UE LI385 DANT

Introduction to iOS development with Swift

Lesson 5

Adrien Humilière
Trainline

adhumi+dant@gmail.com

- → Protocols
- → App anatomy and life cycle
- → Model View Controller
- → Scroll views

Protocols

🤝

Protocols

- Defines a blueprint of methods, properties, and other requirements that suit a particular task or piece of functionality
- Swift standard library defines many protocols, including these:
```
    CustomStringConvertible
    Equatable
    Comparable
    Codable
```
- When you adopt a protocol, you must implement all required methods.

CustomStringConvertible

Printing with CustomStringConvertible

```
let string = "Hello, world!"
print(string) // Hello, world!

let number = 42
print(number) // 42

let boolean = false
print(boolean) // false
```

Printing with CustomStringConvertible

```swift
class Shoe {
  let color: String
  let size: Int
  let hasLaces: Bool

  init(color: String, size: Int, hasLaces: Bool) {
    …
  }
}

let myShoe = Shoe(color: "Black", size: 12, hasLaces: true)
print(myShoe) // __lldb_expr_1.Shoe
```

```
class Shoe: CustomStringConvertible {
    let color: String
    let size: Int
    let hasLaces: Bool

    init(color: String, size: Int, hasLaces: Bool) {
      …
    }




}
```

```
class Shoe: CustomStringConvertible {
    let color: String
    let size: Int
    let hasLaces: Bool

    init(color: String, size: Int, hasLaces: Bool) {
      …
    }

    var description: String {
      return "Shoe(color: \(color), size: \(size), hasLaces: 
\(hasLaces))"
    }
}
```

```
let myShoe = Shoe(color: "Black", size: 12, hasLaces: true)
print(myShoe) // Shoe(color: Black, size: 12, hasLaces: true)
```

Equatable

Comparing information with Equatable

```
struct Employee {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String
}

struct Company {
  let name: String
  let employees: [Employee]
}
```

Comparing information with Equatable

```
let currentEmployee = Session.currentEmployee
let selectedEmployee = Employee(firstName: "Adrien",
  lastName: "Humilière", jobTitle: "Mobile engineer",
  phoneNumber: "415-555-9293")

if currentEmployee == selectedEmployee {
  // Enable "Edit" button
}
```

Comparing information with Equatable

```swift
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    // Equality logic
  }
}
```

Comparing information with Equatable

```
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    return lhs.firstName == rhs.firstName && lhs.lastName ==
rhs.lastName
  }
}
```

Comparing information with Equatable

```
let currentEmployee = Employee(firstName: "Adrien",
  lastName: "Humilière", jobTitle: "Mobile engineer",
  phoneNumber: "415-555-9293")
let selectedEmployee = Employee(firstName: "Adrien",
  lastName: "Humilière", jobTitle: "Customer support",
  phoneNumber: "417-436-7384")

if currentEmployee == selectedEmployee {
  // Enable "Edit" button
}
```

Comparing information with Equatable

```
struct Employee: Equatable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
    return lhs.firstName == rhs.firstName && lhs.lastName ==
rhs.lastName && lhs.jobTitle == rhs.jobTitle &&
lhs.phoneNumber == rhs.phoneNumber
  }
}
```

Comparable

Sorting information with Comparable

```
let employee1 = Employee(firstName: "Ben", lastName: "Atkins")
let employee2 = Employee(firstName: "Vera", lastName: "Carr")
let employee3 = Employee(firstName: "Grant", lastName: "Phelps")
let employee4 = Employee(firstName: "Sang", lastName: "Han")

let employees = [employee1, employee2, employee3, employee4]
```

```
struct Employee: Equatable, Comparable {
  let firstName: String
  let lastName: String
  let jobTitle: String
  let phoneNumber: String

  static func ==(lhs: Employee, rhs: Employee) -> Bool {
      return …
  }

  static func < (lhs: Employee, rhs: Employee) -> Bool {
    return lhs.lastName < rhs.lastName
  }
}
```

```
let employees = [employee1, employee2, employee3, employee4,
employee5]

let sortedEmployees = employees.sorted(by:<)

for employee in sortedEmployees {
  print(employee)
}

// Employee(firstName: "Ben", lastName: "Atkins")
// Employee(firstName: "Vera", lastName: "Carr")
// Employee(firstName: "Sang", lastName: "Han")
// Employee(firstName: "Grant", lastName: "Phelps")
```

```
let employees = [employee1, employee2, employee3, employee4,
employee5]

let sortedEmployees = employees.sorted(by:>)

for employee in sortedEmployees {
  print(employee)
}

// Employee(firstName: "Grant", lastName: "Phelps")
// Employee(firstName: "Sang", lastName: "Han")
// Employee(firstName: "Vera", lastName: "Carr")
// Employee(firstName: "Ben", lastName: « Atkins")
```

Codable

Encoding and decoding objects with Codable

```
struct Employee: Equatable, Comparable, Codable {
    var firstName: String
    var lastName: String
    var jobTitle: String
    var phoneNumber: String

    …
}
```

Encoding and decoding objects with Codable

```
let ben = Employee(firstName: "Ben", lastName: "Atkins",
jobTitle: "Front Desk",
                   phoneNumber: "415-555-7767")

let jsonEncoder = JSONEncoder()
if let jsonData = try? jsonEncoder.encode(ben),
    let jsonString = String(data: jsonData, encoding: .utf8) {
    print(jsonString)
}
```

```
{"firstName":"Ben","lastName":"Atkins","jobTitle":"Front
Desk","phoneNumber":"415-555-7767"}
```

Protocol creation

Creating a protocol

```swift
protocol FullyNamed {
  var fullName: String { get }

  func sayFullName()
}

struct Person: FullyNamed {
  var firstName: String
  var lastName: String
}
```

Creating a protocol

```swift
struct Person: FullyNamed {
  var firstName: String
  var lastName: String

  var fullName: String {
    return "\(firstName) \(lastName)"
  }

  func sayFullName() {
    print(fullName)
  }
}
```

Delegation

Delegation

Enables a class or structure to hand off responsibilities to an instance of another type

```swift
protocol ButtonDelegate {
  func userTappedButton(_ button: Button)
}

class GameController: ButtonDelegate {
  func userTappedButton(_ button: Button) {
    print("User tapped the \(button.title) button.")
  }
}
```

Delegation

```
class Button {
  let title: String
  var delegate: ButtonDelegate? // Add a delegate property

  init(title: String) {
    self.title = title
  }

  func tapped() {
    self.delegate?.userTappedButton(self)
         // If the delegate exists, call the delegate
         // function `userTappedButton` on the delegate
  }
}
```

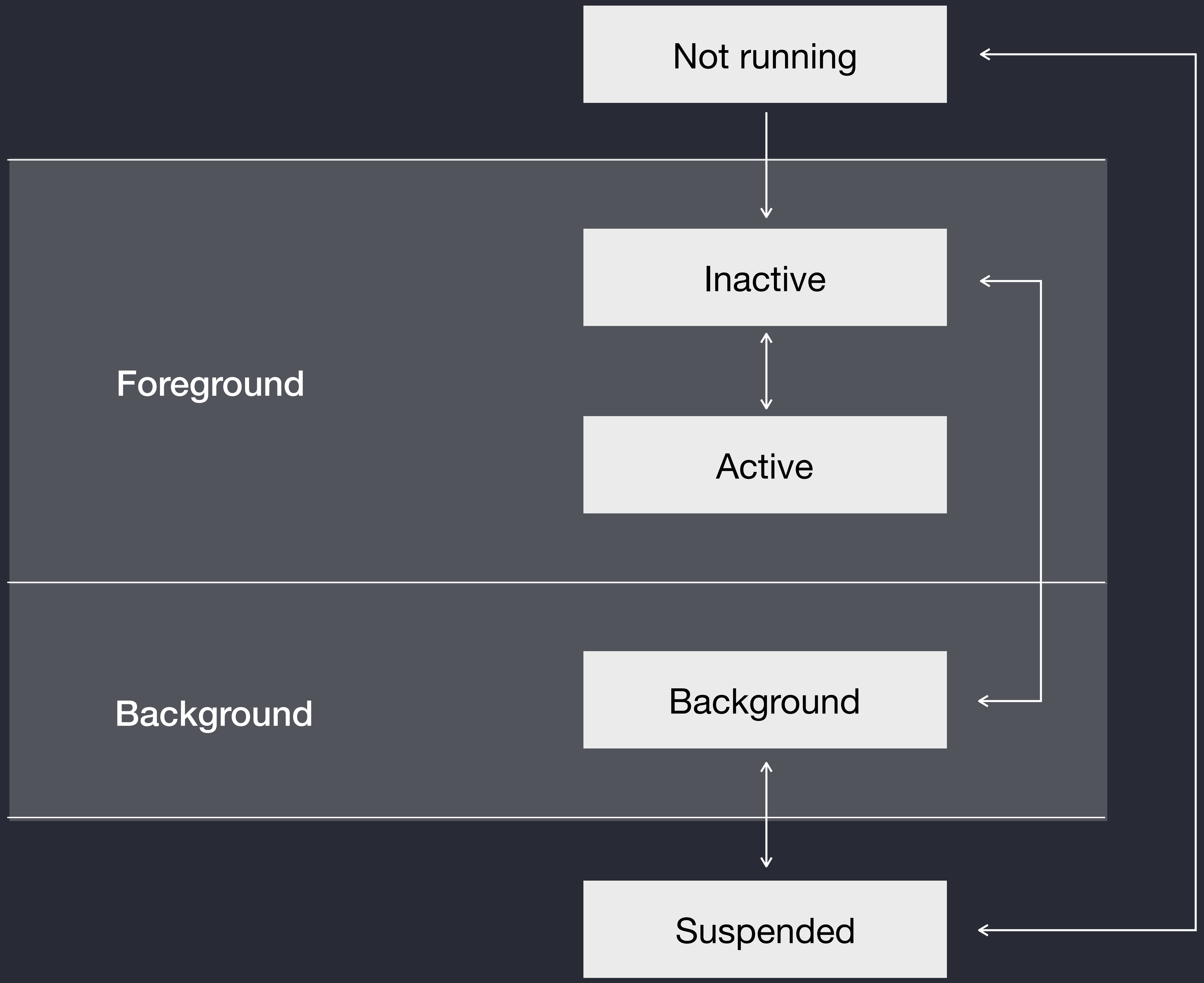
Delegation

```swift
let startButton = Button(title: "Start Game")
let gameController = GameController()
startButton.delegate = gameController

startButton.tapped()
```

