iOS DeCal

lecture 2

AutoLayout

cs198-001 : fall 2018

today’s lecture

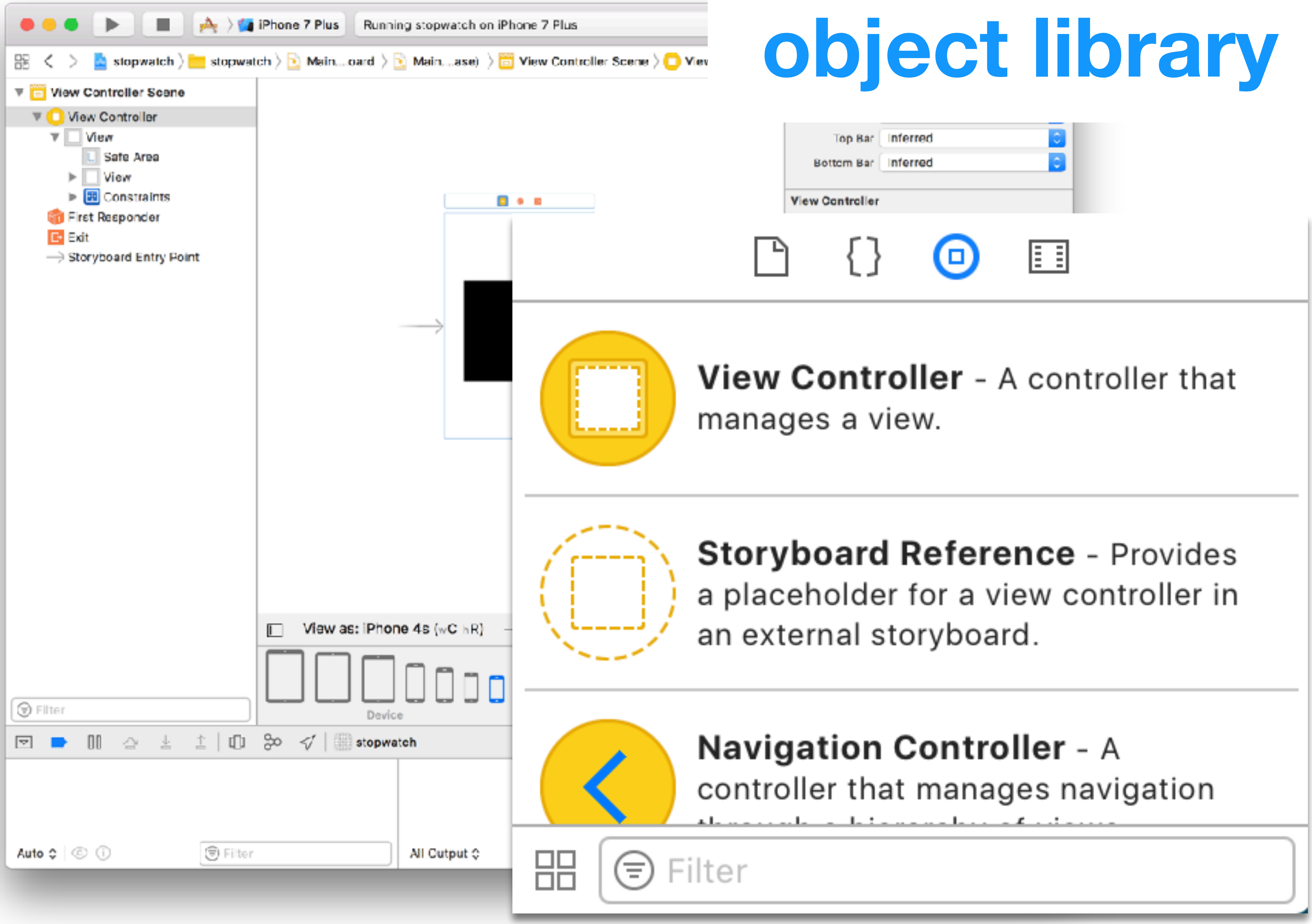
- announcements
- UI toolkit / Object library
- laying out views using Autolayout + Storyboard
- demo
- check in

announcements

- enrollment: please use your CCN by tonight, so we can accommodate waitlisted students by wednesday
- absence policy
- everyone should be enrolled in piazza/the course, come talk to us after if you have any issues
- hw 1 is due at 7 PM, 9/12
  - enroll in the gradescope course to submit: **957BD8**
  - grading will take ~1 week
- first *real* lab this wednesday!

iOS storyboard objects

object library

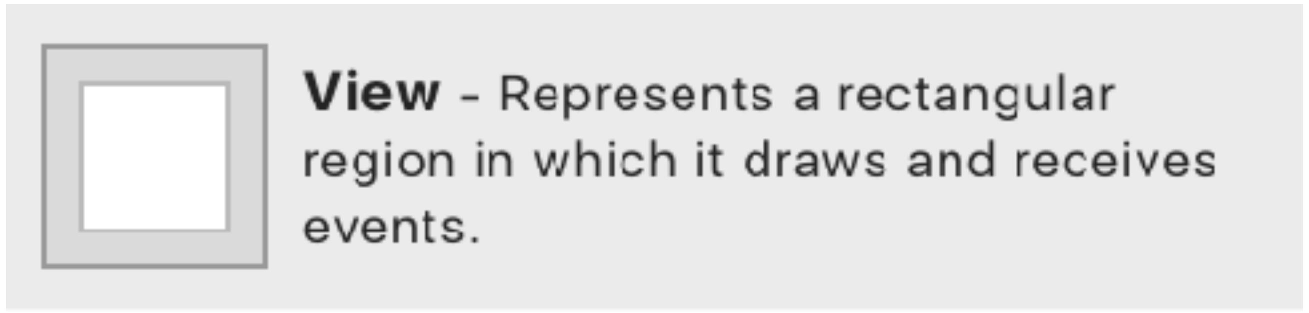


View Controller - A controller that manages a view.

Storyboard Reference - Provides a placeholder for a view controller in an external storyboard.

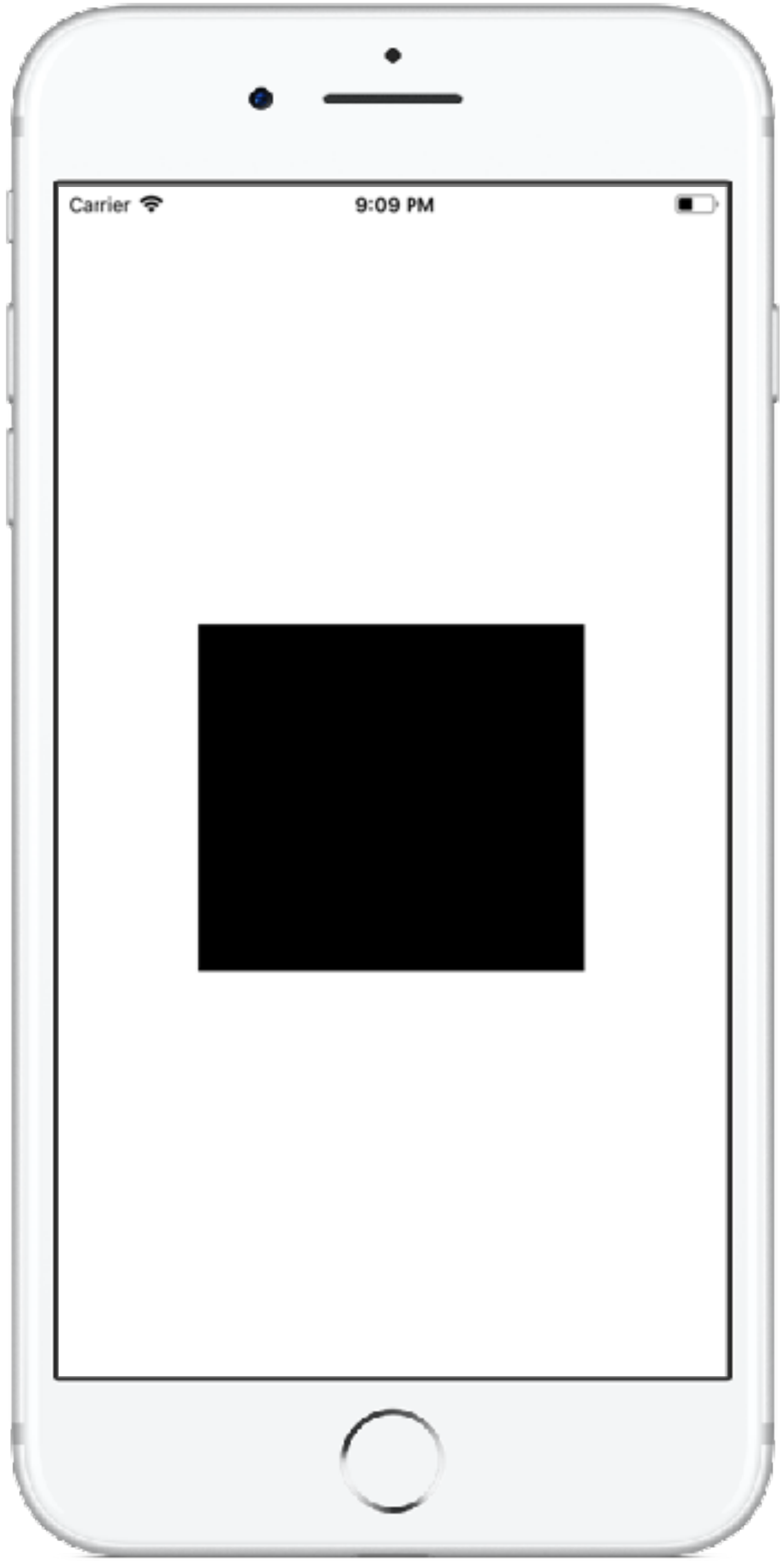
Navigation Controller - A controller that manages navigation

views

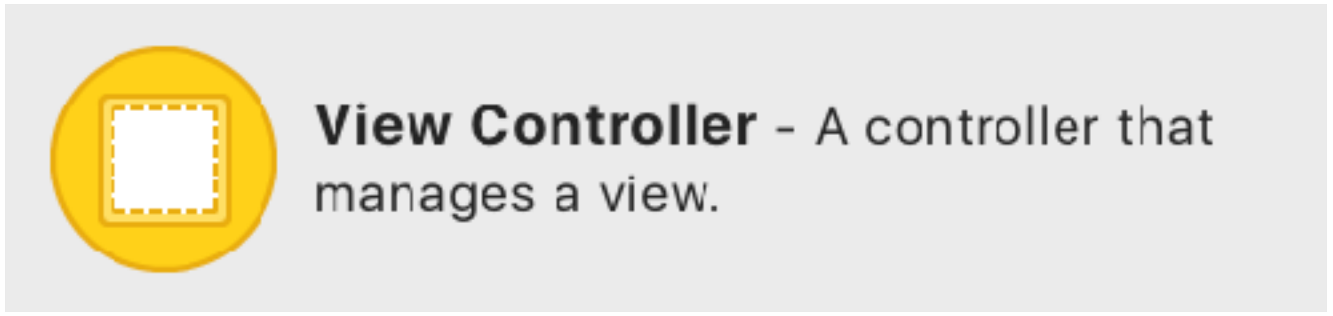


View - Represents a rectangular region in which it draws and receives events.

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

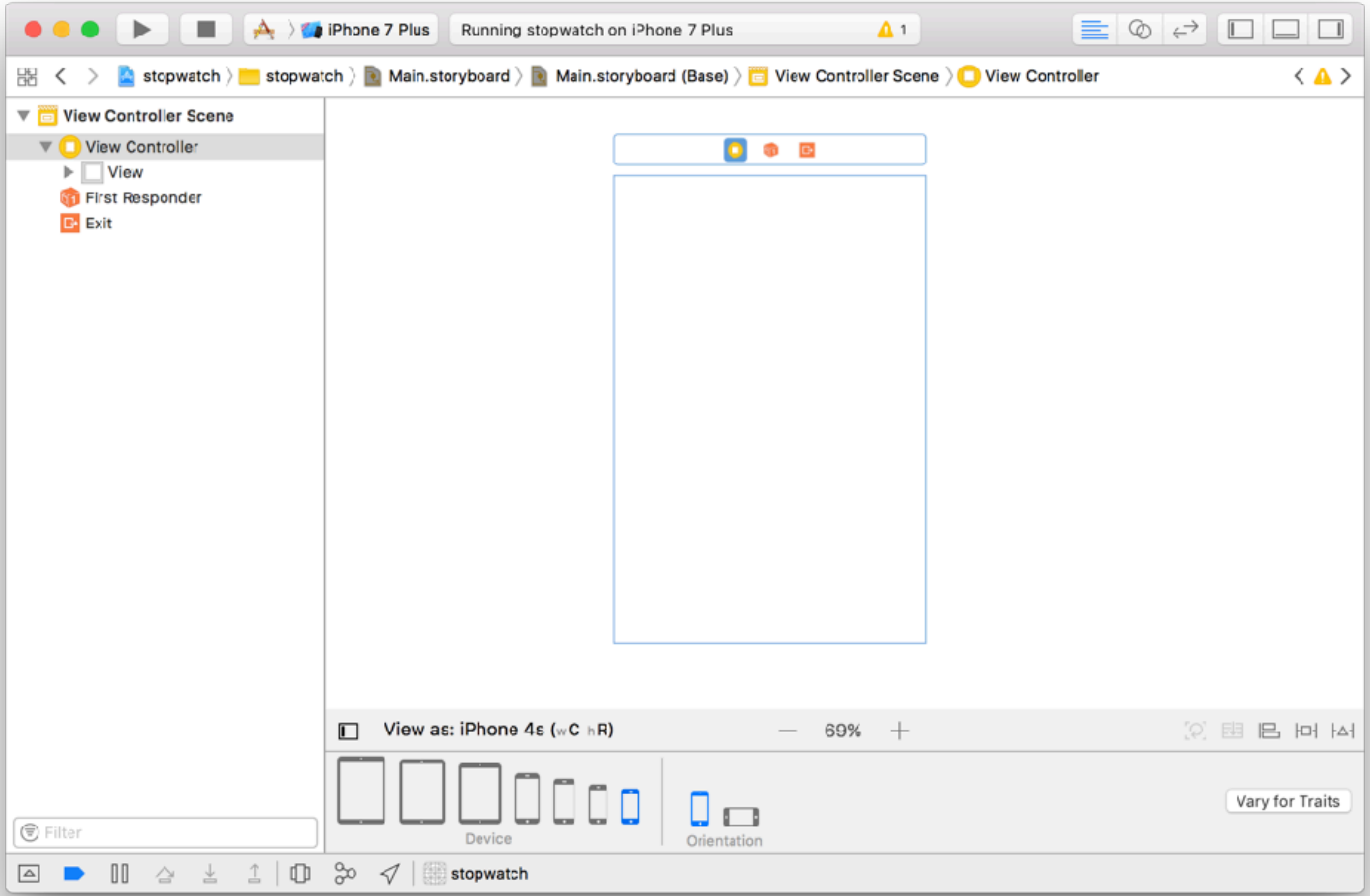


view controllers



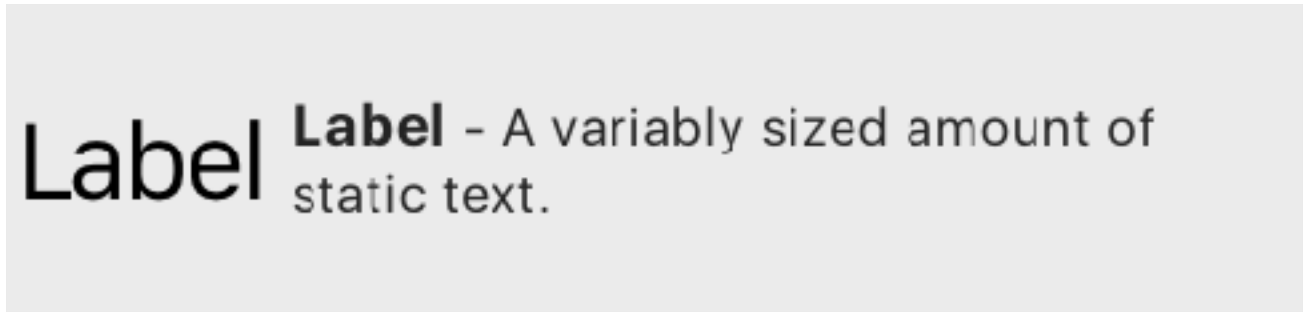
View Controller - A controller that manages a view.

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

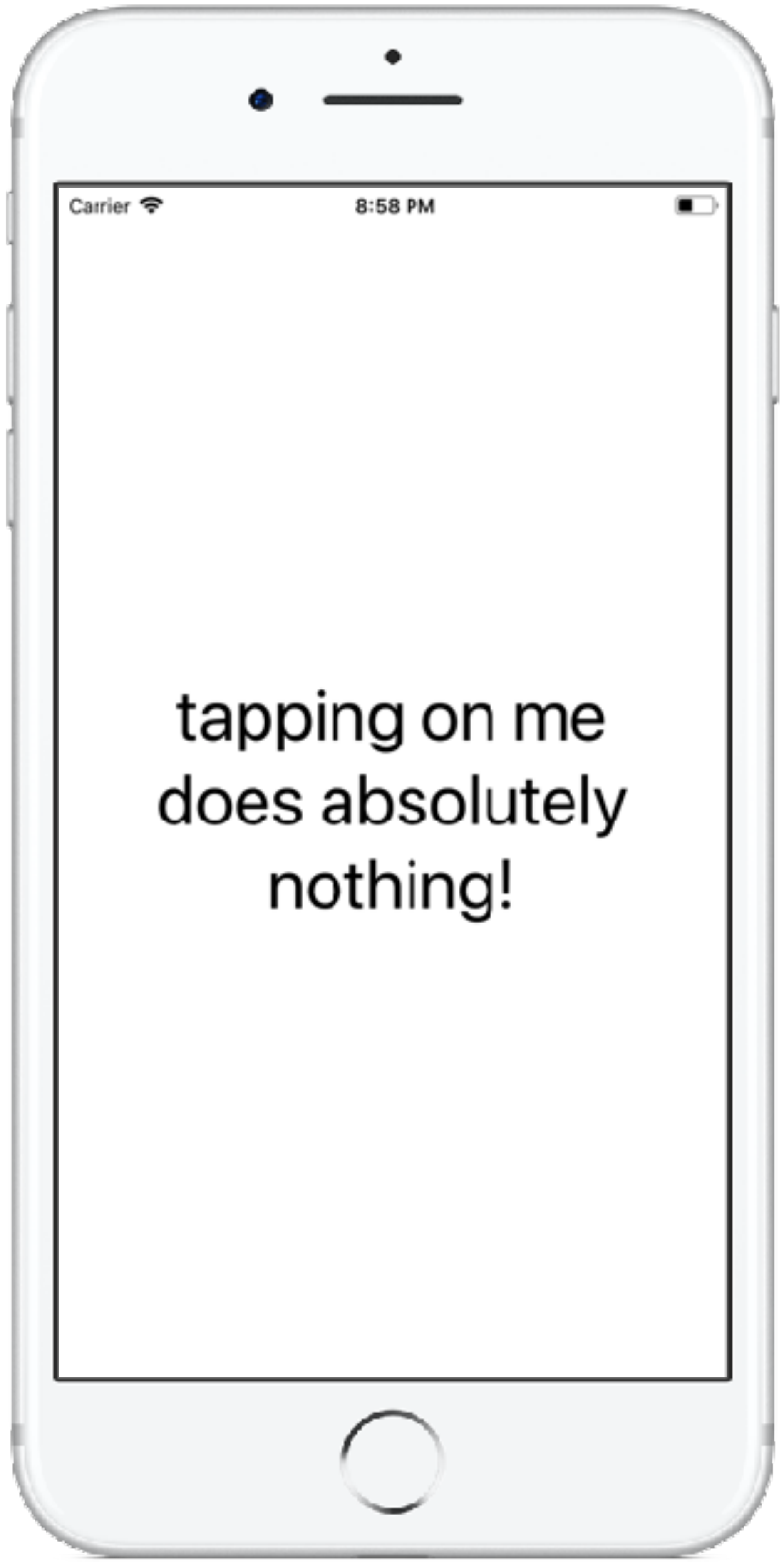


view controller vs. view

labels

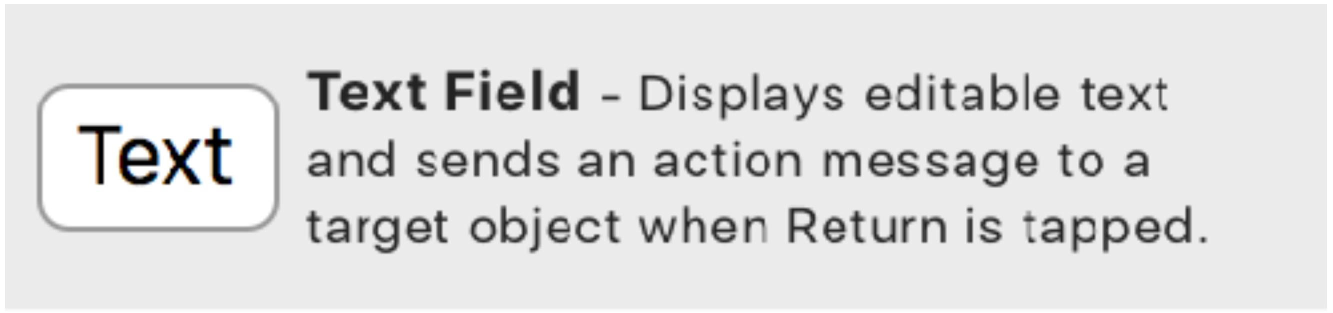

Label **Label** - A variably sized amount of static text.

