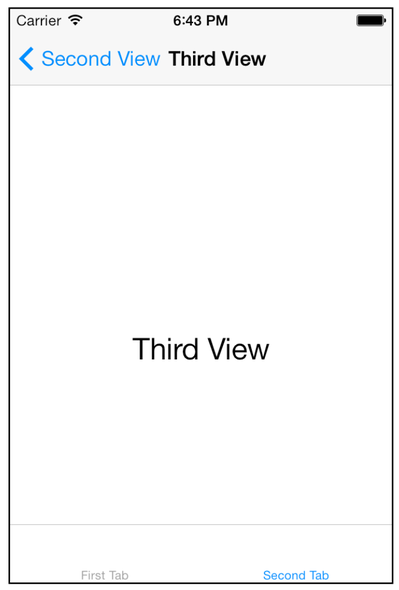


Combining tab bar controllers and navigation controllers

- It is possible to combine tab bar controllers and navigation controllers
- A navigation controller can be embedded inside a tab bar controller, if one or more sections of the app require a drill-down navigation
  - for example, the Music app has several sections (Artists, Albums, ...) and by getting into one of them we get into more detail
- Embedding a tab bar controller inside a navigation controller doesn't make much sense... probably redesigning the app would be better (indeed XCode does not allow you to do this)

