AUTO LAYOUT BY EXAMPLE

Nick Chen

Fall 2015

talentspark.io

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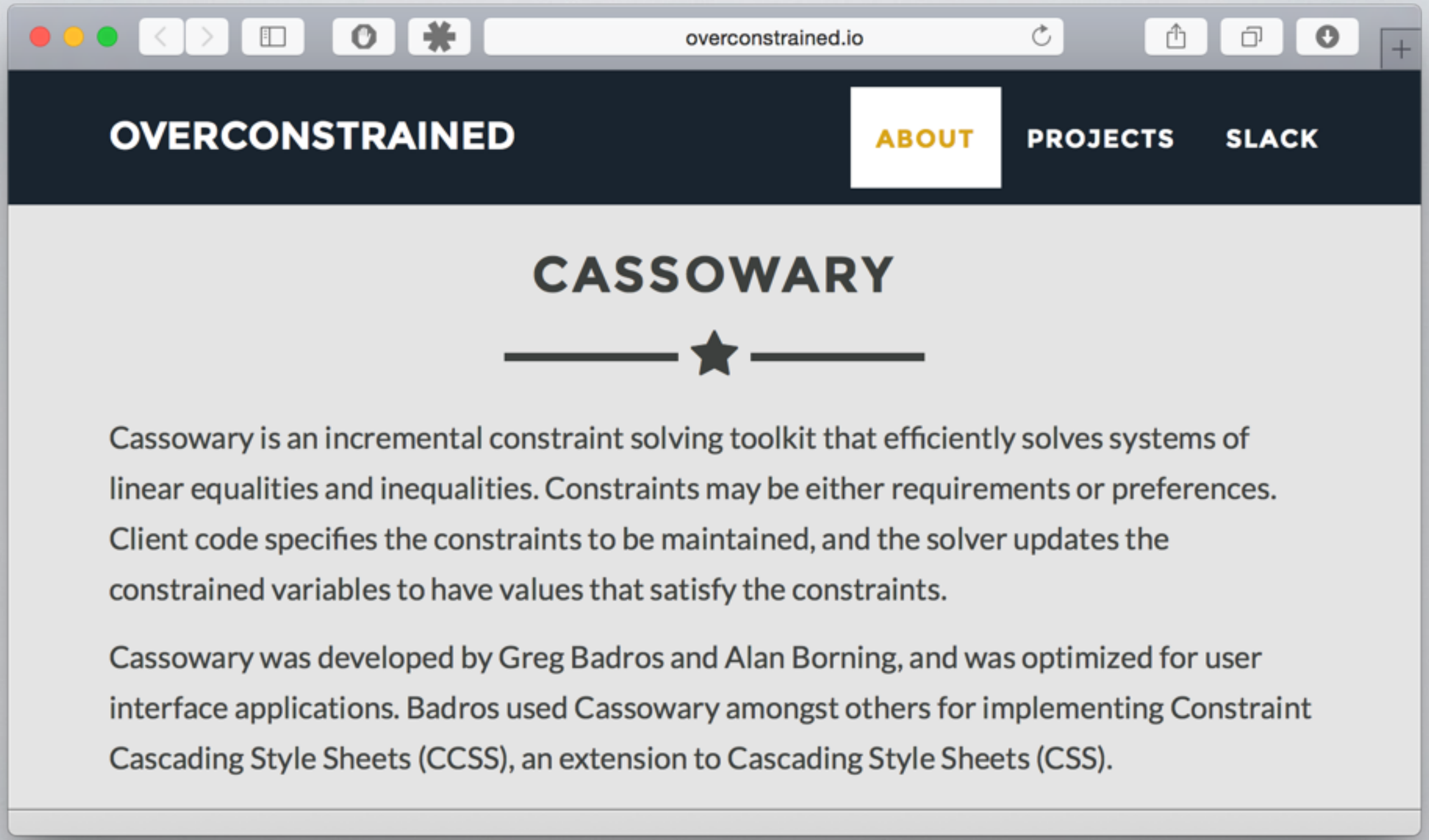
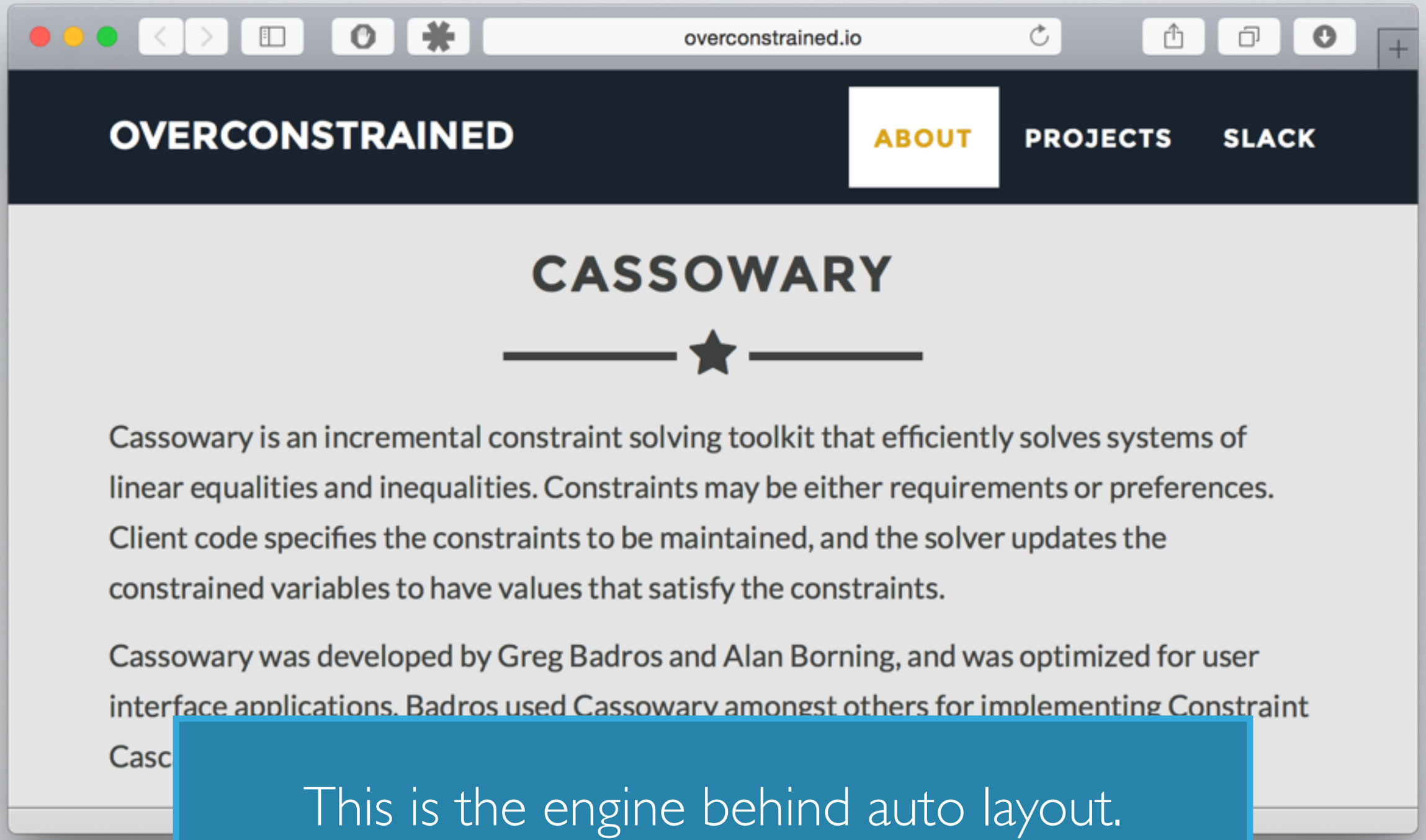
“ANY SUFFICIENTLY ADVANCED TECHNOLOGY IS INDISTINGUISHABLE FROM MAGIC”

– Arthur C. Clarke

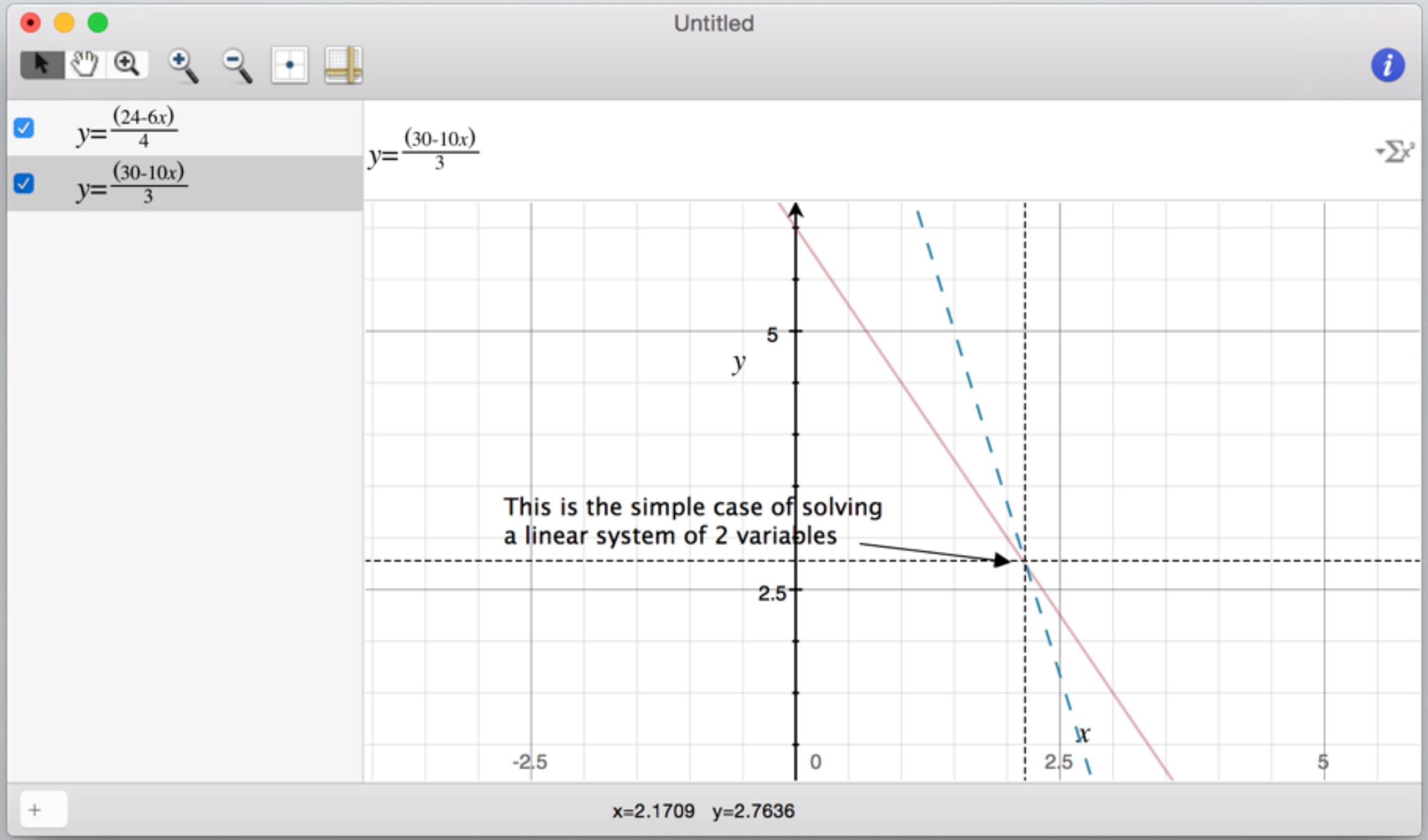
HOW DOES IT WORK?



HOW DOES IT WORK?



HOW DOES IT WORK?



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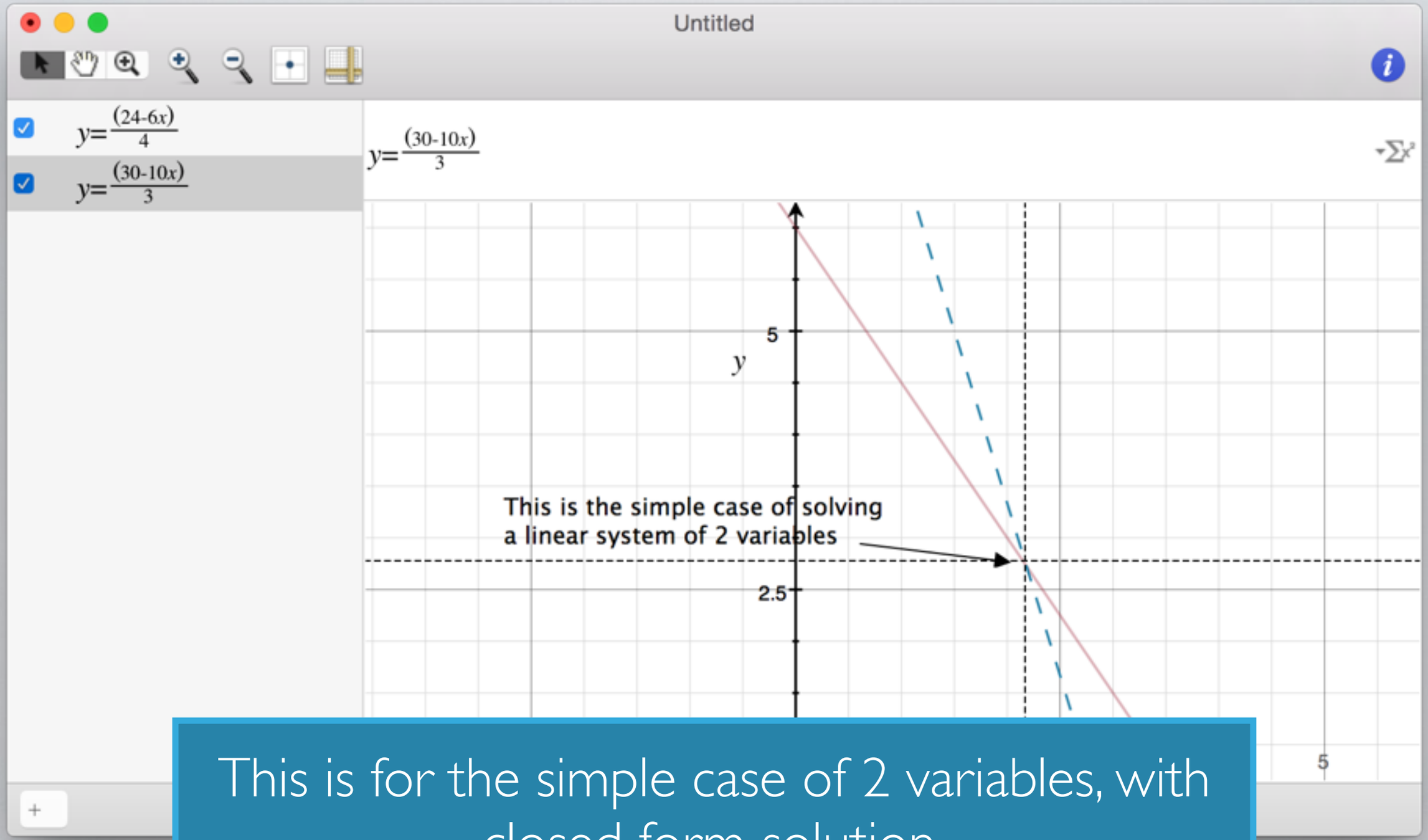


This is for the simple case of 2 variables, with closed form solution.

HOW DOES IT WORK?

constraints.cs.washington.edu/solvers/cassowar

The Cassowary Linear Arithmetic Constraint Solving Algorithm

GREG J. BADROS
and
ALAN BORNING
University of Washington
and
PETER J. STUCKEY
University of Melbourne

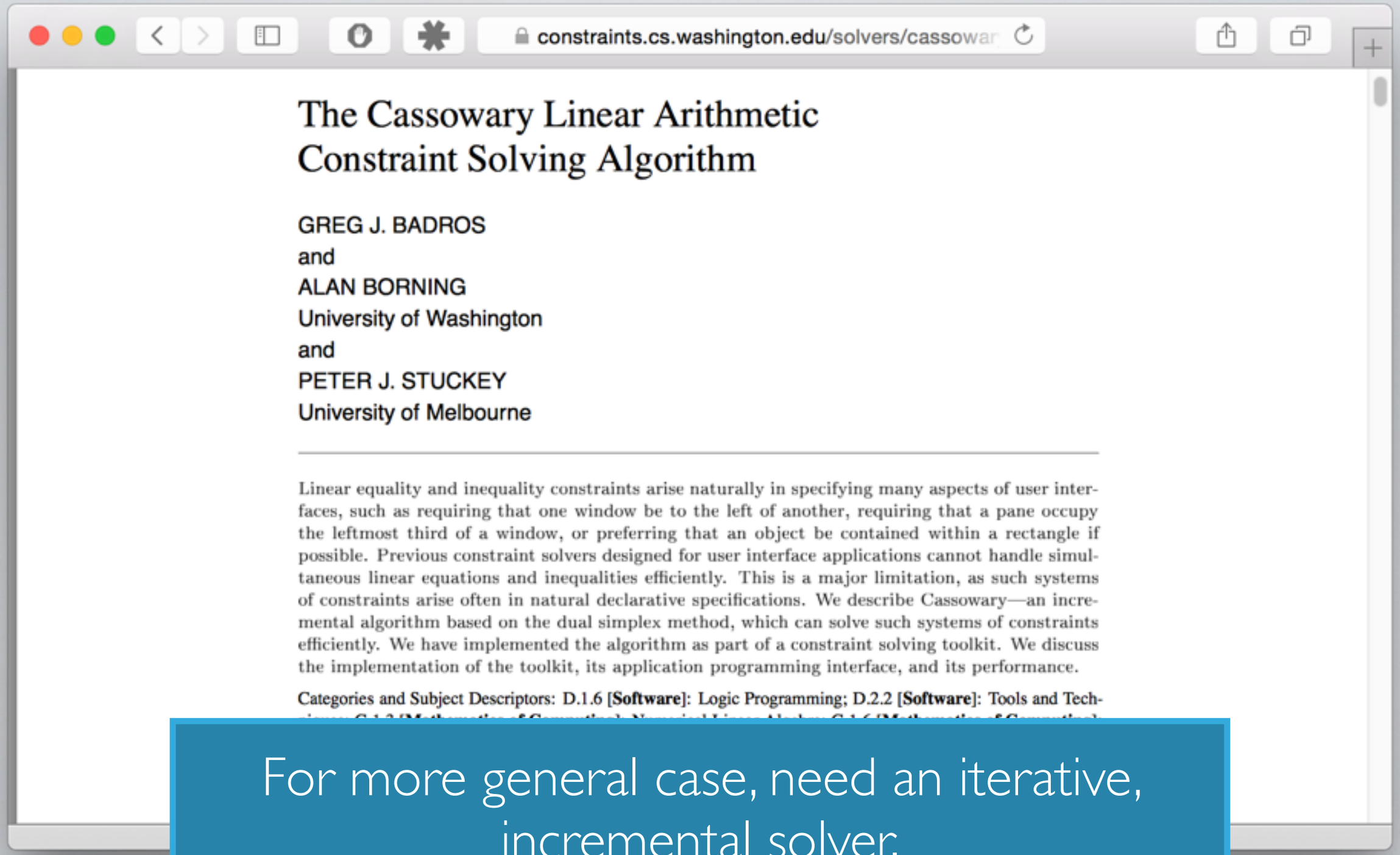
Linear equality and inequality constraints arise naturally in specifying many aspects of user interfaces, such as requiring that one window be to the left of another, requiring that a pane occupy the leftmost third of a window, or preferring that an object be contained within a rectangle if possible. Previous constraint solvers designed for user interface applications cannot handle simultaneous linear equations and inequalities efficiently. This is a major limitation, as such systems of constraints arise often in natural declarative specifications. We describe Cassowary—an incremental algorithm based on the dual simplex method, which can solve such systems of constraints efficiently. We have implemented the algorithm as part of a constraint solving toolkit. We discuss the implementation of the toolkit, its application programming interface, and its performance.

Categories and Subject Descriptors: D.1.6 [**Software**]: Logic Programming; D.2.2 [**Software**]: Tools and Techniques; G.1.3 [**Mathematics of Computing**]: Numerical Linear Algebra; G.1.6 [**Mathematics of Computing**]: Optimization

General Terms: Constraints, User Interface

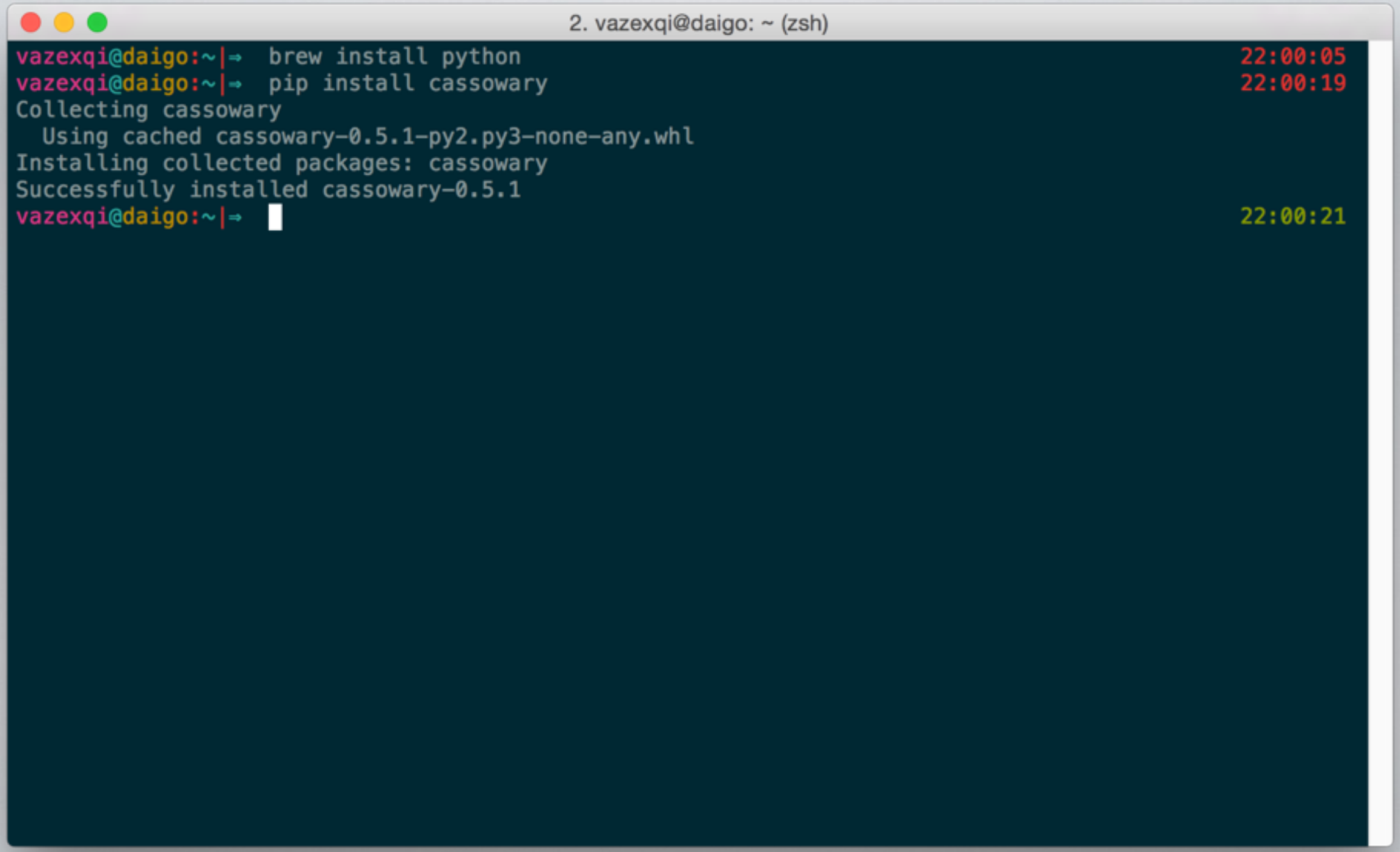
Additional Key Words and Phrases: Cassowary, constraint-solving toolkit

HOW DOES IT WORK?



For more general case, need an iterative, incremental solver.

HOW DOES IT WORK?



HOW DOES IT WORK?

It's unfortunate but I can't access the iOS engine directly so use the python port of cassowary.

HOW DOES IT WORK?

2. python (Python)

```
vazexqi@daigo:~|⇒  python                                          22:02:43
Python 2.7.6 (default, Sep  9 2014, 15:04:36)
[GCC 4.2.1 Compatible Apple LLVM 6.0 (clang-600.0.39)] on darwin
Type "help", "copyright", "credits" or "license" for more information.
>>> from cassowary import SimplexSolver, Variable
>>> solver = SimplexSolver()
>>> left = Variable('left')
>>> middle = Variable('middle')
>>> right = Variable('right')
>>> solver.add_constraint(middle == (left + right) / 2)
Required:{1.0}(0.5*left[0.0] + -1.0*middle[0.0] + 0.5*right[-0.0])
>>> solver.add_constraint(right == left + 10)
Required:{1.0}(10.0 + left[-5.0] + -1.0*right[5.0])
>>> solver.add_constraint(right <= 100)
Required:{1.0}(100.0 + -1.0*right[100.0])
>>> solver.add_constraint(left >= 0)
Required:{1.0}(left[90.0])
>>> left.value
90.0
>>> middle.value
95.0
>>> right.value
100.0
>>>
```

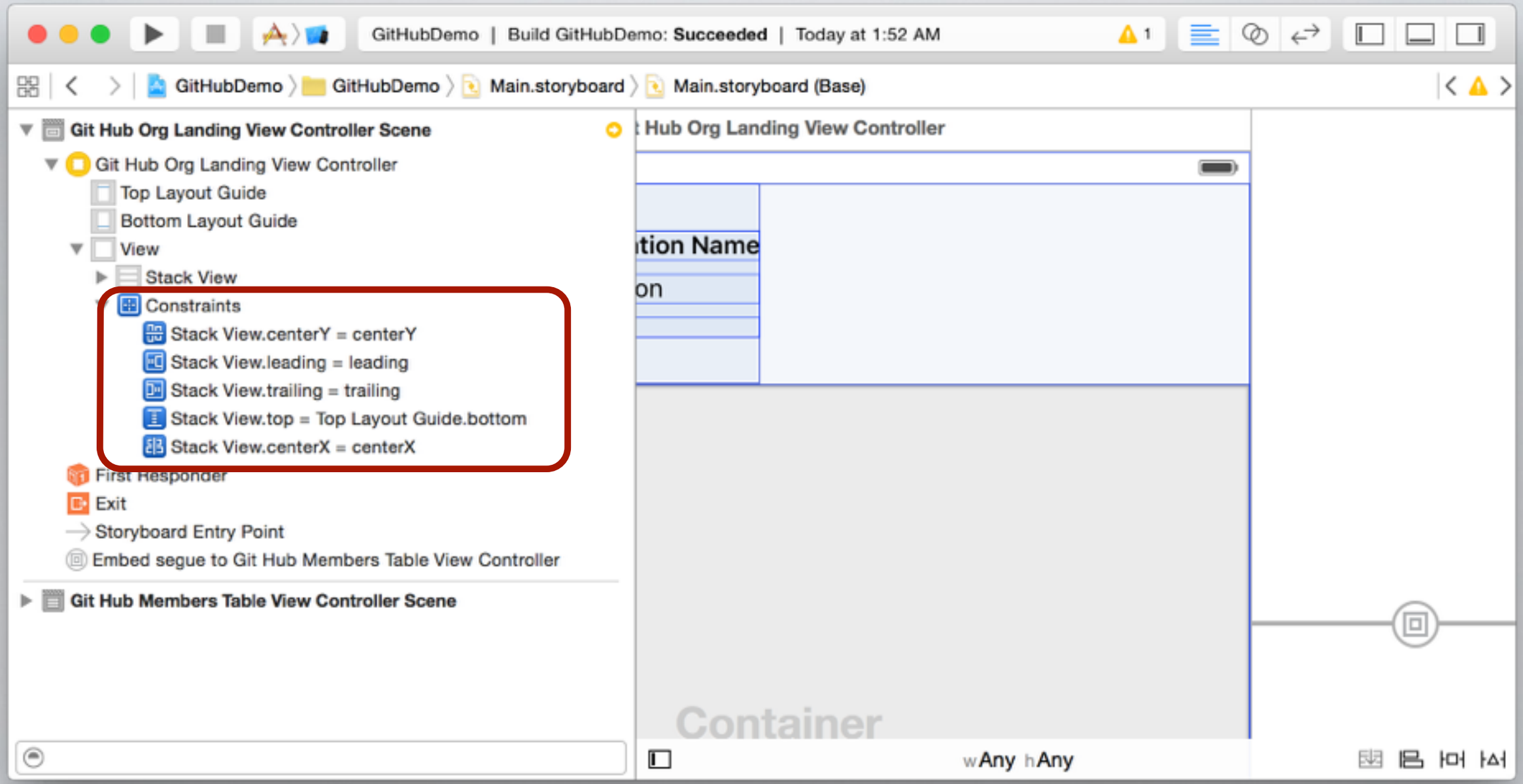
SCENARIOS

- Under-constrained - Ambiguous, more than one solution. Could pick either solution at run time 😞