- used to display text
- not editable by user



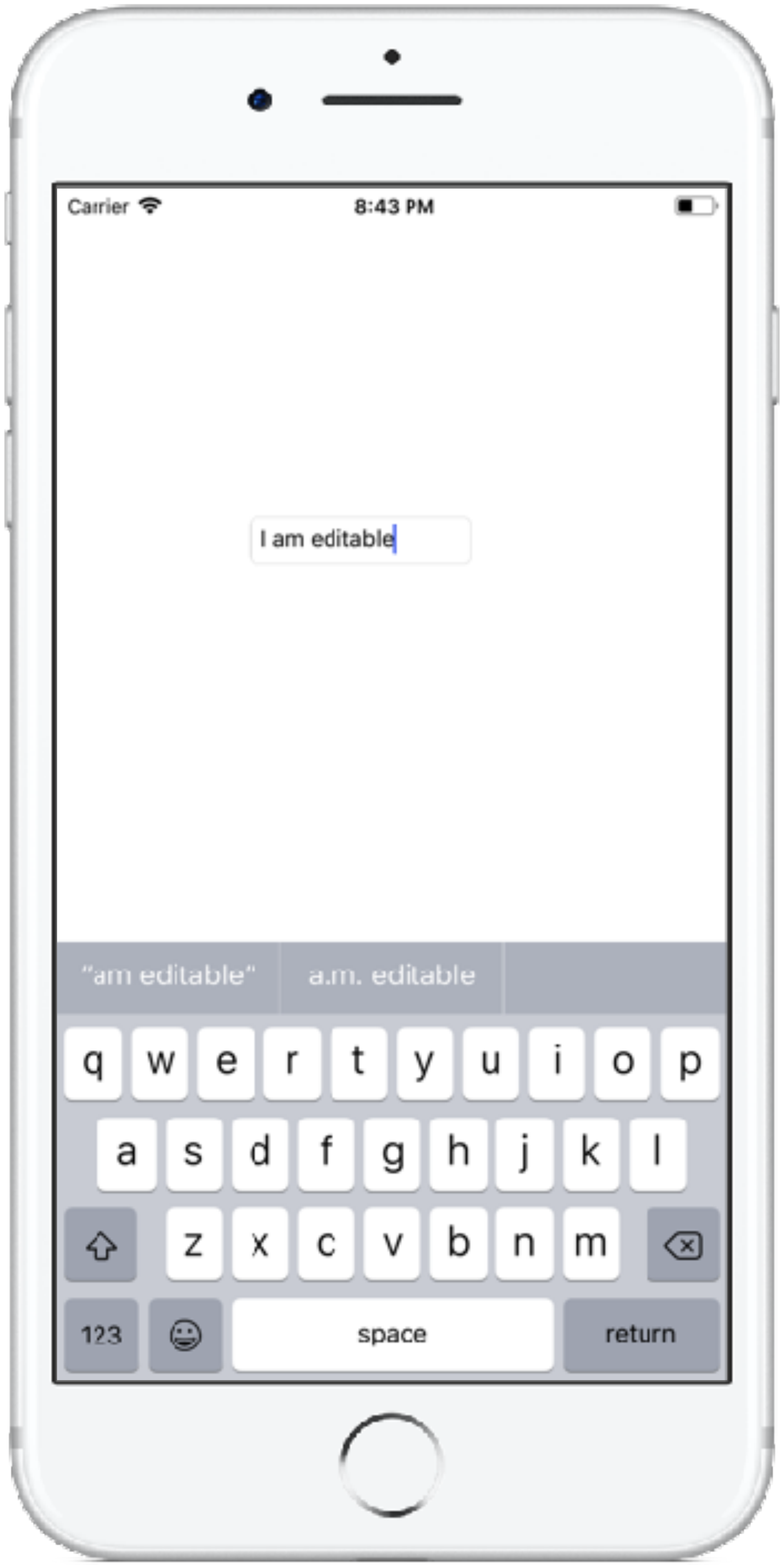
tapping on me does absolutely nothing!

text fields

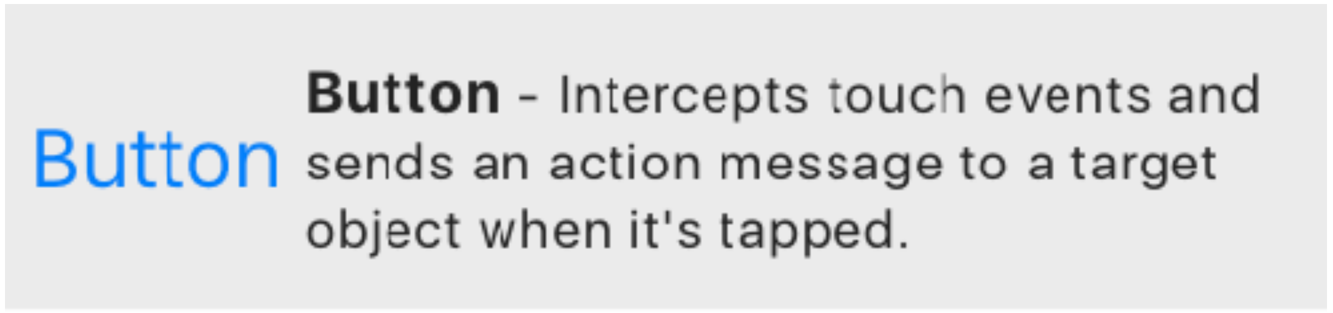


Text Field - Displays editable text and sends an action message to a target object when Return is tapped.

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

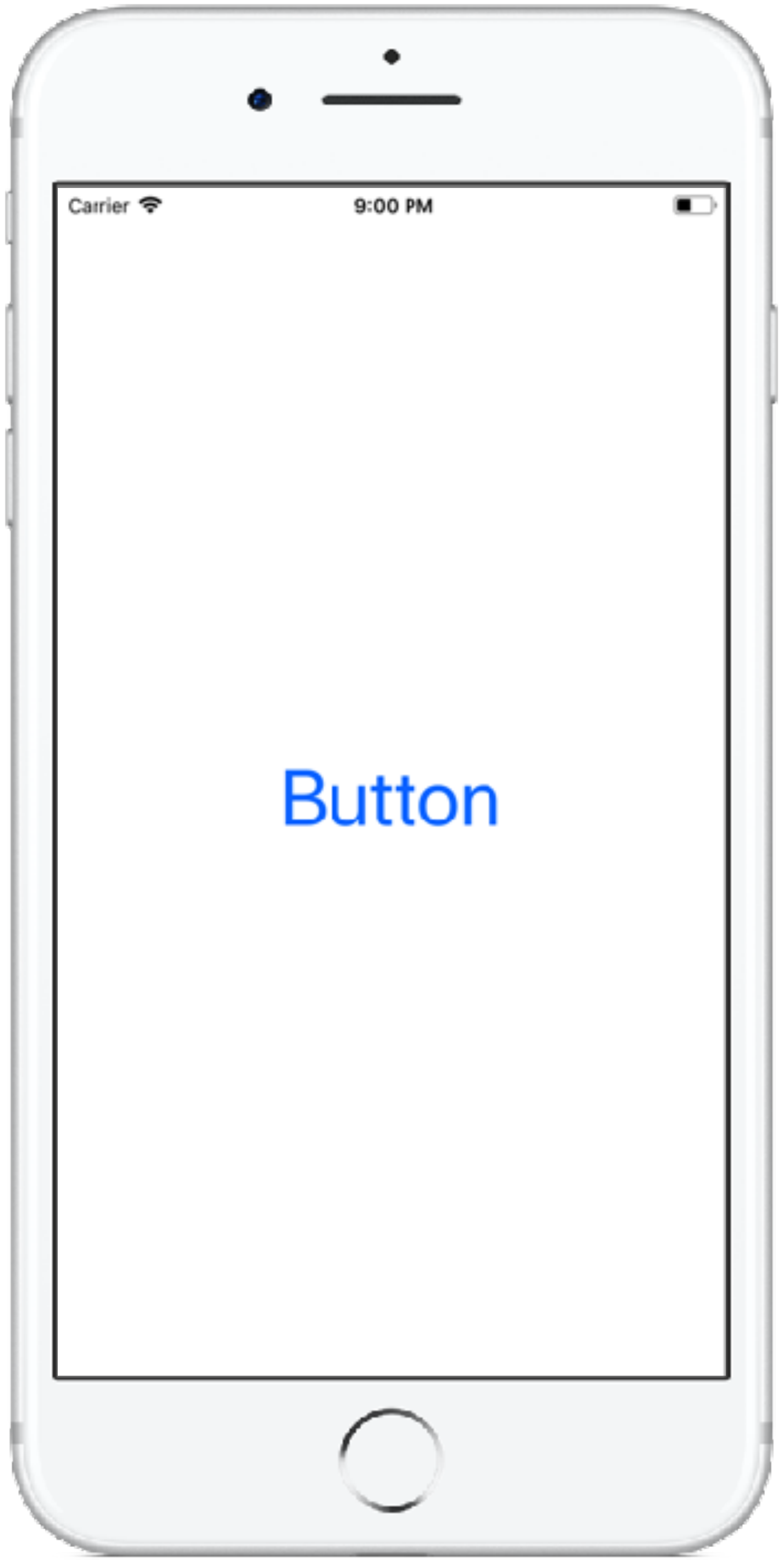


buttons

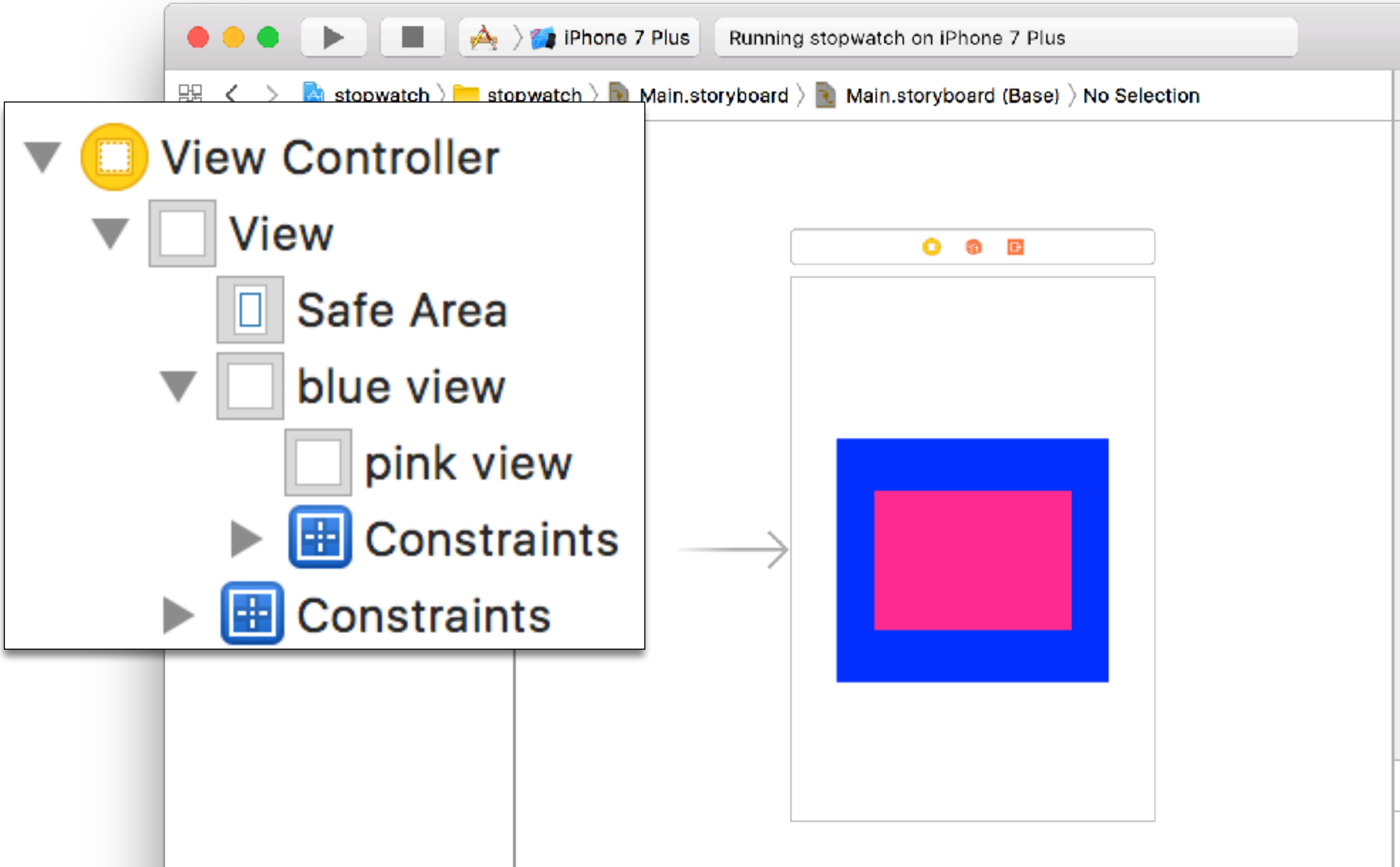


Button - Intercepts touch events and sends an action message to a target object when it's tapped.

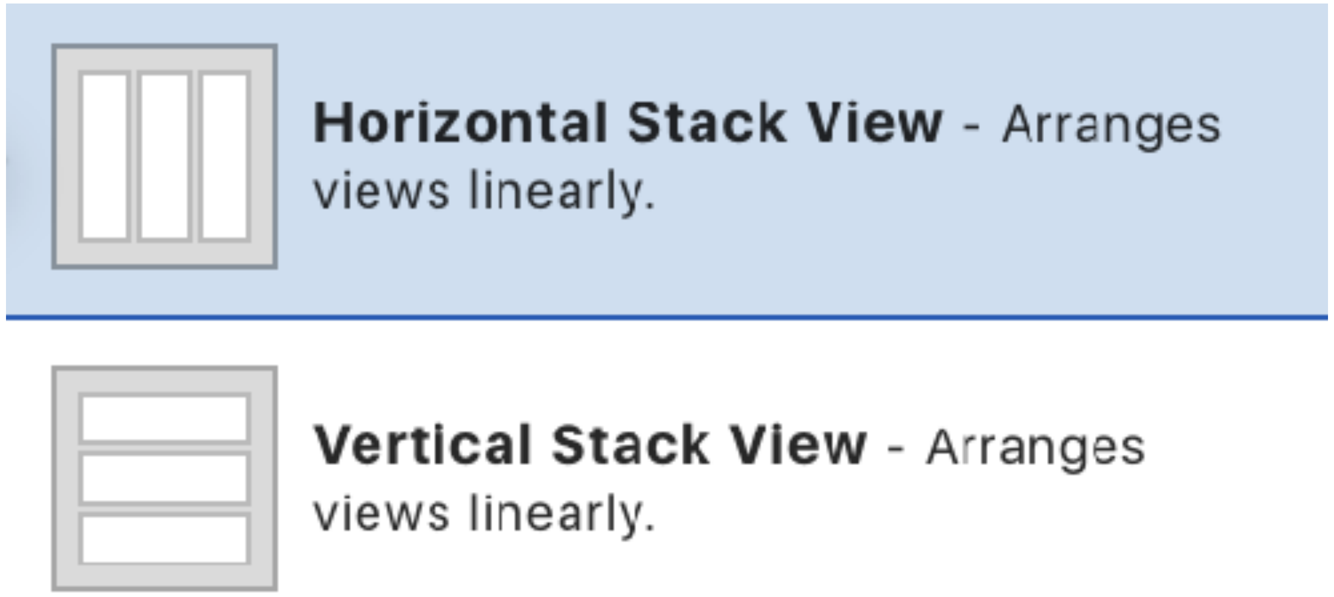
- use to detect touch events
- useless unless you connect to an IBAction or register a selector



superview / subview



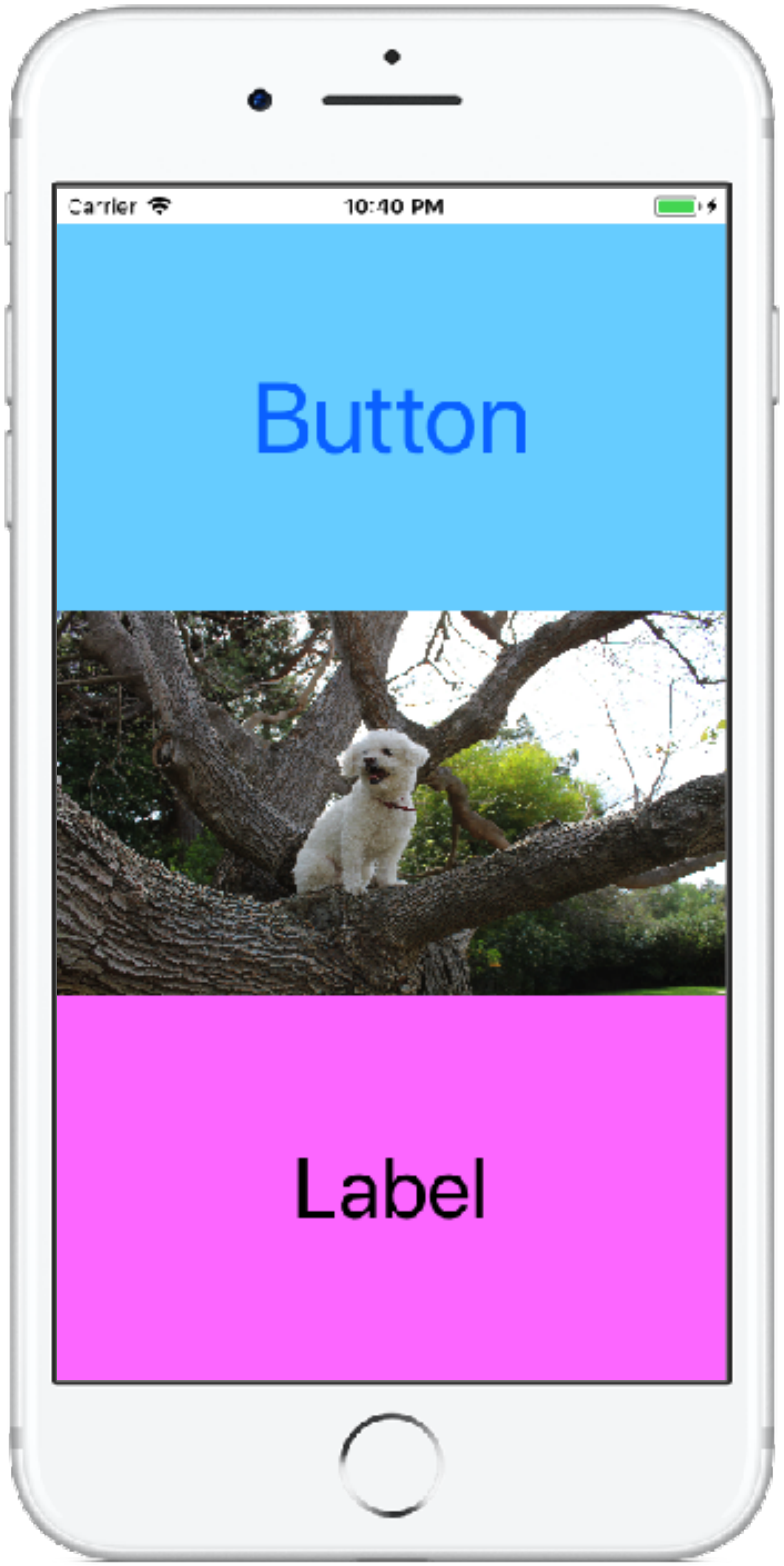
stack views



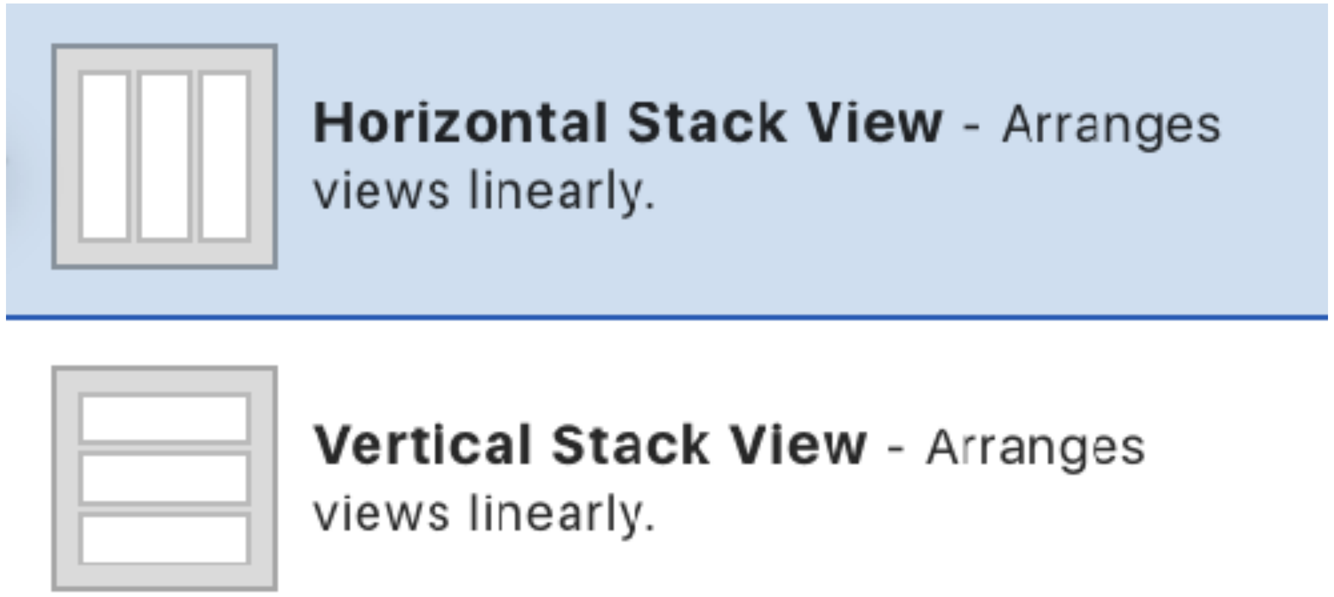
Horizontal Stack View - Arranges views linearly.

