

**CSC 471 / 371**  
**Mobile Application Development for iOS**



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**Build Your First iOS App**

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**Outline**

- Xcode IDE basics
- Creating a new project
- An anatomy of an iOS project
- Widgets and attributes
- App icons and images
- Running apps in iOS simulators



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**Xcode IDE and iOS SDK**

- We will be using
  - SDK for iOS 14
  - Xcode 12 and Swift 5.3
  - **Mandatory for all programming assignments and the final project**
- Download and install the latest SDK & IDE from the App Store
- PLEASE, PLEASE
  - Once you get everything working
  - **DO NOT upgrade or change versions**



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**What's Unique About Mobile Apps**

- One active application at a time
- One window on screen
- Quick response time
- Limited screen size
- Limited system resources
  - Memory, battery power
- No garbage collection
  - You have more responsibilities

**Until iOS 9**  
 Multi-tasking and split screen in iOS 9

Only due to larger screens.  
 Most restrictions still apply.

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**Demo Hello, iOS!**

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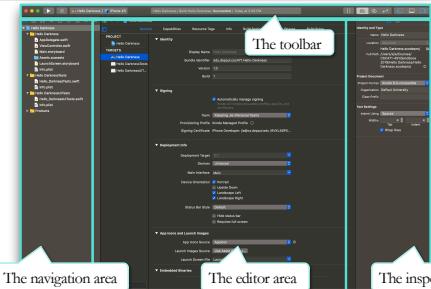
## Launch Xcode 12

- Create a new Xcode project
- Choose a project template
  - Single View Application
- Choose
  - Language: Swift
  - Devices: iPhone
- Choose
  - Storyboard

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## Overview of Xcode Workspace



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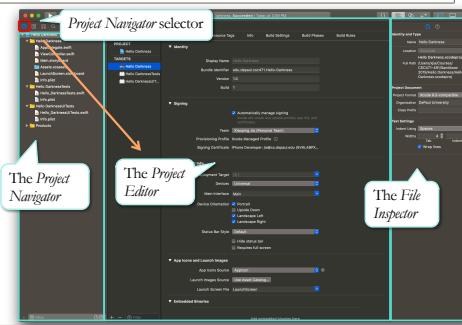
## Editors in Xcode

- Project editor
  - Edit project-level properties and configurations
    - build options, target architectures, and app entitlements, etc.
- Interface Builder
  - Graphically create and edit user interface files.
    - storyboards
- Source editor
  - Edit text files
    - Swift source code, etc.

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## The Xcode IDE The Project Navigator and Editor



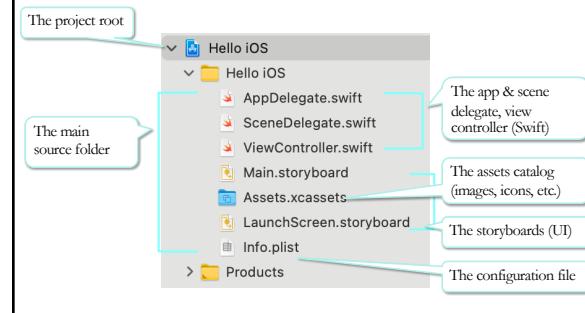
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## An Anatomy of an iOS Project

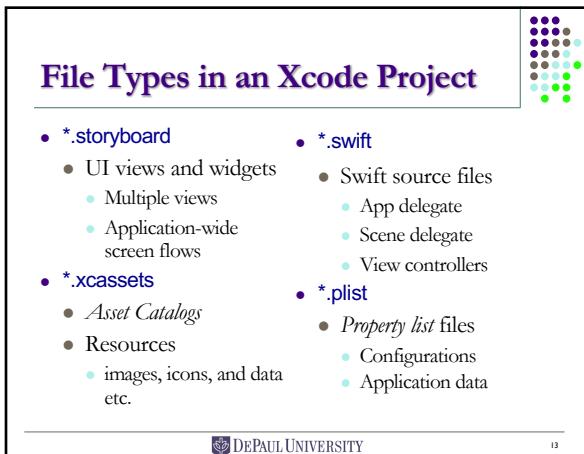
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## iOS Project Structure – Project Navigator View