- Perfectly-constrained 😎

- Over-constrained - Conflicting constraints, have to break one of them. Again unpredictable behavior at run time 😞

CONSTRAINTS IN IOS



NSLAYOUTCONSTRAINT

self.contentView.Left = <multiplier> * self.view.Left + <constant>

```
let leftConstraint = NSLayoutConstraint(item: self.contentView,
                                        attribute: .Left,
                                        relatedBy: .Equal,
                                           toItem: self.view,
                                        attribute: .Left,
                                       multiplier: 1.0,
                                         constant: 0.0)
self.view.addConstraint(leftConstraint)
```

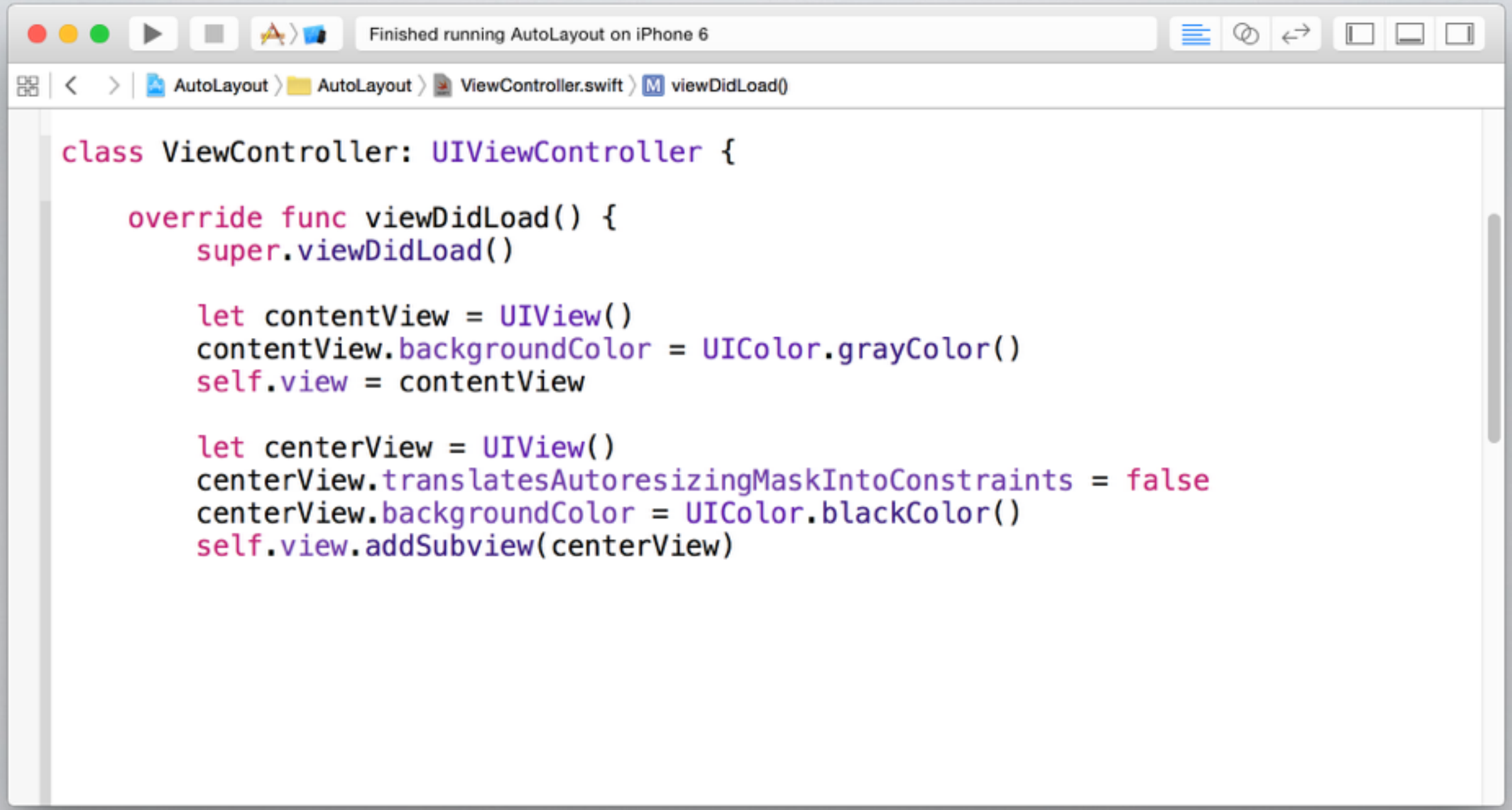
NSLAYOUTCONSTRAINT

self.contentView.Left = <multiplier> * self.view.Left + <constant>

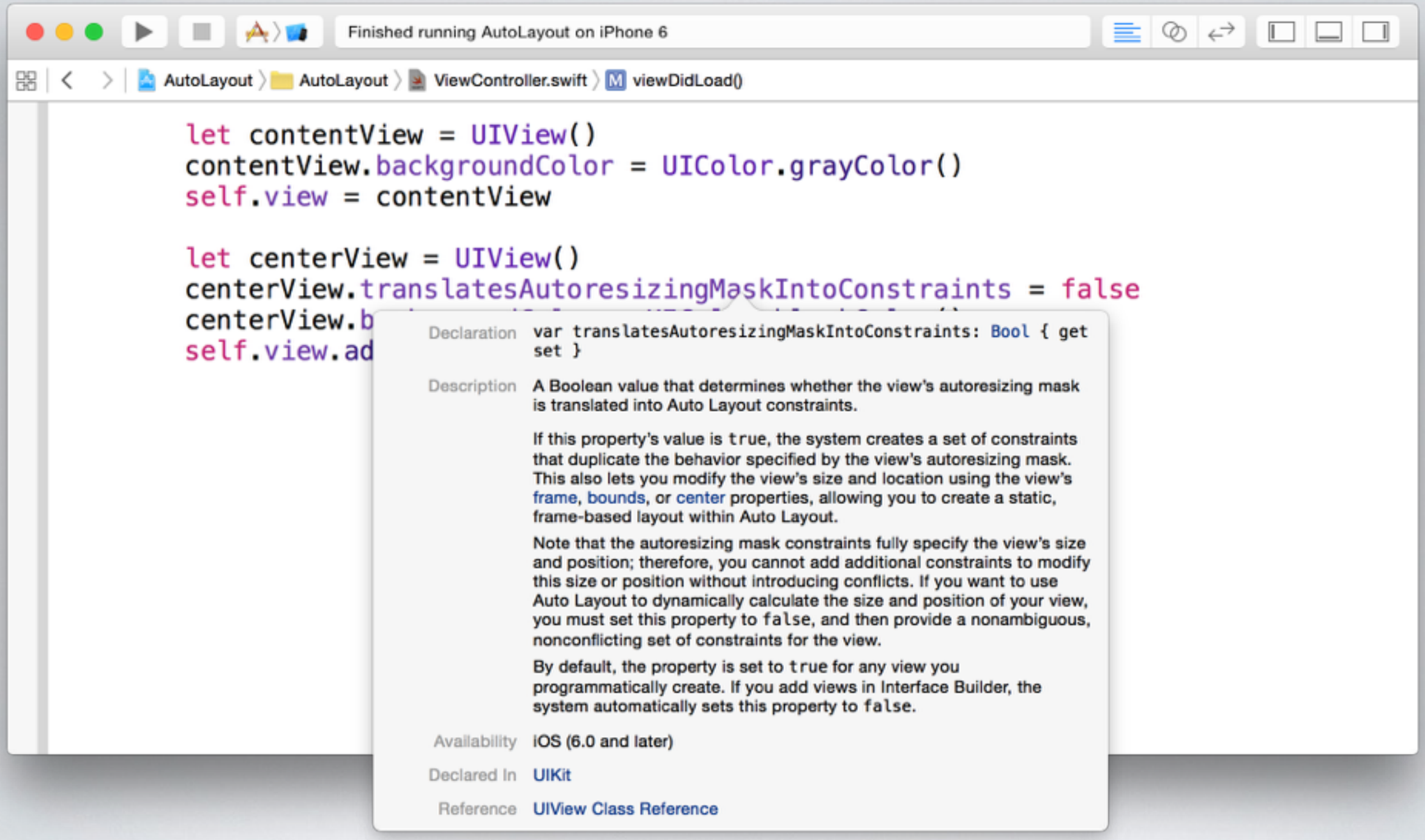
```
let leftConstraint = self.contentView.leftAnchor.constraintEqualToAnchor(
                                self.view.leftAnchor,
                               multiplier:1.0)

self.view.addConstraint(leftConstraint)
```

