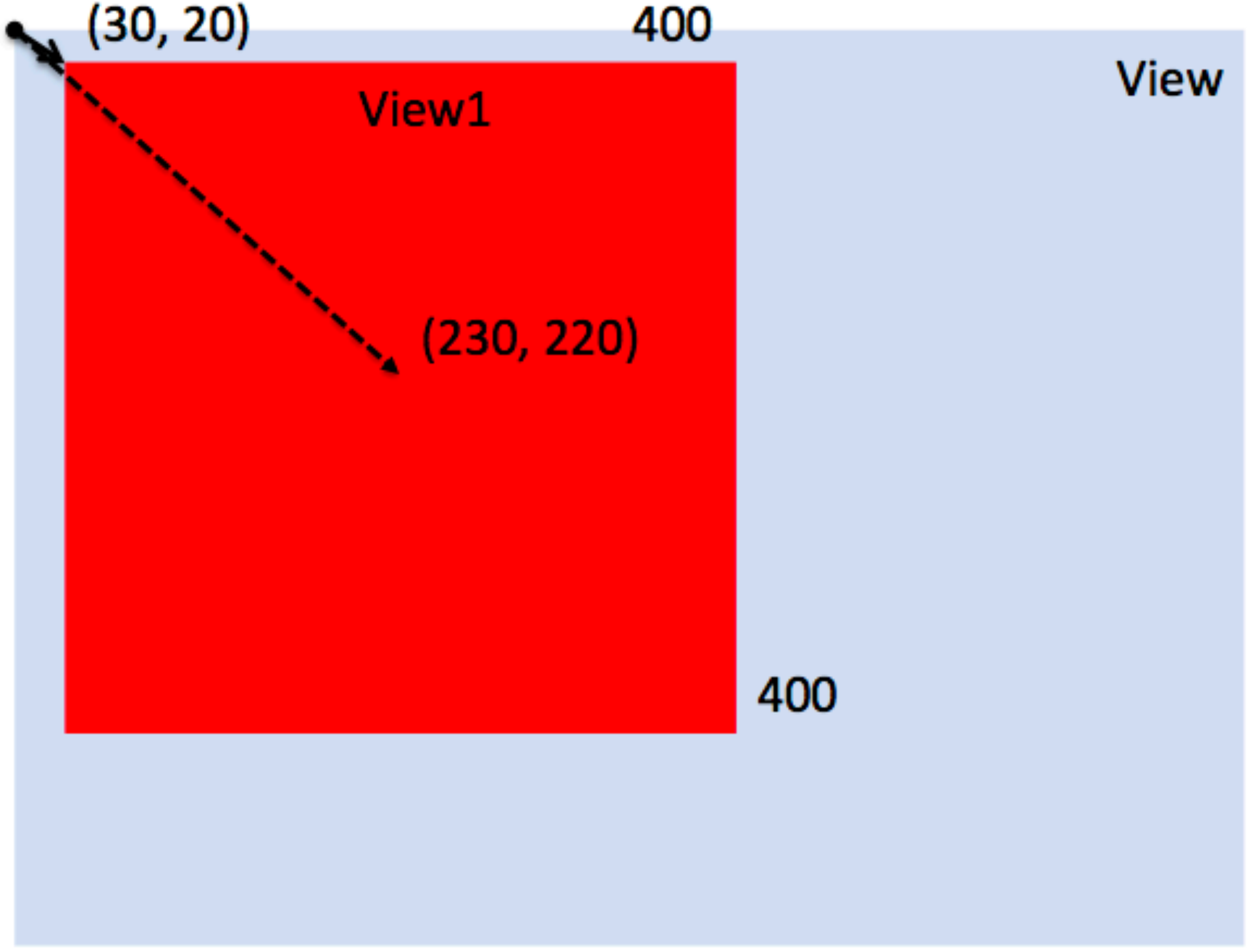
Autolayout

Frame & bounds



View1's Frame
(30, 20, 400, 400)

View1's Bounds
(0,0, 400, 400)

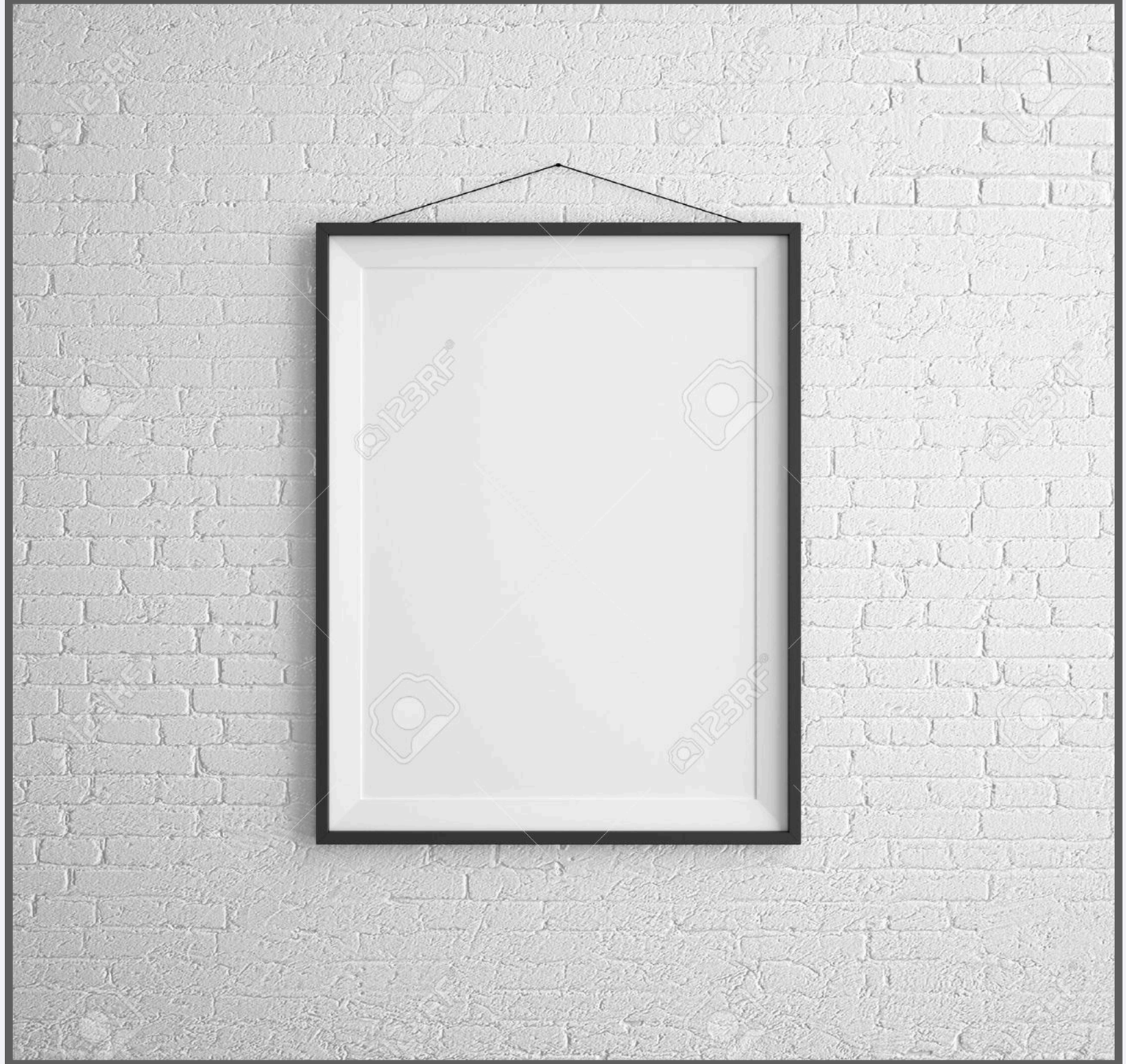
View1's Center
(230, 220)

