

# COMP08076

# Programming Native App Interaction

Android programming for phones and tablets

- Module coordinator: John Nixon
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- Lecture 1
- At Paisley
  - Lectures Monday 12 in L212
  - Labs Monday 1:00-5:00 in J101/J101a

# Moodle

- Module information
- Module descriptor
- Lecture slides
- Lab sheets
  - Files needed for labs
  - Example files
  - Completed exercises
- Assignments
- Engagement
  - Lectures, Labs – register
  - Engagement tasks
  - Assignments – hand in and pass module

# Provisional Module Schedule

- Lab 1 Introduction to Android Studio
- Lab 2 UI, Layout and simple interaction
- Lab 3 Adding functionality to the app
- Lab 4 Multi-activity apps, Intents
- Lab 5 Persistence and saving data
- Lab 6 Tutorial to finalise assessment 1
- Lab 7 Views and SurfaceViews
- Lab 8 Using a SurfaceView and implementing Runnable
- Lab 9 TBC
- Lab 10 Interaction
- Lab 11 Working on assessment
- Lab 12 Tutorial to finalise assessment 2

# Assessment Summary

- Assignment 1 requires the design and implementation of a user interface to meet a given specification using components into which data can be entered and selections made resulting in appropriate actions taken. This assignment accounts for 35% of the module mark
- The deadline for assignment 1 is **13th March 2016 at 11:55pm**
- Assignment 2 requires the creation of game elements combined to meet a specification incorporating a number of user interactions. This assignment accounts for 65% of the module mark.
- The deadline for assignment 2 is **3rd May 2016 at 11:55pm**

# User Interface example

## http://www.calmac.co.uk/

Caledonian MacBrayne Online Booking, Step 1 - Windows Internet Explorer

http://www.calmacbookings.co.uk/booking/asp/web100.asp

Caledonian MacBrayne Online Booking, Step 1

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Outward: 26 Mon January 2009  
Return: 26 Mon January 2009  
Vehicle: Car    Bike Rack?  
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Towing a Caravan or Trailer? No  
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Start Lectures Microsoft Word Microsoft PowerPoint - [...] Caledonian MacBrayne

EN 100% 09:03

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**Outward: Leverburgh To Berneray**

|                         | Departs        | Arrives        | Addn Info             |
|-------------------------|----------------|----------------|-----------------------|
| Monday, 26 January 2009 | 09:20<br>15:15 | 10:20<br>16:15 | <input type="radio"/> |

<<Prev Sailings   Next Sailings>>

**Return: Berneray To Leverburgh**

|                         | Departs | Arrives | Addn Info             |
|-------------------------|---------|---------|-----------------------|
| Monday, 26 January 2009 | 14:05   | 15:05   | <input type="radio"/> |

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Price Check   Submit Details

The following page is 'Important Booking Information'

Click the dot next to the sailing you would like to book. Please do this for the outward and return journeys.  
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Go Back to Start   Go Back to Step1

For help with the Additional Information codes, please mouse over the code, or [click here](#)

Internet   100%   EN   09:04

# Learning Outcomes for the module [from module descriptor]

- At the end of this module the student will be able to:
  - L1. Demonstrate knowledge of software, design and delivery requirements for the distribution of native apps.
  - L2. Design interface and gaming elements within a native app development environment to meet a given specification
  - L3. Use an appropriate development environment to create interactive native apps for information delivery/processing and/or gaming

# Employability Skills and Personal Development Planning (PDP) Skills

- Knowledge of software issues related to programming for interactivity
- Understanding of object oriented program design
- Application of programming constructs to produce a desired outcome
- Planning and problem solving in a programming context
- Use of integrated software development environment. Specification writing
- Work autonomously to deliver a product incorporating interactive elements

# Android Development



- <http://developer.android.com/index.html>
- Design Develop Distribute

The screenshot shows the homepage of the Android Developers website. At the top, there's a navigation bar with links for 'Developers' (which is highlighted), 'Design', 'Develop', and 'Distribute'. Below the navigation is a search bar. The main content area features a large image of three devices: a smartphone, a tablet, and a smartwatch. To the right of the devices, there's a section titled 'Android 5.0 Lollipop' with a brief description of its new features and a 'Learn More' button. Below this, there are three smaller cards: 'Building Apps for Wearables', 'Creating Apps with Material Design', and 'Download Android Studio and SDK Tools'. At the bottom of the page is a green footer bar with links for 'Get the SDK', 'Browse Samples', 'Watch Videos', and 'Manage Your Apps'.

Build for a Multi-Screen World

Android runs on hundreds of millions of handheld devices around the world, and it now supports these exciting, new form-factors.