Vertical Stack View - Arranges views linearly.

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



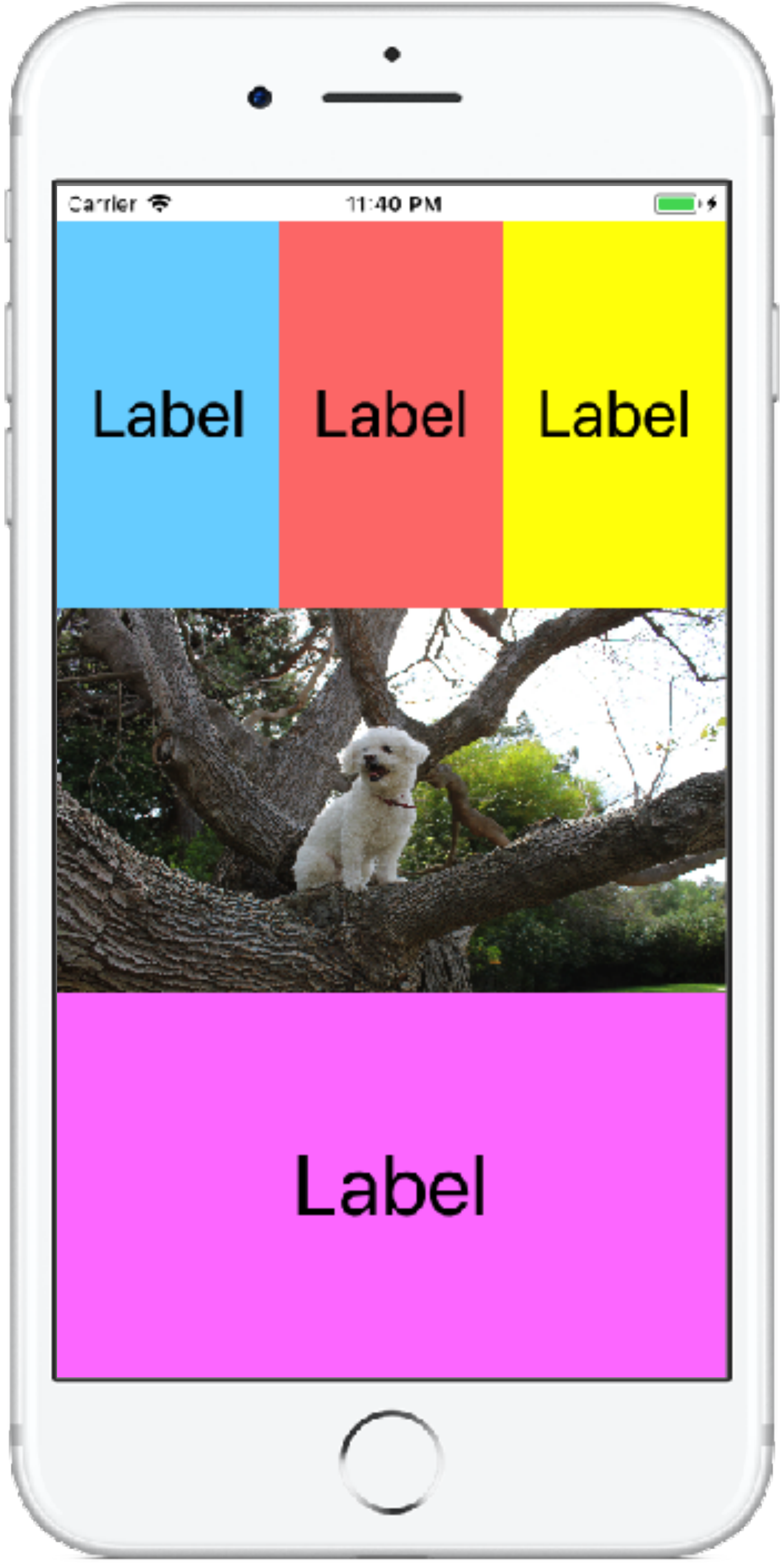
stack views



Horizontal Stack View - Arranges views linearly.

Vertical Stack View - Arranges views linearly.

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



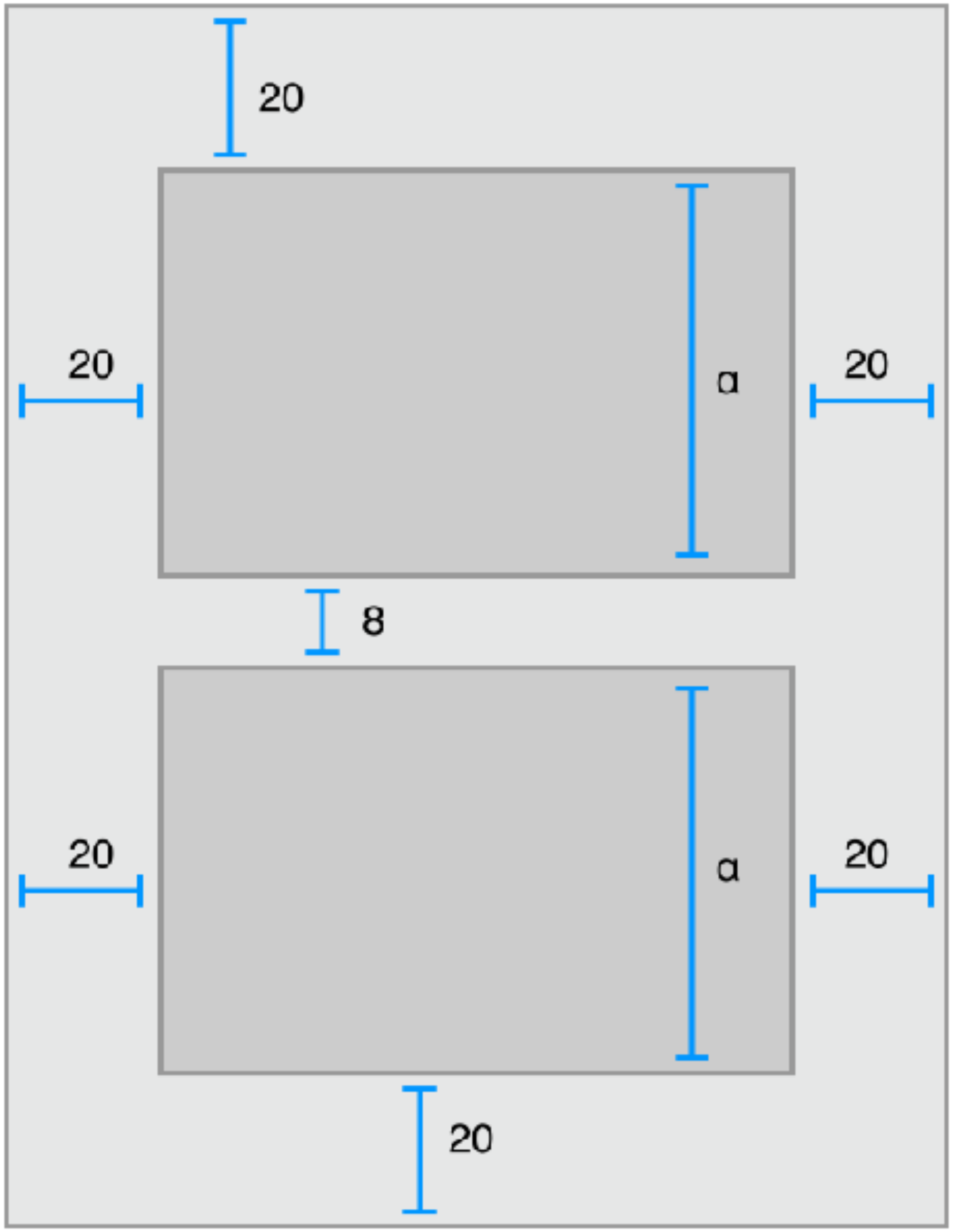
laying out your user interface

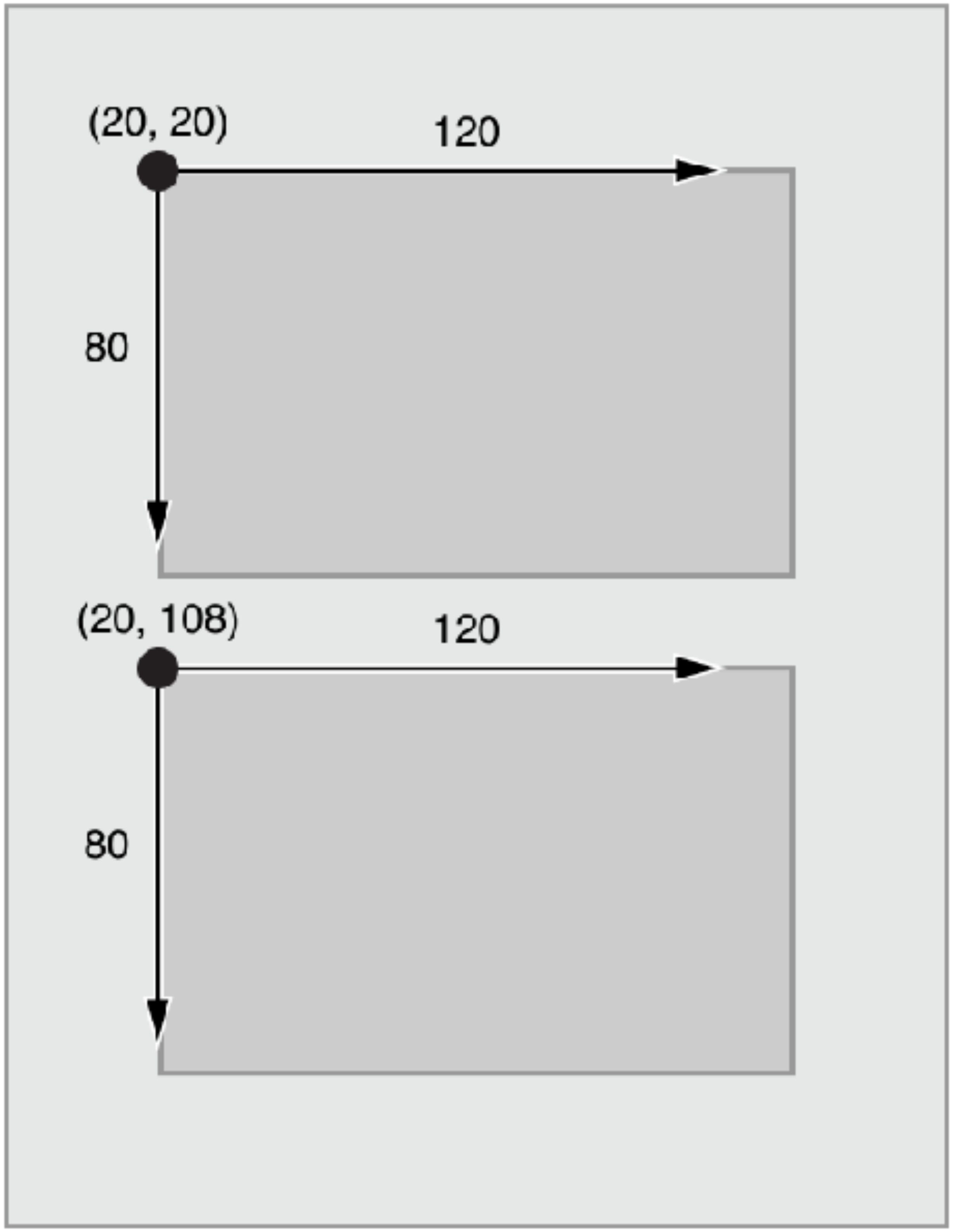
creating your user interface

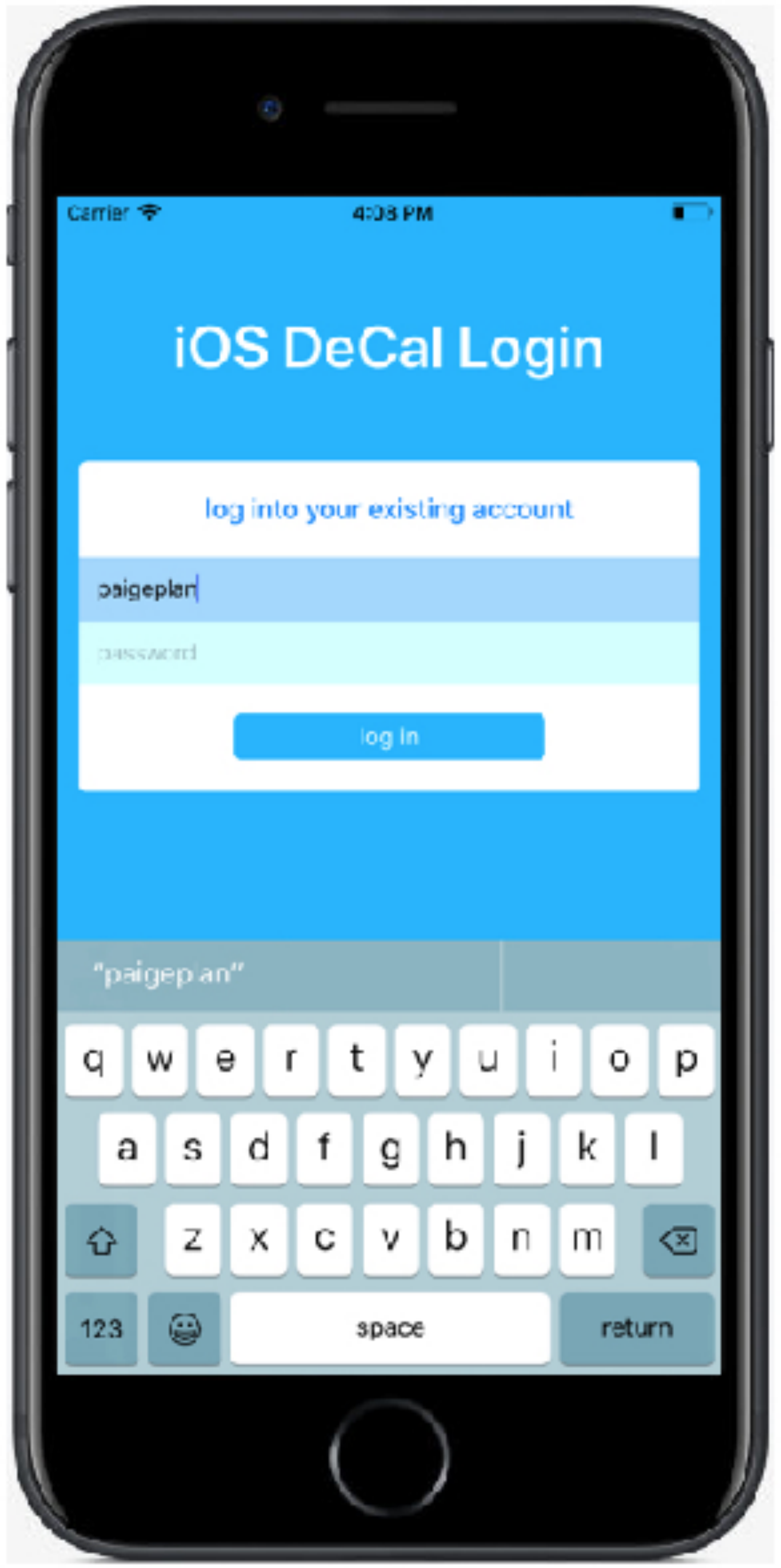
what are our options?

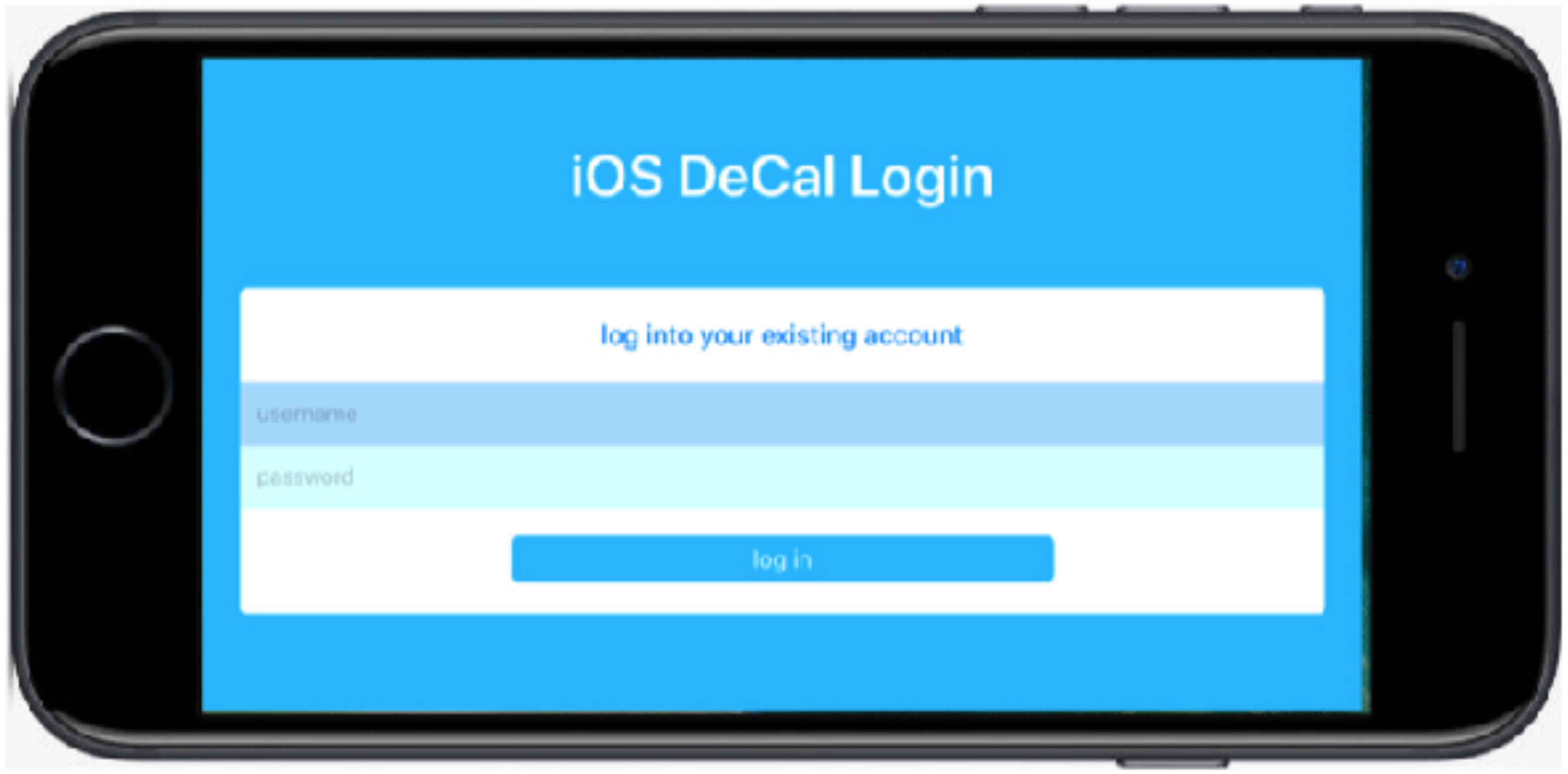
frame-based layout
- define the origin / width / height (frame) for each view
- recalculate frame on layout changes
- implement programmatically

