Chapter 3.

IDEs & Tools for Mobile App Development

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COMP7506 Smart Phone Apps Development
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Why IDEs?

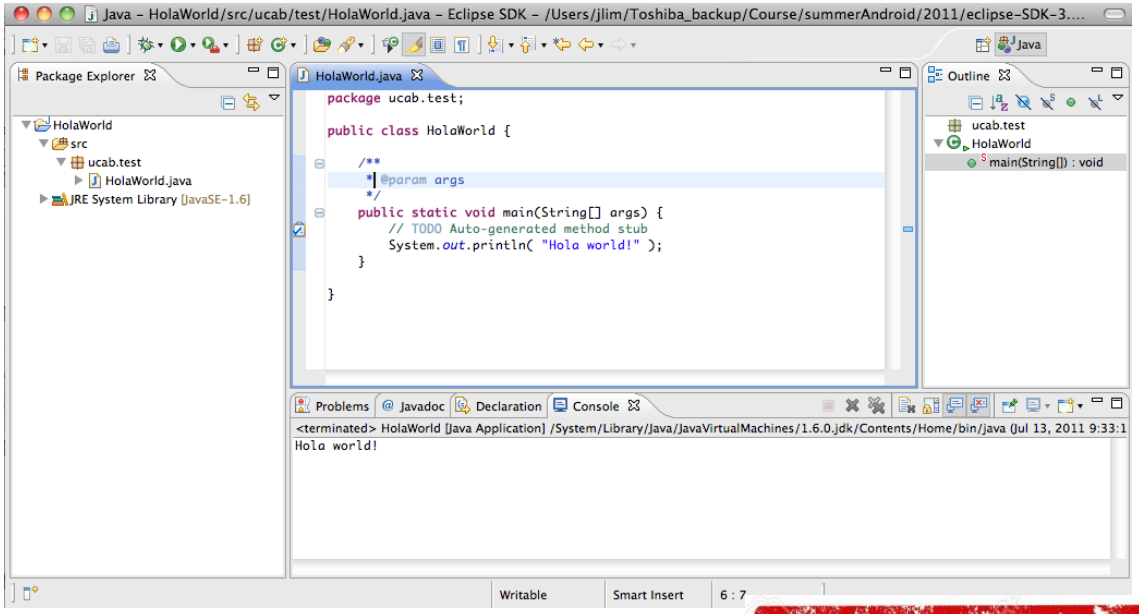
- IDE = Integrated Development Environment
- You cannot write programs on a phone.
  - But you may do so on a tablet
- You need an IDE (to be run on a computer).
  - Software application that allows the computer programmer to develop software for a certain platform on a PC.
  - Normally has: source editor, compiler and/or interpreter and debugger.
  - Upon everything is fine, you can upload / transfer your apps to the smart phone.
  - SDK for a certain model is sometimes required (e.g., Nokia S60)

Some tools for mobile app development

- Android
  - AIDE
  - App Inventor
  - DroidScript
  - CppDroid
  - Android Web Developer (AWD)
  - Python Suite
  - Java Suite
  - Eclipse
  - Arduino
  - Visual Studio
  - Unreal Engine
  - Android Studio
  - Corona
  - PhoneGap
  - …
- iOS
  - Xcode
  - Appcode
  - Atom
  - SublimeText 3
  - CodeRunner 2
  - …