# **Android, the world's most popular mobile platform**

<http://developer.android.com/about/index.html>

## ➤ Platform versions

(<http://developer.android.com/about/dashboards/index.html>)

| Version              | Codename           | API | Distribution (Jan 2016) | Distribution (Jan 2015) | Distribution (Jan 2014) |
|----------------------|--------------------|-----|-------------------------|-------------------------|-------------------------|
| <u>2.2</u>           | Froyo              | 8   | 0.2%                    | 0.4%                    | 1.3%                    |
| <u>2.3.3 - 2.3.7</u> | Gingerbread        | 10  | 3.0%                    | 7.8%                    | 20.0%                   |
| <u>3.2</u>           | Honeycomb          | 13  |                         |                         | 0.1%                    |
| <u>4.0.3 - 4.0.4</u> | Ice Cream Sandwich | 15  | 2.7%                    | 6.7%                    | 16.1%                   |
| <u>4.1.x</u>         |                    | 16  | 9.0%                    | 19.2%                   | 35.5%                   |
| <u>4.2.x</u>         | Jelly Bean         | 17  | 12.2%                   | 20.3%                   | 16.3%                   |
| <u>4.3</u>           |                    | 18  | 3.5%                    | 6.5%                    | 8.9%                    |
| <u>4.4</u>           | KitKat             | 19  | 36.1%                   | 39.1%                   | 1.8%                    |
| 5.0                  | Lollipop           | 21  | 16.9%                   |                         |                         |
| 5.1                  |                    | 22  | 15.7%                   |                         |                         |
| 6.0                  | Marshmallow        | 22  | 0.7%                    |                         |                         |

# Android Virtual Devices

- Nexus Galaxy
- API 15
- 4.0.3



# What is Android?

- Based on Linux kernel
- Dalvik Java virtual machine
- Integrated web browser
- SQLite built in
- Supports many mobile technologies
  
- A complete environment for apps for current mobile devices with a full development eco-system

# Android Features

- Integrated Browser
  - Based on WebKit browser engine, so full featured
  - Same as Chrome and Safari browsers
- Optimized 2D and 3D graphics
  - with hardware acceleration on recent devices
- SQLite database engine
- Support for common graphics, audio and video formats built in
  - MPEG4, H.264, MP3, AAC, AMR, JPEG and PNG
- GSM Telephony, 3G data, WiFi, Bluetooth, Accelerometer
  - As supported by hardware
- Camera, Compass, GPS
  - If provided by hardware

# Android Studio

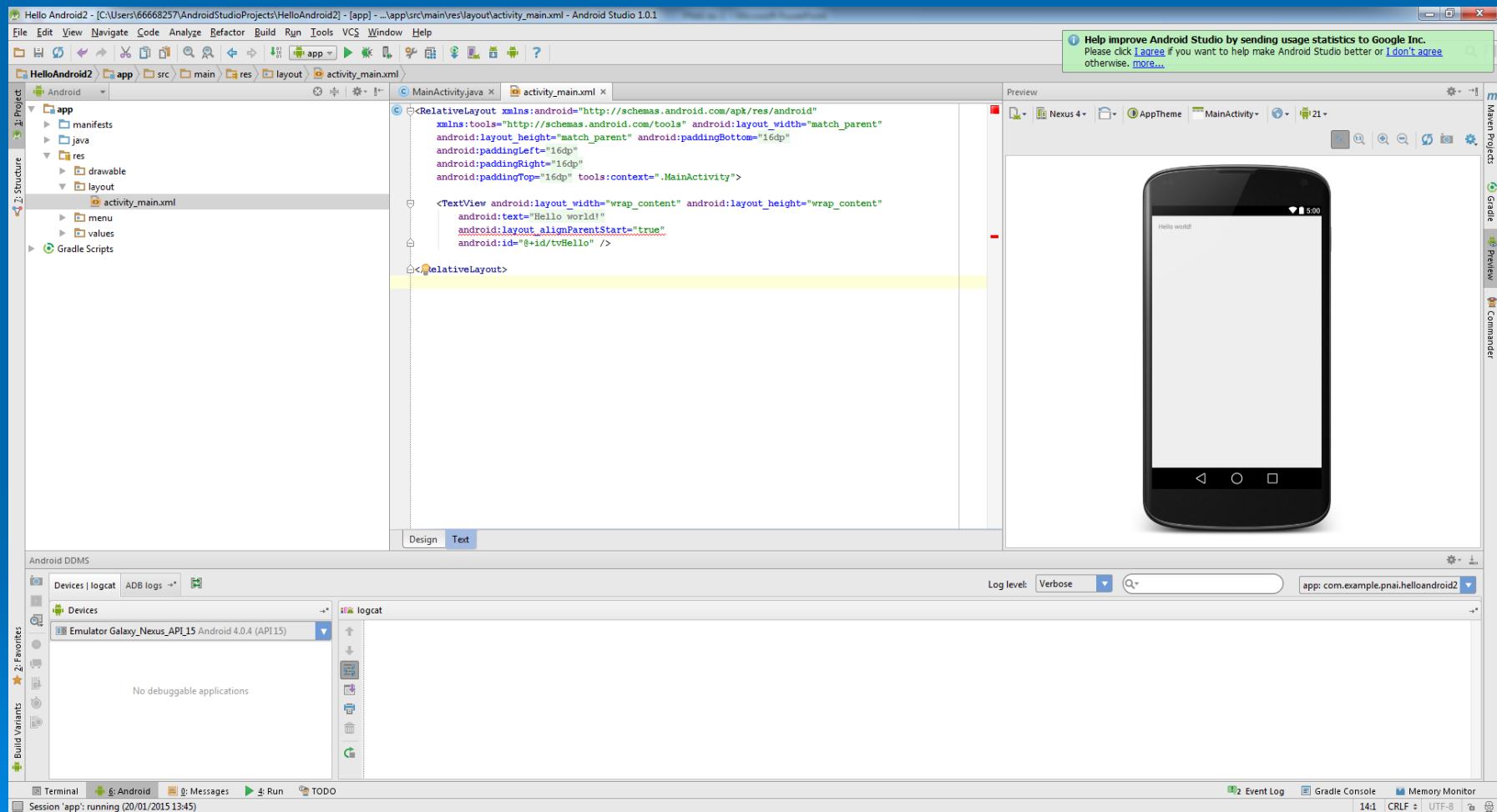
<http://developer.android.com/sdk/index.html>

