iOS DeCal

lecture 3

AutoLayout

cs198-001 : spring 2018

today's lecture

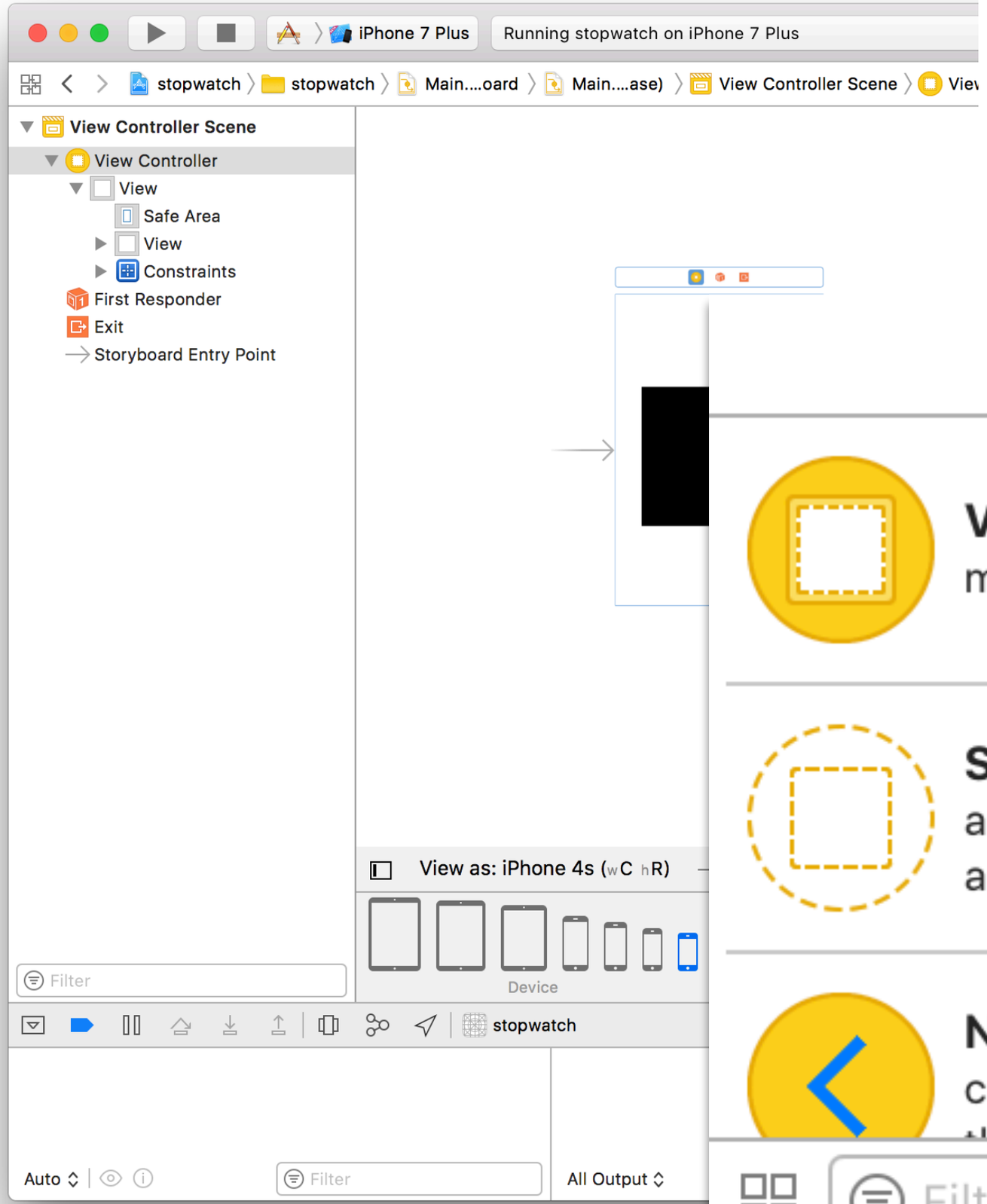
- announcements
- UI toolkit / Object library
- laying out views using Auto layout + Storyboard
- check in

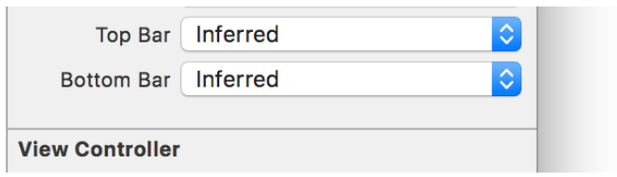
announcements

- hw2 (hangman) released??? tonight.
- due next Monday at 11:59pm
- if you didn't check off for lab last week, you can check off at the beginning of next lab

iOS storyboard objects

object library

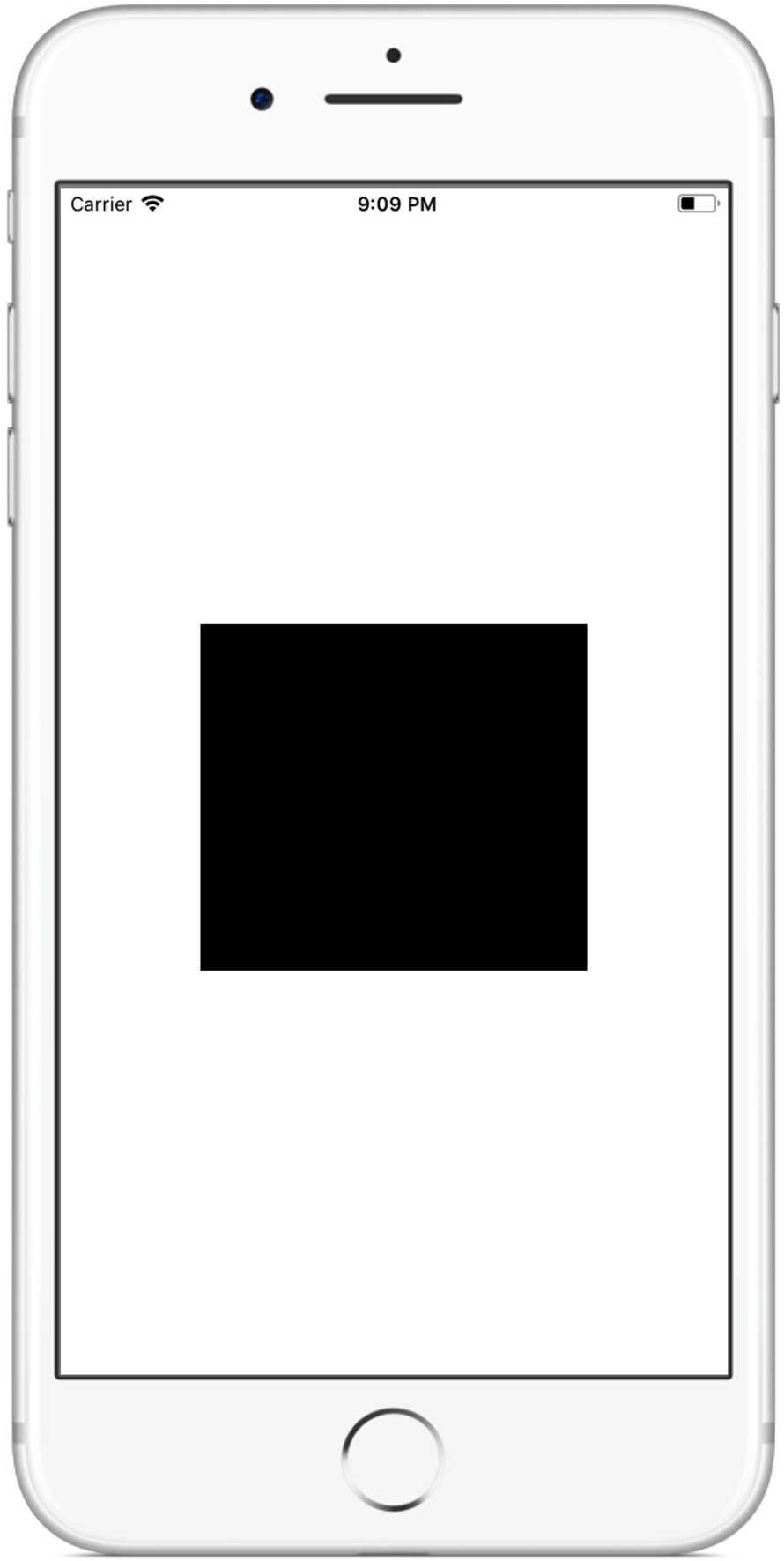




views

View - Represents a rectangular region in which it draws and receives events.

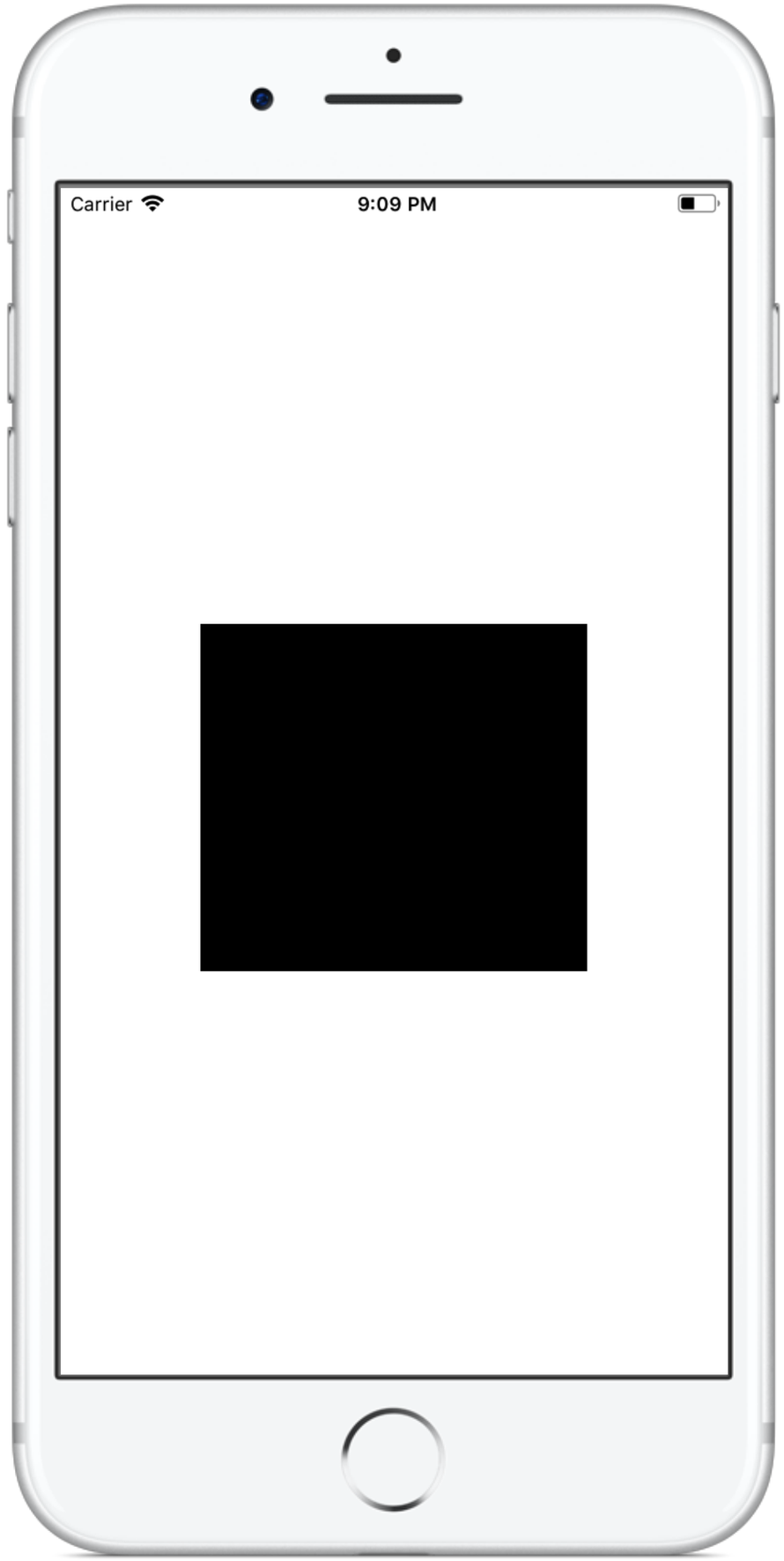
- just a box
- all UI elements subclass UIView
- can respond to touches / other gestures



views

View - Represents a rectangular region in which it draws and receives events.

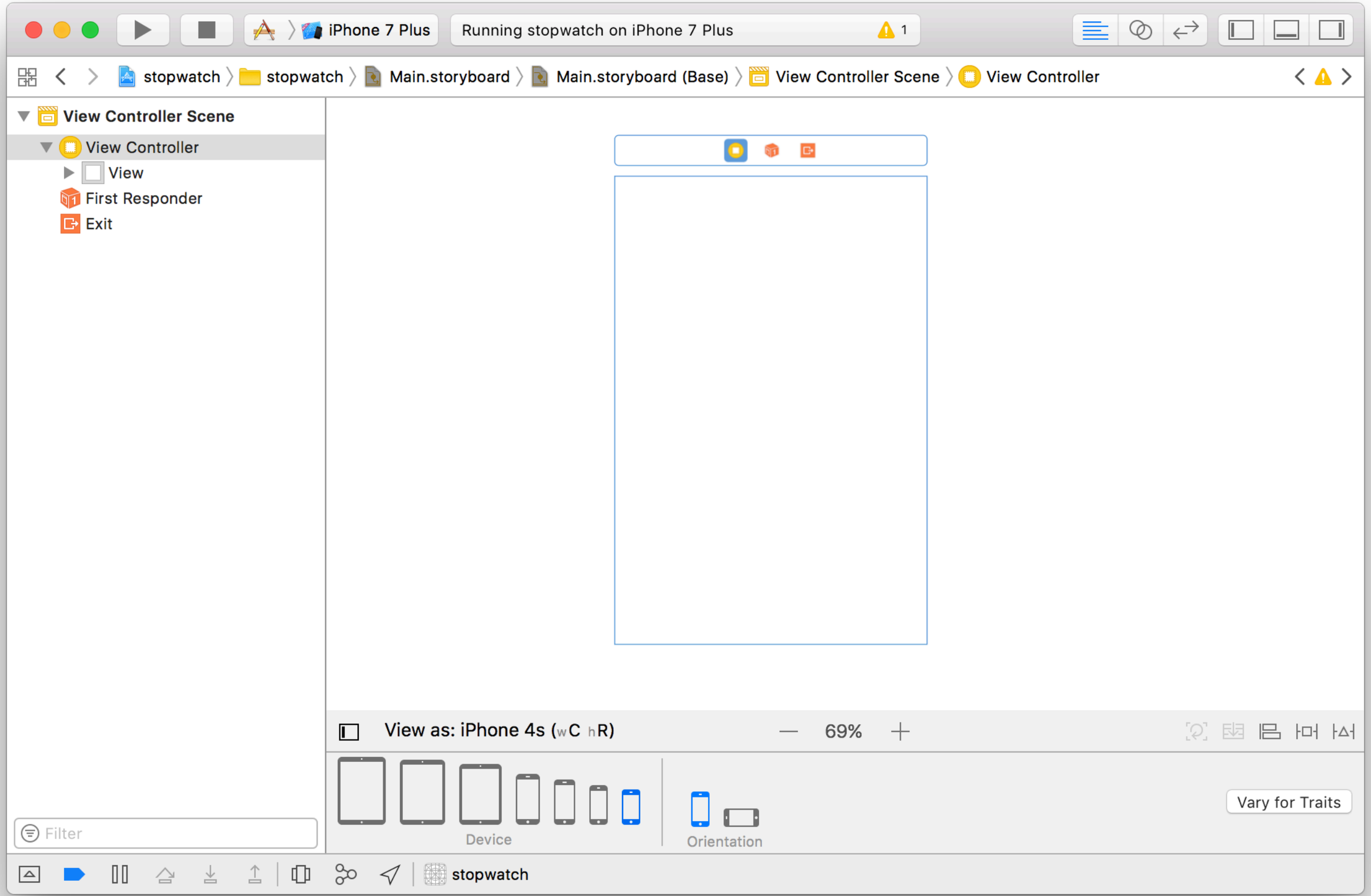
- just a box
- all UI elements subclass UIView
- can respond to touches / other gestures
- *how many views are in this image?*



view controllers

View Controller - A controller that manages a view.