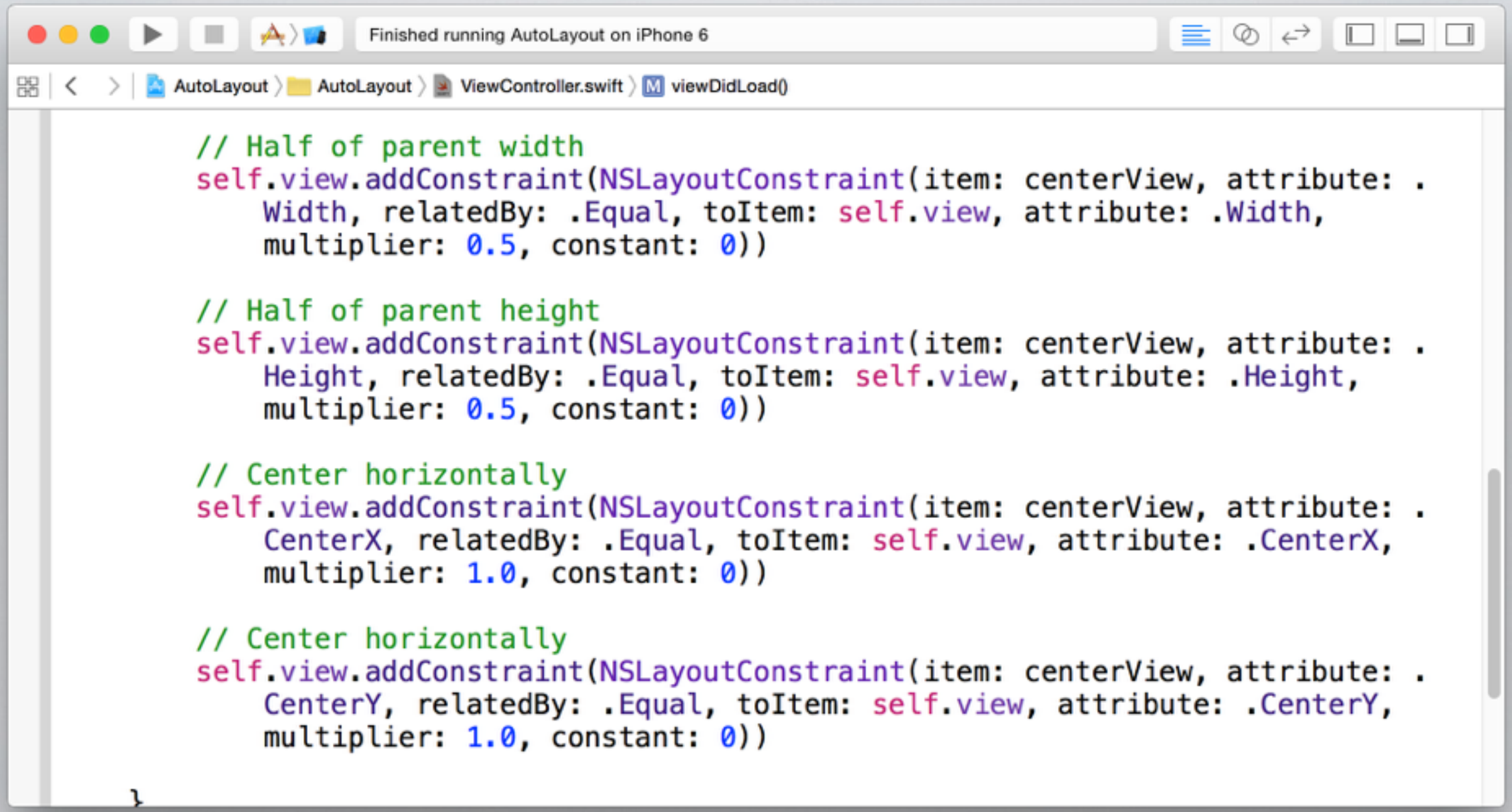
PROGRAMMATICALLY



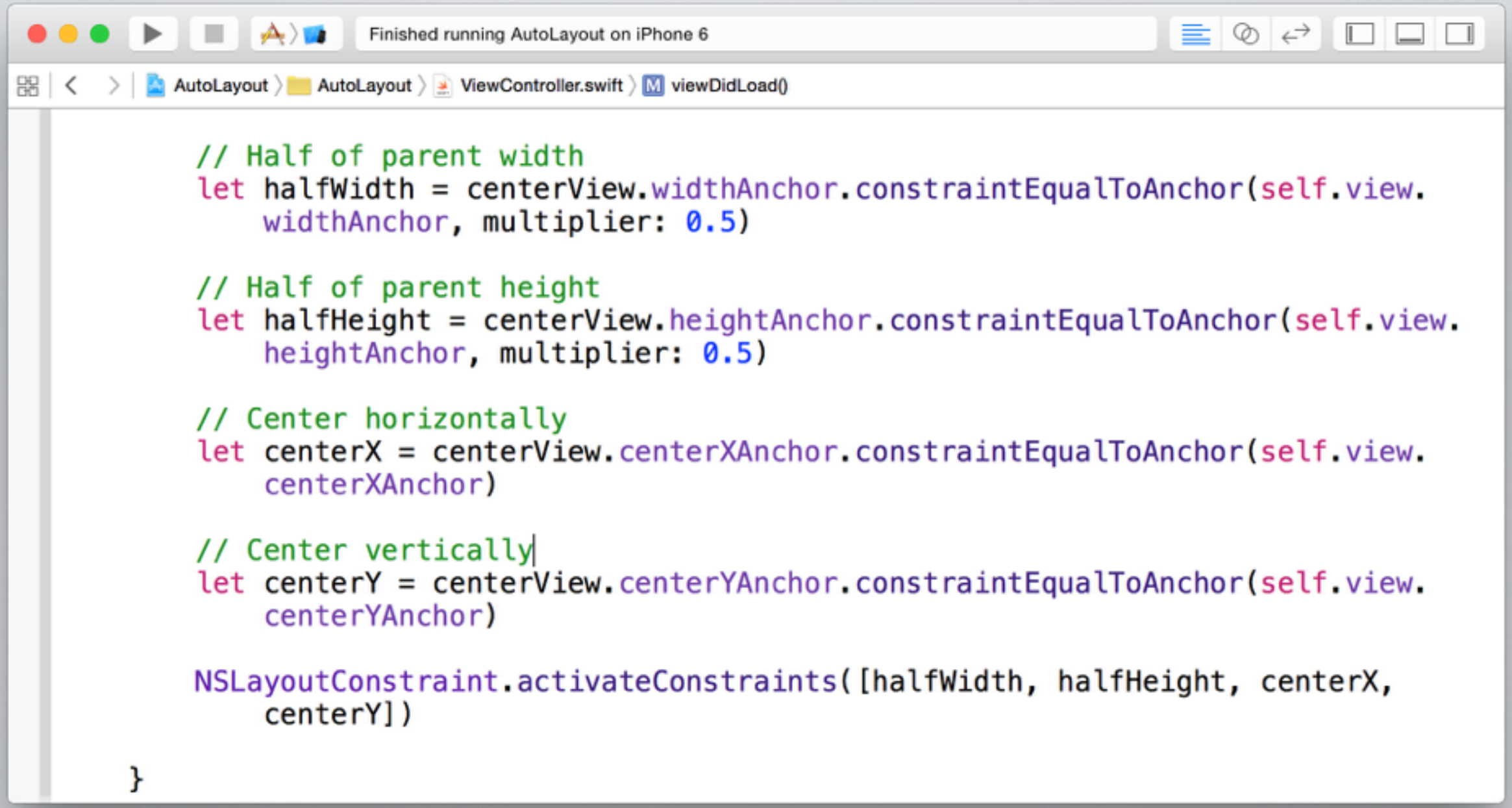
PROGRAMMATICALLY



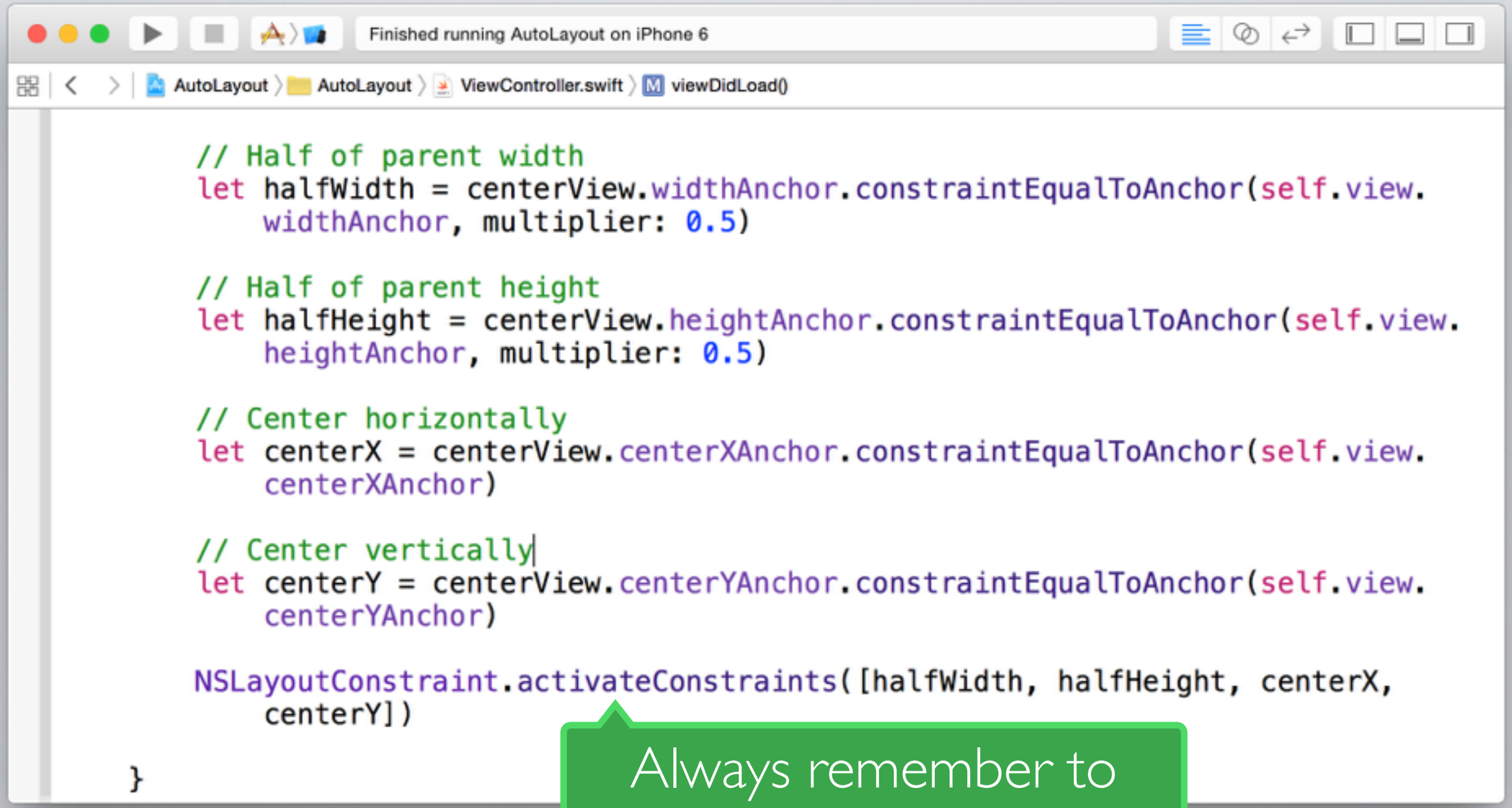
PROGRAMMATICALLY



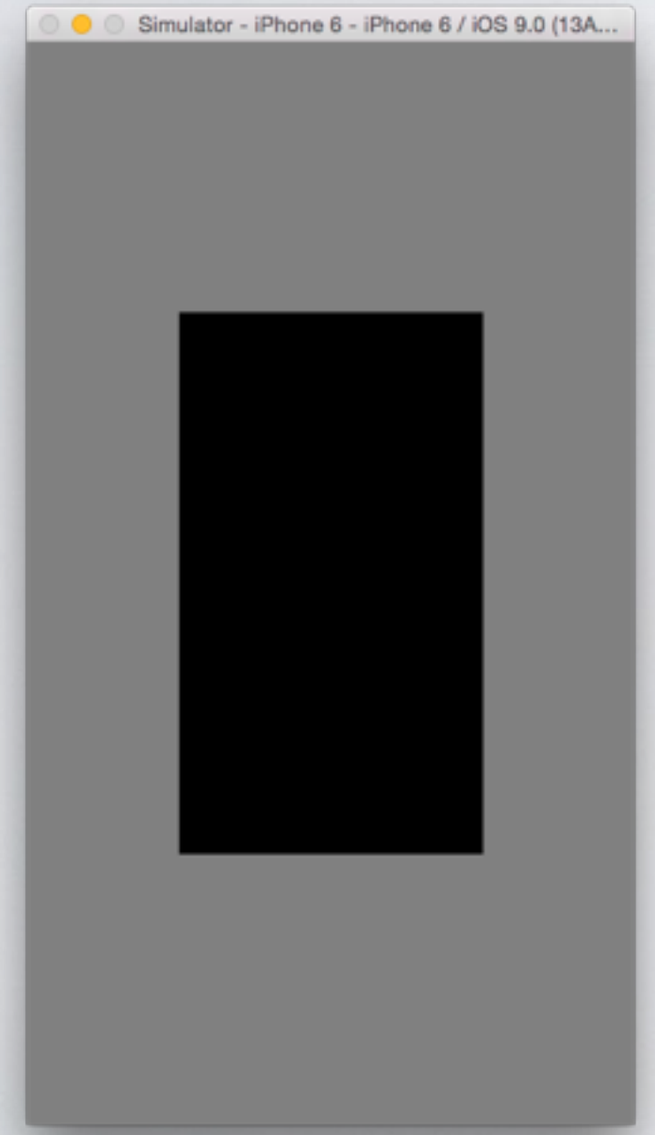
PROGRAMMATICALLY



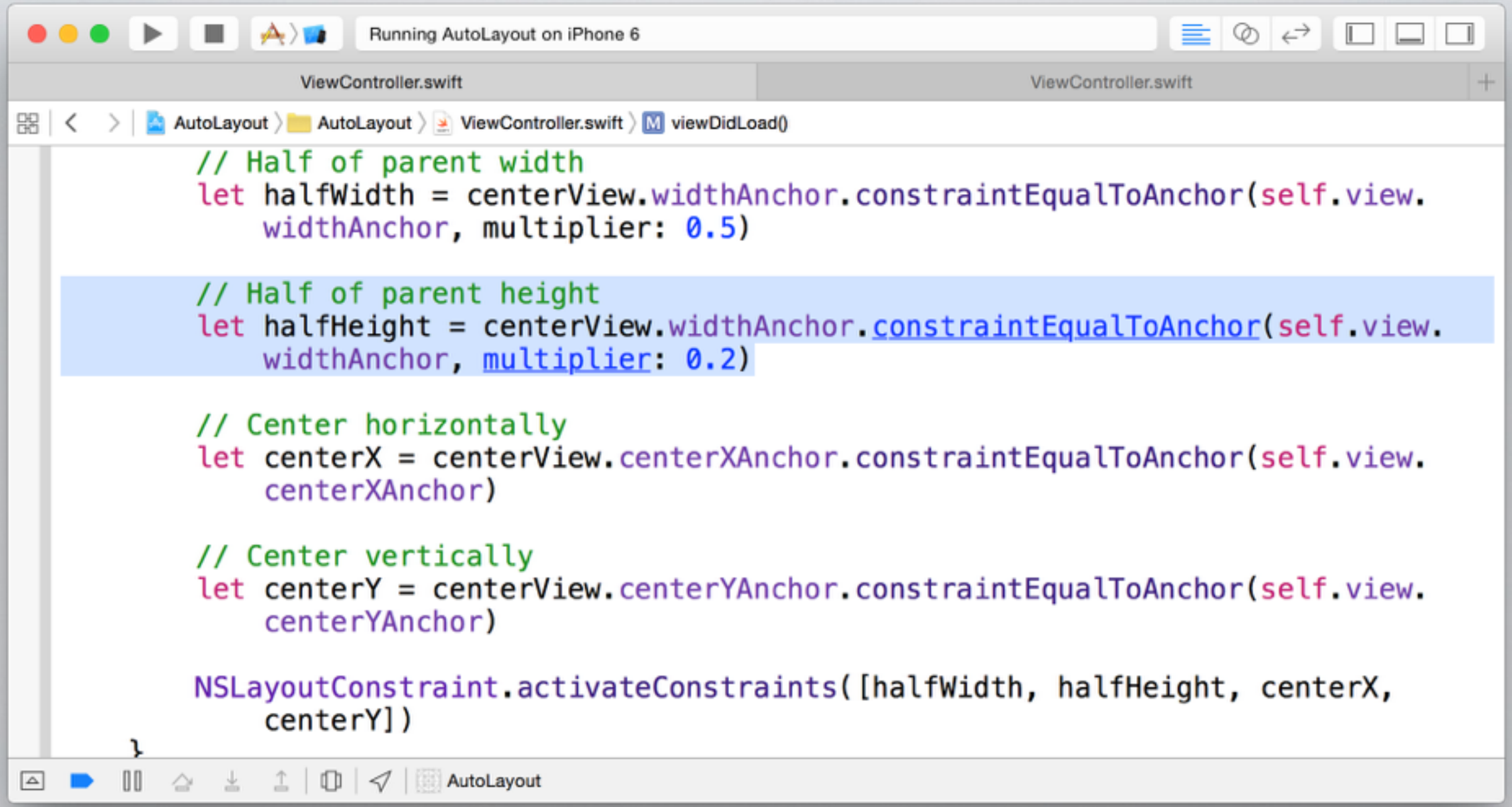
PROGRAMMATICALLY



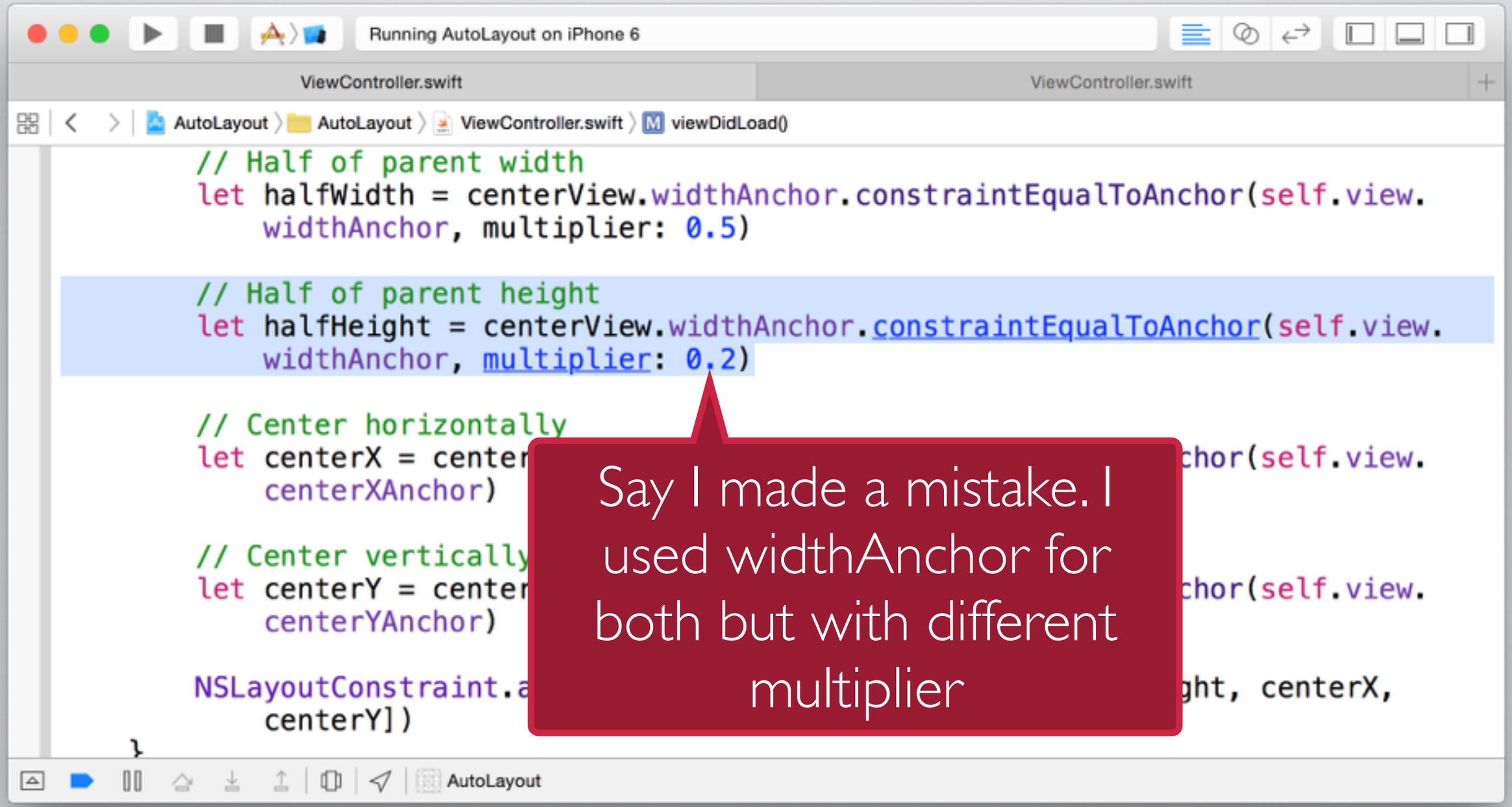
PROGRAMMATICALLY



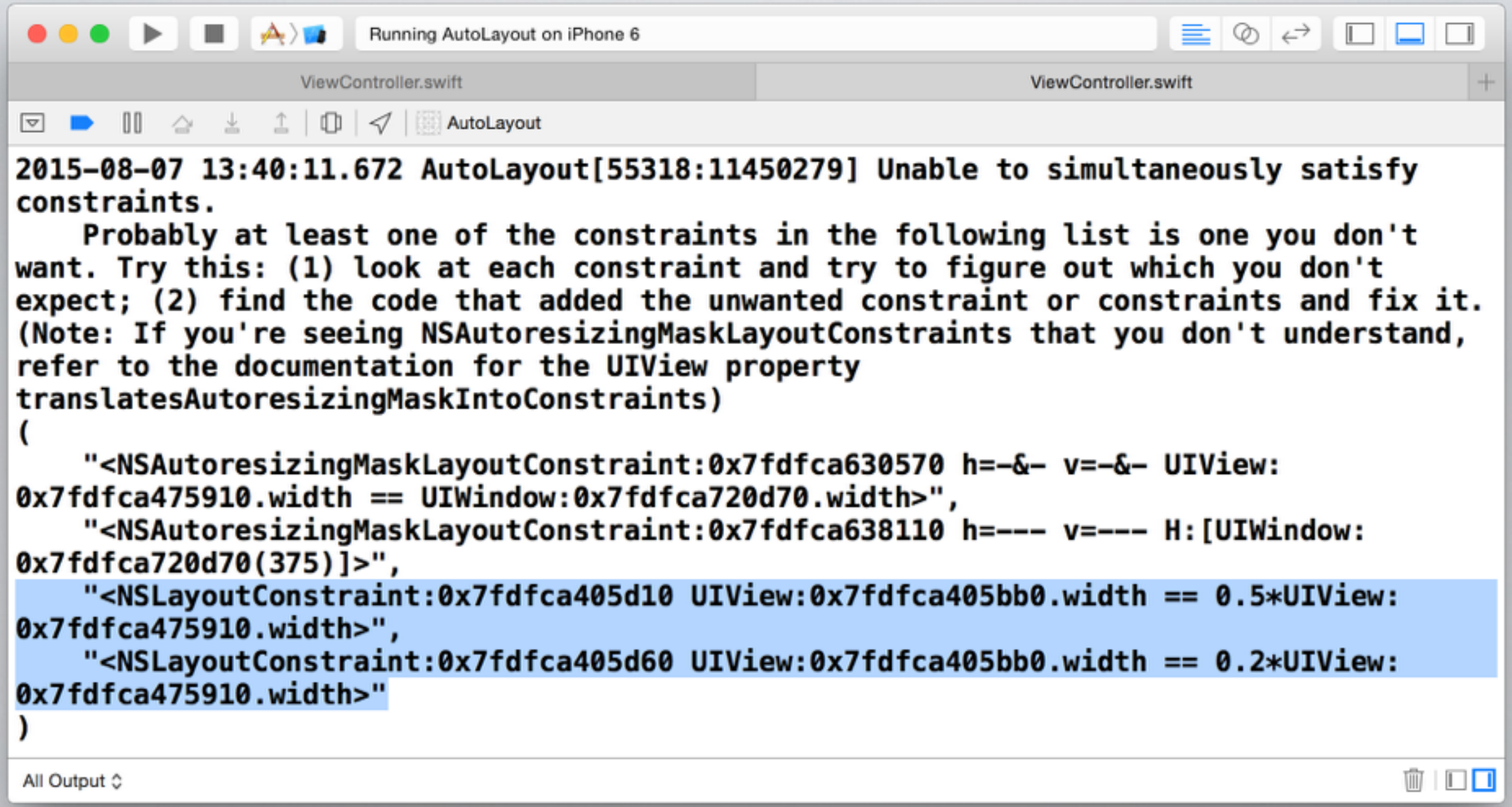
PROGRAMMATICALLY



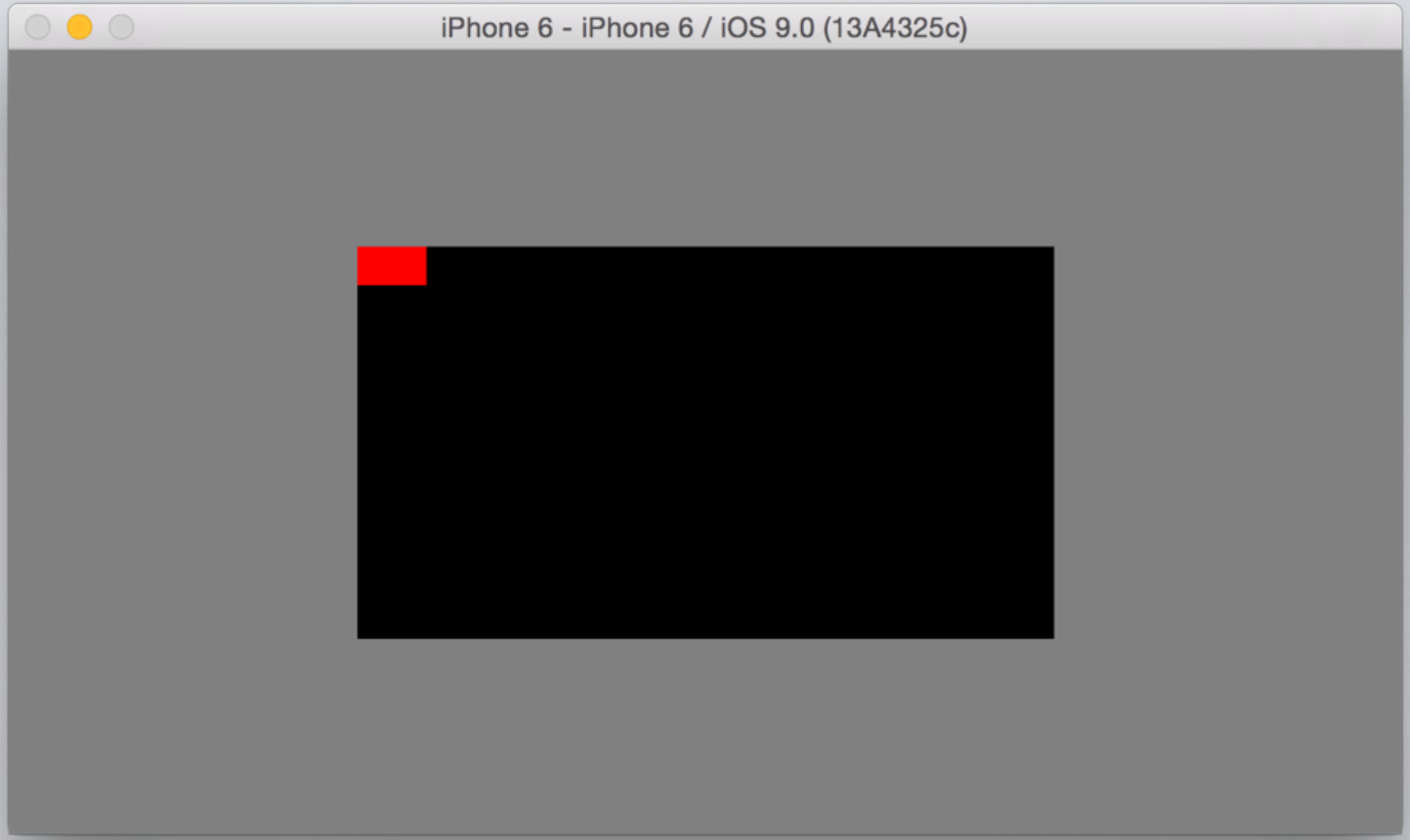
PROGRAMMATICALLY



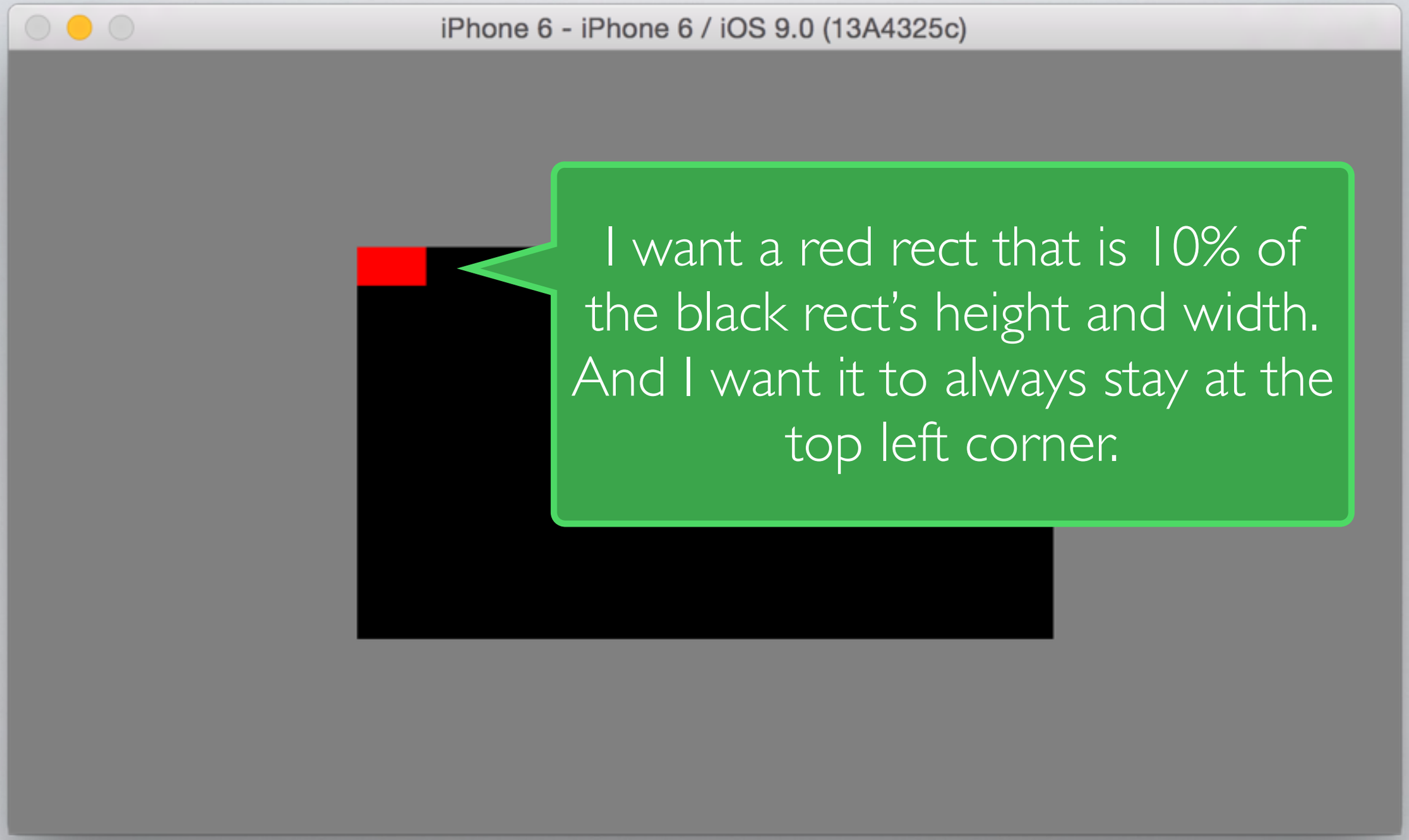
PROGRAMMATICALLY



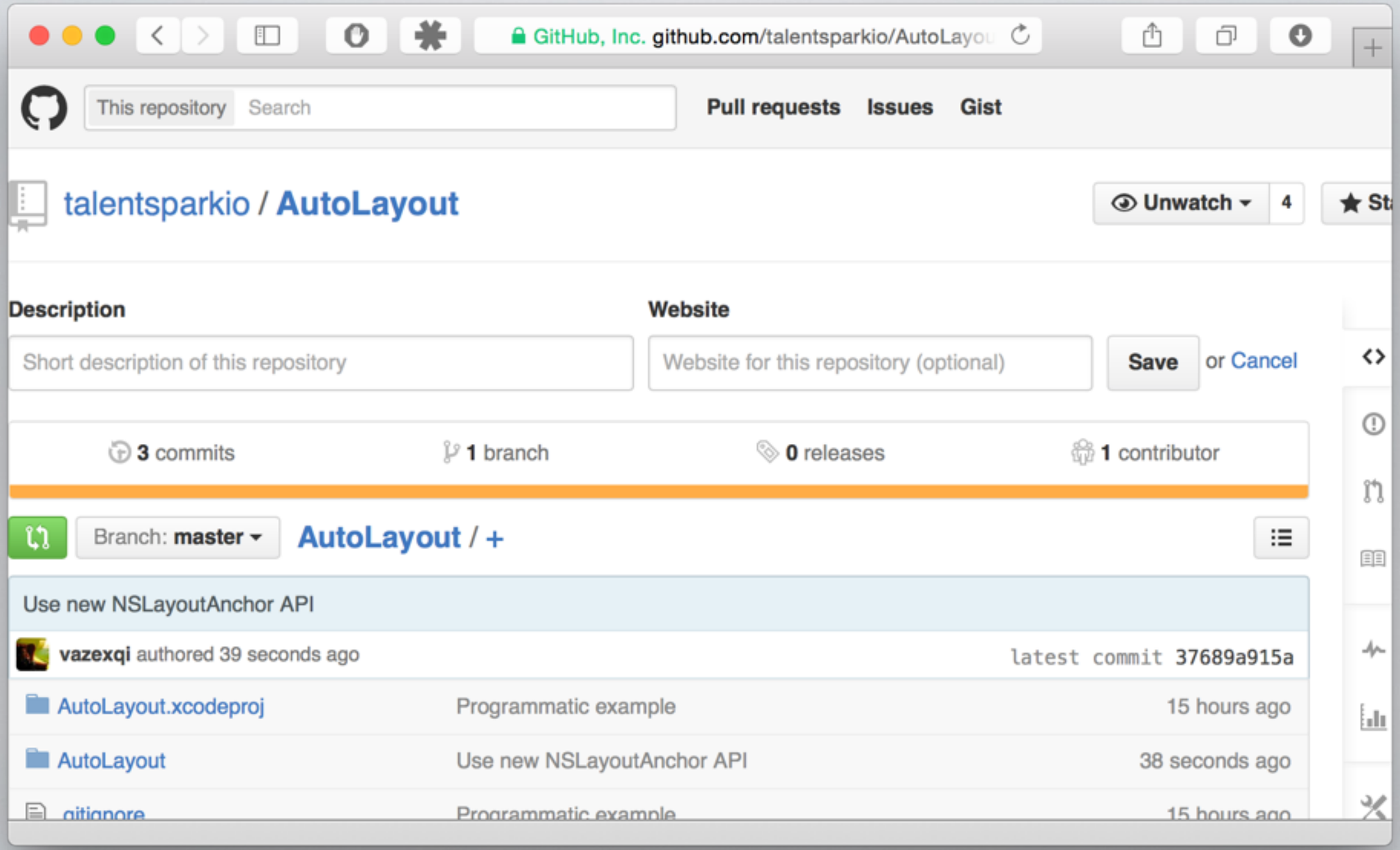
EXERCISE



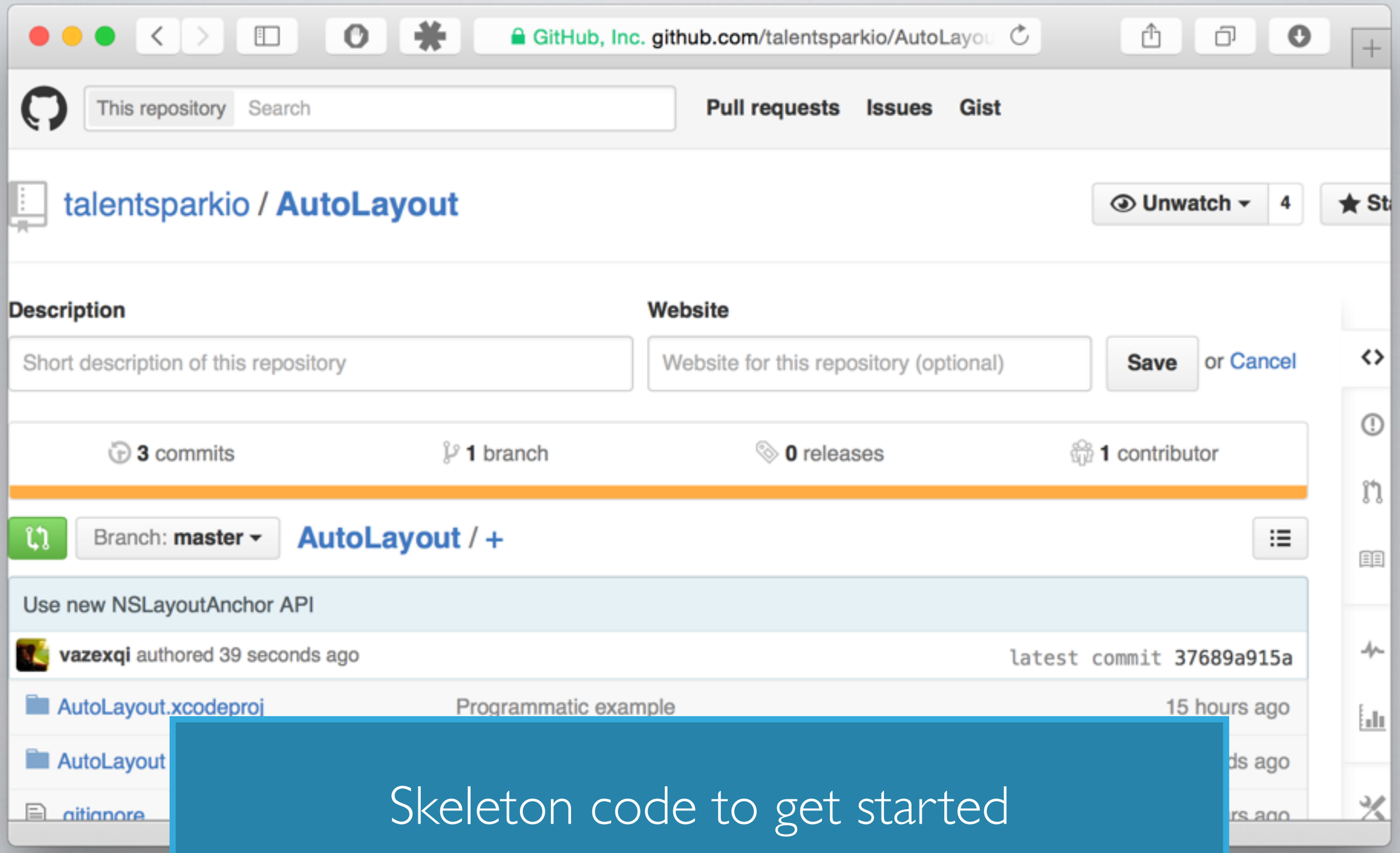
EXERCISE


iPhone 6 - iPhone 6 / iOS 9.0 (13A4325c)
I want a red rect that is 10% of the black rect's height and width. And I want it to always stay at the top left corner.

EXERCISE


GitHub, Inc. github.com/talentsparkio/AutoLayou
This repository
Search
Pull requests
Issues
Gist
talentsparkio / AutoLayout
Unwatch
4
Description
Website
Short description of this repository
Website for this repository (optional)
Save
or Cancel
3 commits
1 branch
0 releases
1 contributor
Branch: master
AutoLayout / +
Use new NSLayoutAnchor API
vazexqi authored 39 seconds ago
latest commit 37689a915a
AutoLayout.xcodeproj
Programmatic example
15 hours ago
AutoLayout
Use new NSLayoutAnchor API
38 seconds ago
.gitignore
Programmatic example
15 hours ago

EXERCISE



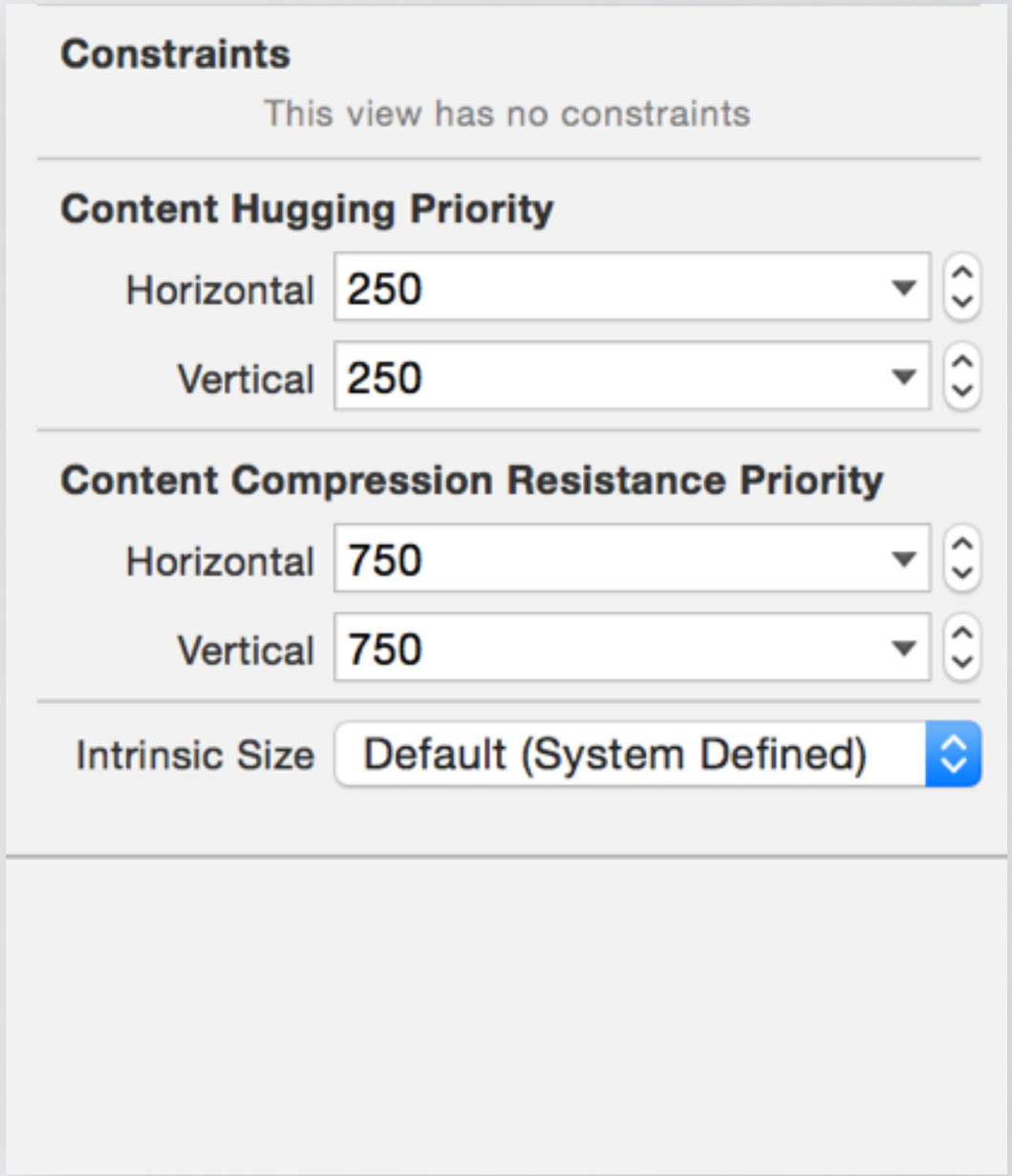
Skeleton code to get started

CONSTRAINTS WE'VE SEEN

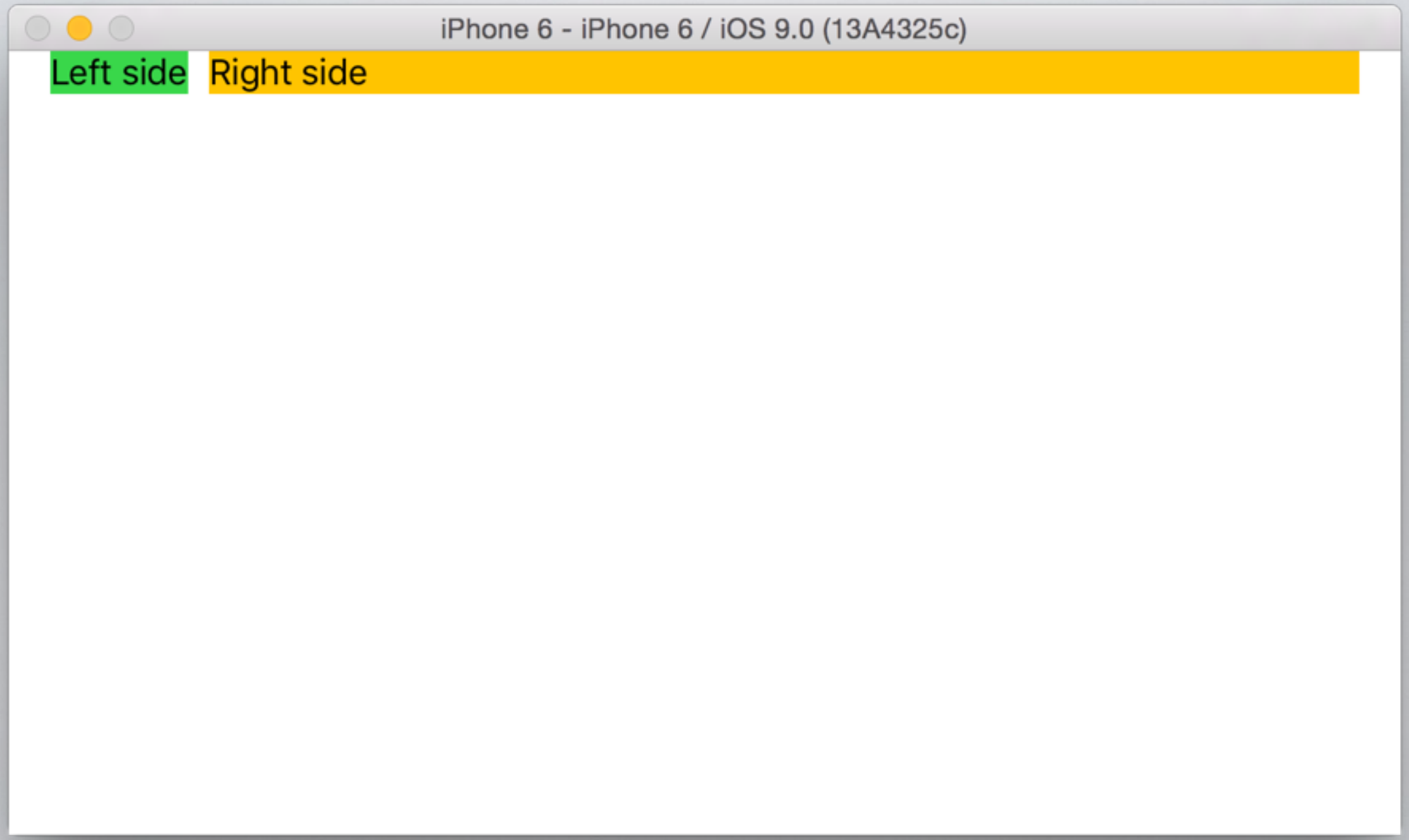
- Alignment constraints (top, left, bottom, right, spacing)
- Size constraints (width, height)