App Anatomy and Life Cycle

👩‍⚕️

App life cycle



UIAppDelegate

→ Did Finish Launching
→ Will Resign Active
→ Did Enter Background
→ Will Enter Foreground
→ Did Become Active
→ Will Terminate

UIAppDelegate

Did Finish Lauching

- → App has finished launching

```
func application(_ application: UIApplication,
didFinishLaunchingWithOptions launchOptions:
    [UIApplicationLaunchOptionsKey: Any]?) -> Bool {
   return true
}
```

- → Override point for customization after app launch

UIAppDelegate

Will Resign Active

→ App is about to move from active to inactive state

```
func applicationWillResignActive(_ application: UIApplication) {}
```

→ Can occur for certain types of temporary interruptions (such as an incoming phone call or SMS message)

→ Can occur when the user quits the app and it begins the transition to the background state

→ Use to pause ongoing tasks, disable timers, and invalidate graphics rendering callbacks

UIAppDelegate

Did Enter Background

- App is about to move from active to inactive state

```
func applicationDidEnterBackground(_ application: UIApplication) {}
```

- Use to release shared resources, save user data, invalidate timers, and store enough application state information to restore your application to its current state in case it’s terminated later
- If your application supports background execution, this method is called instead of applicationWillTerminate: when the user quits

UIAppDelegate

Will Enter Foreground

→ Called immediately before the applicationDidBecomeActive function

```
func applicationWillEnterForeground(_ application: UIApplication) {}
```

→ Called as part of transition from the background to the active state

→ Can be used to undo many of the changes made on entering the background

UIAppDelegate

Did Become Active

→ App was launched by the user or system

```
func applicationDidBecomeActive(_ application: UIApplication) {}
```

→ Restart any tasks that were paused (or not yet started) while the app was inactive

→ If the app was previously in the background, optionally refresh the user interface

UIAppDelegate

Will Terminate

→ App is about to be terminated

```
func applicationWillTerminate(_ application: UIApplication) {}
```

→ Save data if appropriate

→ See also applicationDidEnterBackground:

UIAppDelegate

Which methods should I use?

- → Start with the methods that will run when launching, reopening, or closing your app

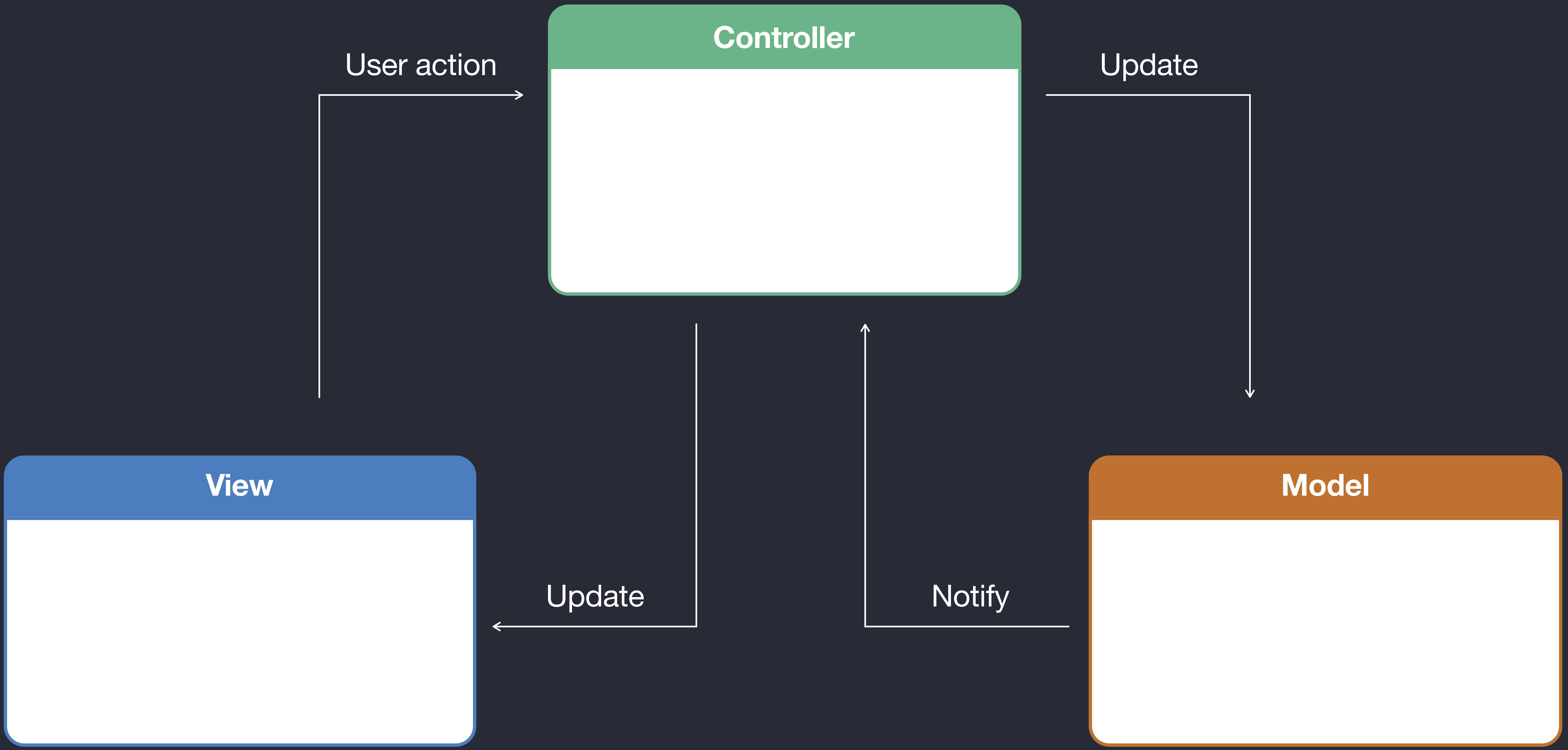
```
applicationDidFinishLaunchingWithOptions
applicationWillResignActive
applicationDidBecomeActive
```

- → Take advantage of the other three delegate methods as you become more experienced