- not really a UI object
- adds a new “screen” to your storyboard
- comes with a blank view
- view controller ≠ view

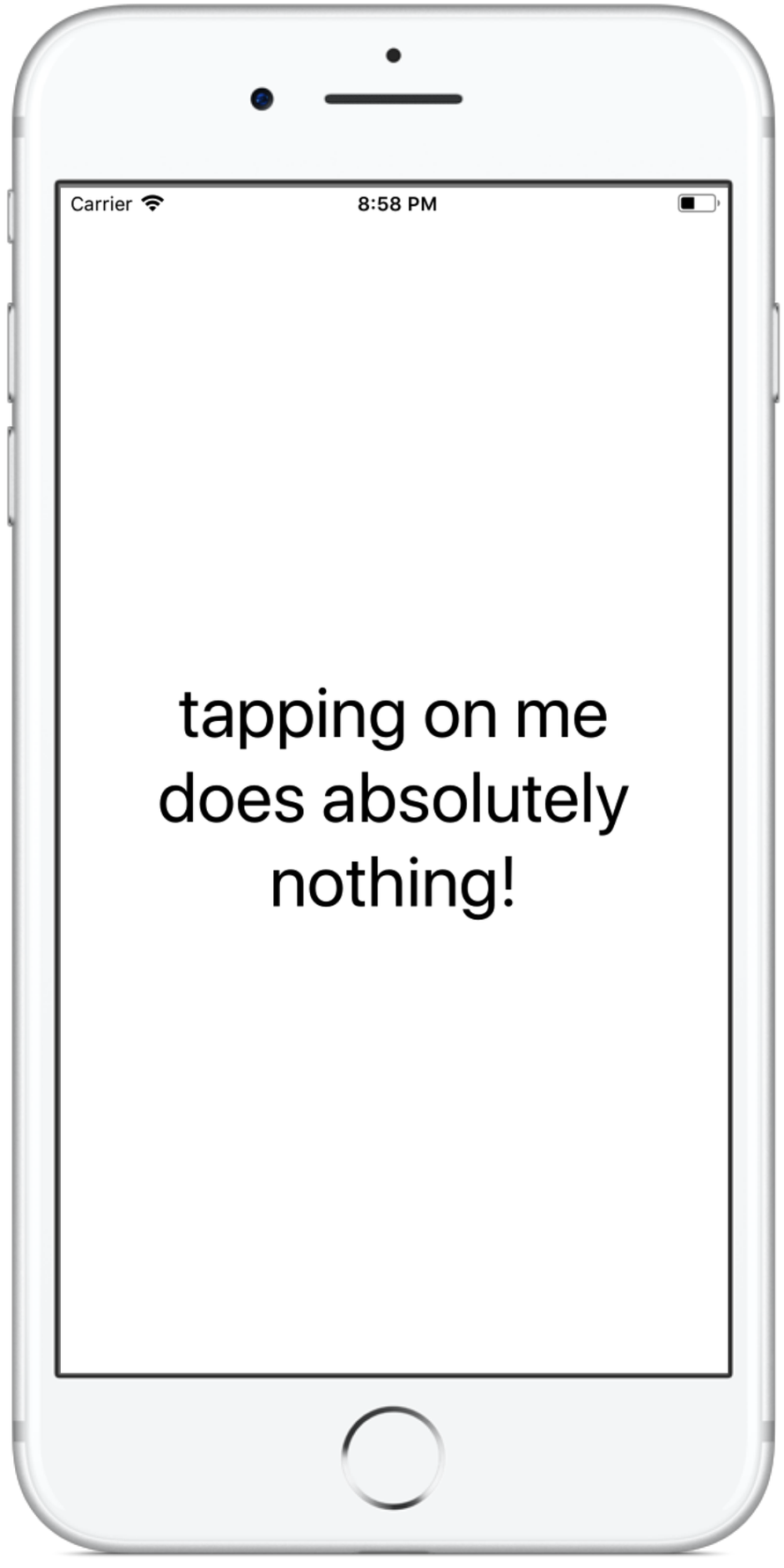


view controller vs. view

labels

Label **Label** - A variably sized amount of static text.

- used to display text
- not editable by user

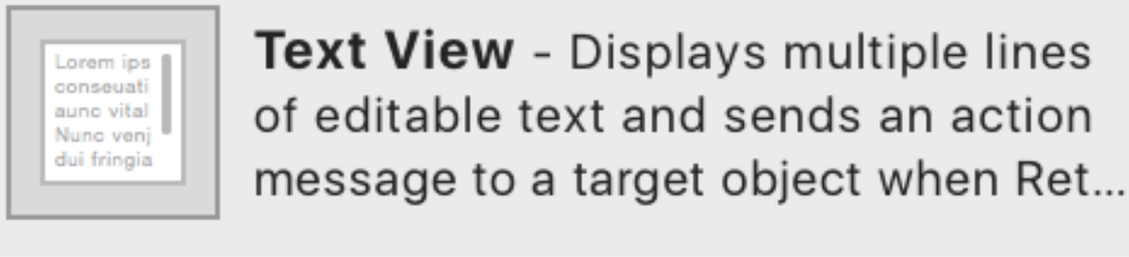


text fields

Text **Text Field** - Displays editable text and sends an action message to a target object when Return is tapped.

- editable text
- limited to one line
- use to get user input

text views



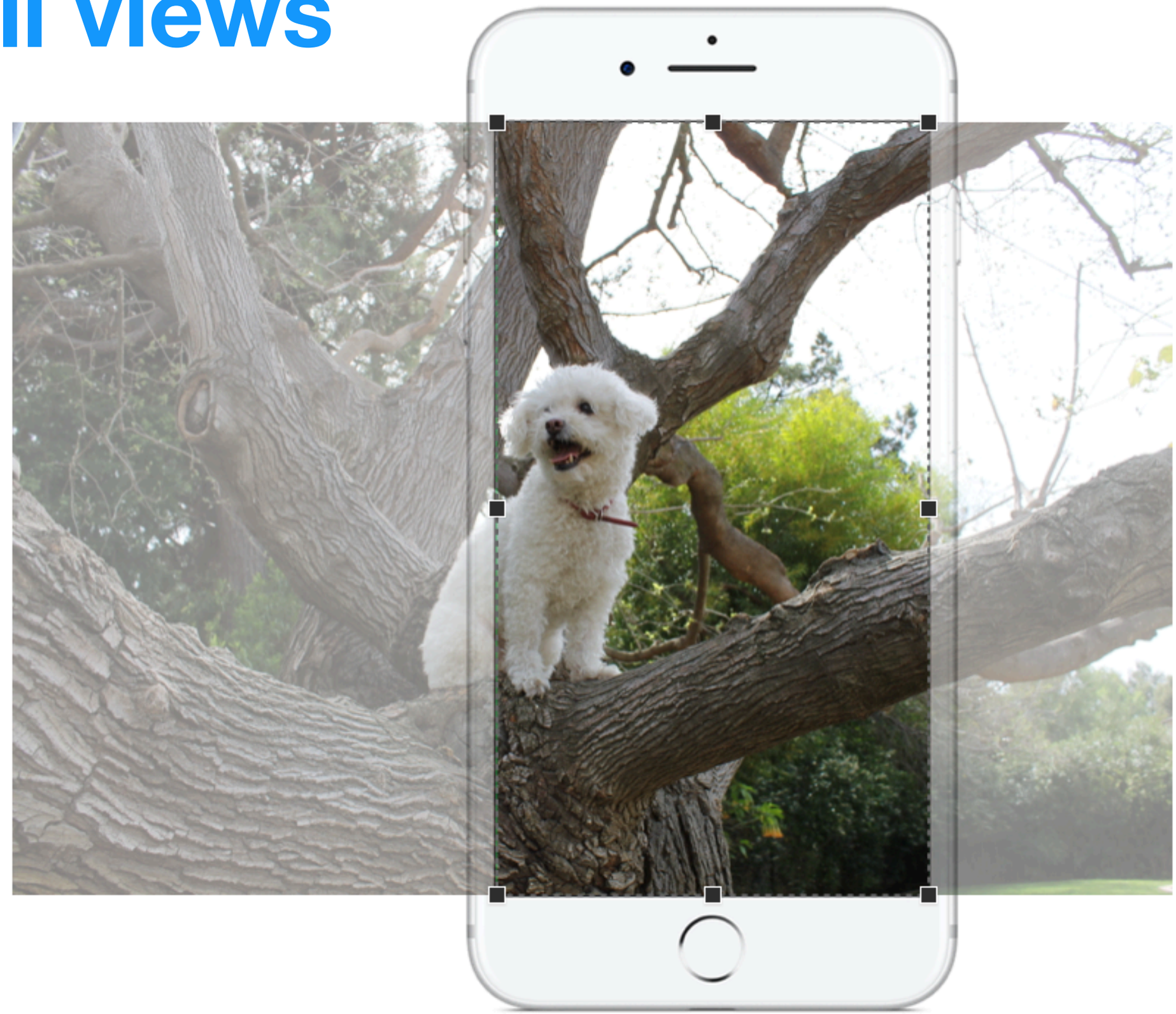
- editable text
- multi-line
- use to get lengthy user text input
- scrollable

scroll views

Scroll View - Provides a mechanism to display content that is larger than the size of the application's window.

- accepts user swipes to scroll embedded content
- typically, you'll use a subclass of `UIScrollView`
- examples: `UITextView`, `UICollectionView`,`UITableView`

scroll views



buttons

Button **Button** - Intercepts touch events and sends an action message to a target object when it's tapped.

- use to detect touch events
- useless unless you connect to an IBAction or register a selector

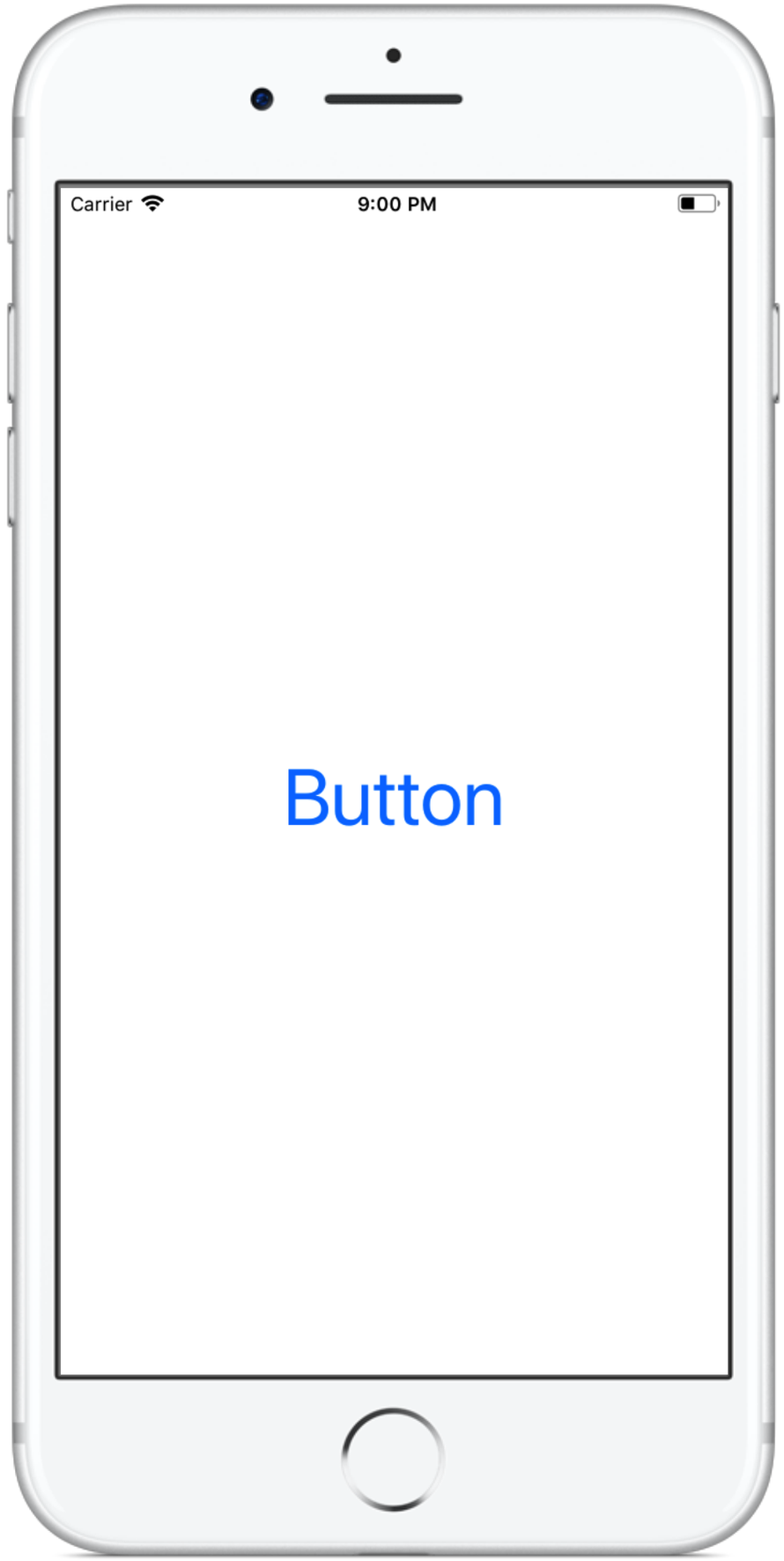
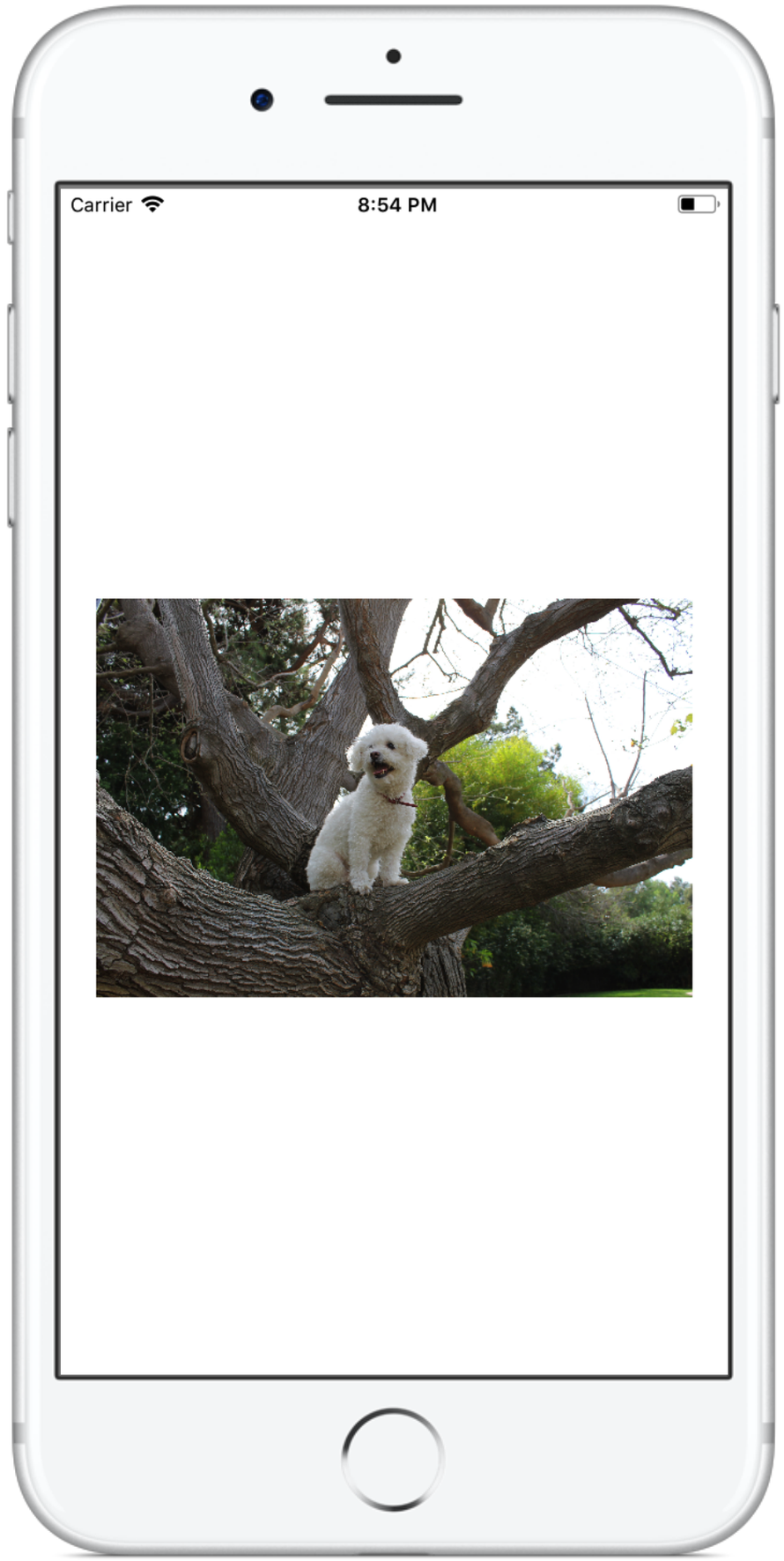


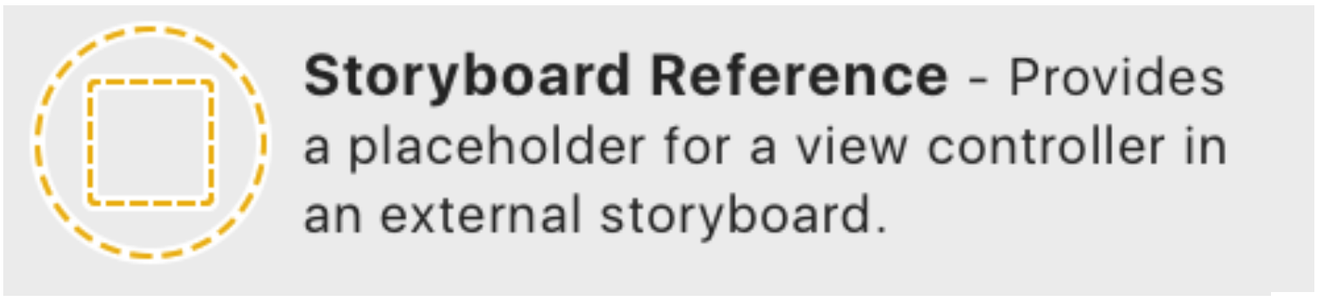
image views

Image View - Displays a single image, or an animation described by an array of images.