Frame vs Bounds

frame = a view's location and size using the parent view's coordinate system

bounds = a view's location and size using its own coordinate system

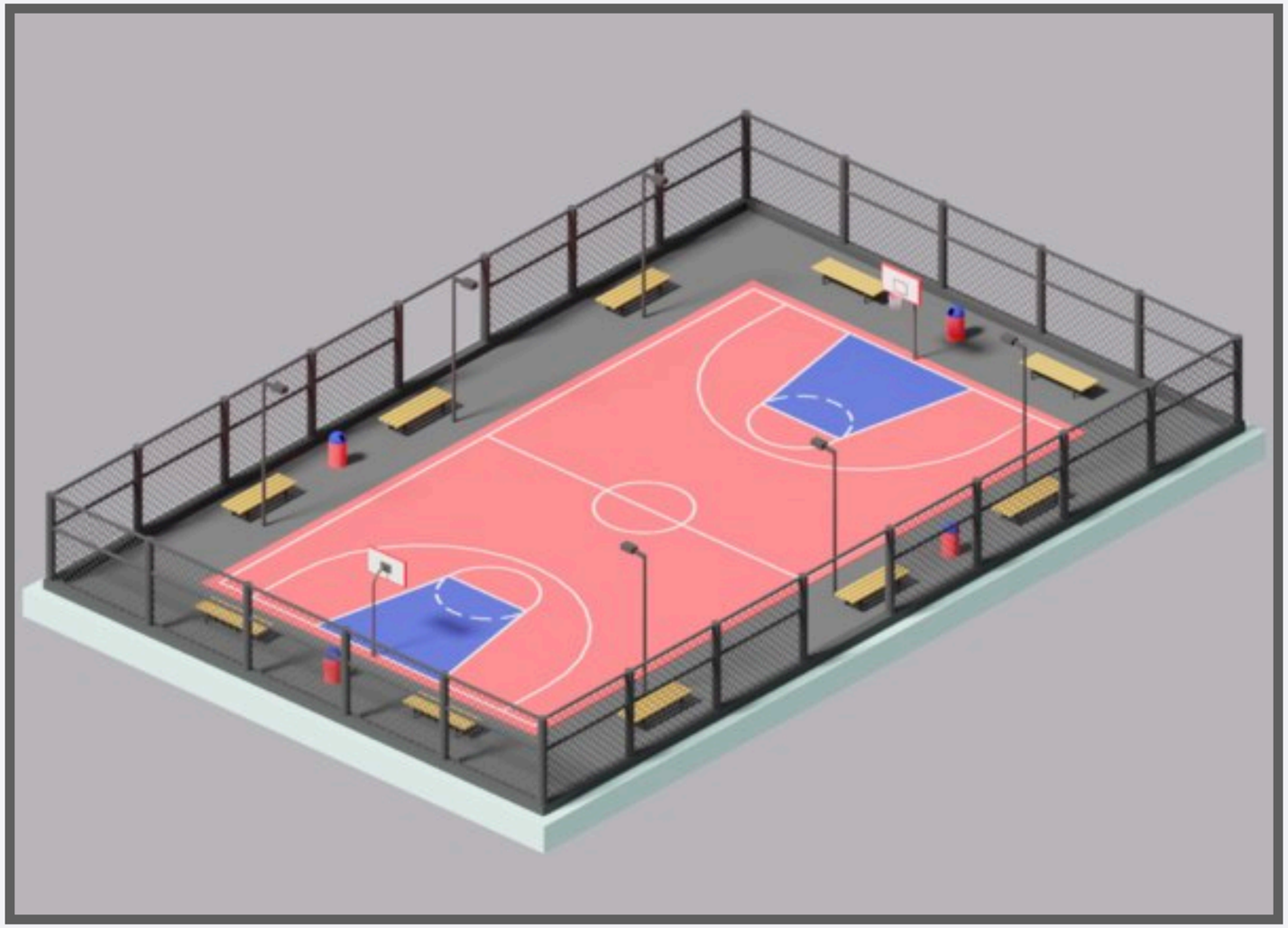
Frame



Сбербанк Онлайн

Devteam

Bounds

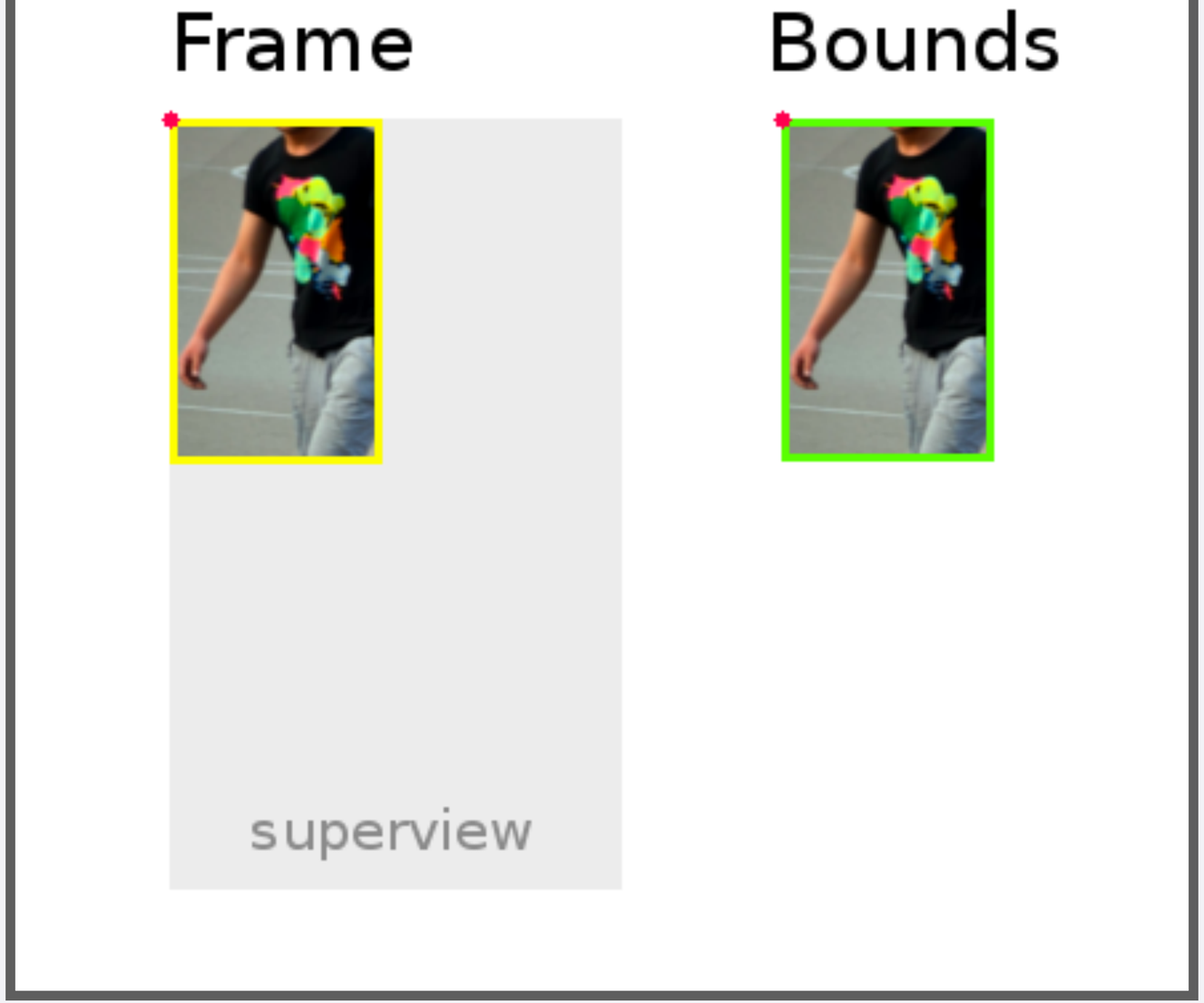


Сбербанк Онлайн

Devteam

Frame vs Bounds

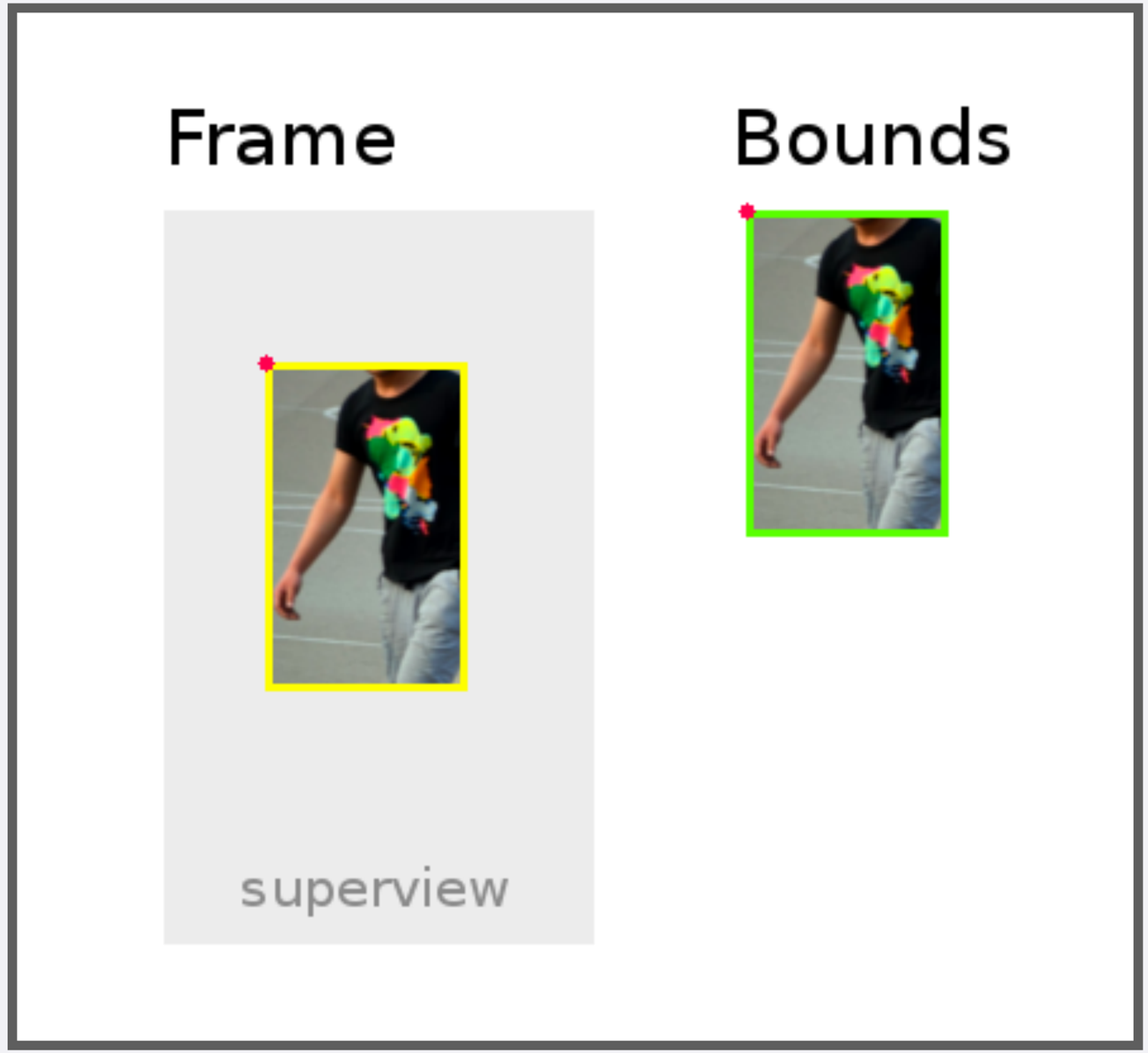
```
Frame
     origin = (0, 0)
     width = 80
     height = 130

Bounds
     origin = (0, 0)
     width = 80
     height = 130
```



Сбербанк Онлайн

Frame vs Bounds

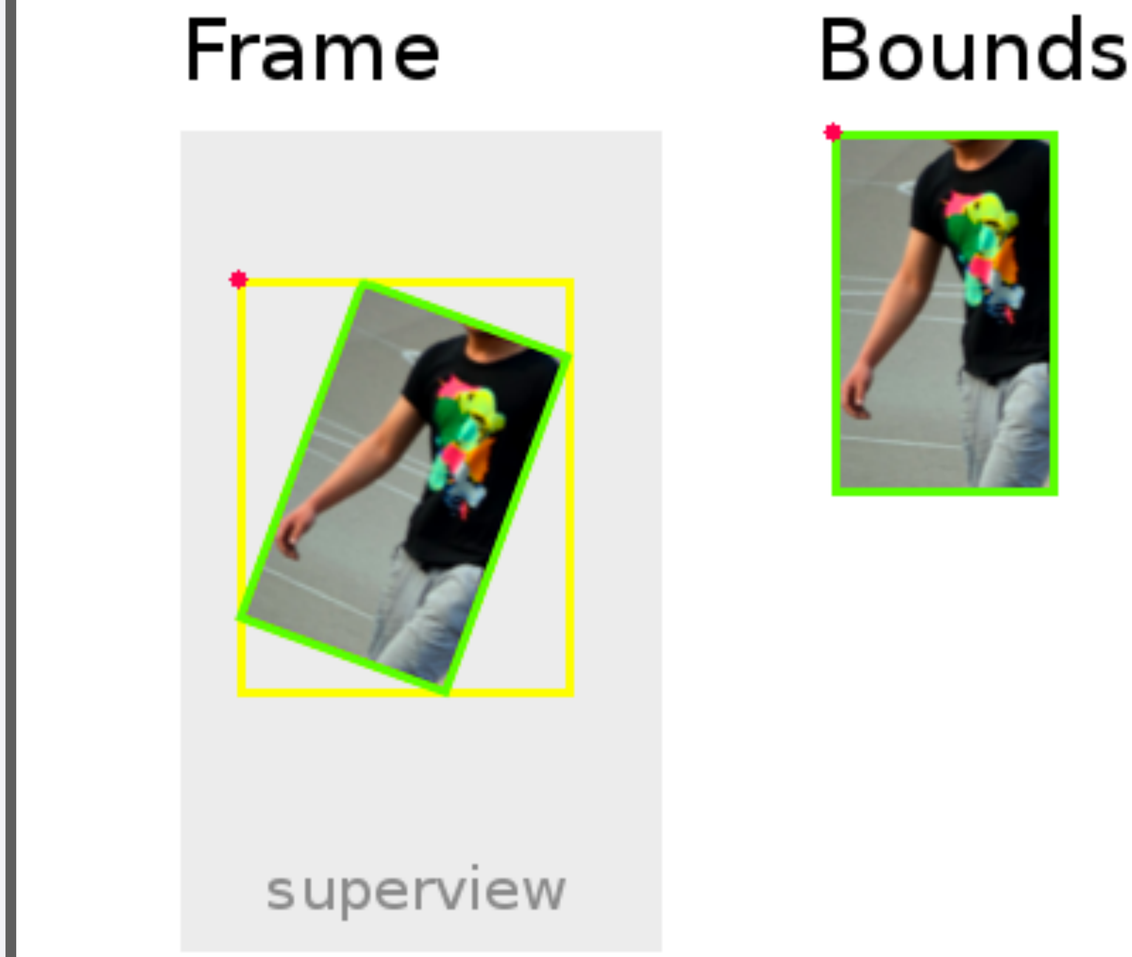
```
Frame
    origin = (40, 60)  // That is, x=40 and y=60
    width = 80
    height = 130

Bounds
    origin = (0, 0)
    width = 80
    height = 130
```



Сбербанк Онлайн

Frame vs Bounds

```
Frame
    origin = (20, 52)  // These are just rough estimates.
    width = 118
    height = 187

Bounds
    origin = (0, 0)
    width = 80
    height = 130
```