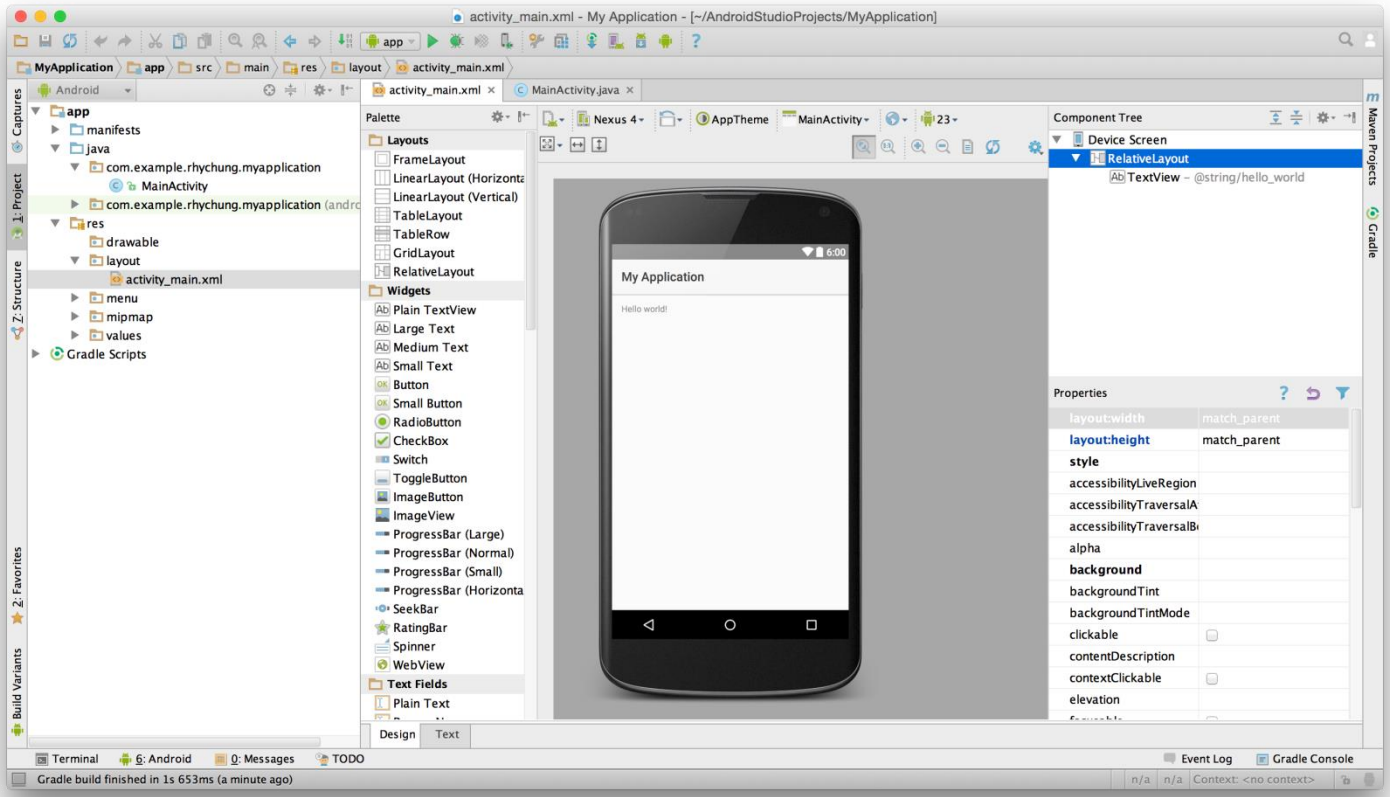
IDE for Android app

- IDE: Eclipse
- Programming language: Java



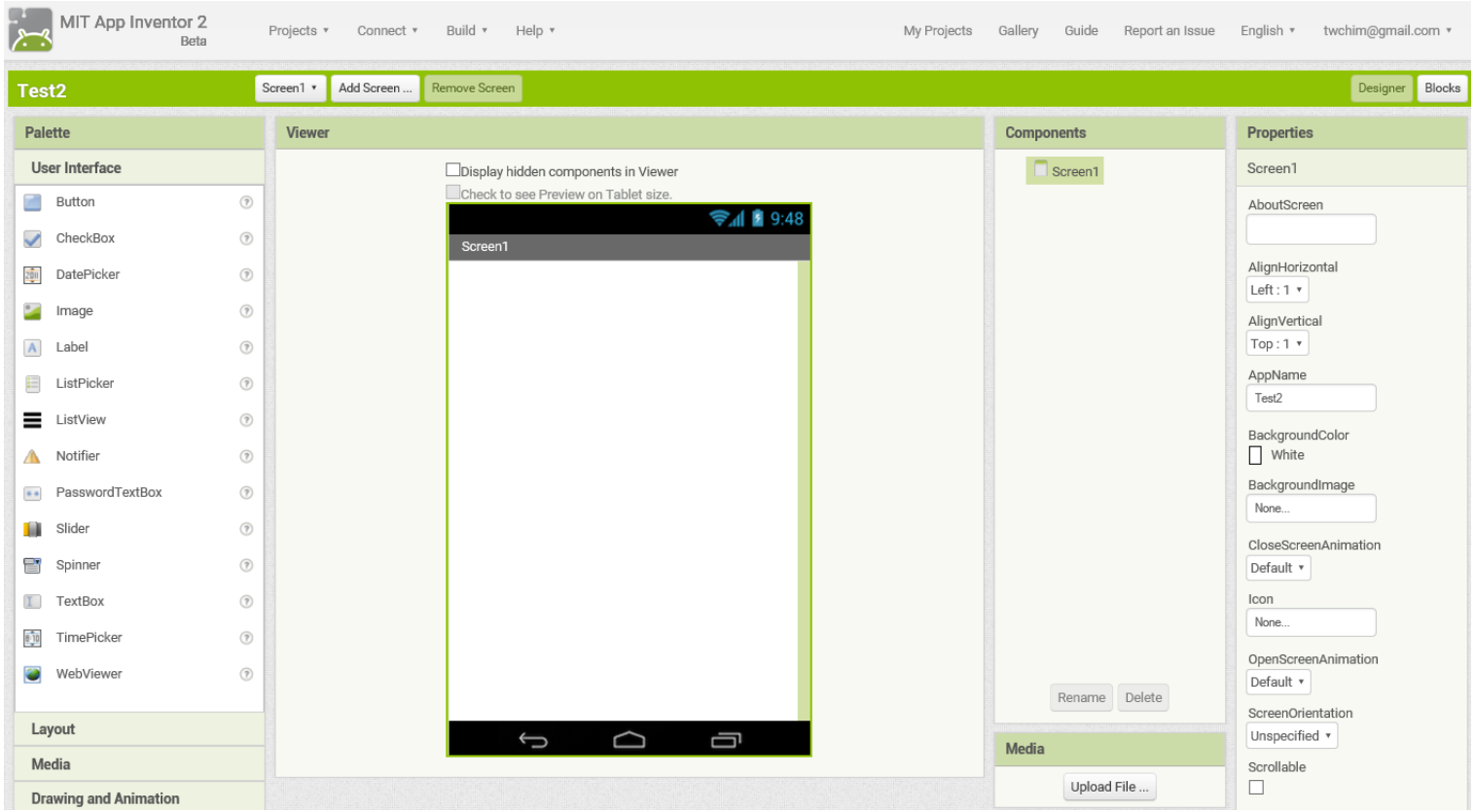
IDE for Android app

- IDE: Android Studio
- Programming language: Java / Kotlin (aim at simplifying Java syntax)



