UI Design and Storyboarding

Mobile Application Development in iOS

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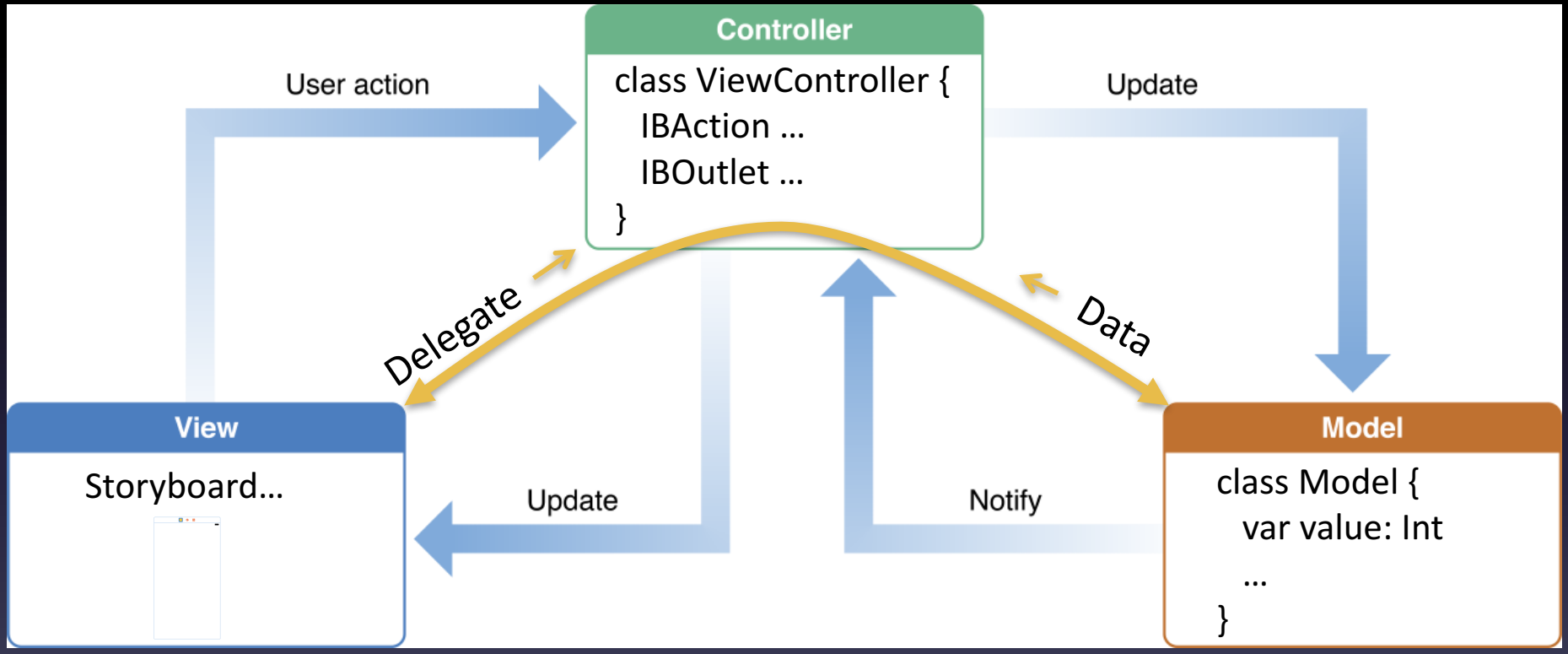
Outline

- Model-View-Controller (MVC) design
- Storyboarding
- Delegates
- Multi-threading and timers

Model-View-Controller (MVC)



