iPhone Application Programming
Lecture 4: User Interface Design

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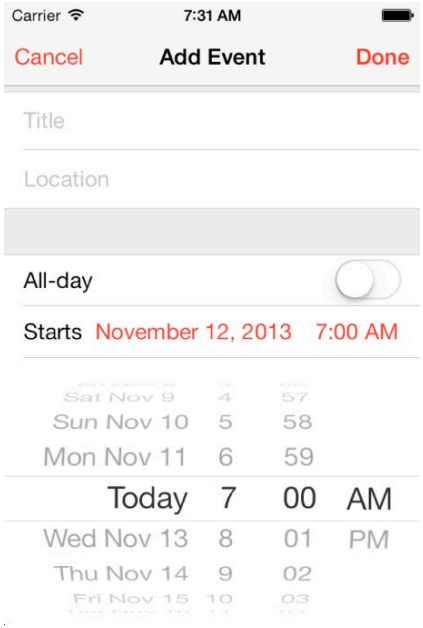
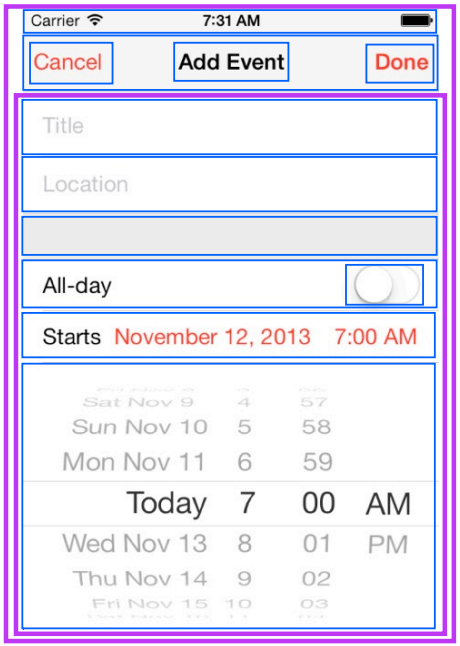
http://hci.rwth-aachen.de/iphone