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


20
20
a
20
8
20
a
20
20


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


Carrier
4:08 PM
iOS DeCal Login
log into your existing account
paigeplan
password
log in
"paigep an"
q w e r t y u i o p
a s d f g h j k l
z x c v b n m
123
space
return


iOS DeCal Login
log into your existing account
username
password
log in

check piazza for a tutorial video

check-in

https://bit.ly/2N4O2q7

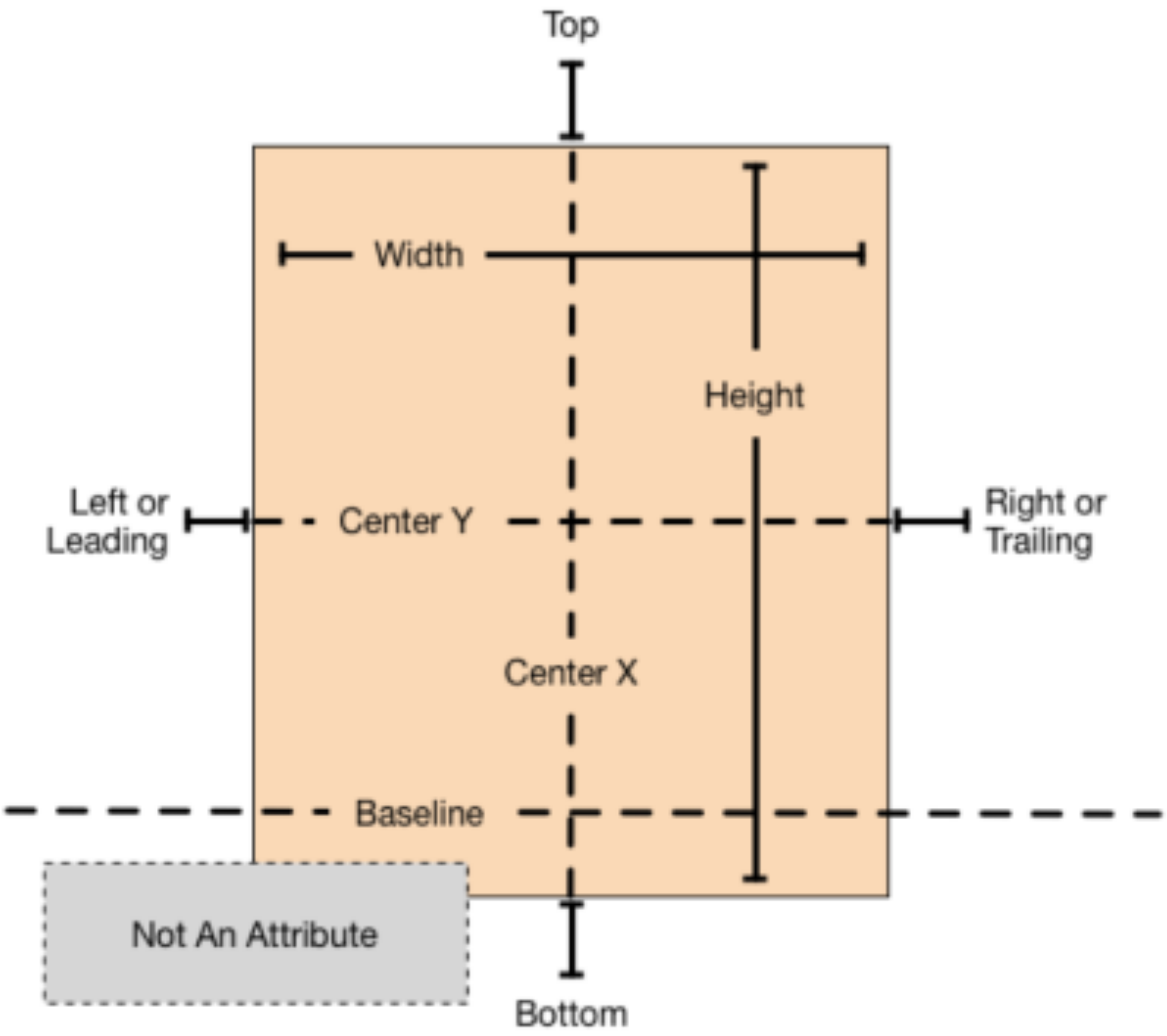
Auto Layout

what is Auto Layout?

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

layout anchors

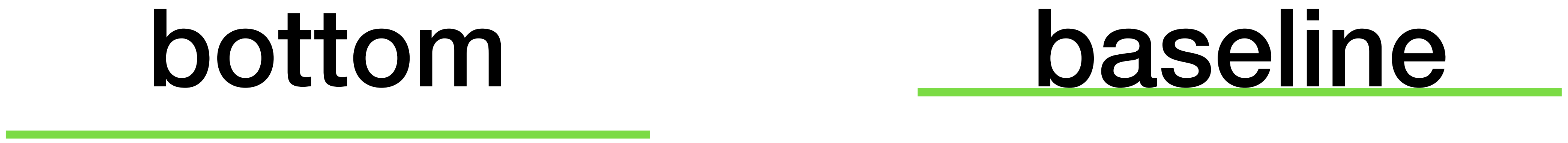
Use these properties to create relationships between views



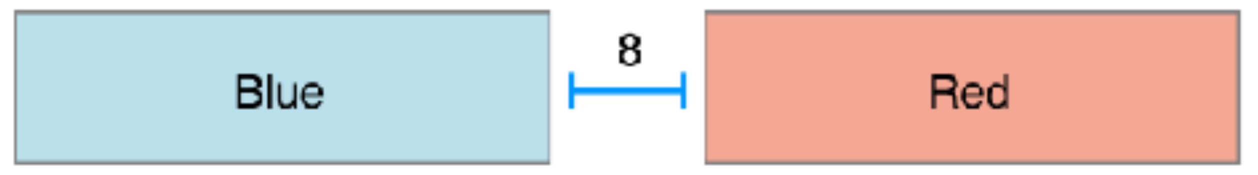
list of constraint types

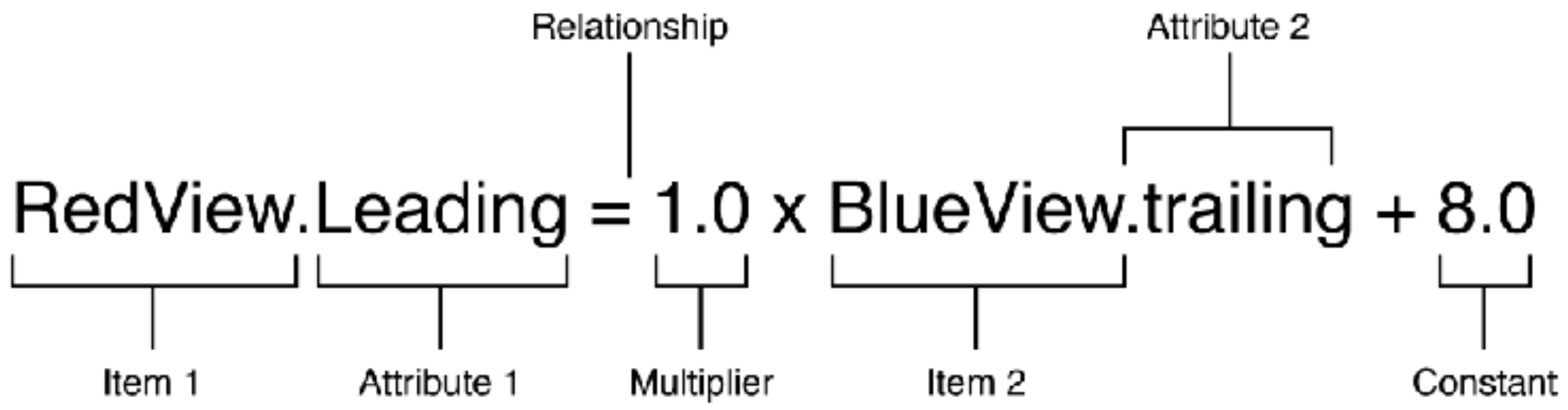
- height - height of view
- width - width of view
- top - vertical spacing to top view
- bottom - vertical spacing to bottom view
- baseline - align baseline
- leading - spacing to left view
- trailing - spacing to right view
- center x - center align horizontally
- center y - center align vertically

a clarification

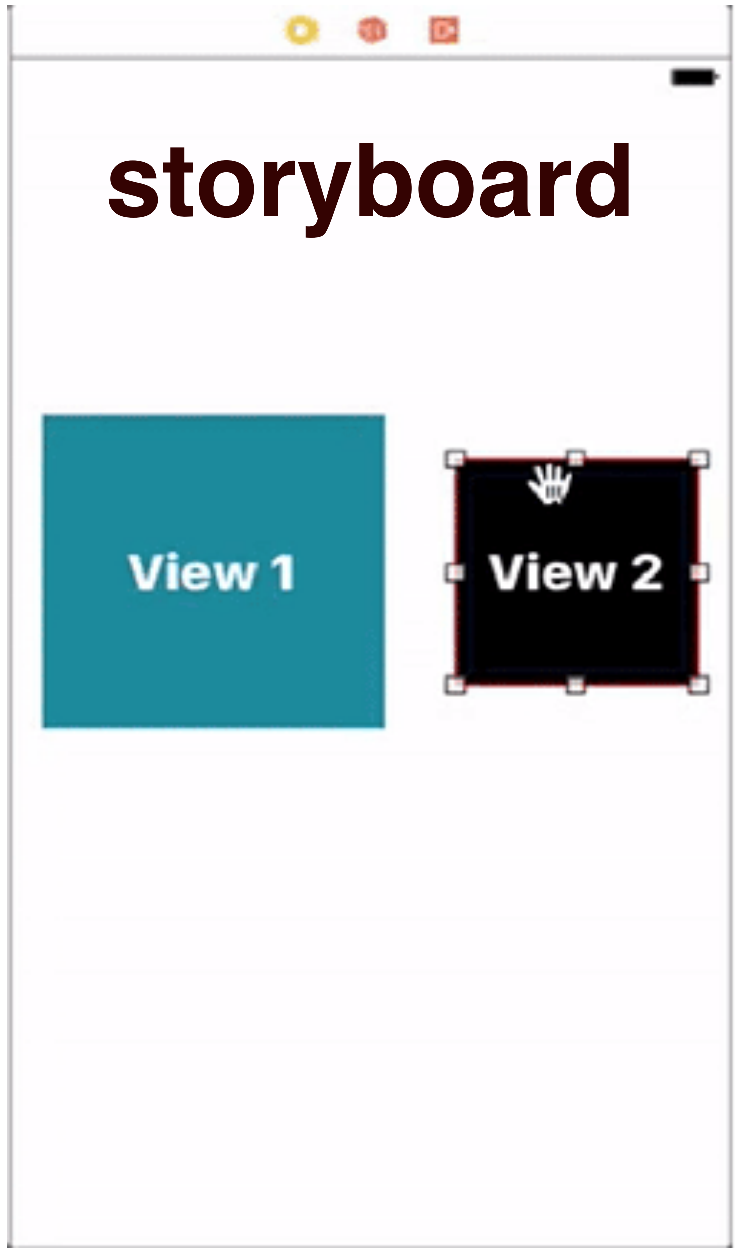


constraints (high level)