Model View Controller

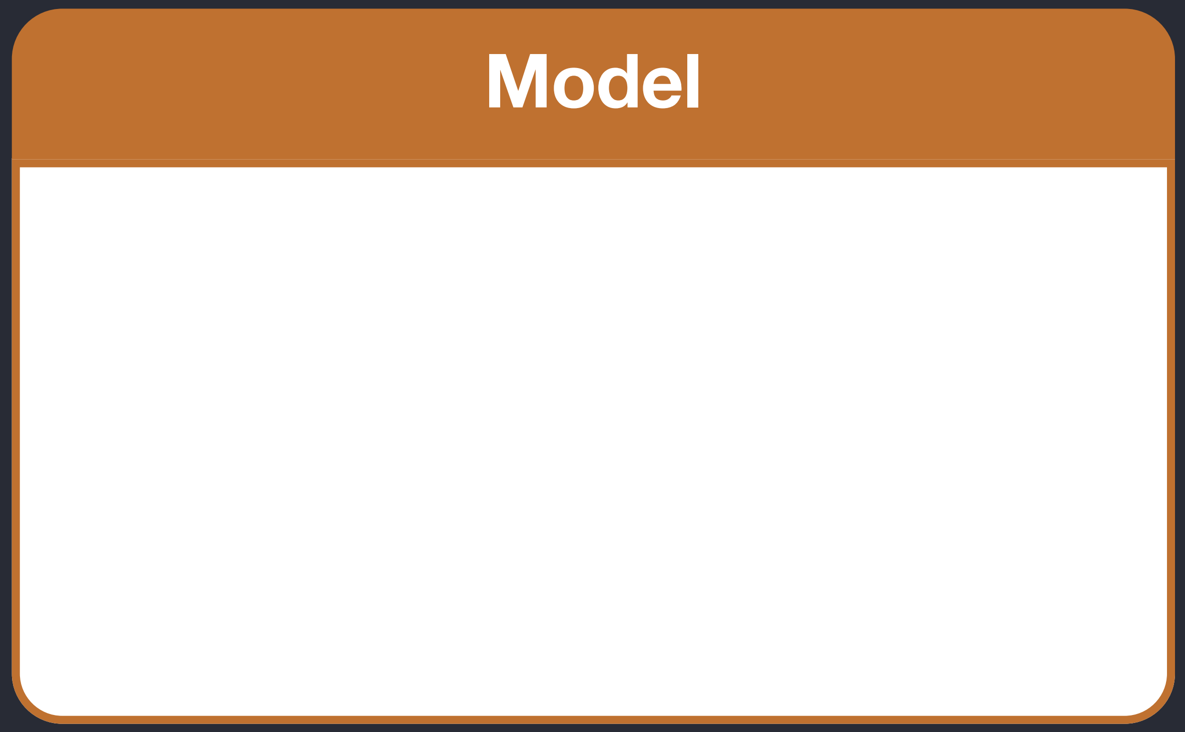
🗂️🖼️👮‍♀️

Model View Controller

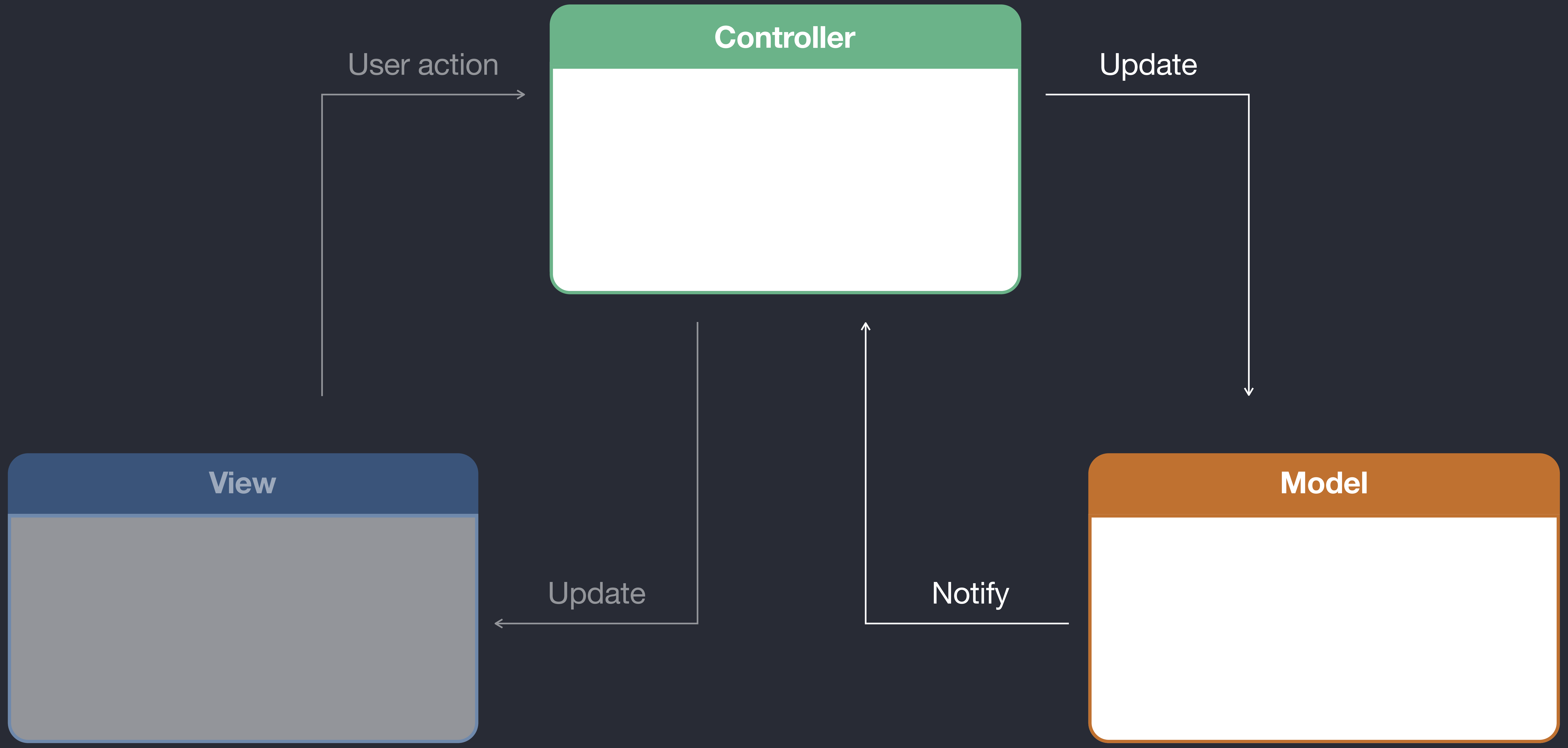


Model objects

- Groups the data needed for a specific problem domain or a type of solution to be built
- Can be related to other model objects



Model objects

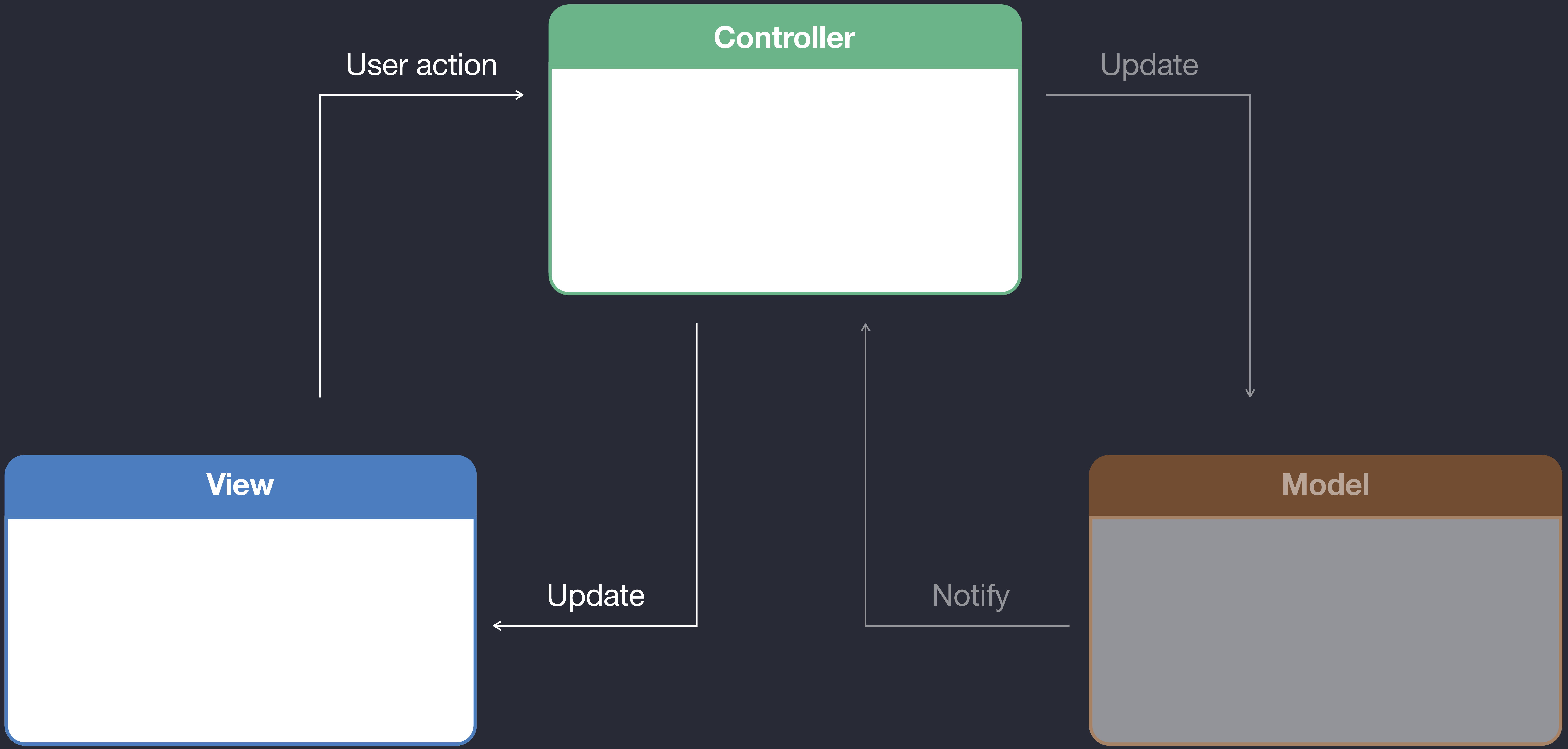


Views

→ Displays data about the app’s model objects and allows user to edit the data

→ Can be reused to show different instances of the model data

Views



Controllers

- Acts as the messenger between views and model objects
- Types:
    - View controllers
    - Model controllers
    - Helper controllers

Model Controllers

Helps control a model object or collection of model objects

Three common reasons to create a model controller:

→ Multiple objects or scenes need access to the model data

→ Logic for adding, modifying, or deleting model data is complex

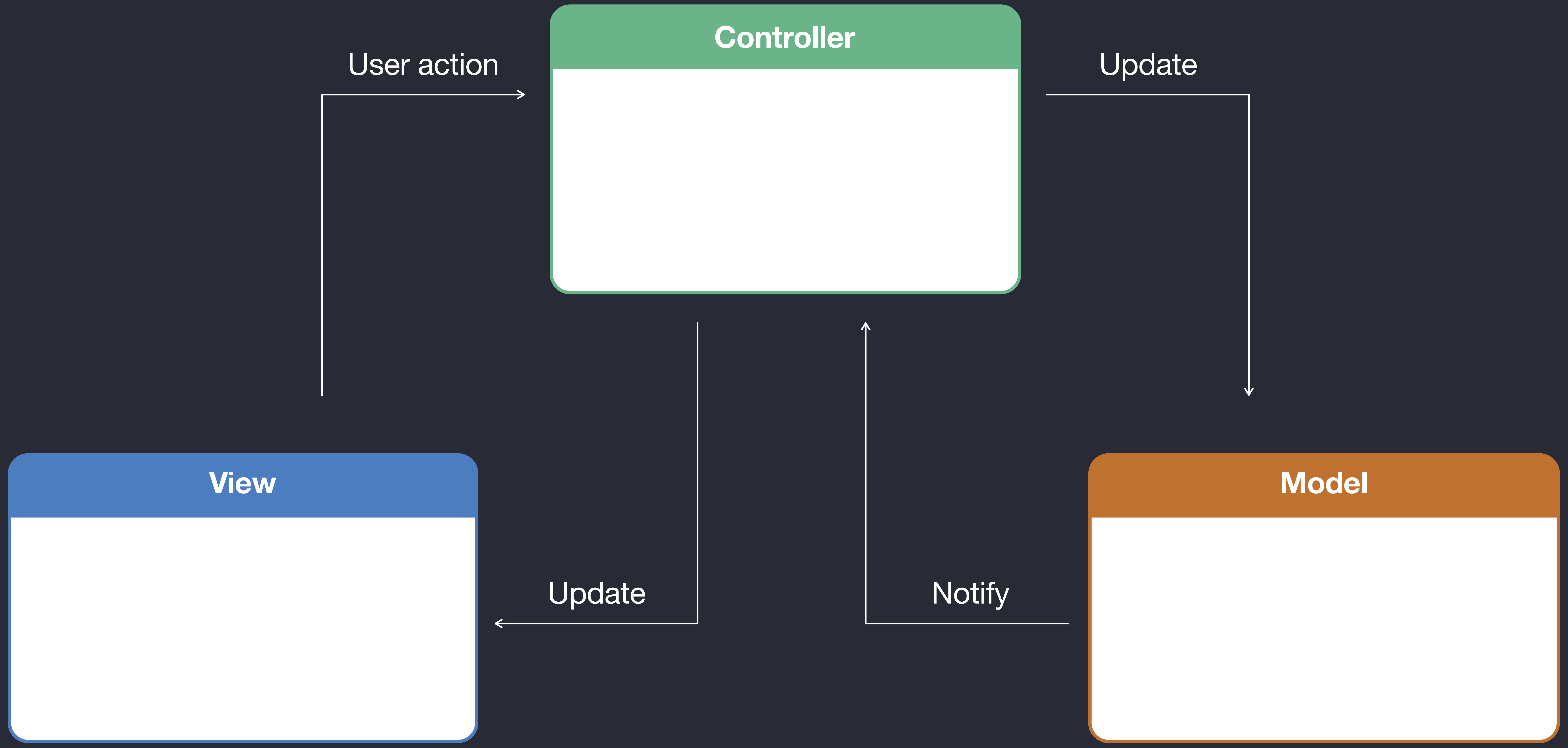
→ Keep the code in view controllers focused on managing the views