TWO OTHER CONSTRAINTS

- Content Hugging Priority
- Compression Resistance Priority



CONTENT HUGGING



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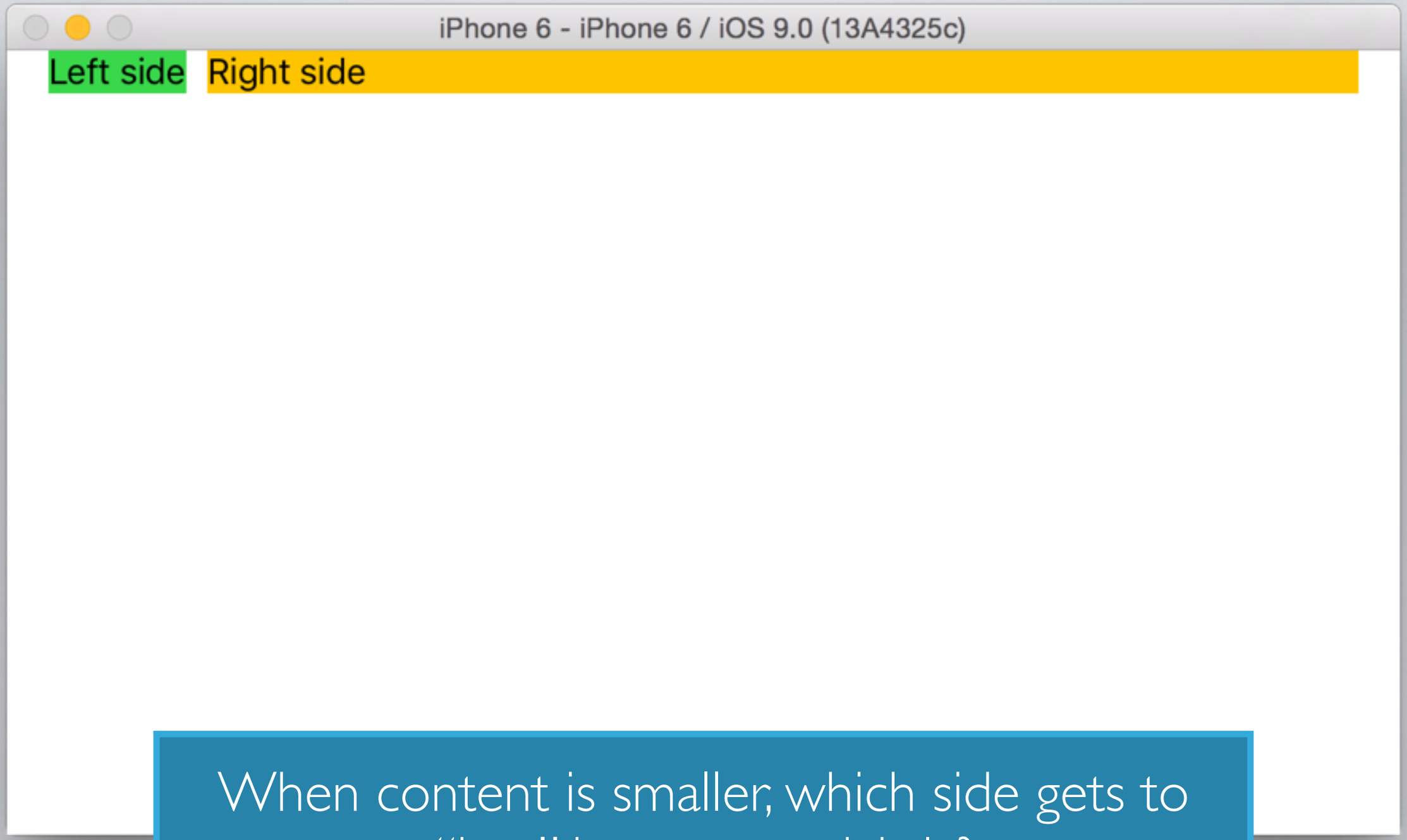
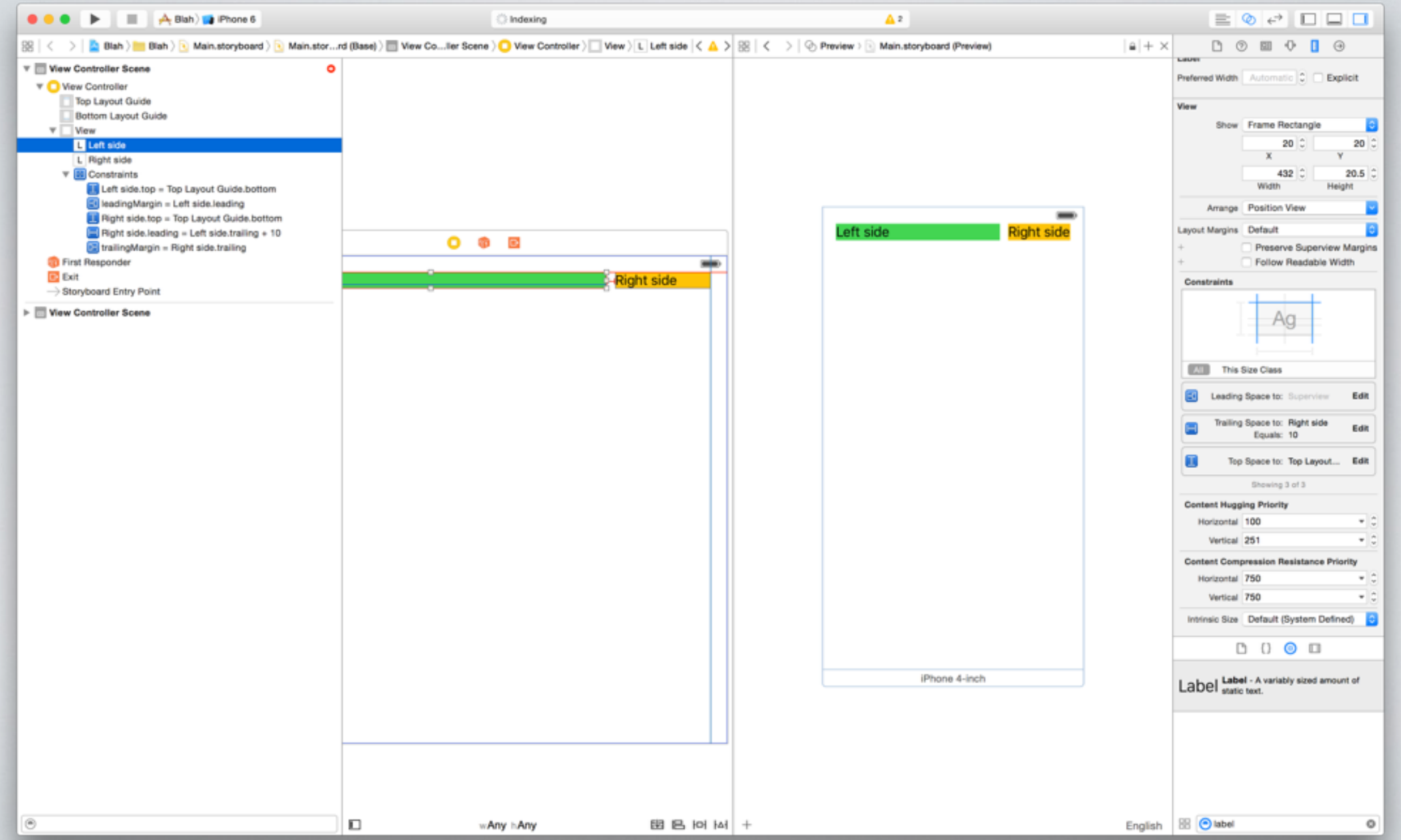


When content is smaller, which side gets to "hug" its content tightly?

CONTENT HUGGING



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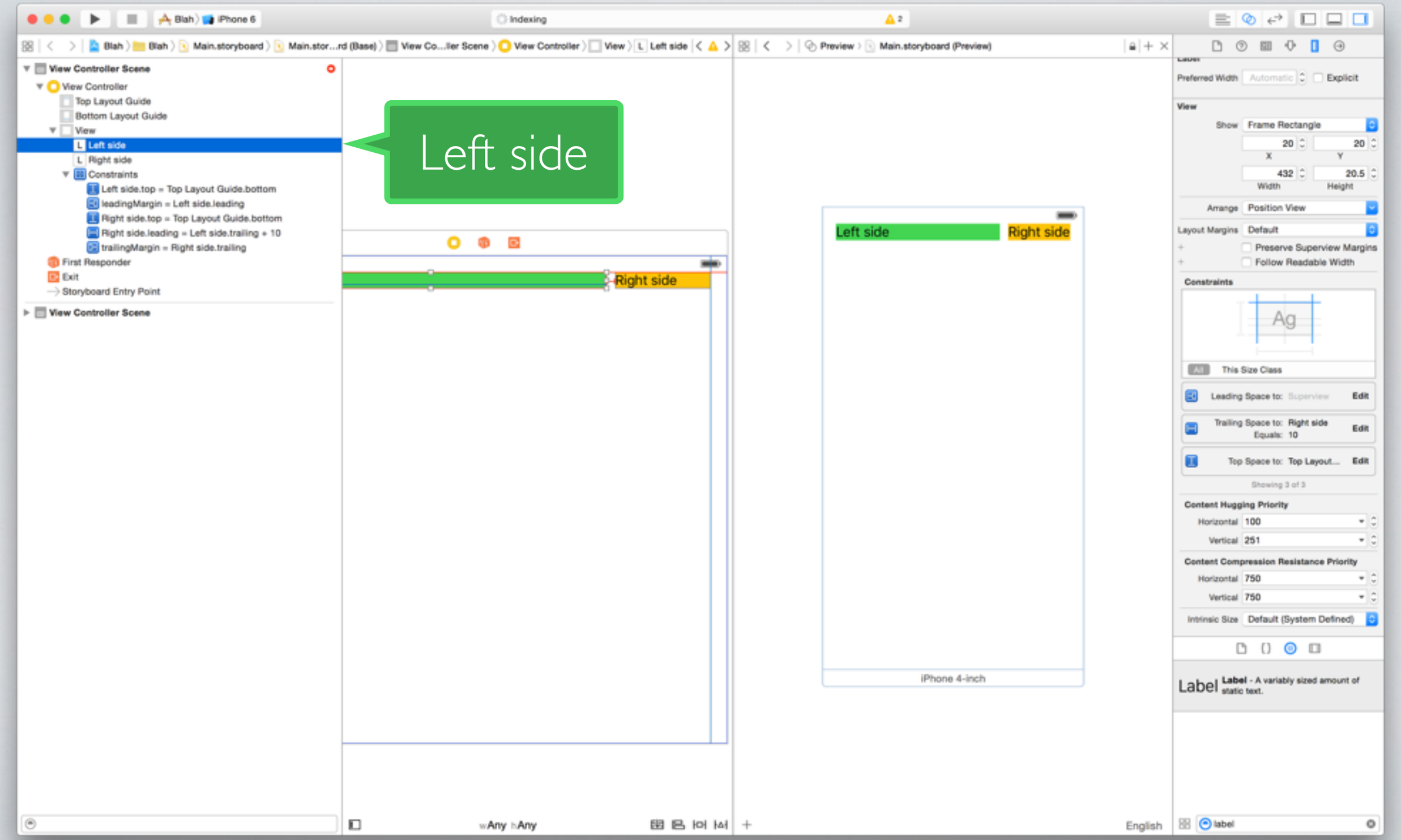

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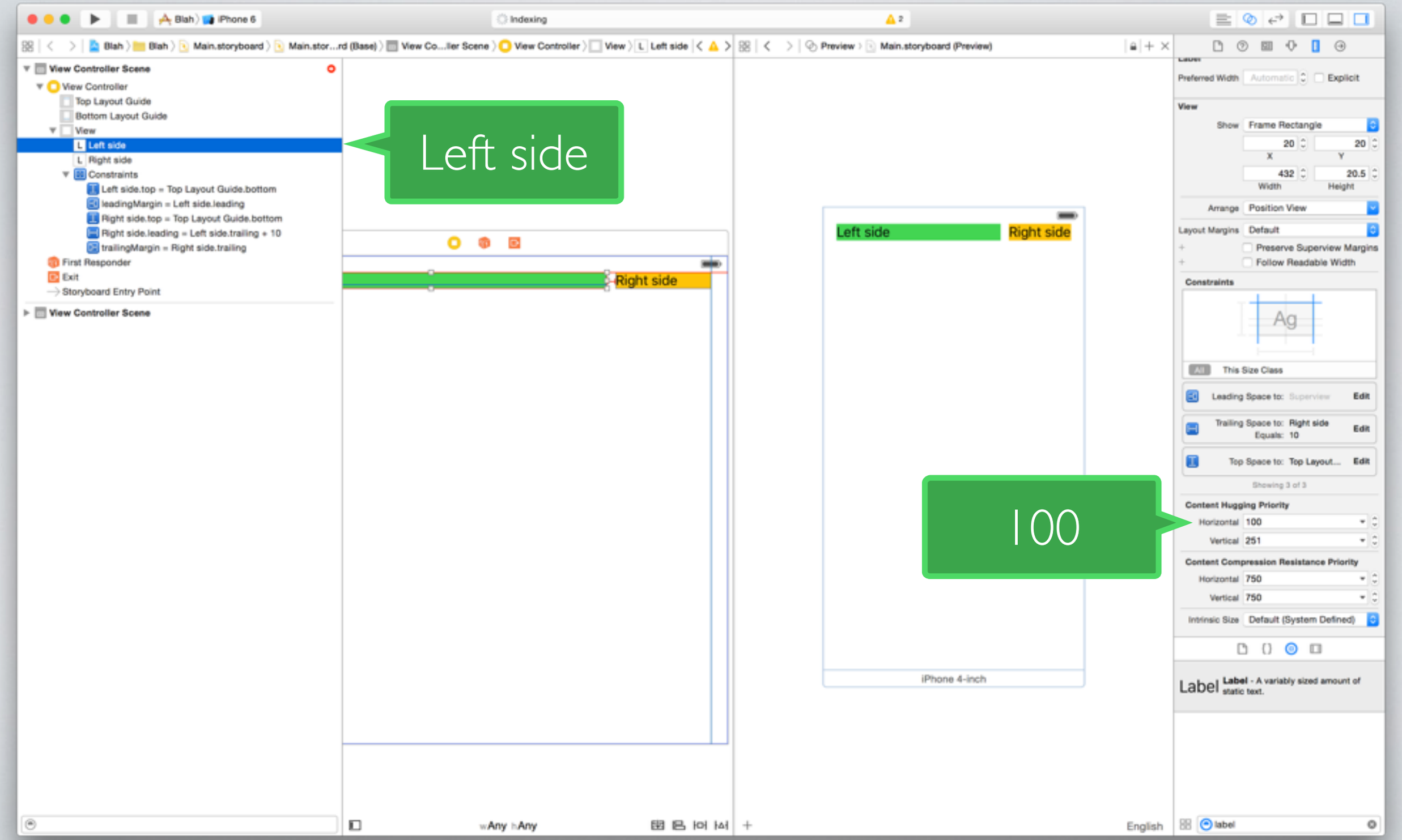

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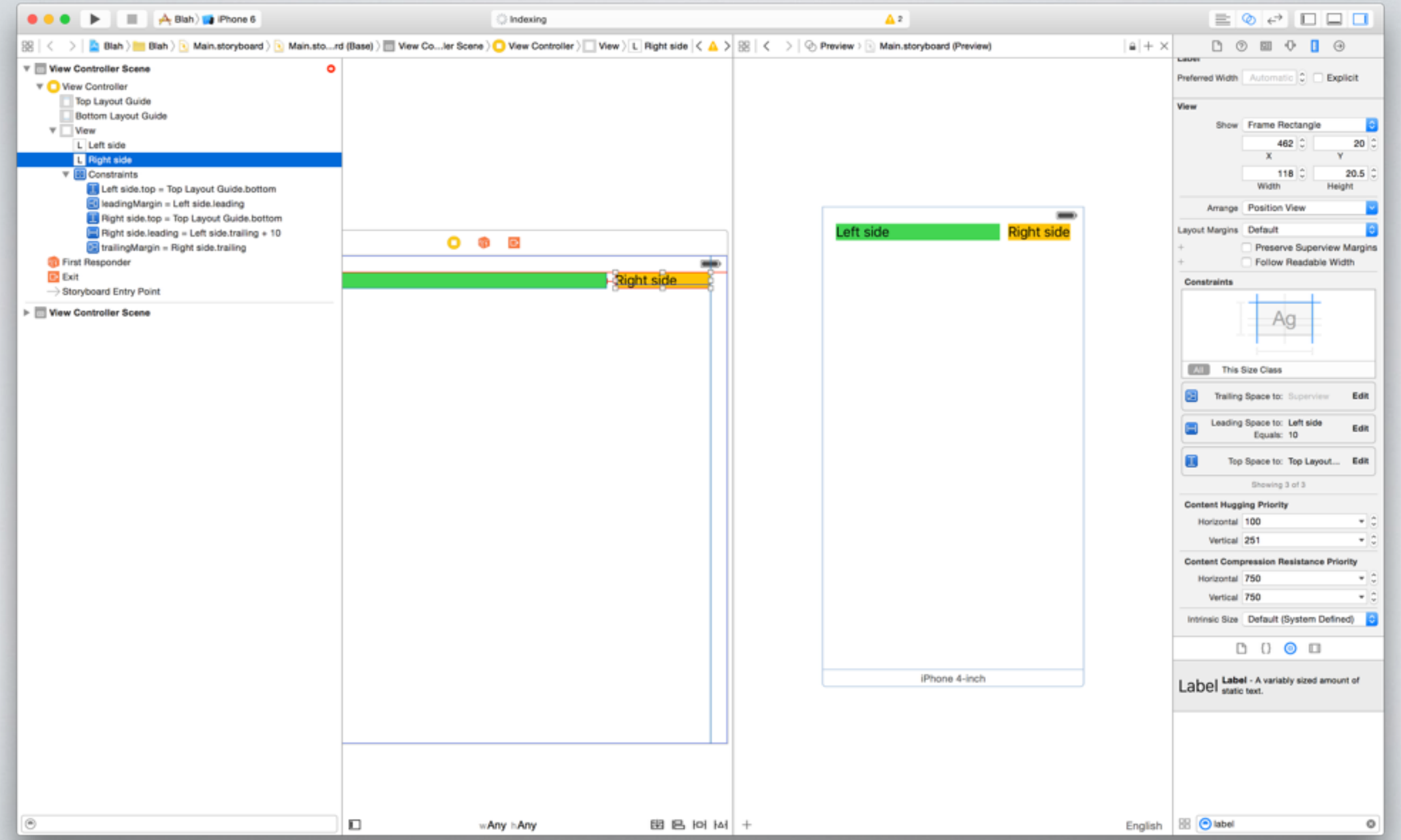

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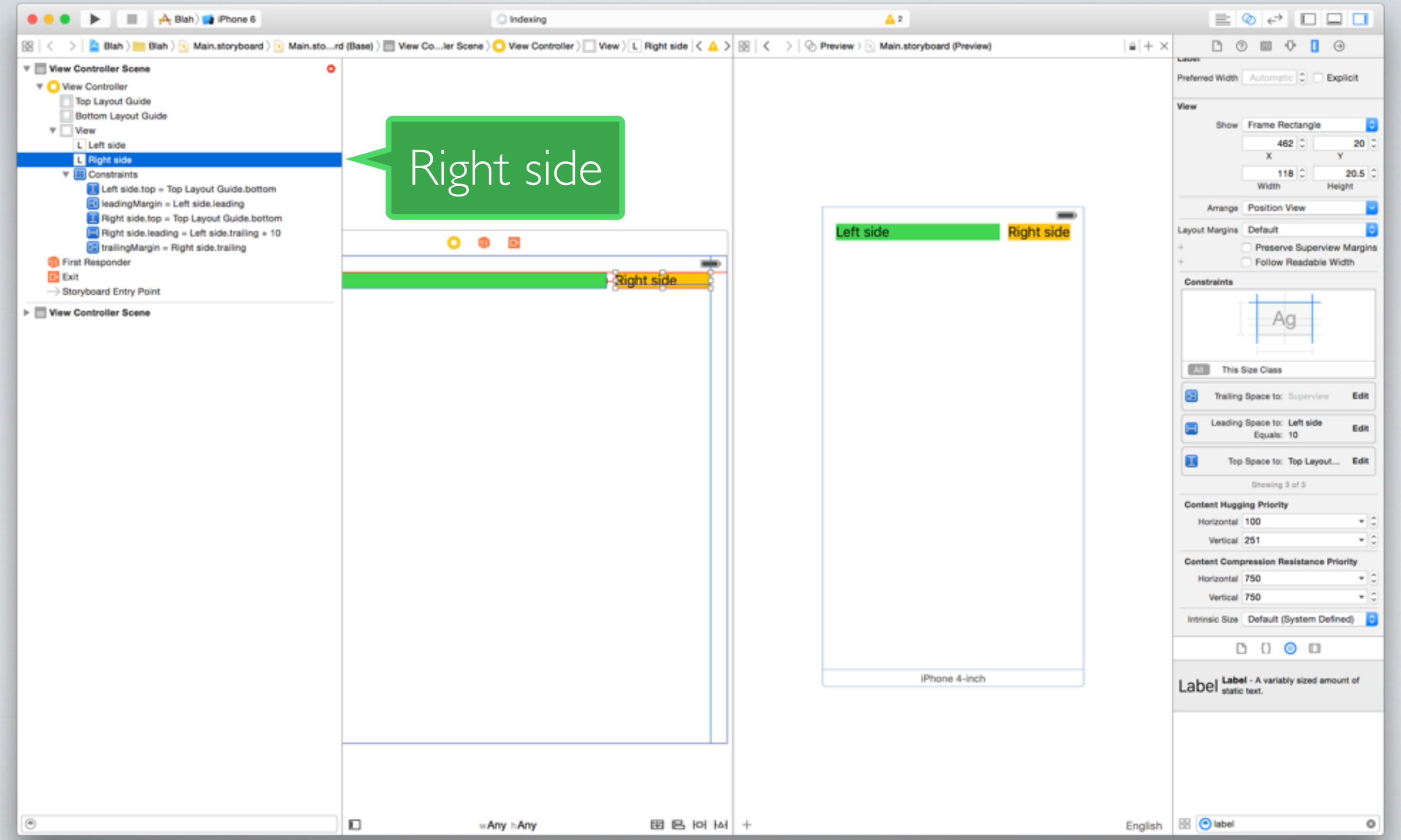

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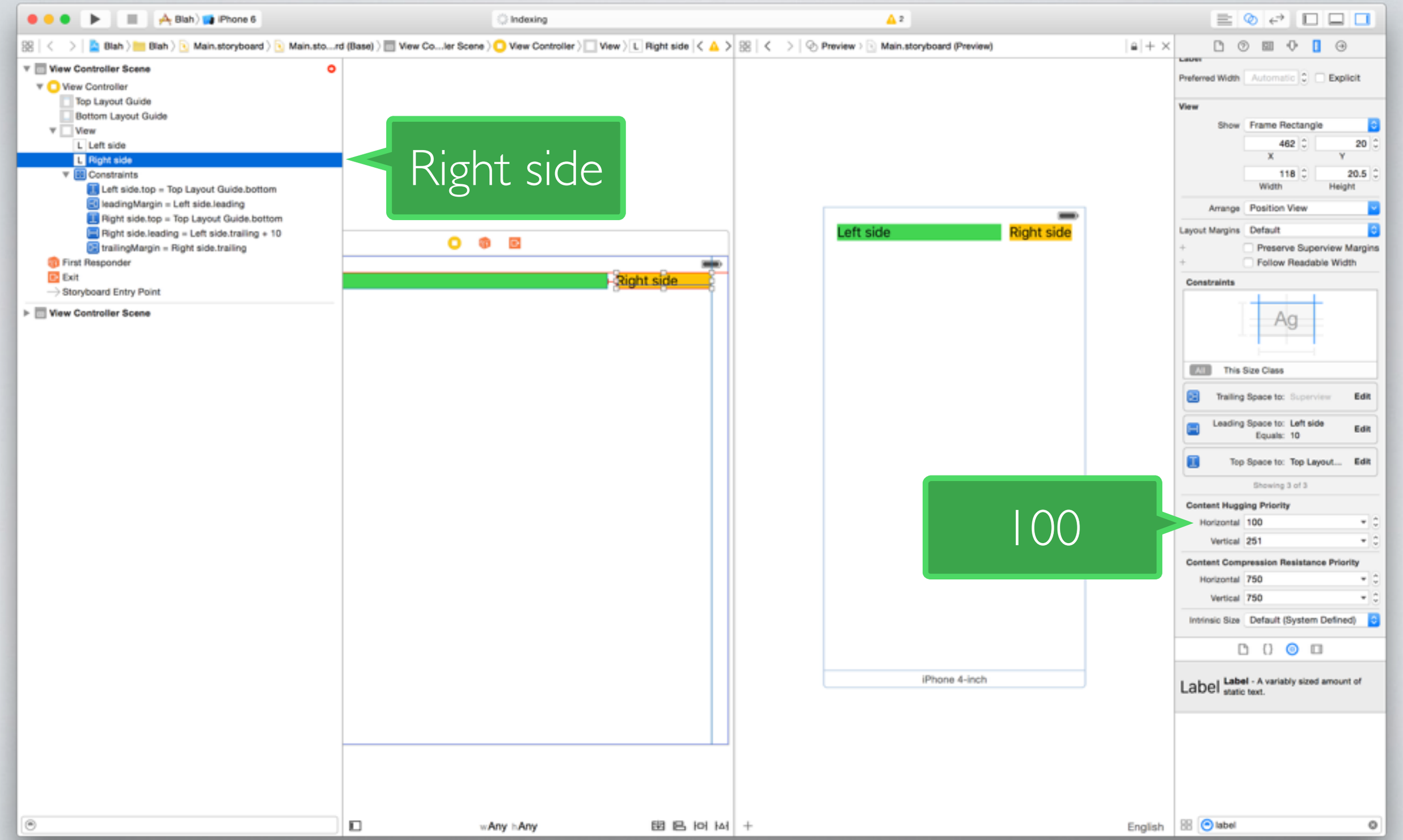

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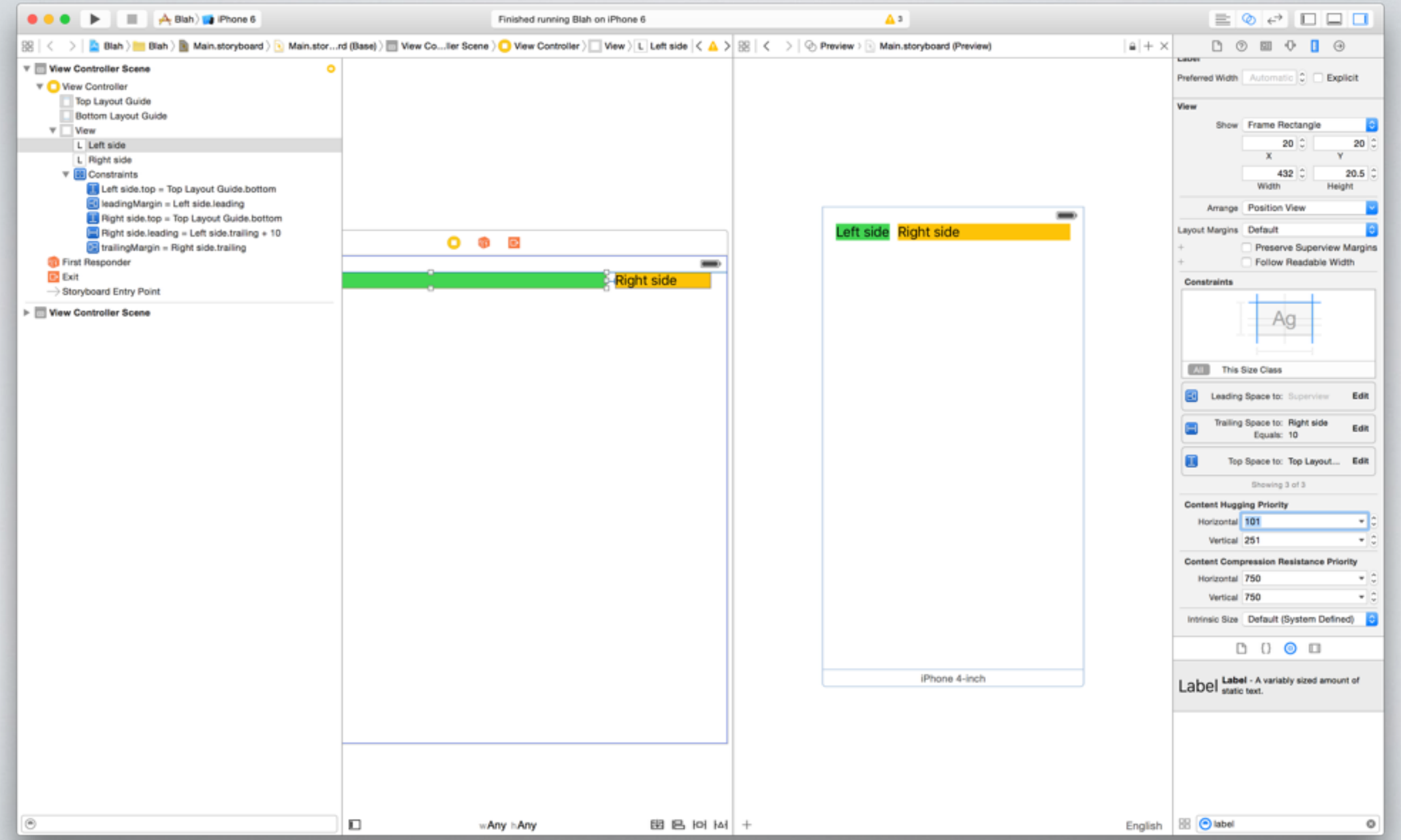