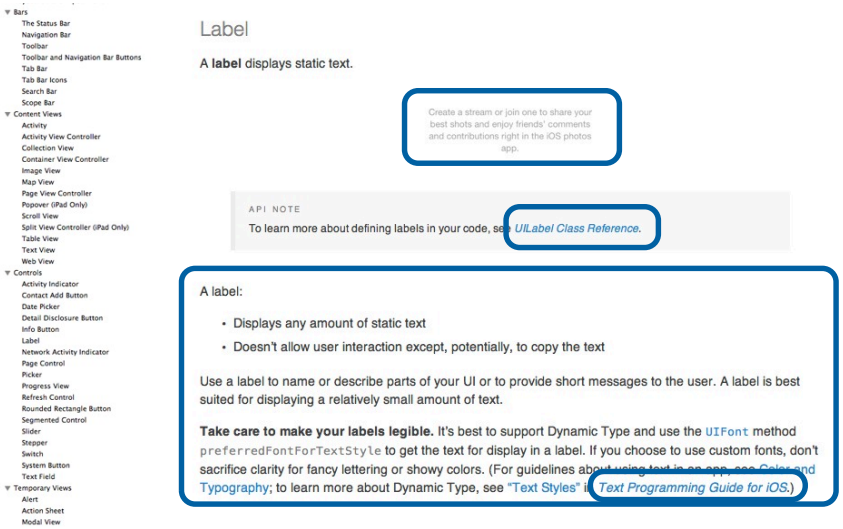
View Concepts

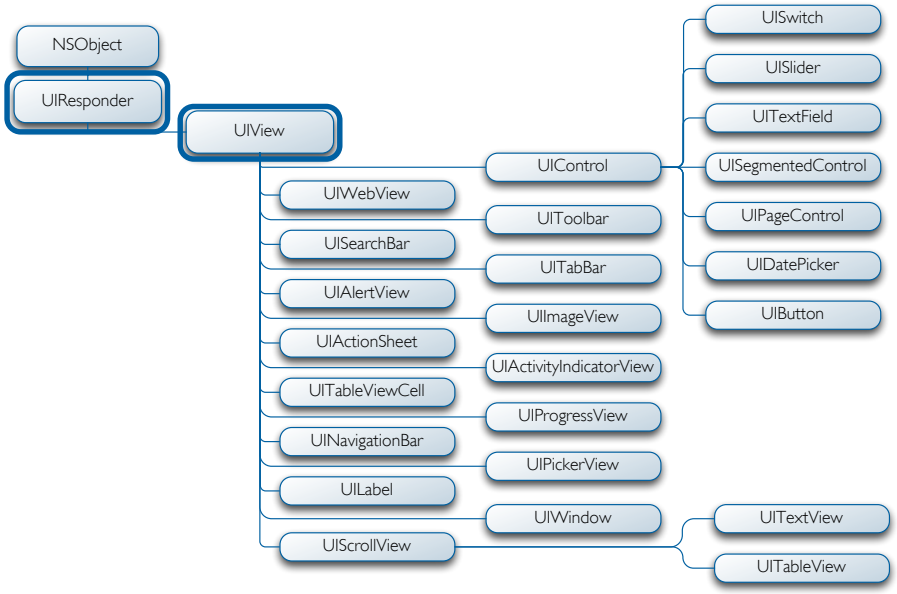
- SDK provide many types of Views to show your content
- At run-time Views are organized as a tree
- Use Interface Builder to design your UI and connect it to code
- Geometry of Views are determined by constraints





Finding the Right View





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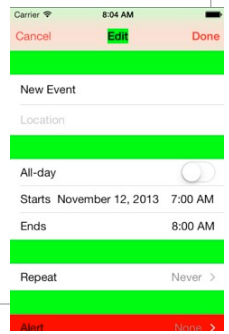
Demo: Hacking Calendar

```
(lldb) po [[UIWindow keyWindow] recursiveDescription]
<UIWindow
   | <UILayoutContainerView
   |    | <UINavigationTransitionView
   |    |    | <UIViewControllerWrapperView
   |    |    |    | <EKCalendarItemEditorTableView: 0xf870200; baseClass = UITableView;
   |    |    |    |    | <UITableViewWrapperView
   |    |    |    |    |    | <UITableViewCell: 0xb19ad90
   |    |    |    |
   |    |    |    ...
   |    |    |
   |    | <UINavigationBar
   |    |    |
   |    |    |    ...
   |    |    |
   |    |    | <UINavigationItemView
   |    |    |    | <UILabel
   |    |    | <UINavigationButton
   |    |    |    ...

(lldb) expr ((UIView *)0xb19ad90).backgroundColor = [UIColor redColor]
(lldb) expr ((UIView *)0xf870200).backgroundColor = [UIColor greenColor]
```