- used to display images
- image view ≠ image
- think of it like a picture frame

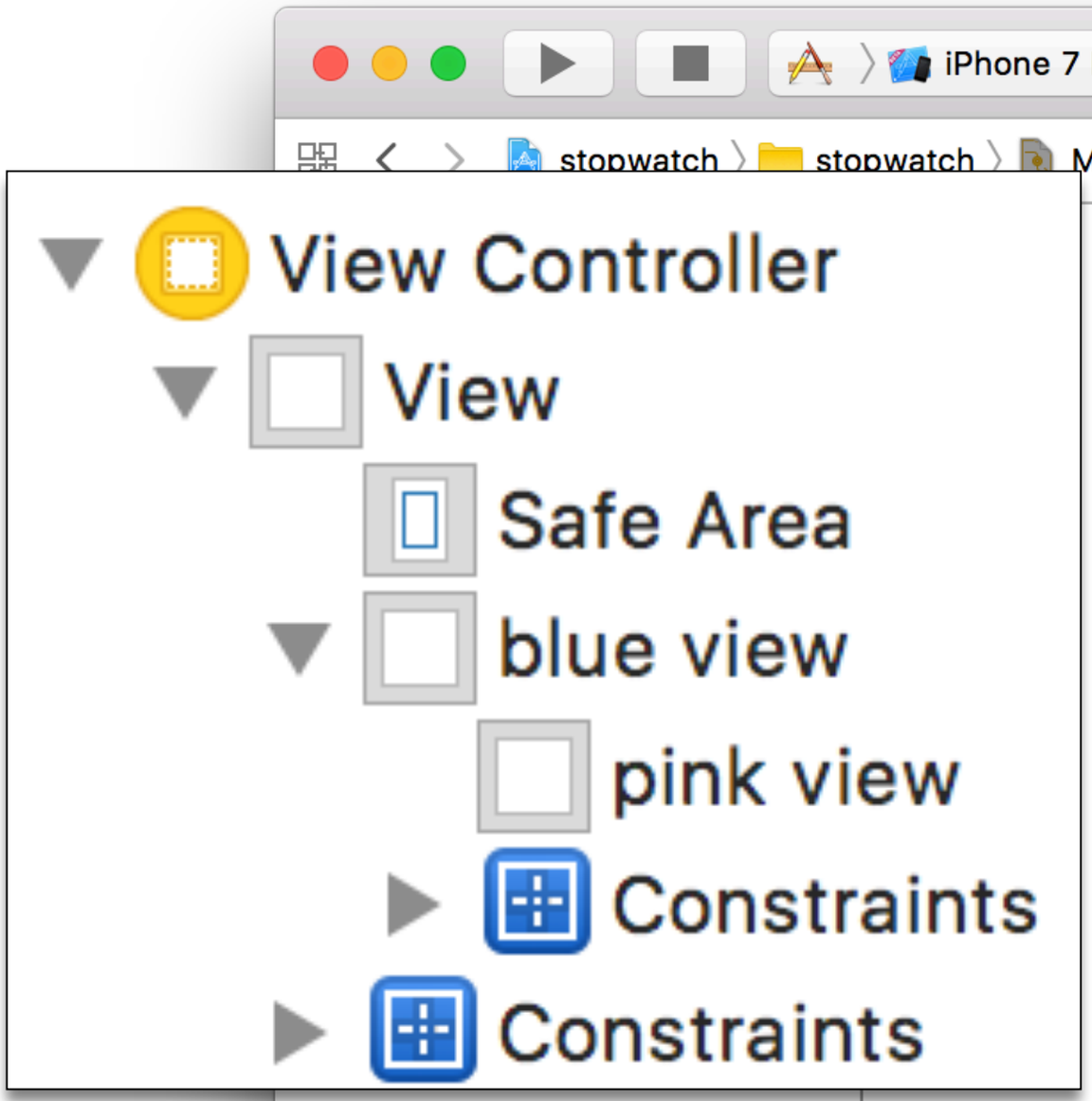


storyboard references



- more than one storyboard file? no problem!
- *these will make more sense when we cover segues (next lecture)*

superview / subview

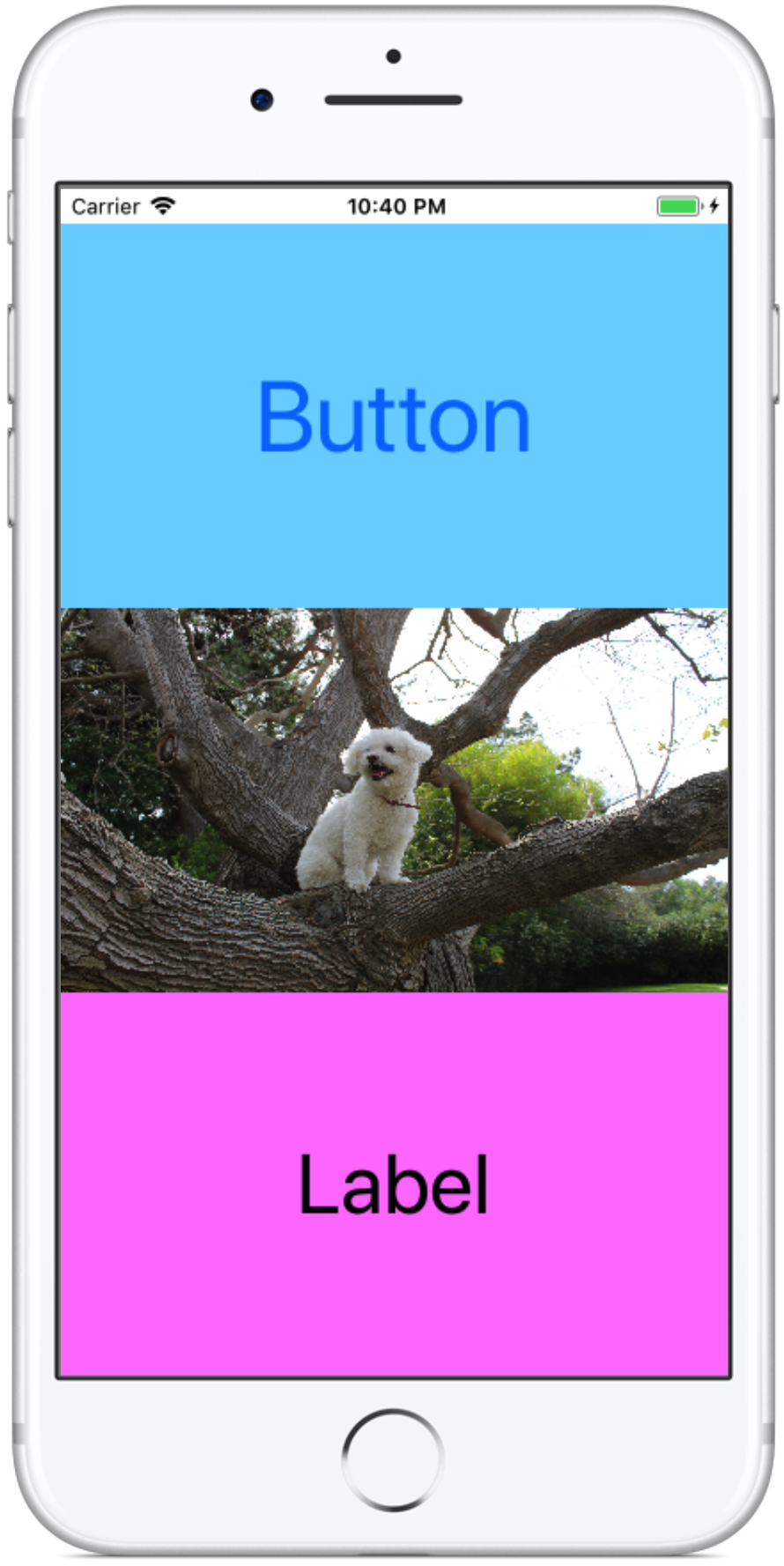


stack views

Horizontal Stack View - Arranges views linearly.

Vertical Stack View - Arranges views linearly.

- used to arrange other subviews (static)
- AutoLayout's best friend



stack views

Horizontal Stack View - Arranges views linearly.

Vertical Stack View - Arranges views linearly.

- used to arrange other subviews (static)
- AutoLayout's best friend
- nested stackviews

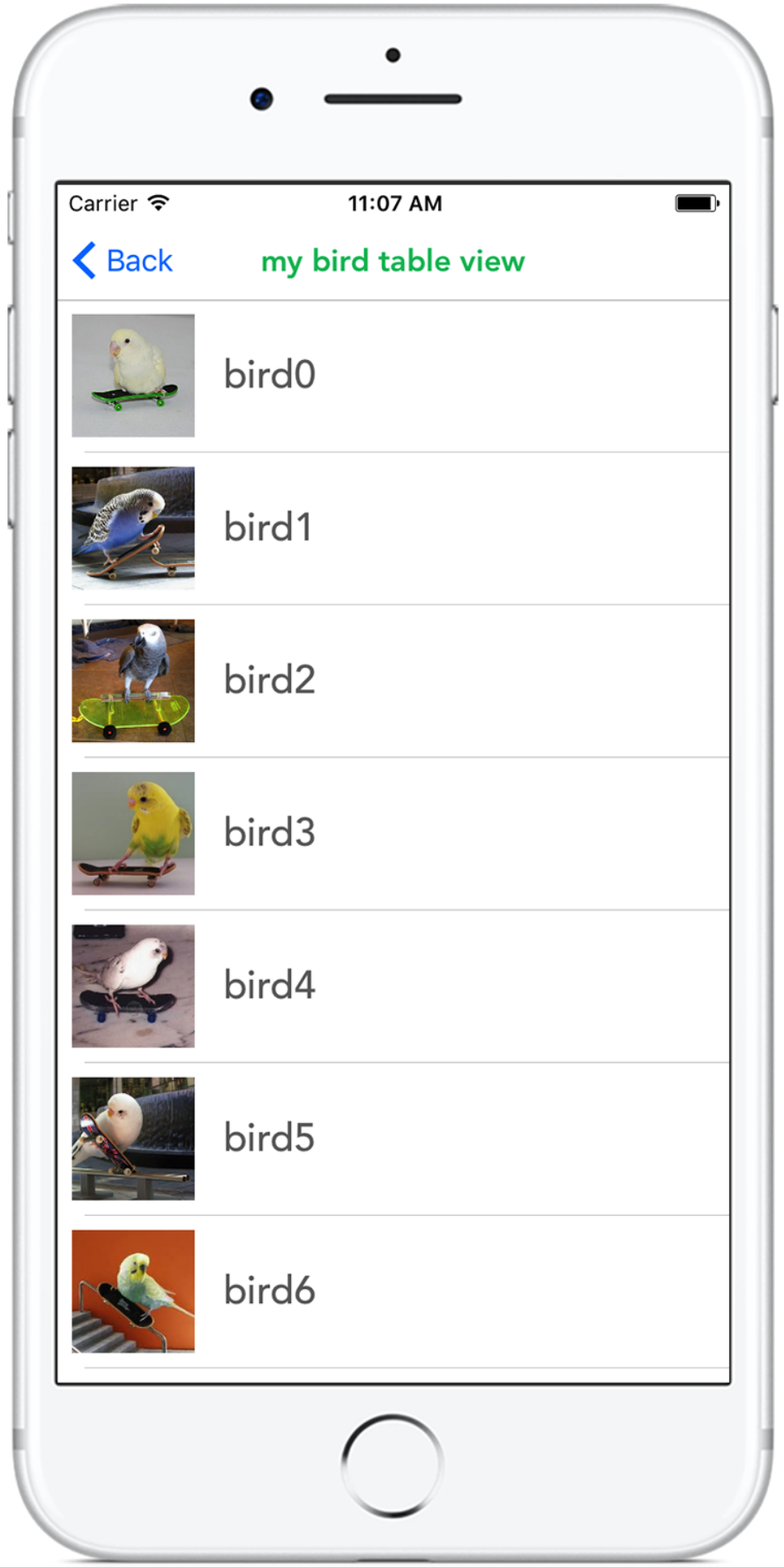
table views (future lecture)

Table View Controller - A controller that manages a table view.

Table View - Displays data in a list of plain, sectioned, or grouped rows.

Table View Cell - Defines the attributes and behavior of cells (rows) in a table view.

- displays cells of data
- scrollable, static or dynamic, view reuse



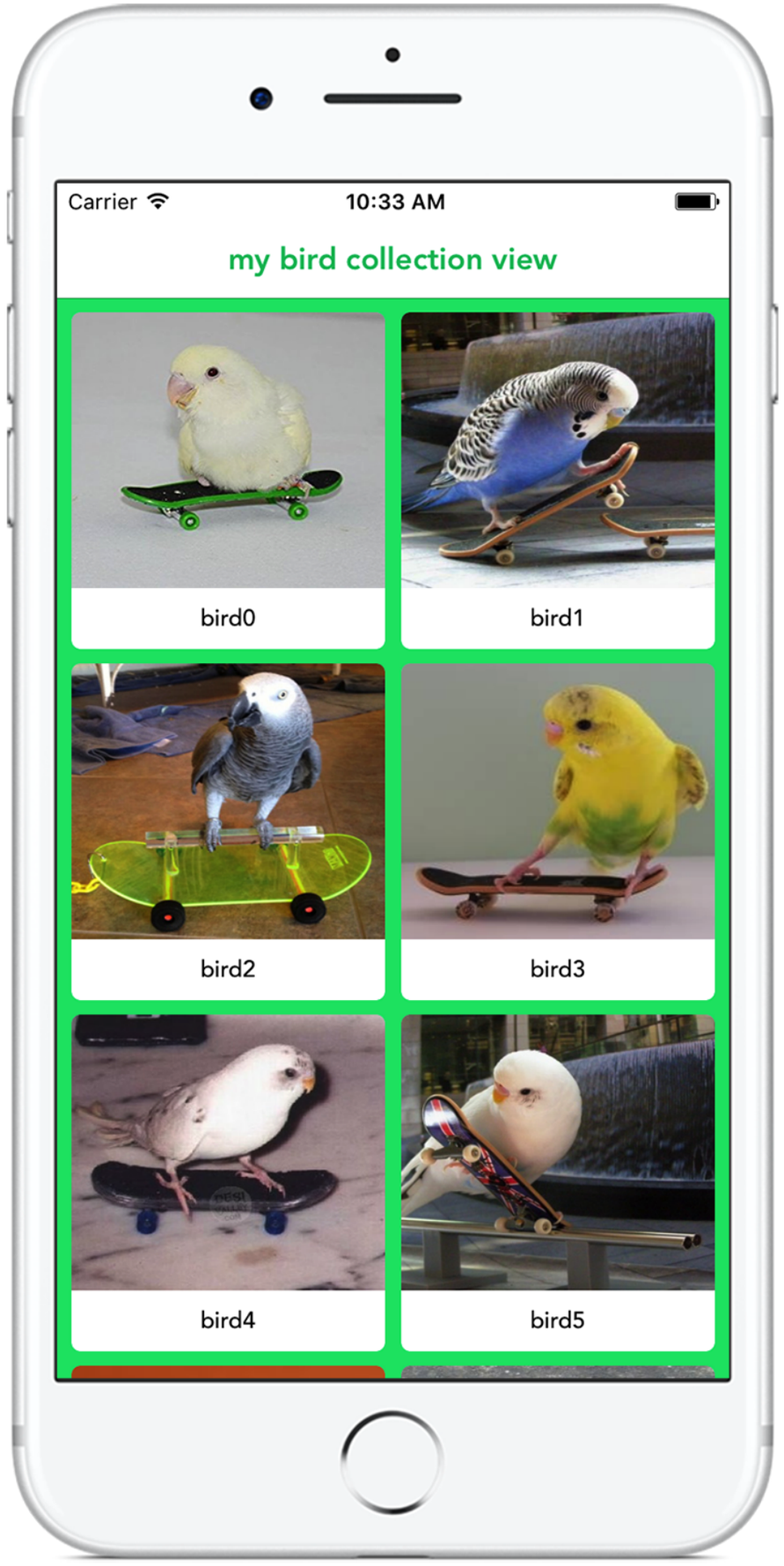
collection views (future lecture)

Collection View Controller - A controller that manages a collection view.