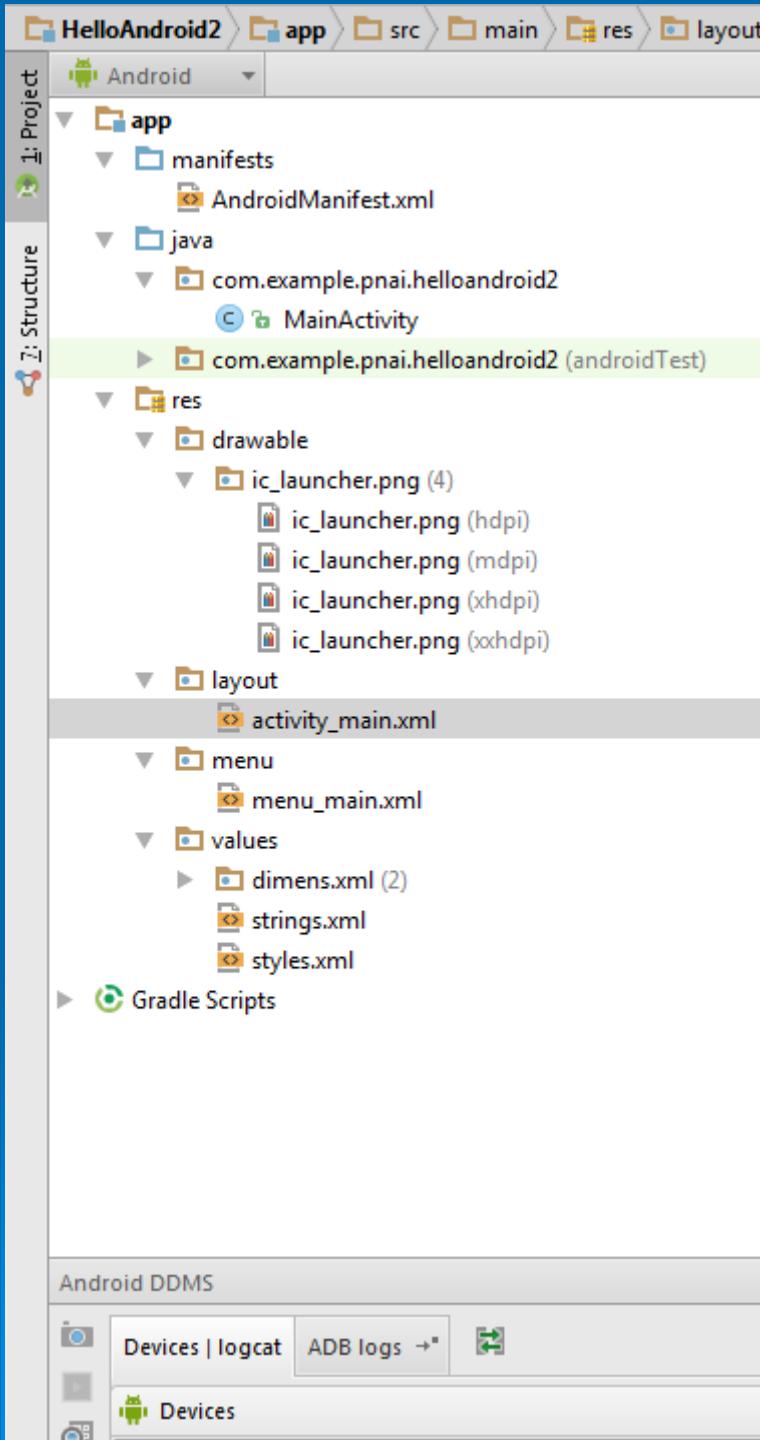
The screenshot shows a web browser displaying the official Android Developers website at <http://developer.android.com/sdk/index.html>. The page is titled "Download" and features the Android Studio logo. It highlights "The official Android IDE" and provides a "Download Android Studio for Windows" button. The left sidebar contains a navigation menu with sections like "Training", "API Guides", "Reference", "Tools" (which is currently selected), "Google Services", and "Samples". Below the main content, there's a section titled "Intelligent code editor" showing a screenshot of the Android Studio interface with code and a configuration editor.