Сбербанк Онлайн

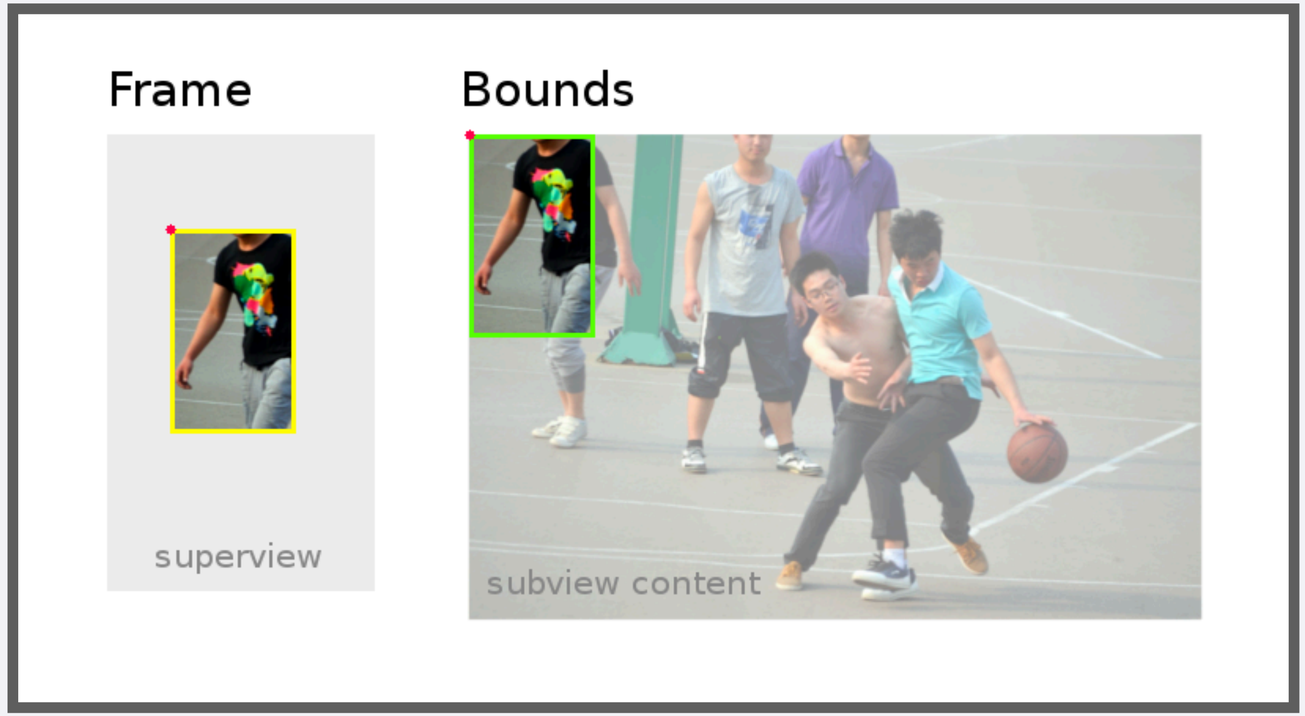
Frame vs Bounds

frame = the smallest bounding box of that view with respect to it’s parents coordinate system, including any transformations applied to that view

bounds = a view's location and size using its own coordinate system

Frame vs Bounds

```
Frame
     origin = (40, 60)
     width = 80
     height = 130

Bounds
     origin = (0, 0)
     width = 80
     height = 130
```



Сбербанк Онлайн

Devteam

Frame vs Bounds

```
Frame
    origin = (40, 60)
    width = 80
    height = 130

Bounds
    origin = (280, 70)
    width = 80
    height = 130
```

Frame vs Bounds

frame = outward changes

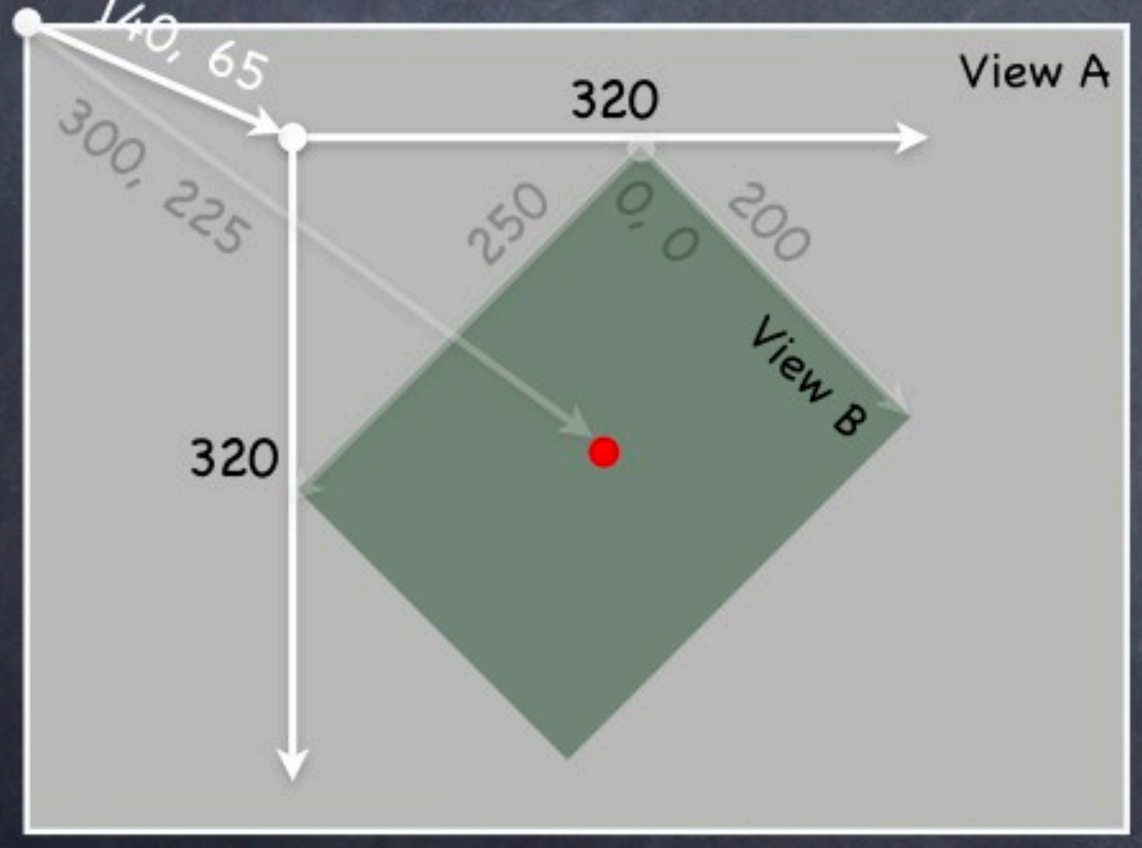
bounds = inward changes

Center

Coordinates

- Use `frame` and `center` to position the view in the hierarchy

  These are used by `superviews`, never inside your `UIView` subclass's implementation.
  You might think `frame.size` is always equal to `bounds.size`, but you'd be wrong ...



Because views can be rotated
(and scaled and translated too).

View B's `bounds` = `((0,0),(200,250))`

View B's `frame` = `((140,65),(320,320))`

View B's `center` = `(300,225)`

View B's middle in its own coordinate space is
`(bound.size.width/2+bounds.origin.x,`
`bounds.size.height/2+bounds.origin.y)`
which is `(100,125)` in this case.

Views are rarely rotated, but don't
misuse `frame` or `center` by assuming that.

Frame vs Bounds vs Center

frame = the smallest bounding box of that view with respect to it’s parents coordinate system, including any transformations applied to that view

bounds = a view's location and size using its own coordinate system

center = a view’s center relative to its superview using the parent view's coordinate system

Autoresizing mask

Autoresizing mask

Instance Property

autoresizesSubviews

A Boolean value that determines whether the receiver automatically resizes its subviews when its bounds change.

Declaration

```
var autoresizesSubviews: Bool { get set }
```

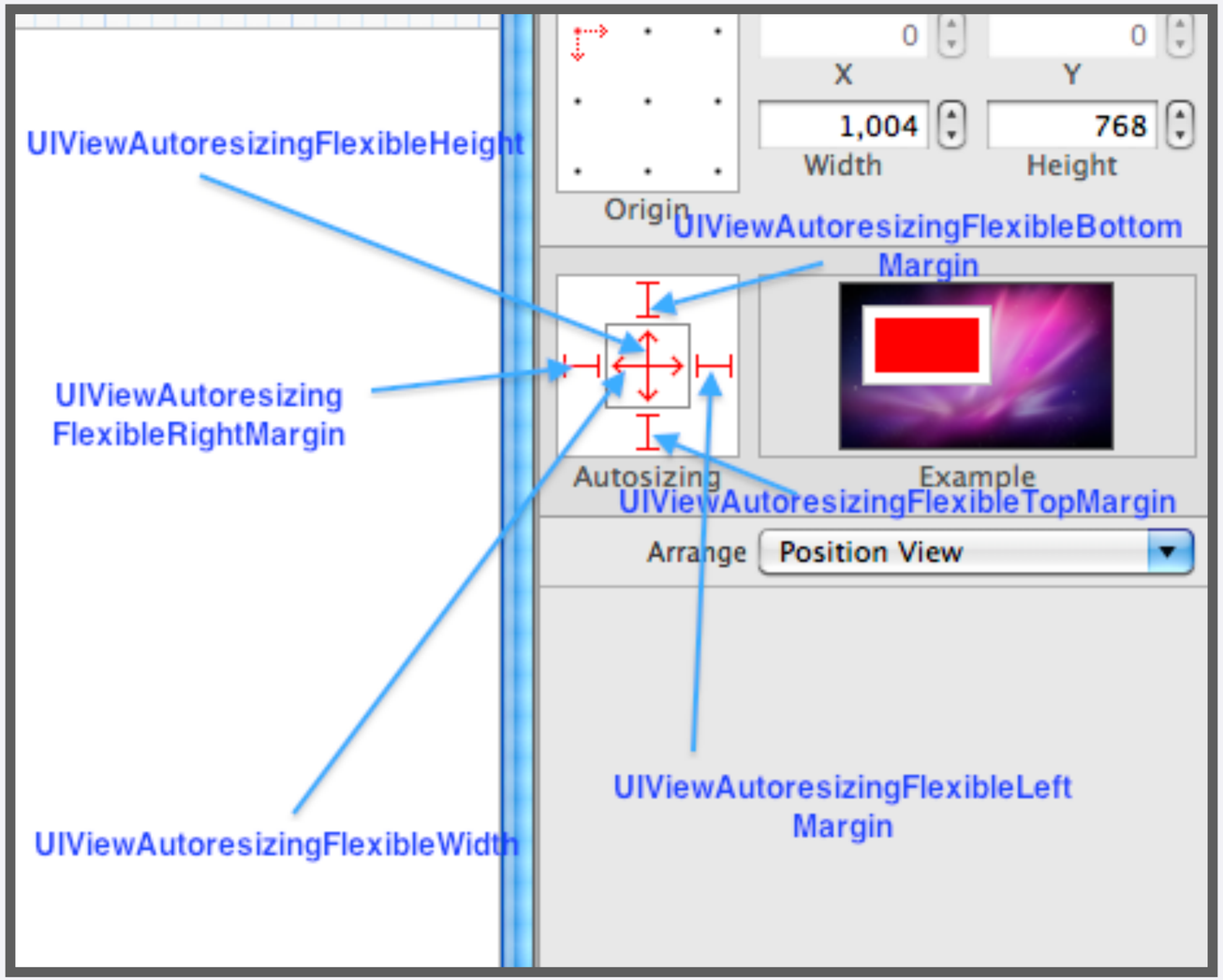
Discussion

When set to `true`, the receiver adjusts the size of its subviews when its bounds change. The default value is `true`.

Сбербанк Онлайн

Devteam

Autoresizing mask



Сбербанк Онлайн

Devteam

Autoresizing mask. OptionSet

```
public struct AutoresizingMask : OptionSet {

    public init(rawValue: UInt)


    public static var flexibleLeftMargin: UIView.AutoresizingMask { get }

    public static var flexibleWidth: UIView.AutoresizingMask { get }

    public static var flexibleRightMargin: UIView.AutoresizingMask { get }

    public static var flexibleTopMargin: UIView.AutoresizingMask { get }

    public static var flexibleHeight: UIView.AutoresizingMask { get }

    public static var flexibleBottomMargin: UIView.AutoresizingMask { get }
}
```

Autoresizing mask

Constants

`static var flexibleLeftMargin: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view in the direction of the left margin.

`static var flexibleWidth: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view's width.

`static var flexibleRightMargin: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view in the direction of the right margin.

`static var flexibleTopMargin: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view in the direction of the top margin.

`static var flexibleHeight: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view's height.