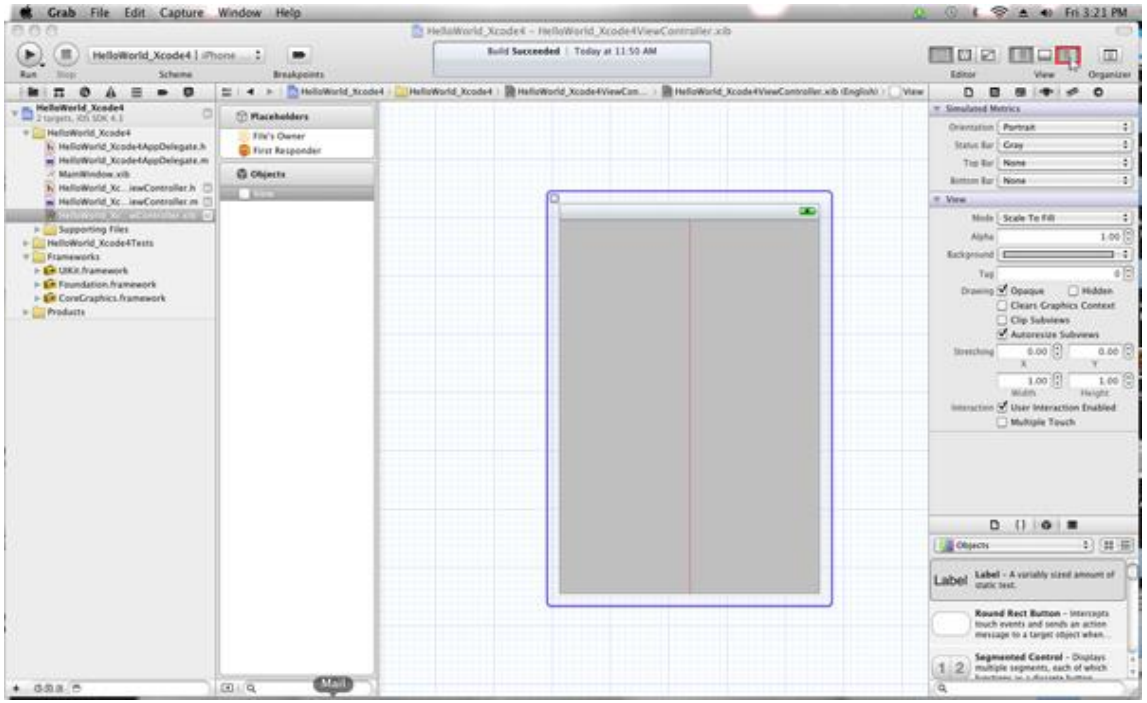
IDE for Android app

- IDE: MIT App Inventor
- A graphical web-based app development tool for Android



IDE for iPhone / iPad app

- IDE: Xcode
- Programming language: Objective C / Swift

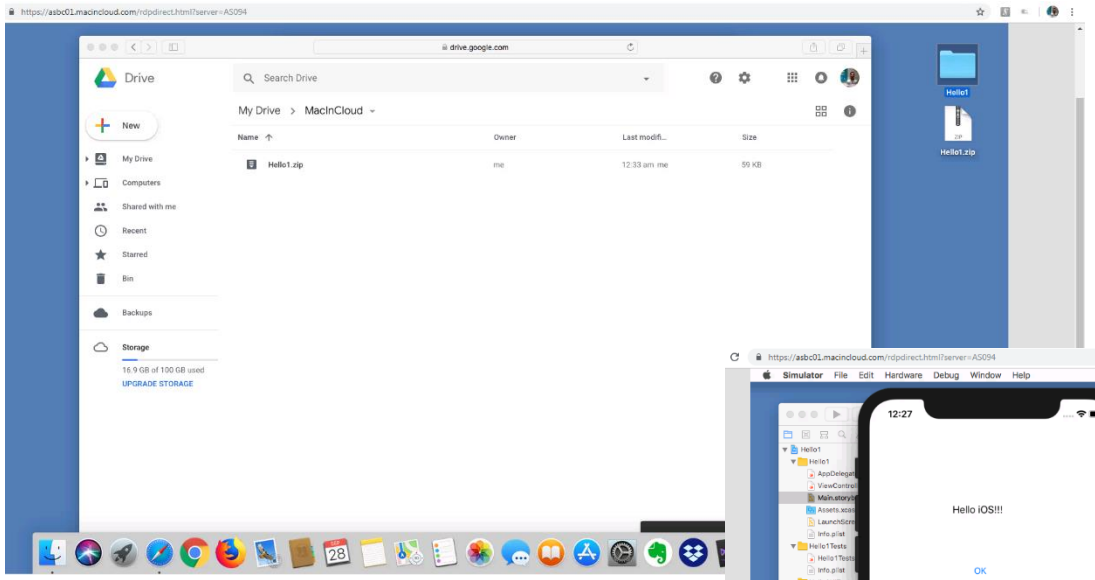


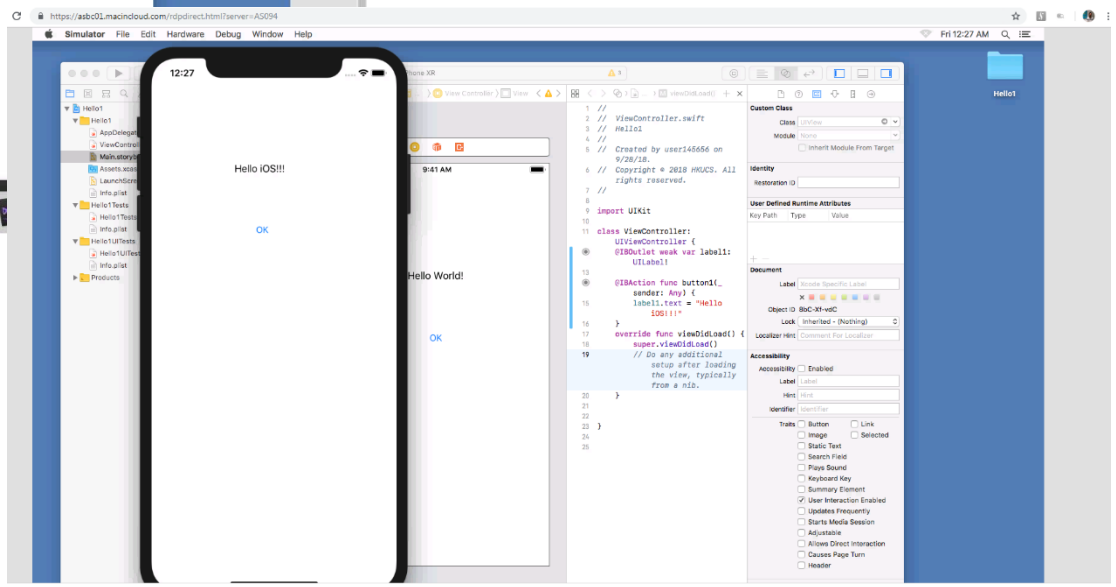
Mac and Xcode

- Xcode can only run on Mac OS.
- If you want to use Mac but do not want to buy a MacBook, you can consider using cloud-based Mac service.
  - MacInCloud (https://portal.macincloud.com/select/#/plans)
  - XCodeClub (http://www.xcodeclub.com/)
  - VirtualMacOSX (http://virtualmacosx.com/index.php/shared-plans)
- You can use an ordinary browser to access their site and the virtual Mac environment will appear in form of remote desktop.
- You need to pay for the service. Let's use MacInCloud as an example, you need to pay $25 USD monthly plus $0.99 USD initial setup fee.
- All the virtual Mac environment has common software like Xcode installed.

