Beginning iOS 10 Development

Views

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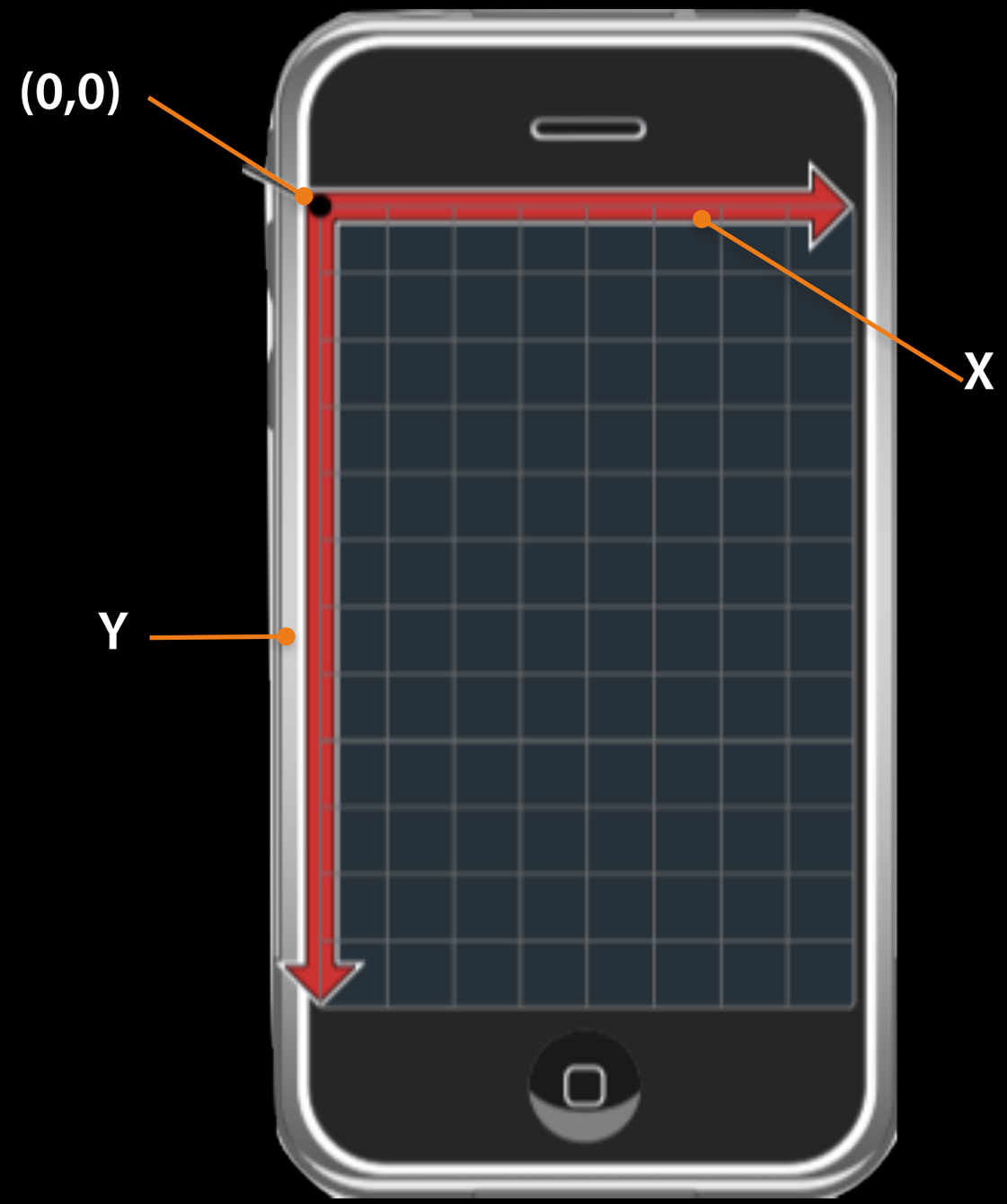
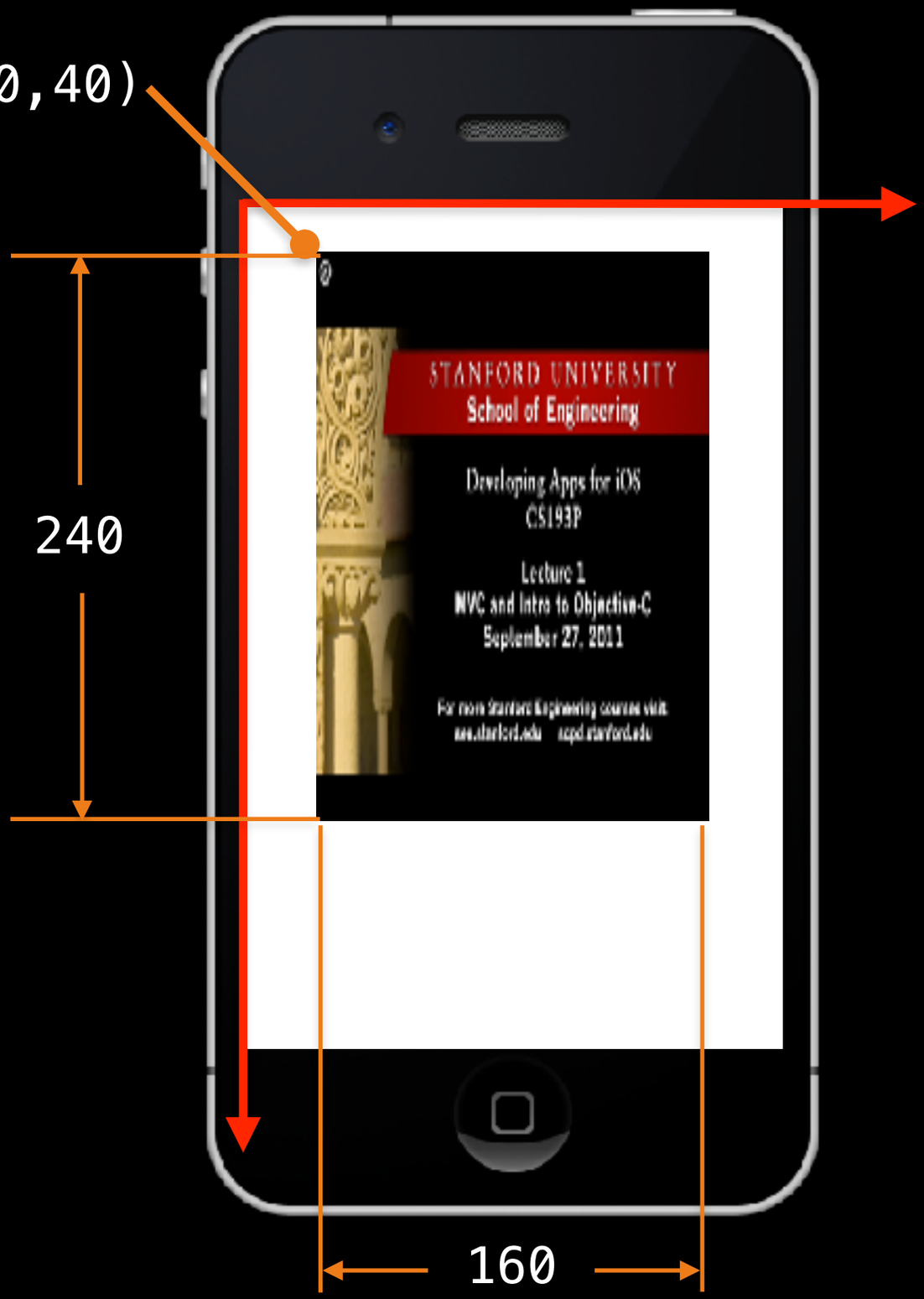
View Geometry

UIKit Coordinates



View Geometry



frame

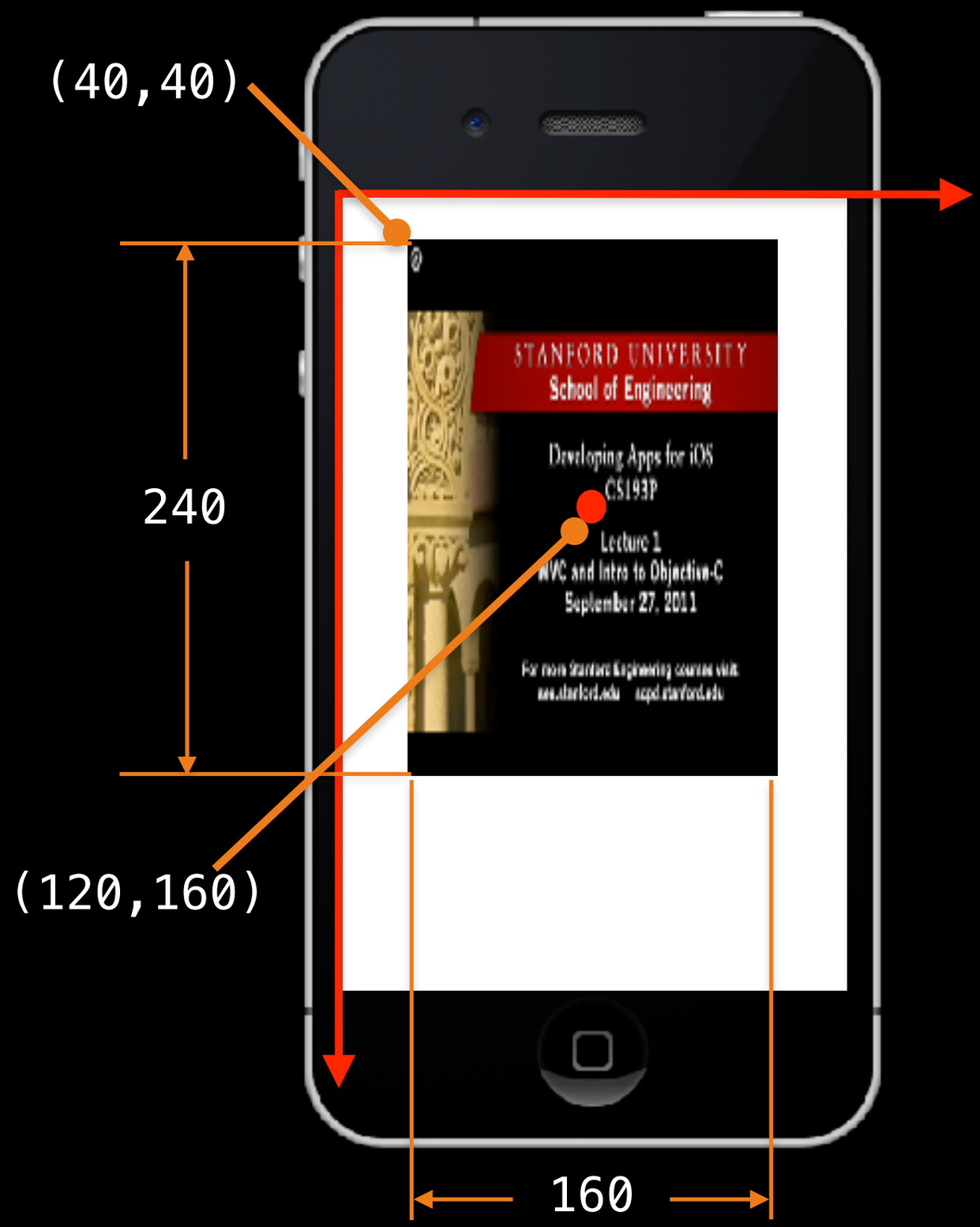
the size and location of the view in its superview's coordinate system