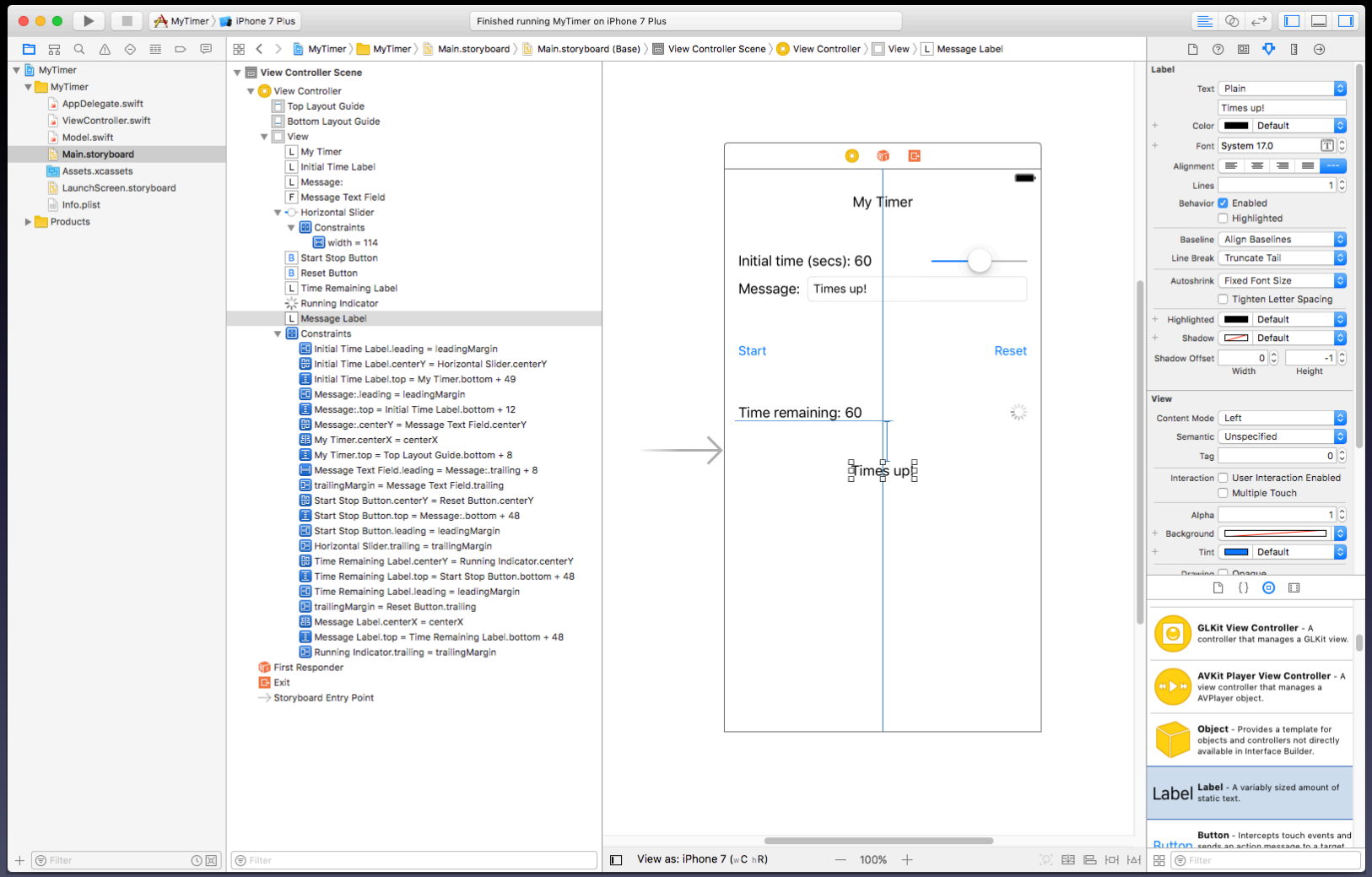
Model

```
class MyTimer {
    var initial: Int
    var current: Int
    var message: String
    var running: Bool

    init (initial: Int, message: String) {
        self.initial = initial
        self.current = initial
        self.message = message
        self.running = false
    }

    func start () {
        self.running = true
    }

    func stop () {
        self.running = false
    }
```

Model (cont.)