implementing AutoLayout



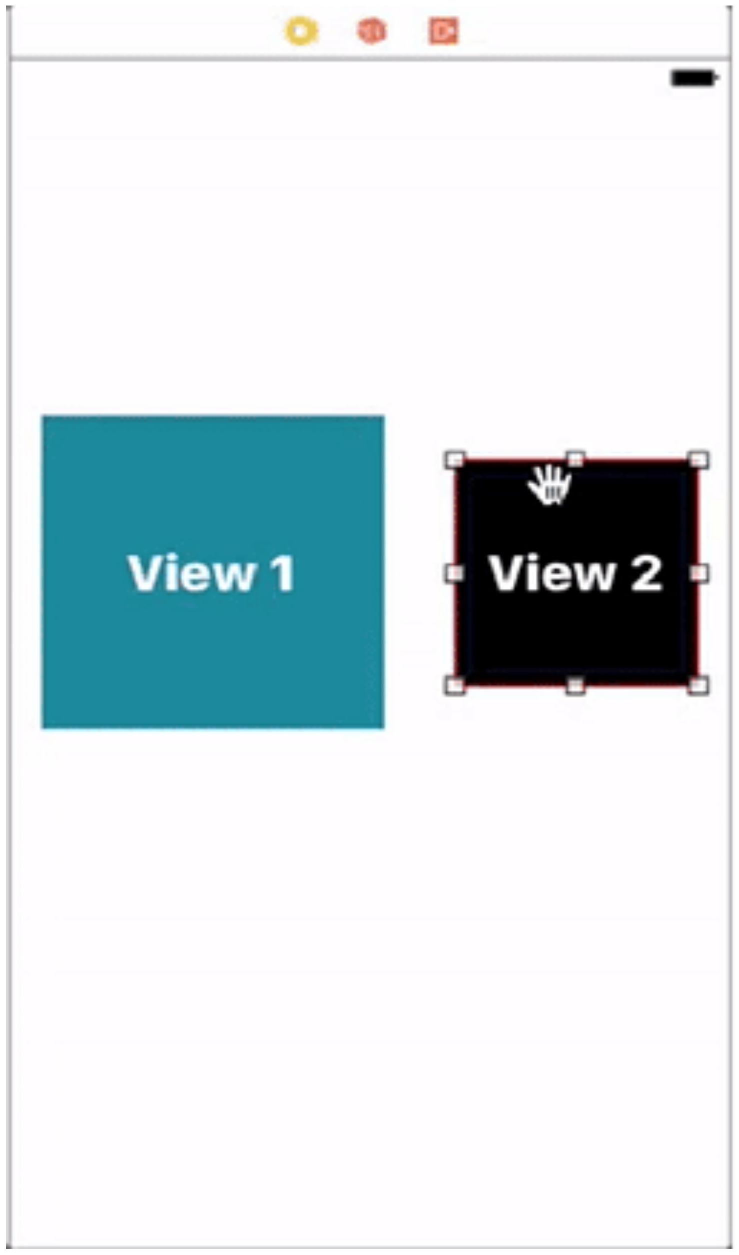
programmatically

```
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

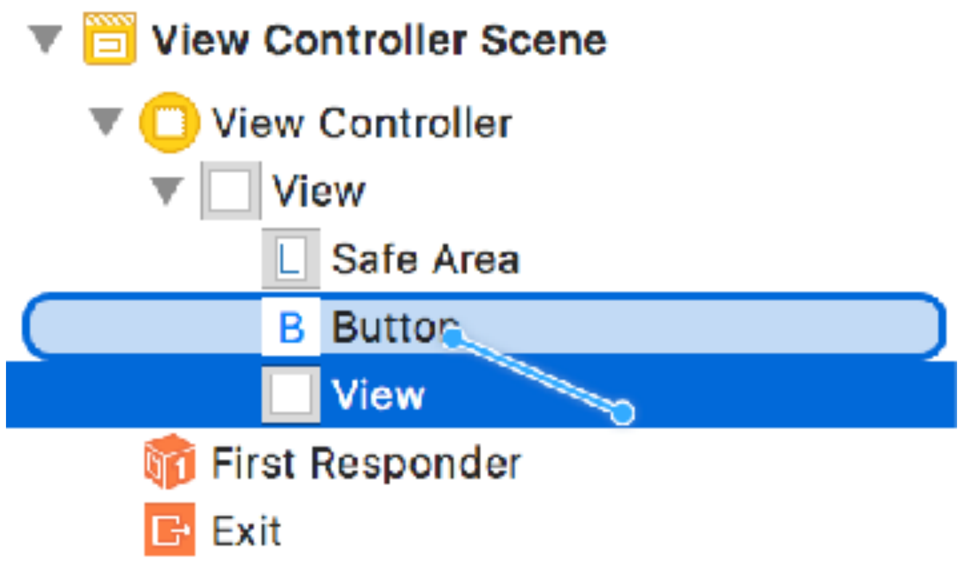
implementing AutoLayout (storyboard)



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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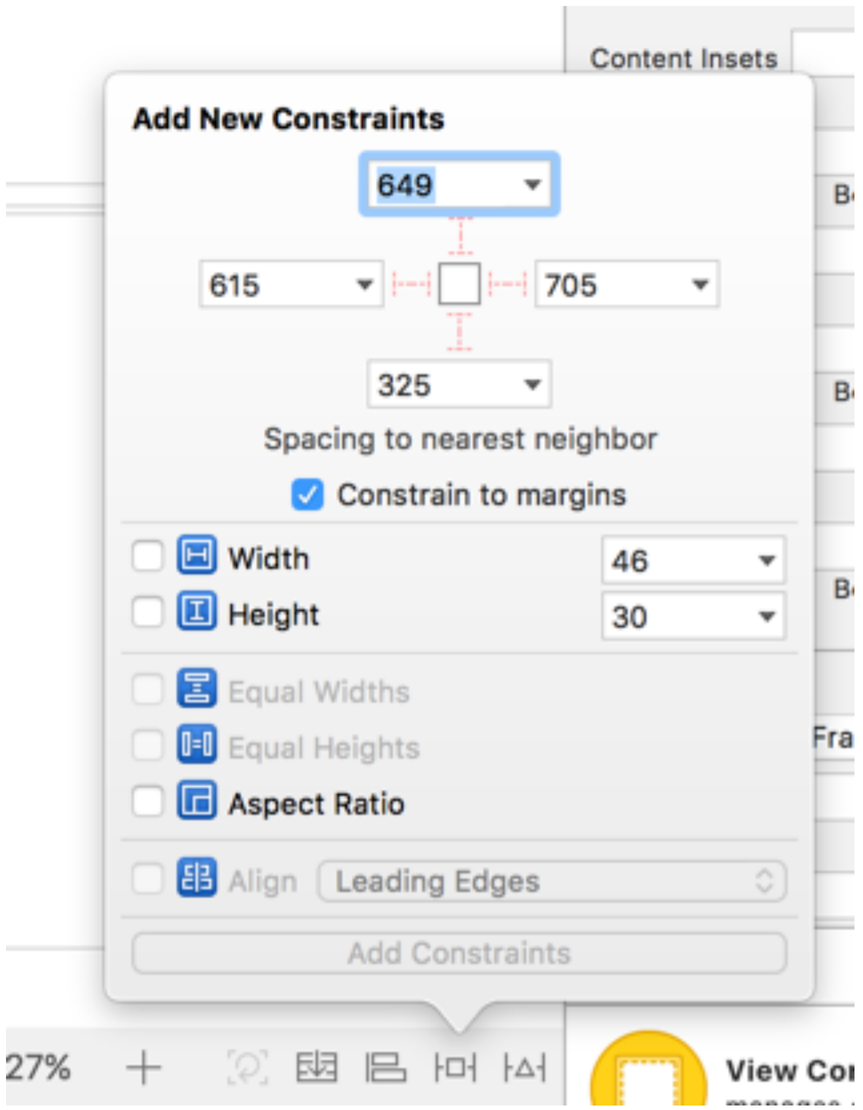
implementing AutoLayout (storyboard)


Add New Constraints

649

615 705

325

Spacing to nearest neighbor

[✓] Constrain to margins

Width	46
Height	30

Equal Widths

Equal Heights

Aspect Ratio

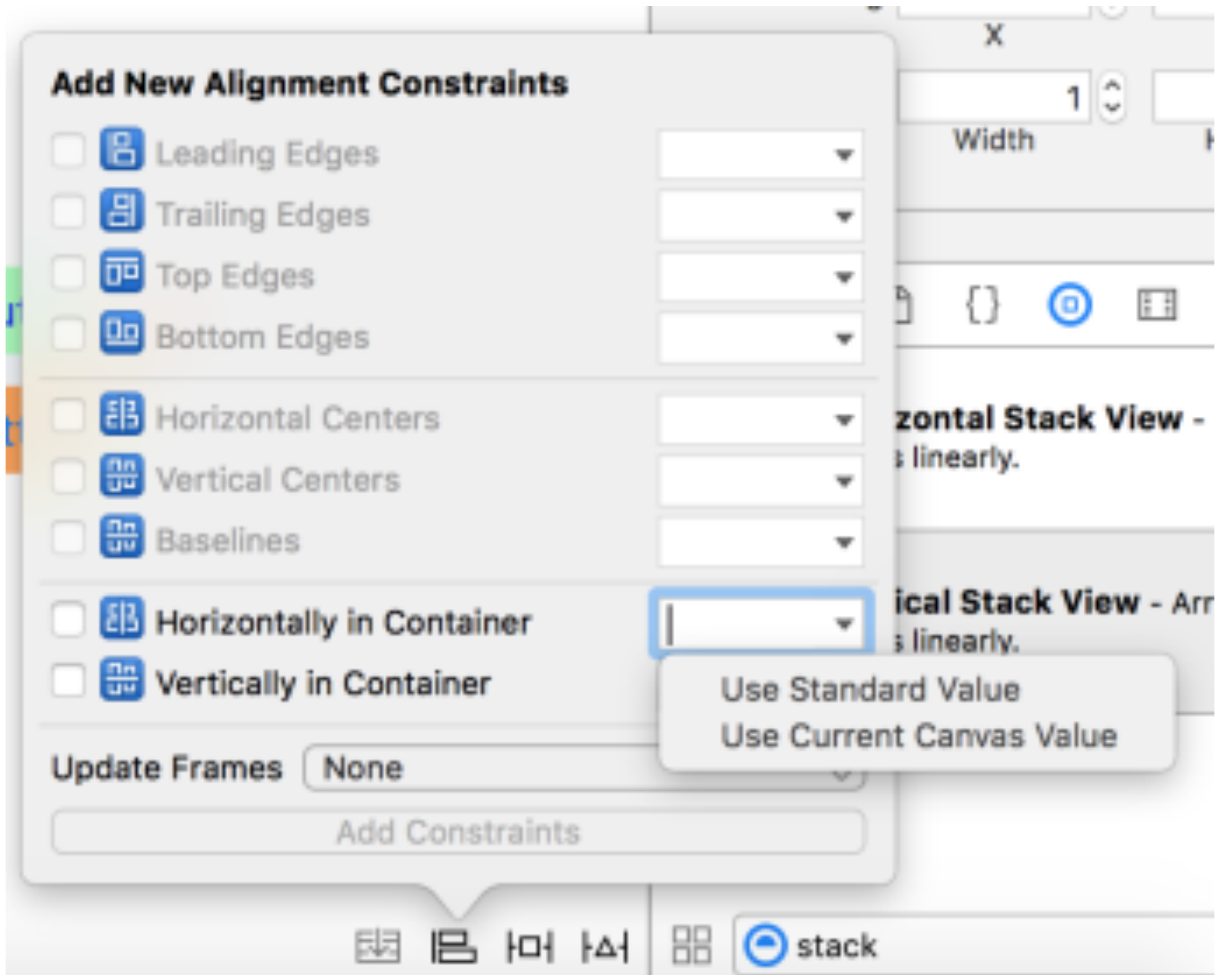
Align Leading Edges

Add Constraints

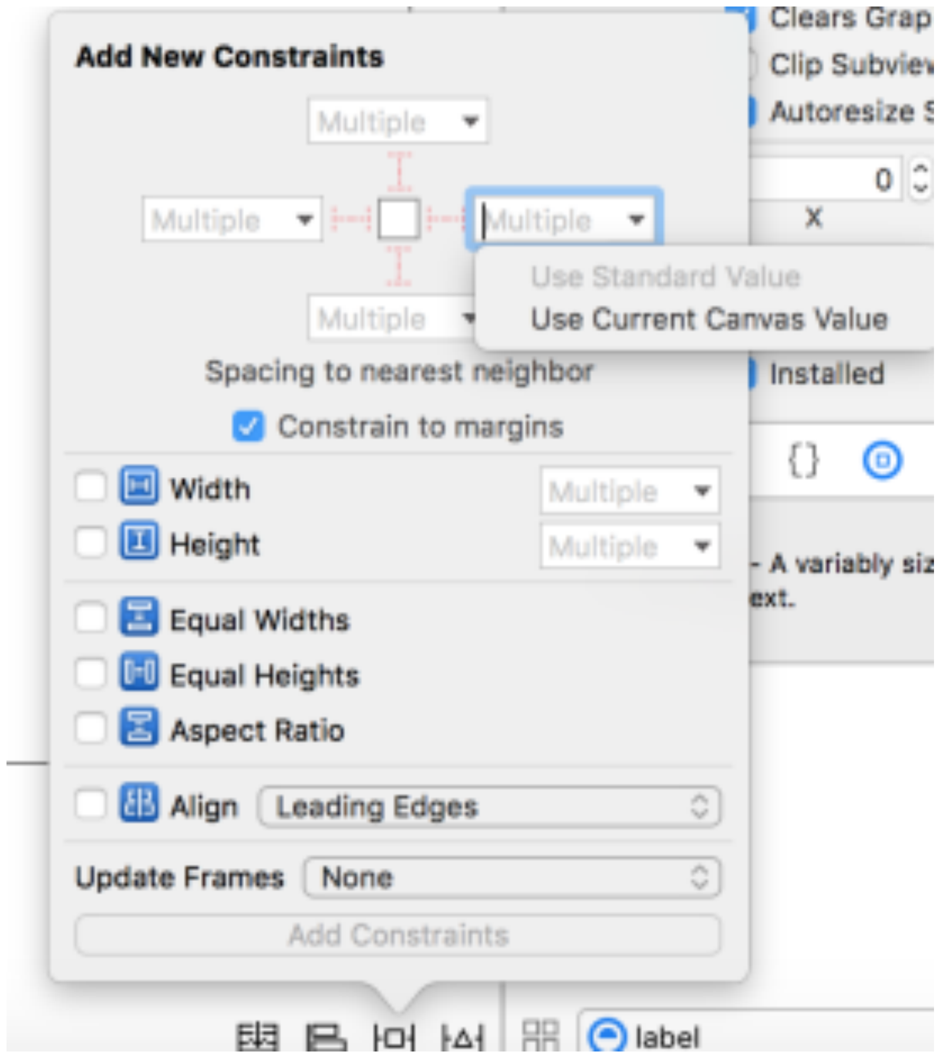
to create a constraint between two views in Storyboard, you can either…

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

types of constraints



Update Frames None



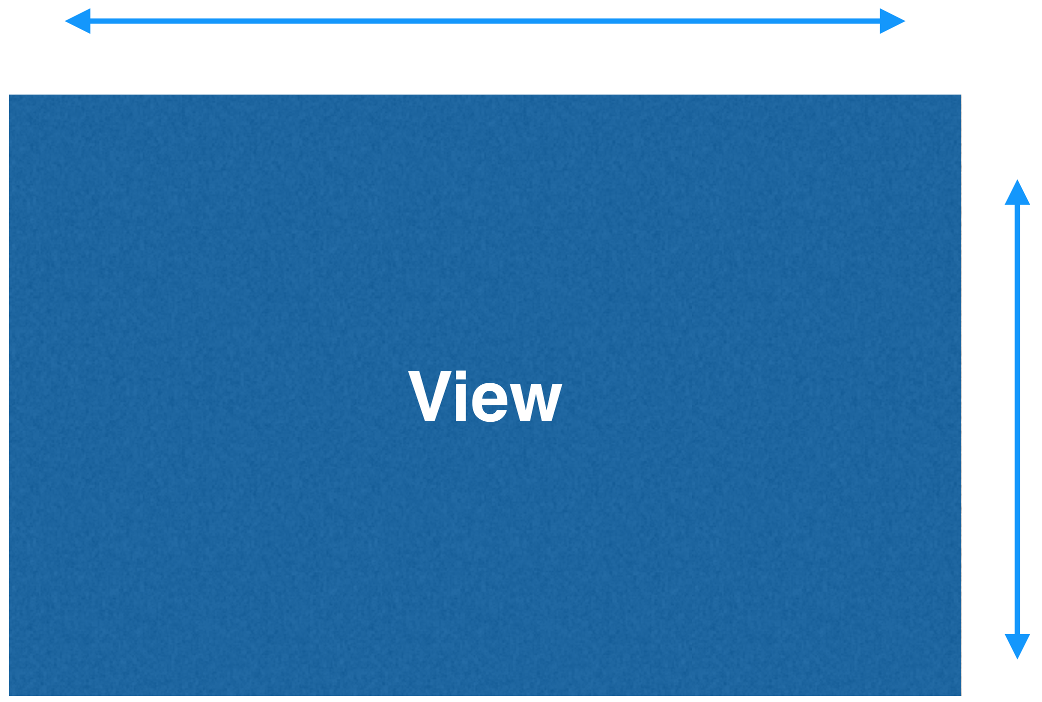
Align Leading Edges

Update Frames None

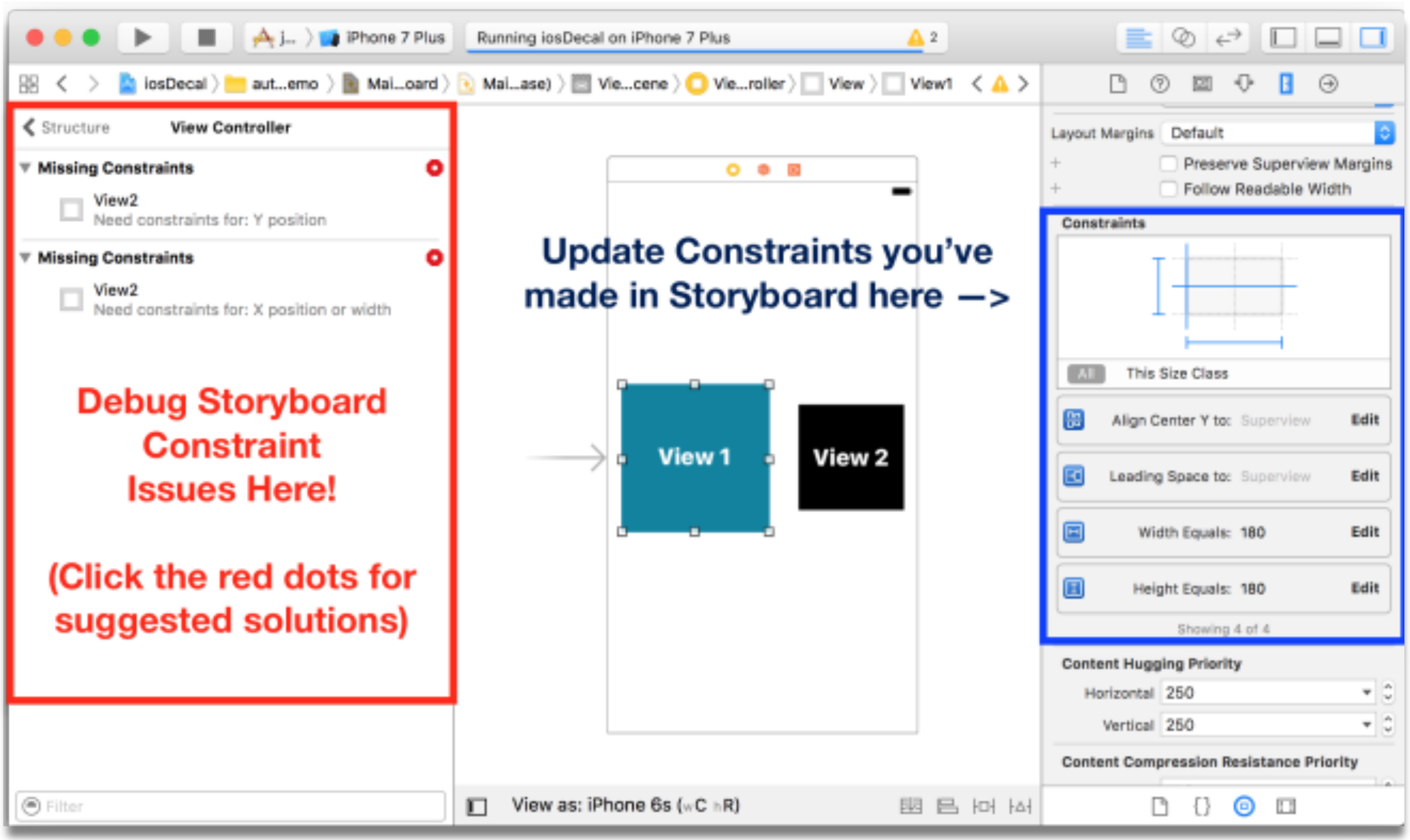
alignment: align objects with each other

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



Running iosDecal on iPhone 7 Plus