At the core of Android Studio is an intelligent code editor capable of advanced code completion, refactoring, and code analysis.

The powerful code editor helps you be a more productive Android app developer.

# Android Studio Project Window





# Android Project Structure

- **Manifest file**
  - Settings and permissions
- **Java**
  - Java class files
- **Res**
  - Files required for app, particularly graphics files
- **Layout**
  - Xml file to describe layout
- **Menu**
  - Xml file to describe layouts
- **Values**
  - Storing values required by app
  - internationalisation
- **Gradle**
  - Scripts to build app

# Android and XML

- XML is integral to Android
  - XML provides structured format for storing app data
  - Android includes API support for reading and writing XML at run-time
- XML used to define layout of user-interfaces in a project
  - Can use code or XML to define layout
  - Development of easy UI layout tools
    - Separating presentation from behaviour
- XML plays a major role in Android
  - In particular, Settings and Permissions are confined in the Manifest file
  - Also other requirements, such as minimum Android version, access to library code etc

# What is XML?

[http://www.w3schools.com/xml/xml\\_whatis.asp](http://www.w3schools.com/xml/xml_whatis.asp)

- XML stands for EXtensible Markup Language
- XML was designed to describe data
  - As opposed to HTML designed to display data
- **XML Does Not DO Anything**
- **XML uses tags to describe data**
  - <note>  
    <to>Tove</to>  
    <from>Jani</from>  
    <heading>Reminder</heading>  
    <body>Don't forget me this weekend!</body>  
  </note>

# AndroidManifest.xml

```
<?xml version="1.0" encoding="utf-8"?>
<manifest xmlns:android="http://schemas.android.com/apk/res/android"
    package="com.example.pnai.helloandroid2" >

    <application
        android:allowBackup="true"
        android:icon="@drawable/ic_launcher"
        android:label="@string/app_name"
        android:theme="@style/AppTheme" >
        <activity
            android:name=".MainActivity"
            android:label="@string/app_name" >
            <intent-filter>
                <action android:name="android.intent.action.MAIN" />
                <category android:name="android.intent.category.LAUNCHER" />
            </intent-filter>
        </activity>
    </application>
```

# activity\_main.xml

- <RelativeLayout xmlns:android="http://schemas.android.com/apk/res/android"  
➤     xmlns:tools="http://schemas.android.com/tools"  
➤     android:layout\_width="match\_parent"  
➤     android:layout\_height="match\_parent"  
➤     android:paddingBottom="@dimen/activity\_vertical\_margin"  
➤     android:paddingLeft="@dimen/activity\_horizontal\_margin"  
➤     android:paddingRight="@dimen/activity\_horizontal\_margin"  
➤     android:paddingTop="@dimen/activity\_vertical\_margin" tools:context=".MainActivity" />
  
- <TextView android:layout\_width="wrap\_content" android:layout\_height="wrap\_content"  
➤         android:text="@string/hello\_world"  
➤         android:layout\_alignParentStart="true"  
➤         android:id="@+id/tvHello" />
  
- </RelativeLayout>

# MainActivity.java

```
> package com.example.pnai.helloandroid2;  
  
> import android.app.Activity;  
> import .....  
  
> public class MainActivity extends Activity implements View.OnClickListener{  
  
>     Button button;  
>     int touchCount;  
  
>     @Override  
>     public void onCreate(Bundle savedInstanceState) {  
        super.onCreate(savedInstanceState);  
        button = new Button(this);  
        button.setText( "Touch me!" );  
        button.setOnClickListener(this);  
        setContentView(button);  
> }
```

# Android Activity

- <http://developer.android.com/guide/components/activities.html>
- An Activity is an application component that provides a screen with which users can interact in order to do something, such as dial the phone, take a photo, send an email, or view a map. Each activity is given a window in which to draw its user interface. The window typically fills the screen, but may be smaller than the screen and float on top of other windows

# Today's Lab

- Introduction to Android studio
- Homework
  - Install and configure Android studio on your own system.