CGRect frame;

- CGPoint origin
- CGSize size

```
imageView.frame.origin.x
imageView.frame.origin.y
imageView.frame.size.width
imageView.frame.size.height
```

View Geometry



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```
imageView.frame.origin.x
imageView.frame.origin.y
imageView.frame.size.width
imageView.frame.size.height
```

center

the center point of the view in its superview's coordinate system

CGPoint center;

```
imageView.center.x
imageView.center.y
```

The View Geometry

bound

the size of the view (and its content origin) in the view's own local coordinate system

CGRect bound;

- CGPoint origin
- CGSize size

```
imageView.bound.origin.x
imageView.bound.origin.y
imageView.bound.size.width
imageView.bound.size.height
```

Points vs. Pixels

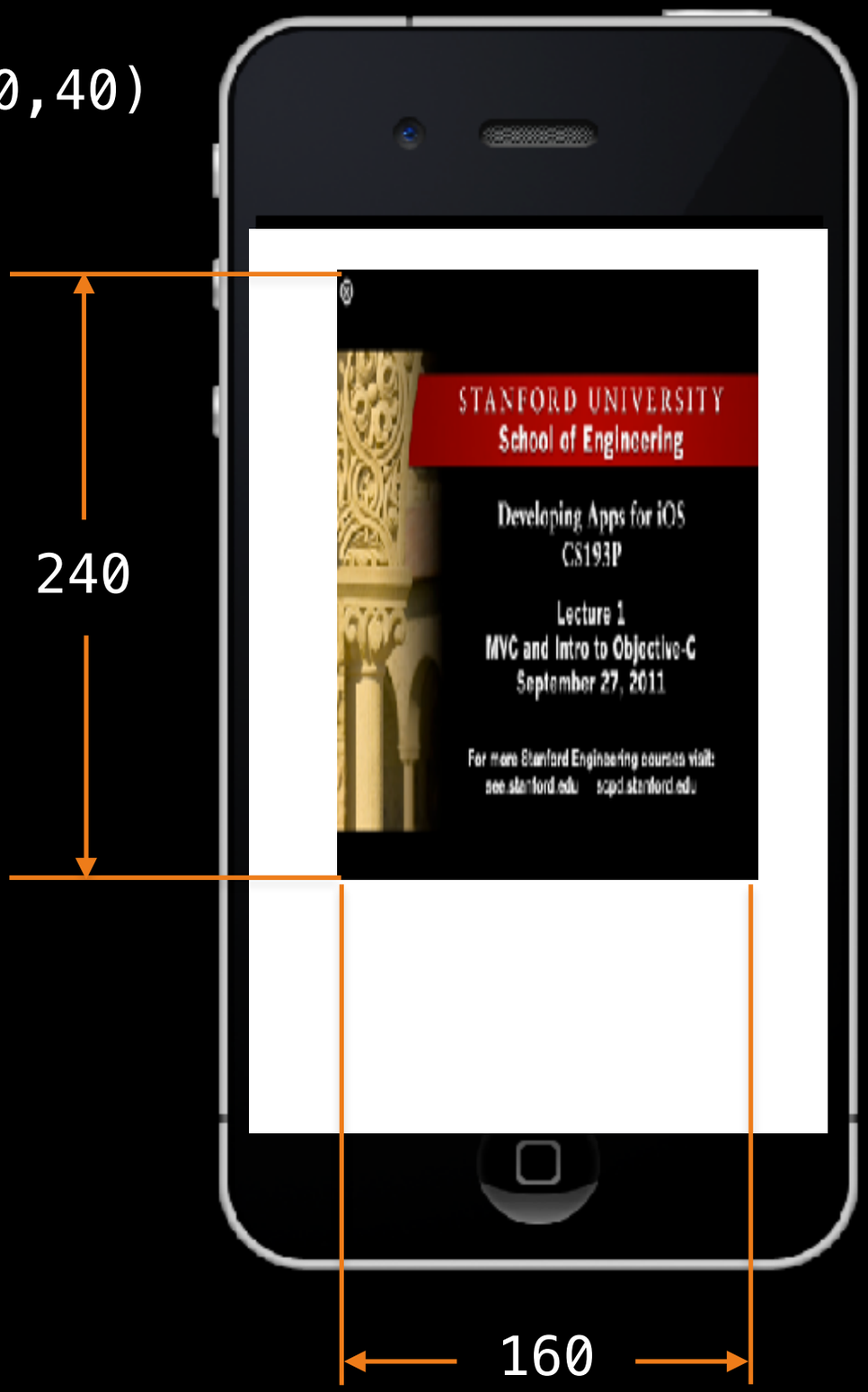
- All iOS devices are measured in pixels
- All coordinate systems are specified in points
- iOS does the mapping automatically

Device	**Points vs. Pixels**
non-Retina Display	1 point = 1 pixel
Retina Display	1 point = 2 pixel
HD Display	1 point = 3 pixels

Points vs. Pixes

Device	Device Dimensions (pixes)	Screen Dimensions (points)
iPhone 7/6 Plus	1242x2208	414x736
iPhone 7/6	750x1334	375x667
iPhone 5	640x1136	320x568
iPhone 4	640x960	320x480

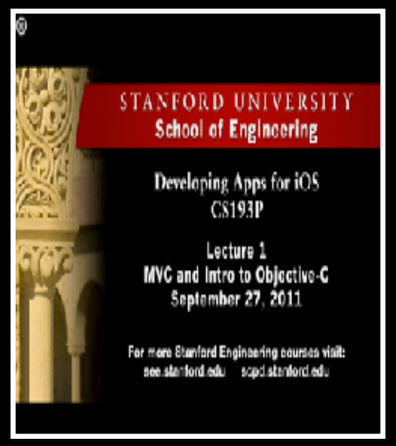
(40,40)



240

160

Non-Retina Display



240x160
cover.png

Retina Display

480x320
cover@2x.png

Content Modes

- The **contentMode** property -- how the view recycles its content in response to the changes in its geometry
  - Non-distorting
  - Distorting

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Non-distorting

ViewContentModeAspectFit

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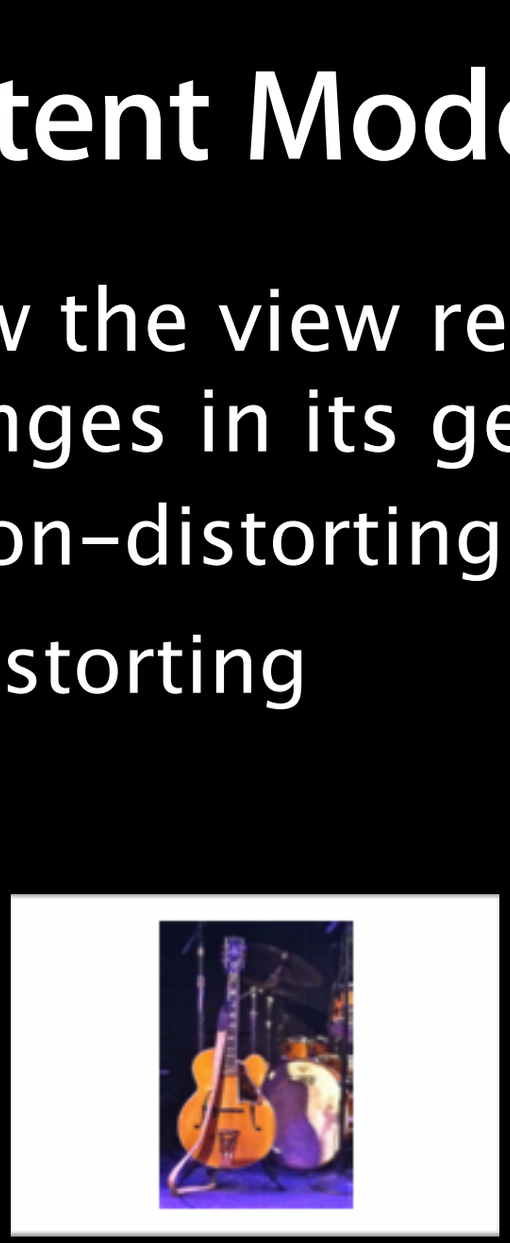

Non-distorting

ViewContentModeAspectFill

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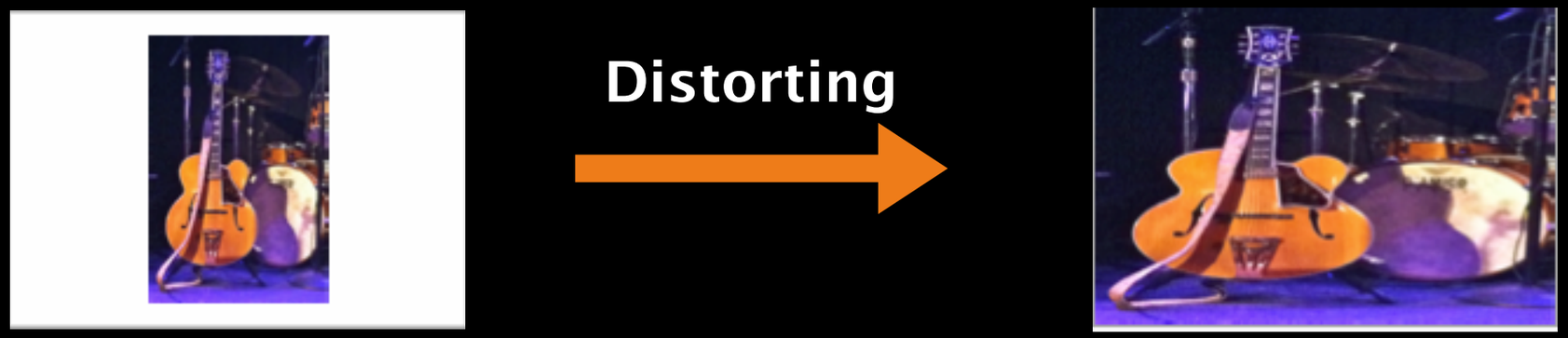


ViewContentModeScaleToFill

Auto Layout

Auto-layout

- A constraint-based descriptive layout system
- Create UIs adaptive to changes in screen size and device orientation
- View frames (sizes and positions) are calculated automatically
- Each view needs four properties (two in each dimension)

Constraints

- Geometric properties of views