Crucial in larger projects for readability and maintainability

Helper Controllers

→ Useful to consolidate related data or functionality so that it can be accessed by other objects in your app

Controllers



Example

Meal tracker example

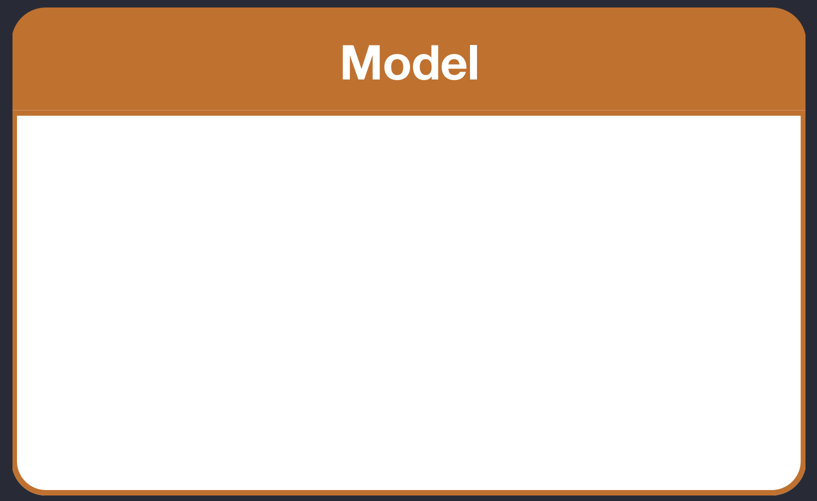
Creating an app to track eaten meals

- What should be in a "Meal" model object?
- What views are needed to display meals?
- How many controllers makes sense?

Meal tracker example

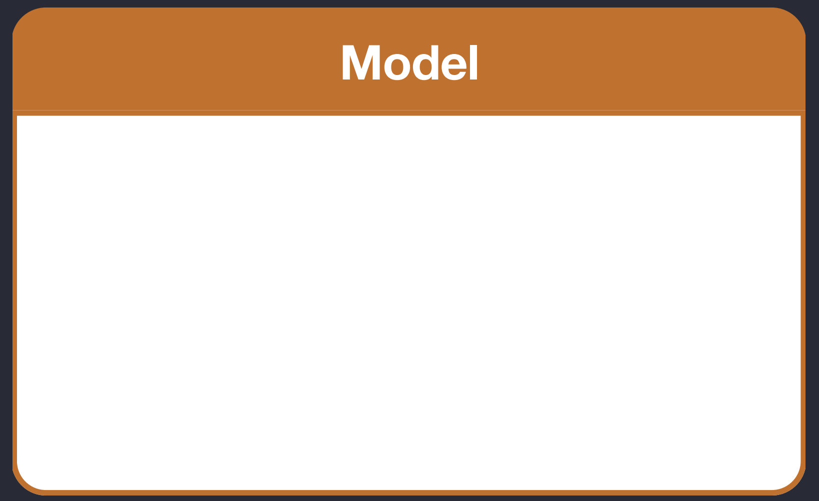
Meal:

- → Name
- → Photo
- → Notes
- → Rating
- → Timestamp



Meal tracker example

```swift
struct Meal {
    var name: String
    var photo: UIImage
    var notes: String
    var rating: Int
    var timestamp: Date
}
```



Meal tracker example

Two possible views:

- List of all tracked meals
- Details of each meal

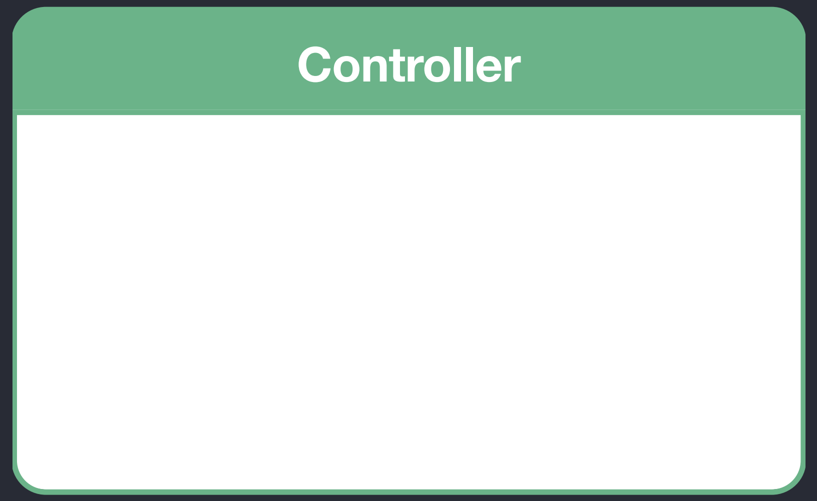
Each needs a view controller class

Meal tracker example

Minimum of two controllers:

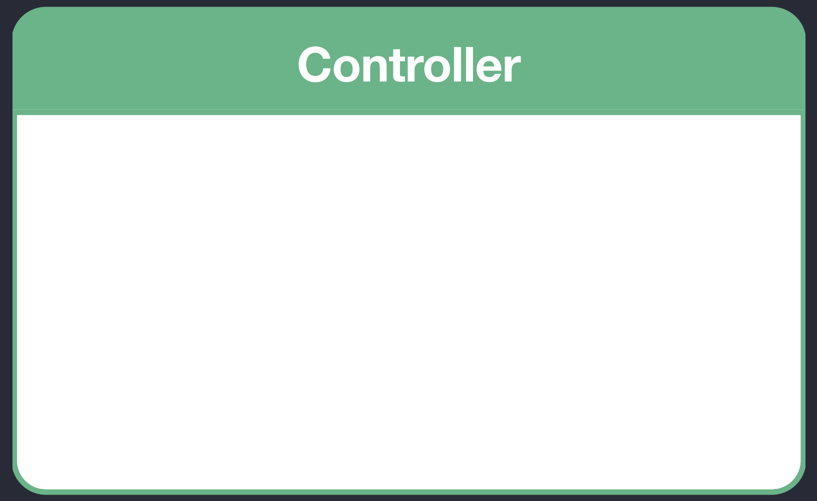
→ List view

→ Detail view



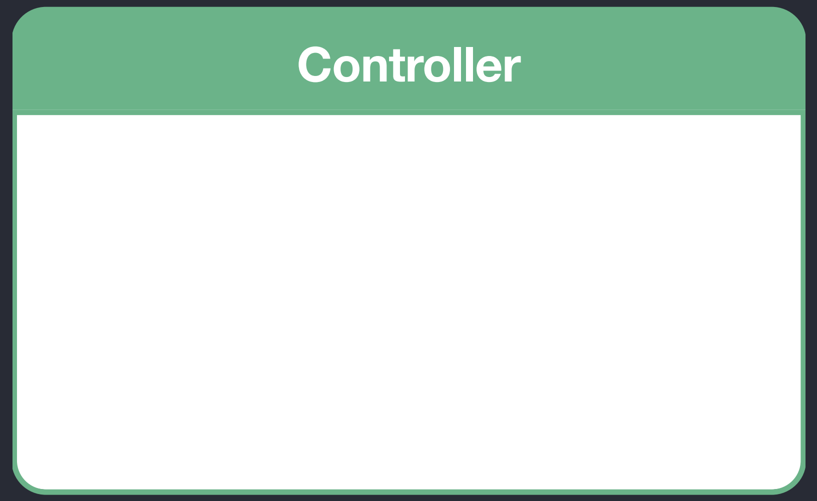
Meal tracker example

```
class MealListTableViewController: UITableViewController {

    var meals: [Meal] = []
    @IBOutlet weak var tableView: UITableView!
}
```



Meal tracker example

```
class MealListTableViewController: UITableViewController {

    var meals: [Meal] = []

    func saveMeals() {...}

    func loadMeals() {...}
}
```