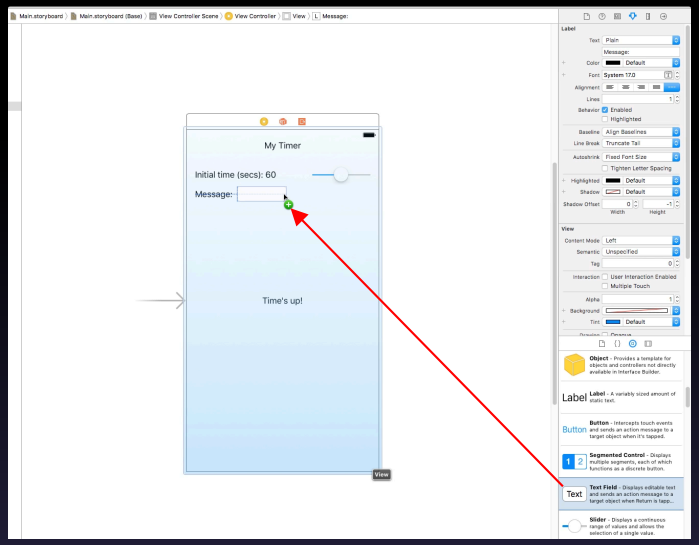
```
    ...
    func reset () {
        self.running = false
        self.current = self.initial
    }

    // Decrements timer if running; returns true if time's up
    func decrement () -> Bool {
        if (self.running) {
            current = current - 1
            if (current == 0) {
                self.running = false
                return true
            }
        }
        return false
    }
}
```

Storyboard

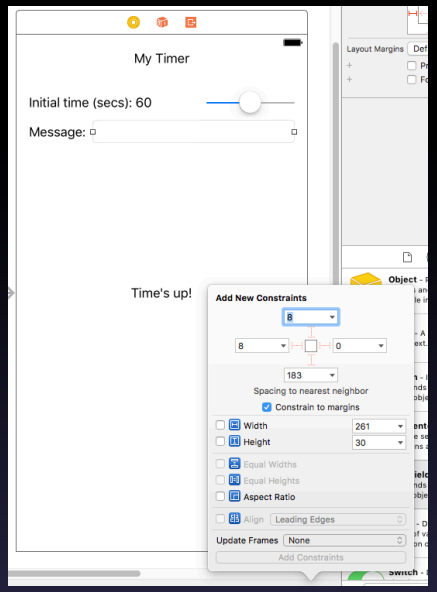

MyTimer
iPhone 7 Plus
Finished running MyTimer on iPhone 7 Plus
MyTimer
MyTimer
Main.storyboard
Main.storyboard (Base)
View Controller Scene
View Controller
View
Message Label
MyTimer
AppDelegate.swift
ViewController.swift
Model.swift
Main.storyboard
Assets.xcassets
LaunchScreen.storyboard
Info.plist
Products
View Controller Scene
View Controller
Top Layout Guide
Bottom Layout Guide
View
My Timer
Initial Time Label
Message:
Message Text Field
Horizontal Slider
Constraints
width = 114
Start Stop Button
Reset Button
Time Remaining Label
Running Indicator
Message Label
Constraints
Initial Time Label.leading = leadingMargin
Initial Time Label.centerY = Horizontal Slider.centerY
Initial Time Label.top = My Timer.bottom + 49
Message:.leading = leadingMargin
Message:.top = Initial Time Label.bottom + 12
Message:.centerY = Message Text Field.centerY
My Timer.centerX = centerX
My Timer.top = Top Layout Guide.bottom + 8
Message Text Field.leading = Message:.trailing + 8
trailingMargin = Message Text Field.trailing
Start Stop Button.centerY = Reset Button.centerY
Start Stop Button.top = Message:.bottom + 48
Start Stop Button.leading = leadingMargin
Horizontal Slider.trailing = trailingMargin
Time Remaining Label.centerY = Running Indicator.centerY
Time Remaining Label.top = Start Stop Button.bottom + 48
Time Remaining Label.leading = leadingMargin
trailingMargin = Reset Button.trailing
Message Label.centerX = centerX
Message Label.top = Time Remaining Label.bottom + 48
Running Indicator.trailing = trailingMargin
First Responder
Exit
Storyboard Entry Point
My Timer
Initial time (secs): 60
Message:
Times up!
Start
Reset
Time remaining: 60
Times up
View as: iPhone 7 (wC hR)
100%
Label
Text
Plain
Times up!
Color
Default
Font
System 17.0
Alignment
Lines
Behavior
Enabled
Highlighted
Baseline
Align Baselines
Line Break
Truncate Tail
Autoshrink
Fixed Font Size
Tighten Letter Spacing
Highlighted
Default
Shadow
Default
Shadow Offset
Width
Height
View
Content Mode
Left
Semantic
Unspecified
Tag
Interaction
User Interaction Enabled
Multiple Touch
Alpha
Background
Tint
Default
GLKit View Controller - A controller that manages a GLKit view.
AVKit Player View Controller - A view controller that manages a AVPlayer object.
Object - Provides a template for objects and controllers not directly available in Interface Builder.
Label - A variably sized amount of static text.
Button - Intercepts touch events and