```
button1.width = 30; button1.height = 15;
```

- Geometric relationships between views

```
button1.width = button2.width;
```

Relationships have a coefficient and a constant

```
button1.width = 2 * button2.width + 10;
```

Constraints

- Can be equalities and inequalities

```
button1.width >= 120;
```

- Constraints have priorities

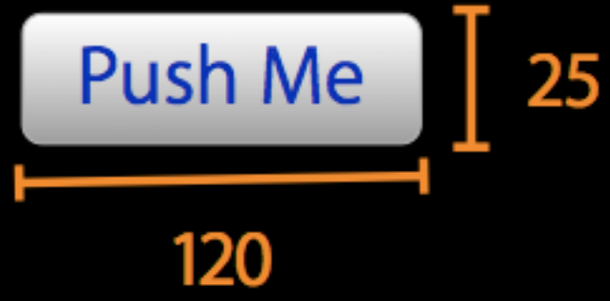
```
button1.width >=60 with priority 1000

button1.width = 120 with priority 750
```

  - priority = 1000: the constraint must be met
  - priority < 1000: the constraint is optional and is satisfied in a best-effort manner

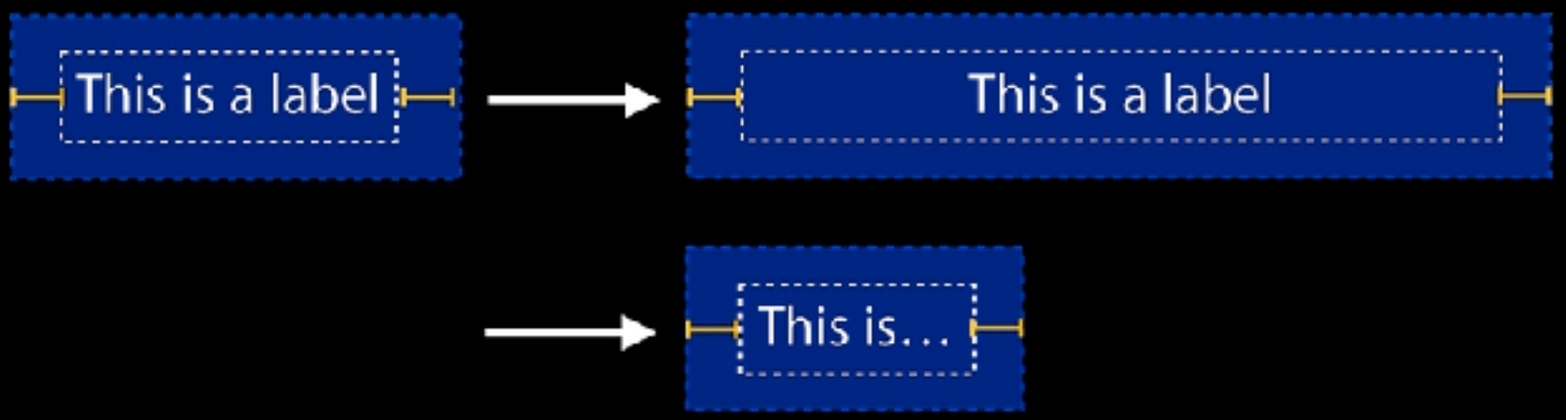