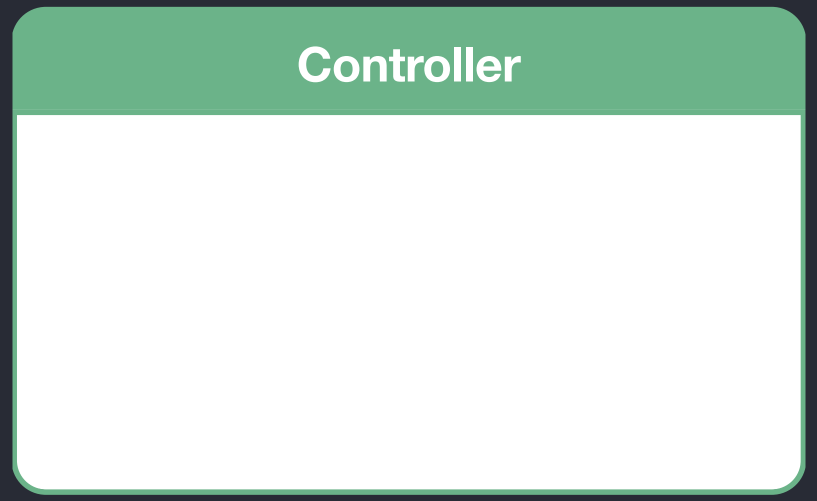


```
class MealListTableViewController: UITableViewController {

    let meals: [Meal] = []

    override func viewDidLoad() {
        // load the meals and set up the table view
    }

    // Required table view methods

    override func tableView(_ tableView: UITableView,
numberOfRowsInSection section: Int) -> Int {...}

    override func tableView(_ tableView: UITableView,
cellForRowAt indexPath: IndexPath) -> UITableViewCell {...}
```

```
   // Navigation methods
   override func prepare(for segue: UIStoryboardSegue, sender:
Any?) {
        // Pass the selected meal to the MealDetailViewController
    }
    @IBAction func unwindToMealList(sender: UIStoryboardSegue) {
        // Capture the new or updated meal from the
MealDetailViewController and save it to the meals property
    }

    // Persistence methods
    func saveMeals() {
        // Save the meals model data to the disk
    }

    func loadMeals() {
        // Load meals data from the disk and assign it to the
meals property
    }
}
```

Meal tracker example

```
class MealDetailViewController: UIViewController {...}
```



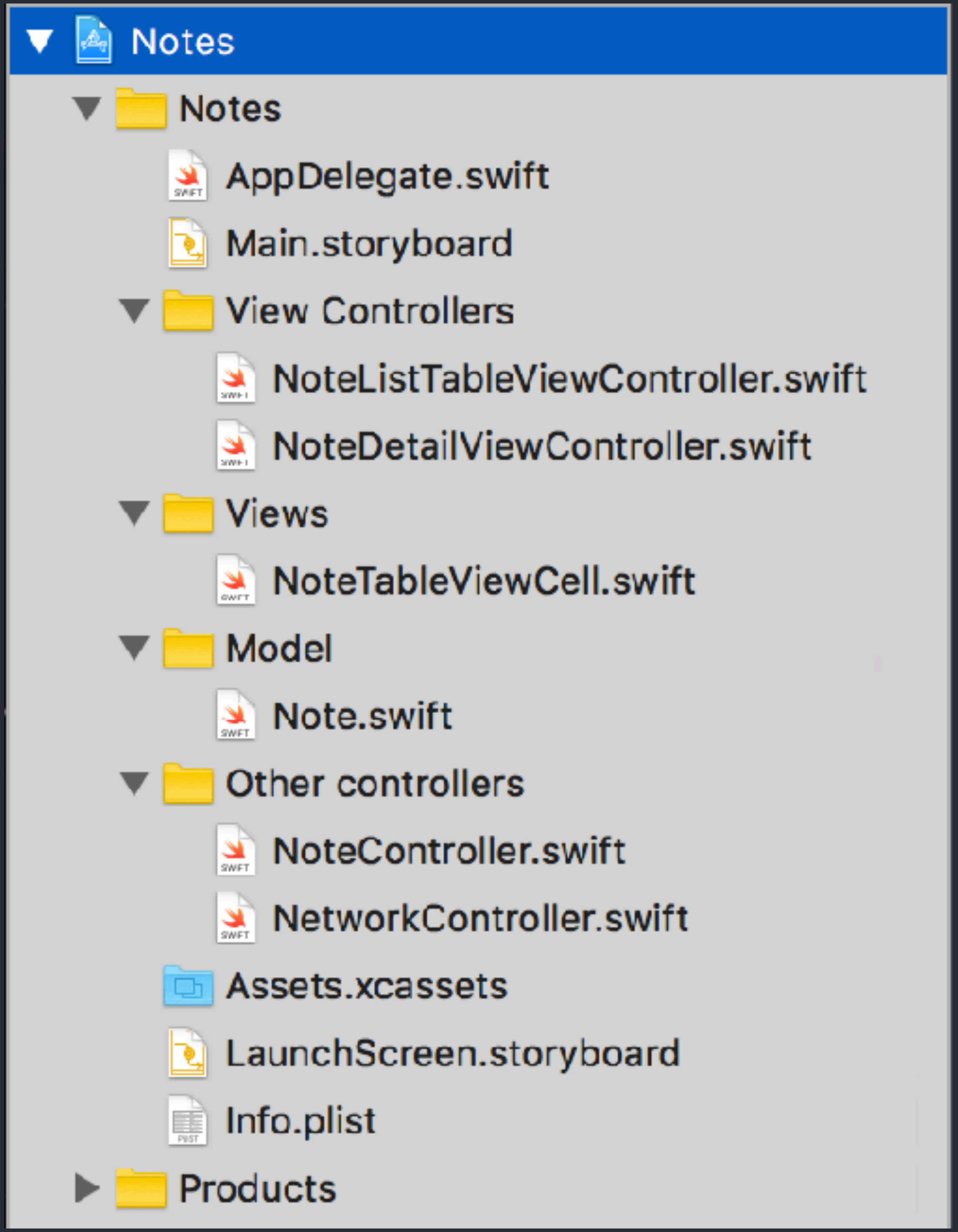
```
class MealDetailViewController: UIViewController,
UIImagePickerControllerDelegate {

    @IBOutlet weak var nameTextField: UITextField!
    @IBOutlet weak var photoImageView: UIImageView!
    @IBOutlet weak var ratingControl: RatingControl!
    @IBOutlet weak var saveButton: UIBarButtonItem!

    var meal: Meal?

    override func viewDidLoad() {
        if let meal = meal {
            update(meal)
        }
    }

    func update(_ meal: Meal) {
        // Update all outlets to reflect the data about the meal
    }
    // Navigation methods

    override func prepare(for segue: UIStoryboardSegue,
sender: Any?) {
        // Update the meal property that will be accessed by
the MealListTableViewController to update the list of meals
    }

    @IBAction func cancel(_ sender: UIBarButtonItem) {
        // Dismiss the view without saving the meal
    }
```

Reminder

- Model-View-Controller is a useful pattern
- More than one way to implement it
- Everyone has their own style
- Yours will evolve as you gain experience

Project organization

- Use clear, descriptive filenames
- Create separate files for each of your type definitions
- Write your code as if complete strangers are going to read it
- Group files to help organize your code