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 —>

Layout Margins: Default

Preserve Superview Margins

Follow Readable Width

Constraints

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

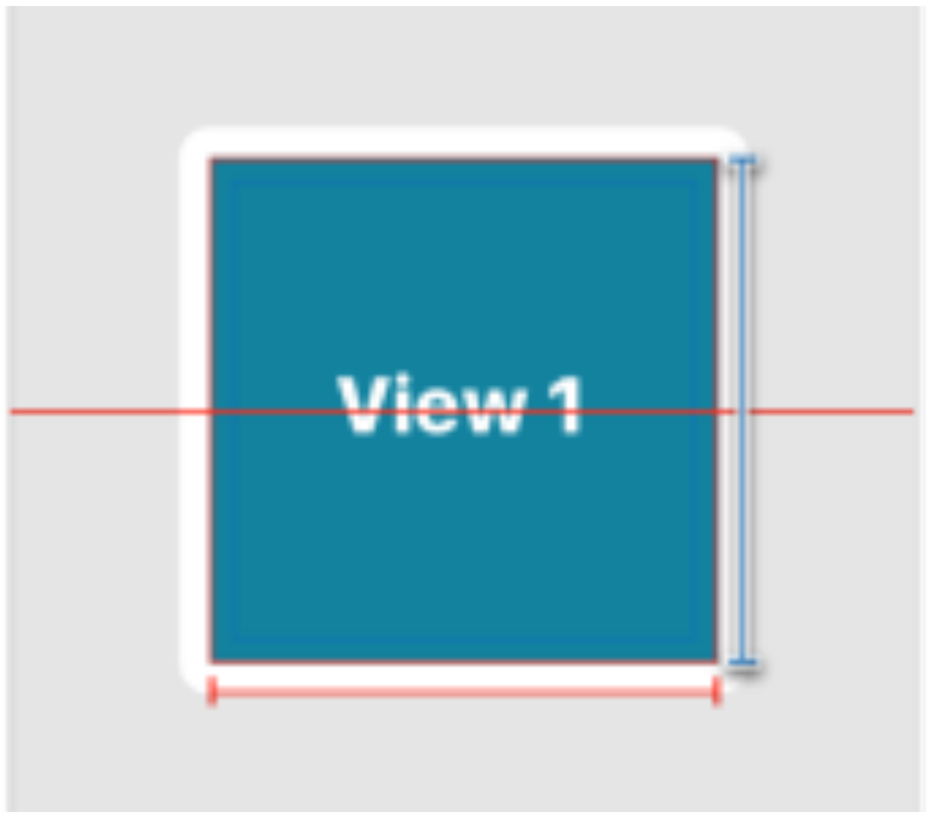
View as: iPhone 6s (wC hR)

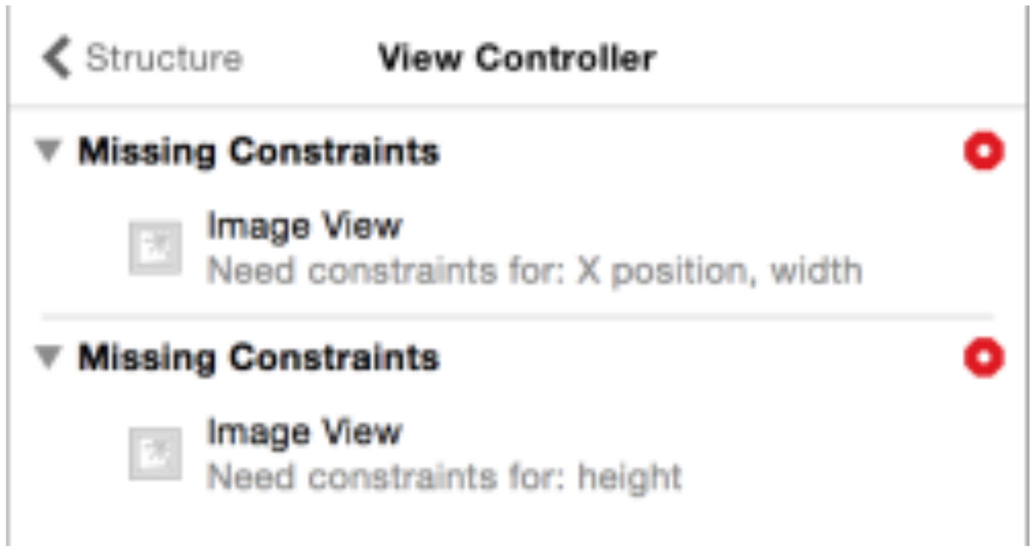
Auto Layout debugging

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)**





< Structure　　View Controller

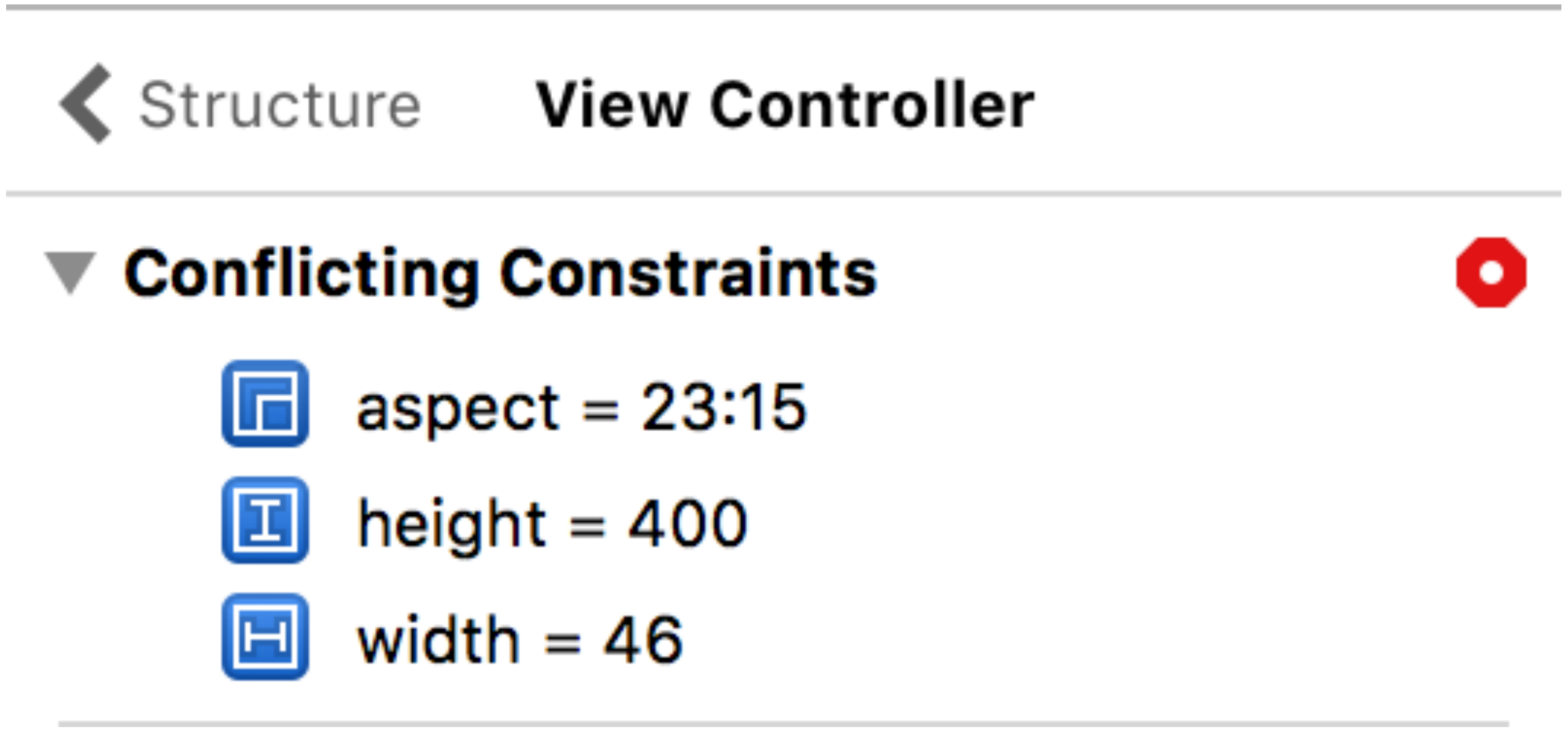
Missing Constraints

Image View
Need constraints for: X position, width

Missing Constraints

Image View
Need constraints for: height

conflicts


Structure View Controller

Conflicting Constraints

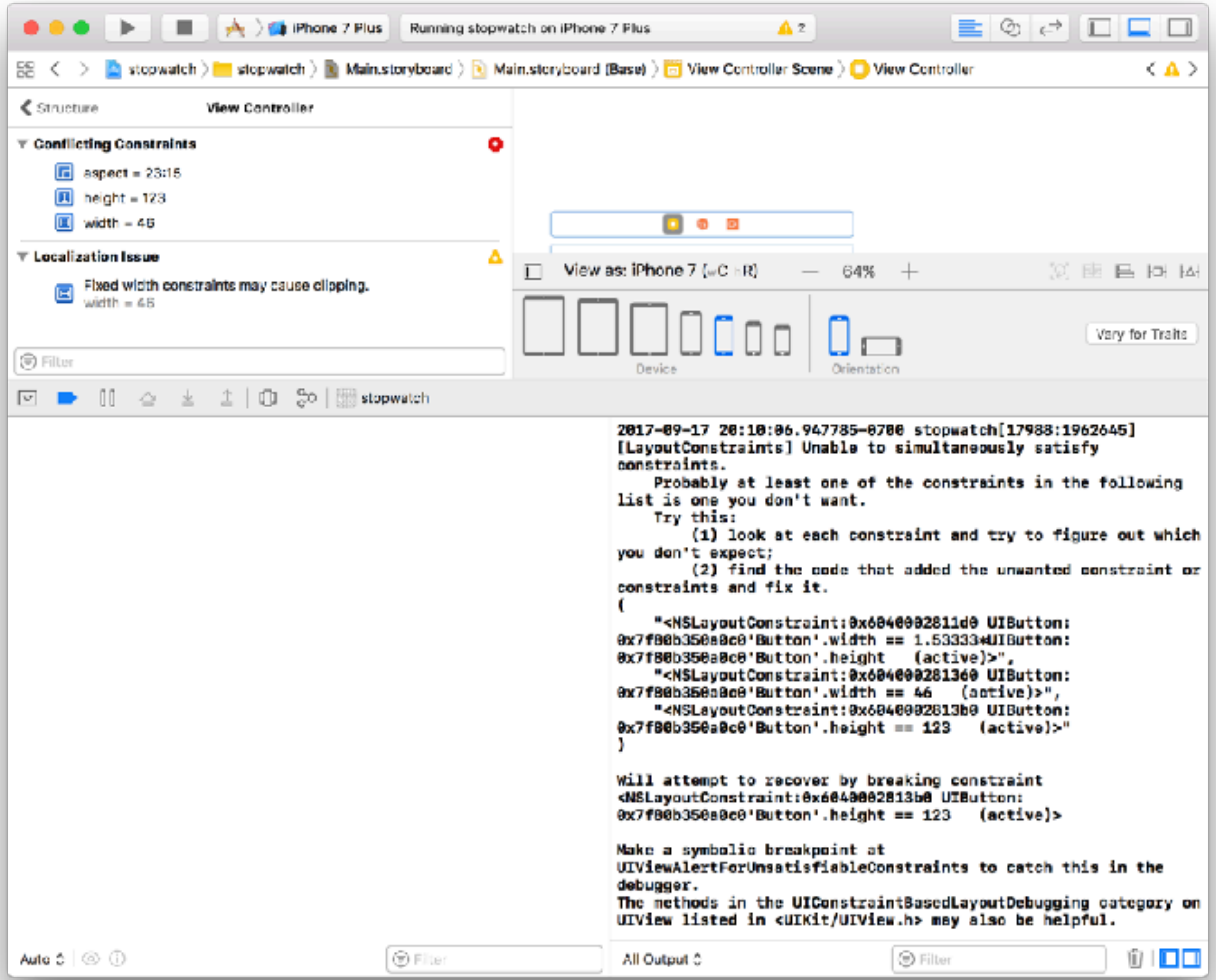
aspect = 23:15

height = 400

width = 46

Xcode will warn you when create multiple conflicting constraints

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
View as: iPhone 7 (wC hR)
64%
Device
Orientation
Vary for Traits
stopwatch
Auto
All Output
Filter

Conflicting Constraints
- aspect = 23:15
- height = 123
- width = 46

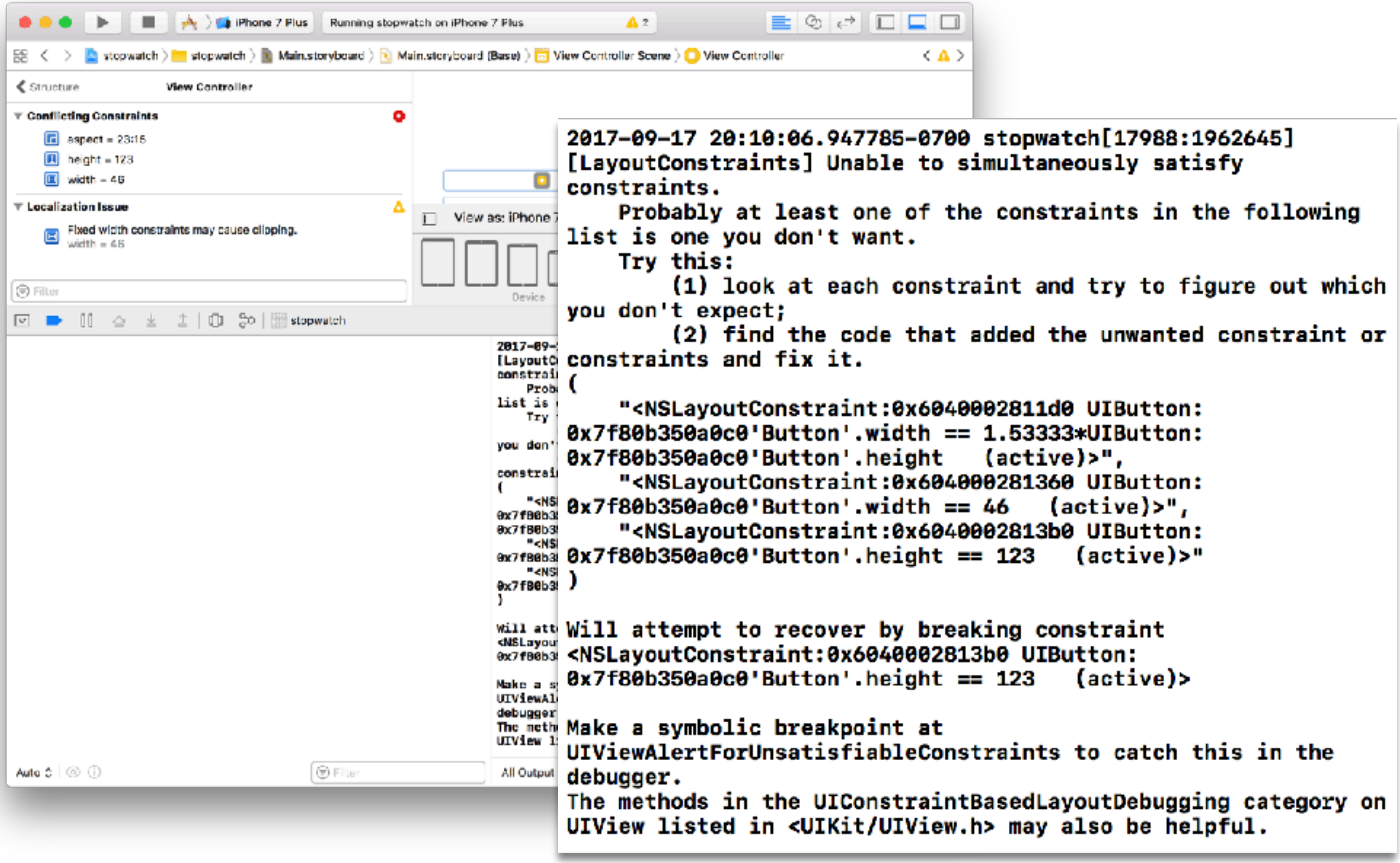
Localization Issue
- Fixed width constraints may cause clipping.
  width = 46