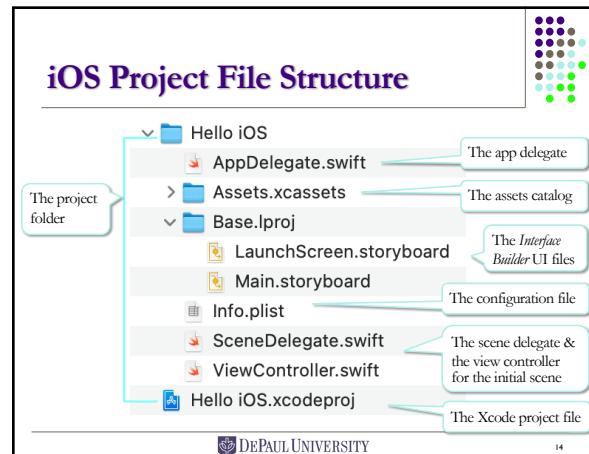


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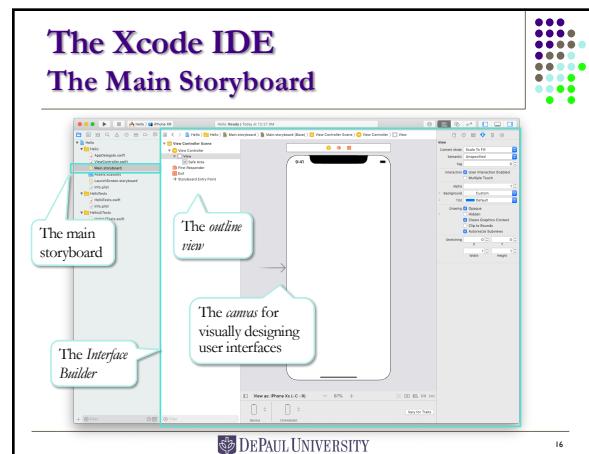
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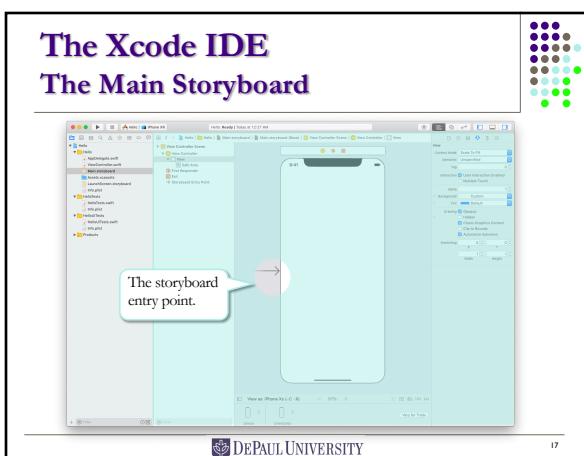
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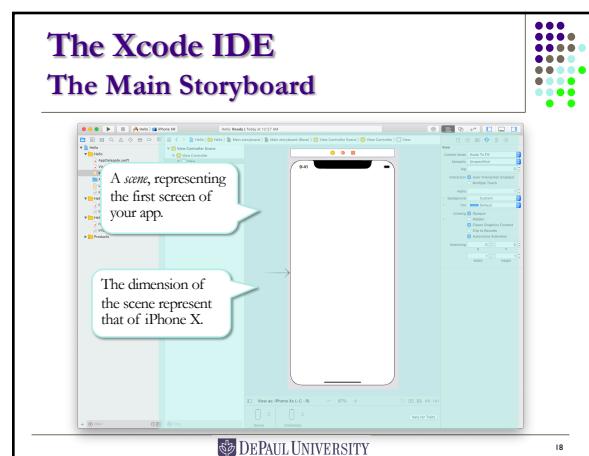
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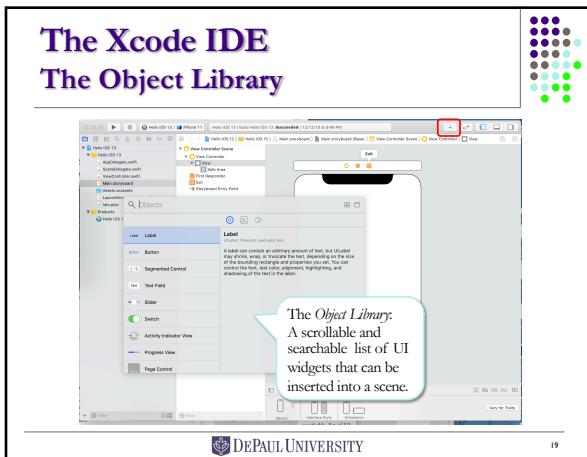
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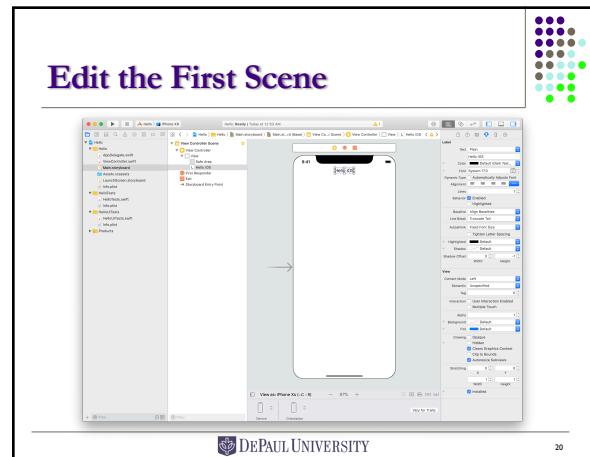
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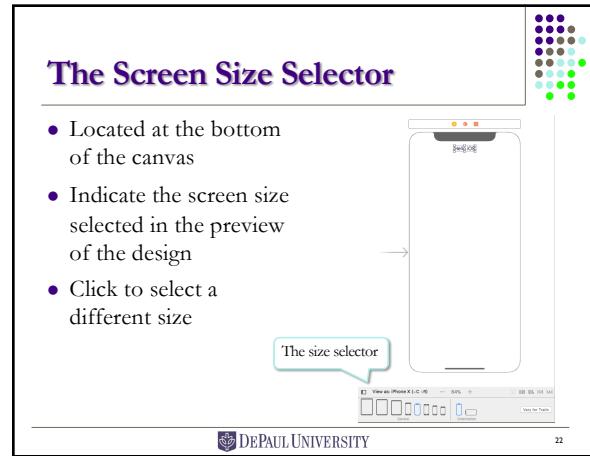
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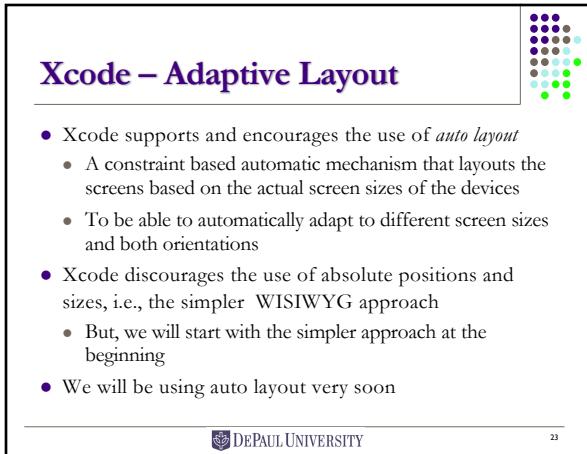
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## The Attribute Inspector