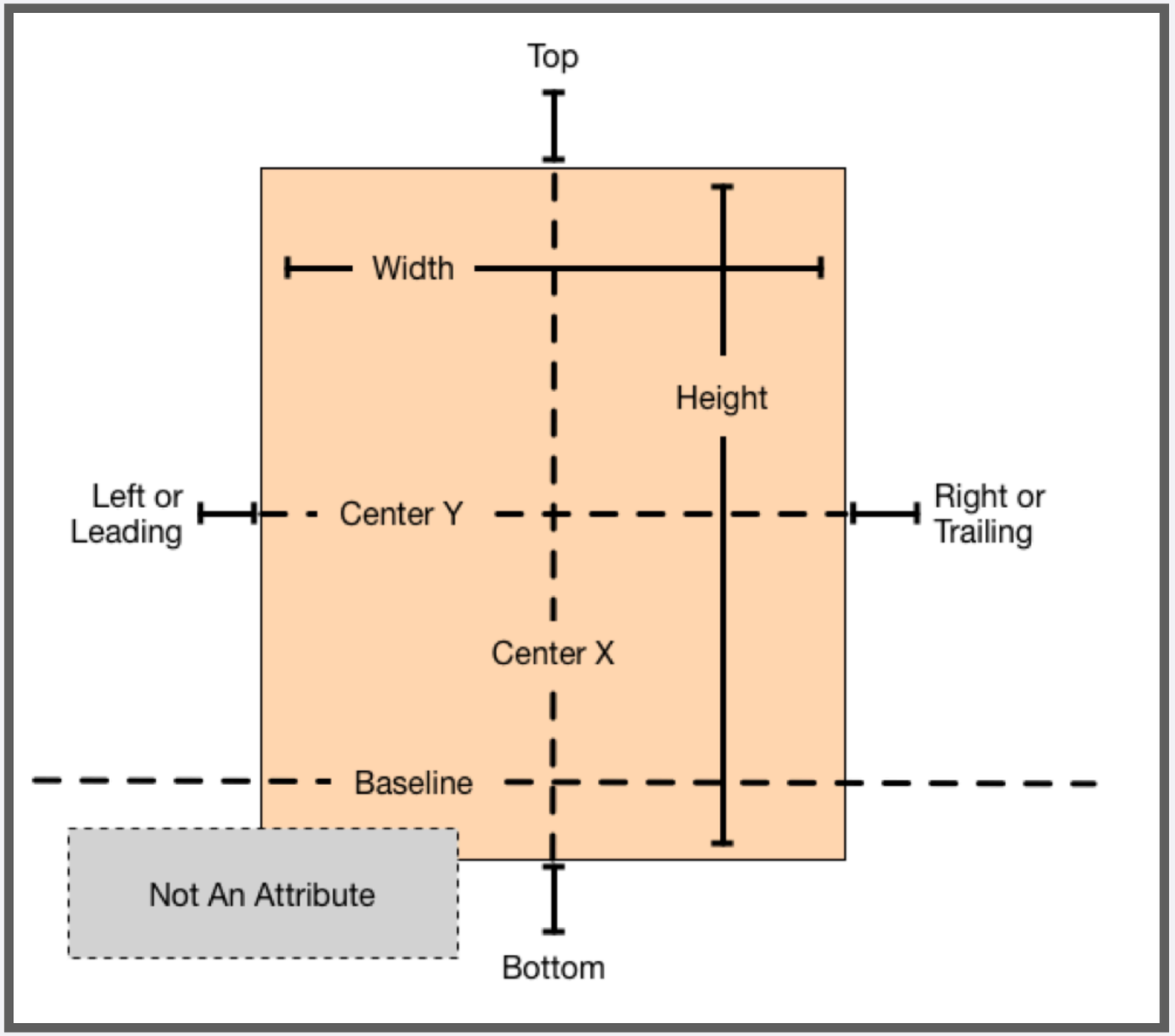
`static var flexibleBottomMargin: UIView.AutoresizingMask`
Resizing performed by expanding or shrinking a view in the direction of the bottom margin.

```
view.autoresizingMask = [.flexibleRightMargin, .flexibleLeftMargin, .flexibleBottomMargin]
```

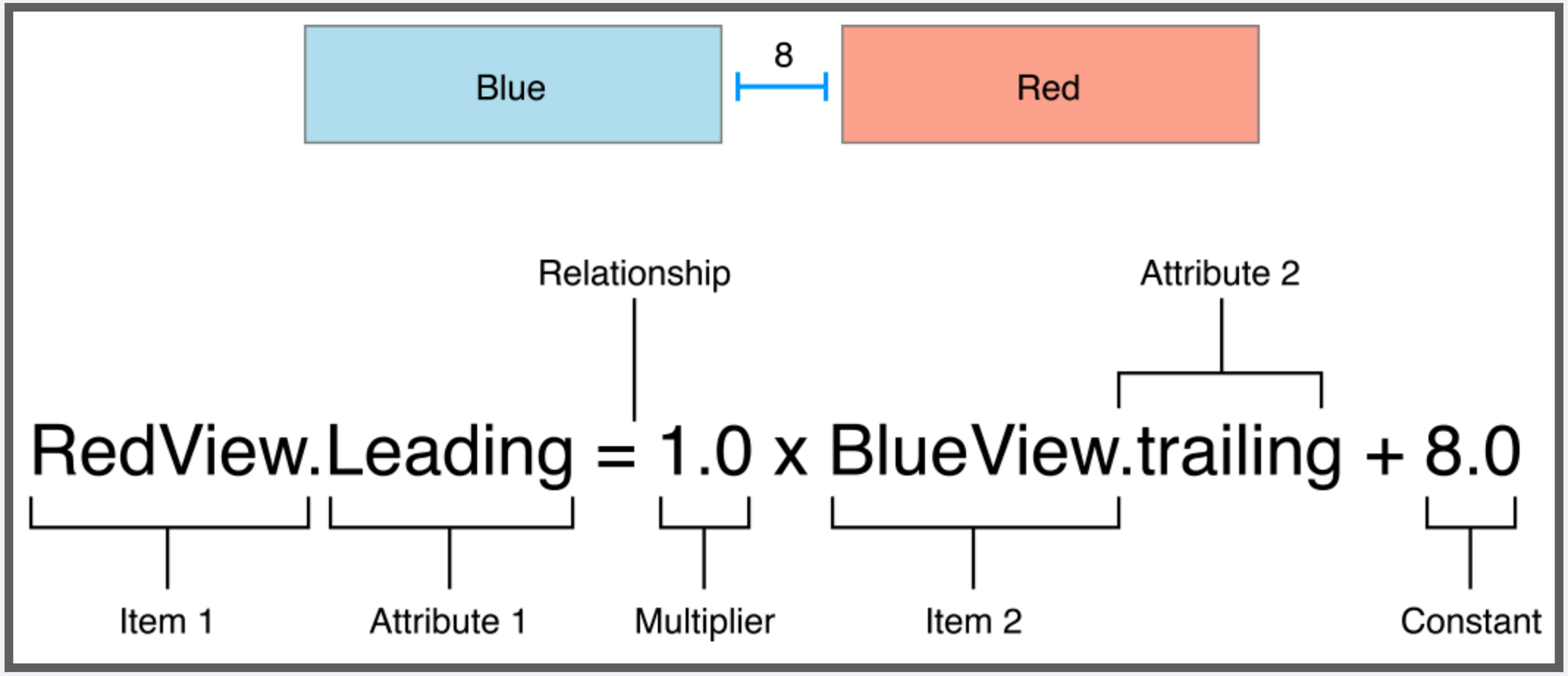
Autolayout

Сбербанк Онлайн

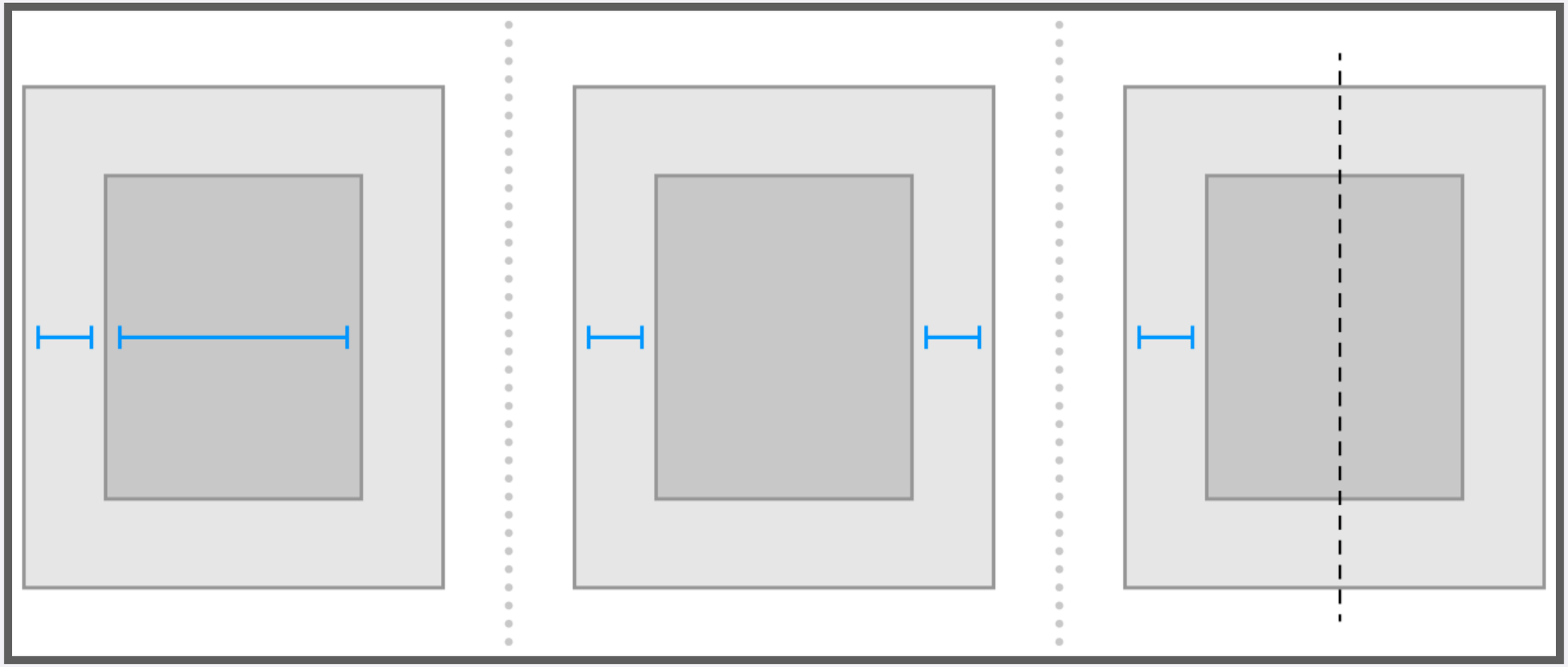
Devteam



Autolayout



Autolayout



Сбербанк Онлайн

Devteam

VS

```swift
@objc private func didPullRefreshControl() {
    delegate?.didPullToRefresh()
    refreshControl.endRefreshing()
}

private func setupLoadingView() {
    addSubview(loadingView)
    constrain(loadingView, self) { view, superview in
        view.edges == superview.edges
    }
}

private func setupEmptyStateView() {
    addSubview(emptyStateView)
    constrain(emptyStateView, self) { view, superview in
        view.edges == superview.edges
    }
}

func setup(delegate: WalletViewDelegate) {
    self.delegate = delegate
    tableView.dataSource = delegate
    tableView.delegate = delegate
    emptyStateView.setup(delegate: delegate)
}

func setupBackground(with color: UIColor) {
    loadingView.bgColor = color
}

func renderLoading() {
    emptyStateView.isHidden = true
    loadingView.show(animated: false, opacity: 1)
}
```