```
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.
```

conflicts



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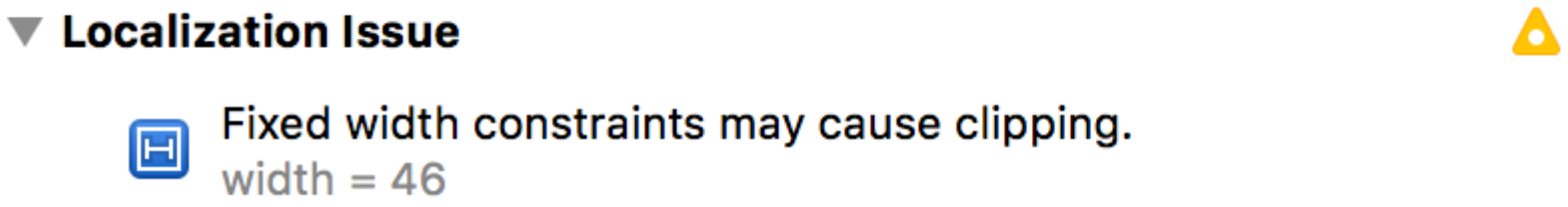
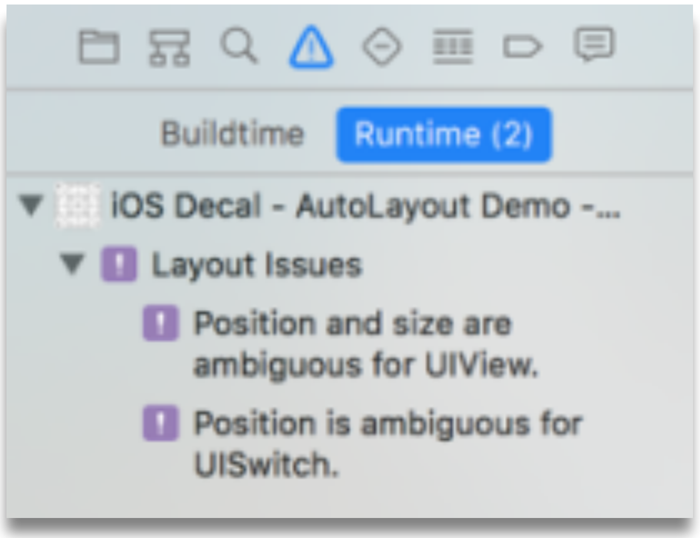
localization issues


Localization Issue

Fixed width constraints may cause clipping.
width = 46

fixed width constraints for text elements generate localization warnings

Debug View Hierarchy



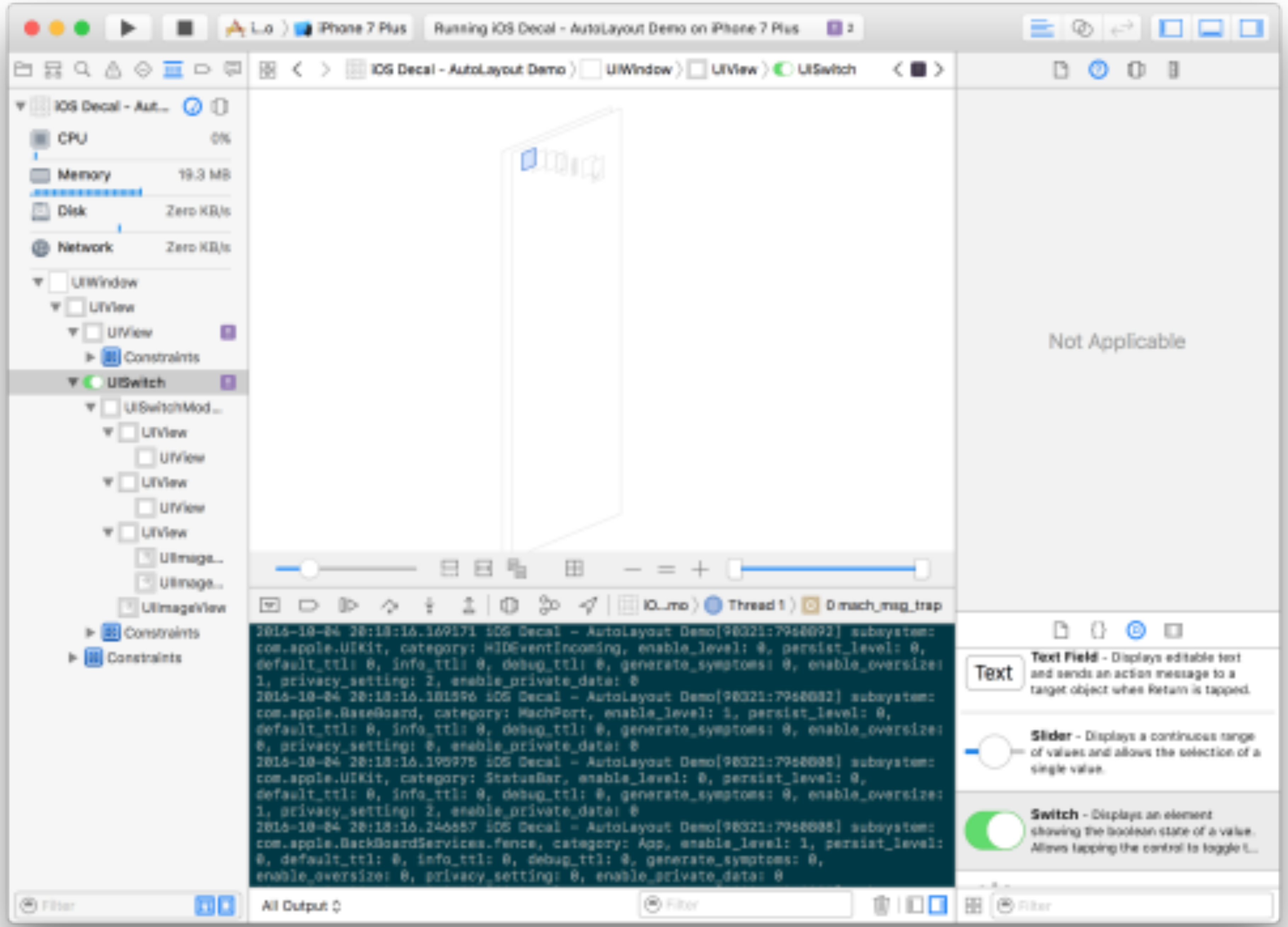
Buildtime | Runtime (2)

iOS Decal - AutoLayout Demo -...

Layout Issues

Position and size are ambiguous for UIView.

Position is ambiguous for UISwitch.



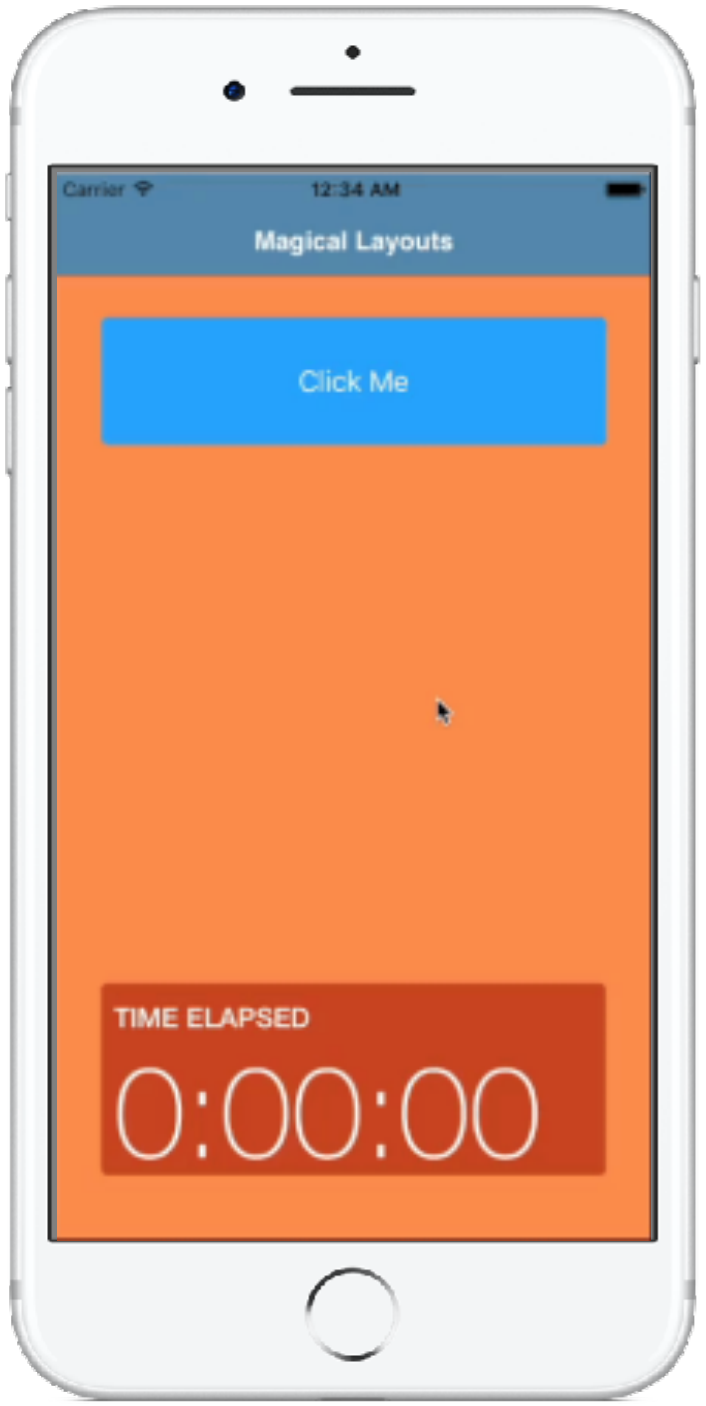
```
2016-10-04 20:18:16.169171 iOS Decal - AutoLayout Demo[90321:7960092] subsystem:
com.apple.UIKit, category: HIDEventIncoming, enable_level: 0, persist_level: 0,
default_ttl: 0, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize:
1, privacy_setting: 2, enable_private_data: 0
2016-10-04 20:18:16.181596 iOS Decal - AutoLayout Demo[90321:7960082] subsystem:
com.apple.BaseBoard, category: MachPort, enable_level: 1, persist_level: 0,
default_ttl: 0, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize:
0, privacy_setting: 0, enable_private_data: 0
2016-10-04 20:18:16.195975 iOS Decal - AutoLayout Demo[90321:7960008] subsystem:
com.apple.UIKit, category: StatusBar, enable_level: 0, persist_level: 0,
default_ttl: 0, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0, enable_oversize:
1, privacy_setting: 2, enable_private_data: 0
2016-10-04 20:18:16.246657 iOS Decal - AutoLayout Demo[90321:7960008] subsystem:
com.apple.BackBoardServices.fence, category: App, enable_level: 1, persist_level:
0, default_ttl: 0, info_ttl: 0, debug_ttl: 0, generate_symptoms: 0,
enable_oversize: 0, privacy_setting: 0, enable_private_data: 0
```

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

Slider - Displays a continuous range of values and allows the selection of a single value.

Switch - Displays an element showing the boolean state of a value. Allows tapping the control to toggle t...

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

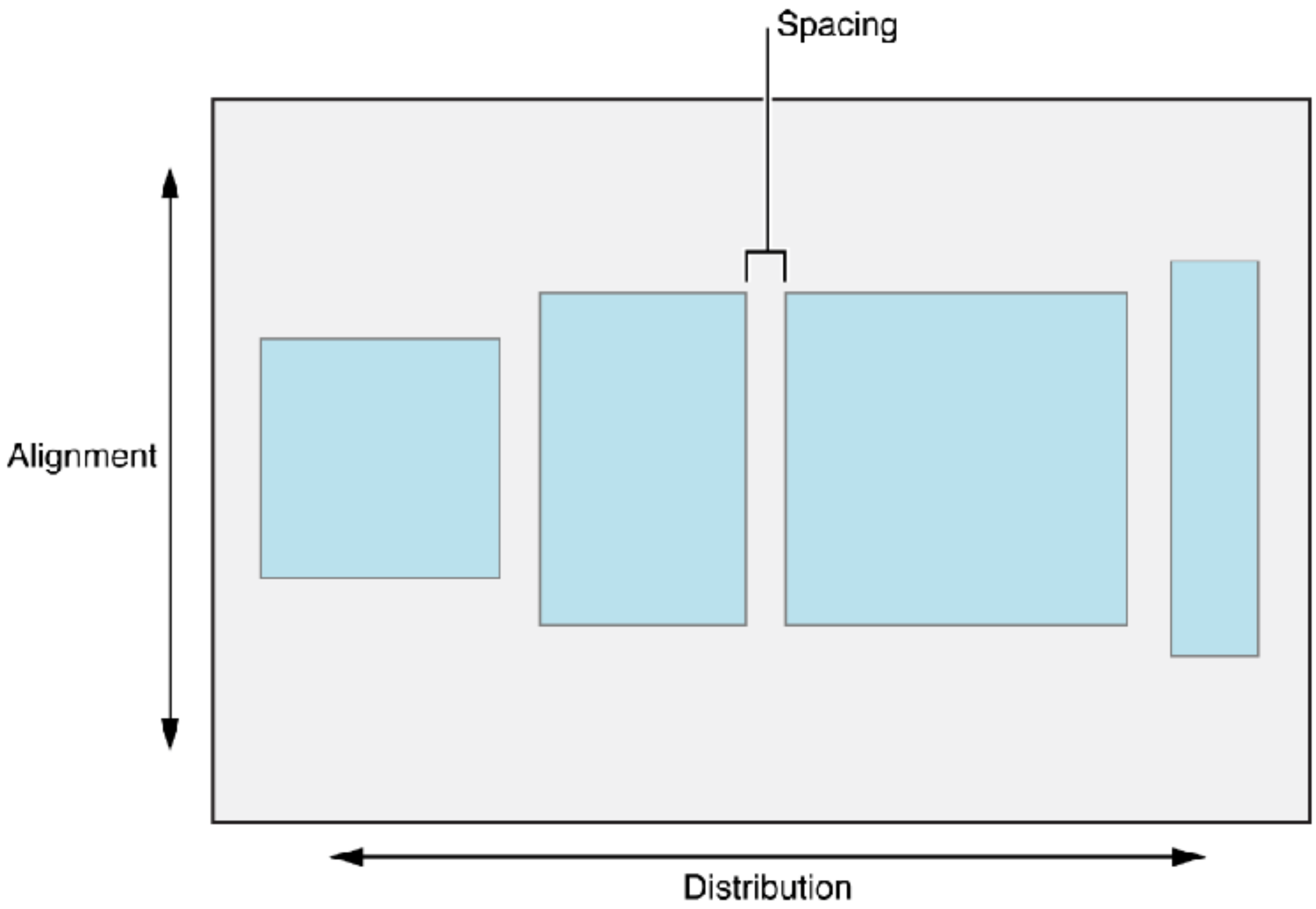
distribution - the distribution of the arranged views **along the stack view's axis**

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

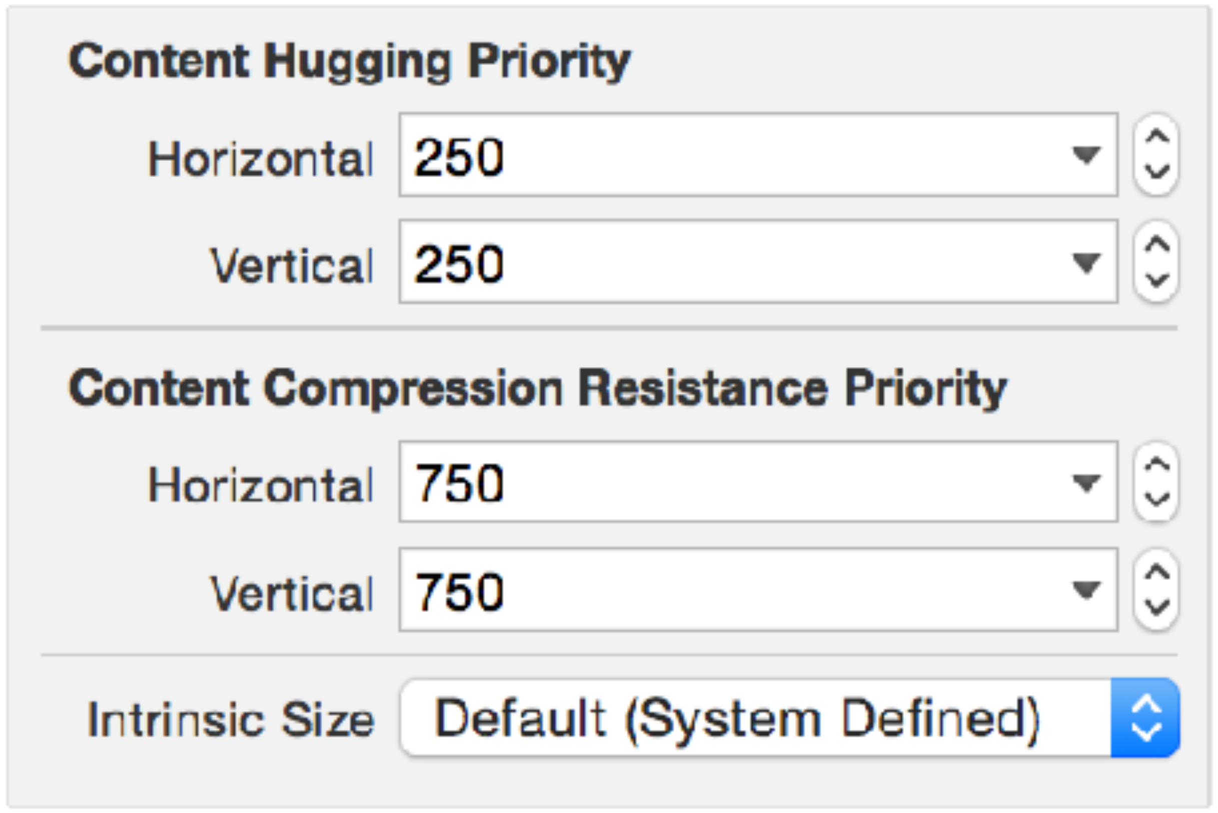


hugging / compression

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



Content Hugging Priority

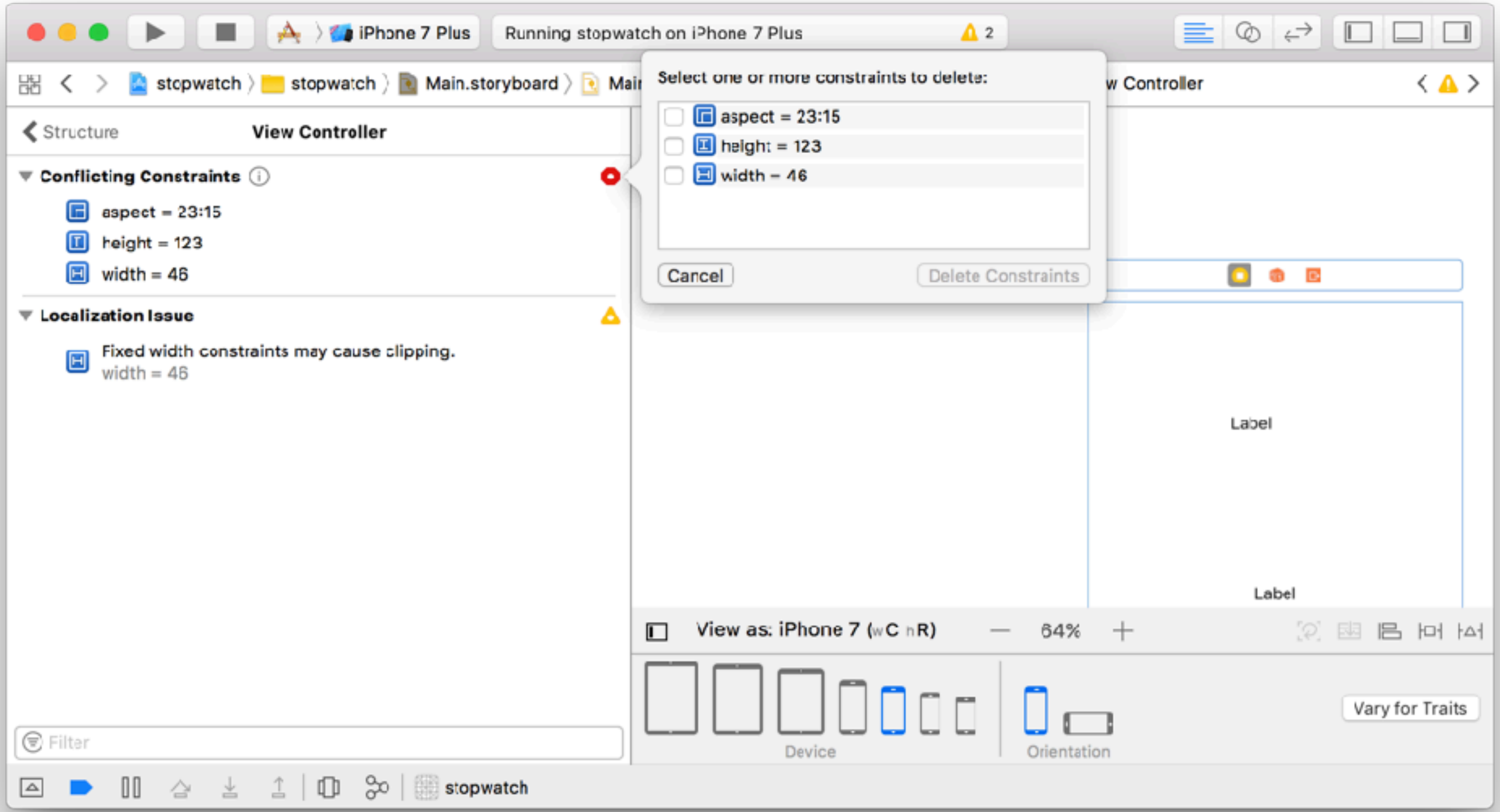
Horizontal	250
Vertical	250

Content Compression Resistance Priority

Horizontal	750
Vertical	750
Intrinsic Size	Default (System Defined)

some AutoLayout tricks

resolving conflicts



Running stopwatch on iPhone 7 Plus

Select one or more constraints to delete:

- aspect = 23:15
- height = 123
- width = 46

Conflicting Constraints

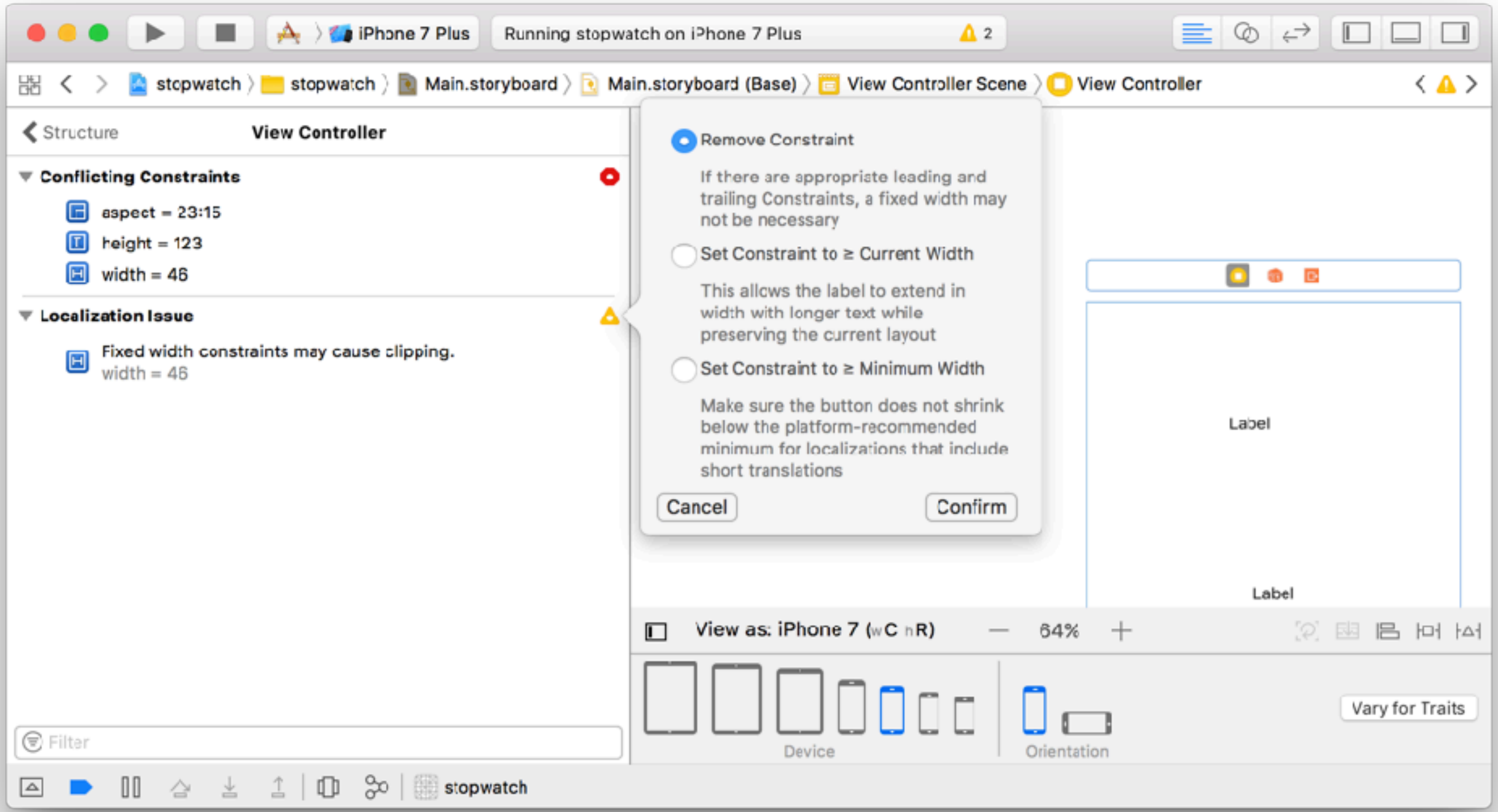
- aspect = 23:15
- height = 123
- width = 46

Localization Issue

Fixed width constraints may cause clipping.
width = 46

tap on warning icon to reveal tips to resolve your issue

resolving localization issues



Running stopwatch on iPhone 7 Plus

stopwatch 〉 stopwatch 〉 Main.storyboard 〉 Main.storyboard (Base) 〉 View Controller Scene 〉 View Controller

Conflicting Constraints

- aspect = 23:15
- height = 123
- width = 46

Localization Issue