Mac and Xcode

- MacInCloud:





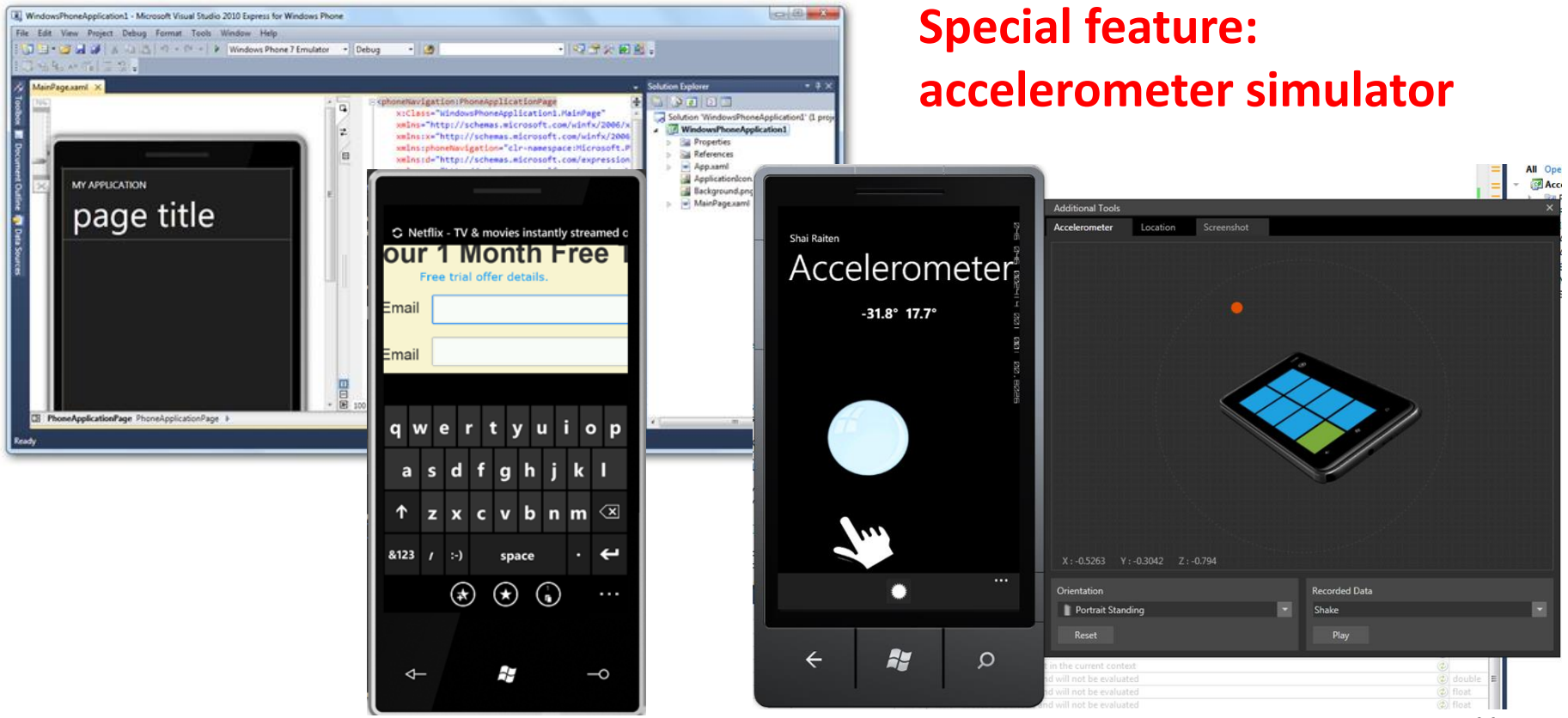
Mac and Xcode

- We cooperated with our CS technical staff and established something similar to cloud-based Mac service.
- We bought 21 Mac mini (mac001 to mac021), which can support remote desktop connection.
- Steps:
  - Open a command window (Windows) / Terminal (Mac) and issue the following command:
    - ssh –L 9001:<mac_host_name>:3389 <your_cs_username>@gatekeeper.cs.hku.hk
    - E.g., ssh –L 9001:mac001.cs.hku.hk:3389 twchim@gatekeeper.cs.hku.hk
    - <mac_host_name>: {mac001, mac002, …, mac021}.cs.hku.hk (e.g: mac001.cs.hku.hk)
  - Connect to mac mini by Microsoft remote desktop connection.
    - Windows -> search "remote desktop connection" click it.
    - Type: “localhost:9001”
    - Username: user1; password: 20192019
  - Please remember to save your own project and upload the files to cloud storage (e.g., dropbox / google drive). Also please delete your project before logout the machine.
- Don't use remote Mac mini if you have Mac computer. It is slower than your own machine for sure.

IDE for Windows Phone app

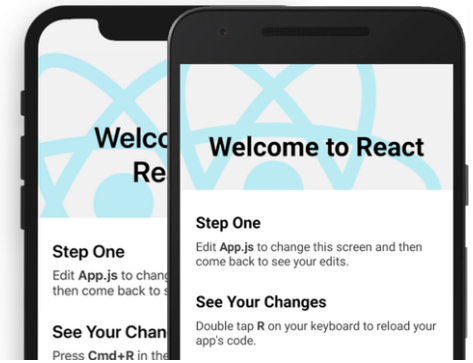
- IDE: Microsoft XNA (an example)
- Programming language: C#