Collection View - Displays data in a collection of cells.

Collection View Cell - Defines the attributes and behavior of cells in a collection view.

- like table views, but displays data in a grid



laying out your user interface

creating your user interface

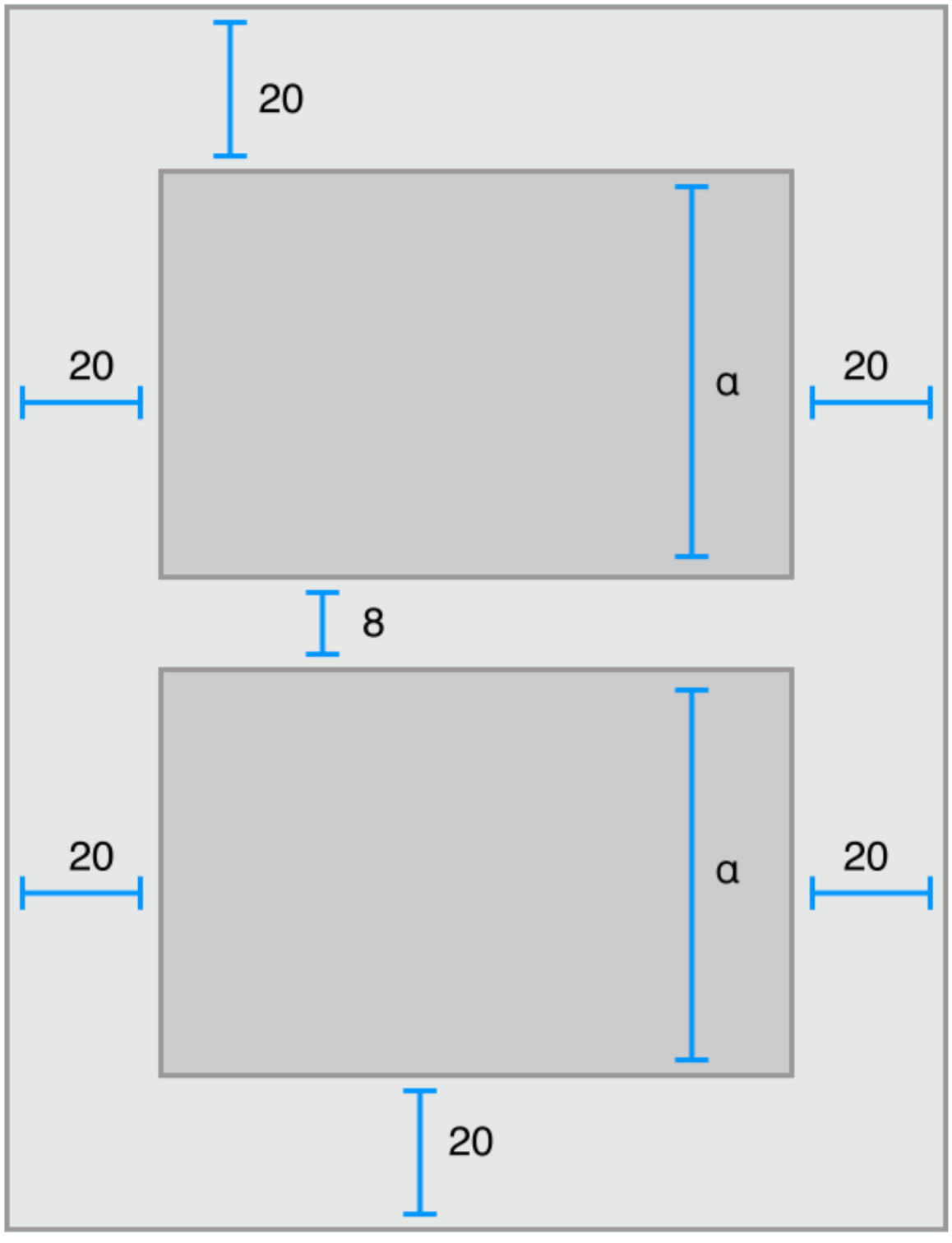
what are our options?

frame-based layout

- define the origin / width / height (frame) for each view
- recalculate frame on layout changes
- implement programmatically

AutoLayout

- define sizing / layout through relational constraints
- implement either in Storyboard or programmatically
- what we'll go over in this class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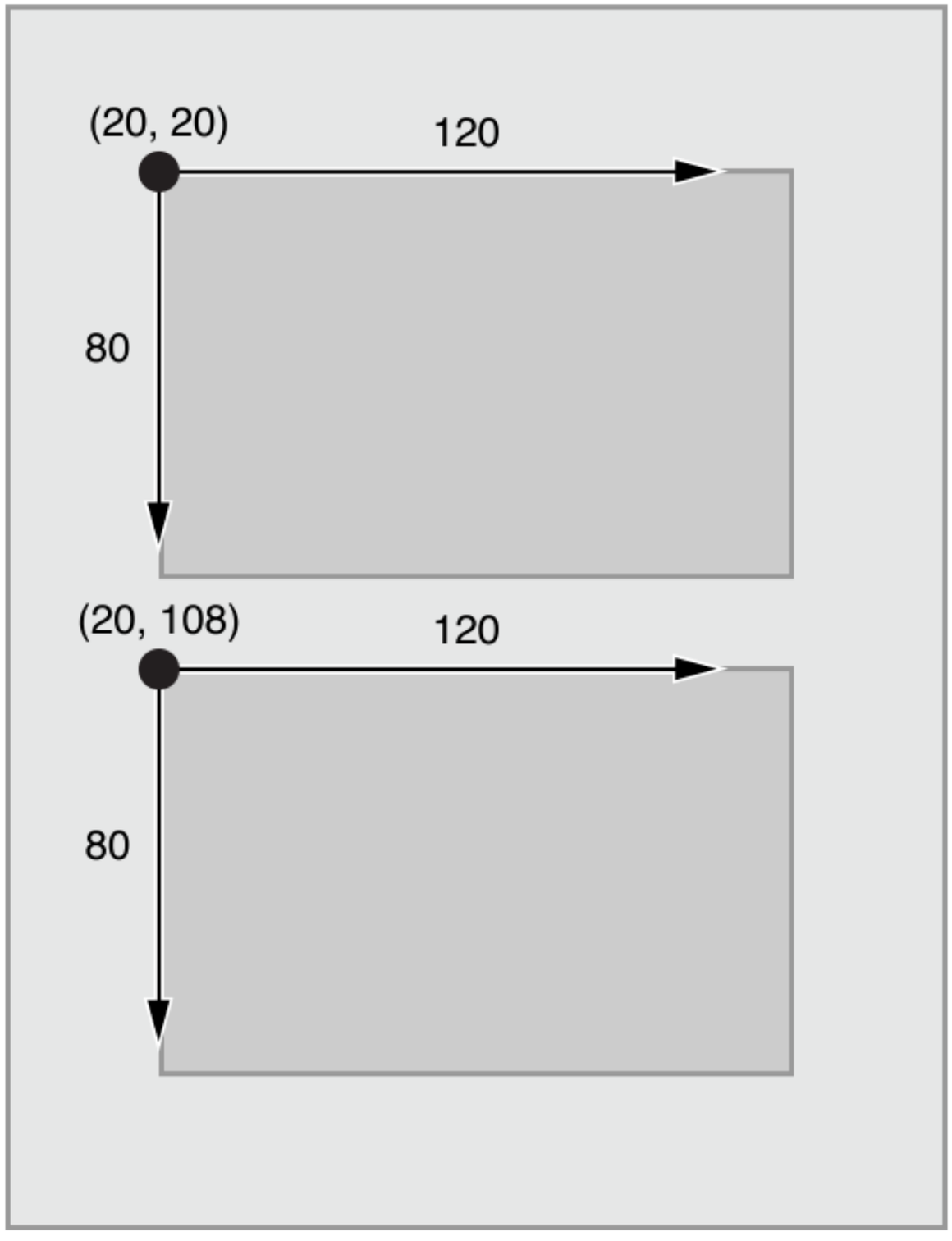

(20, 20)
120
80
(20, 108)
120
80

why autolayout (with storyboard)

- visual (readability pro)
- positioning / frame code is lengthy
- less steep learning curve
- recommended + constantly being updated with new Xcode releases

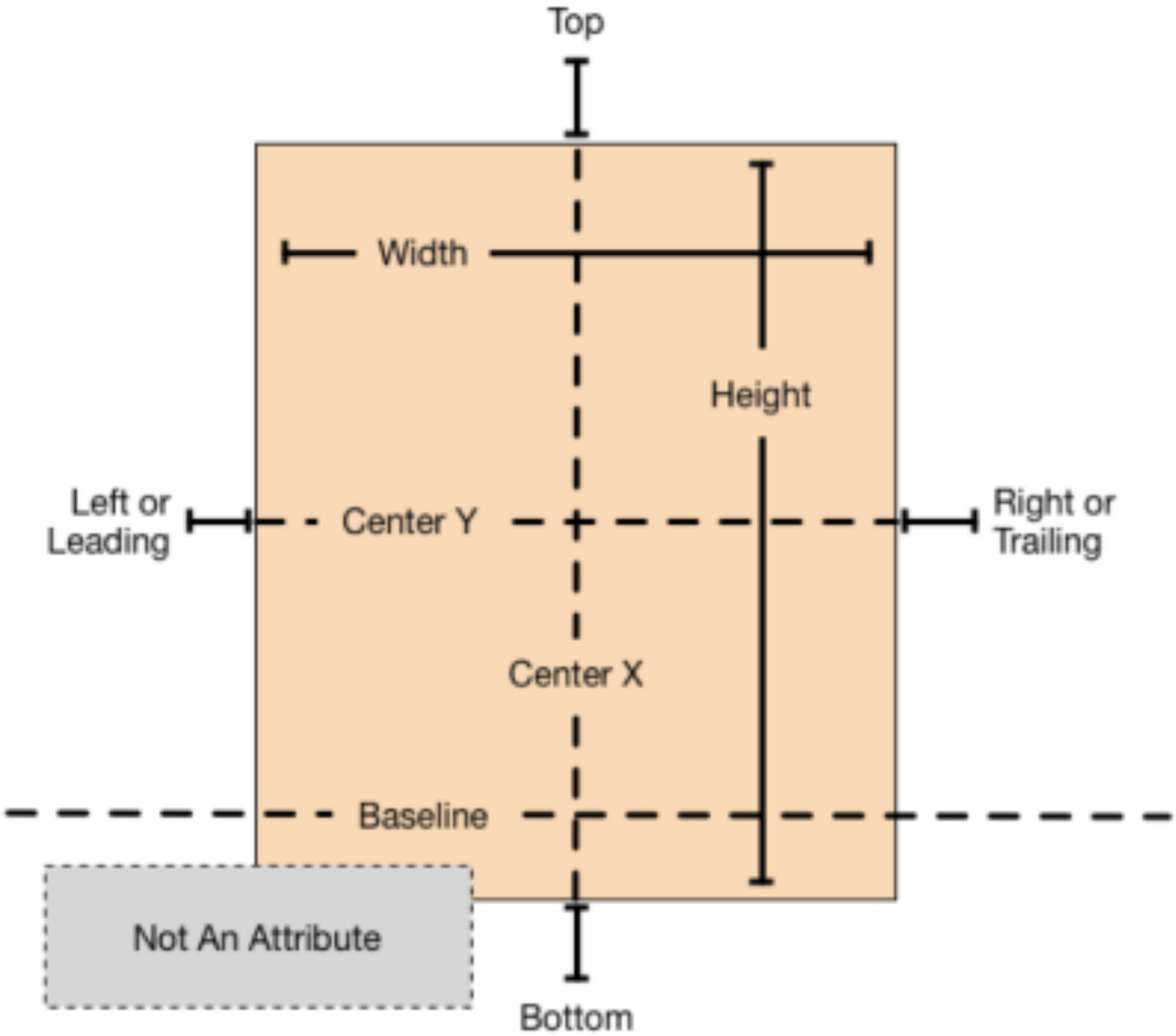
Auto Layout

what is Auto Layout?

- constraint based, descriptive layout system
- create adaptive interfaces that responds to changes in screen size and device orientation

layout anchors

Use these properties to create relationships between views



list of constraint types

- height - height of view
- width - width of view
- top - vertical spacing to top view
- bottom - vertical spacing to bottom view
- baseline - align baseline
- leading - spacing to left view
- trailing - spacing to right view
- center x - center align horizontally
- center y - center align vertically

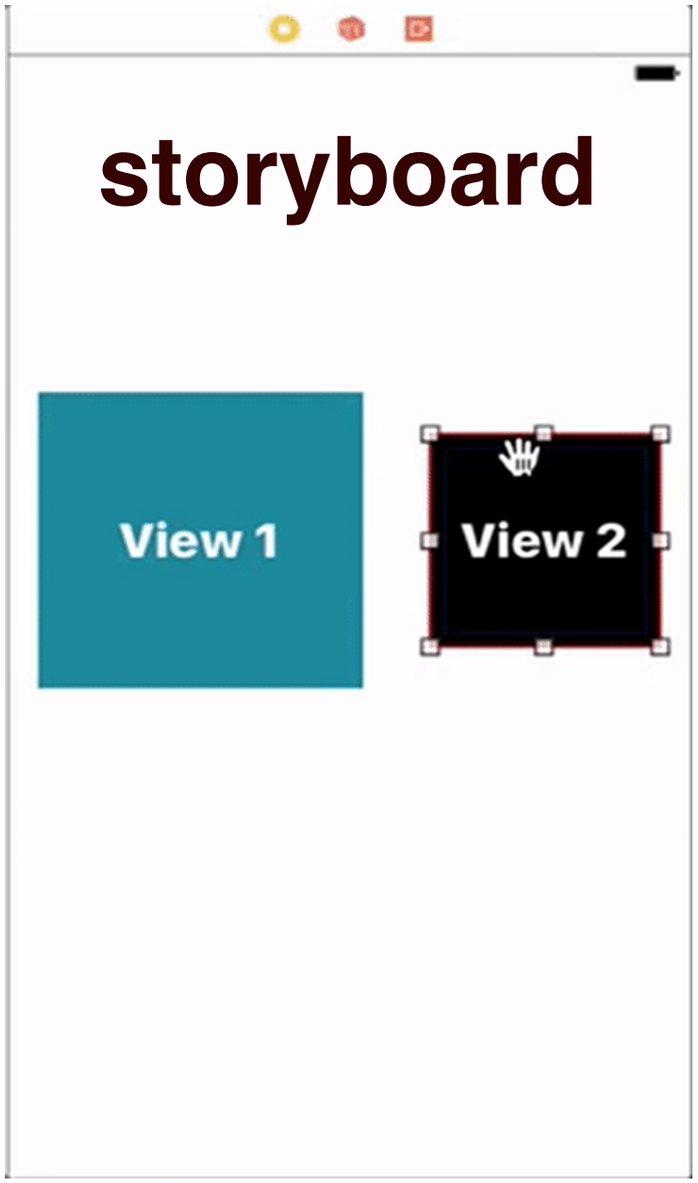
a clarification

bottom

baseline

constraints (high level)