Fixed width constraints may cause clipping.
width = 46

(●) Remove Constraint

If there are appropriate leading and trailing Constraints, a fixed width may not be necessary

( ) Set Constraint to ≥ Current Width

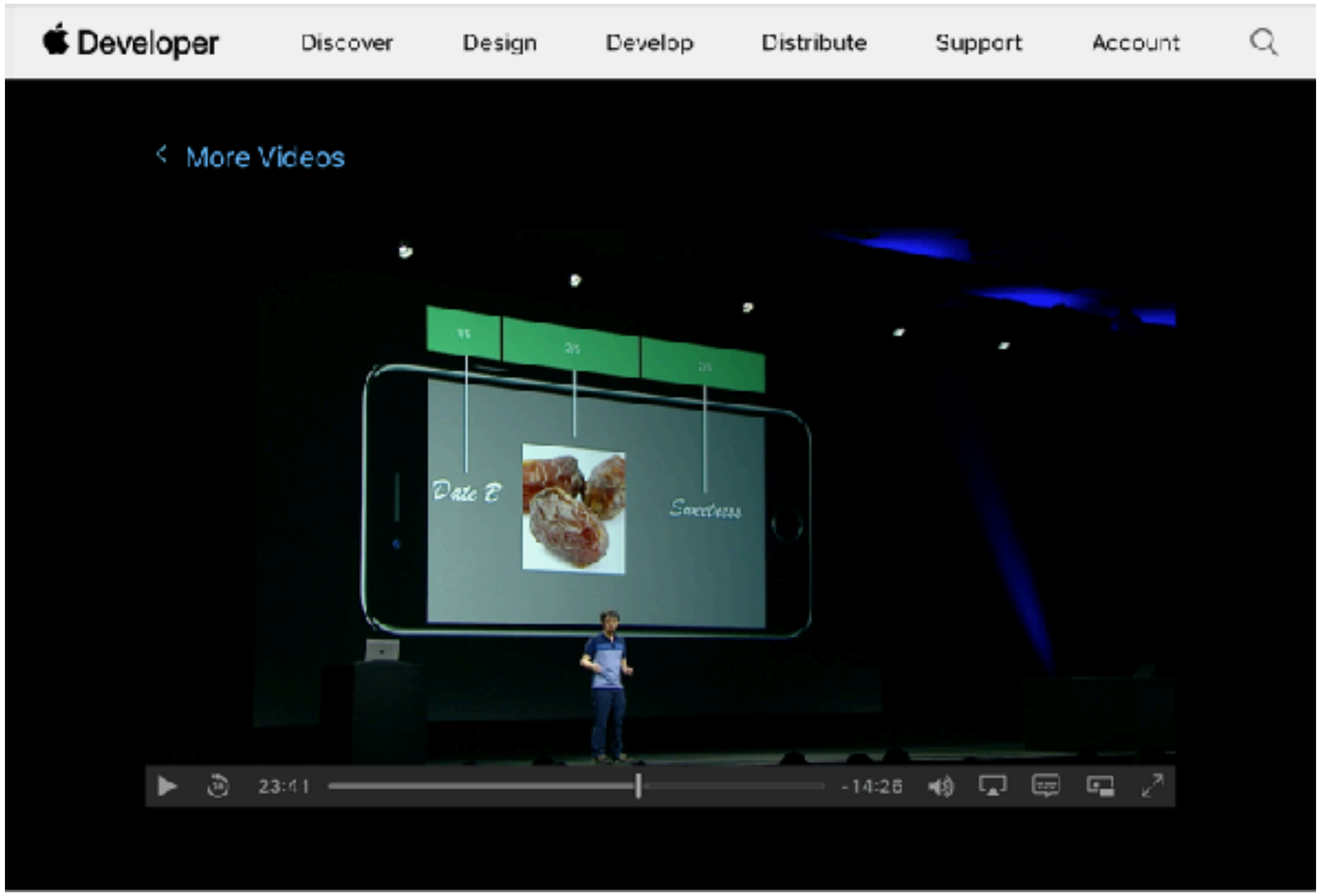
This allows the label to extend in width with longer text while preserving the current layout

( ) Set Constraint to ≥ Minimum Width

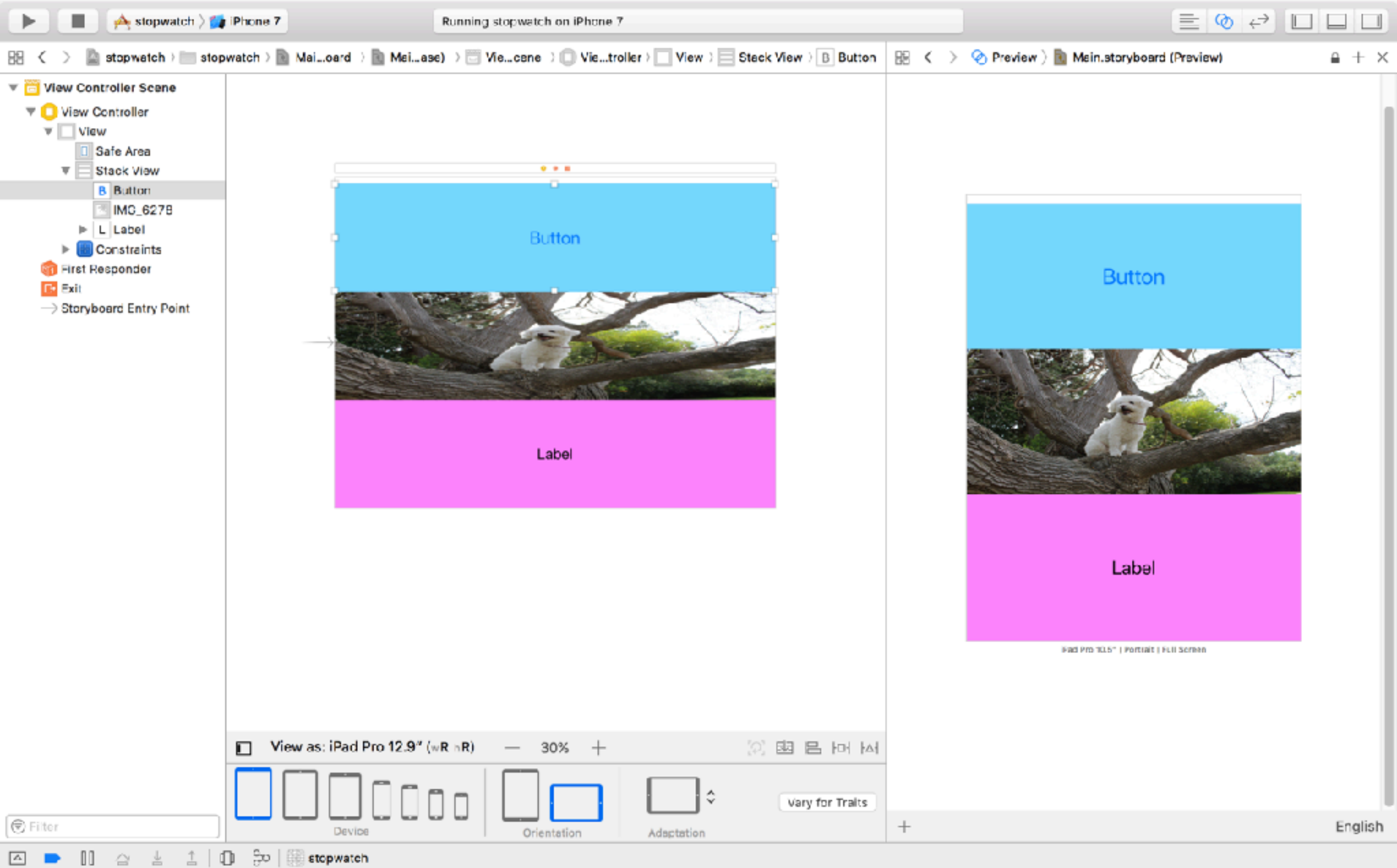
Make sure the button does not shrink below the platform-recommended minimum for localizations that include short translations

spacer views

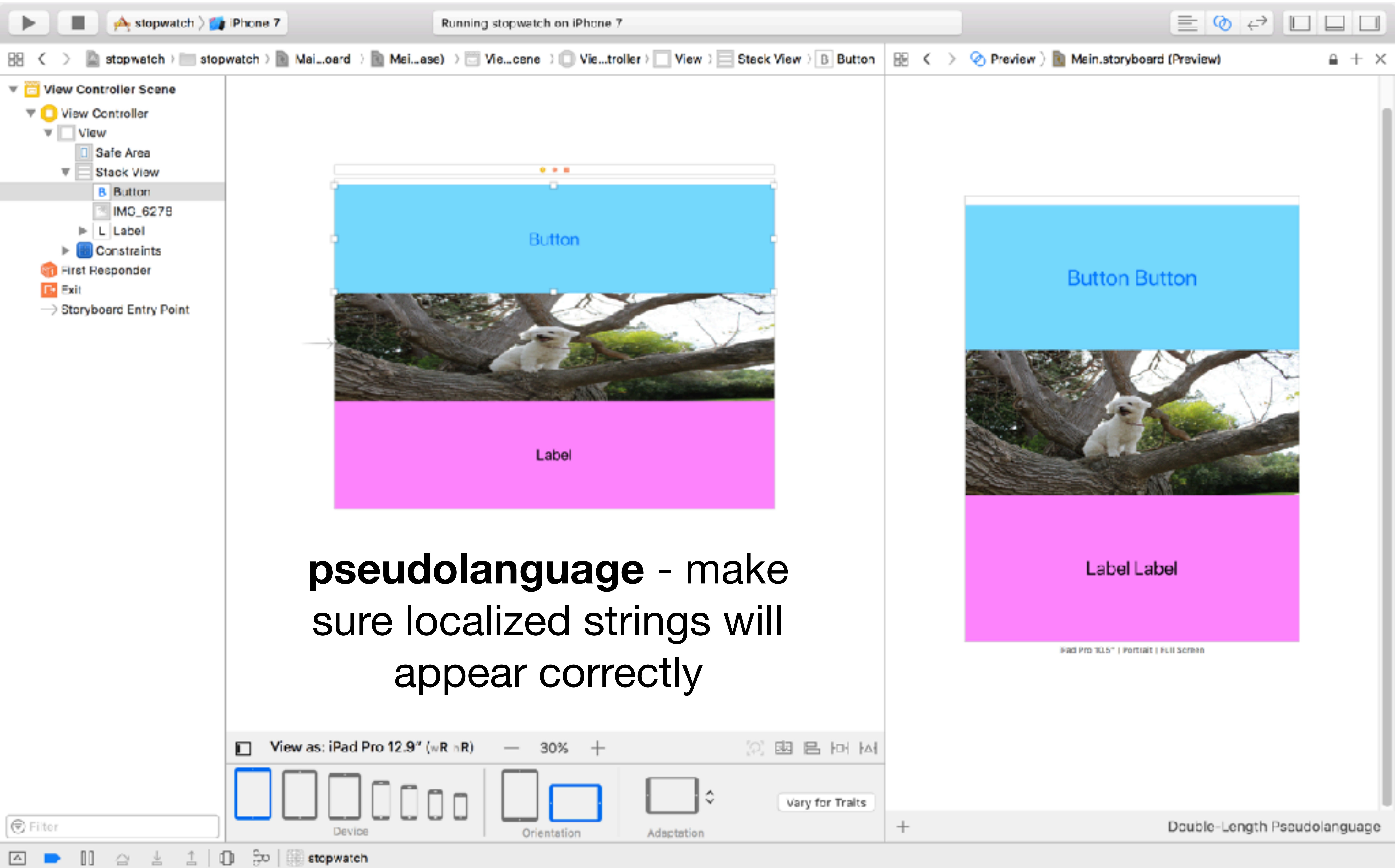
spacer views - hidden UIViews to enforce proportions



preview mode

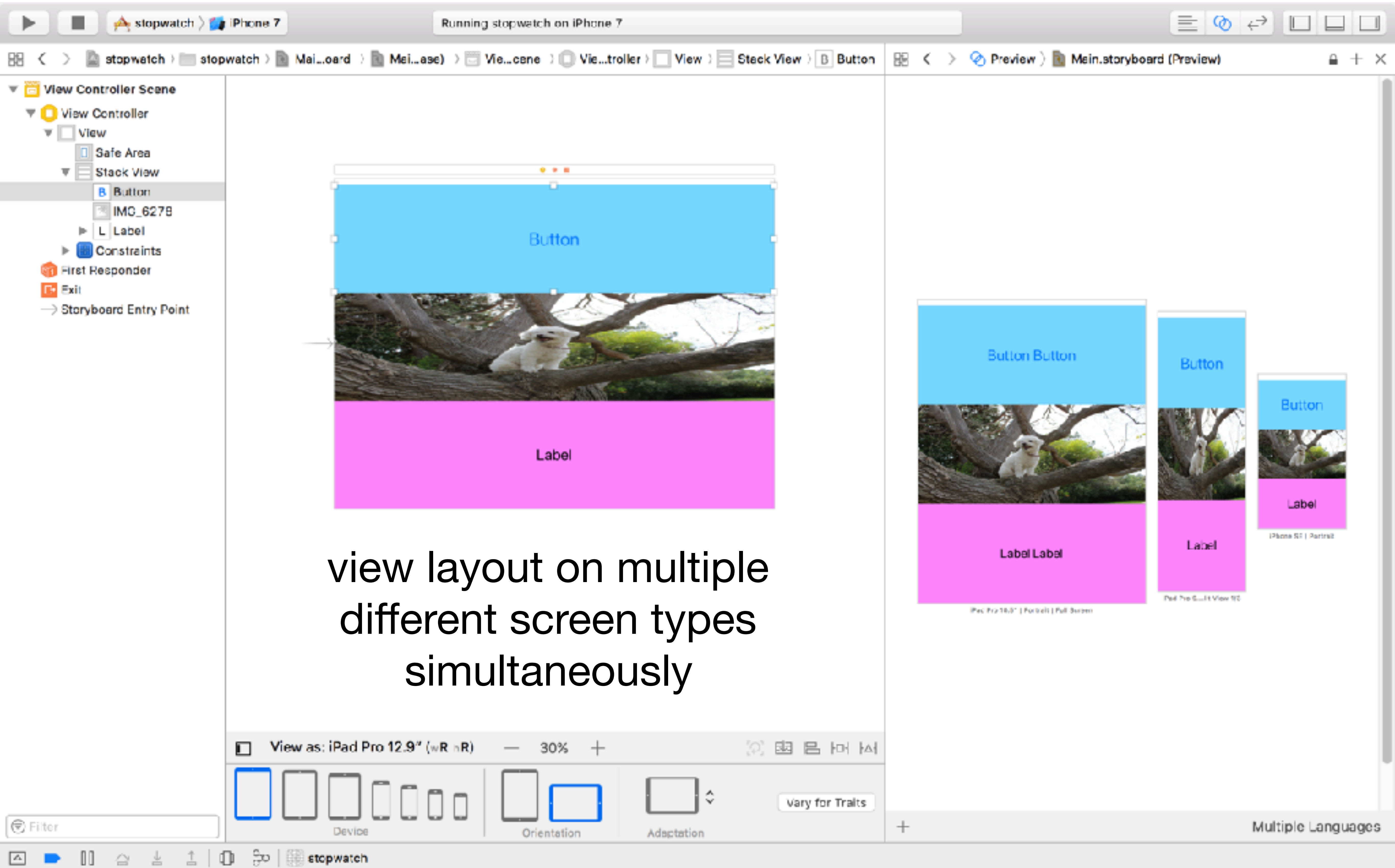


preview mode



pseudolanguage - make sure localized strings will appear correctly

preview mode



view layout on multiple different screen types simultaneously

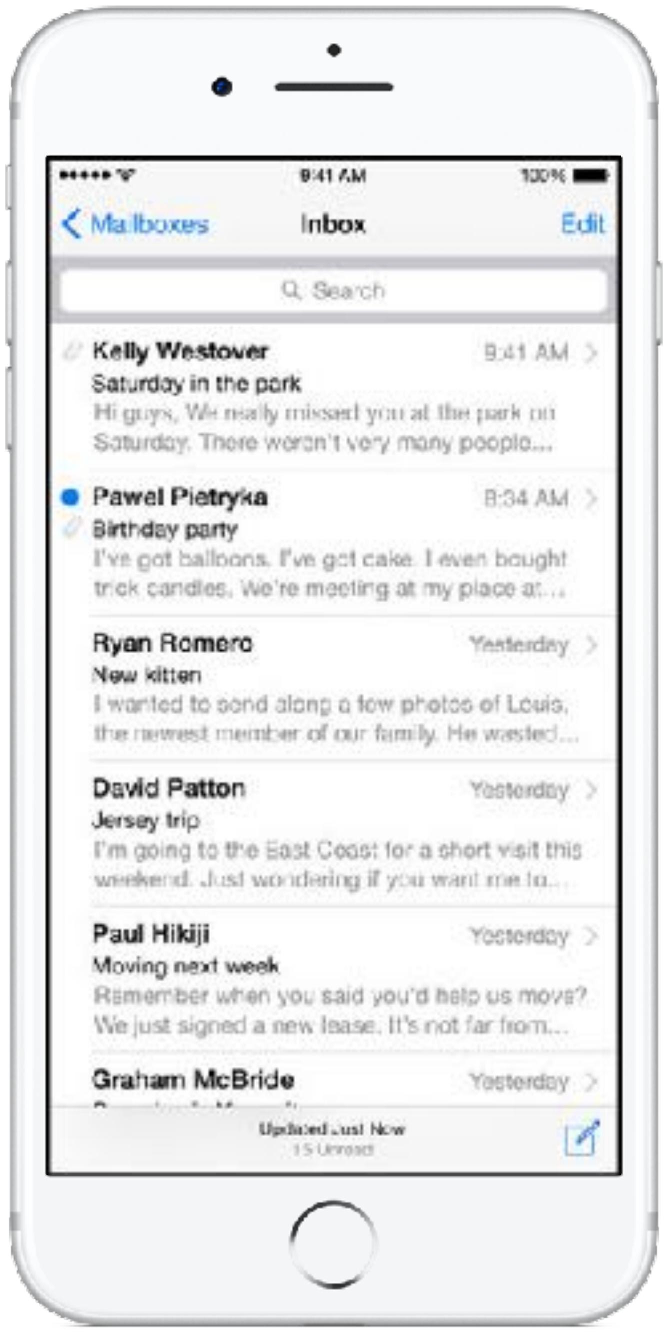
extra slides

… but what if I want a completely different UI on device rotation?

answer

size classes

size classes - motivation



9:41 AM 100%

Mailboxes Inbox Edit

Search

Kelly Westover 9:41 AM
Saturday in the park
Hi guys, We really missed you at the park on Saturday. There weren't very many people...

Pawel Pietryka 8:34 AM
Birthday party
I've got balloons. I've got cake. I even bought trick candles. We're meeting at my place at...

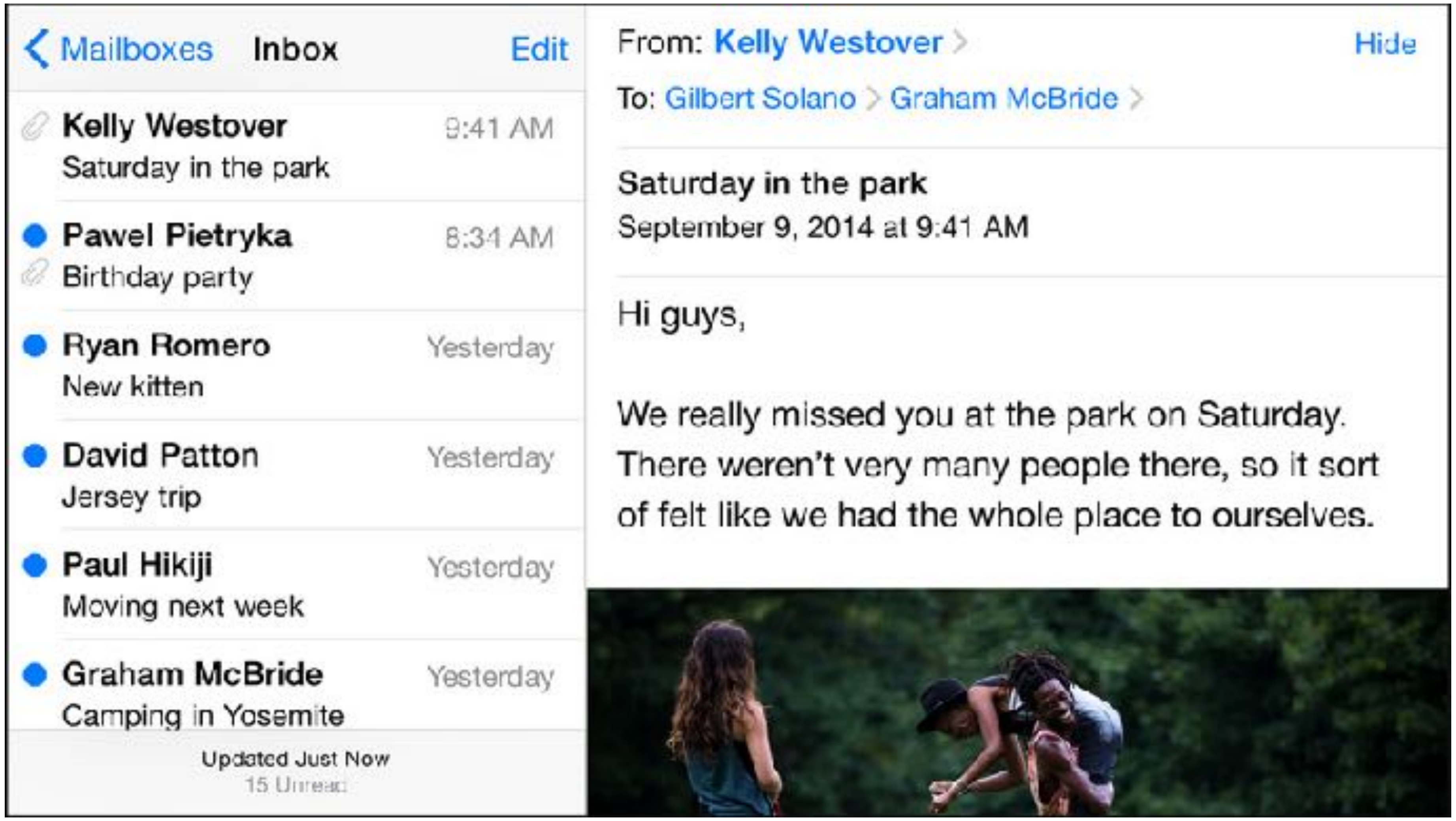
Ryan Romero Yesterday
New kitten
I wanted to send along a few photos of Louis, the newest member of our family. He wasted...

David Patton Yesterday
Jersey trip
I'm going to the East Coast for a short visit this weekend. Just wondering if you want me to...

Paul Hikiji Yesterday
Moving next week
Remember when you said you'd help us move? We just signed a new lease. It's not far from...

Graham McBride Yesterday

Updated Just Now
15 Unread



Mailboxes Inbox Edit

Kelly Westover 9:41 AM
Saturday in the park

Pawel Pietryka 8:34 AM
Birthday party

Ryan Romero Yesterday
New kitten

David Patton Yesterday
Jersey trip

Paul Hikiji Yesterday
Moving next week

Graham McBride Yesterday
Camping in Yosemite

Updated Just Now
15 Unread

From: Kelly Westover Hide

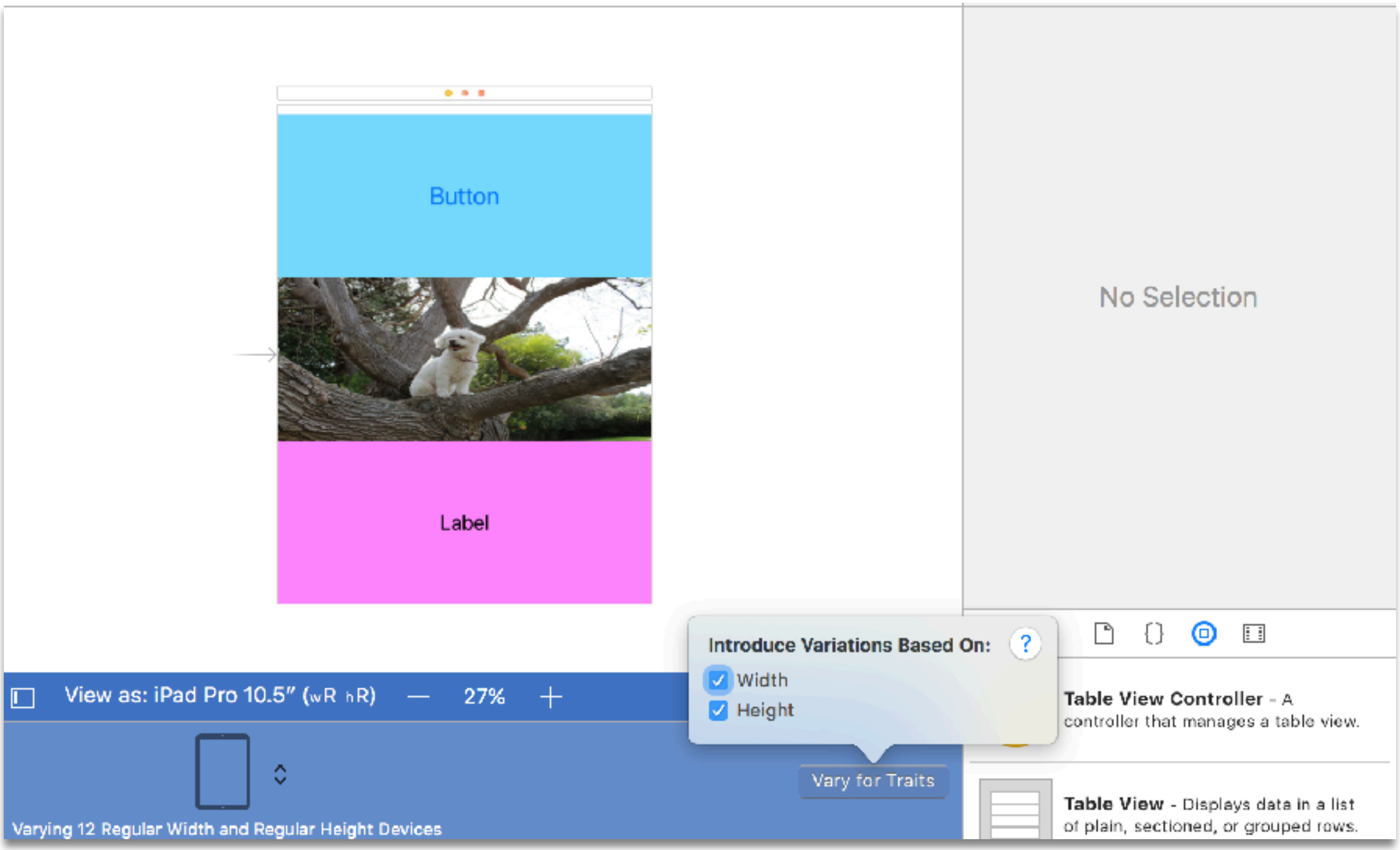
To: Gilbert Solano Graham McBride

Saturday in the park
September 9, 2014 at 9:41 AM

Hi guys,

We really missed you at the park on Saturday. There weren't very many people there, so it sort of felt like we had the whole place to ourselves.

size classes



Button
Label
No Selection
View as: iPad Pro 10.5" (wR hR)
27%
Vary for Traits
Varying 12 Regular Width and Regular Height Devices

Introduce Variations Based On:

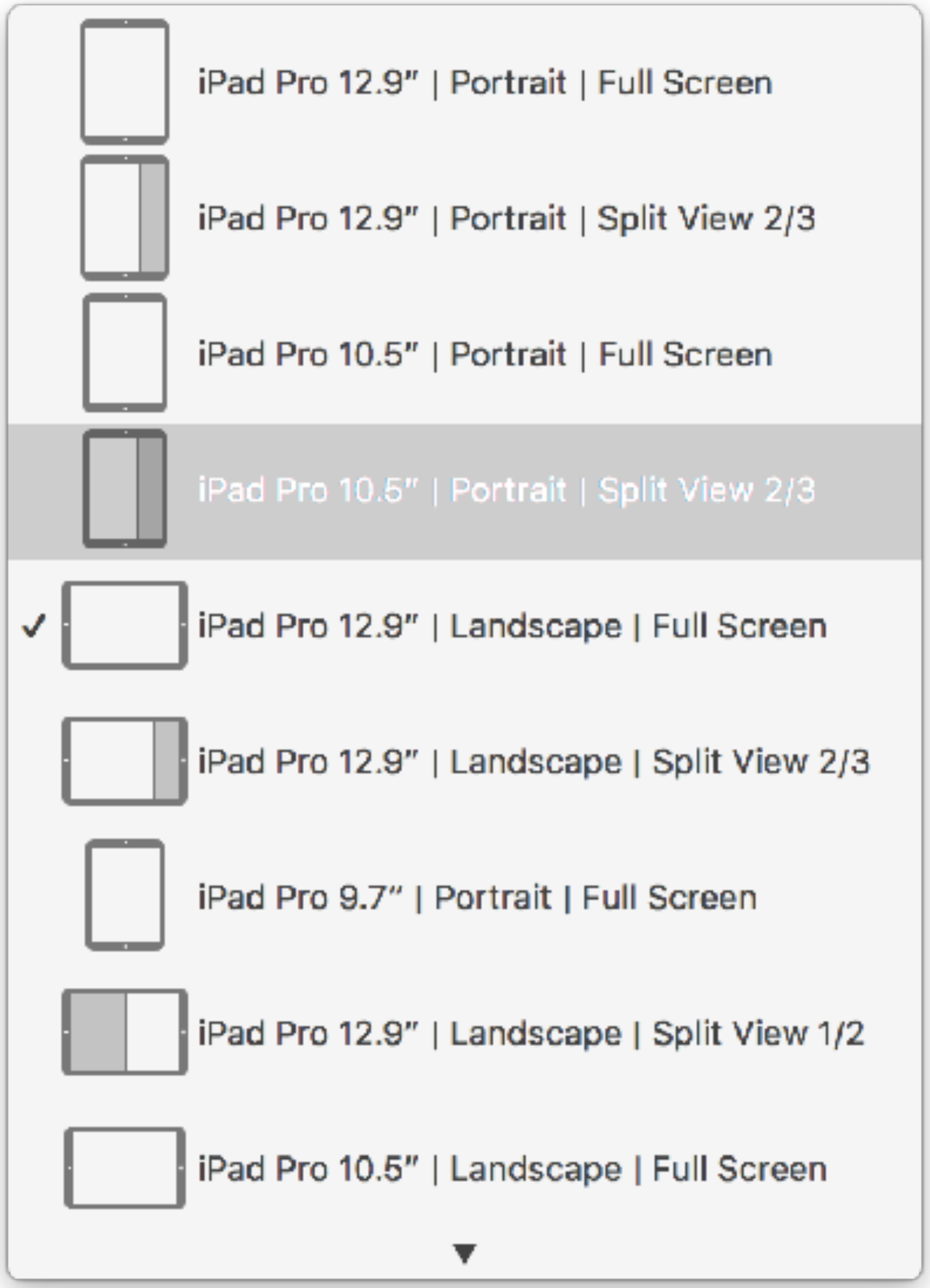
- [✓] Width
- [✓] Height

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

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

size classes

size classes allow you to create different constraints depending on the device **size, orientation, type,** etc.


iPad Pro 12.9" | Portrait | Full Screen
iPad Pro 12.9" | Portrait | Split View 2/3
iPad Pro 10.5" | Portrait | Full Screen
iPad Pro 10.5" | Portrait | Split View 2/3
✓ iPad Pro 12.9" | Landscape | Full Screen
iPad Pro 12.9" | Landscape | Split View 2/3
iPad Pro 9.7" | Portrait | Full Screen
iPad Pro 12.9" | Landscape | Split View 1/2
iPad Pro 10.5" | Landscape | Full Screen