OUTDATED



Special feature: accelerometer simulator

Cross-platform Development Tool: React Native



Create native apps for Android and iOS using React

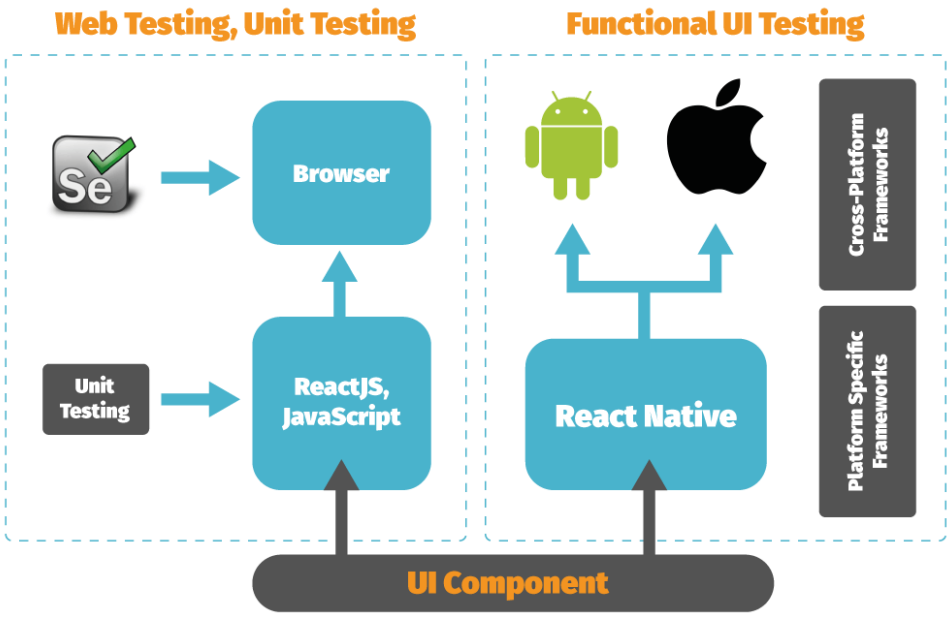
React Native combines the best parts of native development with React, a best-in-class JavaScript library for building user interfaces.

Use a little—or a lot. You can use React Native today in your existing Android and iOS projects or you can create a whole new app from scratch.

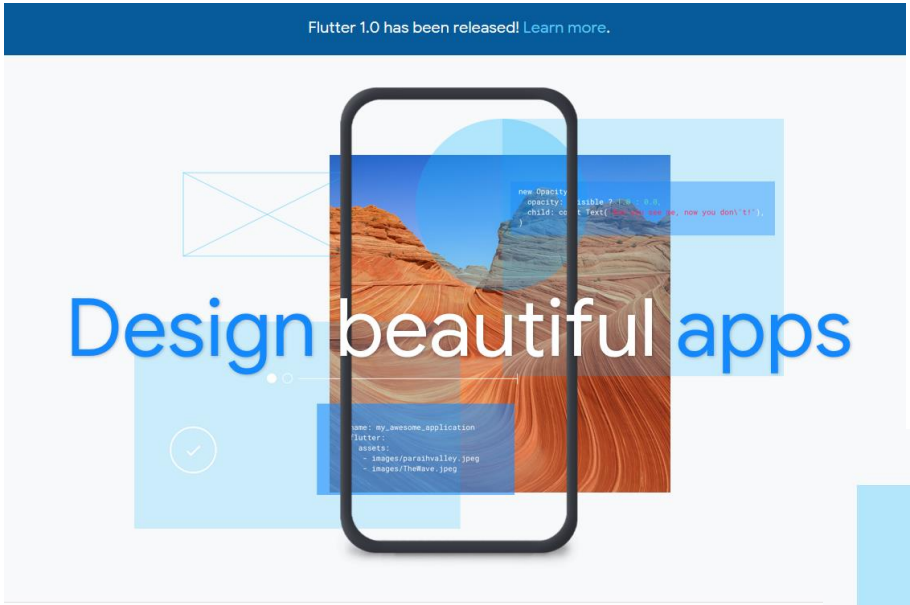
```
import React from 'react';
import {Text, View} from 'react-native';
import {Header} from './Header';

const WelcomeScreen = () =>
  <View>
    <Header title="Welcome to React Native"/>
    <Text style={header}>Step One</Text>
    <Text>
      Edit App.js to change this screen and turn it
      into your app.
    </Text>
    <Text style={header}>See Your Changes</Text>
    <Text>
      Press Cmd + R inside the simulator to reload
      your app's code.
    </Text>
    <Text style={header}>Debug</Text>
    <Text>
      Press Cmd + M or Shake your device to open the
      React Native Debug Menu.
```

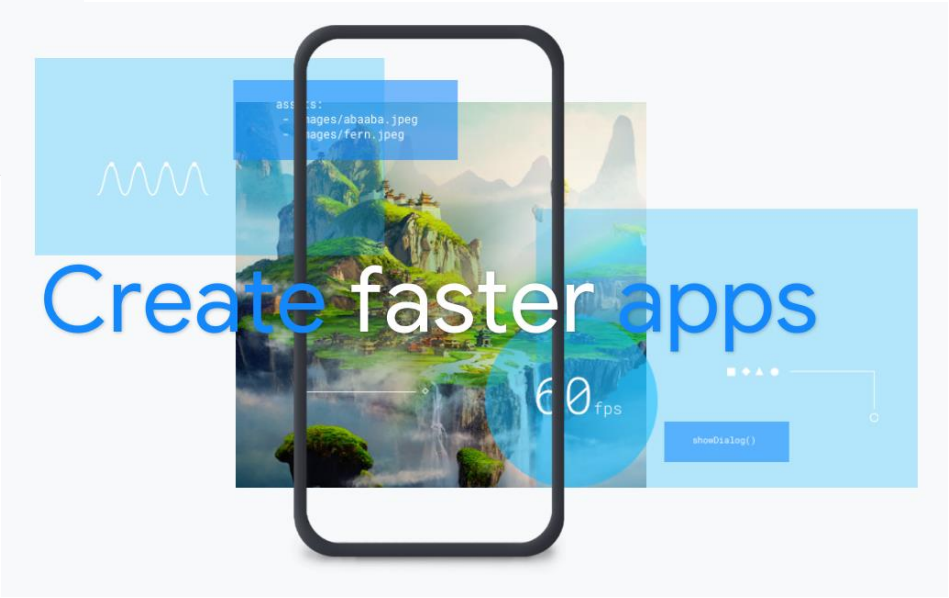
Cross-platform Development Tool: React Native

- Link: https://facebook.github.io/react-native/
- React Native lets you build cross-platform mobile apps using only JavaScript.
- It uses the same design as React (for web applications), letting you compose a rich mobile UI from declarative components.
- You build a real mobile app that's indistinguishable from an app built using Objective-C / Swift / Java / Kotlin.
- React Native uses the same fundamental UI building blocks as regular iOS and Android apps. You just put those building blocks together using JavaScript and React.
- Thousands of apps are using React Native, from established Fortune 500 companies to hot new startups.