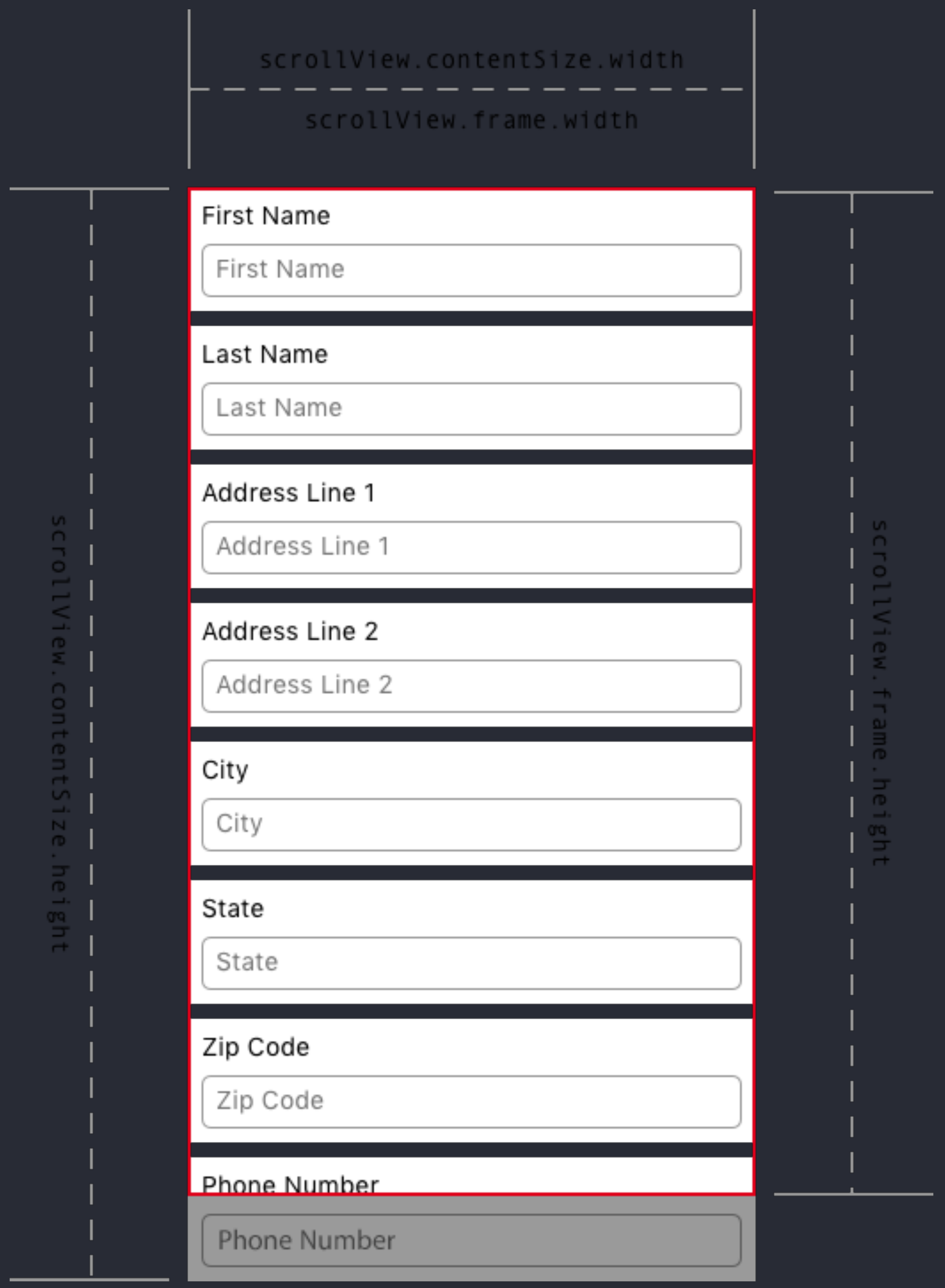
Scroll views

Scroll views

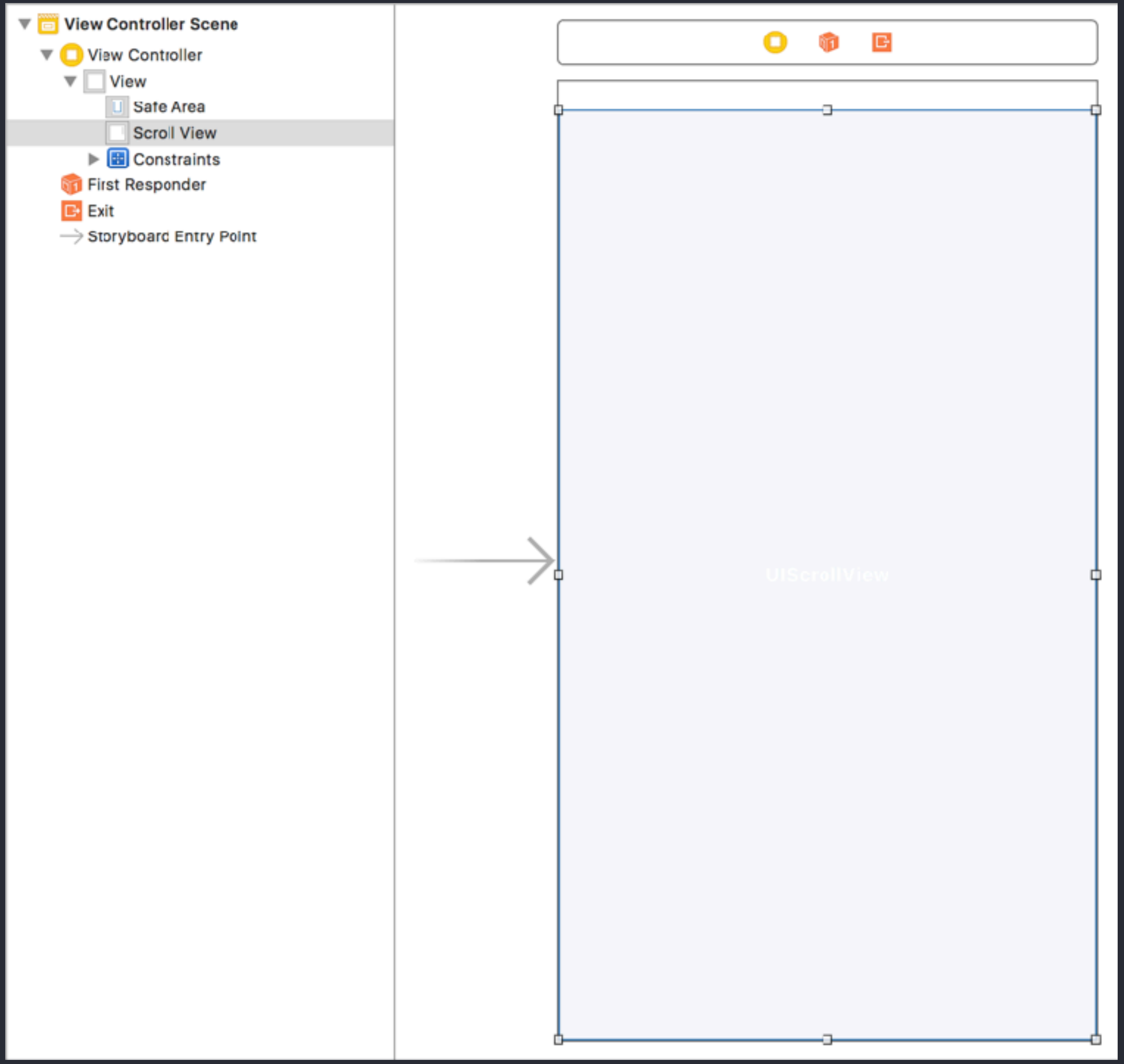
UIScrollView

- For displaying more content than can fit on the screen
- Users scroll within the content by making swiping gestures
- Content can optionally be zoomed with a pinch gesture
- UIScrollView needs to know the size of the content