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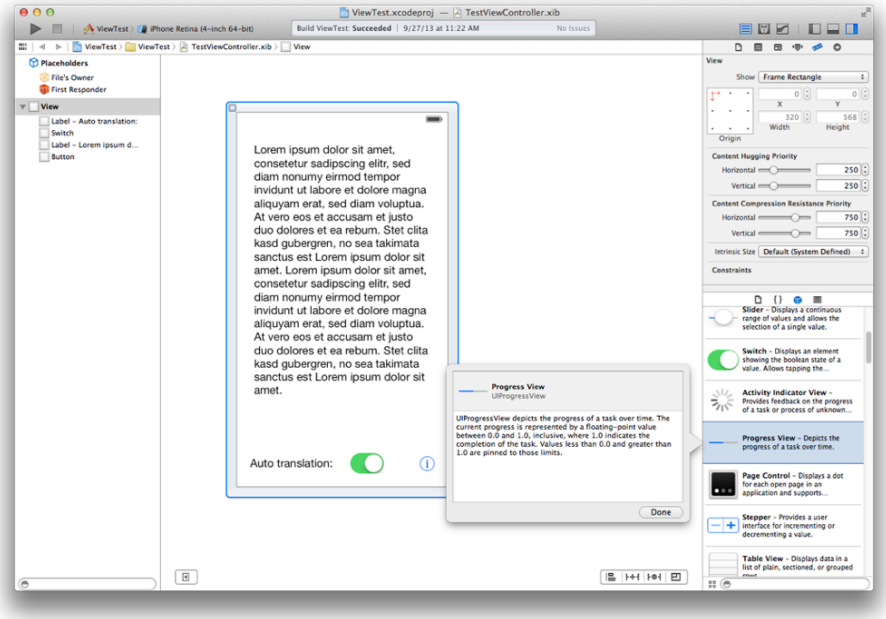
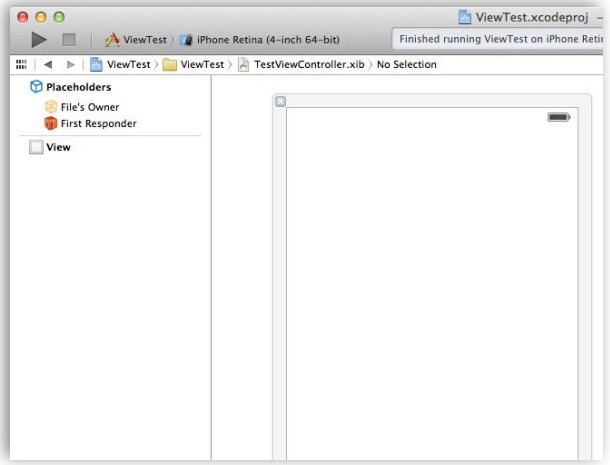


Interface Builder

- Graphical tool to layout user interfaces
- Create the widget hierarchy
- Set attributes of widgets
- Set up connections between the widgets
- Store these informations in nib files