Intrinsic Content Size

- Some views (e.g., buttons, labels) display content which naturally defines a preferred size of the view
- An intrinsic content size generates two constraints per dimension



Intrinsic Content Size Properties

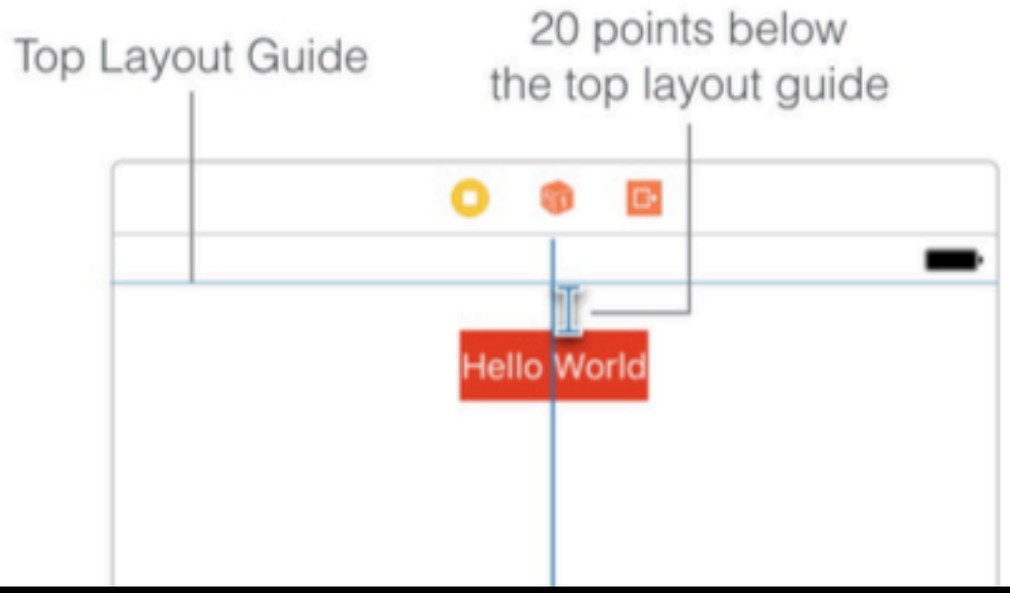
- Content hugging priority — how easy a control is allowed to grow
- Content Compression resistance priority — How easy a control is allowed to be squished

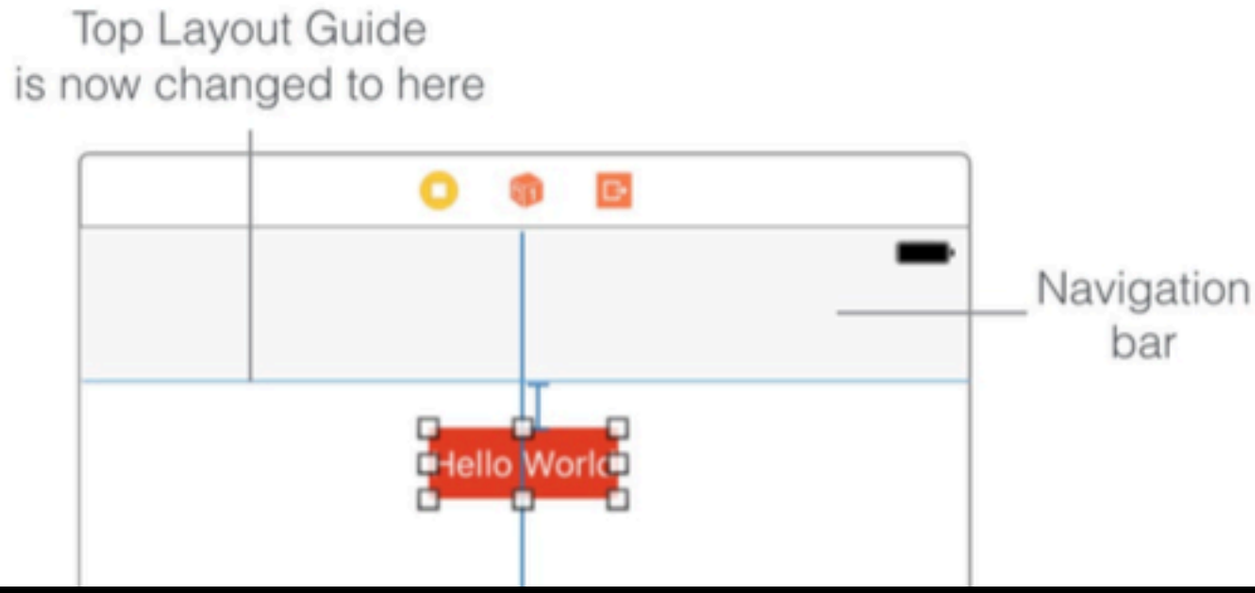


Default

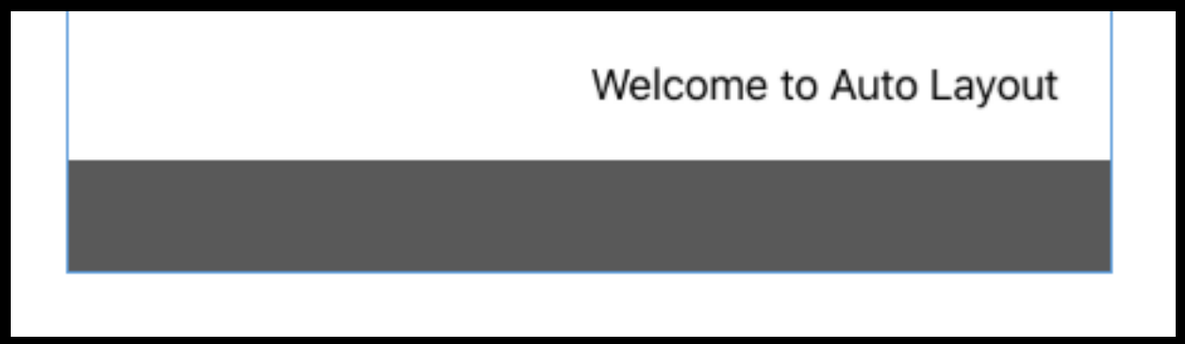
- Low content hugging priority (250) — allow self to grow