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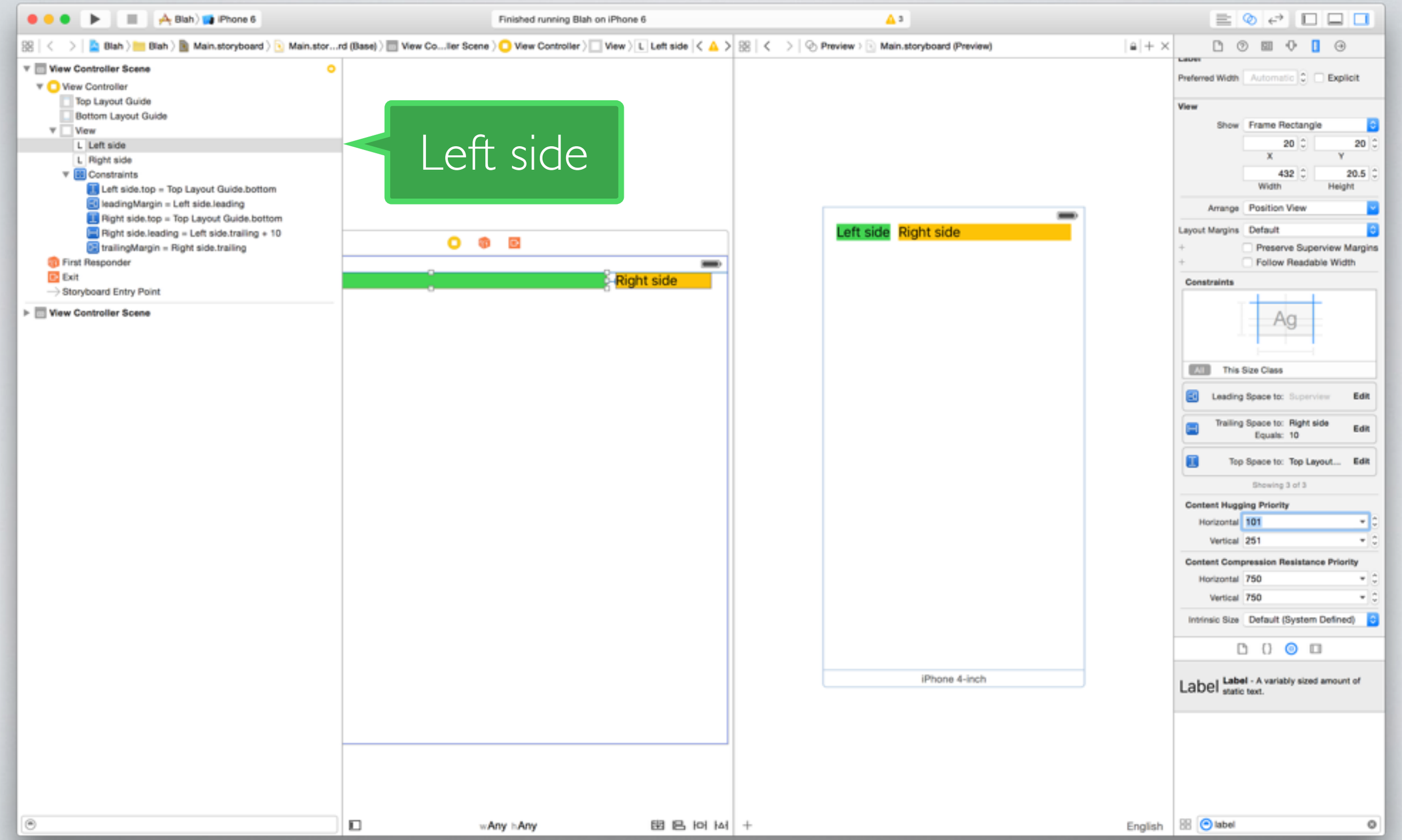

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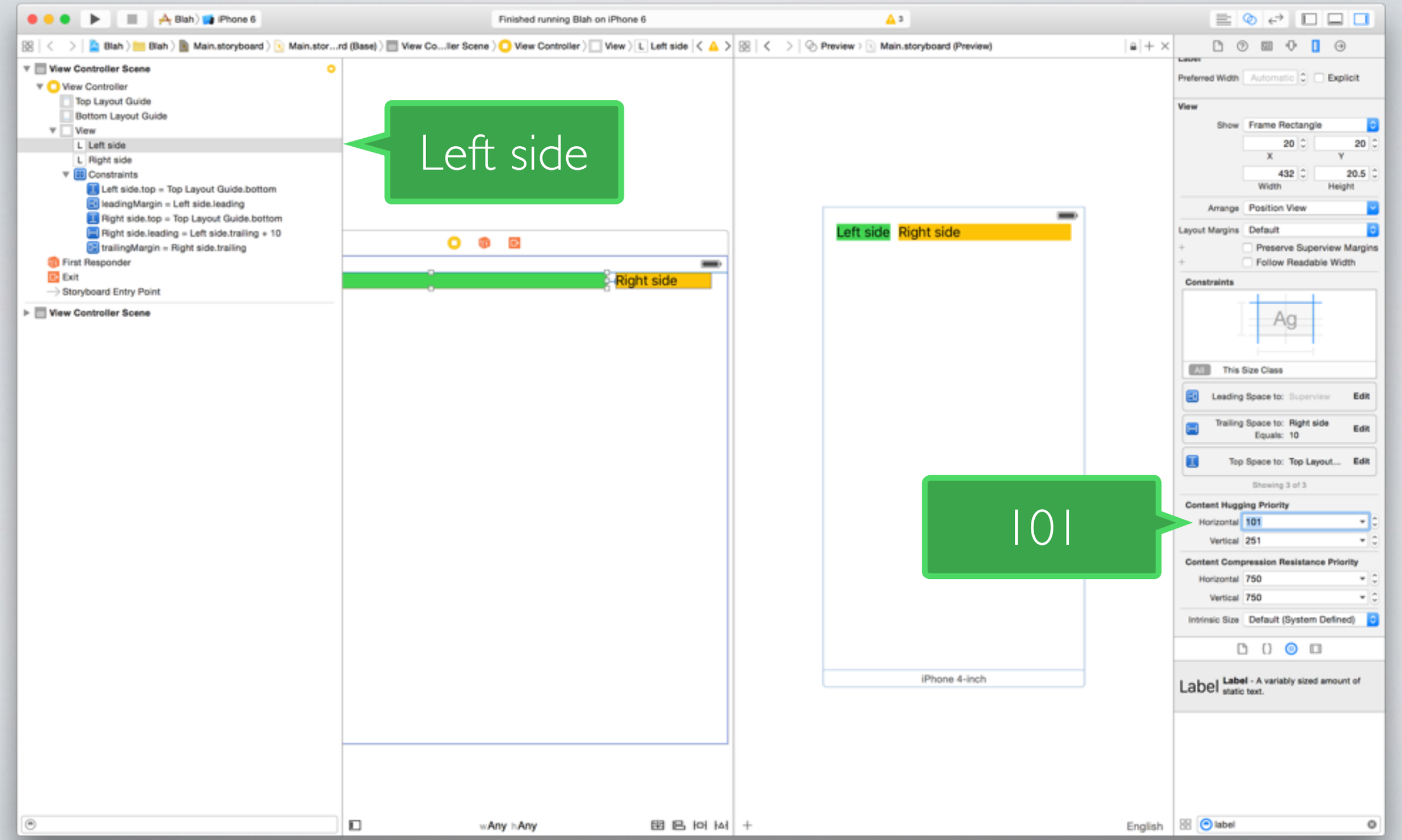

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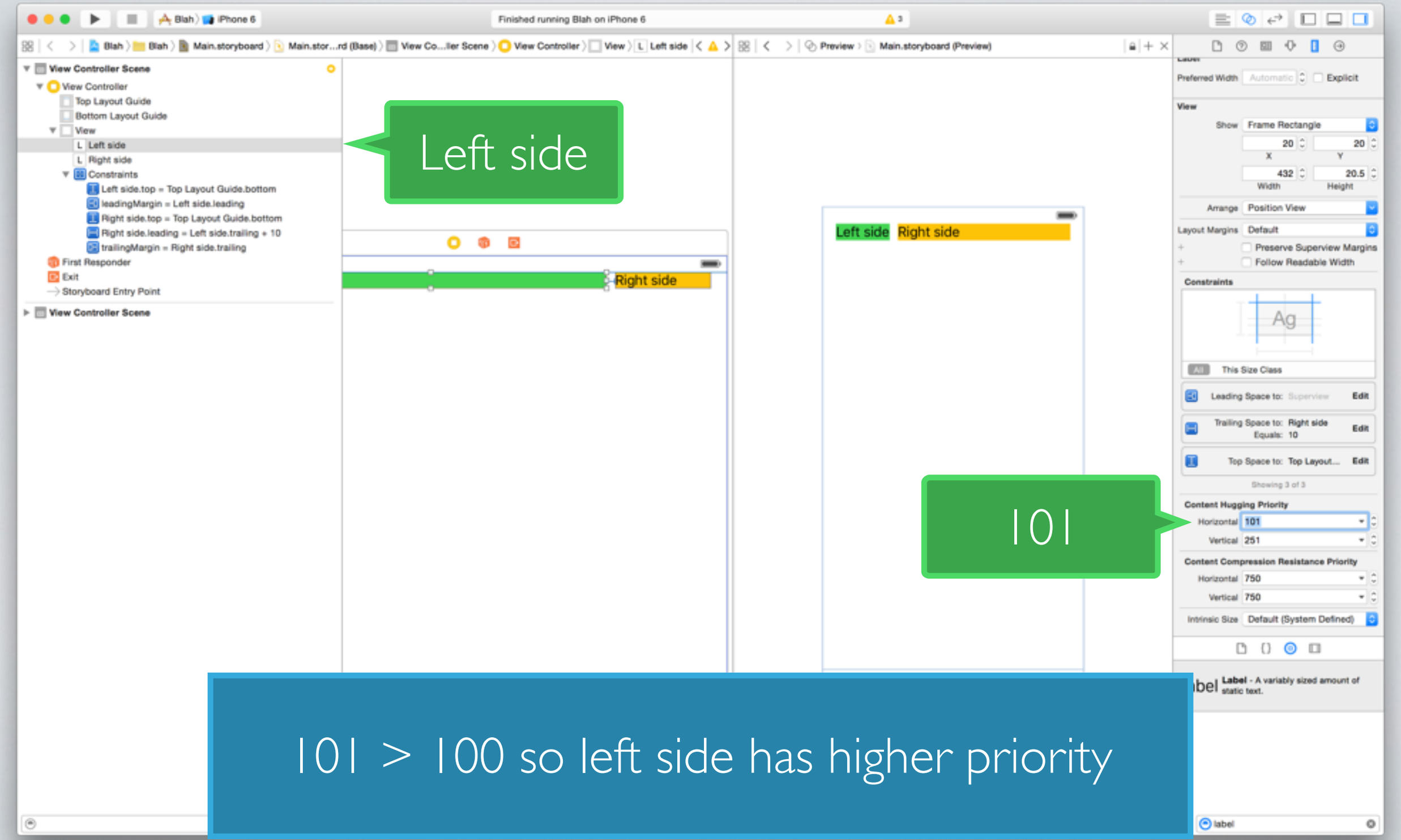
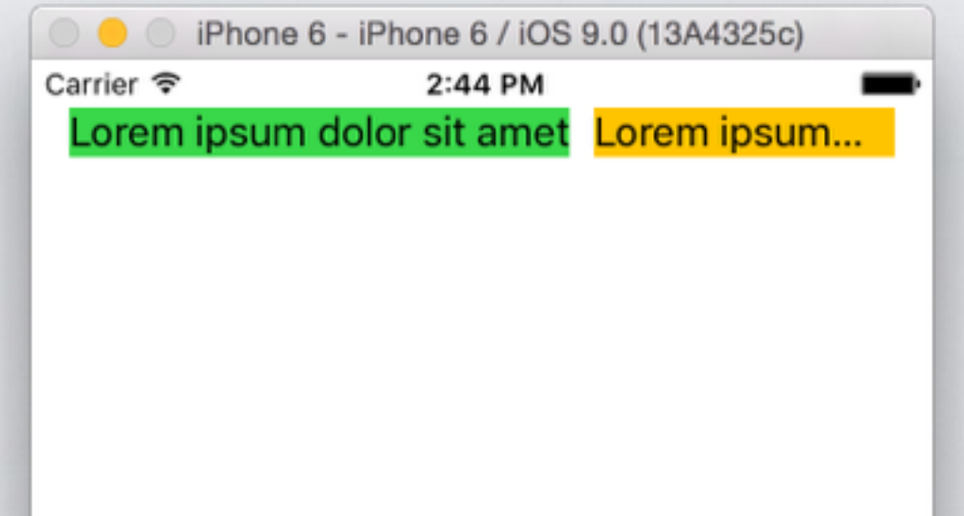
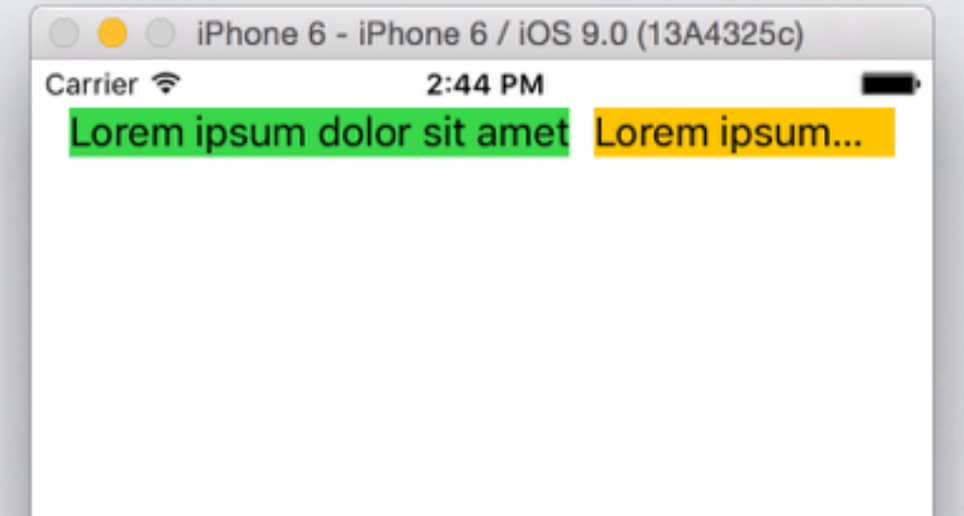


COMPRESSION RESISTANCE

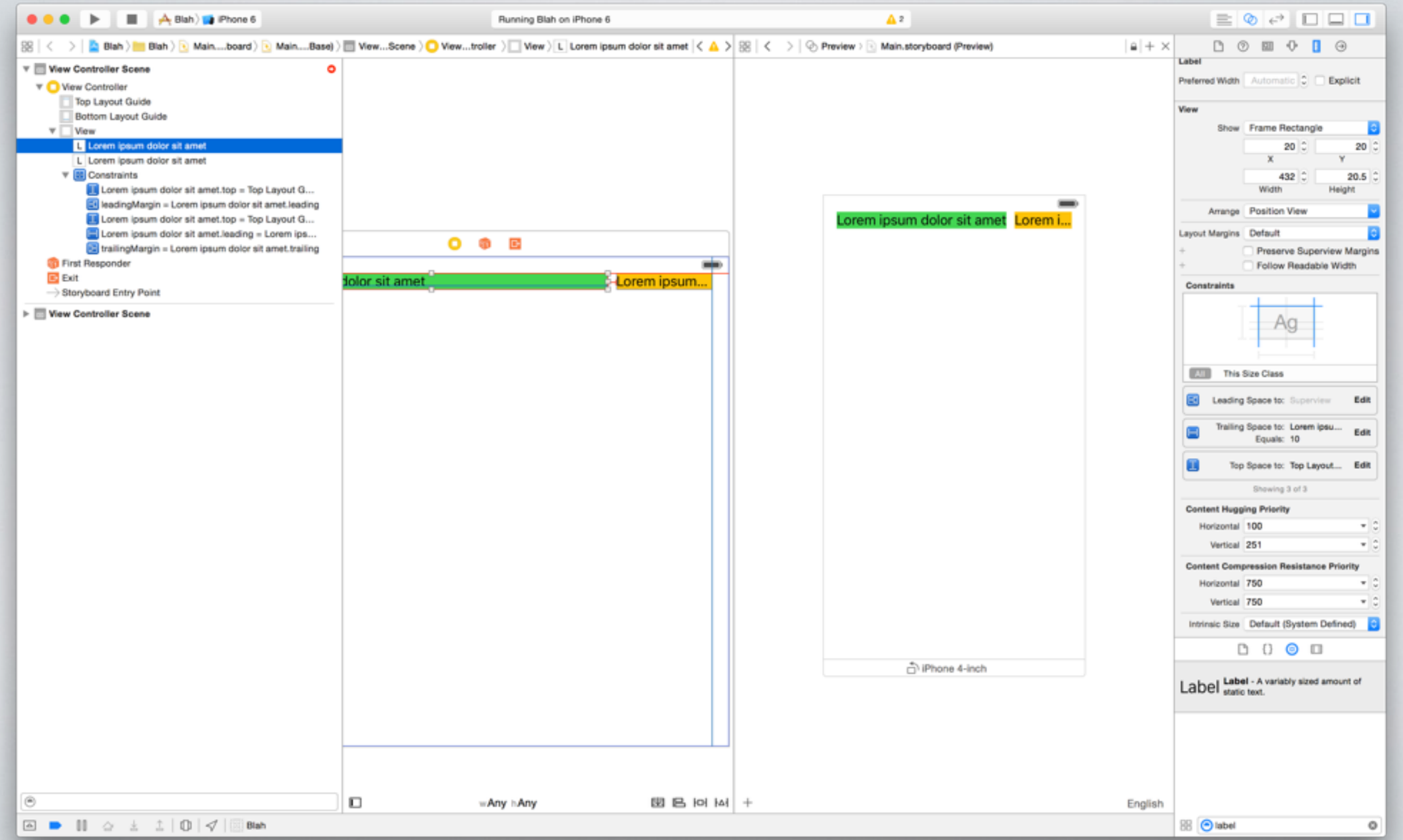


COMPRESSION RESISTANCE



When content is larger, which side gets to "hug" its content tightly?

COMPRESSION RESISTANCE



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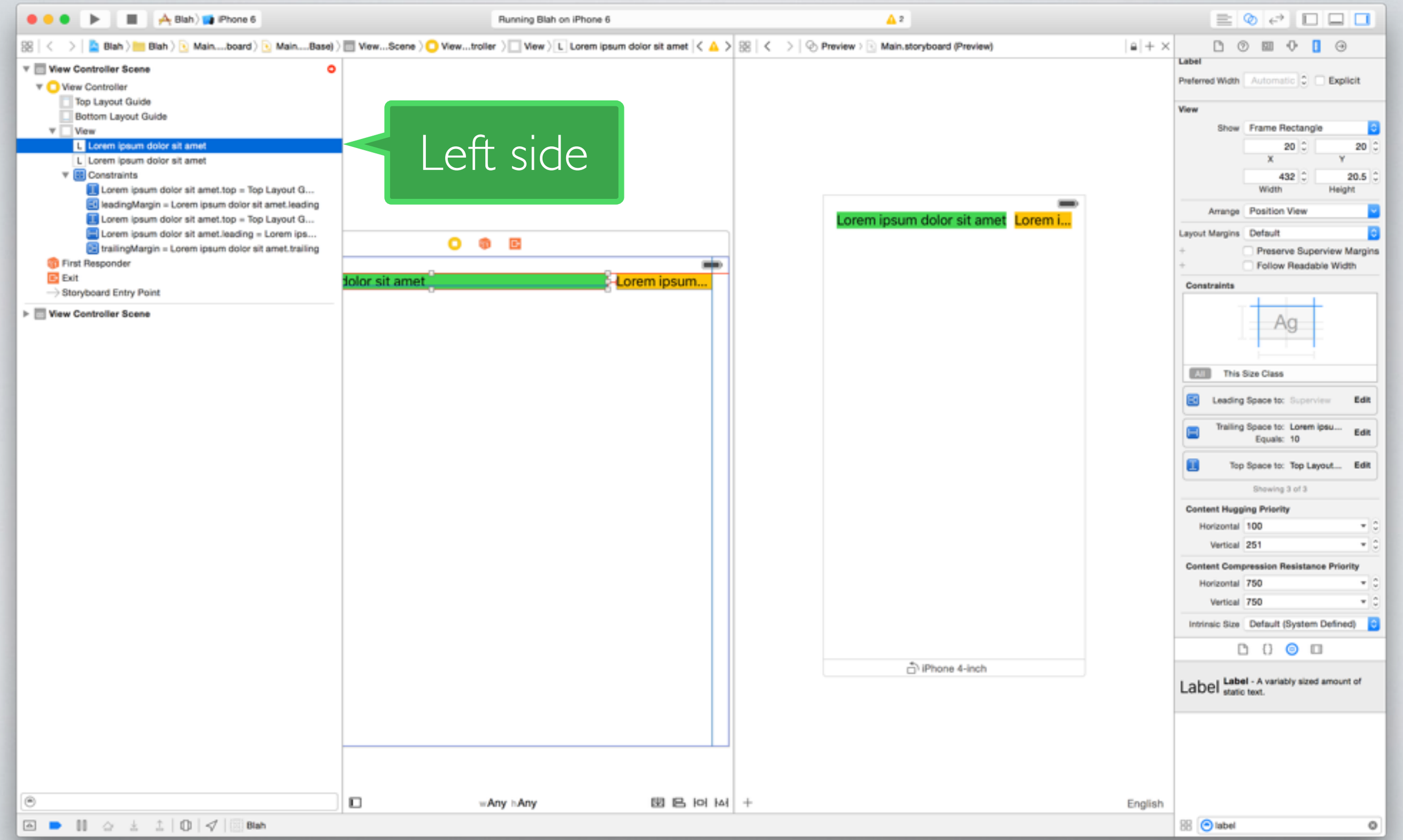

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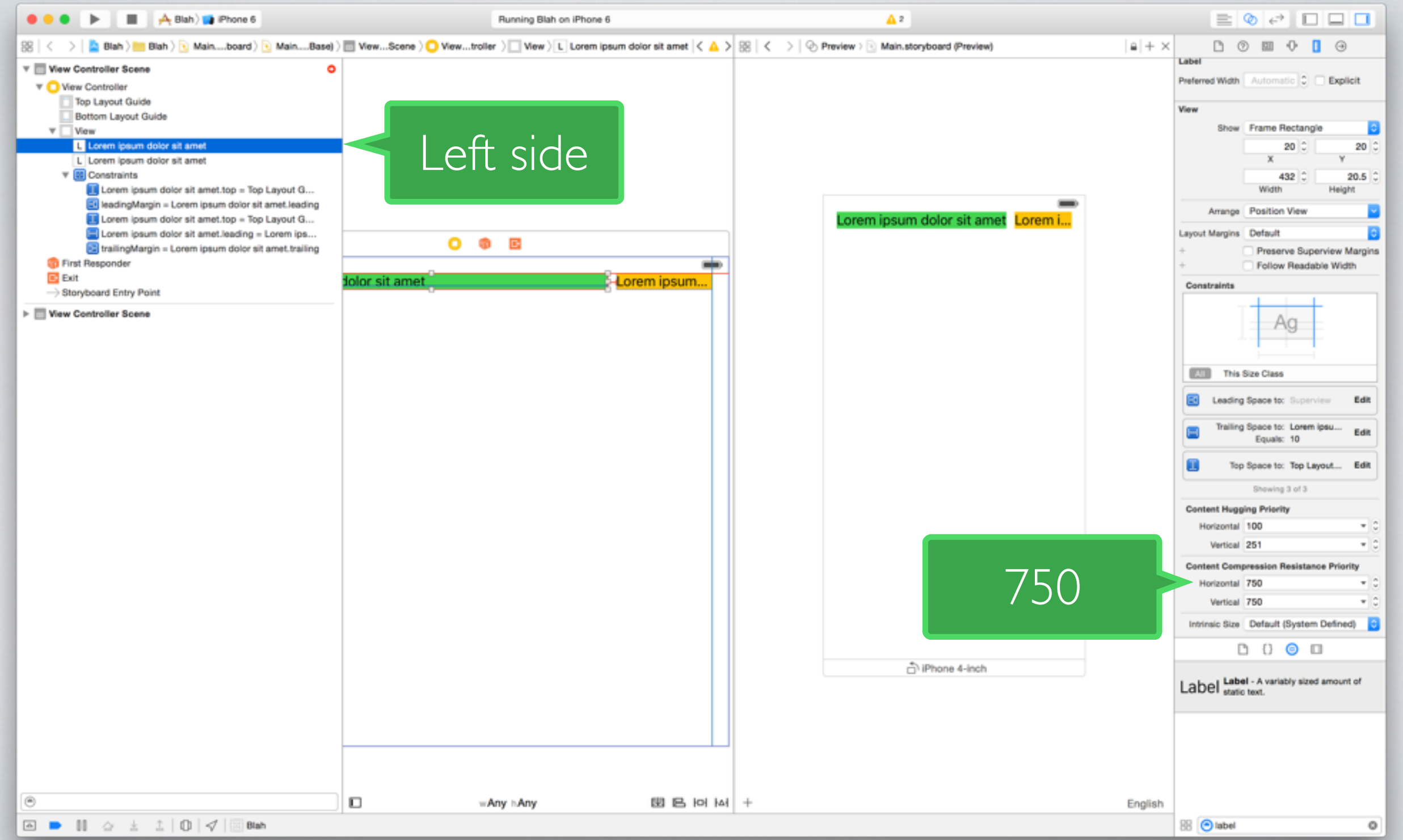

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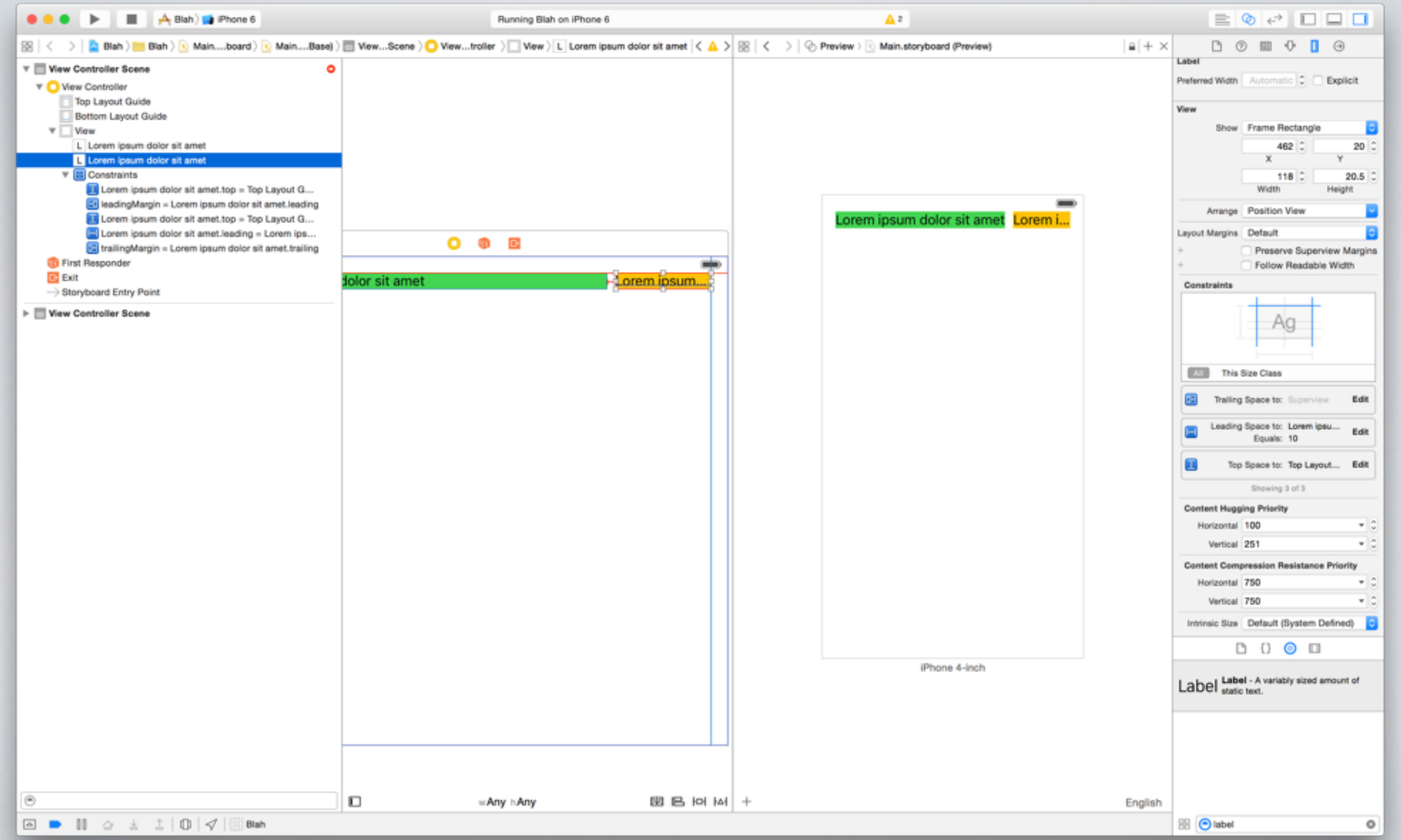