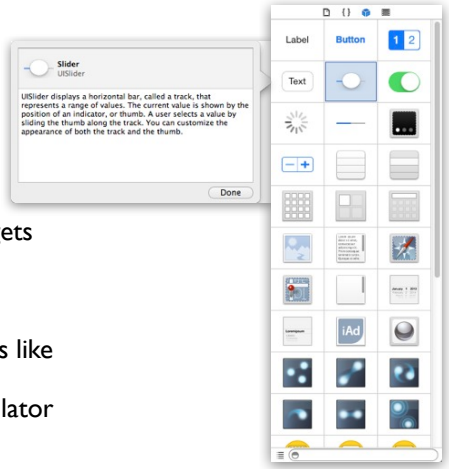
The Anatomy of a xib File



The Source of a xib

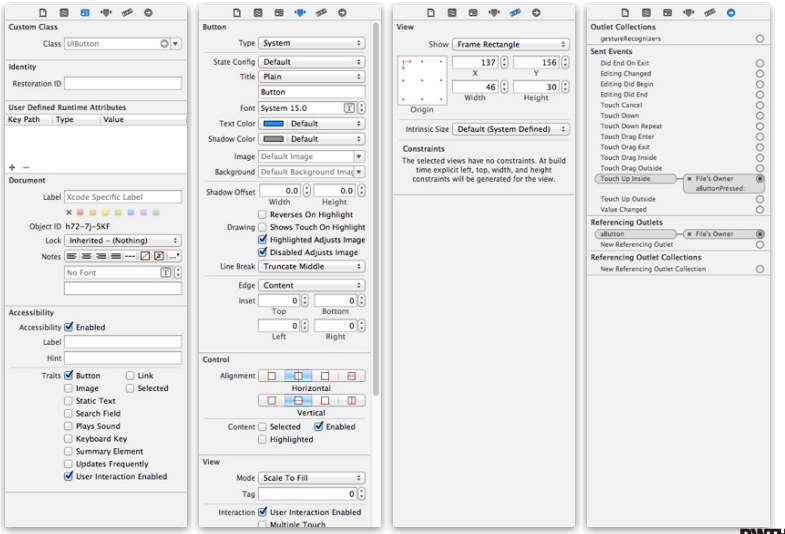
```
<?xml version="1.0" encoding="UTF-8"?>
<archive type="com.apple.InterfaceBuilder3.CocoaTouch.XIB" version="8.00">
    <data>
        <int key="IBDocument.SystemTarget">1280</int>
        <string key="IBDocument.SystemVersion">11C74</string>
        <string key="IBDocument.InterfaceBuilderVersion">1938</string>
        <string key="IBDocument.AppKitVersion">1138.23</string>
        <string key="IBDocument.HIToolboxVersion">567.00</string>
        <object class="NSMutableDictionary" key="IBDocument.PluginVersions">
            <string key="NS.key.0">com.apple.InterfaceBuilder.IBCocoaTouchPlugin</string>
            <string key="NS.object.0">933</string>
        </object>
        <array key="IBDocument.IntegratedClassDependencies">
            <string>IBUITextView</string>
            <string>IBUISwitch</string>
            <string>IBUIButton</string>
            <string>IBUIView</string>
            <string>IBUILabel</string>
            <string>IBProxyObject</string>
        </array>
        <array key="IBDocument.PluginDependencies">
            <string>com.apple.InterfaceBuilder.IBCocoaTouchPlugin</string>
        </array>
        <object class="NSMutableDictionary" key="IBDocument.Metadata">
            <string key="NS.key.0">PluginDependencyRecalculationVersion</string>
            <integer value="1" key="NS.object.0"/>
        </object>
        <array class="NSMutableArray" key="IBDocument.RootObjects" id="1000">
            <object class="IBProxyObject" id="841351856">
                <string key="IBProxiedObjectIdentifier">IBFilesOwner</string>
                <string key="targetRuntimeIdentifier">IBCocoaTouchFramework</string>
            </object>
            <object class="IBProxyObject" id="371349661">
                <string key="IBProxiedObjectIdentifier">IBFirstResponder</string>
                <string key="targetRuntimeIdentifier">IBCocoaTouchFramework</string>
            </object>
            <object class="IBUIView" id="474857037">
                <reference key="NSNextResponder"/>
                <int key="NSvFlags">292</int>
                <array class="NSMutableArray" key="NSSubviews">
                    <object class="IBUITextView" id="694905917">
                        <reference key="NSNextResponder" ref="474857037"/>
                        <int key="NSvFlags">274</int>
                        <string key="NSFrame">{{20, 20}, {280, 385}}</string>
                        <reference key="NSSuperview" ref="474857037"/>
```


Laying out the User Interface



- The library contains all UI Widgets
- Drag them to your view
- See instantly what your UI looks like
- Test your UI in the iPhone Simulator

Set Widget Attributes



Connecting Widgets and Code

- IBActions
  - Tags a method as a target for an interface action
- IBOutlets
- IBOutletCollection
  - Variables to populate with objects from a nib file

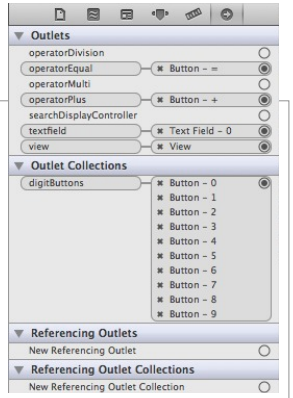
Connecting Widgets and Code

```
@interface iCalcView: UIView {

}

- (IBAction)addDigit:(id)sender;
- (IBAction)calculateResult:(id)sender;


//declared properties
//textfield
@property (nonatomic,weak) IBOutlet UITextField *textfield;
//operators: + =
@property (nonatomic,weak) IBOutlet UIButton *operatorPlus
@property (nonatomic,weak) IBOutlet UIButton *operatorEqual;
//digits
@property (nonatomic,weak) IBOutletCollection (UIButton) NSArray* digitButtons;
```