Сбербанк Онлайн

Devteam

Autolayout. Code

- Layout anchors
- NSLayoutConstraint class
- Visual Format Language

Generic Class

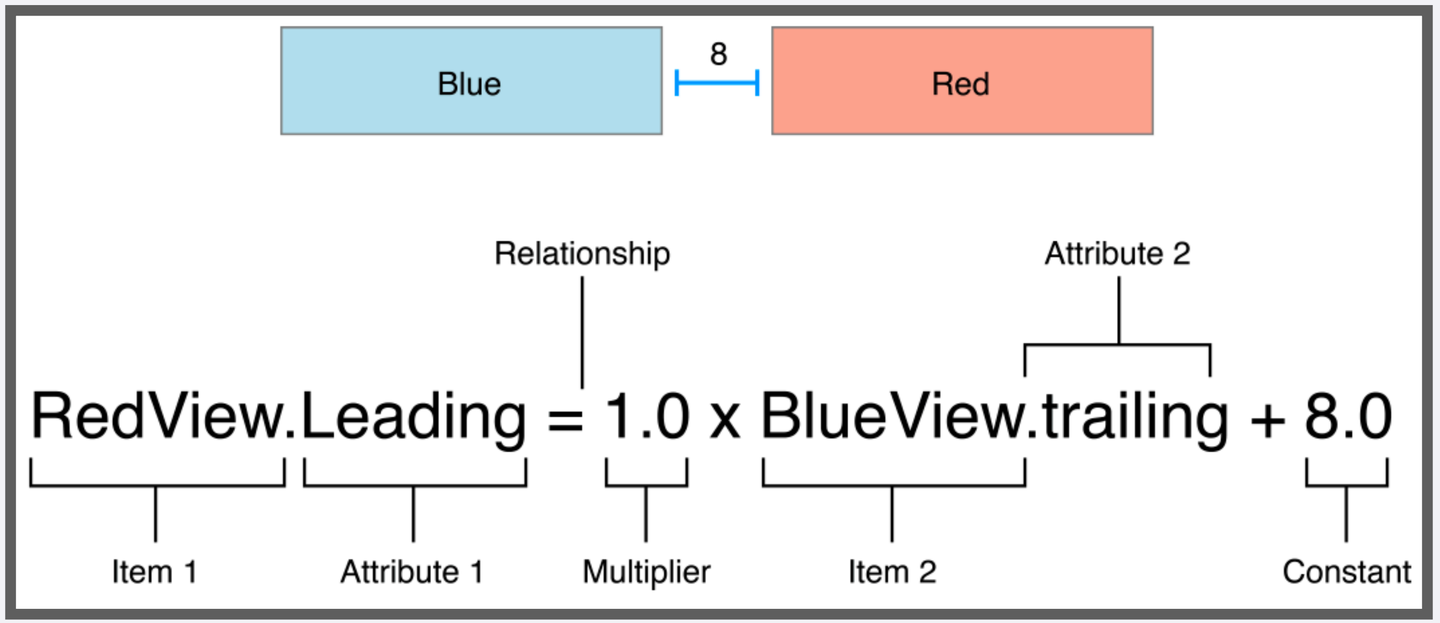
NSLayoutAnchor

A factory class for creating layout constraint objects using a fluent API.

Declaration

```
class NSLayoutAnchor<AnchorType> : NSObject where AnchorType : AnyObject
```

Autolayout. Anchor

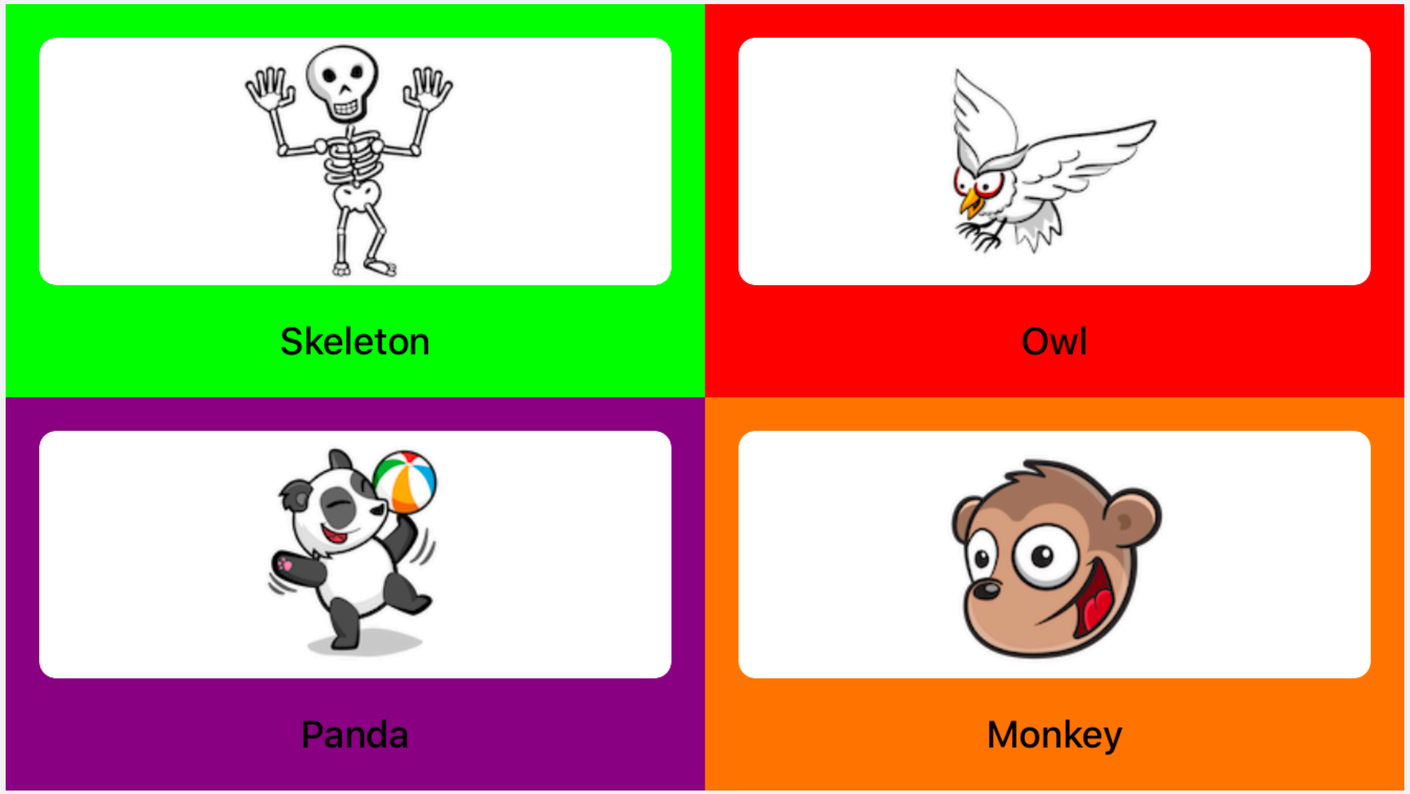



```
myView.leadingAnchor.constraint(equalTo: margins.leadingAnchor).isActive = true
```

Autolayout. Anchor

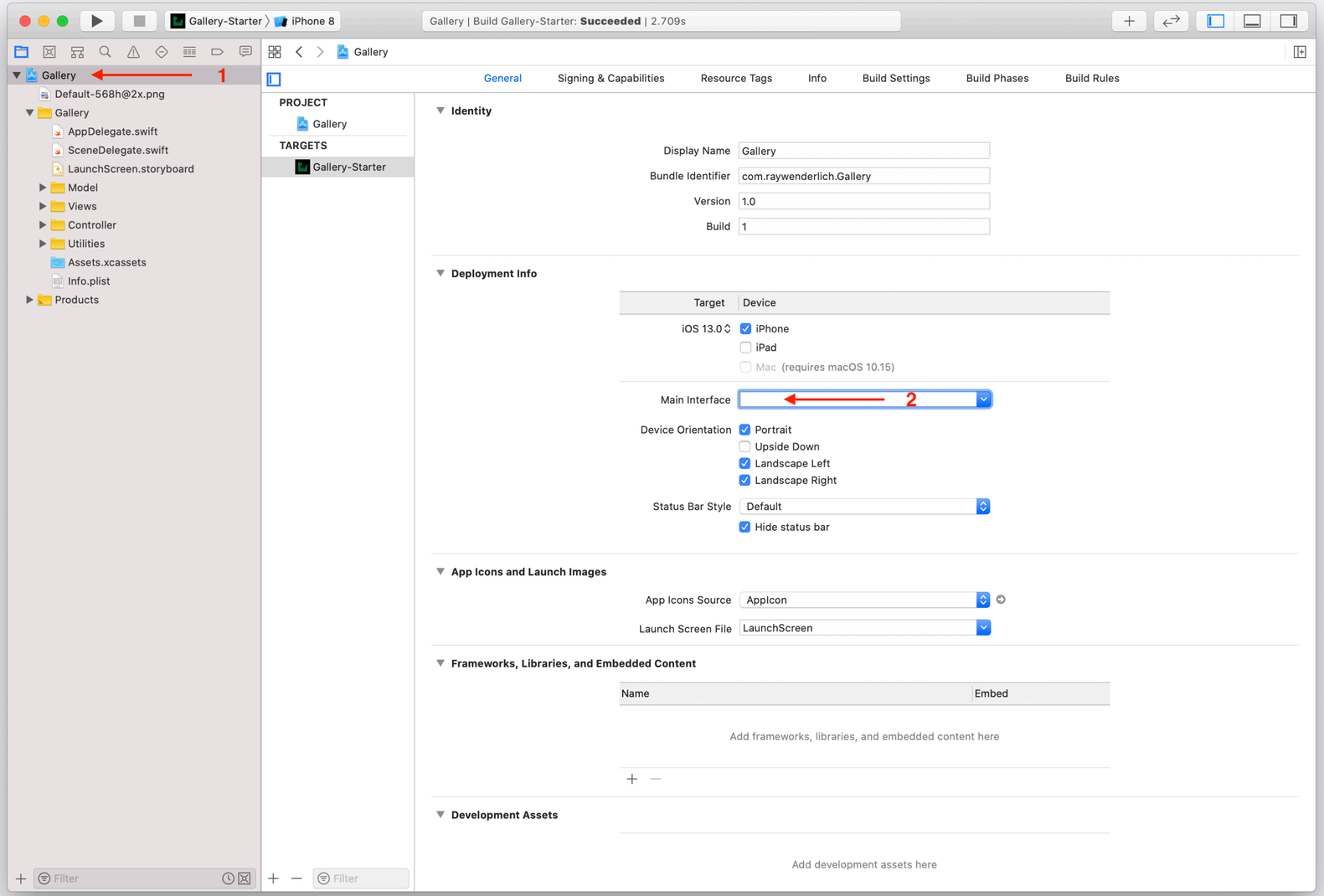
```swift
// Creating constraints using NSLayoutConstraint
NSLayoutConstraint(item: subview,
                   attribute: .leading,
                   relatedBy: .equal,
                   toItem: view,
                   attribute: .leadingMargin,
                   multiplier: 1.0,
                   constant: 0.0).isActive = true

NSLayoutConstraint(item: subview,
                   attribute: .trailing,
                   relatedBy: .equal,
                   toItem: view,
                   attribute: .trailingMargin,
                   multiplier: 1.0,
                   constant: 0.0).isActive = true


// Creating the same constraints using Layout Anchors
let margins = view.layoutMarginsGuide

subview.leadingAnchor.constraint(equalTo: margins.leadingAnchor).isActive = true
subview.trailingAnchor.constraint(equalTo: margins.trailingAnchor).isActive = true
```