- Edit the attributes of the selected widget

Widgets can also be selected from the Outline View

Selected the widget

Attribute Inspector

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## Hello, iOS!

### Iteration #3: App Icons

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## App Icons

- Every app has an *app icon*
- The app icon appears in several contexts and in different sizes, in *points* (pt)
  - The *Home* screen, 60x60
  - Results of *Spotlight Search*, 40x40
  - The *Settings* app, 29x29
- Point*, a logical unit that maintains a constant physical dimension on devices with different screen densities.

8:23

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## App Icons in Different Contexts

5:04

5:19

5:04

The Home screen 60x60pt

The Search results 40x40pt

The Settings 29x29pt

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## iPhone Screen Resolutions – Early Models, 2007-2016

	iPhone 3G iPhone 3GS	iPhone 4 iPhone 4S	iPhone 5 iPhone 5S iPhone SE	iPhone 6 iPhone 6S iPhone 7/8	iPhone 6+ iPhone 6S+ iPhone 7+/8+
Size (diagonal)	3.5"	3.5"	4"	4.7"	5.5"
Display type	Classic	Retina	Retina	Retina (HD)	Retina HD True Tone
Pixels (px)	320×480	640×960	640×1136	750×1334	1080×1920
Density (ppi)	163	326	326	326	401
Points (pt)	320×480	320×480	320×568	375×667	414×736
Aspect ratio	3:2	3:2	~16:9	16:9	16:9
Scale factor	1x	2x	2x	2x	3x

- An icon or an image should be the same size *in points* across all devices
  - Different sizes *in pixels*
- For best results, provide icons/images in different pixel sizes