implementing AutoLayout



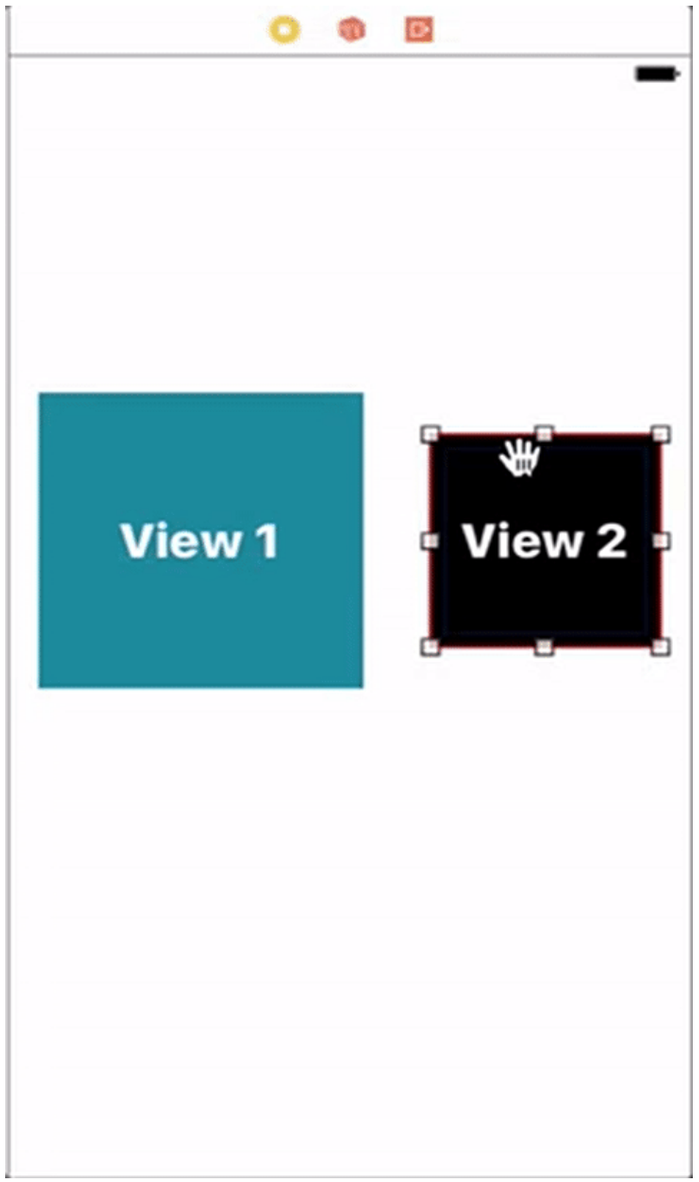
programmatically

```
let constraint =
    view2.leadingAnchor.constraint(
        equalTo: view1.trailingAnchor,
        constant: 8)

constraint.isActive = true
```

in both of these examples, the spacing between view’s is set to 8 points

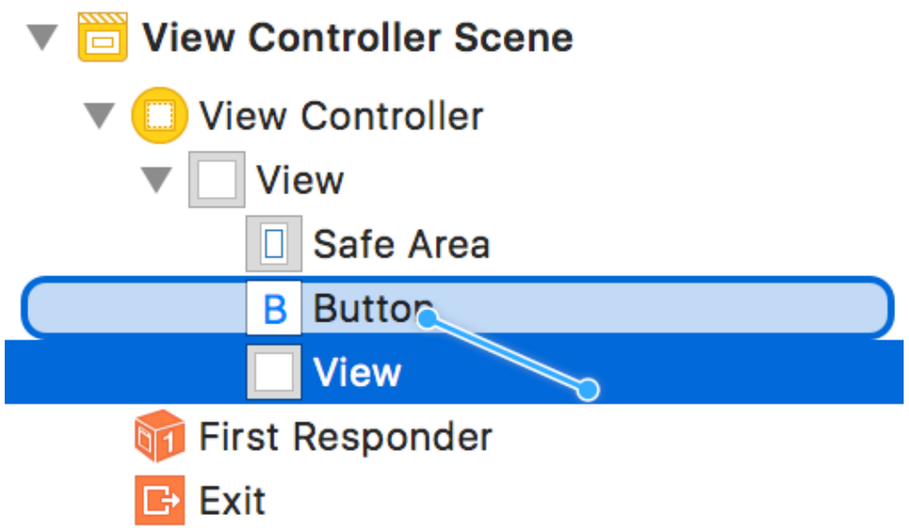
implementing AutoLayout (storyboard)



to create a constraint between two views in Storyboard, you can either…

- **control + drag** between the two views
- **control + drag** between view names in the document outline
- use align + add new constraints menu's

implementing AutoLayout (storyboard)



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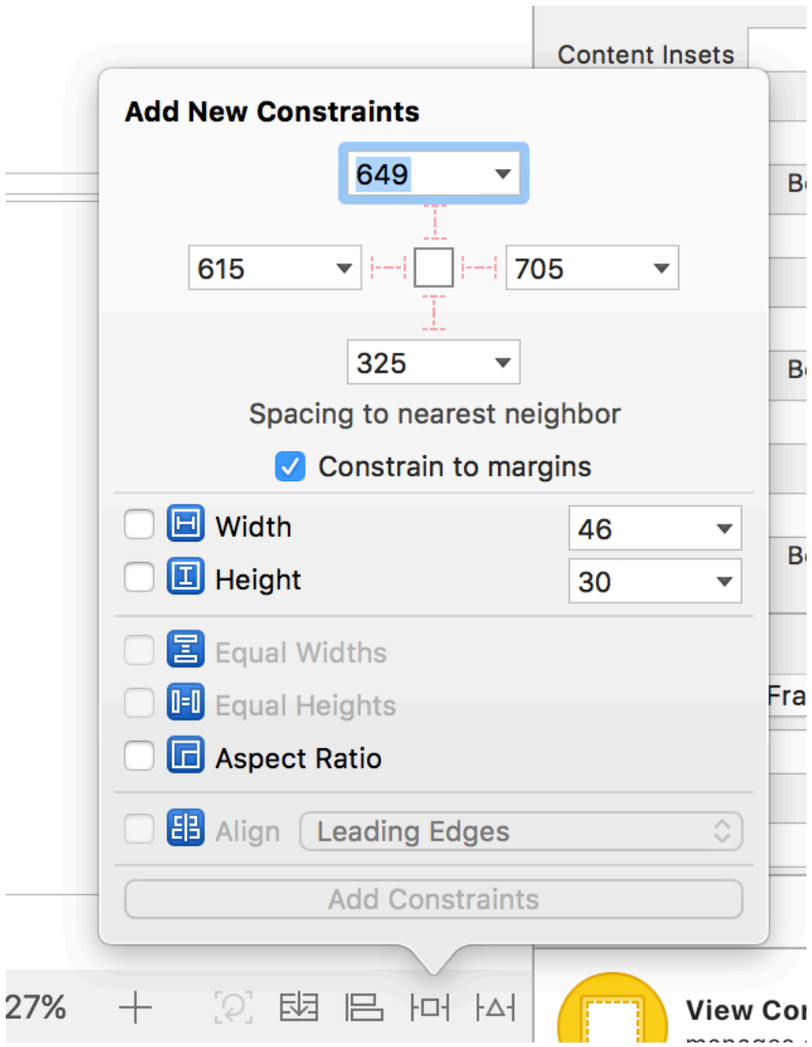
implementing AutoLayout (storyboard)



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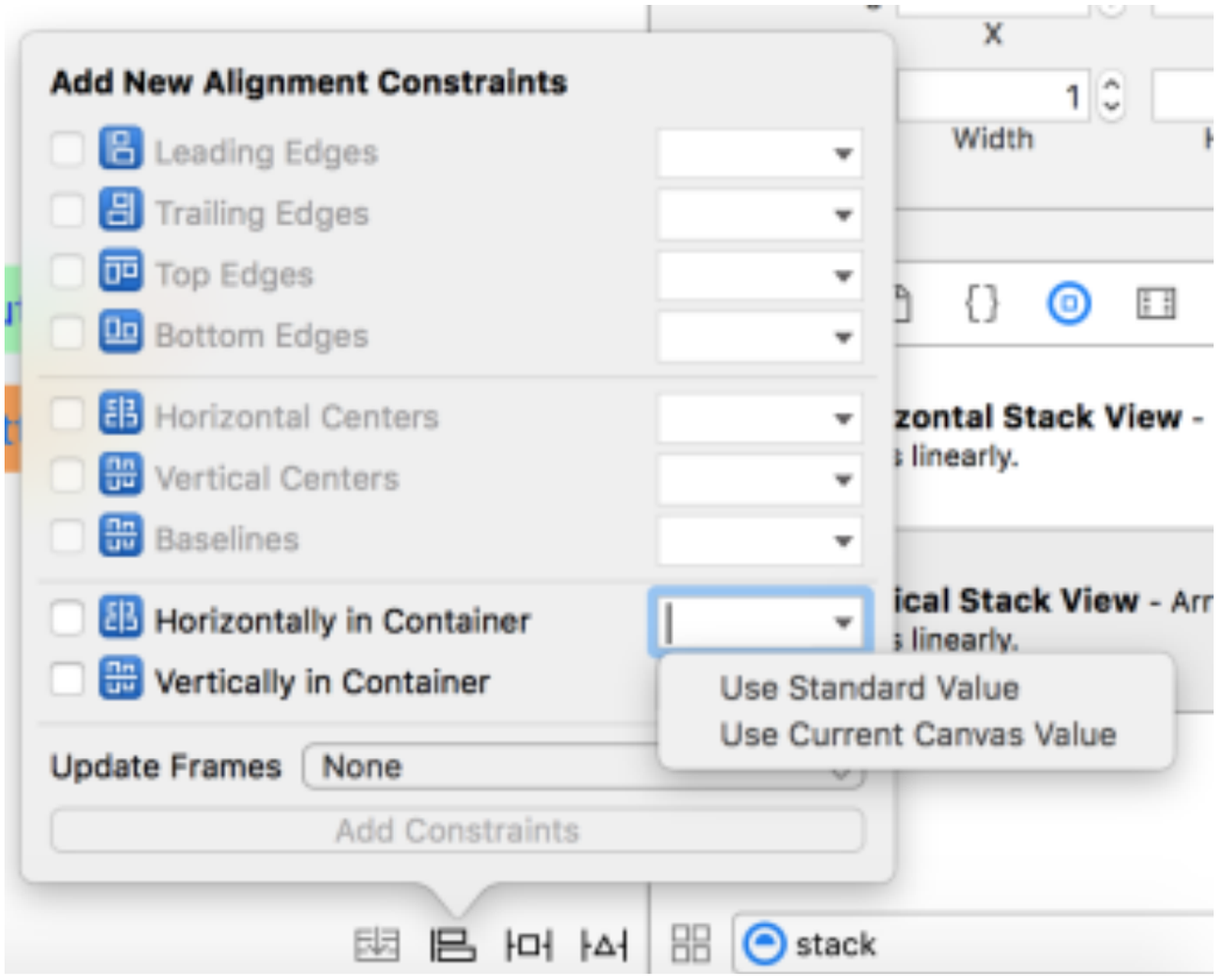
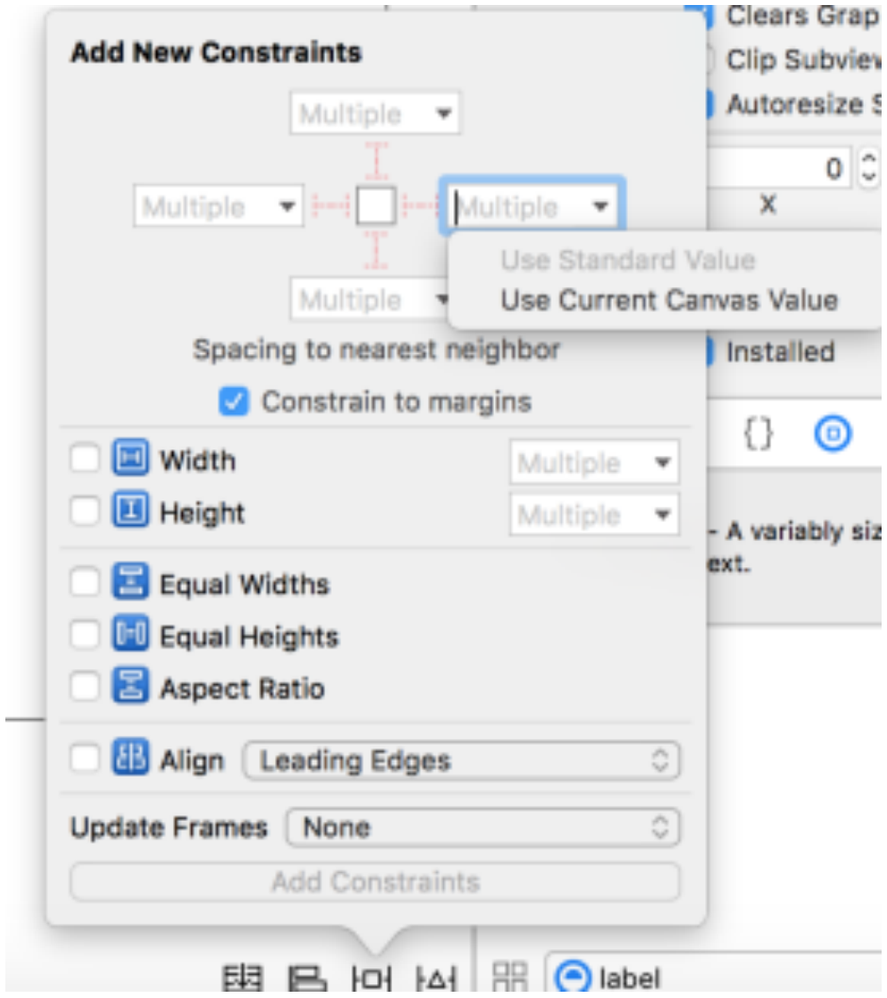
- use align + add new constraints menu's