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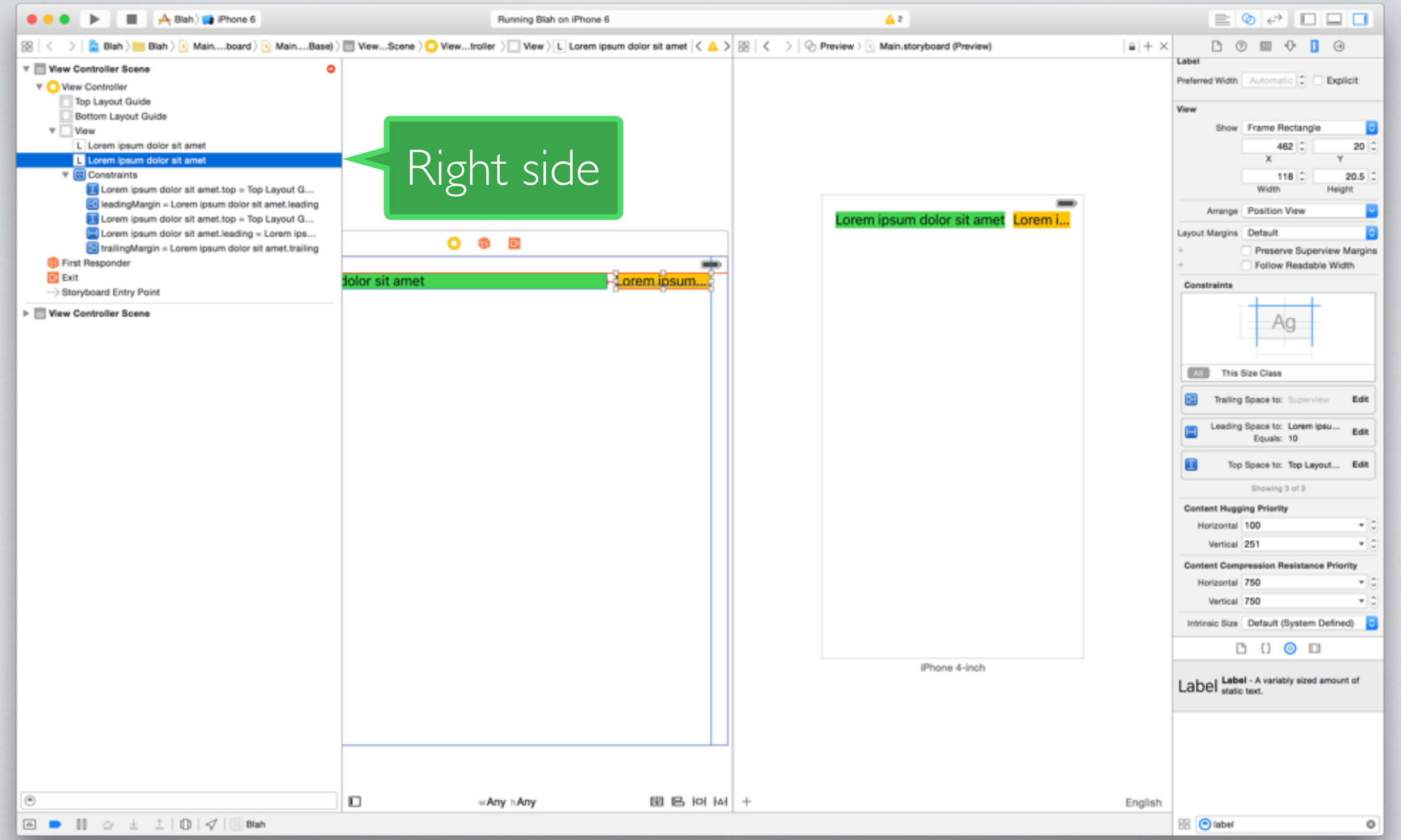
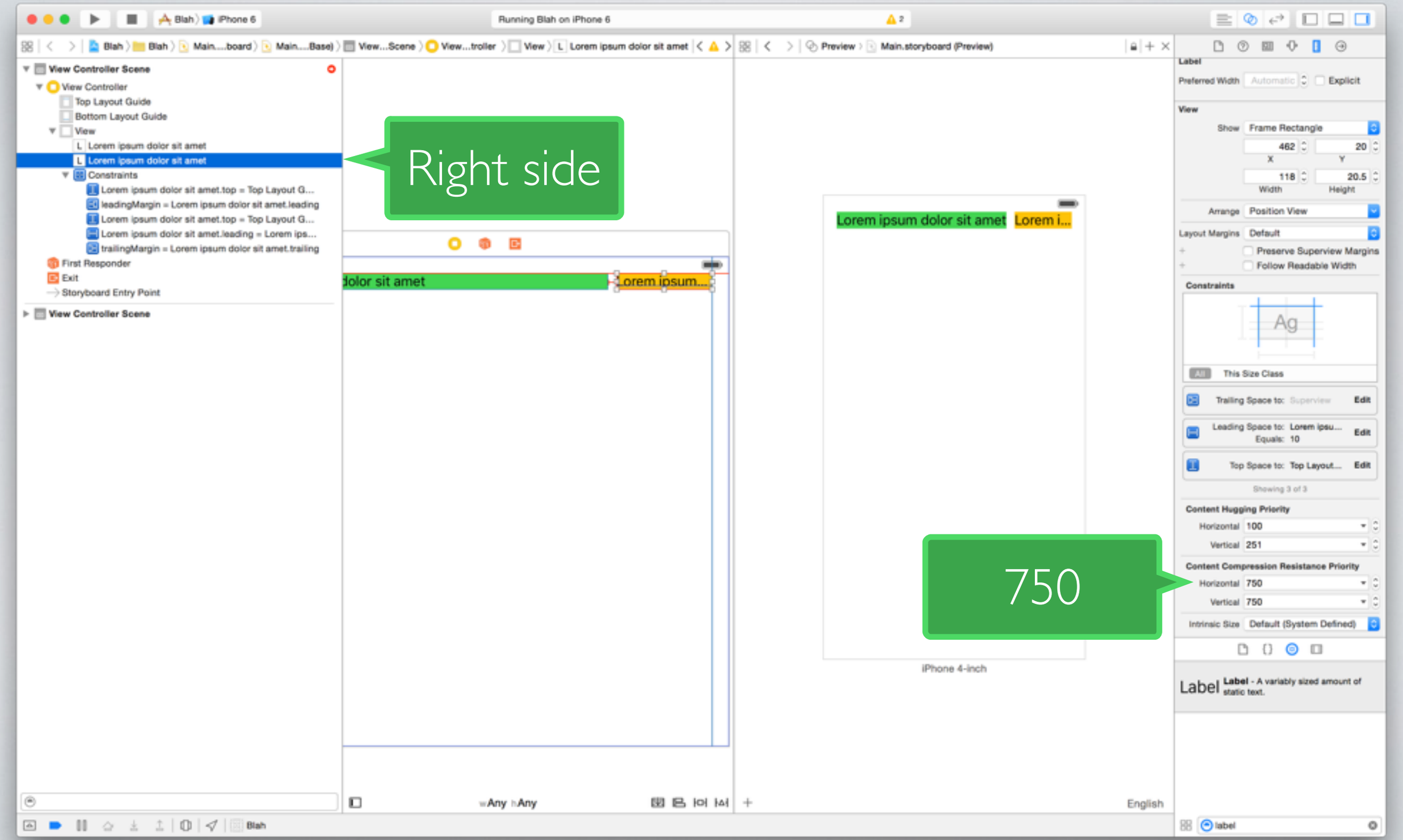


COMPRESSION RESISTANCE



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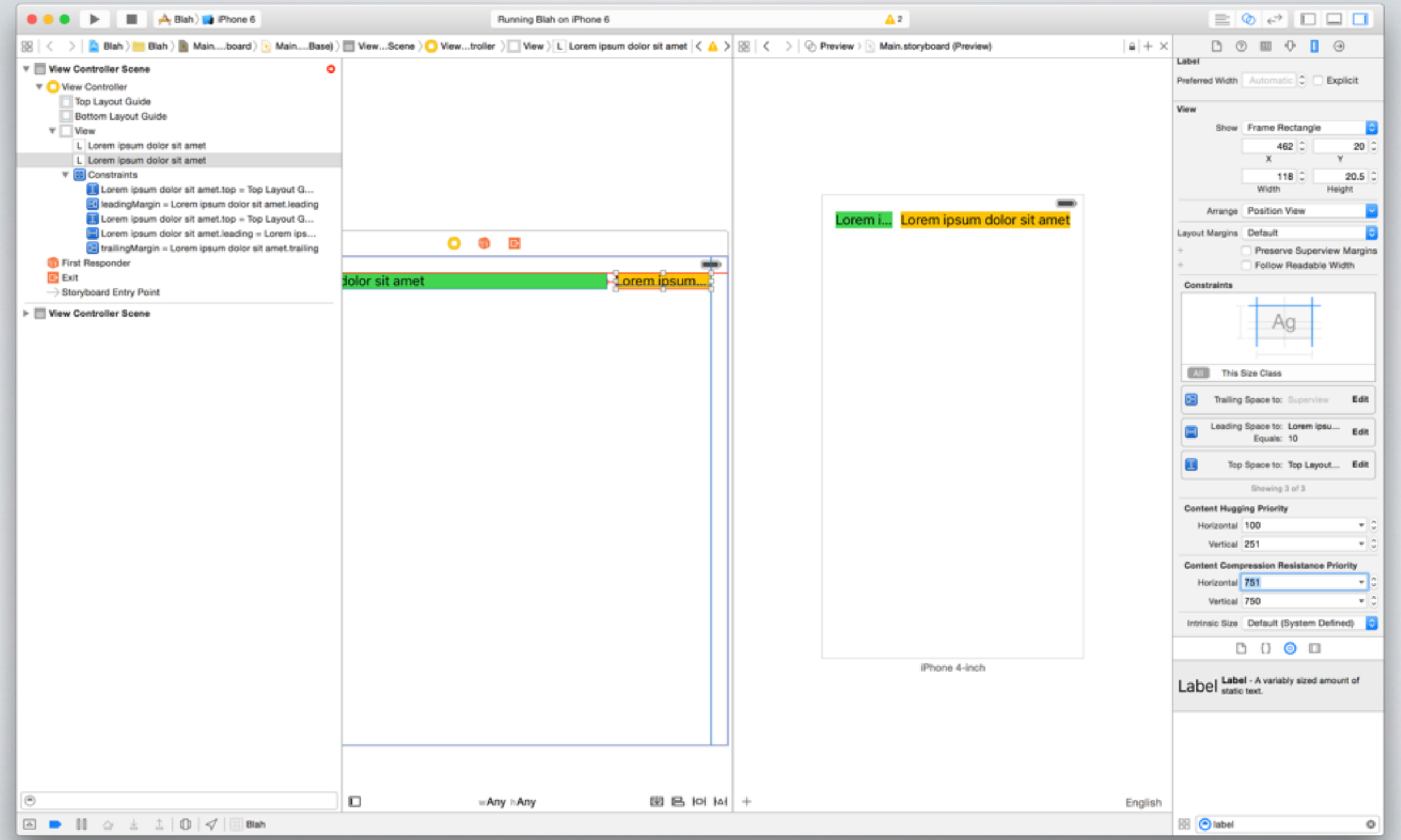
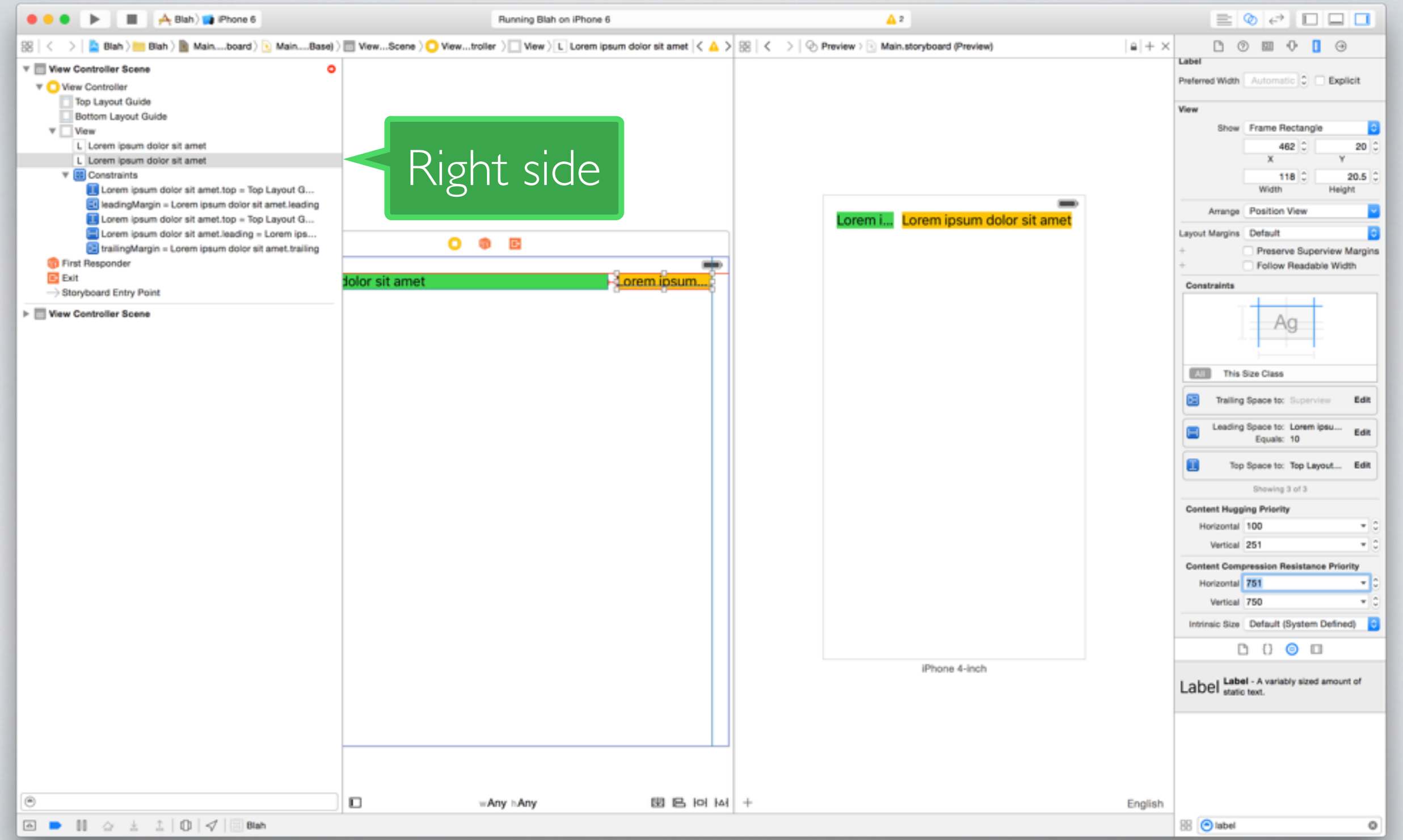
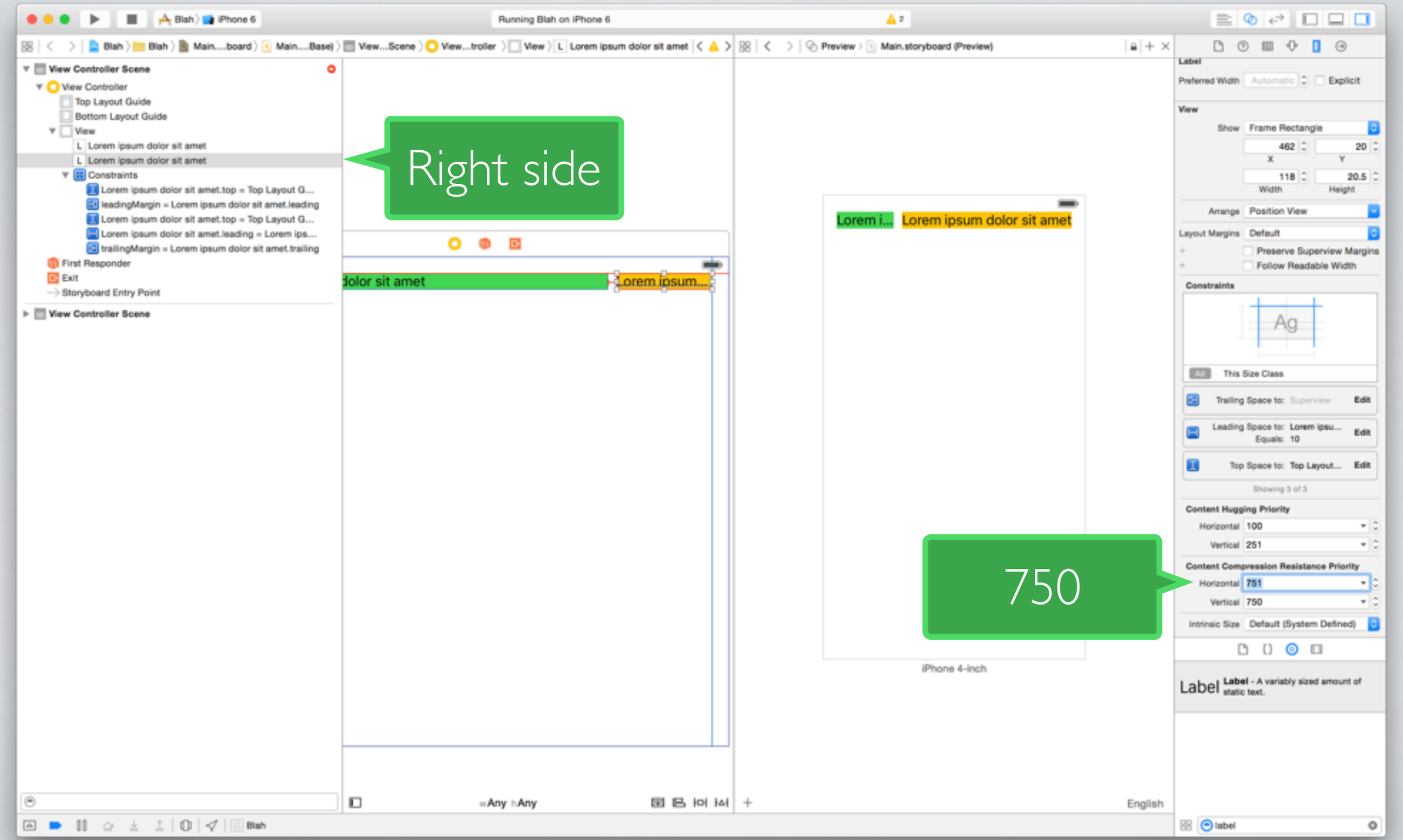


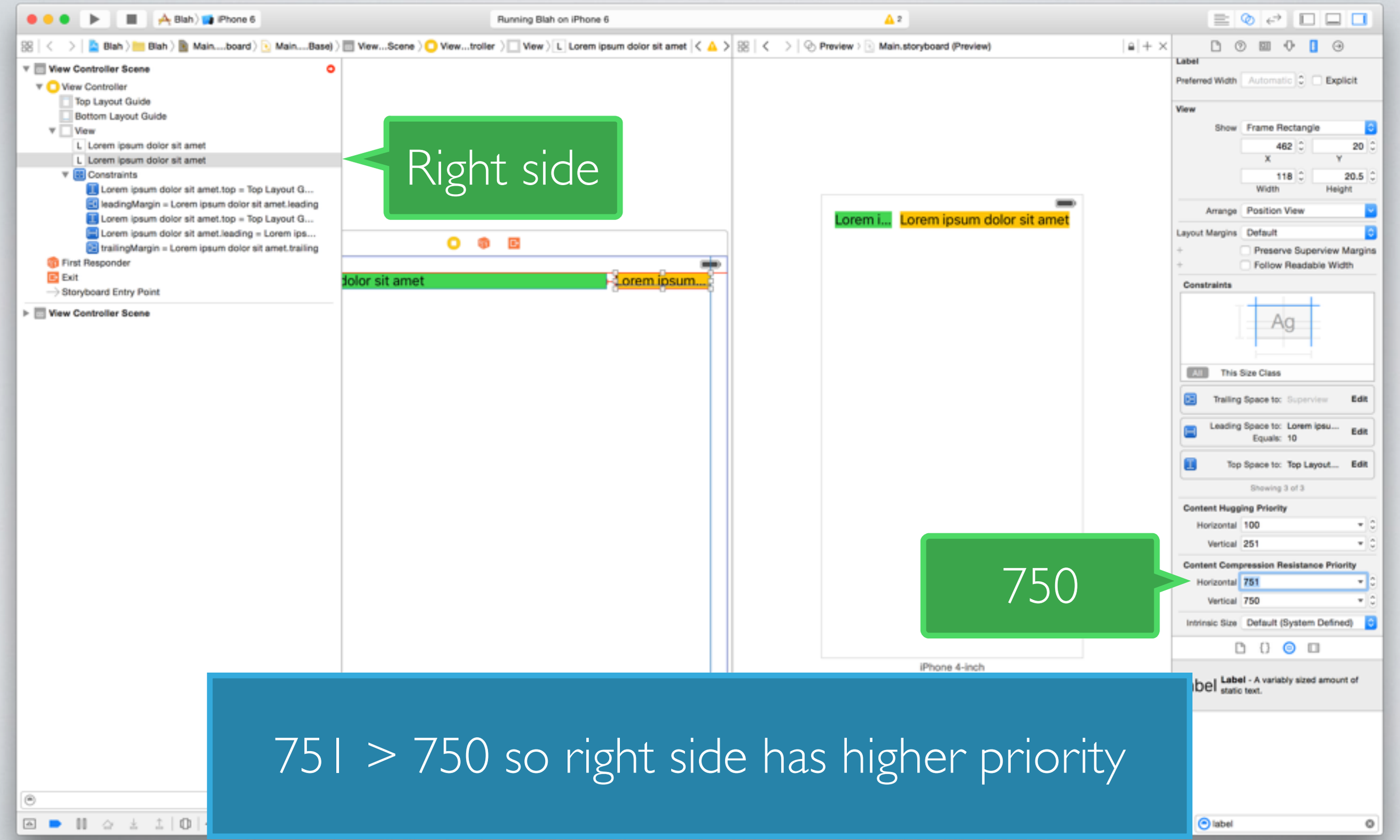
COMPRESSION RESISTANCE



COMPRESSION RESISTANCE



COMPRESSION RESISTANCE



SIZE CLASSES

SIZE CLASSES

We know how to make things look good on different orientations

SIZE CLASSES

We know how to make things look good on different orientations

SIZE CLASSES

We know how to make things look good on different orientations

http://www.appcoda.com/stack-views-intro/

SIZE CLASSES

SIZE CLASSES

Can we make things look *different* based on the orientation?

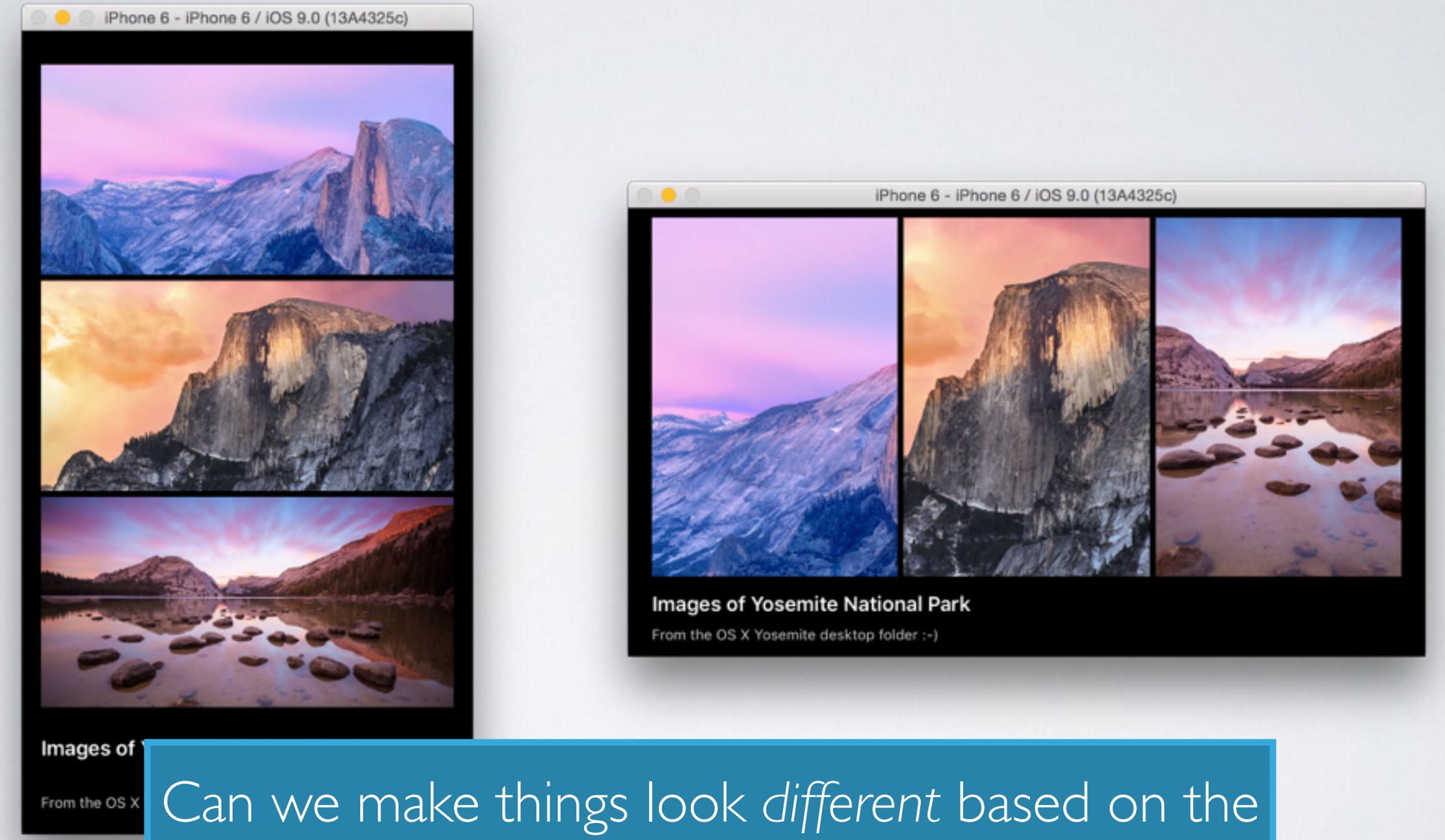
SIZE CLASSES

Can we make things look *different* based on the orientation?

SIZE CLASSES

Can we make things look *different* based on the orientation?

SIZE CLASSES



Can we make things look *different* based on the orientation?