- High compression resistance priority (750) — not allow self to shrink

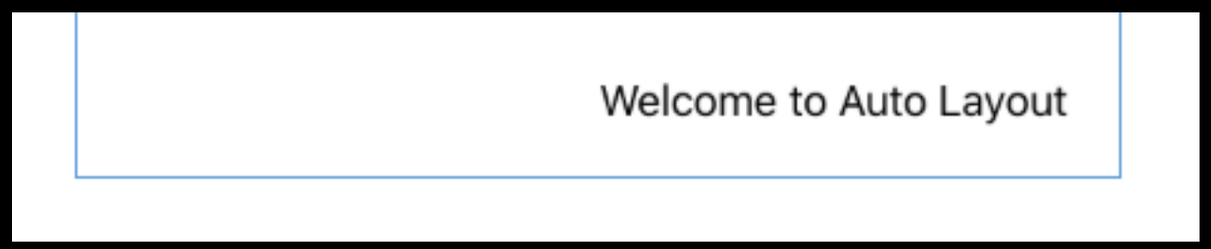
Top Layout Guide





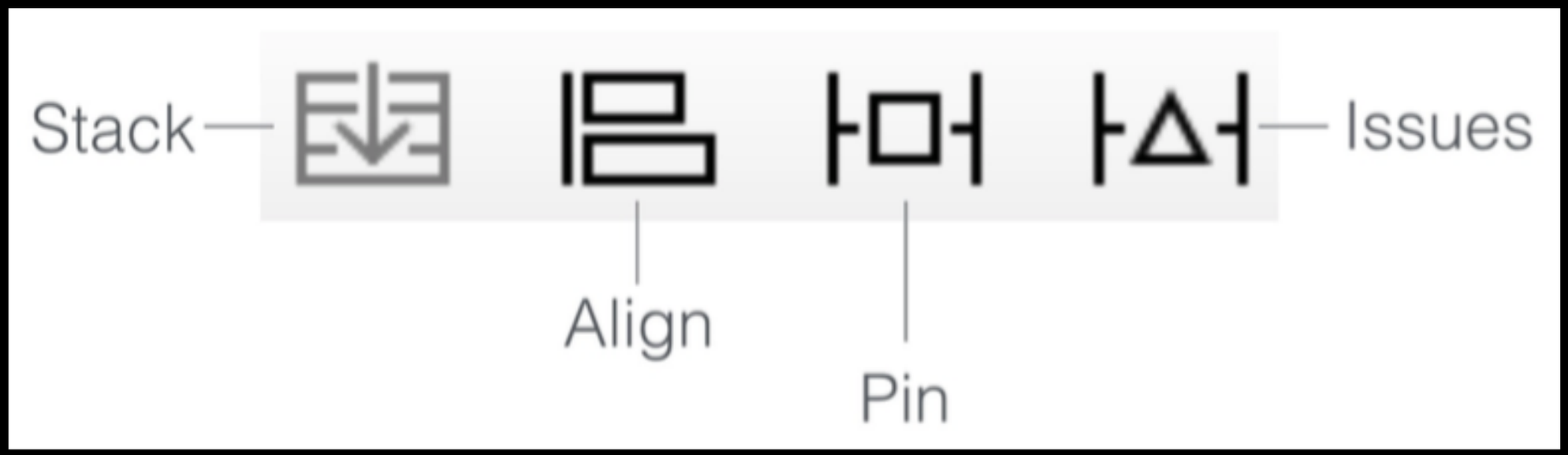
Bottom Layout Guide





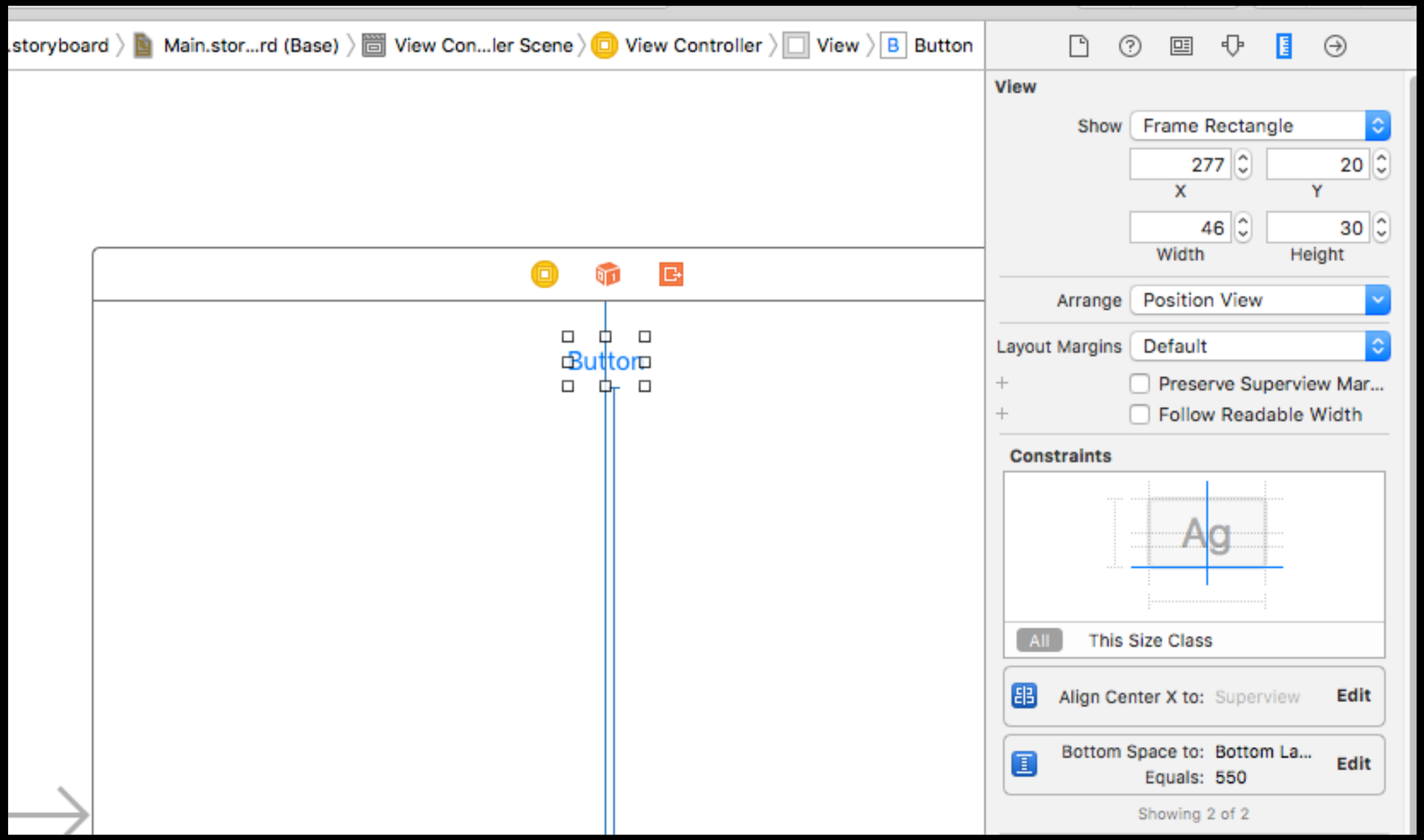
Define Constraints in Xcode

- Auto-layout bar

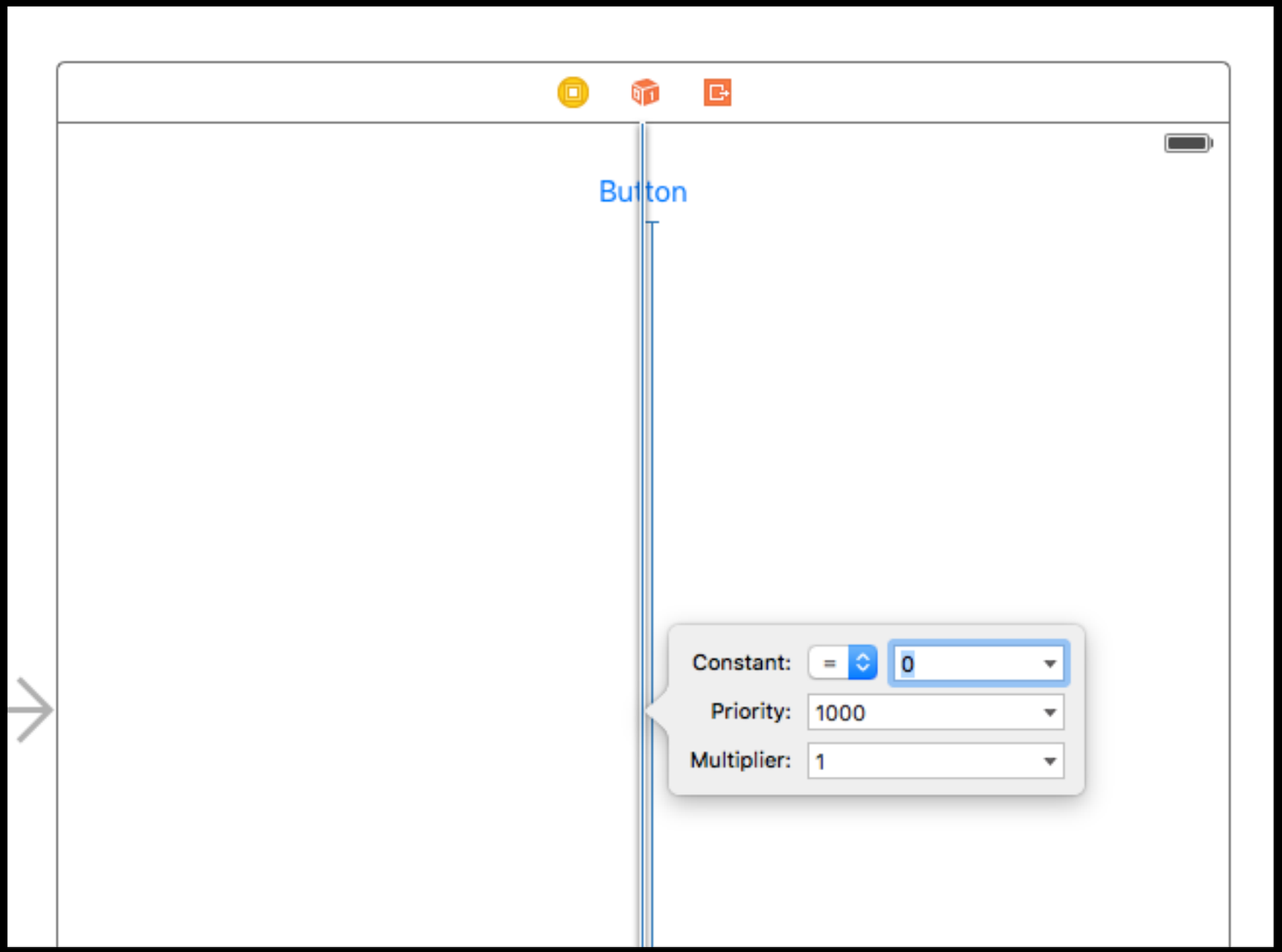


- Ctrl-drag

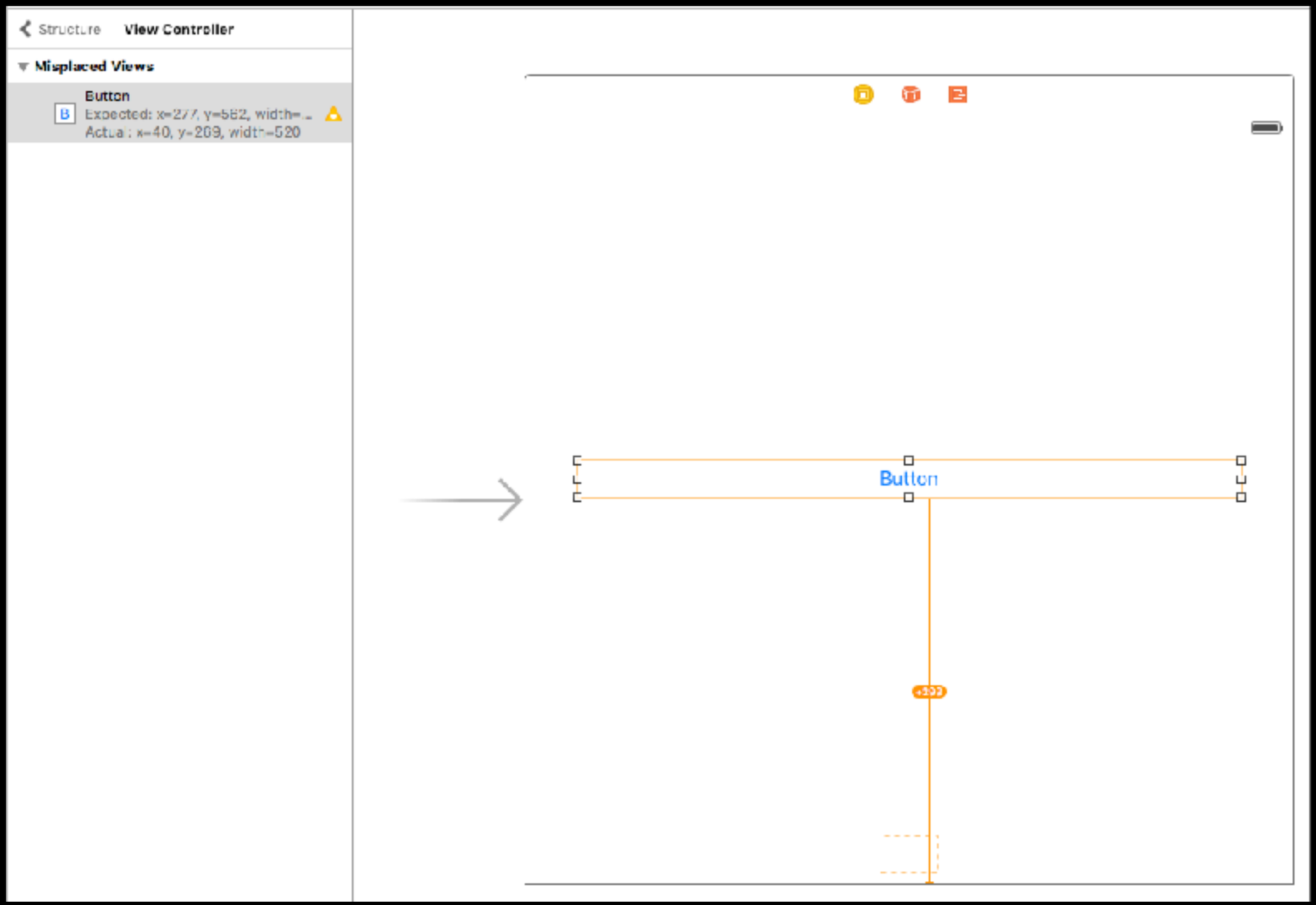
Editing a Constraint — Attributes Inspector



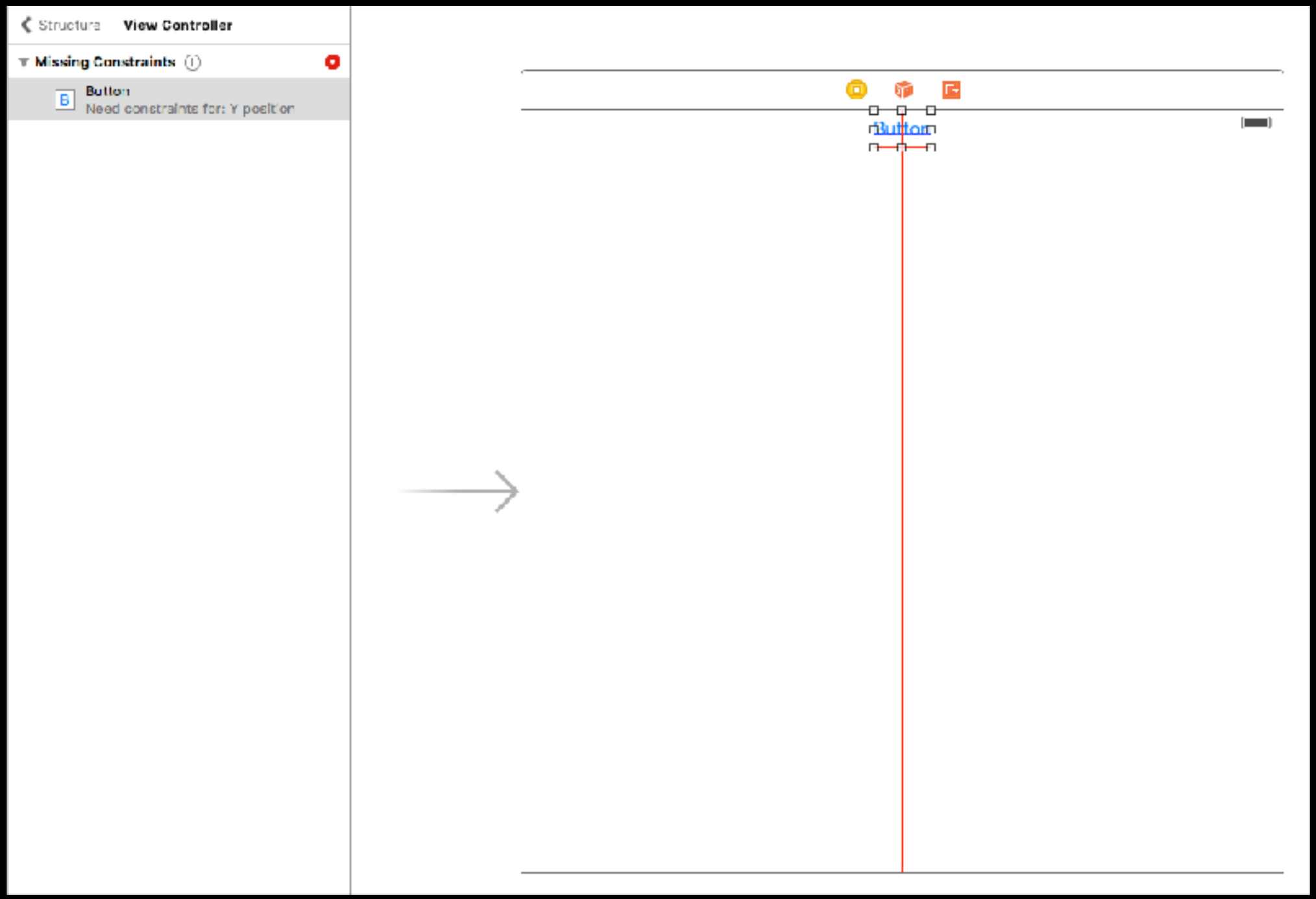
Editing a Constraint — Constraint Pop-up



Issues — Ambiguous Constraints

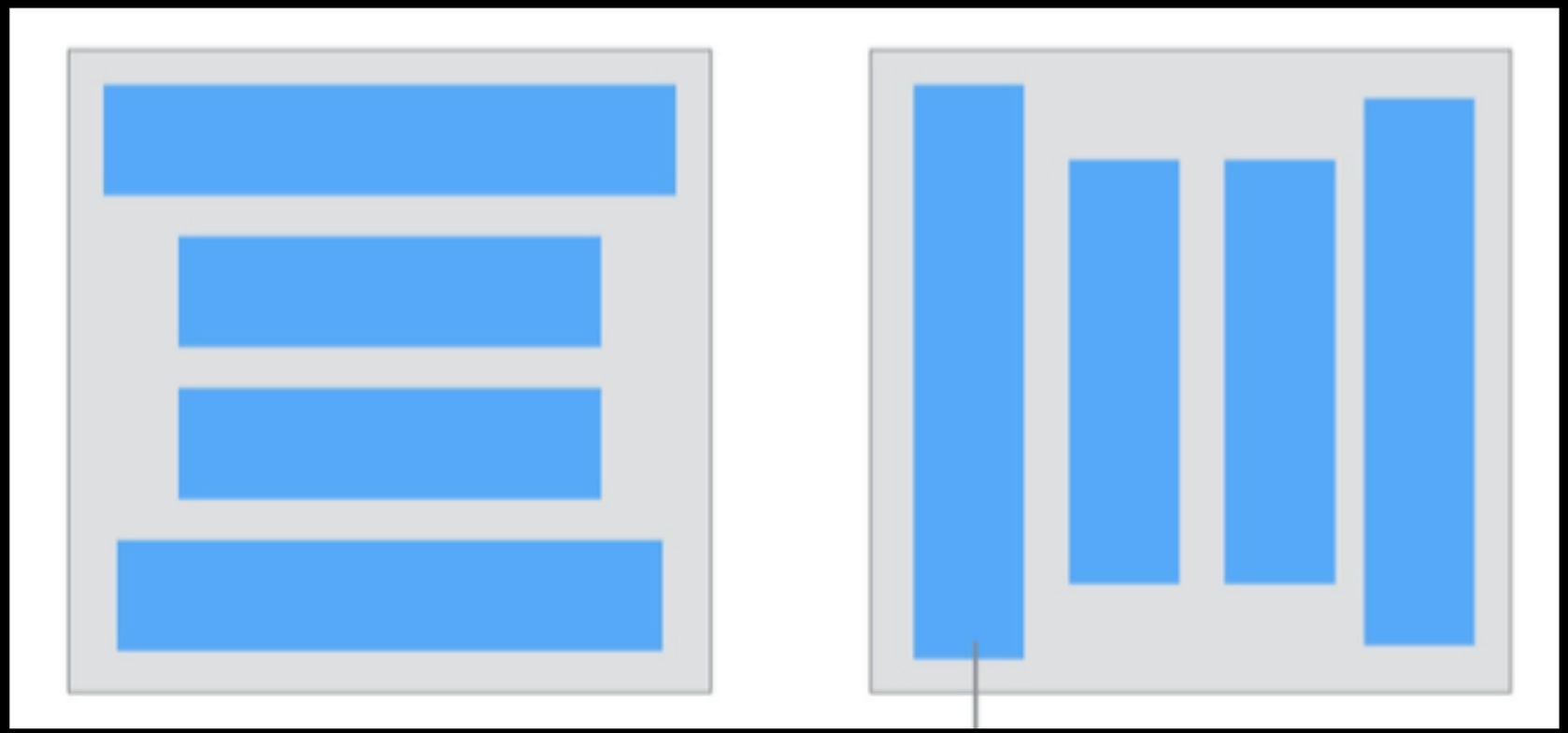


Issues — Unsatisfactory Constraints

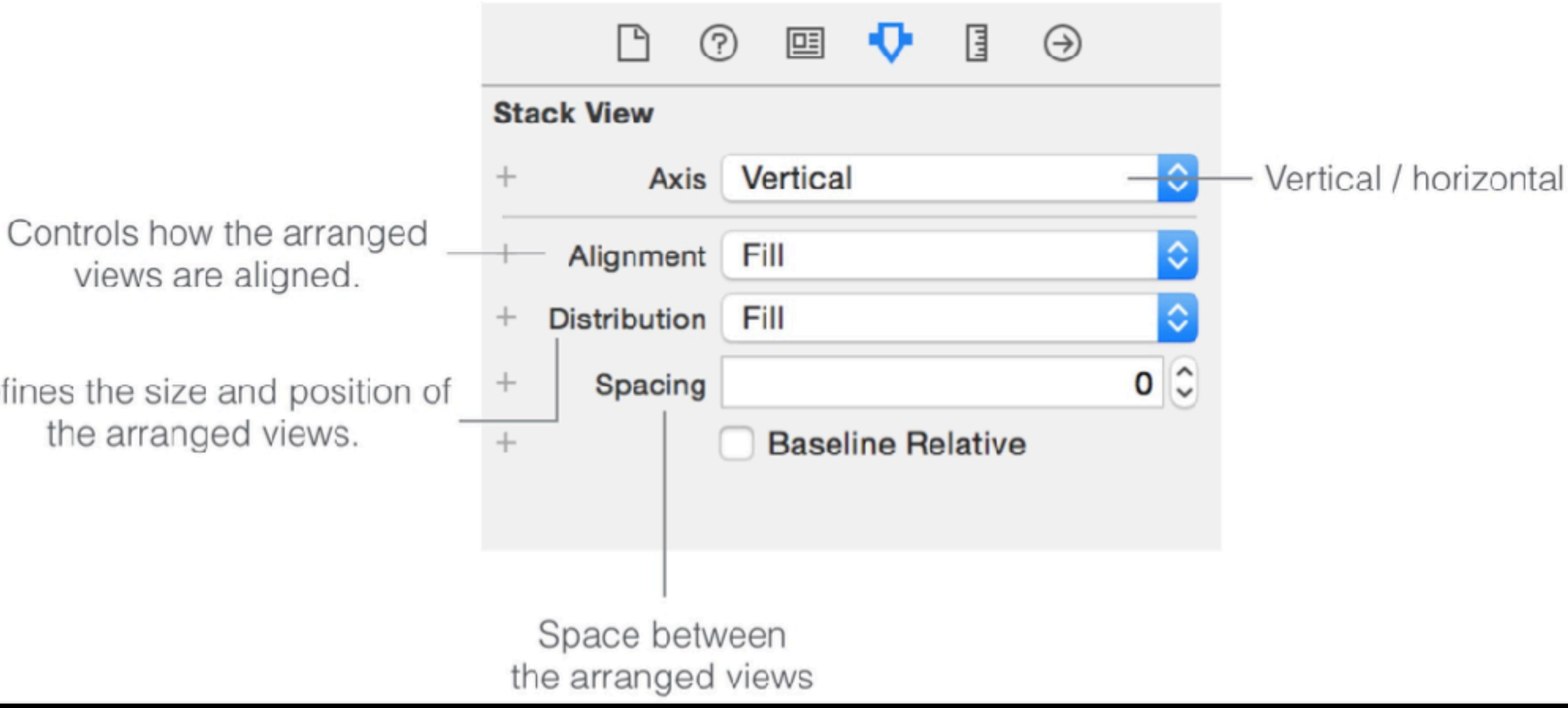