types of constraints

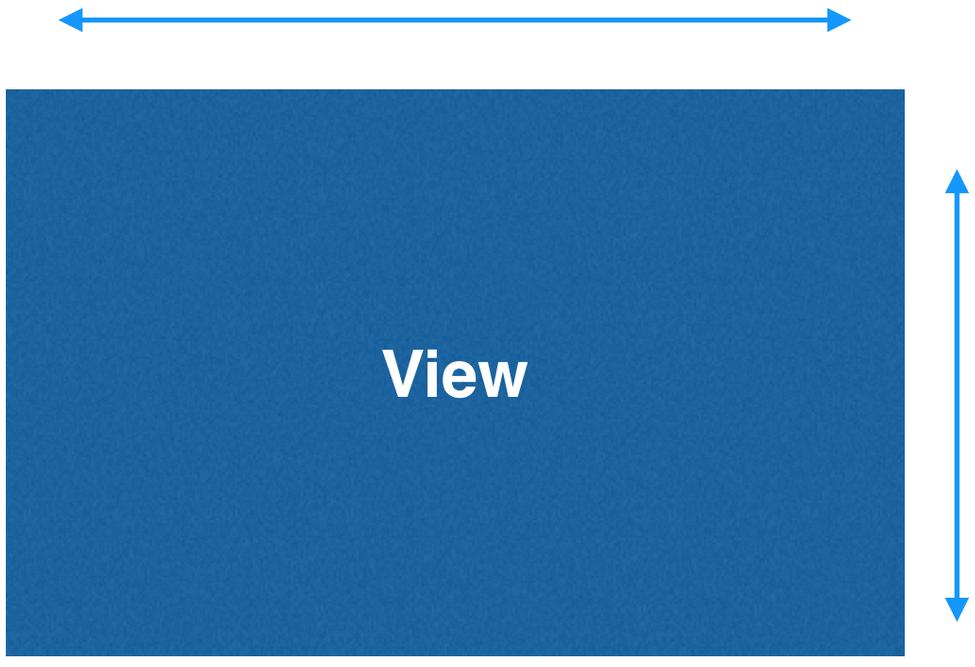


alignment: align objects with each other

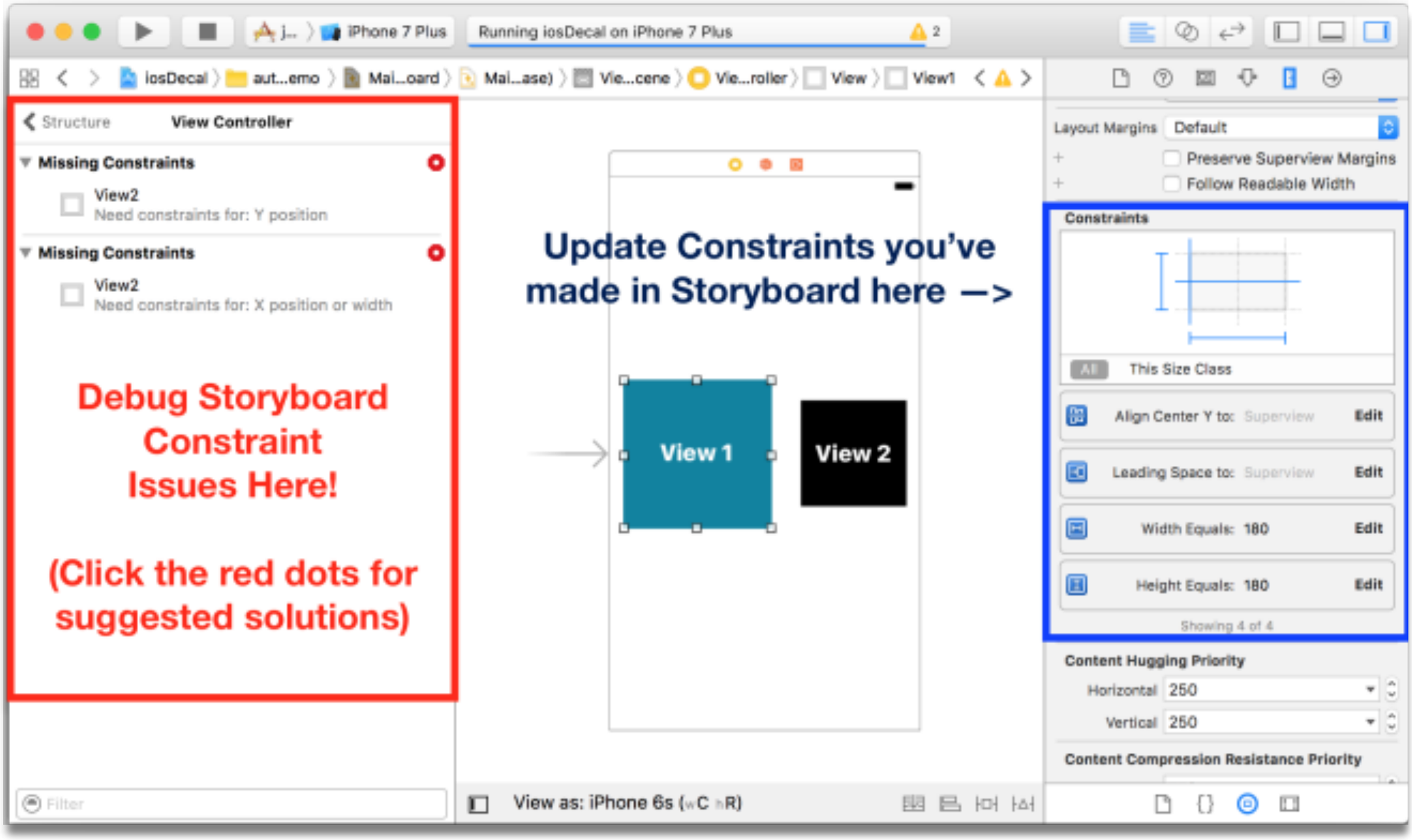


pin: adds space to nearest neighbor (can be a superview or itself)

creating constraints - the philosophy



1. x position
2. y position
3. height
4. width

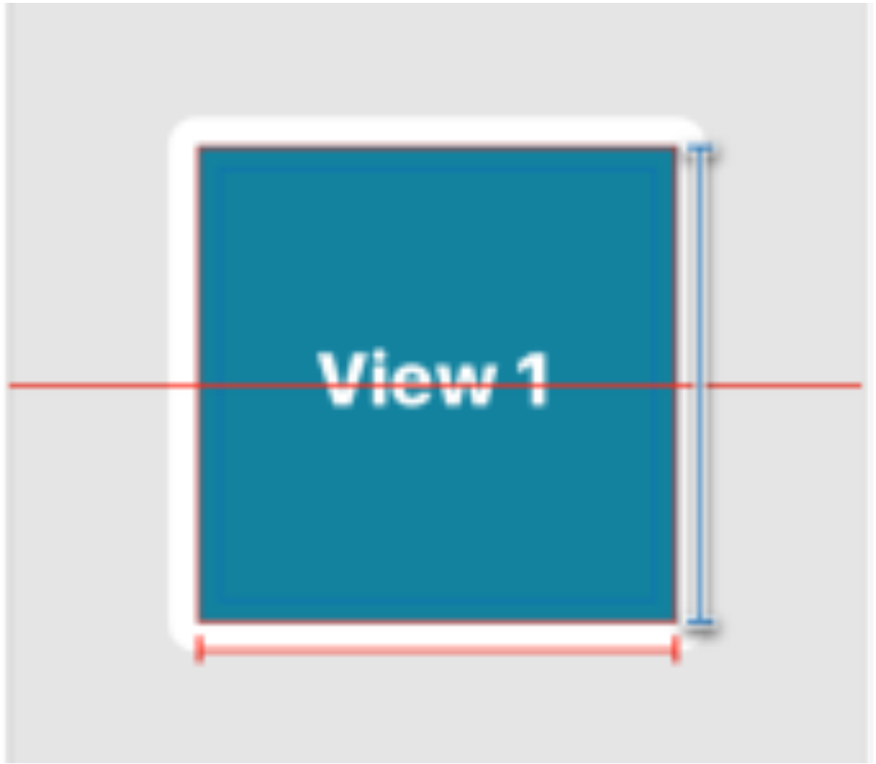

iPhone 7 Plus
Running iosDecal on iPhone 7 Plus
2
iosDecal
aut...emo
Mai...oard
Mai...ase)
Vie...cene
Vie...roller
View
View1
Structure
View Controller
Missing Constraints
View2
Need constraints for: Y position
Missing Constraints
View2
Need constraints for: X position or width
Debug Storyboard Constraint Issues Here!
(Click the red dots for suggested solutions)
Update Constraints you've made in Storyboard here —>
View 1
View 2
Layout Margins
Default
Preserve Superview Margins
Follow Readable Width
Constraints
All
This Size Class
Align Center Y to: Superview
Edit
Leading Space to: Superview
Edit
Width Equals: 180
Edit
Height Equals: 180
Edit
Showing 4 of 4
Content Hugging Priority
Horizontal
250
Vertical
250
Content Compression Resistance Priority
Filter
View as: iPhone 6s (wC hR)

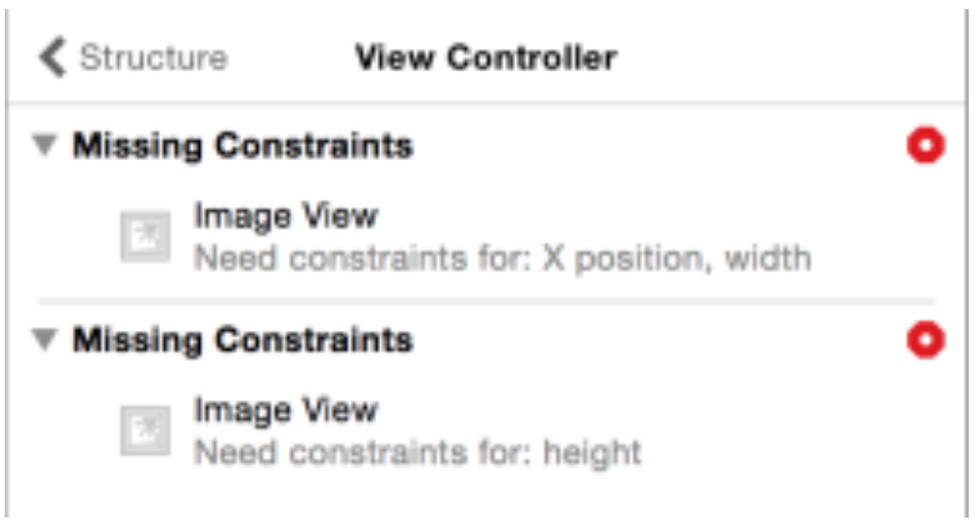
Auto Layout debugging

red lines - Interface Builder

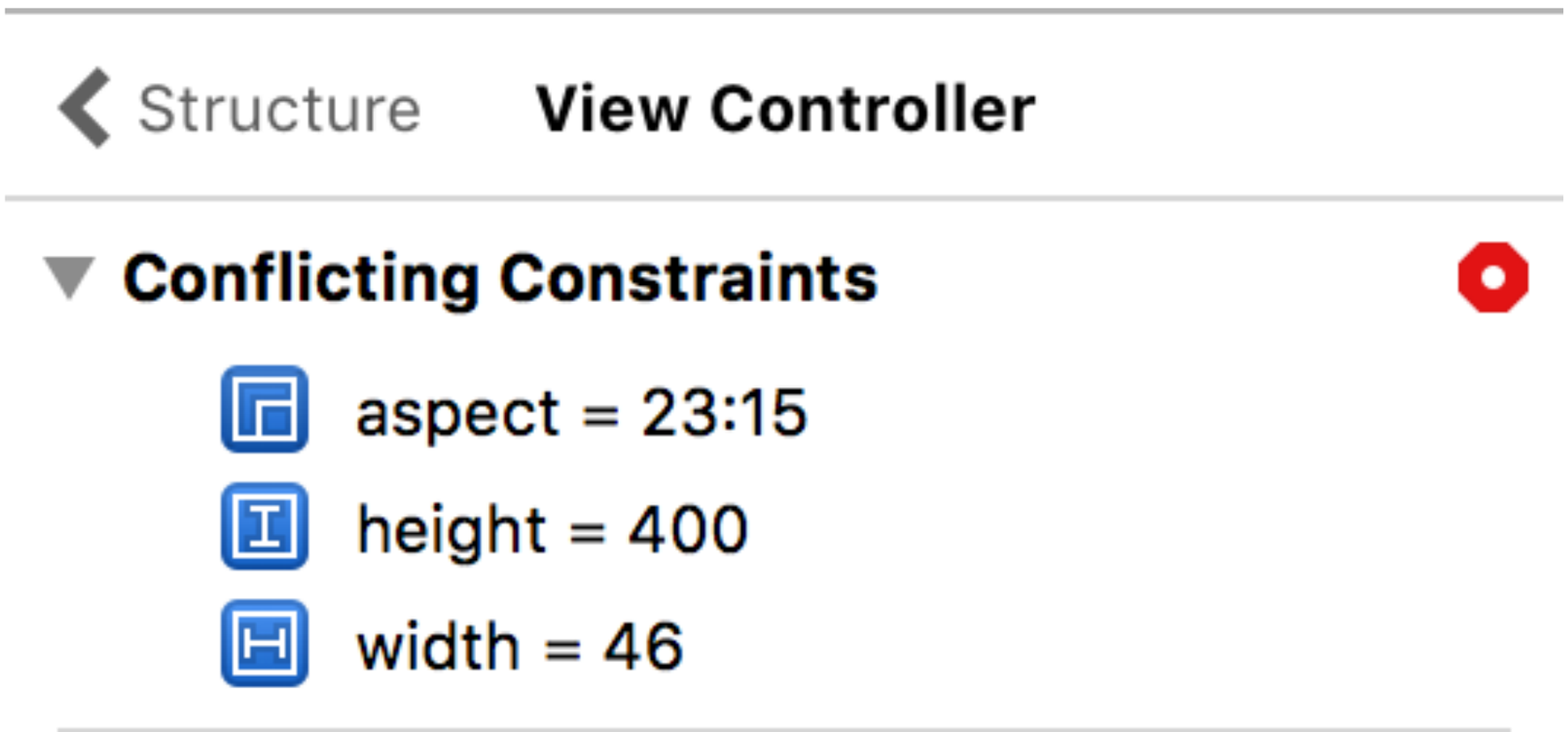
If you see red lines in interface builder, that means you either have:

- too few constraints (**ambiguous**)
- too many constraints (**conflicting**)