Interface Builder Demo

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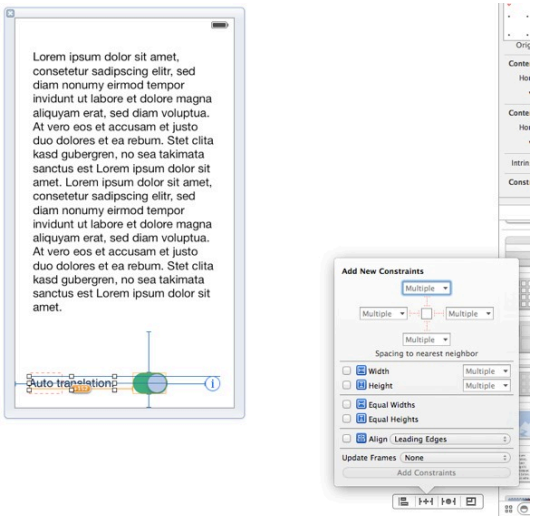
Auto Layout

- Preferred layout management
- Allows you to create views that work both in portrait and landscape mode
- Available in iOS 6 and higher
- Spatial relationships expressed by constraints

Auto Layout Constraints

- Constraints are mathematical expressions
  - <=, ==, =>
- Constraints have a priority level
- The runtime tries to solve the system of equations

Adding Constraints



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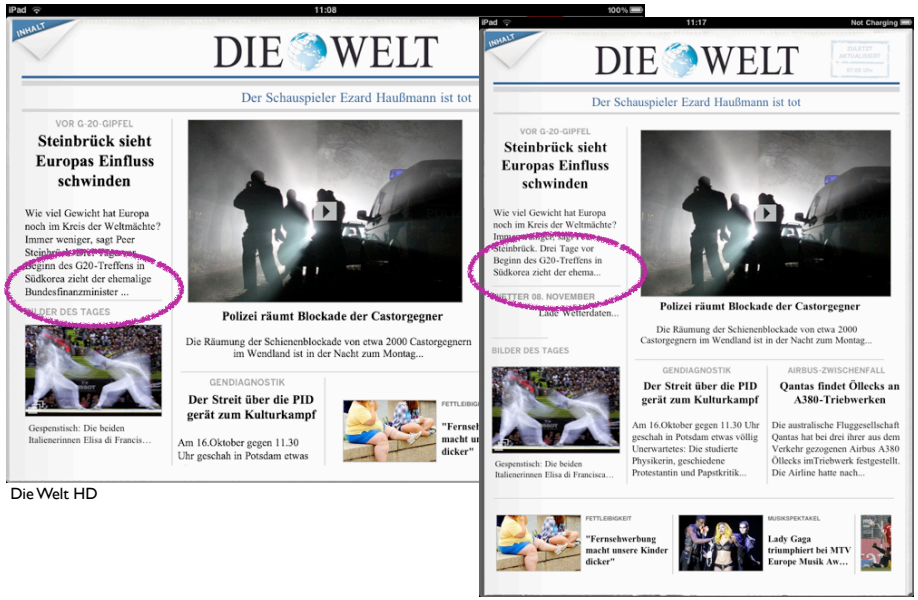
UIView

- Defines a rectangular area on the screen
- Two responsibilities
  - Render content
  - React to user input
  - Manage subviews
- Layout as view hierarchy