Cross-platform Development Tool: Flutter

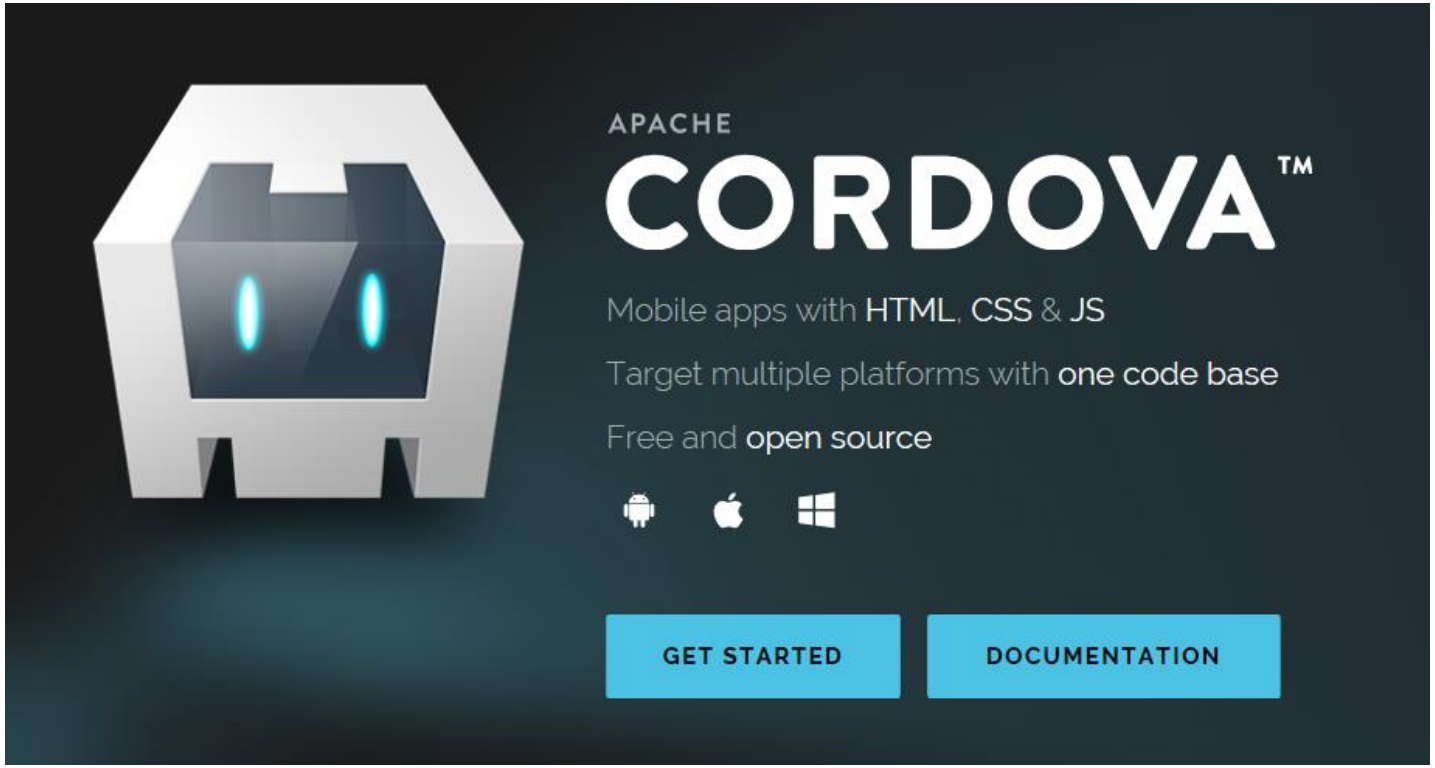




Cross-platform Development Tool: Flutter

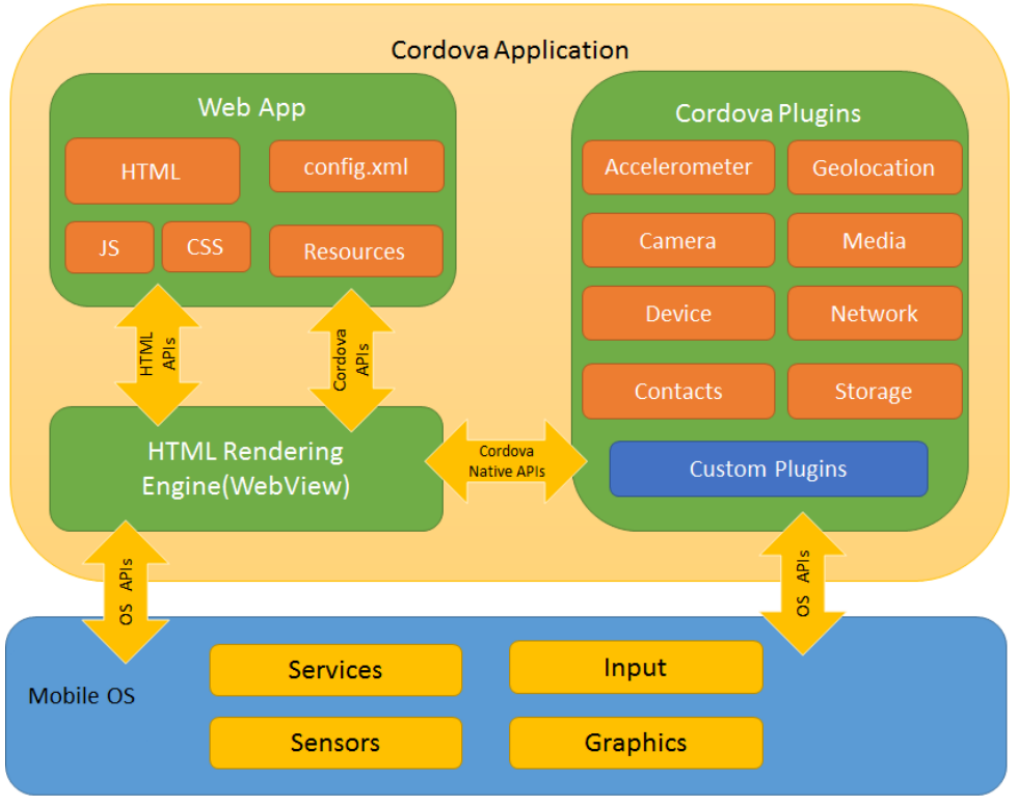
- Link: https://flutter.dev/
- Flutter was introduced in May 2017 by Google.
- Flutter is an open-source mobile application development SDK created by Google. It is used to develop applications for Android and iOS.
- Flutter's engine, written primarily in C++, provides low-level rendering support using Google's Skia graphics library. Additionally, it interfaces with platform-specific SDKs such as those provided by Android and iOS.
- Flutter apps are written in the Dart language and make use of many of the language's more advanced features.