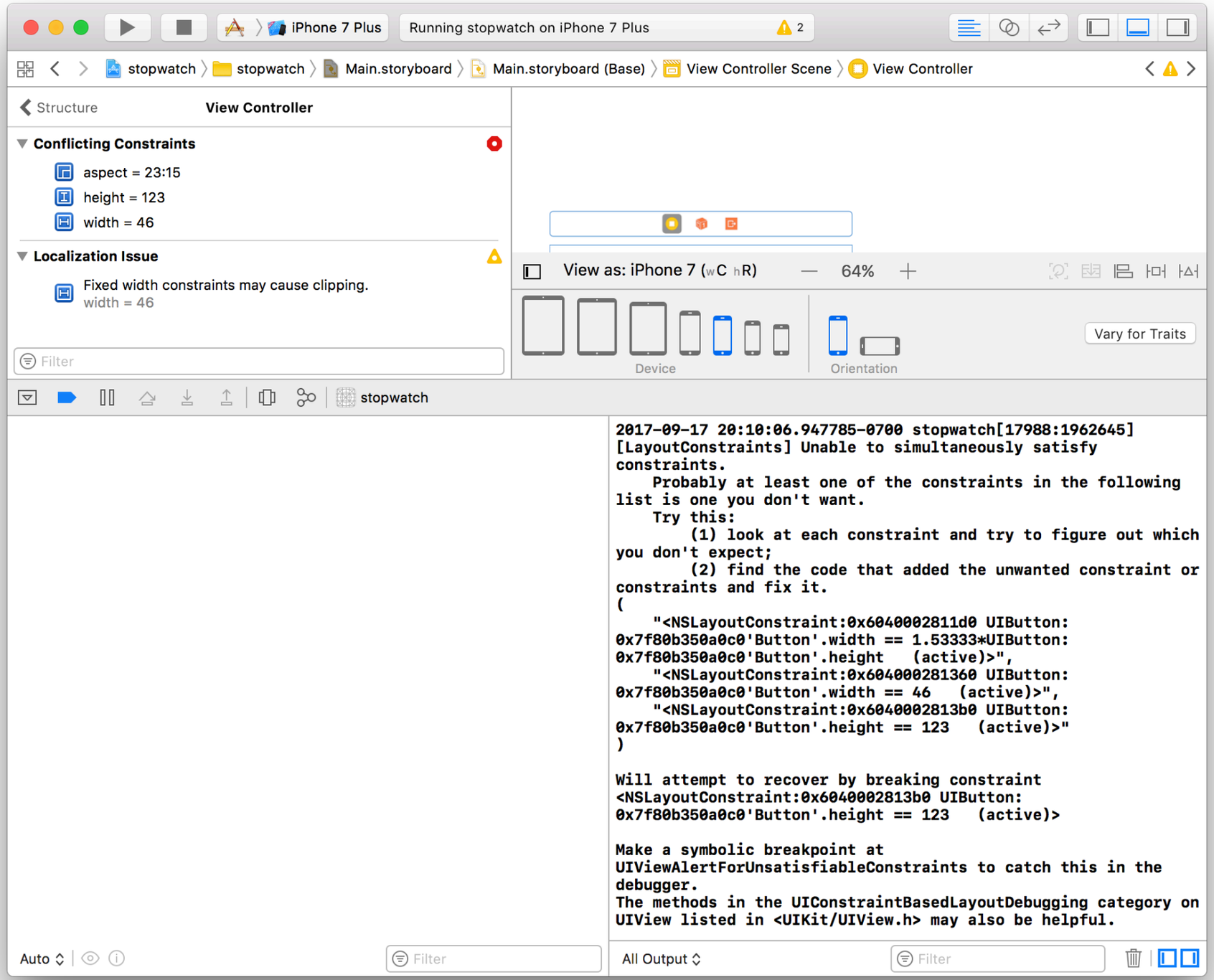


conflicts

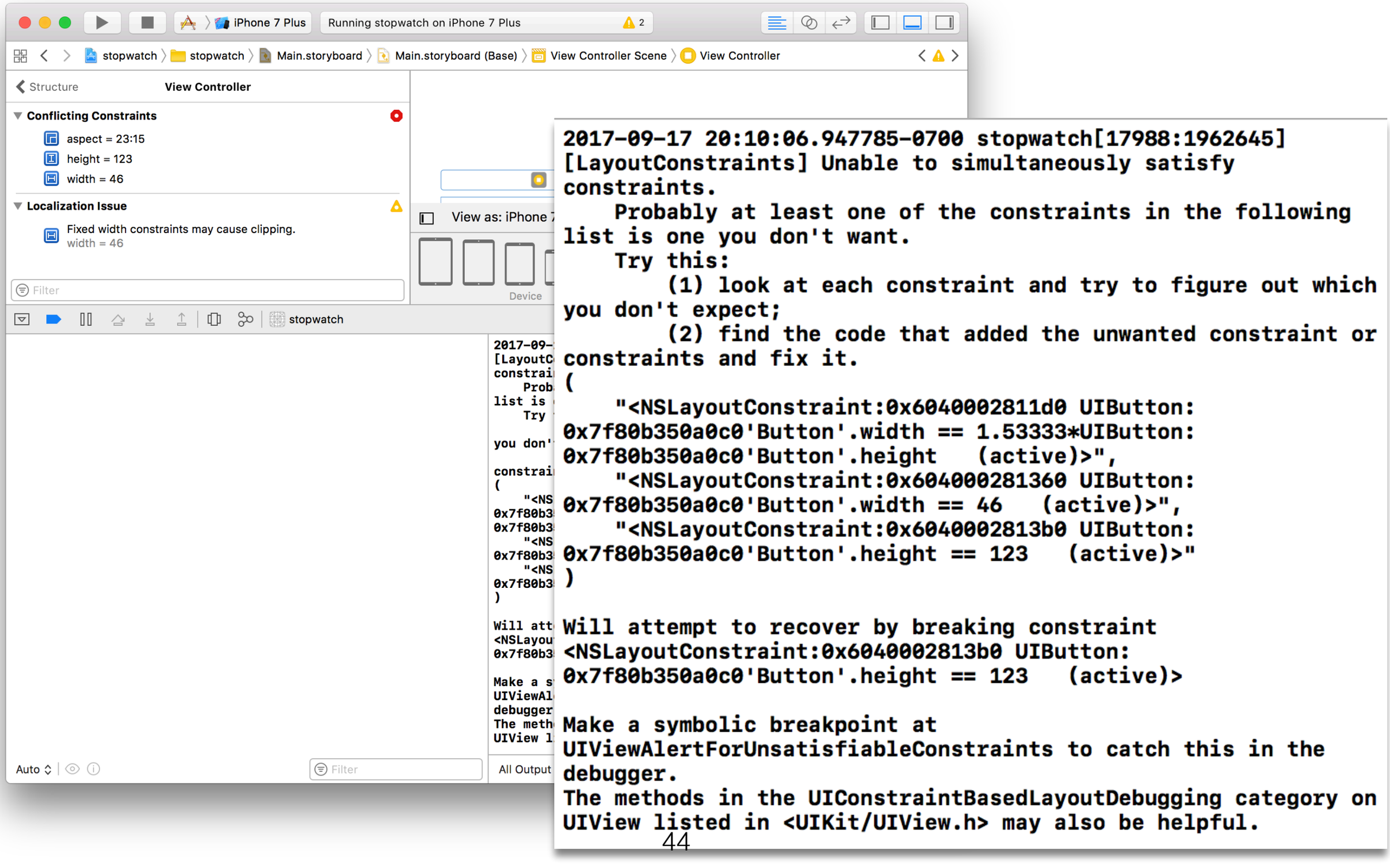


Xcode will warn you when create multiple conflicting constraints

conflicts


iPhone 7 Plus
Running stopwatch on iPhone 7 Plus
2
stopwatch
stopwatch
Main.storyboard
Main.storyboard (Base)
View Controller Scene
View Controller
Structure
View Controller
Conflicting Constraints
aspect = 23:15
height = 123
width = 46
Localization Issue
Fixed width constraints may cause clipping.
width = 46
Filter
View as: iPhone 7 (wC hR)
64%
Device
Orientation
Vary for Traits
stopwatch
2017-09-17 20:10:06.947785-0700 stopwatch[17988:1962645]
[LayoutConstraints] Unable to simultaneously satisfy
constraints.
Probably at least one of the constraints in the following
list is one you don't want.
Try this:
(1) look at each constraint and try to figure out which
you don't expect;
(2) find the code that added the unwanted constraint or
constraints and fix it.
(
"<NSLayoutConstraint:0x6040002811d0 UIButton:
0x7f80b350a0c0'Button'.width == 1.53333*UIButton:
0x7f80b350a0c0'Button'.height (active)>",
"<NSLayoutConstraint:0x604000281360 UIButton:
0x7f80b350a0c0'Button'.width == 46 (active)>",
"<NSLayoutConstraint:0x6040002813b0 UIButton:
0x7f80b350a0c0'Button'.height == 123 (active)>"
)
Will attempt to recover by breaking constraint
<NSLayoutConstraint:0x6040002813b0 UIButton:
0x7f80b350a0c0'Button'.height == 123 (active)>
Make a symbolic breakpoint at
UIViewAlertForUnsatisfiableConstraints to catch this in the
debugger.
The methods in the UIConstraintBasedLayoutDebugging category on
UIView listed in <UIKit/UIView.h> may also be helpful.
Auto
Filter
All Output
Filter

conflicts


iPhone 7 Plus
Running stopwatch on iPhone 7 Plus
stopwatch
stopwatch
Main.storyboard
Main.storyboard (Base)
View Controller Scene
View Controller
Structure
View Controller
Conflicting Constraints
aspect = 23:15
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Filter
View as: iPhone 7
Device
stopwatch
Auto
Filter
All Output
2017-09-17 20:10:06.947785-0700 stopwatch[17988:1962645]
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0x7f80b350a0c0'Button'.width == 46 (active)>",
"<NSLayoutConstraint:0x6040002813b0 UIButton:
0x7f80b350a0c0'Button'.height == 123 (active)>"
)
Will attempt to recover by breaking constraint
<NSLayoutConstraint:0x6040002813b0 UIButton:
0x7f80b350a0c0'Button'.height == 123 (active)>
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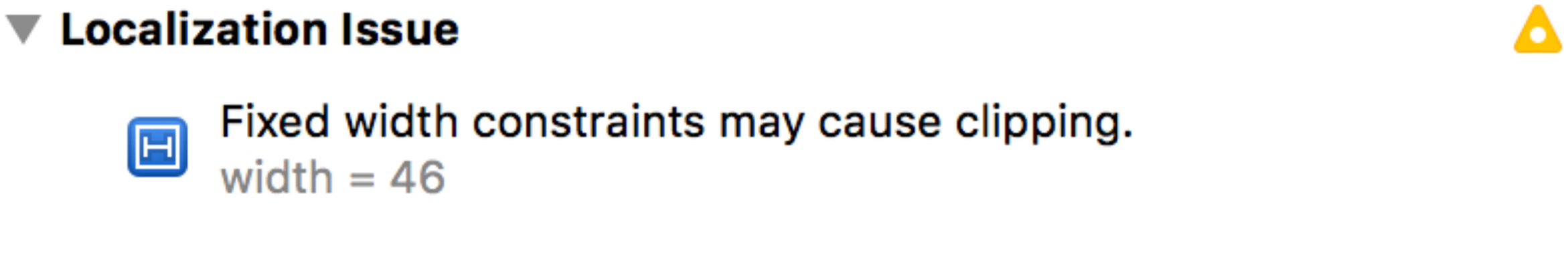
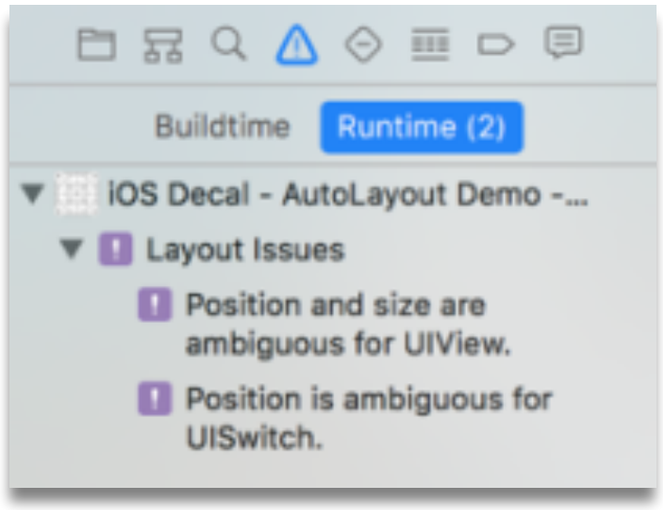
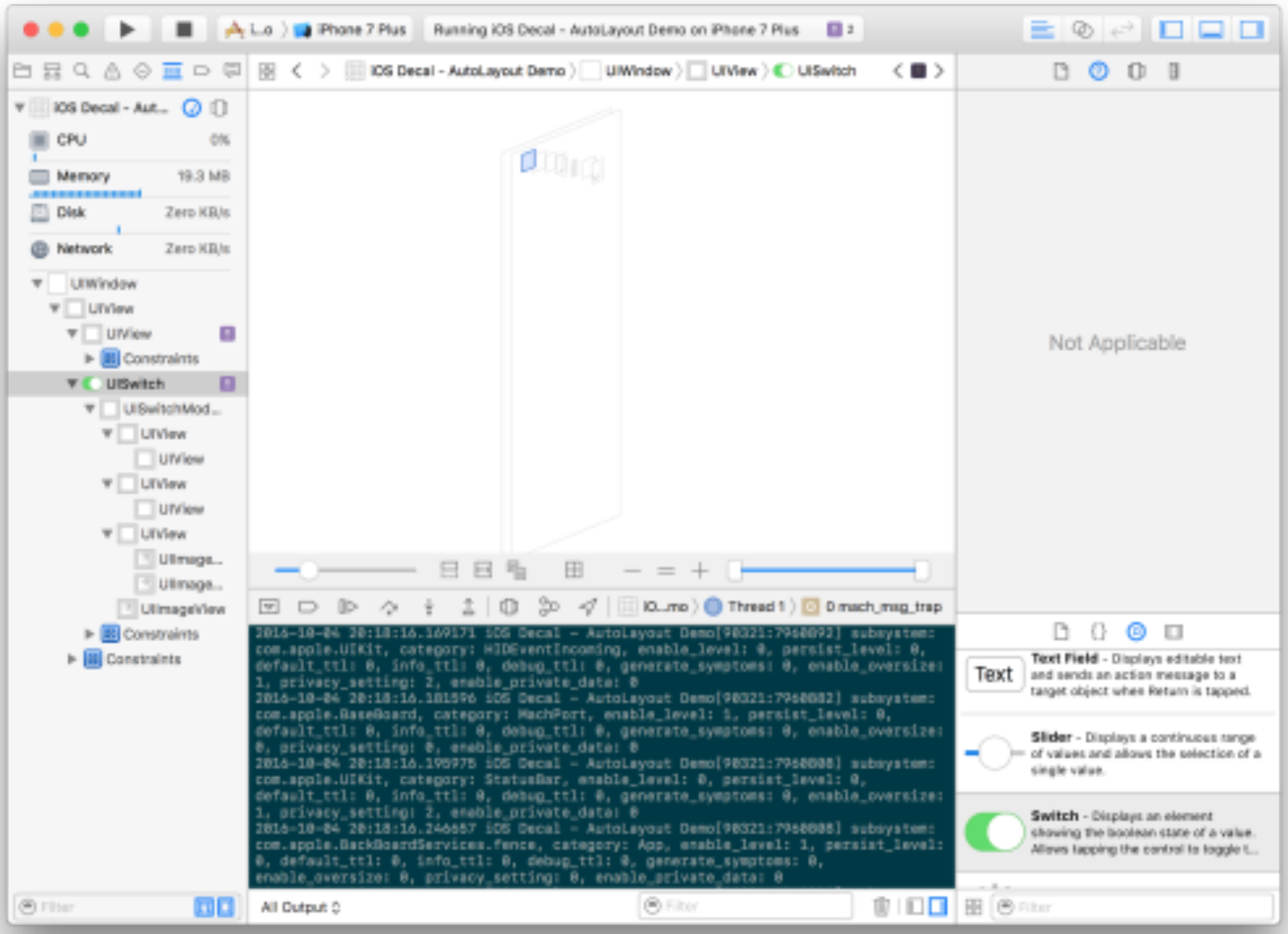
localization issues



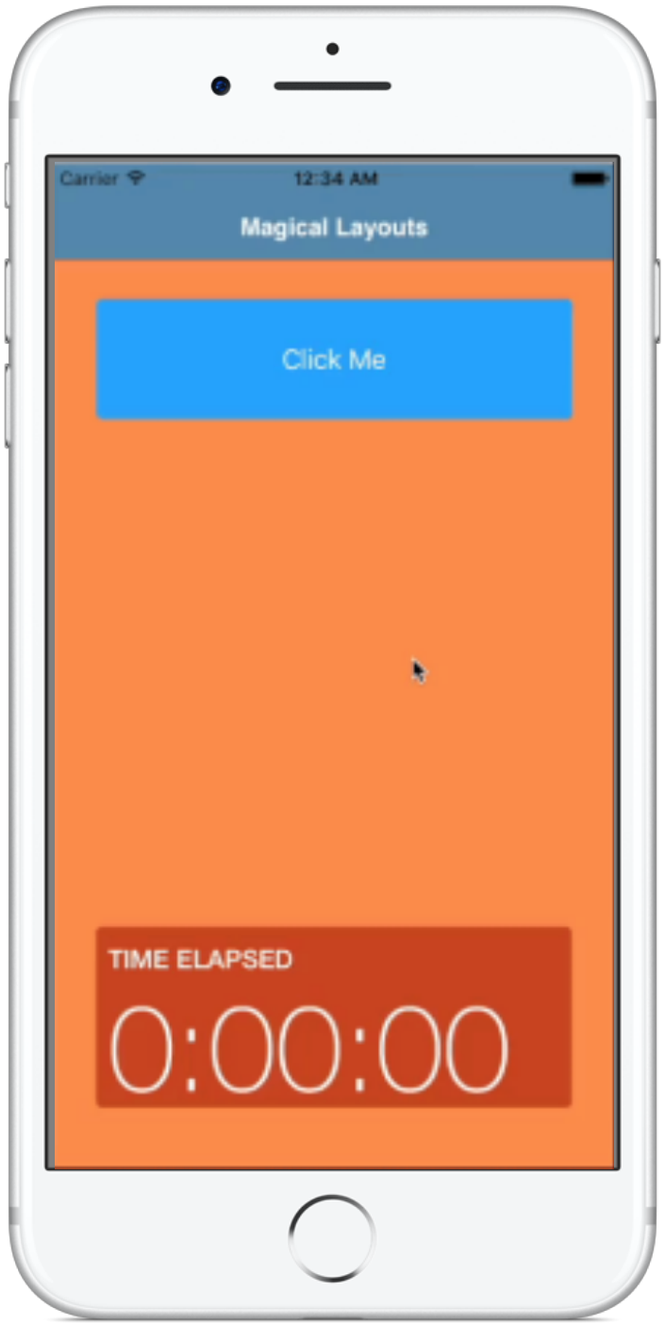
fixed width constraints for text elements generate localization warnings