Stack Views

- A view that groups multiple views in a column or a row
- In most cases, the views inside do not need to specify constraints



Stack Views


Stack View
Axis
Vertical
Alignment
Fill
Distribution
Fill
Spacing
0
Baseline Relative
Vertical / horizontal
Controls how the arranged views are aligned.
Defines the size and position of the arranged views.
Space between the arranged views

Stack Views

Alignment

Alignment	Description
fill	the arranged views are resized to fill the available space perpendicular to the stack view's axis
leading (top)	the arranged views are aligned along the leading edge.
center	the arranged views are aligned with their center
trailing (bottom)	the arranged views are aligned along the trailing edge.

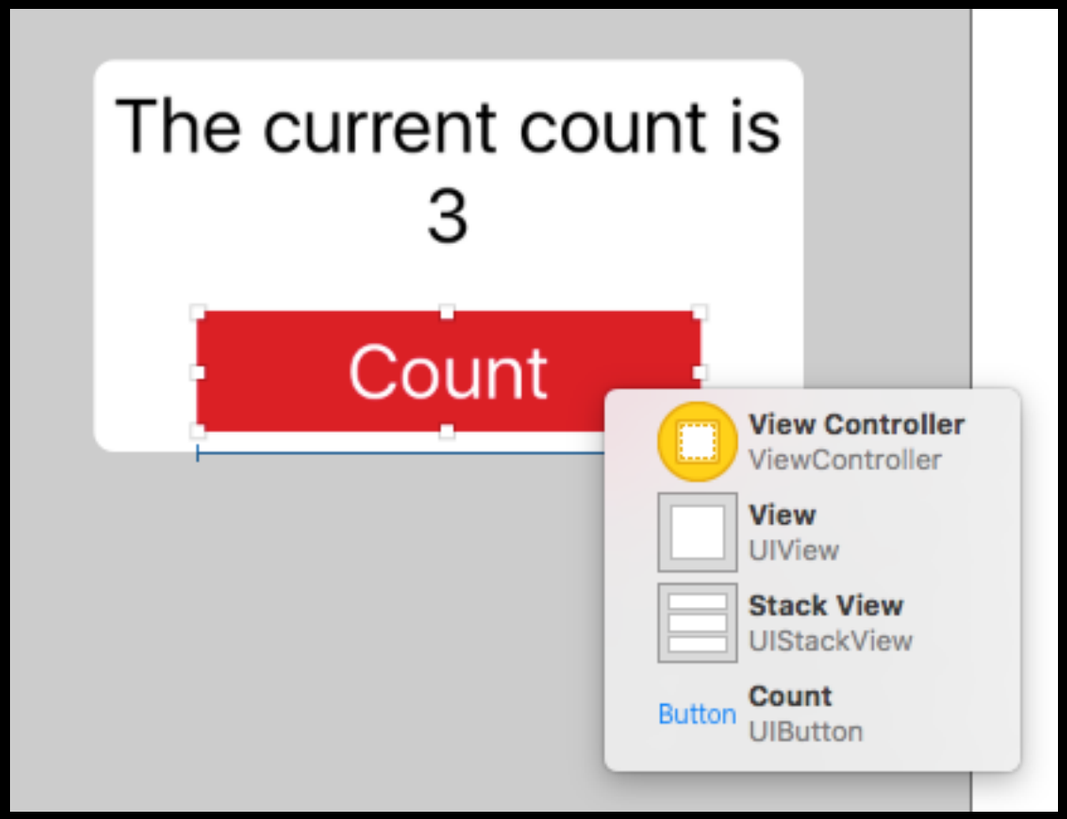
Stack Views

Distribution — how arranged views fill the space

Alignment	Description
fill	the arranged views are resized
fill equally	the arranged views are resized to the same size
fill proportionally	the arranged views are resized based on their intrinsic content size
equal spacing	the arranged views pads the spacing between them evenly
equal centering	the arranged views have an equal center-to-center spacing along the stack view's axis

Stack Views