Autolayout



Сбербанк Онлайн

Autolayout. Code. 1/3



Сбербанк Онлайн

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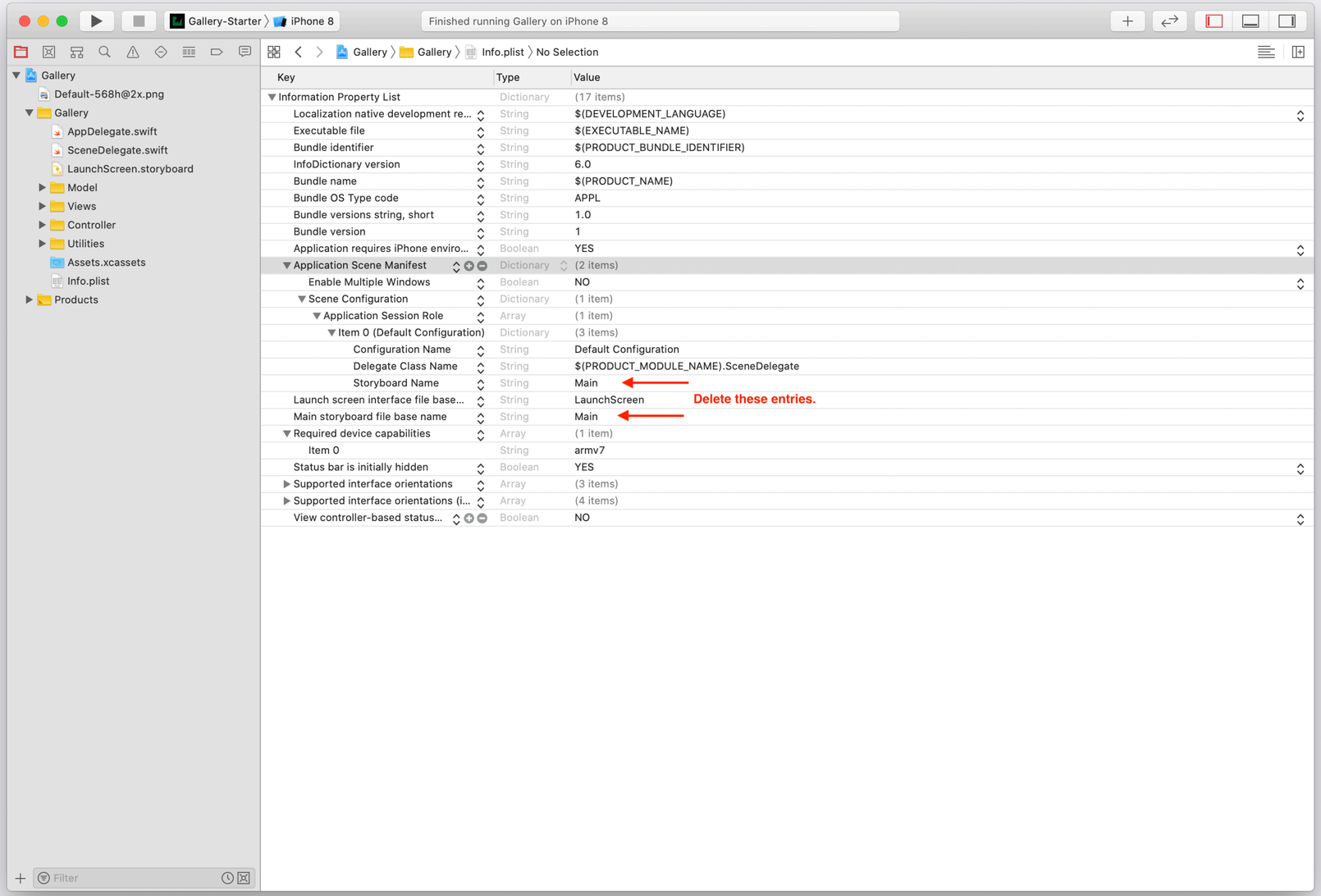
Autolayout. Code. 2/3



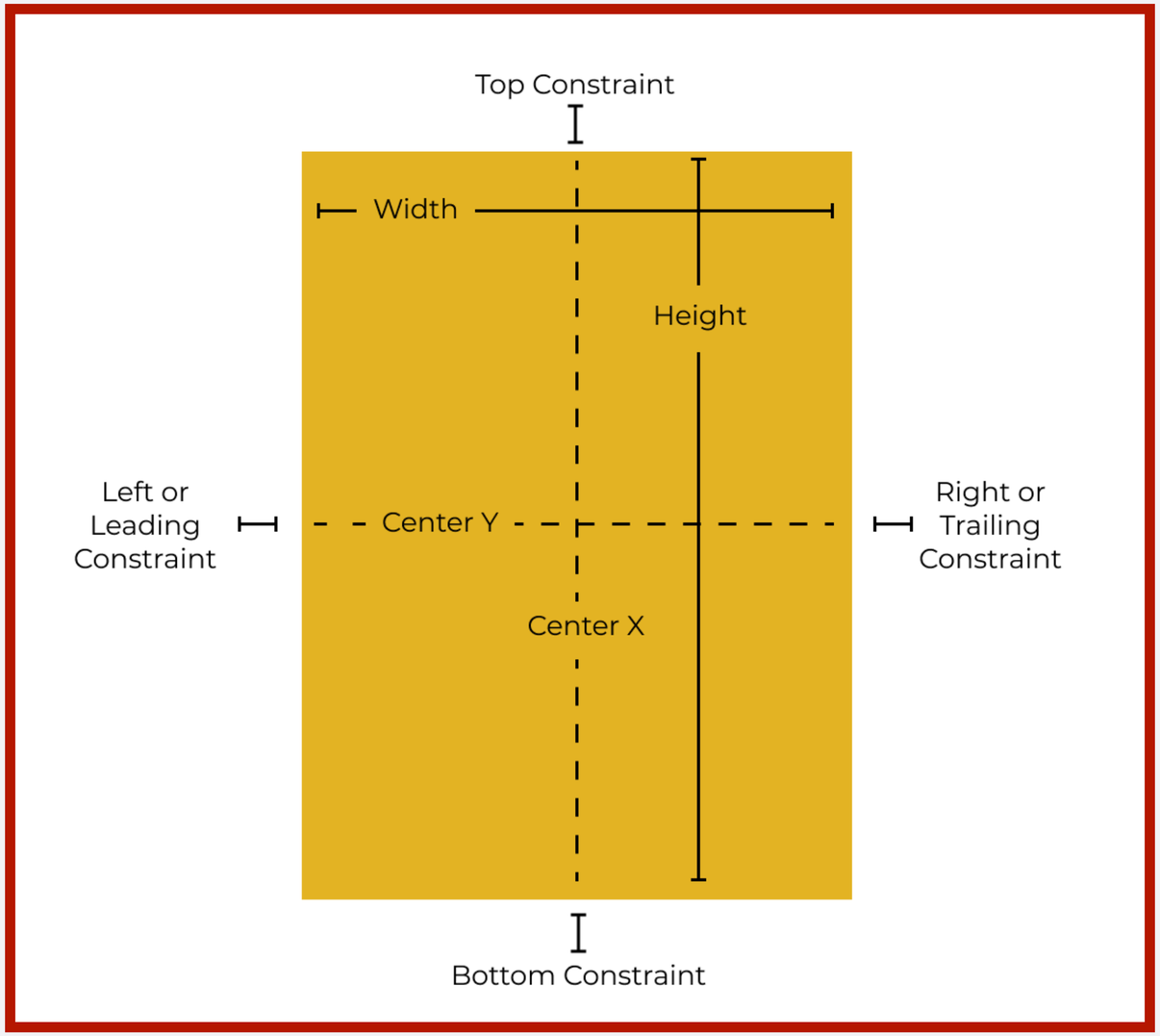
Сбербанк Онлайн

Devteam

Autolayout. Code. 3/3

```
  func scene(_ scene: UIScene, willConnectTo session: UISceneSession, options
connectionOptions: UIScene.ConnectionOptions) {
    guard let windowScene = scene as? UIWindowScene else { return }

    window = UIWindow(frame: windowScene.coordinateSpace.bounds)

    window?.windowScene = windowScene

    window?.rootViewController = GalleryController()

    window?.makeKeyAndVisible()
  }
```

Autolayout



Сбербанк
Онлайн

Devteam

Autolayout

```
lazy var cardView1: CardView = {
  let cardView = CardView(with: .skeleton)
  cardView.translatesAutoresizingMaskIntoConstraints = false
  return cardView
}()
```

Autolayout

Instance Property

translatesAutoresizingMaskIntoConstraints

A Boolean value that determines whether the view’s autoresizing mask is translated into Auto Layout constraints.

Declaration

```
var translatesAutoresizingMaskIntoConstraints: Bool { get set }
```

Autolayout

```
private func setupConstraints() {
  let safeArea = view.safeAreaLayoutGuide

  NSLayoutConstraint.activate([
    cardView1.leadingAnchor.constraint(equalTo: safeArea.leadingAnchor),
    cardView1.topAnchor.constraint(equalTo: safeArea.topAnchor),
    cardView1.widthAnchor.constraint(equalTo: safeArea.widthAnchor, multiplier: 0.5),
    cardView1.heightAnchor.constraint(equalTo: safeArea.heightAnchor, multiplier: 0.5),
  ])
}
```

Autolayout

Type Method

activate(_:)

Activates each constraint in the specified array.

Declaration

```
class func activate(_ constraints: [NSLayoutConstraint])
```

Parameters

constraints

An array of constraints to activate.

Сбербанк Онлайн

Devteam

Autolayout. Content Hugging

Сбербанк Онлайн

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Autolayout. Content Hugging

```
textLabel.setContentHuggingPriority(.init(rawValue: 252), for: .vertical)
textLabel.setContentCompressionResistancePriority(.init(rawValue: 751), for: .vertical)
```

Сбербанк Онлайн

Devteam

Работа в группах

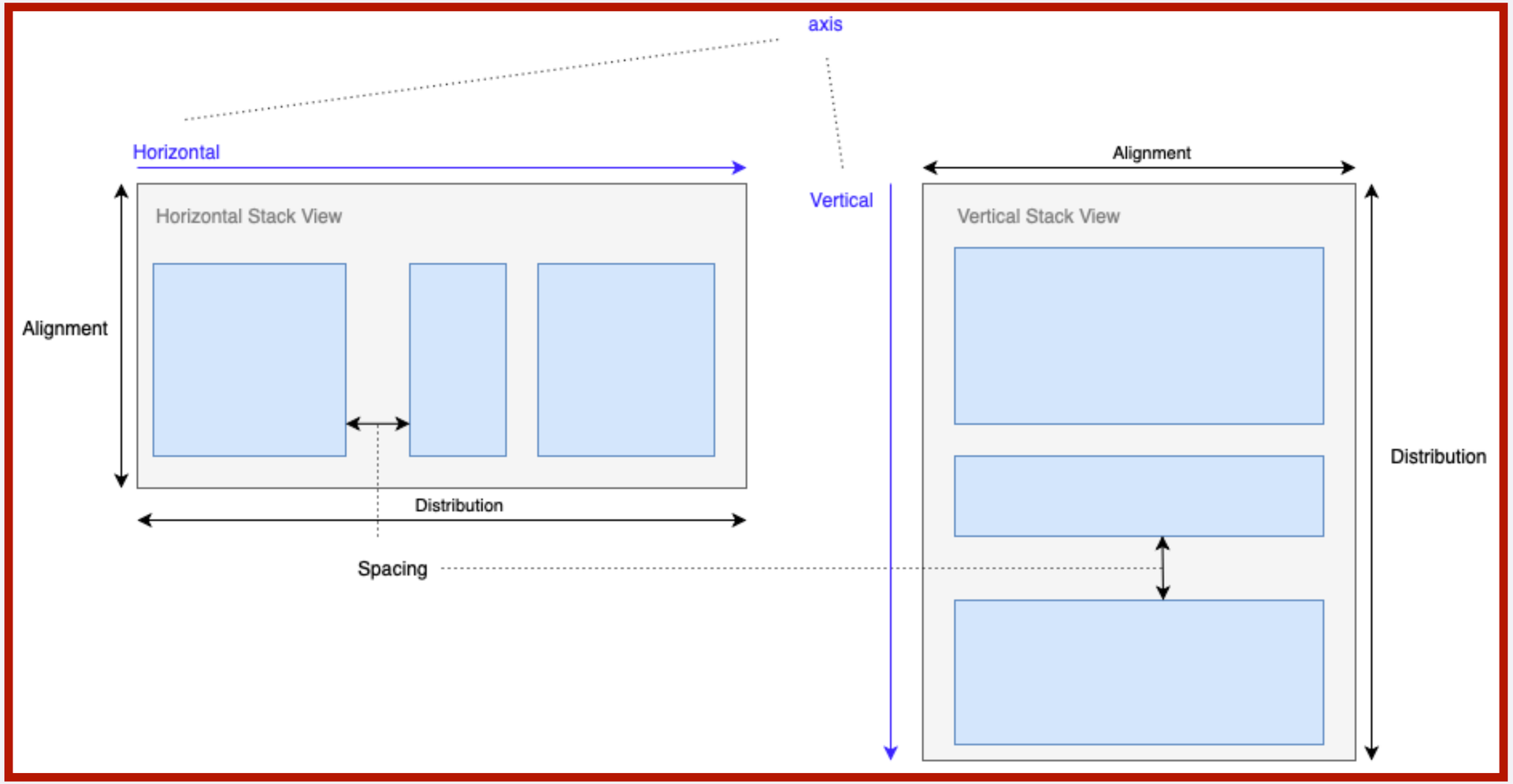
- Сделать тестовый проект, в котором надо управлять позицией и размером **3 view**.
- Используем 2 подхода: **autoresizing mask** и **autolayout+anchors**.
- Верстка только в коде.
- Надо поддержать поворот экрана
- Выведите размеры frame, bounds и значение center.