The Times

The Times



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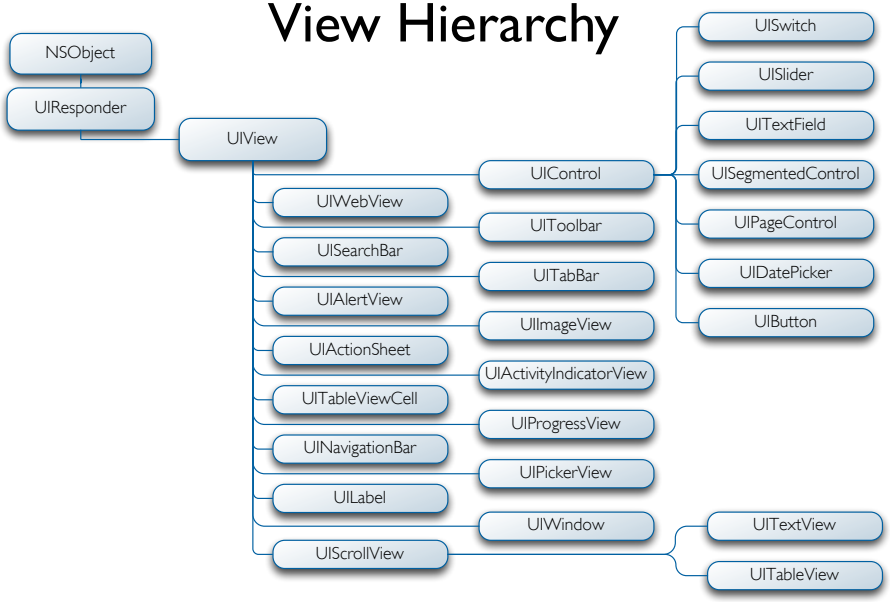
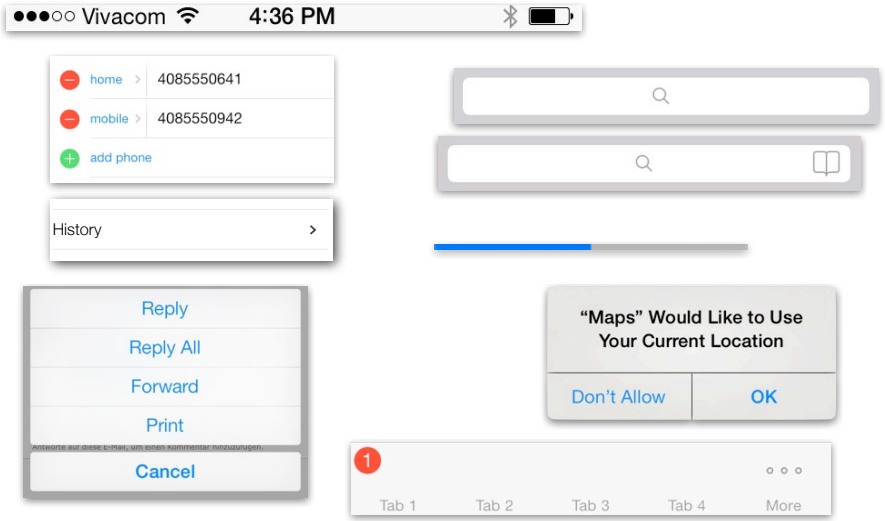
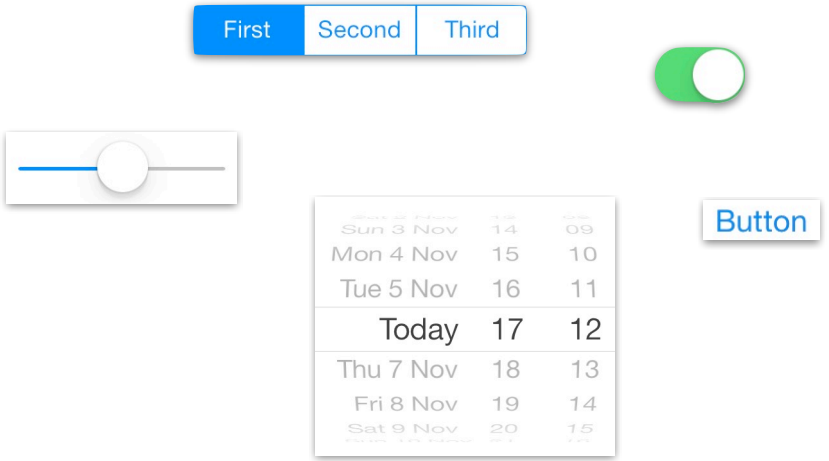
View Hierarchy



UI Widgets



Control Widgets



View Categories: Examples

- Containers: UIScrollView
- Controls: UIButton
- Display views: UIImageView
- Text and web views: UITextView
- Alert views: UIAlertView
- Navigation views: UITabBar
- UIWindow

UIViewController

- Manages typically one screen
- Flushes the view on low-memory situations
- Resizes the view on orientation change
- Creates modal views on top of the current view