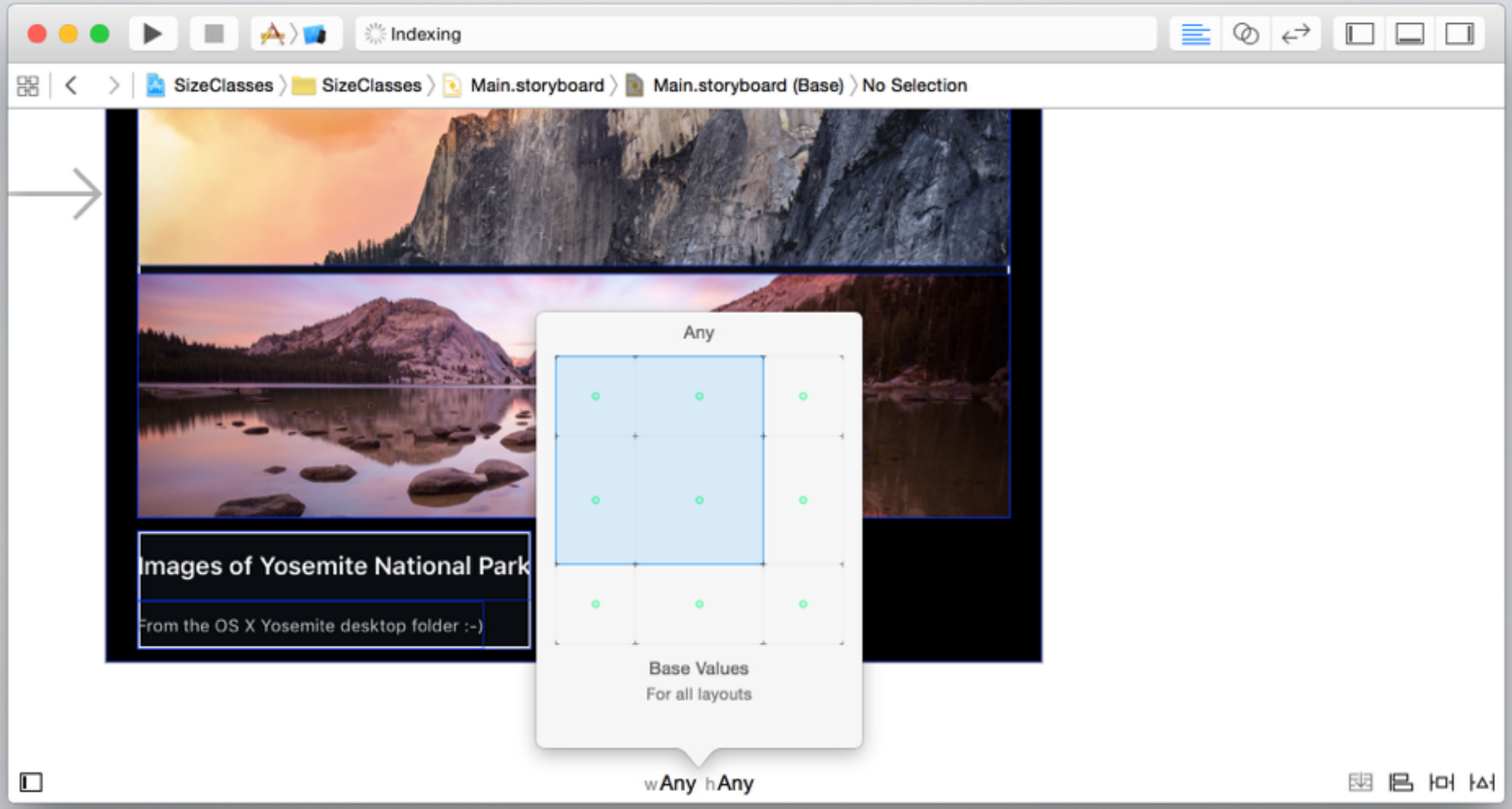
EXERCISE

- Recreate the example using only Storyboards and auto layout

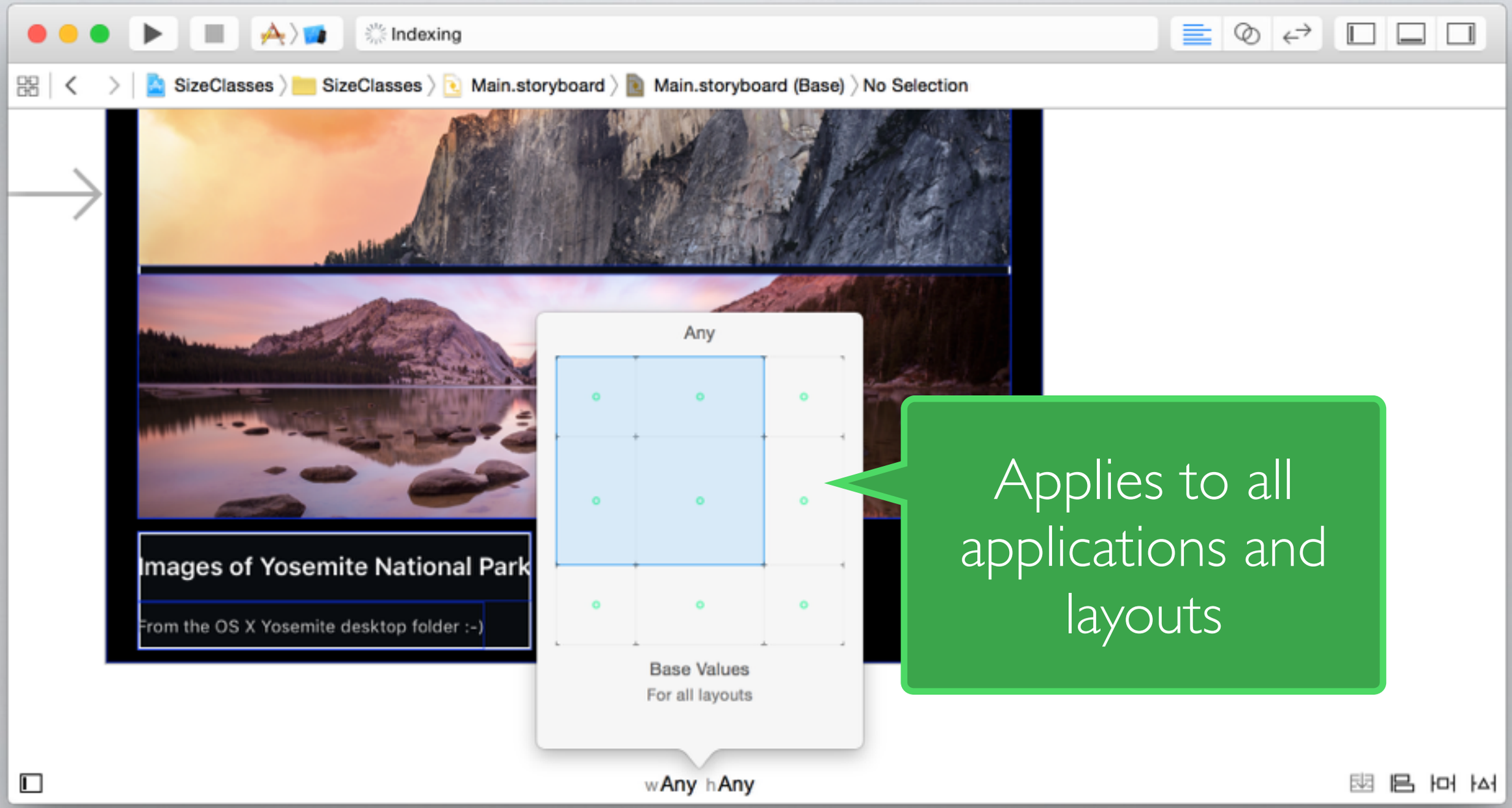
- You can find the images in /Library/Desktop Pictures/

- Scale the images down first – they are huge!