Сбербанк Онлайн

Devteam

StackView

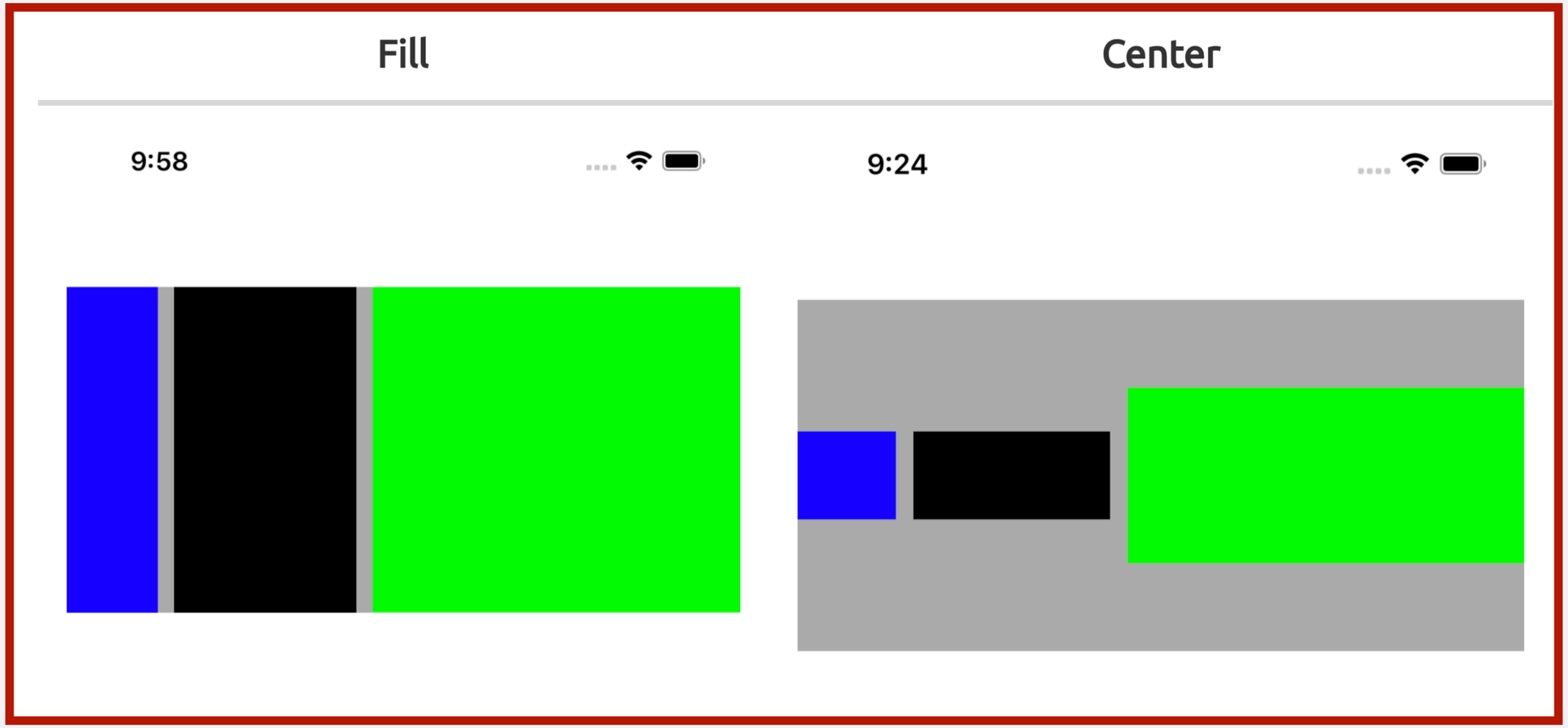
StackView



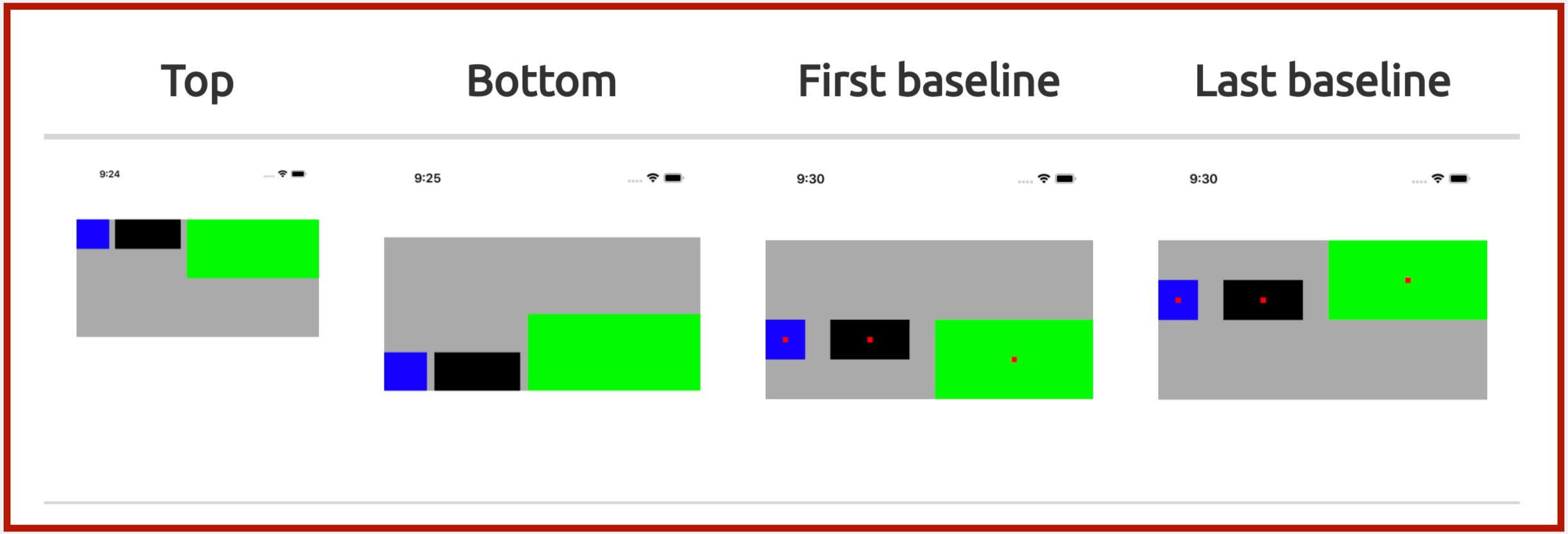
Сбербанк Онлайн

Devteam

StackView



StackView. Horizontal



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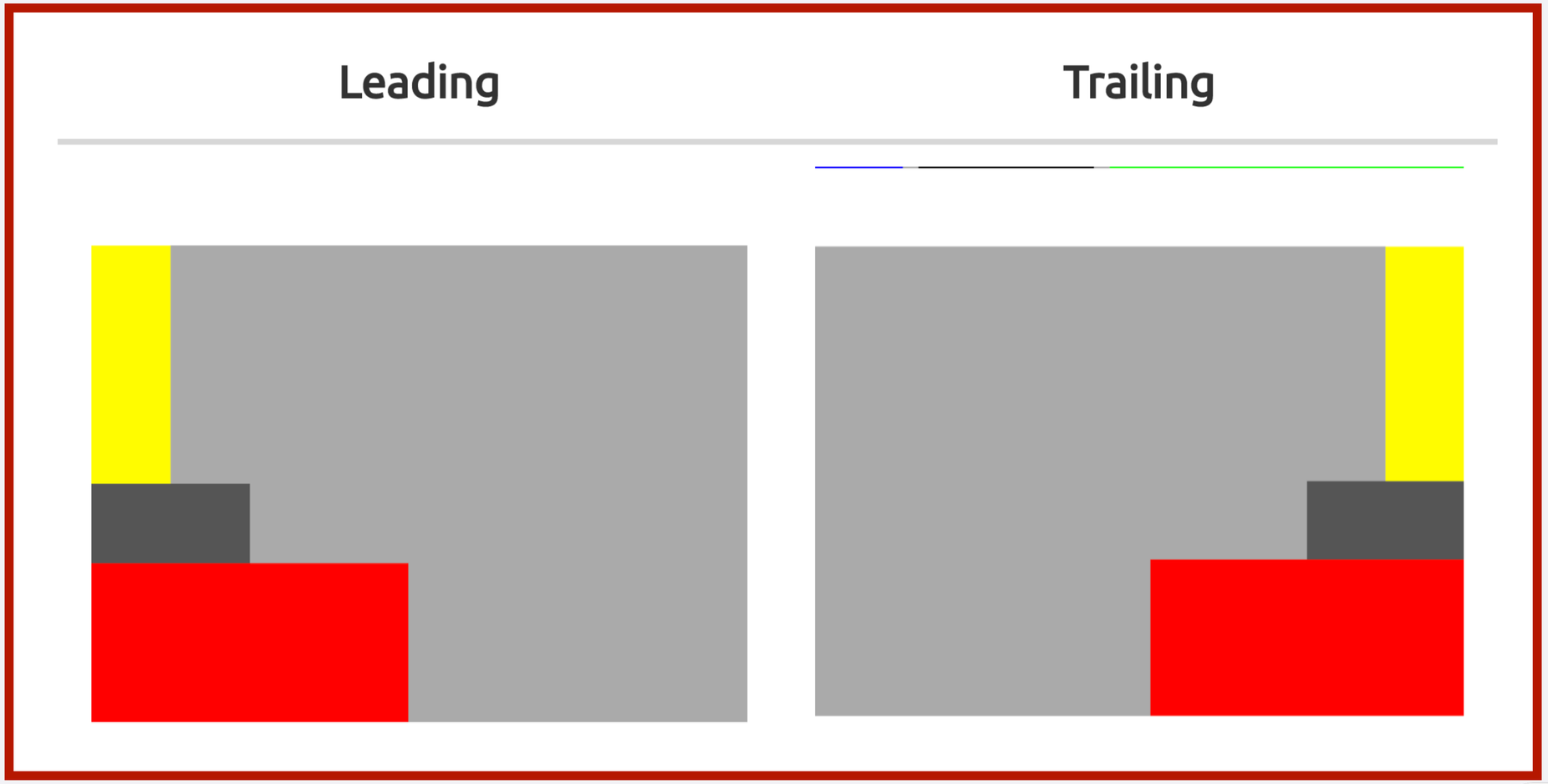
StackView. Vertical