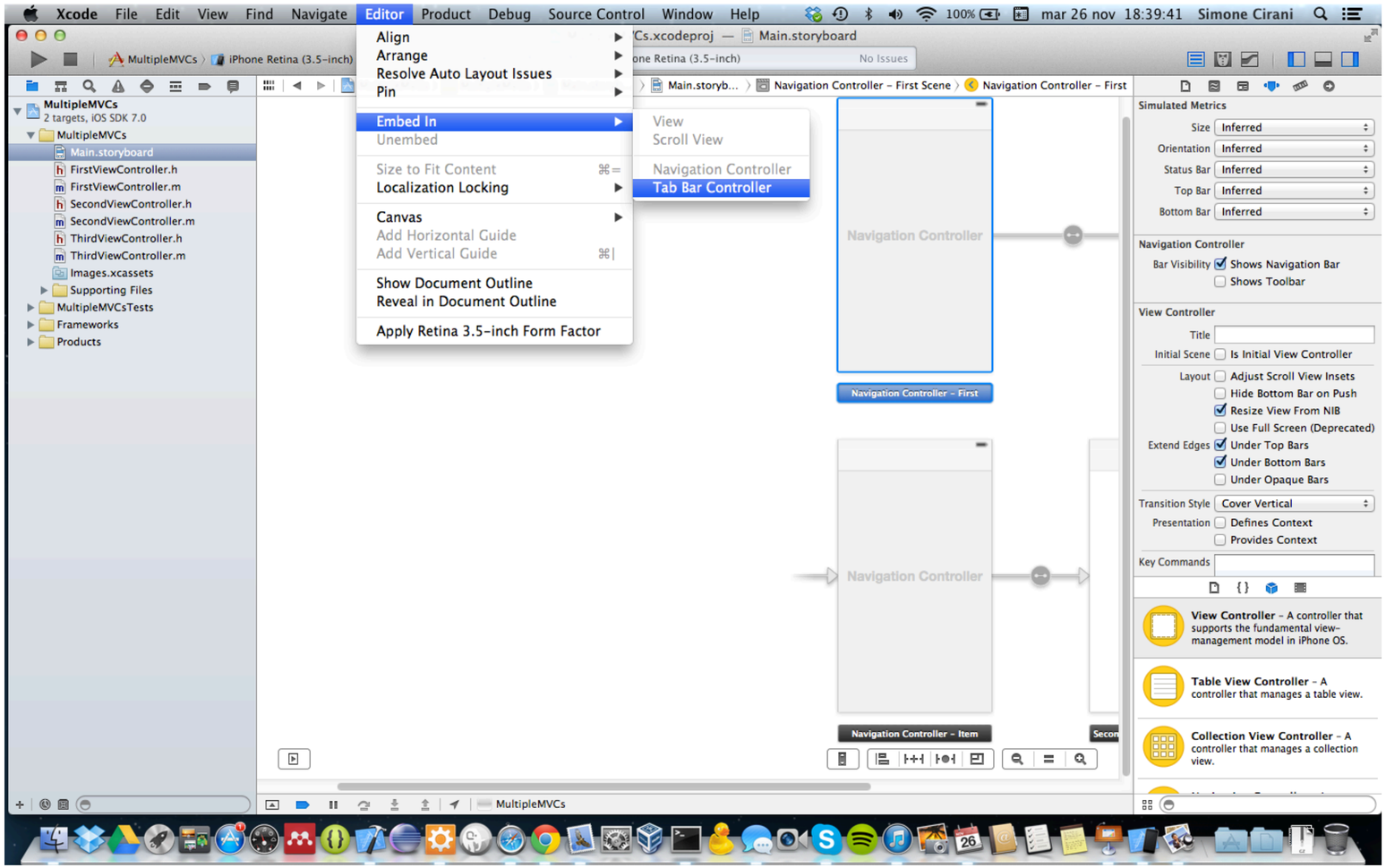






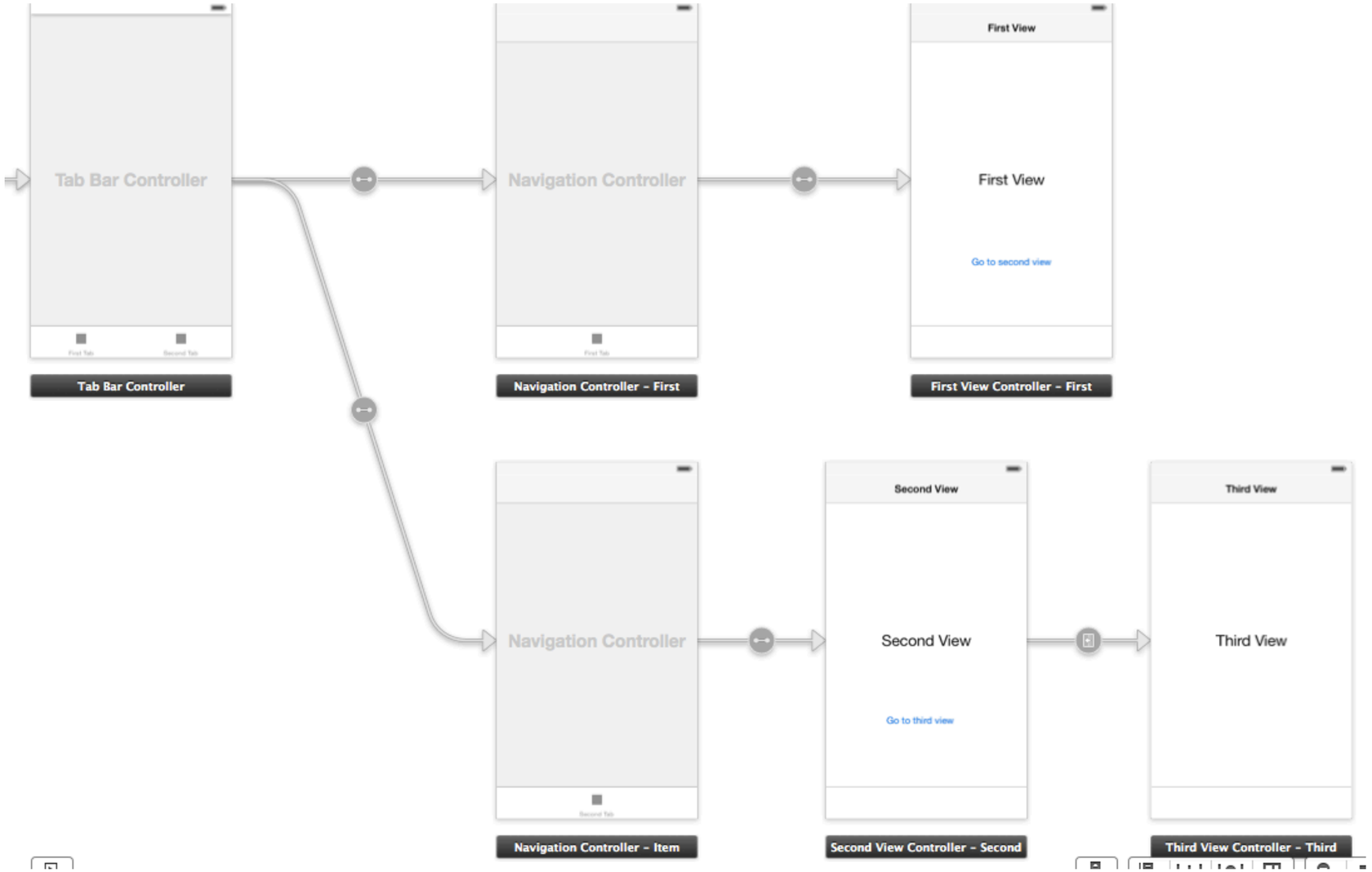
Combining tab bar controllers and navigation controllers

- To embed a `UINavigationController` inside a `UITabBarController` in storyboard, select the navigation controller, then go to Editor → Embed in → Tab Bar Controller



Combining tab bar controllers and navigation controllers

- It is possible to have complex storyboards for advanced user experience



Mobile Application Development

Lecture 16
Controllers of View Controllers