Storyboard: Adding Elements

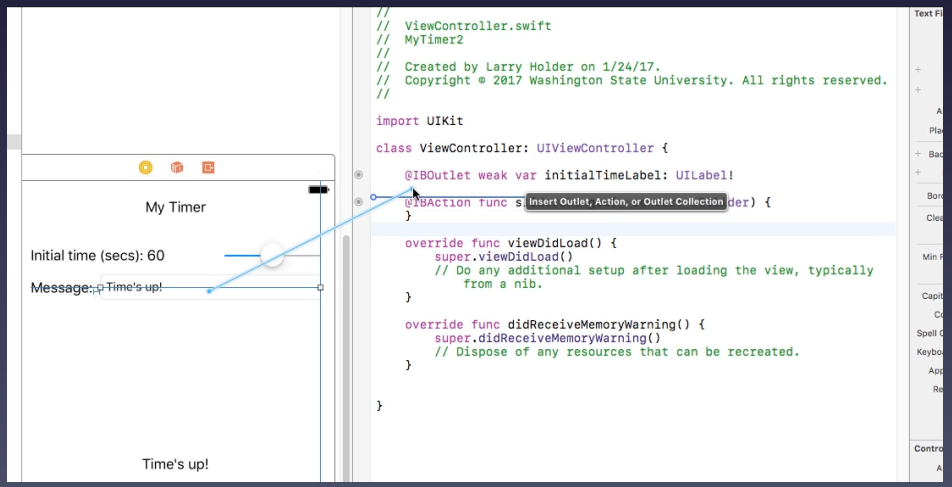
1. Drag element into view.



2. Add layout contraints.



3. Connect element to view controller.



- Adding elements to views
  - Create IBOutlet to get/set properties of element
  - Create IBAction to detect interaction with element

Delegate

- Object that responds to events from another object
- Defines a protocol that must be followed
  - Required methods
  - Optional methods
- View elements generating multiple different actions use delegates (rather than IBAction)

Delegate Example: UITextField

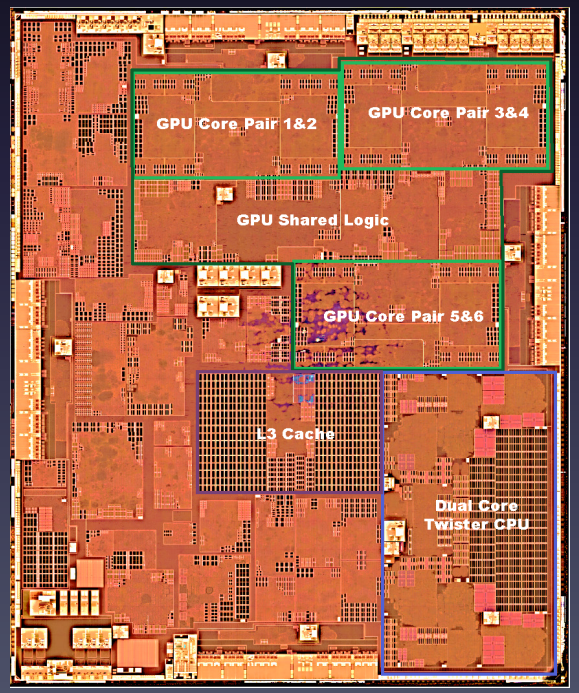
- UITextFieldDelegate
  - textFieldDidBeginEditing
  - textFieldDidEndEditing
  - textFieldShouldReturn
- More
  - developer.apple.com/reference/uikit/uitextfielddelegate