Cross-platform Development Tool: Apache Cordova



Cross-platform Development Tool: Apache Cordova

- Link: https://cordova.apache.org/
- Apache Cordova is an open-source mobile development framework.
- It allows you to use standard web technologies - HTML5, CSS3, and JavaScript for cross-platform development.
- Applications execute within wrappers targeted to each platform, and rely on standards-compliant API bindings to access each device's capabilities such as sensors, data, network status, etc.



Game Engine

- A software framework designed for the creation and development of video games.
- Key components:
  - **Main game program**
    - The actual game logic being implemented using algorithms.
  - **Rendering engine**
    - How to display or project 2D or 3D graphics onto the screen?
  - **Audio engine**
    - Componentry consisting of any algorithm related to sound
  - **Physics engine**
    - Responsible for giving the application a realistic sense of the laws of physics in the application
  - **Artificial intelligence**
    - Usually outsourced from the main game program into a special module to be designed and written by software engineers with specialist knowledge.

Concept of Frame in Game Engine

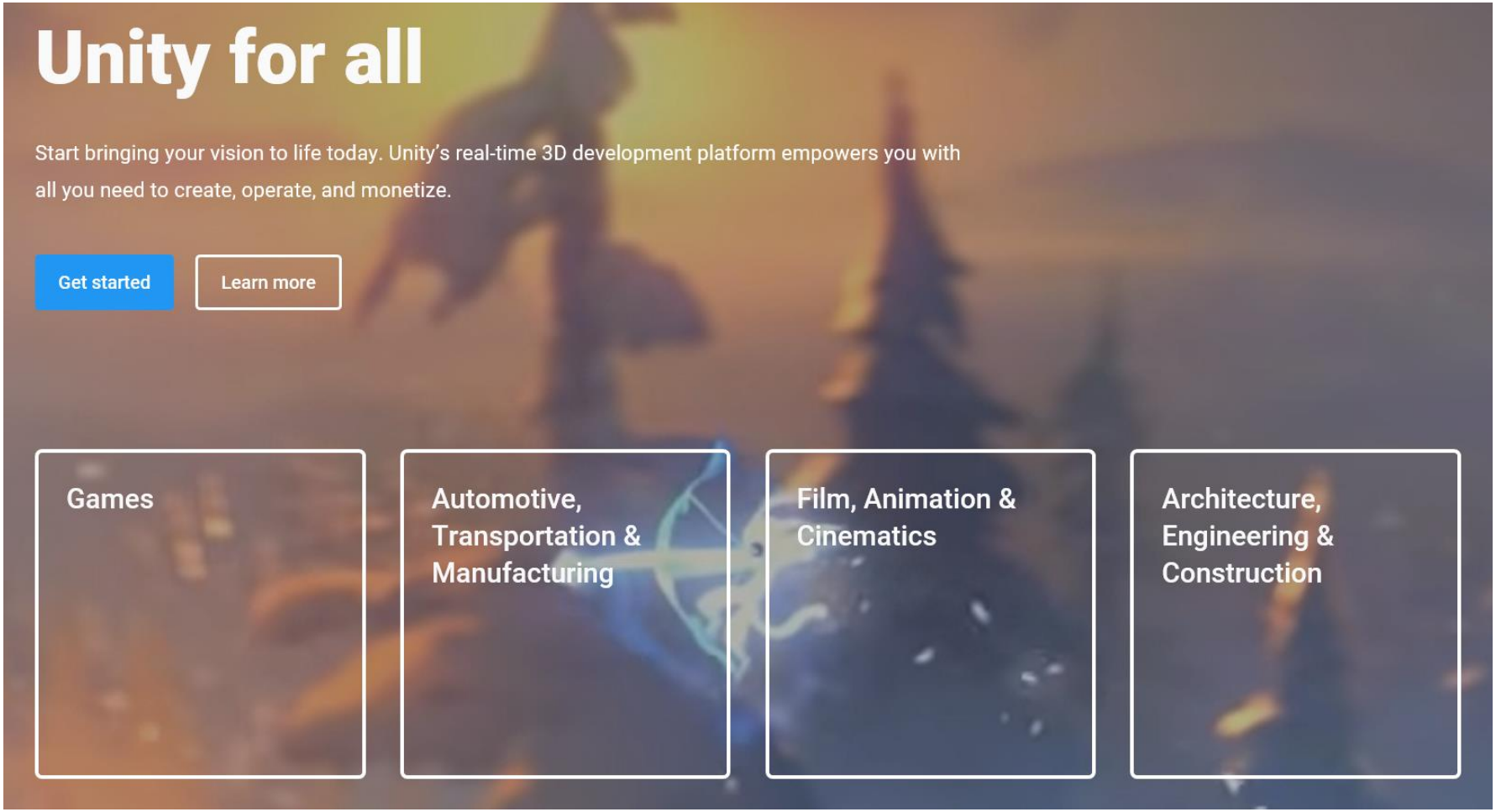
- User interface is updated frame by frame (whole screen).
- All updates (e.g., motion of characters) are made in a buffer first and then contents of the buffer are copied to the screen (a complete frame).
- As a game usually involves the update of several components, frame concept can ensure smooth animation.
- More details:
  - The time axis is divided into frames and the frames will be updated at pre-defined intervals.
  - Like a cinema movie.
  - If you want some updates, include them into the next frame.