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## iPhone Screen Resolutions – Late Models, 2017-2019

	iPhone X, XS iPhone 11 Pro	iPhone XS Max iPhone 11 Pro Max	iPhone XR iPhone 11
Size (diagonal)	5.85"	6.46"	6.06"
Display type	AMOLED HDR10	AMOLED HDR10	LED HDR10
Pixels (px)	1125×2436	1242×2688	828×1792
Density (ppi)	458	458	326
Points (pt)	375×812	414×896	414×896
Aspect ratio	~19.5:9	~19.5:9	~19.5:9
Scale factor	3x	3x	2x

- An icon or an image should be the same size *in points* across all devices
  - Different sizes *in pixels*
- For best results, provide icons/images in different pixel sizes

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## iPhone Screen Resolutions – Late Models, 2020

	iPhone 12 Pro	iPhone 12 Pro Max	iPhone 12	iPhone 12 Mini
Size (diagonal)	6.06"	6.46"	6.06"	5.42"
Display type	AMOLED XDR	AMOLED XDR	AMOLED XDR	AMOLED XDR
Pixels (px)	1170x2532	1248x2778	1170x2532	1080x2340
Density (ppi)	460	458	460	476
Points (pt)	390x844	416x926	390x844	360x780
Aspect ratio	~19.5:9	~19.5:9	~19.5:9	~19.5:9
Scale factor	3x	3x	3x	3x

- An icon or an image should be the same size in *points* across all devices
  - Different sizes in *pixels*
- For best results, provide icons/images in different pixel sizes

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## Managing Images with Xcode Asset Catalogs

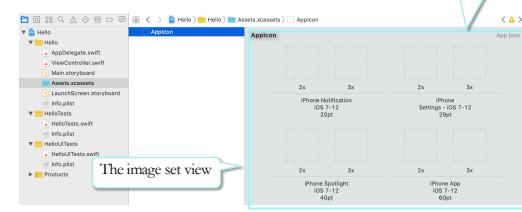
- Xcode uses *asset catalogs* to simplify the management of icons and images
- Each asset catalog consists of
  - a name, used to refer to the asset in your app
  - a set of images of different sizes (in pixel)
- At runtime, iOS will load the image from the set that is most appropriate for the current scale factor
  - An image will be scaled if necessary
    - Runtime cost and reduced quality

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## Add App Icons

- In the Project Navigator
  - Select **images.xcassets**
  - Select **AppIcon**



The image wells.  
You can drag and drop images into these wells.

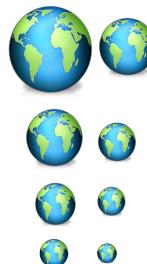
The image set view

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## Add App Icons

- You should provide images of sizes:
  - Home screen (60pt):
    - 120x120 (2x), 180x180 (3x)
  - Spotlight Search (40pt):
    - 80x80 (2x), 120x120 (3x)
  - Settings (29pt):
    - 58x58 (2x), 87x87 (3x)
  - Notification (20pt):
    - 40x40 (2x), 60x60 (3x)
- Use PNG format –
  - Portable Network Graphics format
- Also support vector PDF format



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## Add App Icons

- Drag and drop image files into the image wells



2x 3x

2x 3x

2x 3x

2x 3x

iPhone Notification iOS 7-12 20pt

iPhone Settings iOS 7-12 29pt

iPhone Spotlight iOS 7-12 40pt

iPhone App iOS 7-12 60pt

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## App Icons of Hello iOS



5:39

5:55

5:48

General

Privacy

Maps

Safari

News

Siri

Photos

Game Center

Developer

Hello iOS

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## Demo – Hello, iOS!

- Missed something?
  - Watch the lecture over again
- You need to feel comfortable and confident in dealing with Xcode
  - Experiment with various options

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## Assignments

## Programming Assignment 1

- Go though the process and create your own *Hello World* app.
  - Do it.
  - Don't worry, if you stumble. Most of you will at first.
- Once you get it working
  - Experiment with some variations and try it again!
  - Explore Xcode features
  - This needs to be second nature

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## Assignment Submission

- Submit a single zip file for each project
  - Zip the contents of the project folder
- Include your source code files
  - \*.swift, \*.plist, \*.storyboard etc.
  - Image files
  - Project files
- Before you submit
  - Build the code, make sure everything compiles and works

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## Next ...

- Learn Swift programming language
- Dive into iOS SDK

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