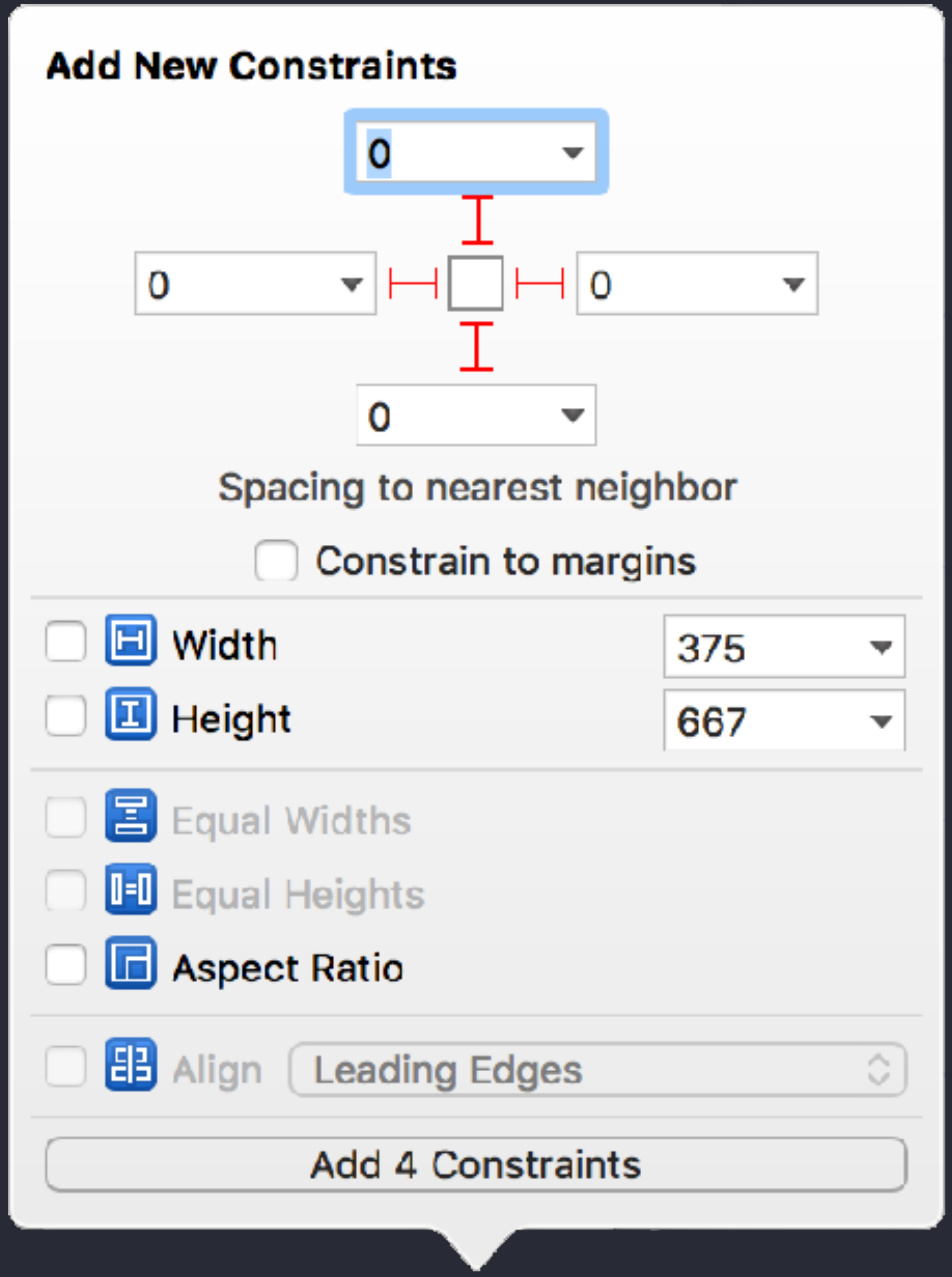
UIScrollView



Scroll views in Interface Builder



Scroll views in Interface Builder



Add New Constraints

0

0

0

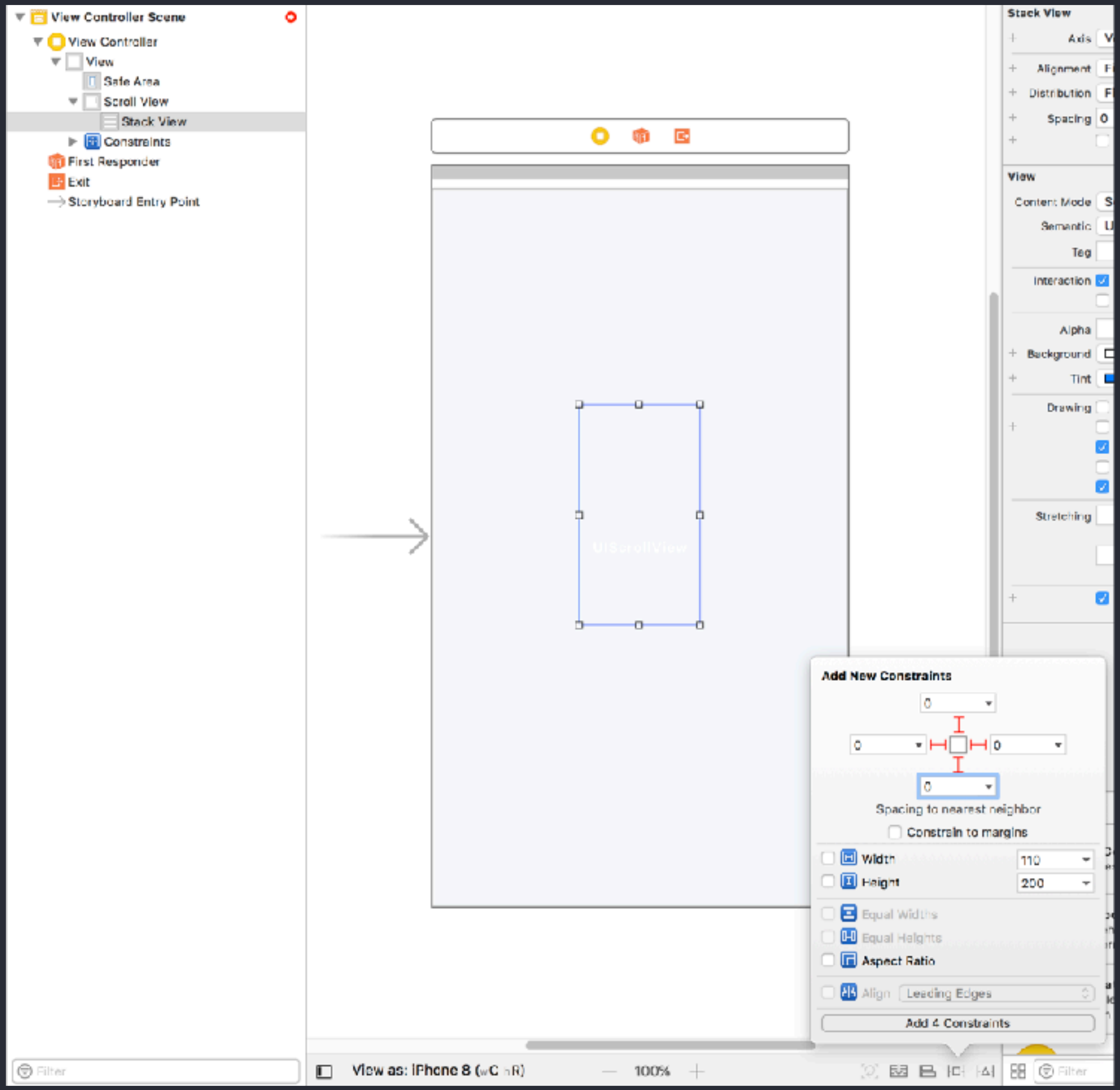
0

Spacing to nearest neighbor

☐ Constrain to margins

☐	Width	375
☐	Height	667
☐	Equal Widths	
☐	Equal Heights	
☐	Aspect Ratio	
☐	Align	Leading Edges

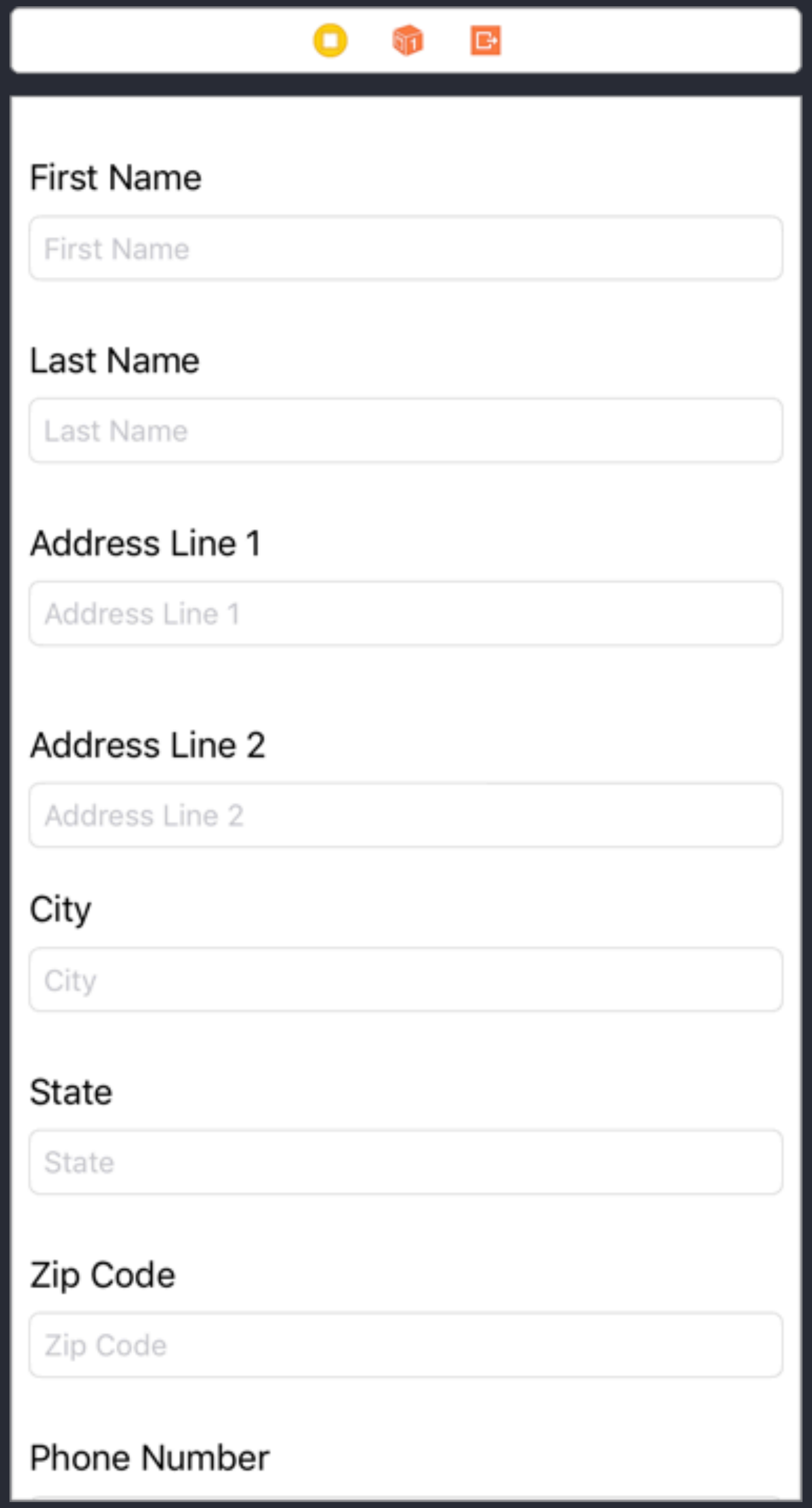
Scroll views in Interface Builder



Scroll views in Interface Builder

```
imageView.centerXAnchor.constraints(equalTo: scrollView.contentLayoutGuide.centerXAnchor)
imageView.centerYAnchor.constraints(equalTo: scrollView.contentLayoutGuide.centerYAnchor)
```

Scroll views in Interface Builder



First Name

First Name

Last Name

Last Name

Address Line 1

Address Line 1

Address Line 2

Address Line 2

City

City

State

State

Zip Code

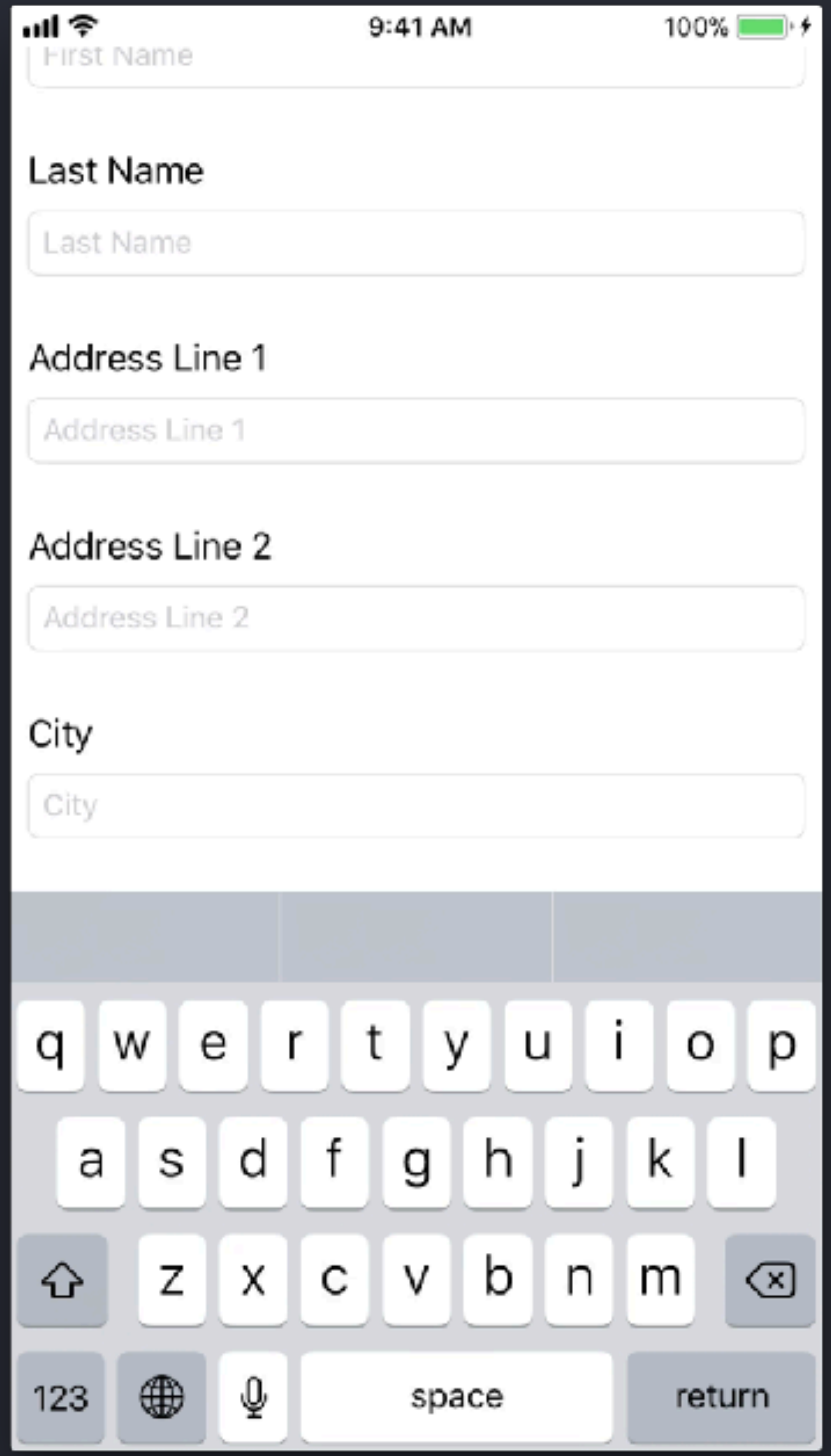
Zip Code

Phone Number

Keyboard issues

- Sent a notification when the keyboard has been shown or will be hidden
- Register for keyboard notifications

```
func registerForKeyboardNotifications() {
  NotificationCenter.default.addObserver(self,
selector: #selector(keyboardWasShown(_:)),
name: .UIKeyboardDidShow, object: nil)
  NotificationCenter.default.addObserver(self,
selector: #selector(keyboardWillBeHidden(_:)),
name: .UIKeyboardWillHide, object: nil)
}
```