UITextField Delegate

```
class ViewController: UIViewController, UITextFieldDelegate {
    @IBOutlet weak var messageTextField: UITextField!
    @IBOutlet weak var timesUpMessage: UILabel!

    func textFieldDidEndEditing(_ textField: UITextField) {
        timesUpMessage.text = textField.text
    }

    func textFieldShouldReturn(_ textField: UITextField) -> Bool {
        textField.resignFirstResponder()  // remove keyboard on Return
        return false   // do default behavior? (no difference here)
    }

    override func viewDidLoad() {
        super.viewDidLoad()
        messageTextField.delegate = self
    }
}
```

Multi-Threading

- Running multiple tasks concurrently
- Tasks assigned to threads
- Threads assigned to processor cores



A9 Processor
- 2 cores
- iPhone 6

A10 Processor
- 4 cores
- iPhone 7

Multi-Threading in iOS

- Referred to as “Concurrency”
  - Manipulate “queues”, not threads
- Grand Central Dispatch (GCD)
  - iOS mechanism for sending tasks to different queues
  - You can create your own queues, and assign tasks to them
  - Threads take tasks from queues and run on a core
- Main queue used for UI and user interaction
  - Don’t put intensive tasks on Main queue!
- Also, UI changes not on Main queue “lost”

```
let myQueue = DispatchQueue.global()
myQueue.async {
    // Do something, not affecting UI
}
```

```
DispatchQueue.main.async {
    // Do something easy
    // Or affecting UI
}
```

Timers

- Timer class
  - Wait specified time interval, then call function
  - Can repeat
- Start immediately

```
scheduledTimer(withTimeInterval interval: TimeInterval,
    repeats: Bool, block: @escaping (Timer) -> Void) -> Timer
```

- Stop `Timer.invalidate()`

Timers

- Create

```
init(timeInterval interval: TimeInterval,
    repeats: Bool, block: @escaping (Timer) -> Void) -> Timer
```

- Create to fire later

```
init(fire: Date, timeInterval interval: TimeInterval,
    repeats: Bool, block: @escaping (Timer) -> Void) -> Timer
```

- Add to run loop

```
let runLoop = RunLoop.current
runLoop.add(timer, forMode: .defaultRunLoopMode)
```

Timers

```
var timer1: Timer!
var timer2 = Timer.init(timeInterval: 1.0, repeats: false, block:
handleTick)

func startButtonTapped {
    timer1 = Timer.scheduledTimer(withTimeInterval: 1.0,
        repeats: true, block: handleTick)
    RunLoop.current.add(timer2, forMode: .defaultRunLoopMode)
}

func stopButtonTapped {
    timer1.invalidate()
    timer2.invalidate()
}

func handleTick (timer: Timer) {
    print("tick")
}
```

Resources

- Storyboard
  - http://help.apple.com/xcode/mac/8.3/
- Protocols and Delegates
  - https://developer.apple.com/library/content/documentation/Swift/Conceptual/Swift_Programming_Language/Protocols.html
- UITextField and UITextFieldDelegate
  - https://developer.apple.com/reference/uikit/uitextfield
  - https://developer.apple.com/reference/uikit/uitextfielddelegate
- Grand Central Dispatch (GCD)
  - https://developer.apple.com/reference/dispatch
- Timer
  - https://developer.apple.com/reference/foundation/timer