Debug View Hierarchy





Auto Layout with stack views



use stack views to cut down on the amount of layout work you need to do

side note: setting a stack subview’s hidden property to true animates beautifully

stack view properties

arrangedSubviews - the views inside the stack

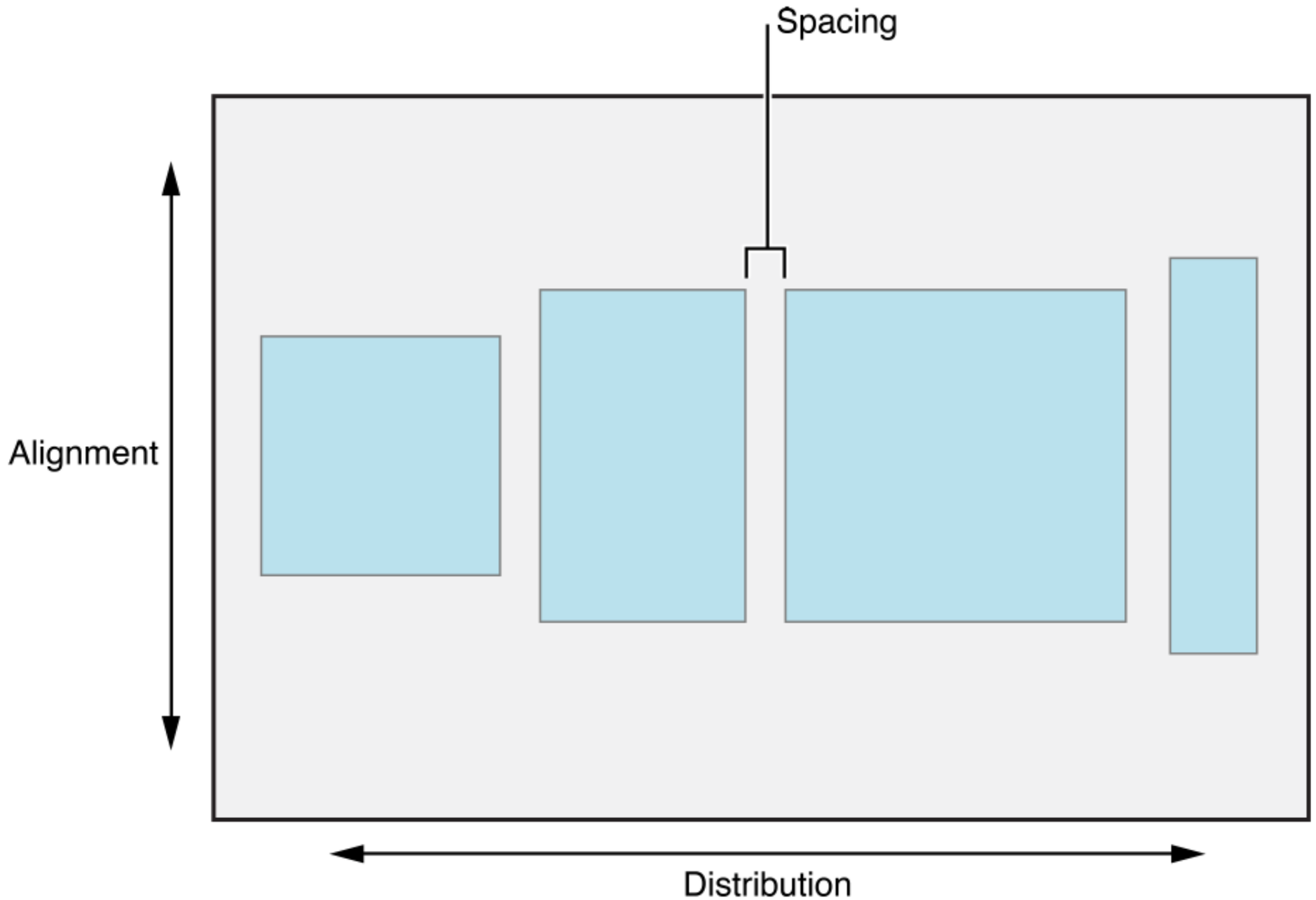
distribution - the distribution of the arranged views along the stack view's axis

alignment - The alignment of the arranged subviews perpendicular to the stack view's axis

axis - horizontal or vertical

spacing - space between subviews

stack view properties

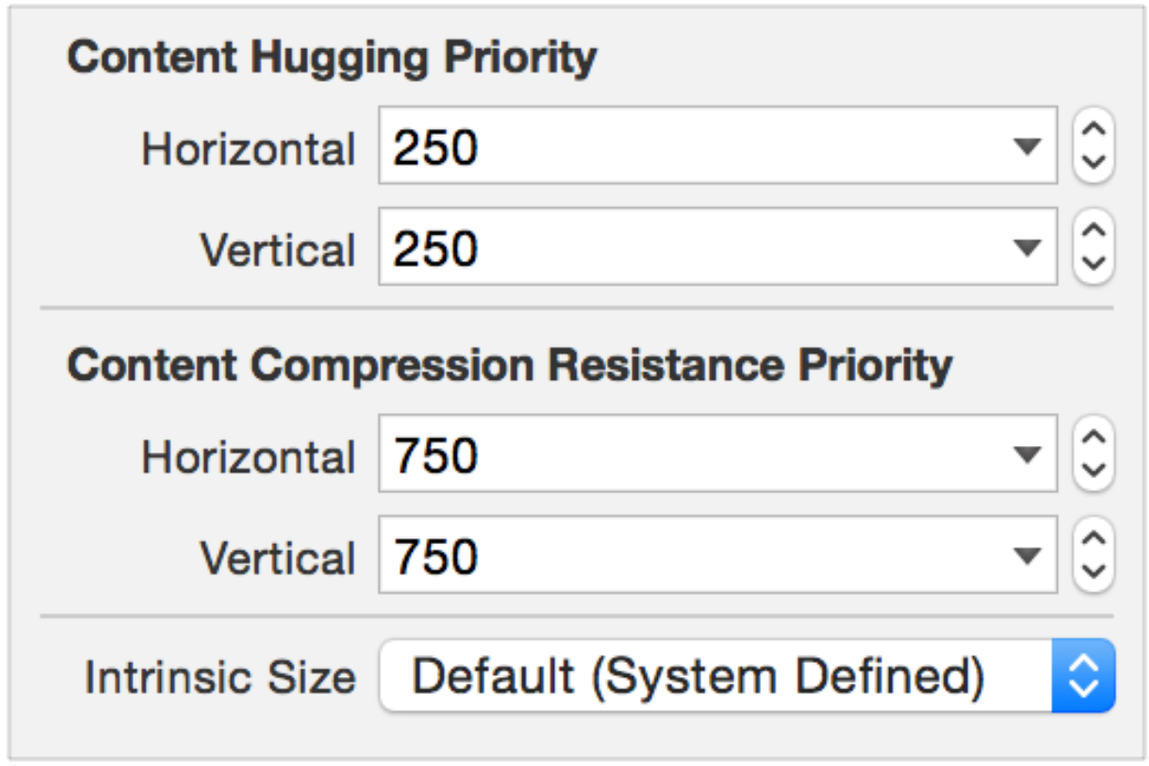


hugging / compression

most of the time - you can avoid setting this

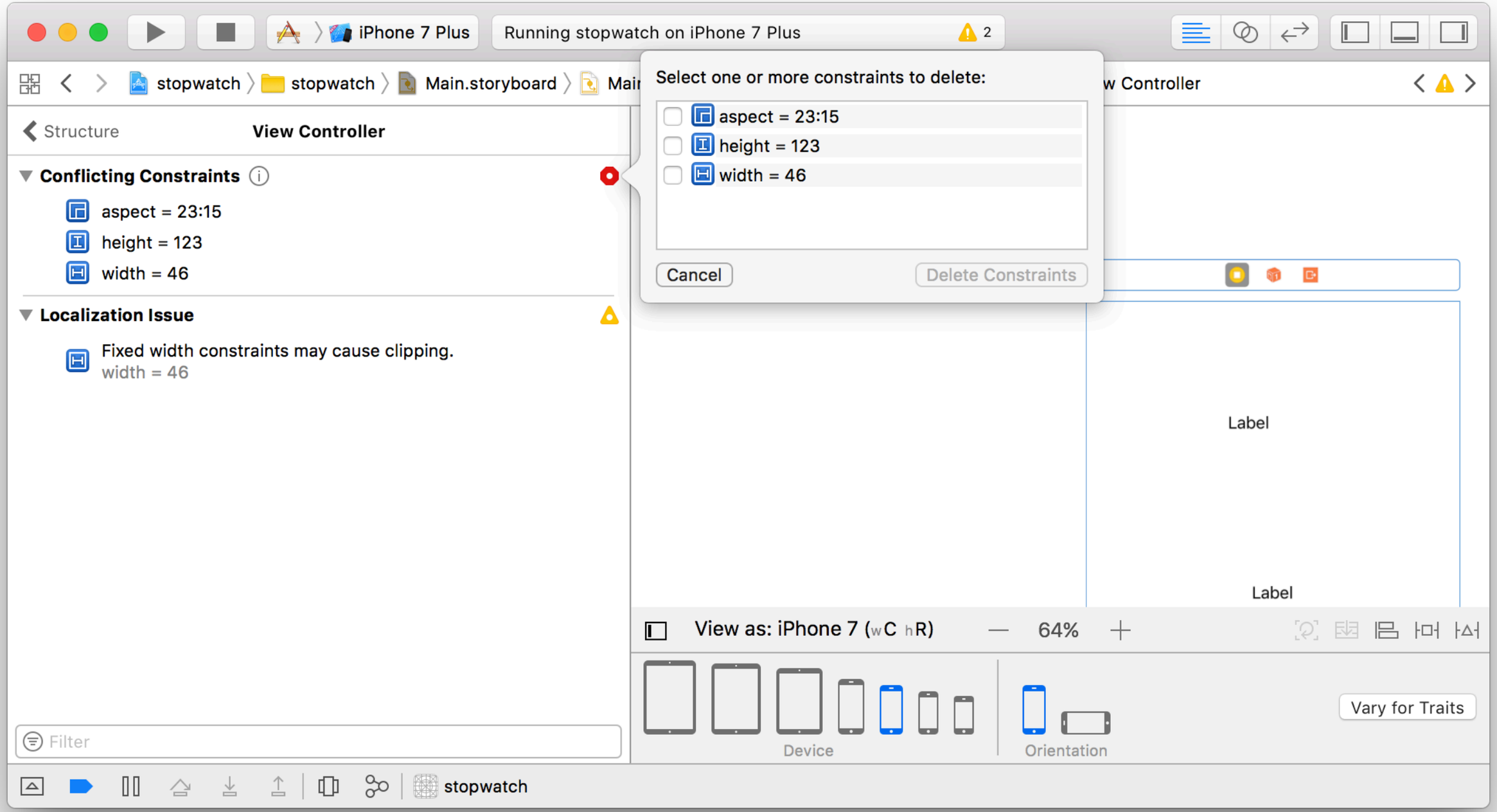
hugging - how much view *does not* want to grow

compression - how much view *does not* want to shrink



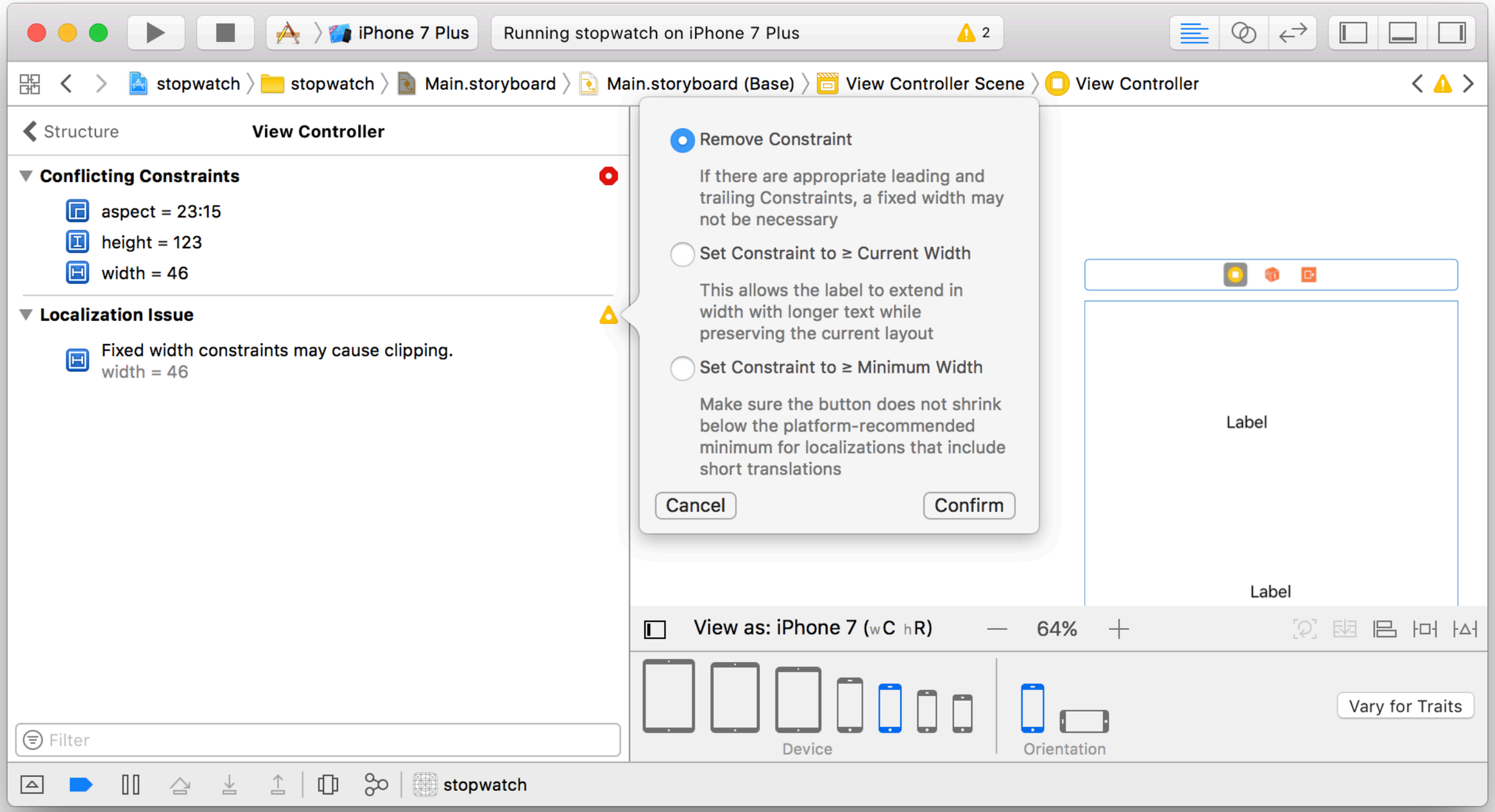
some AutoLayout tricks

resolving conflicts



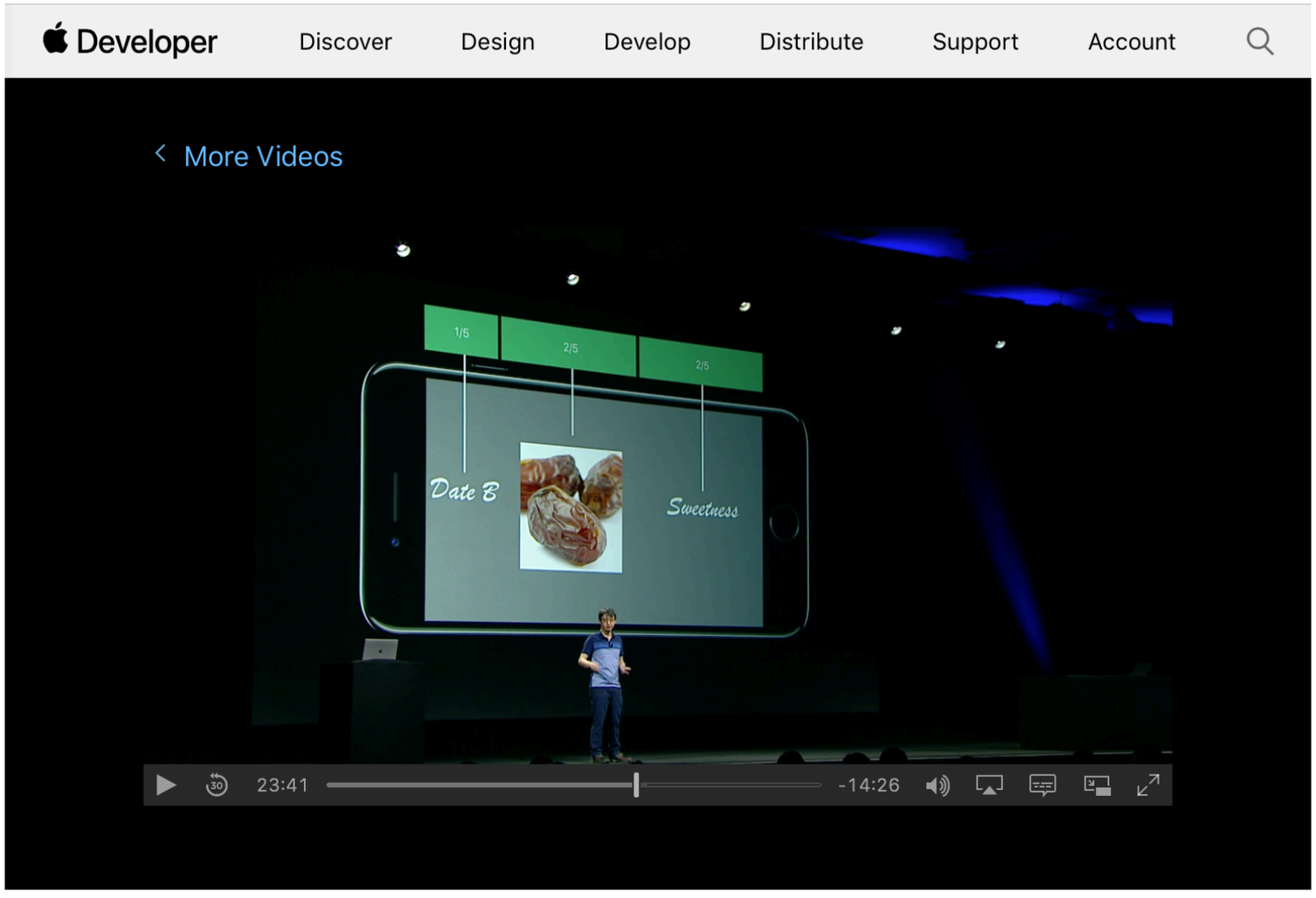
tap on warning icon to reveal tips to resolve your issue

resolving localization issues



spacer views

spacer views - hidden UIViews to enforce proportions



check piazza for a auto-layout tutorial video

check-in

hw 2 : hangman

due Monday (2/19) at 11:59 pm

Next Lab : Auto Layout