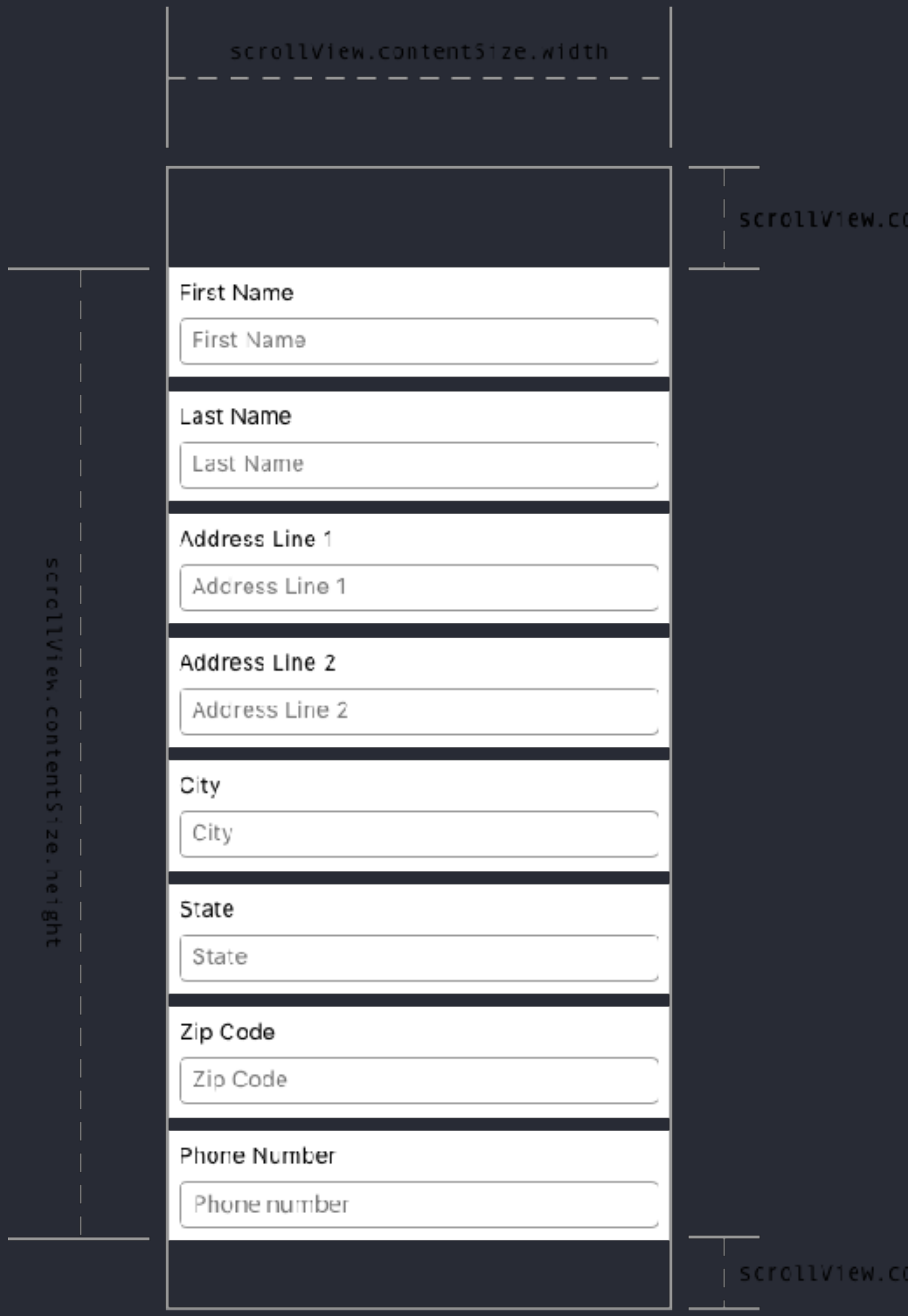


```
func keyboardWasShown(_ notificiation: NSNotification) {
    guard let info = notificiation.userInfo,
        let keyboardFrameValue =
info[UIKeyboardFrameBeginUserInfoKey] as? NSValue else { return }

    let keyboardFrame = keyboardFrameValue.cgRectValue
    let keyboardSize = keyboardFrame.size



    let contentInsets = UIEdgeInsetsMake(0.0, 0.0,
keyboardSize.height, 0.0)
    scrollView.contentInset = contentInsets
    scrollView.scrollIndicatorInsets = contentInsets
}

func keyboardWillBeHidden(_ notification: NSNotification) {
    let contentInsets = UIEdgeInsets.zero
    scrollView.contentInset = contentInsets
    scrollView.scrollIndicatorInsets = contentInsets
}
```

Content insets

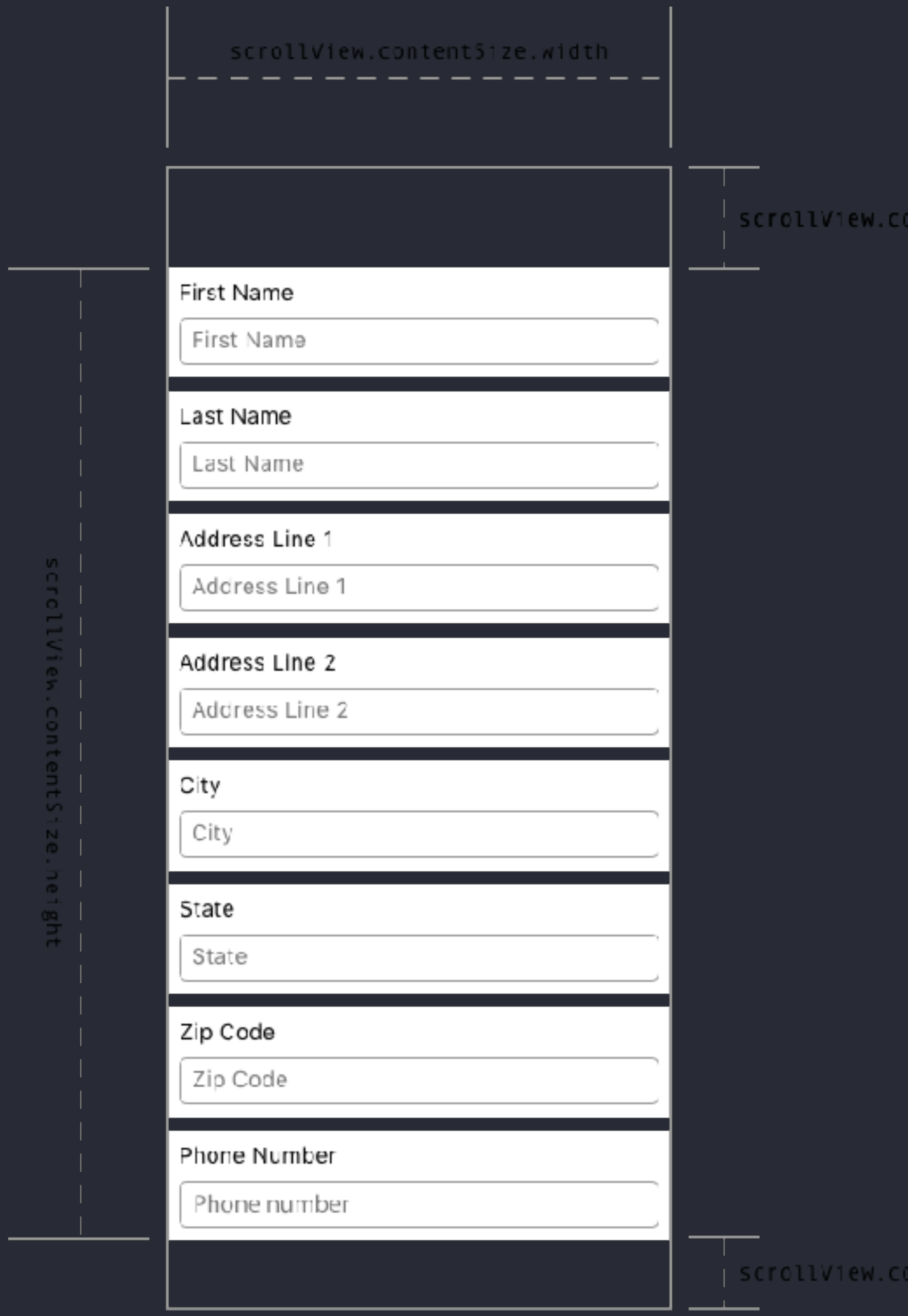
- Allows you to pad the content at the top and bottom of the scroll view
- Useful if you have toolbars floating above your scroll view

```
scrollview.contentInset.top
                       .bottom
                       .left
                       .right
```



Scroll indicator

```
let contentInsets = UIEdgeInsetsMake(0.0, 0.0,
     keyboardSize.height, 0.0)
scrollView.contentInset = contentInsets
scrollView.scrollIndicatorInsets = contentInsets
```



The End.