Cross-platform Development Tool: cocos2d

Cross-platform Development Tool: cocos2d

- Link: http://cocos2d.org/
- Cocos2d is an open source 2D game framework. The original Cocos2D framework is written in Python but has been ported to other languages and platforms.
- Derivative frameworks:
  - Cocos2d-x (program in C++ and for multi-platform)
  - Cocos2d-JS (program in JavaScript and for multi-platform, similar to Cocos2d-x)
  - Cocos2d-XNA (program in C# and for XNA)
  - Cocos2d-Swift (program with Xcode and Objective-C for iOS)
  - Cocos2d (Python) (program in Python and for multi-platform, similar to Cocos2d-x)

Cross-platform Development IDE: Unity



Cross-platform Development IDE: Unity

- Link: http://unity3d.com/
- Unity is a cross-platform game engine and IDE developed by Unity Technologies, targeting web plugins, desktop platforms and mobile devices.
- Programming language: C#

Mini Program

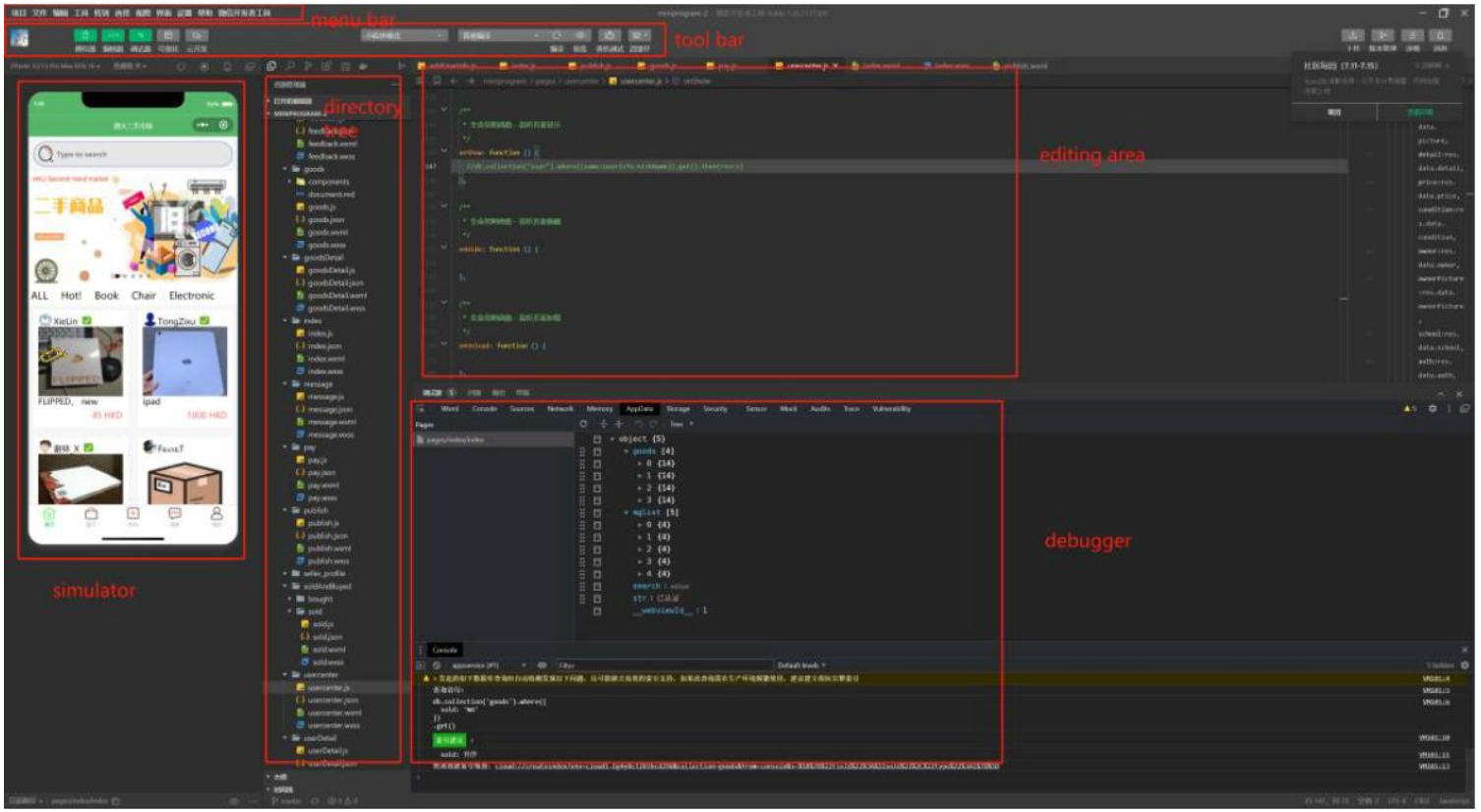
- After WeChat Mini Program was launched at the end of 2016, many similar lightweight programs become popular in China (e.g., Alipay Mini Program, Baidu Mini Program).
- Mini Program is different from traditional mobile applications.
  - It can be obtained directly through a search in another application (e.g., WeChat).
  - It can be obtained by scanning a QR code or via a link shared by another user
  - It occupies very little memory and storage space. No installation is required.
  - It can be opened quickly.
  - It can achieve a user experience closer to the native APP. The set of core functions are nearly the same.

Mini Program

- Mini Program can be regarded as a hybrid APP. Let's take WeChat Mini Program as an example.
  - Bottom layer: a container provided by Native
  - Upper layer: WXML (WeChat Markup Language) & WXS (WeChat Script) & JS provided by WeChat for business development (WXML and WXS are developed from HTML and CSS).
  - Very similar to a browser and server-side architecture

Mini Program

- Development tools are available for the development. An example is WeChat DevTools.



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End

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