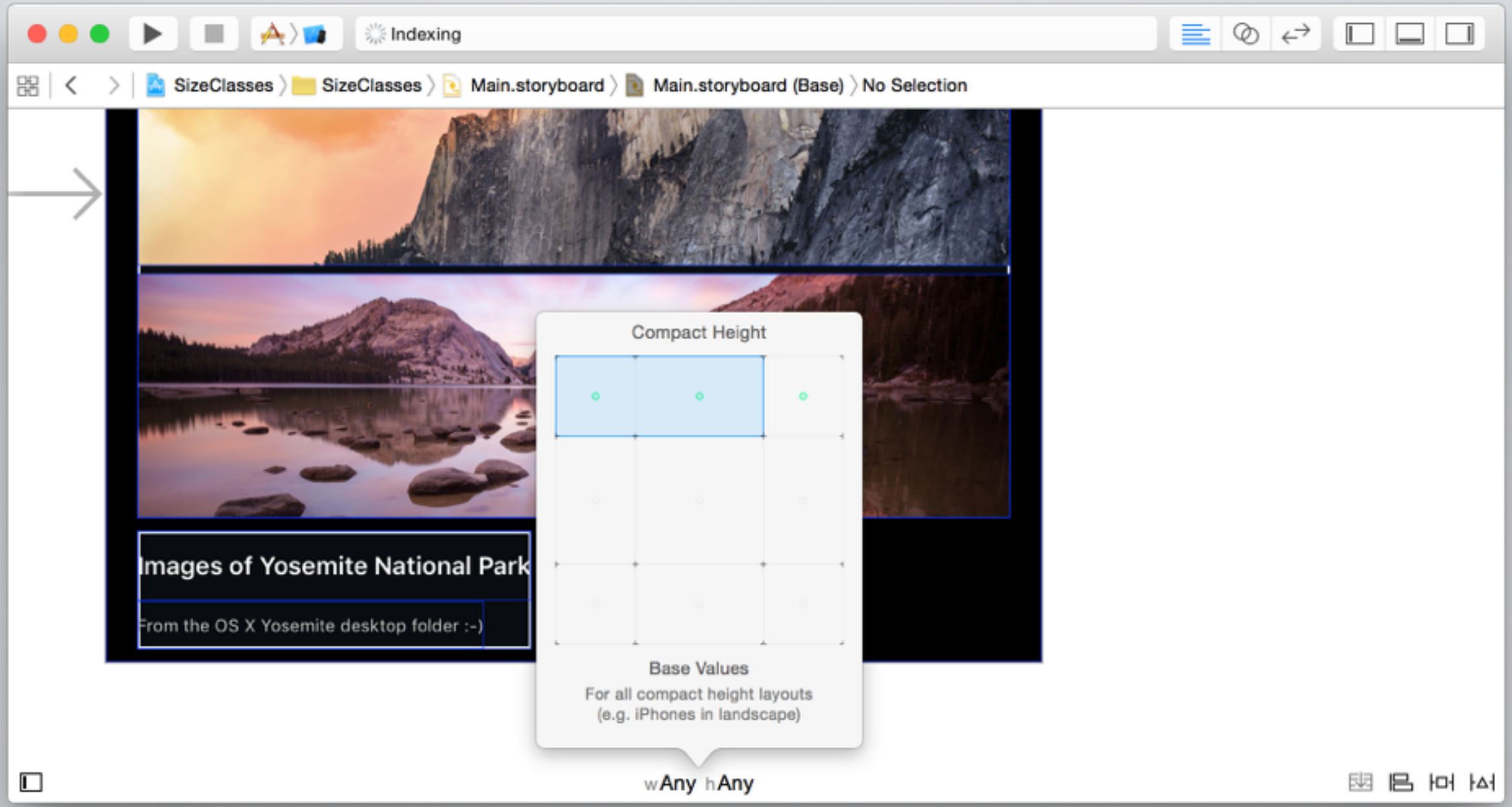
SIZE CLASSES



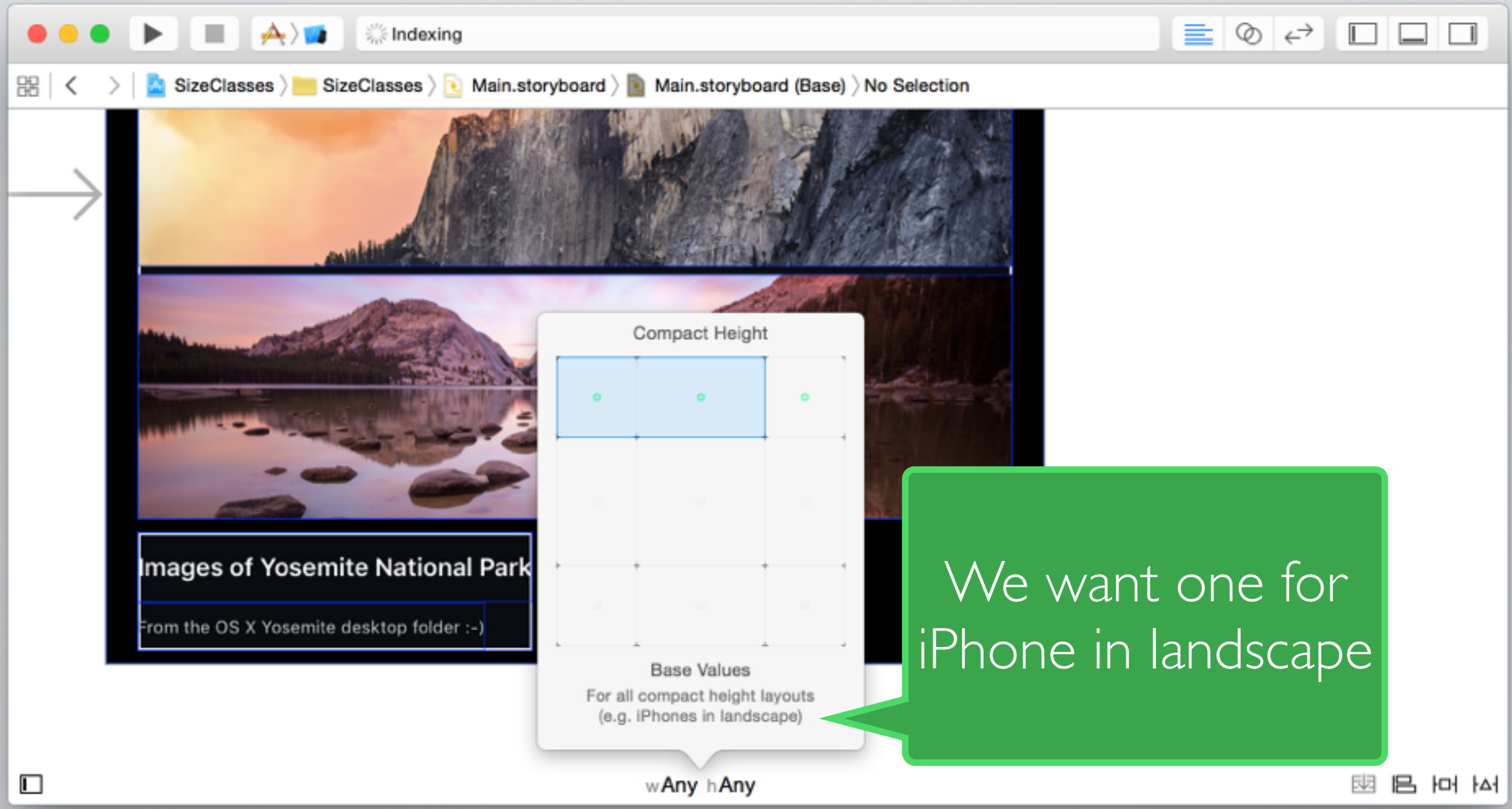
SIZE CLASSES



SIZE CLASSES

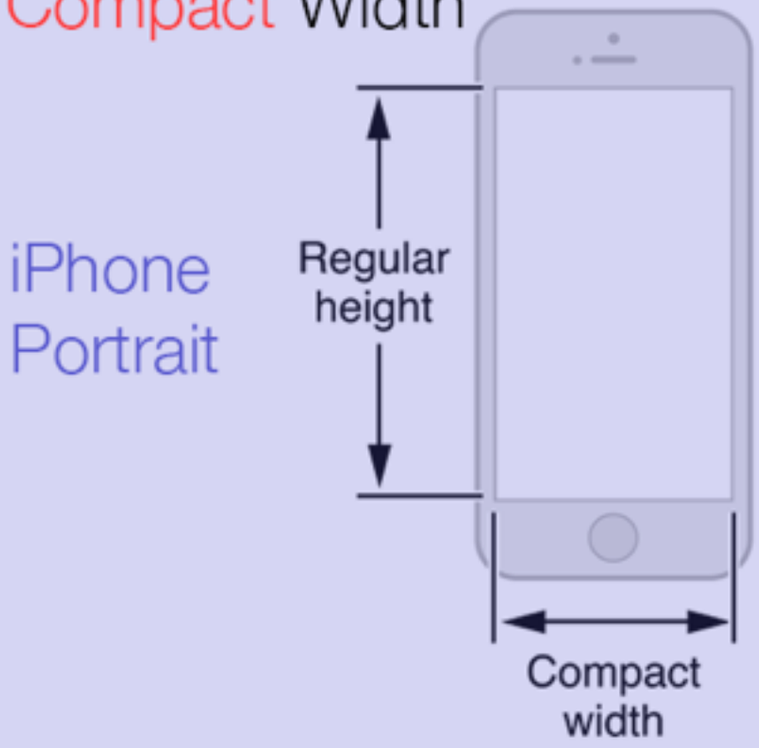


SIZE CLASSES



Regular Height
Compact Width

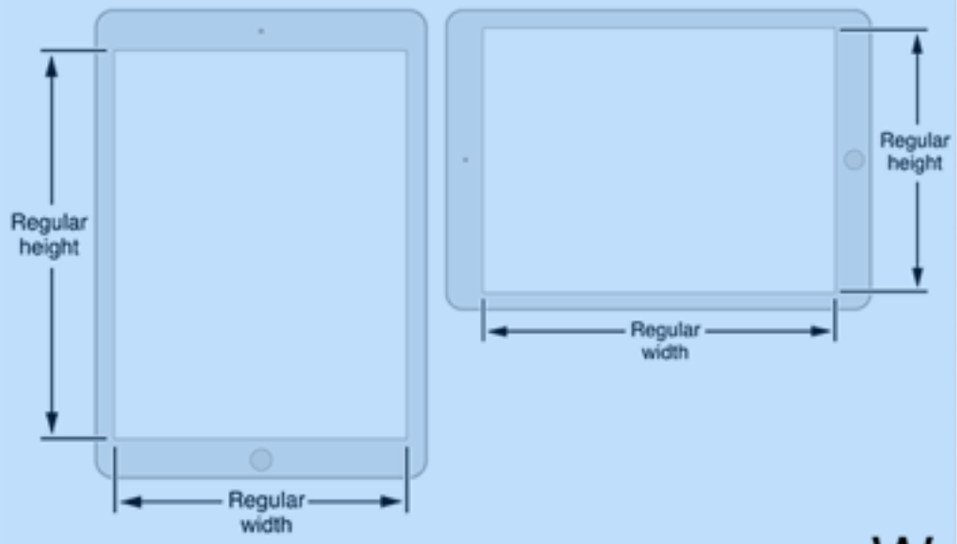
iPhone
Portrait



H

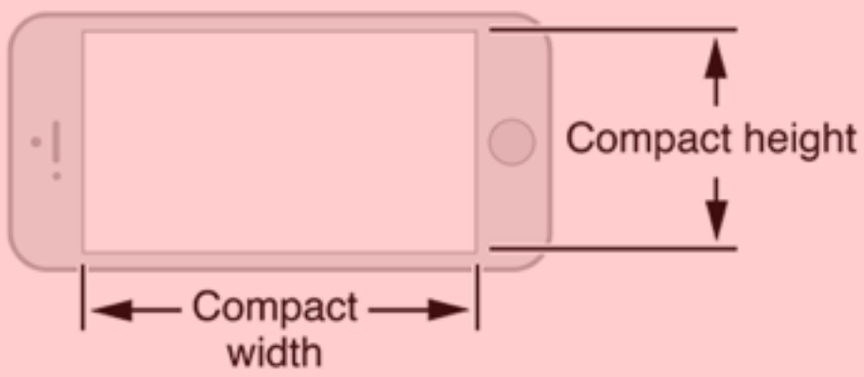
Regular Height
Regular Width

iPad Portrait & Landscape

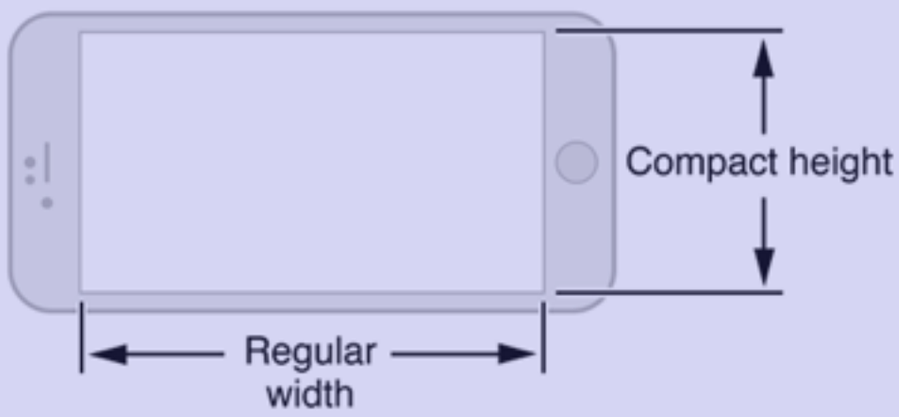


W

iPhone 4, 5, 6 Landscape



iPhone 6 Plus Landscape

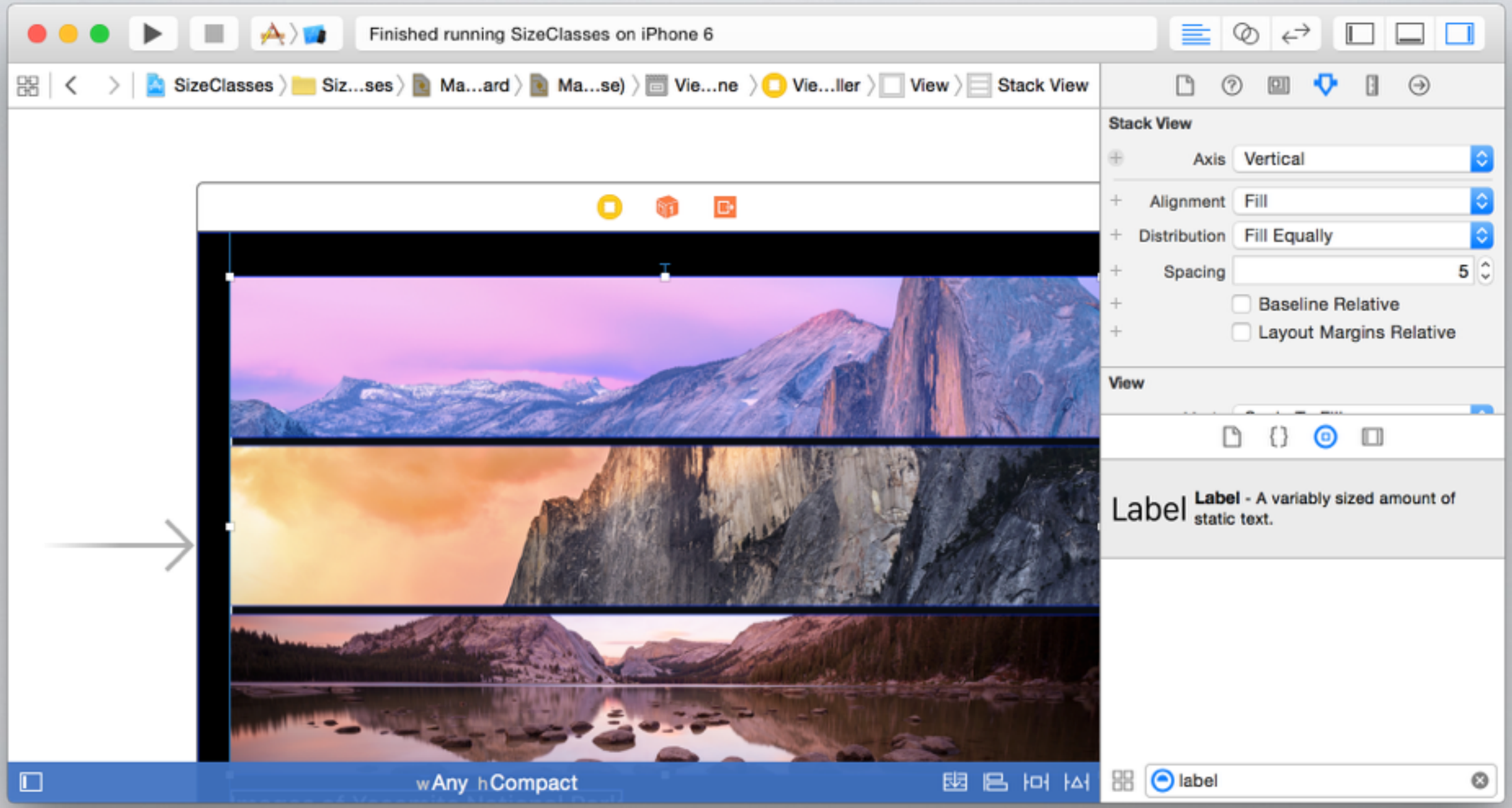


Compact Height
Compact Width

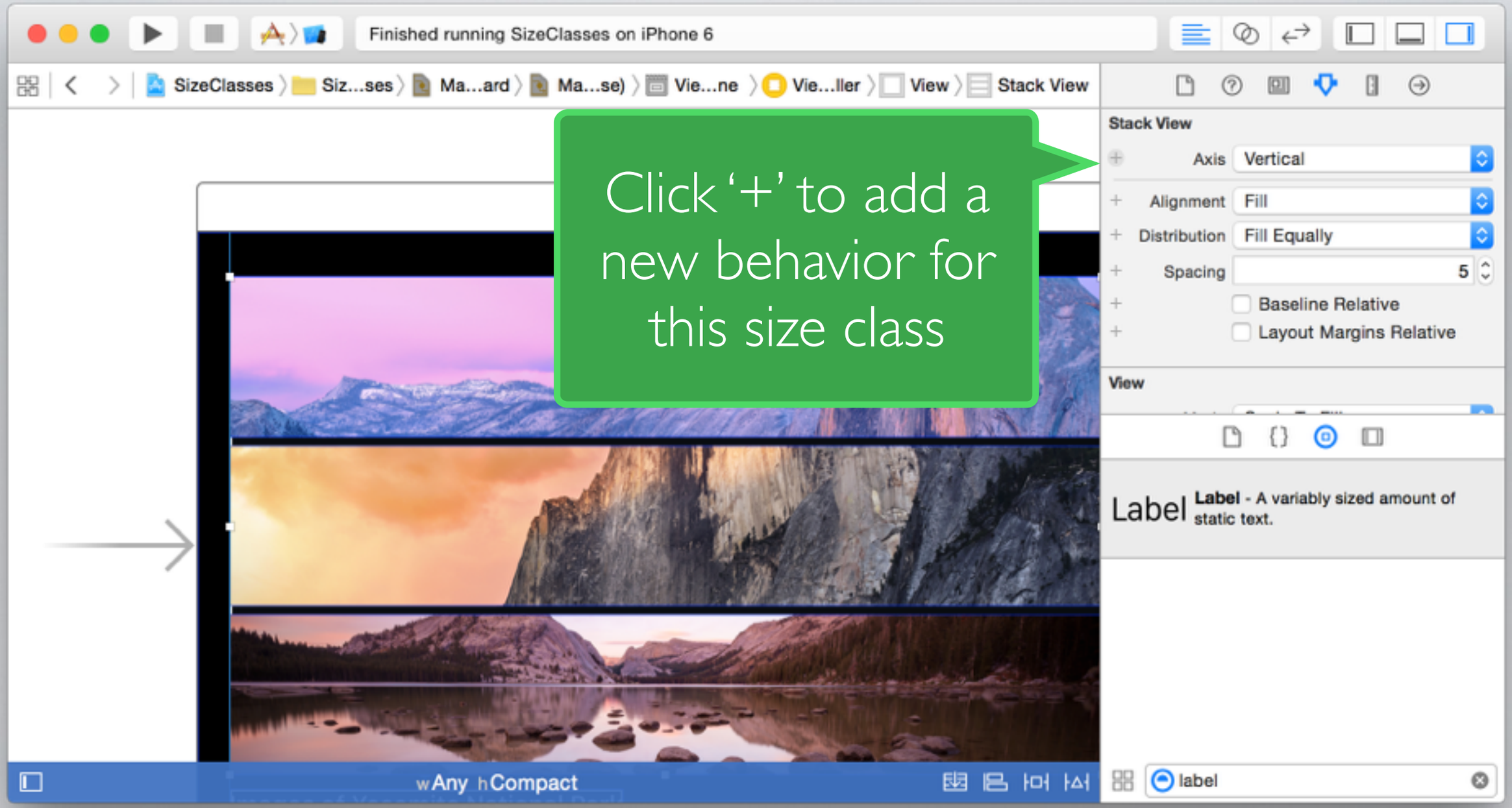
Compact Height
Regular Width

http://www.jessesquires.com/adaptive-user-interfaces

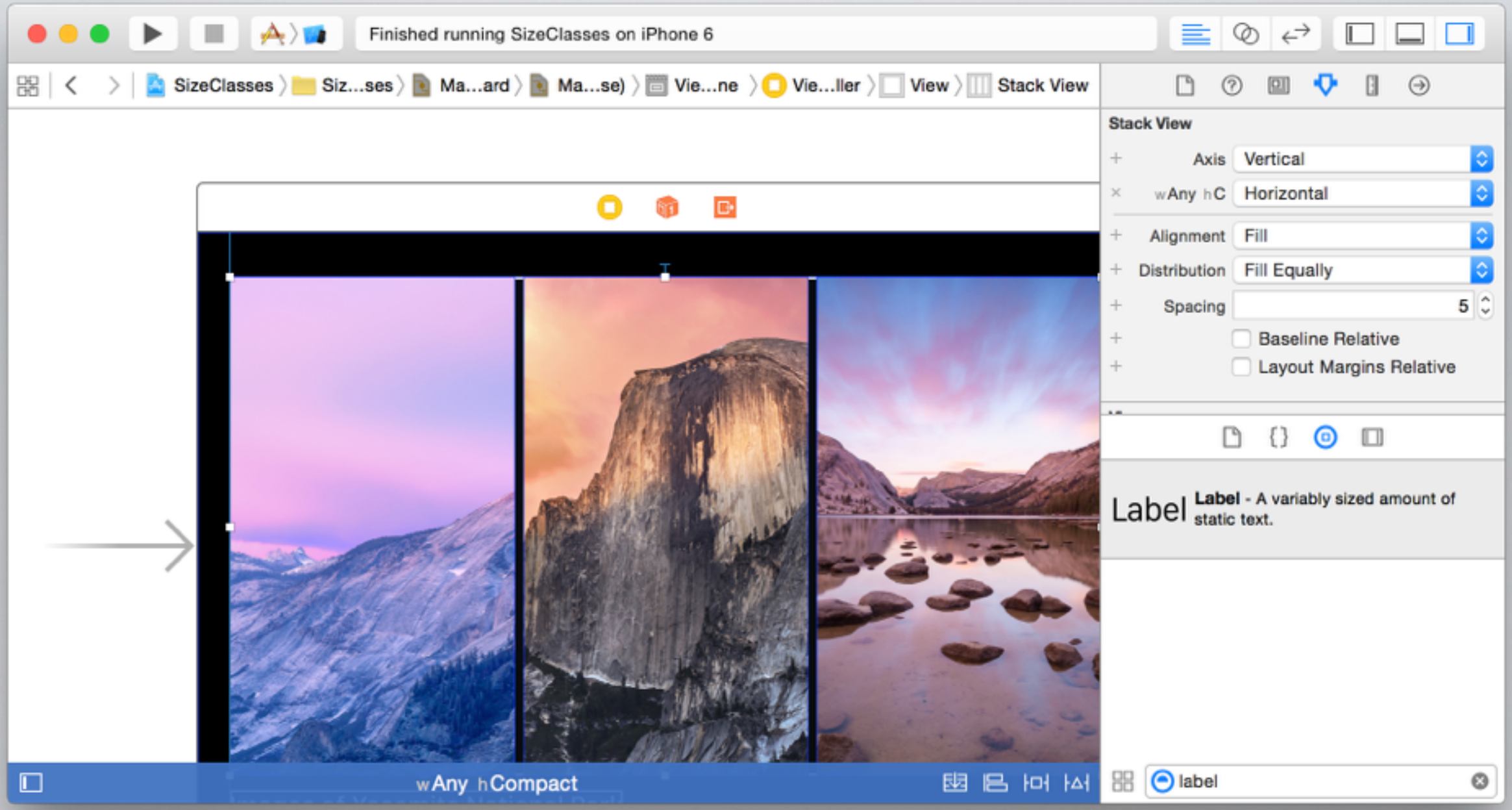
SIZE CLASSES



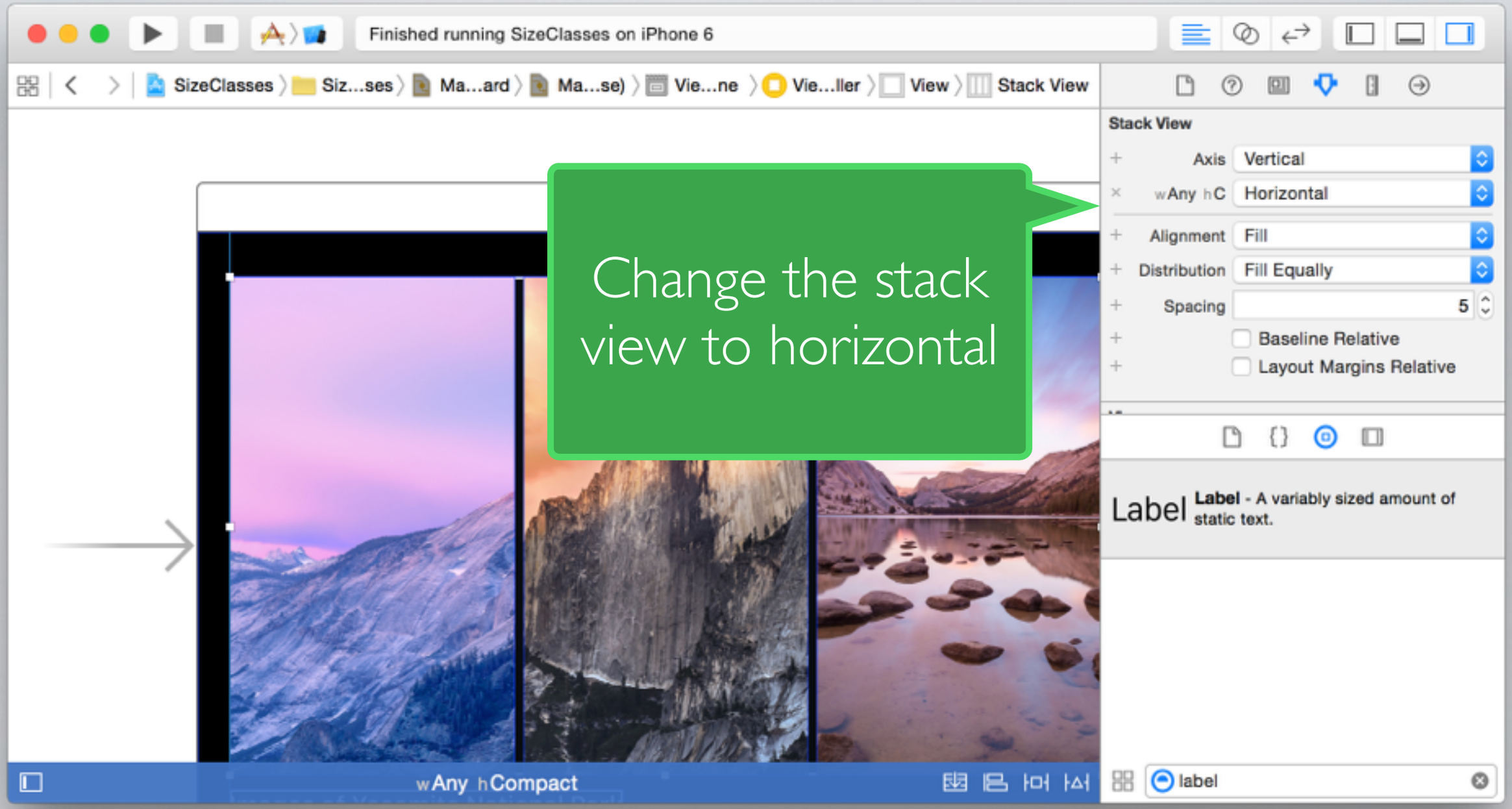
SIZE CLASSES



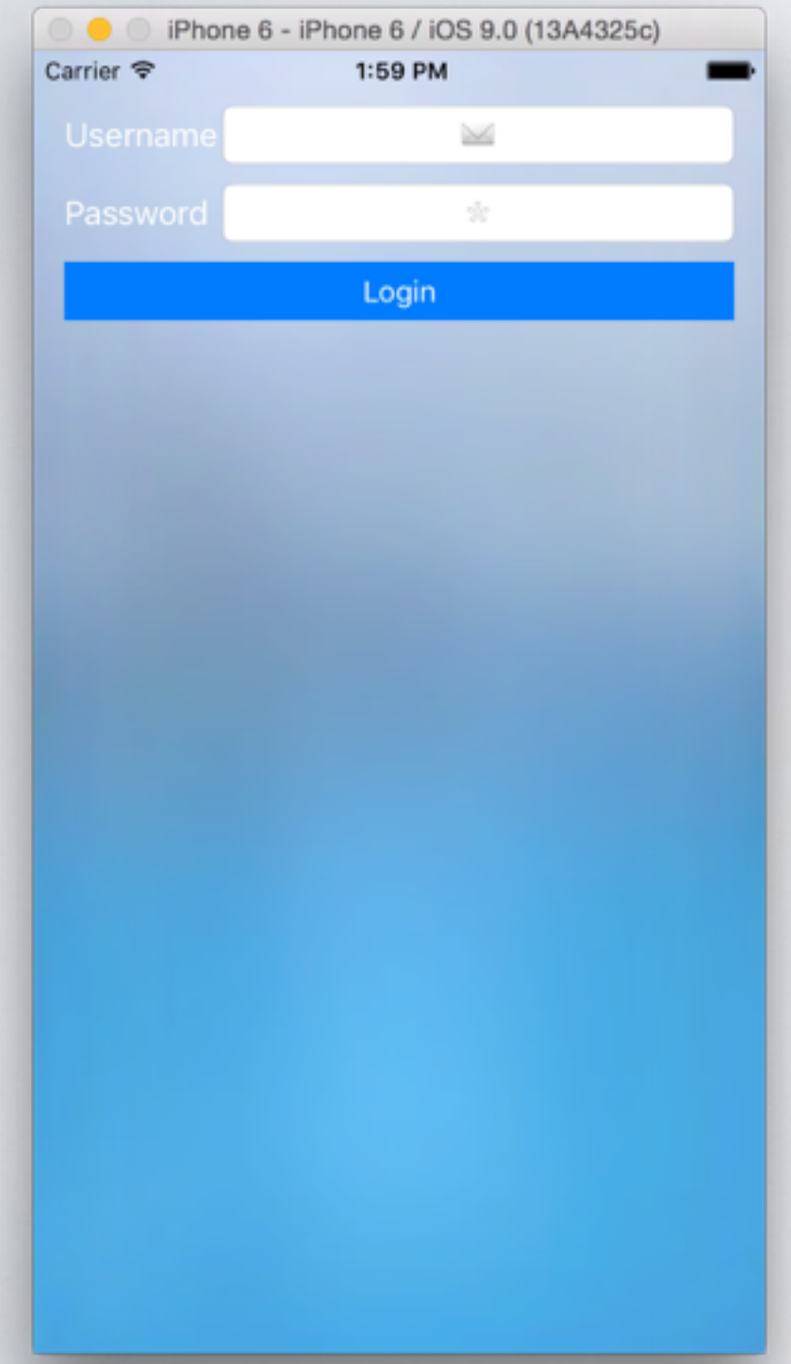
SIZE CLASSES



SIZE CLASSES



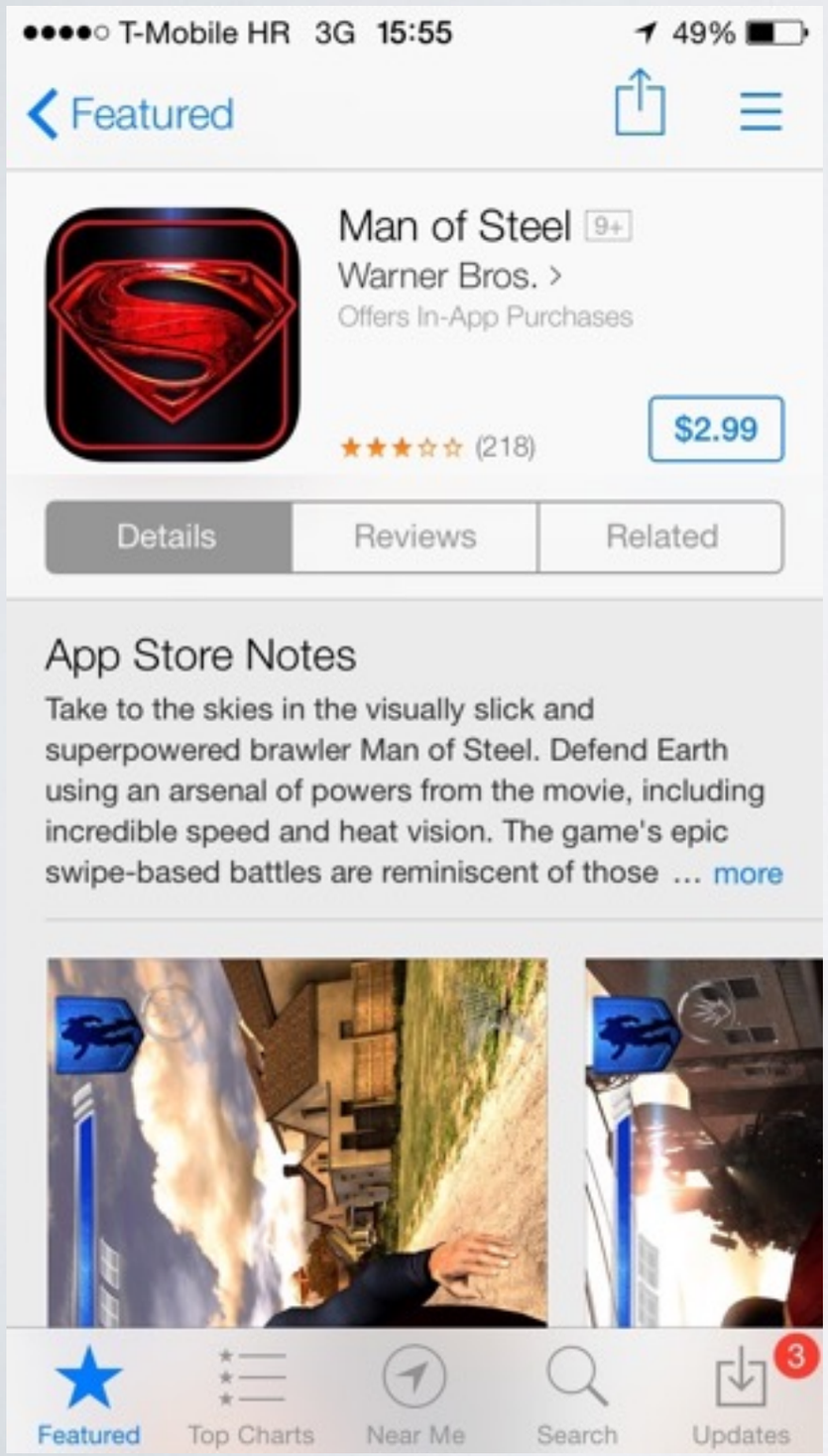
EXERCISE



Try to recreate this

- This does not follow iOS guidelines but it's fine as an exercise
- In general take a look at http://pttrns.com/?did=1&scid=9 for inspiration of signup screens

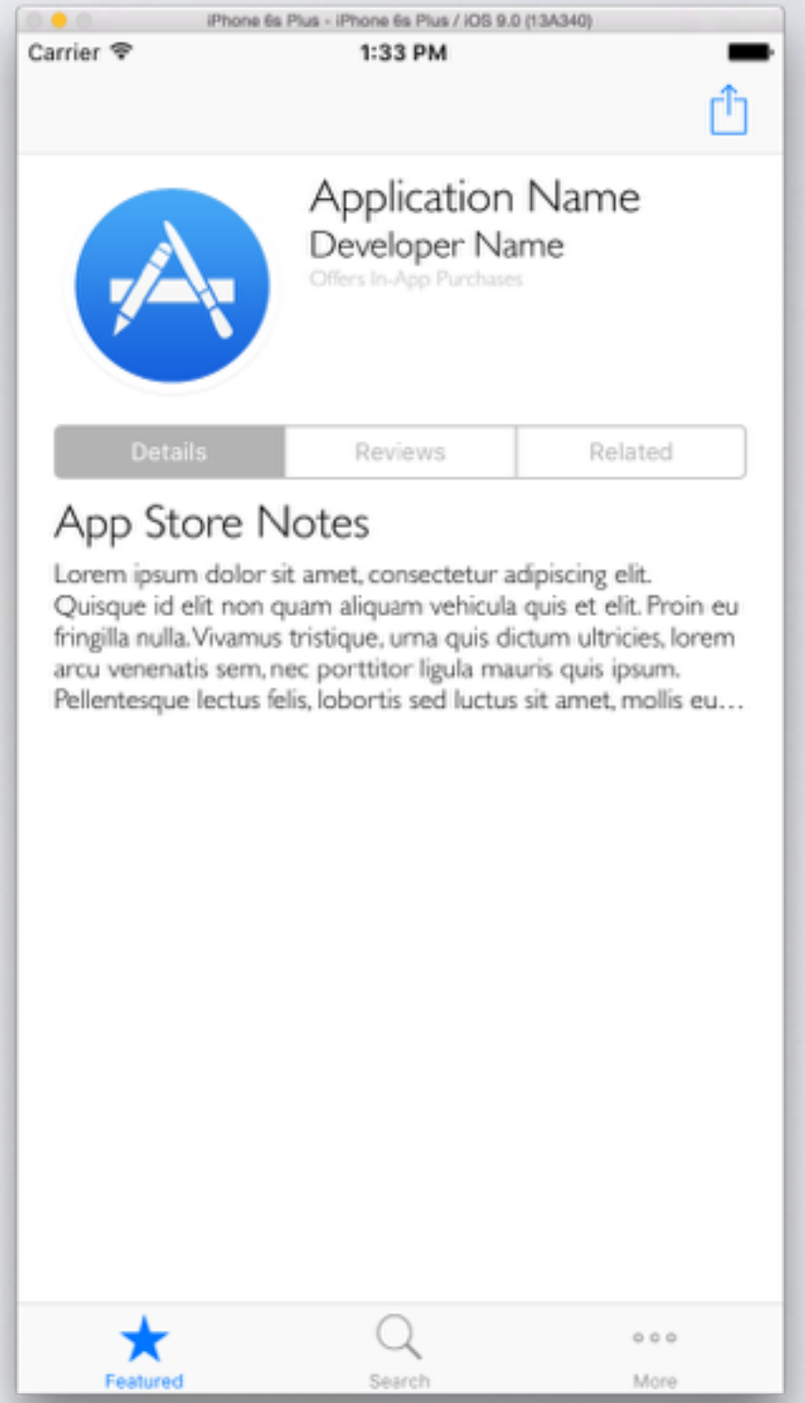
EXERCISE



Try to recreate this

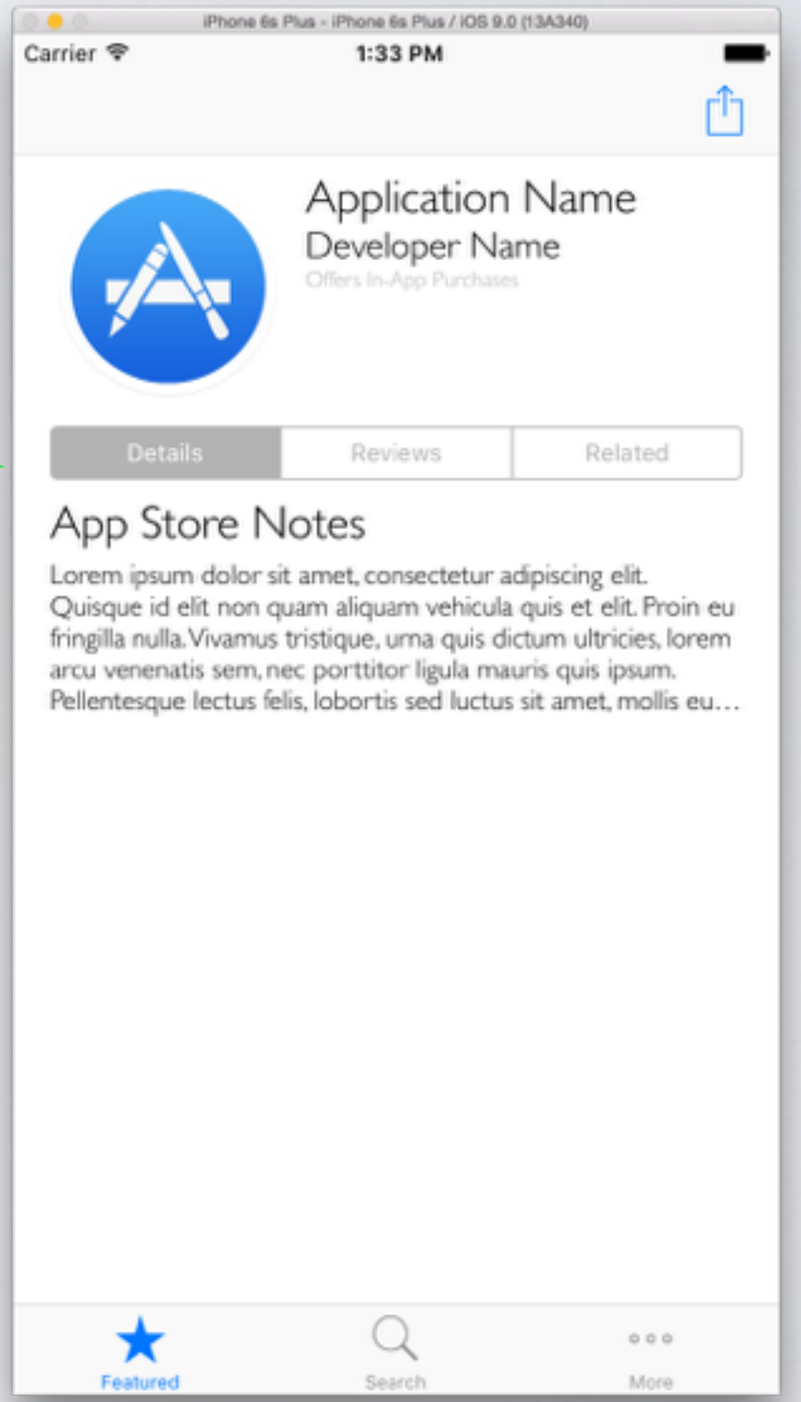
- Don't worry about the top and bottom bar first
- Add a UIImage for the logo
- Add some text for app name, developer, details

EXERCISE


iPhone 6s Plus - iPhone 6s Plus / iOS 9.0 (13A340)
Carrier
1:33 PM
Application Name
Developer Name
Offers In-App Purchases
Details
Reviews
Related
App Store Notes
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Quisque id elit non quam aliquam vehicula quis et elit. Proin eu fringilla nulla. Vivamus tristique, urna quis dictum ultricies, lorem arcu venenatis sem, nec porttitor ligula mauris quis ipsum. Pellentesque lectus felis, lobortis sed luctus sit amet, mollis eu…
Featured
Search
More

EXERCISE

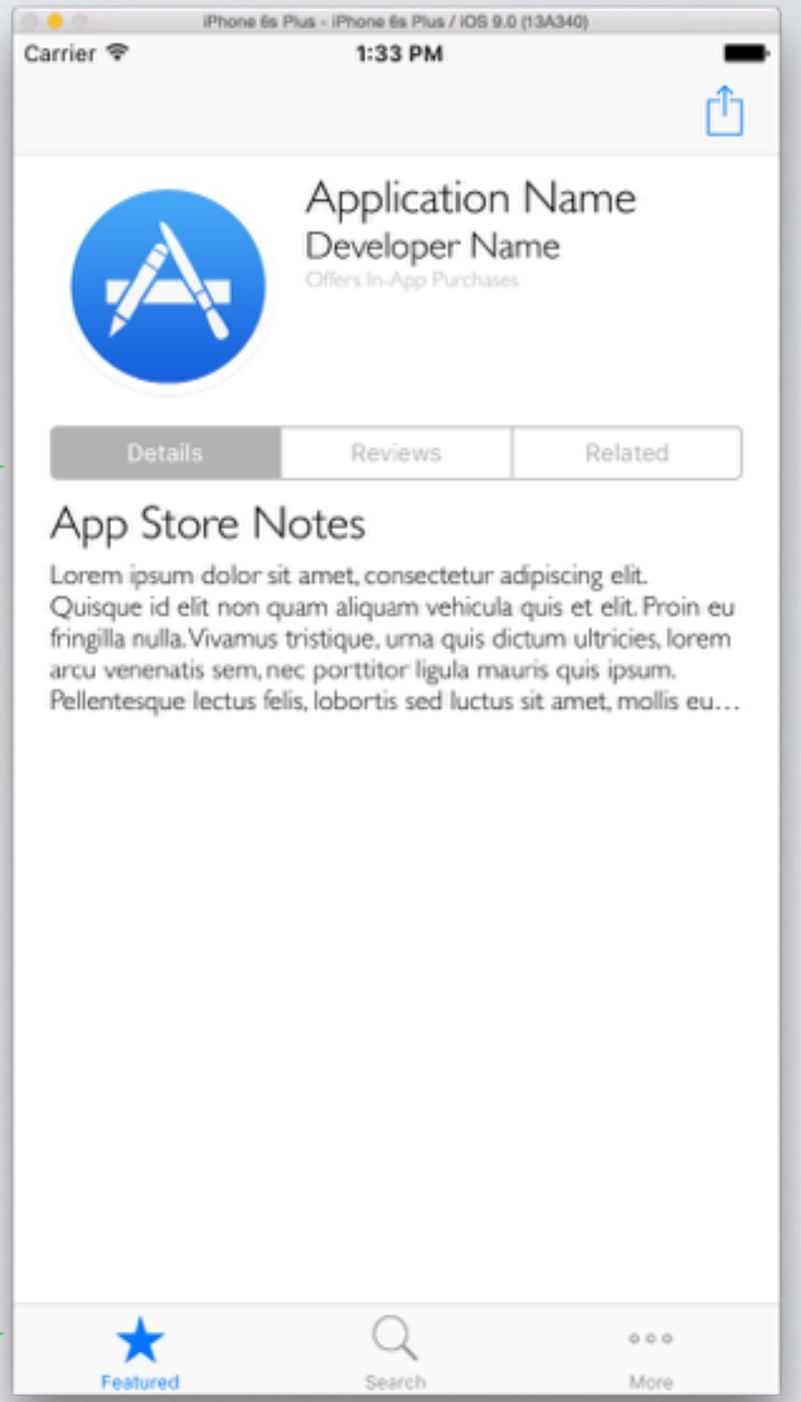
UISegmentedControl



EXERCISE

UISegmentedControl

TabBarController

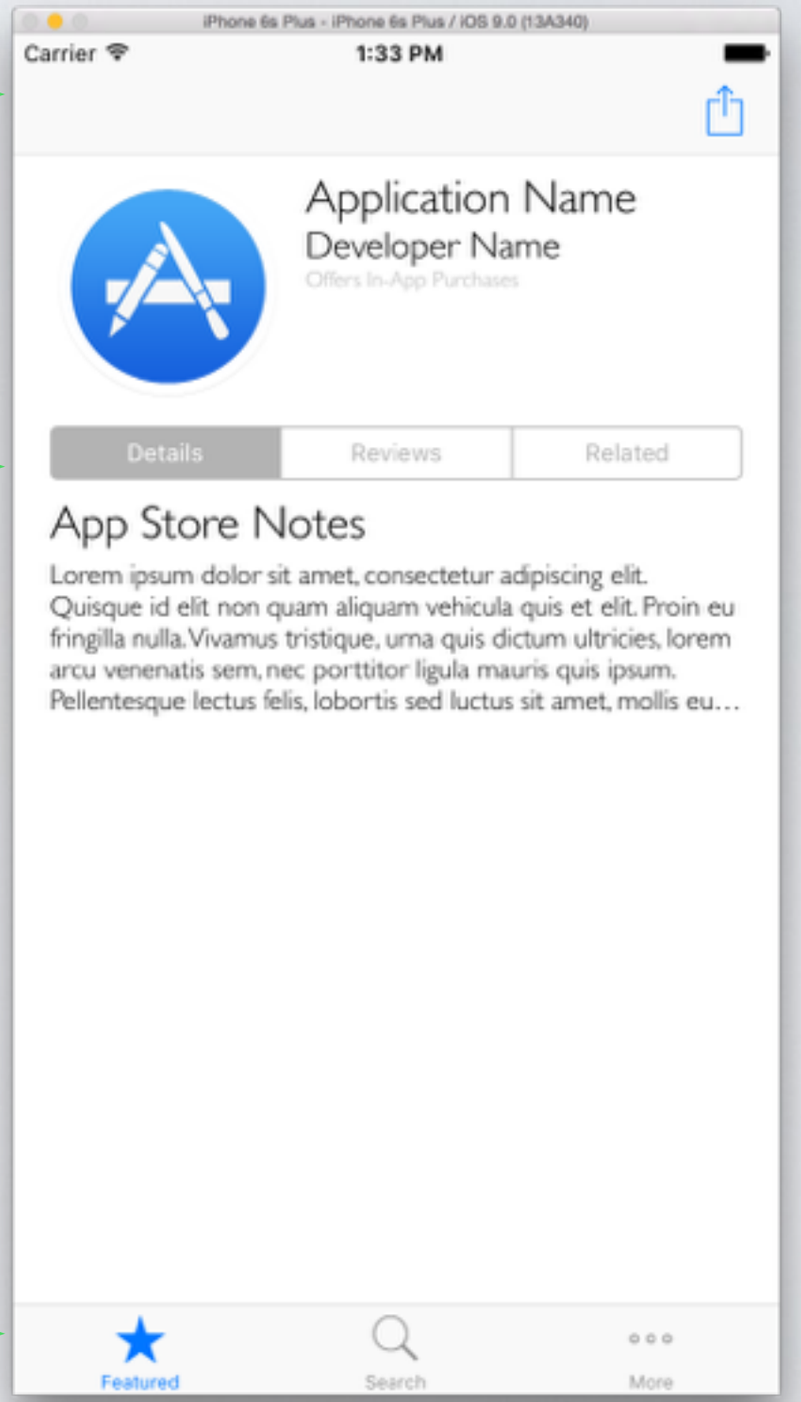


EXERCISE

NavigationController

UISegmentedControl

TabBarController



NEXT TIME

- Editing in a table view and custom table view cells