Сбербанк Онлайн

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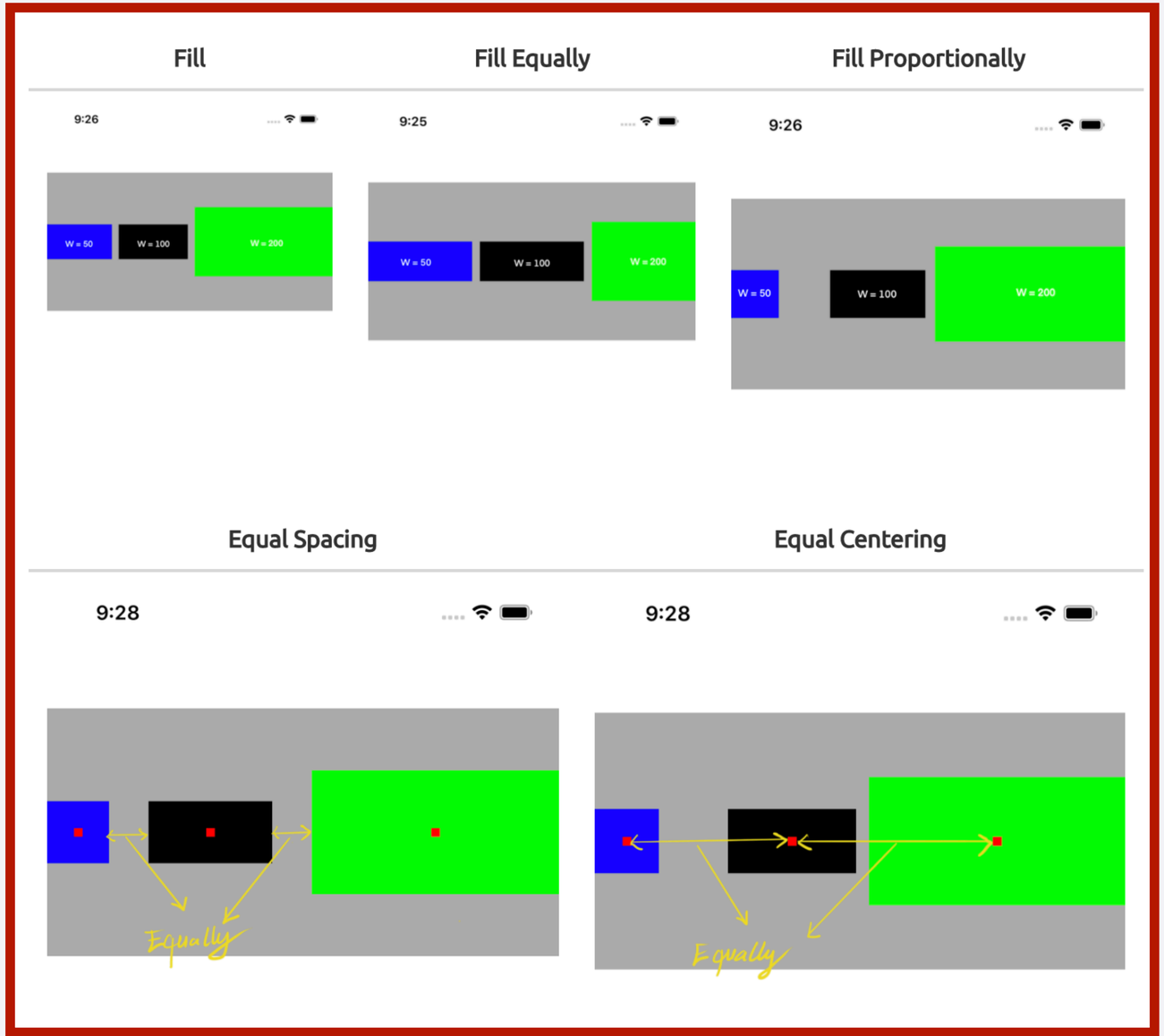
StackView. Distribution



Сбербанк Онлайн

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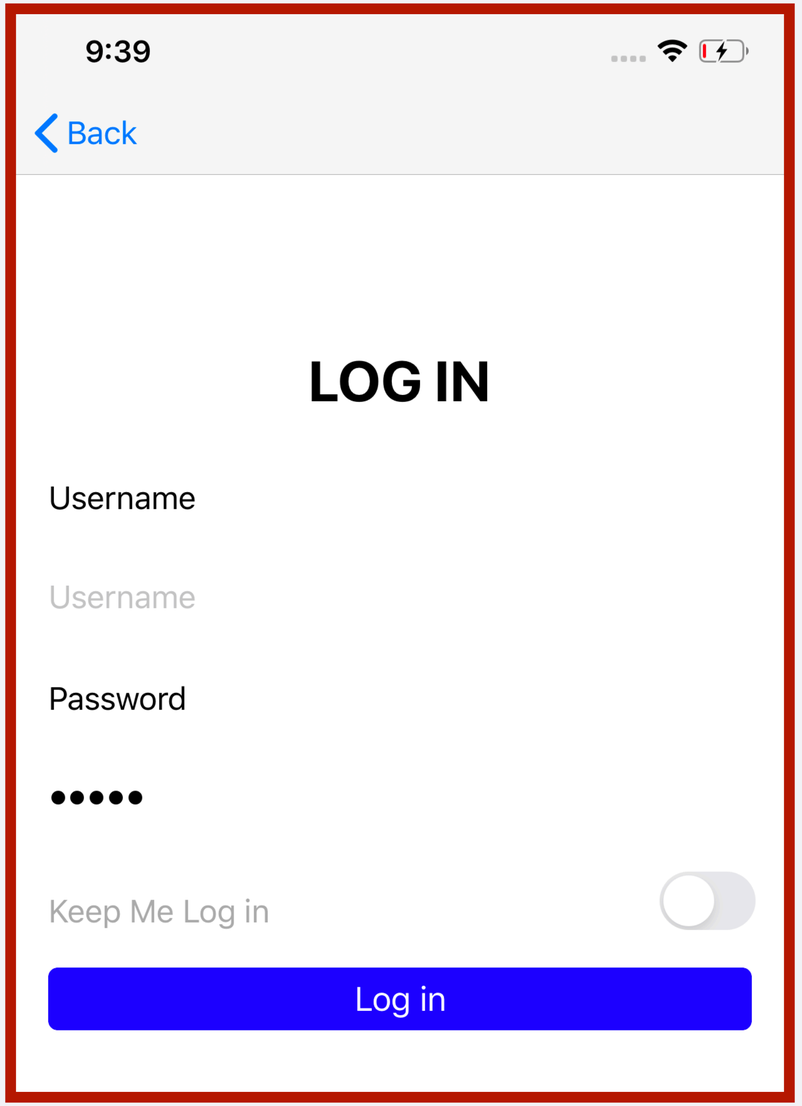
StackView. Example



Сбербанк Онлайн

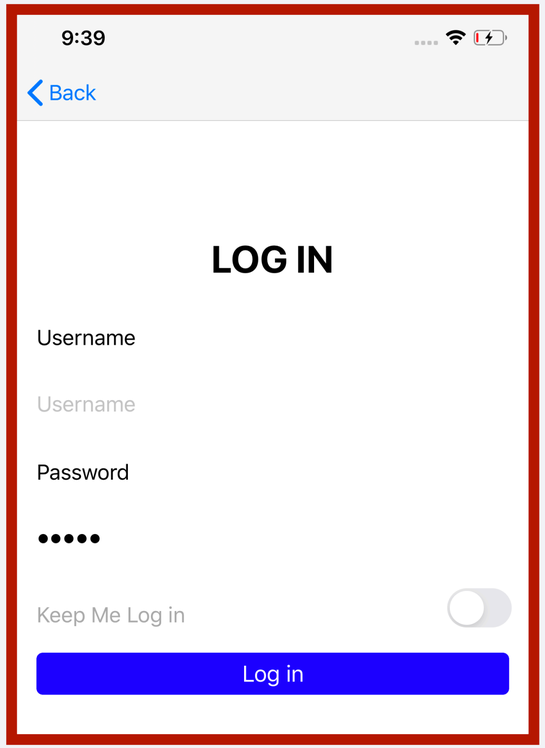
Devteam

StackView. Example

```
view.addSubview(lblLogin)
lblLogin.snp.makeConstraints { (make) in
    make.centerX.equalToSuperview()
    make.centerY.equalToSuperview().offset(-250)
    make.left.equalToSuperview().offset(20)
    make.right.equalToSuperview().offset(-20)
    make.height.equalTo(30)
}

view.addSubview(lblUsername)
lblUsername.snp.makeConstraints { (make) in
    make.centerX.left.right.equalTo(lblLogin)
    make.top.equalTo(lblLogin.snp.bottom).offset(30)
    make.height.equalTo(30)
}

view.addSubView(btnLogin)
//...
// The rest omitted
```

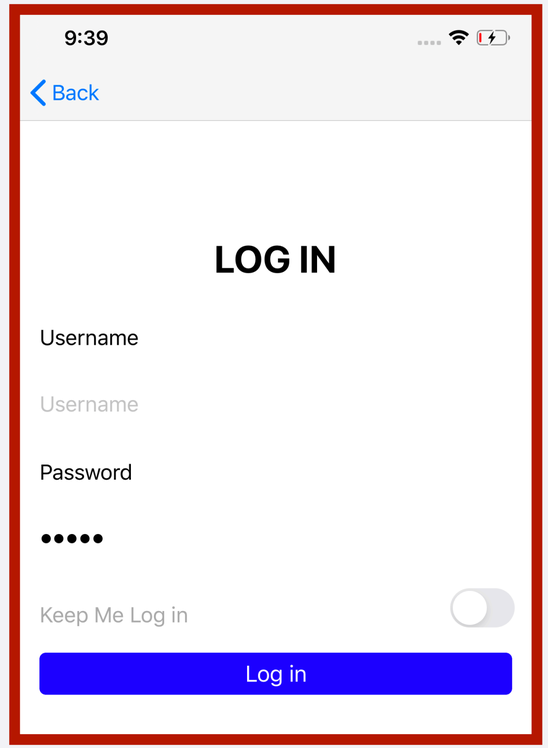


Сбербанк Онлайн

Devteam

StackView. Example

```
lazy var stackView: UIStackView = {
    let stack = UIStackView()
    stack.axis = .vertical
    stack.spacing = 20.0
    stack.alignment = .fill
    stack.distribution = .fillEqually
    [self.lblUsername,
        self.txtUserName,
        self.lblPassword,
        self.txtPassword,
        self.btnLogin].forEach { stack.addArrangedSubview($0) }
    return stack
}()
```

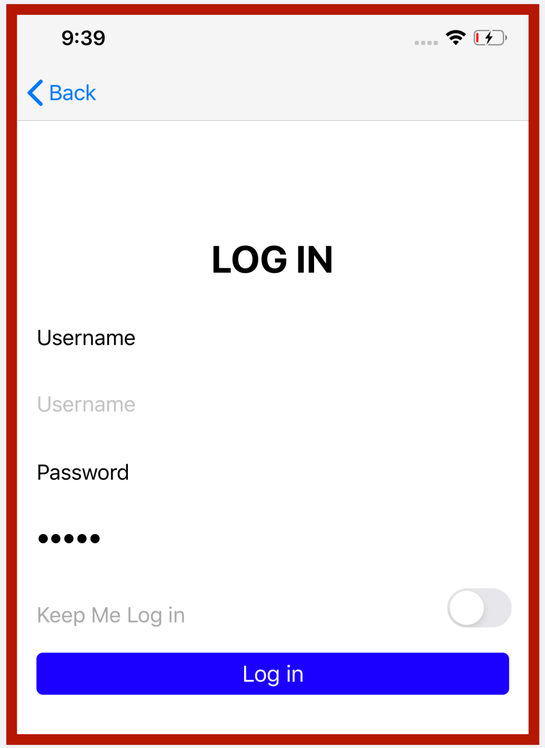


Сбербанк Онлайн

Devteam

StackView. Example

```
override func viewDidLoad() {
    super.viewDidLoad()
    // ...
    view.addSubview(stackView)
    stackView.snp.makeConstraints { (make) in
        make.centerX.left.right.equalTo(lblLogin)
        make.top.equalTo(lblLogin.snp.bottom).offset(30)
        make.height.equalTo(280)
    }
}
```



Сбербанк Онлайн

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Read

- https://ashfurrow.com/blog/i-totally-didnt-understand-frames-and-bounds/
- https://code.tutsplus.com/tutorials/ios-fundamentals-frames-bounds-and-cggeometry--cms-21196
- https://developer.apple.com/documentation/uikit/uiview/autoresizingmask
- https://developer.apple.com/library/archive/documentation/WindowsViews/Conceptual/ViewPG_iPhoneOS/CreatingViews/CreatingViews.html
- https://developer.apple.com/library/archive/documentation/UserExperience/Conceptual/AutolayoutPG/index.html
- https://sarunw.com/posts/history-of-auto-layout-constraints/
- https://habr.com/ru/company/oleg-bunin/blog/437584/
- https://www.vadimbulavin.com/effective-auto-layout-programmatically-in-swift/
- https://developer.apple.com/library/archive/technotes/tn2154/_index.html
- https://uynguyen.github.io/2020/07/18/iOS-Introducing-Stack-Views/