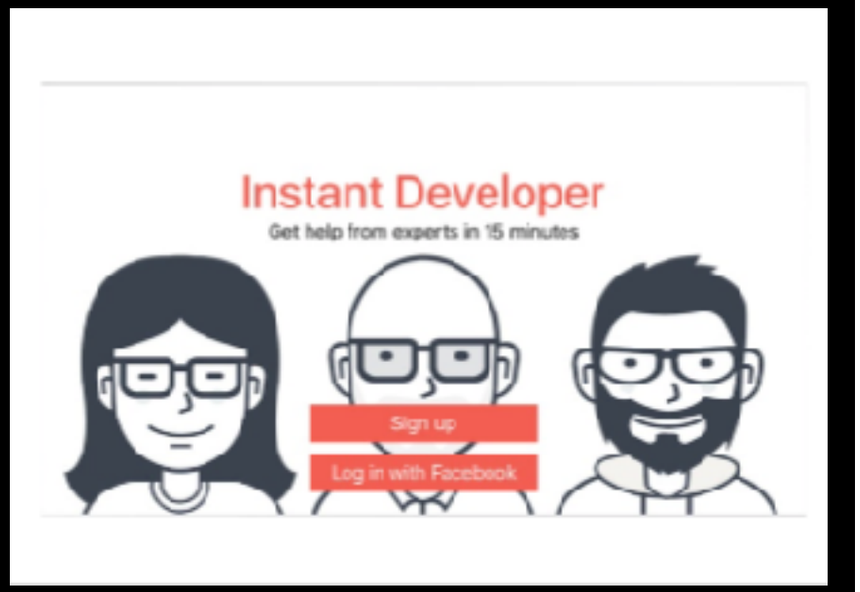
Short-cut Menu for Selection

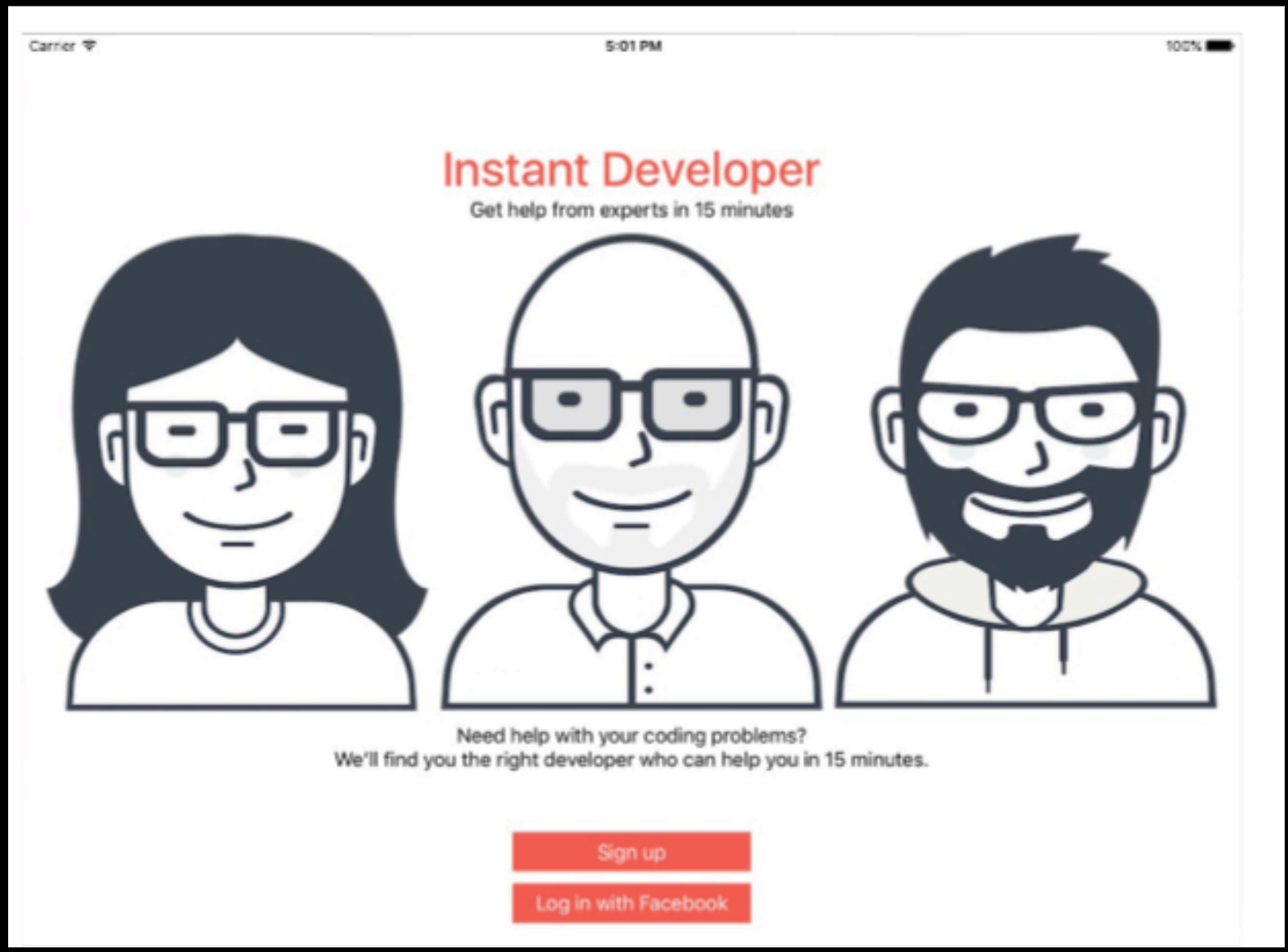


Hold Shift + Right Click a view

Adaptive Layout

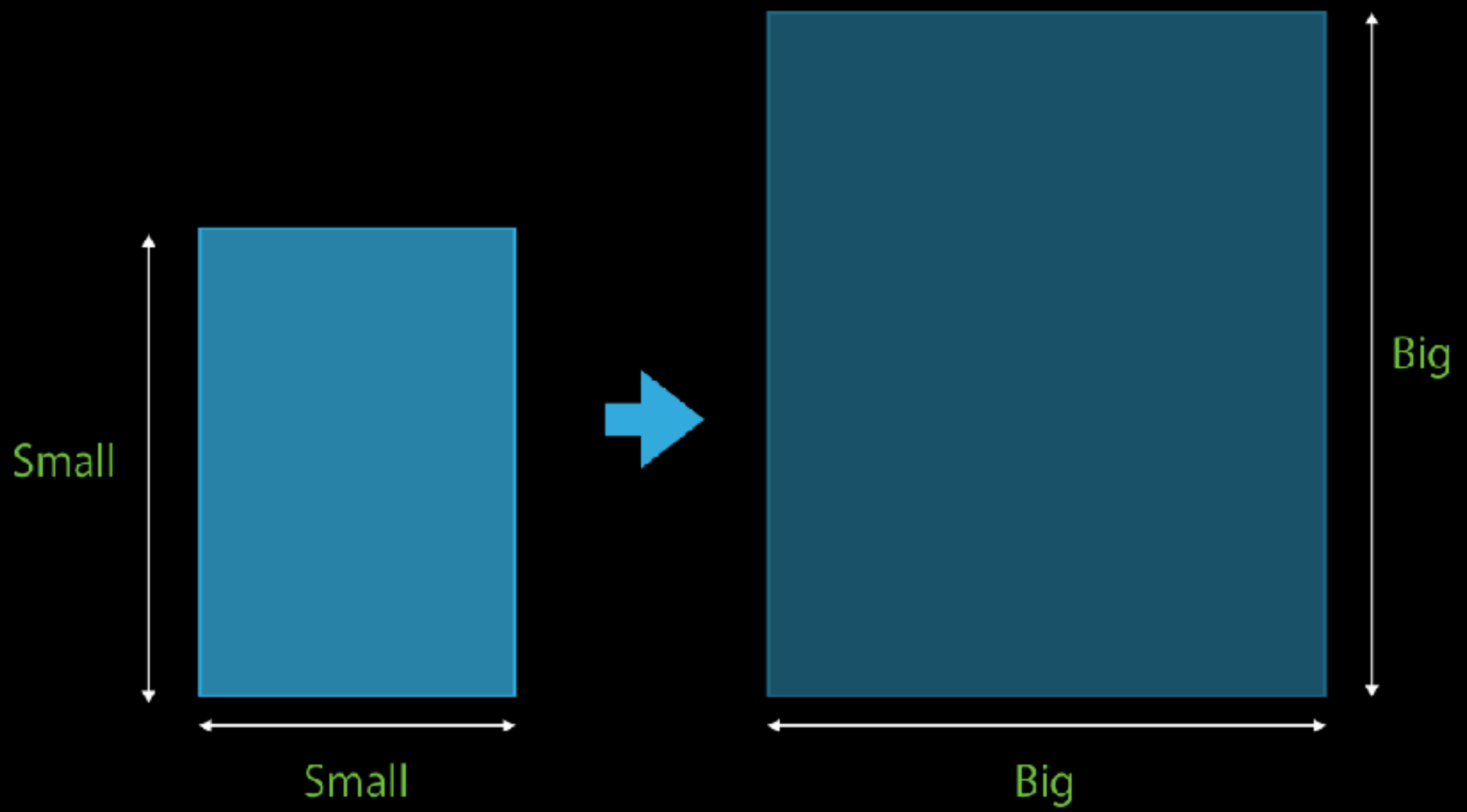
- An app can adapt its UI to a particular device and/or device orientation



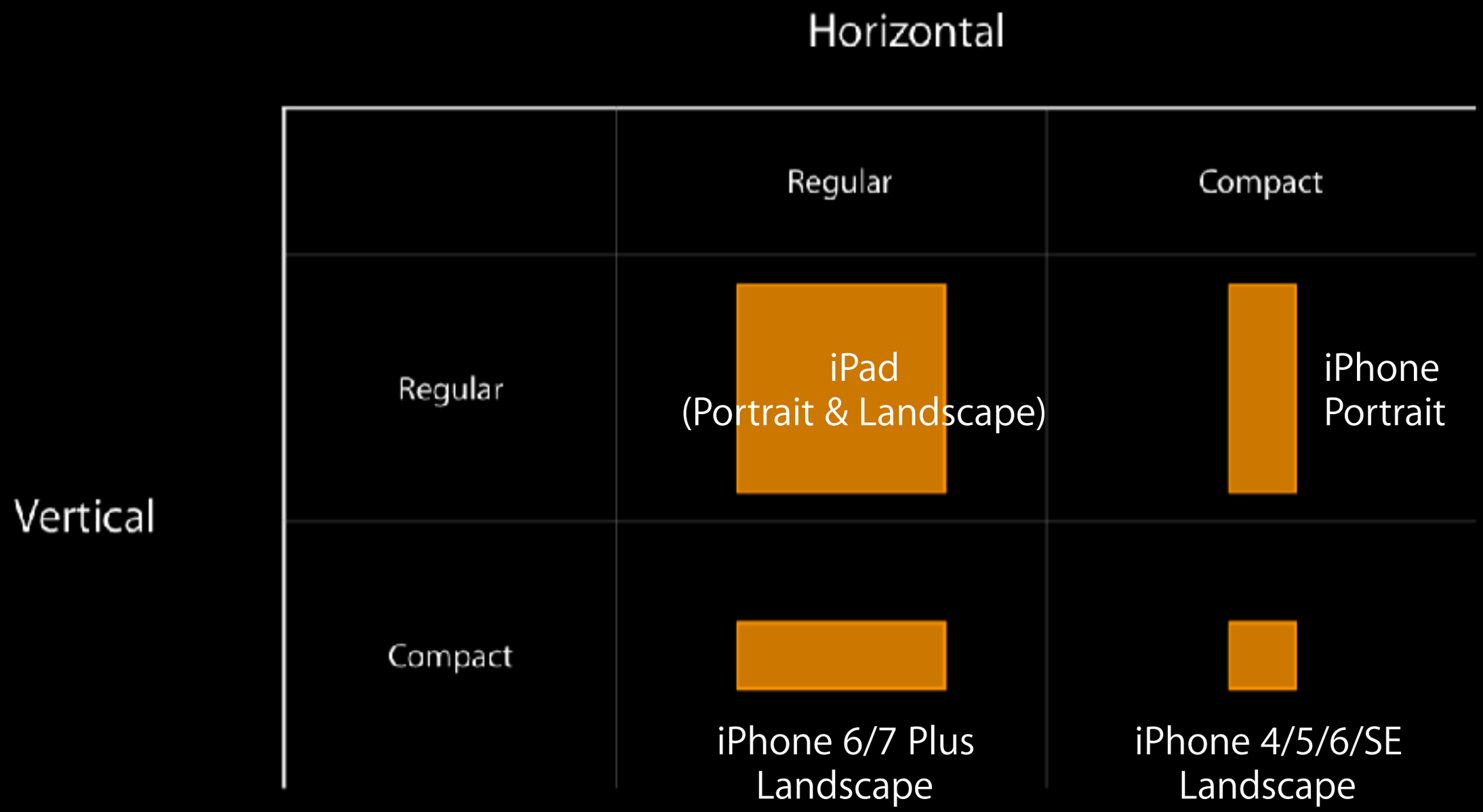


Size Class

- Coarsely defines the display space available in horizontal and vertical dimensions

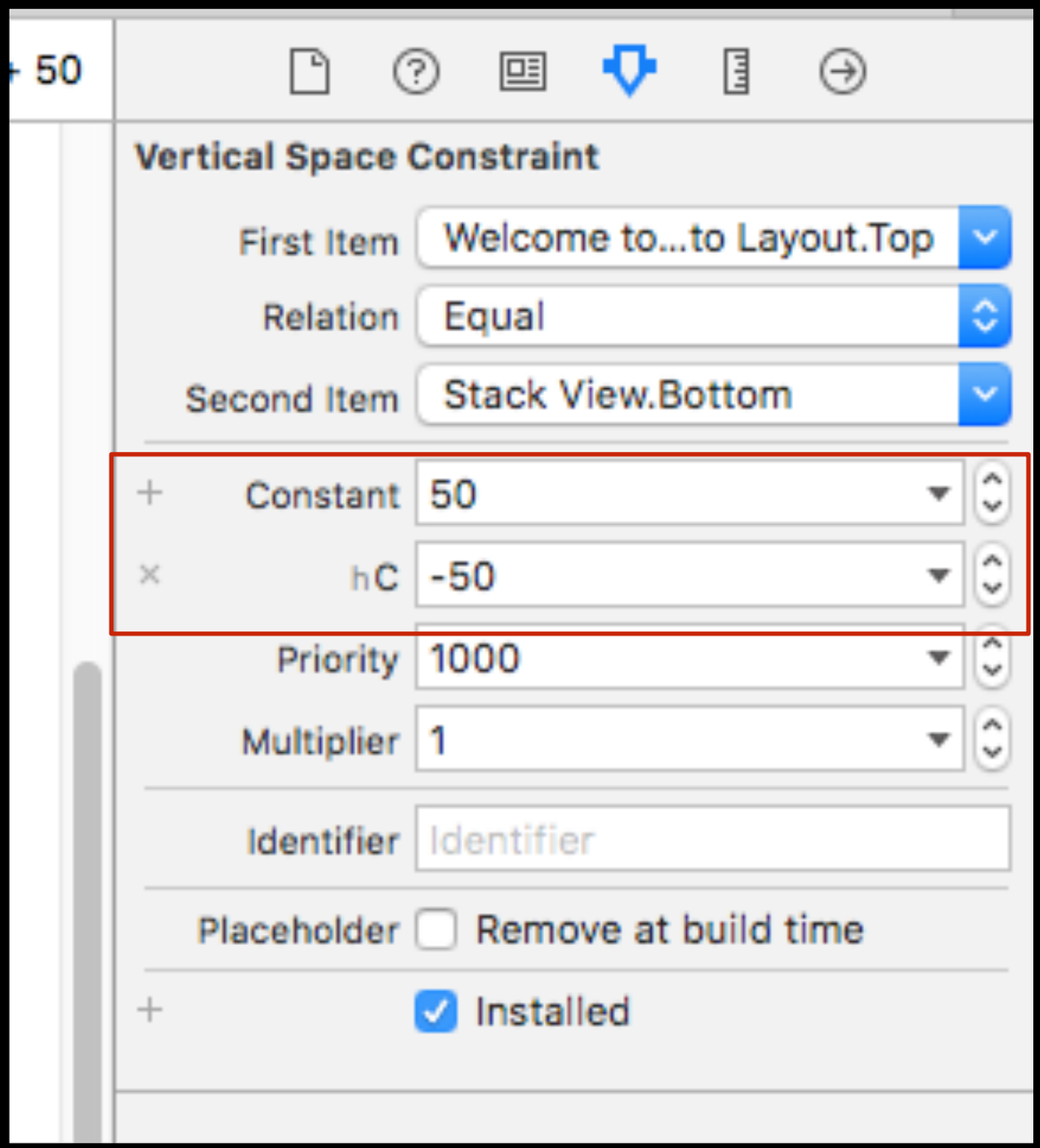


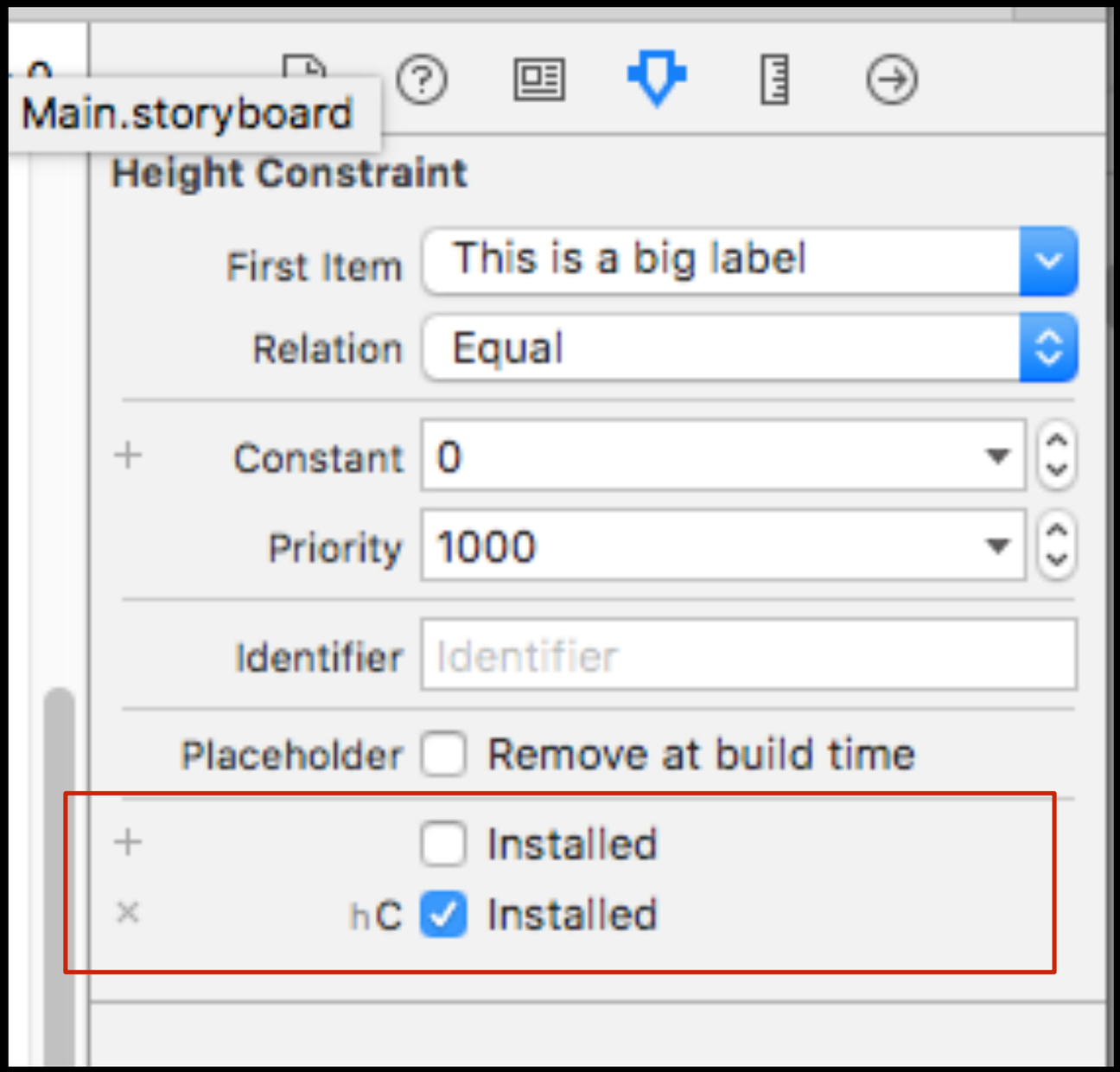
Size Classes



Size Class

Define different values



Size Class

Install a constraint/view for certain size class