Mobile Application Development

Lesson 1

Dr. Syed Asim Jalal
Department of Computer Science
University of Peshawar

Contents

- Android is an ecosystem
- Android platform architecture
- Android Versions
- Challenges of Android app development
- App fundamentals

What is Android?

- Mobile operating system based on Linux kernel
- User Interface for touch screens
- Used on over 80% of all smartphones
- Powers devices such as watches, TVs, and cars
- Over 2 Million Android apps in Google Play store
- Highly customizable for devices / by vendors
- Open source

Android user interaction

- Touch gestures: swiping, tapping, pinching
- Virtual keyboard for characters, numbers, and emoji
- Support for Bluetooth, USB controllers and peripherals

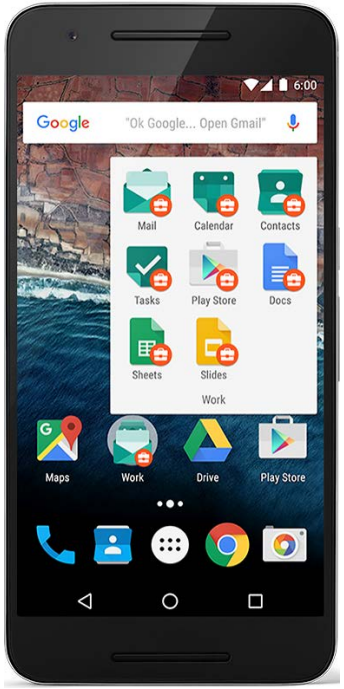
Android and sensors

Sensors can discover user action and respond

- Device contents rotate as needed
- Walking adjusts position on map
- Tilting steers a virtual car or controls a physical toy
- Moving too fast disables game interactions

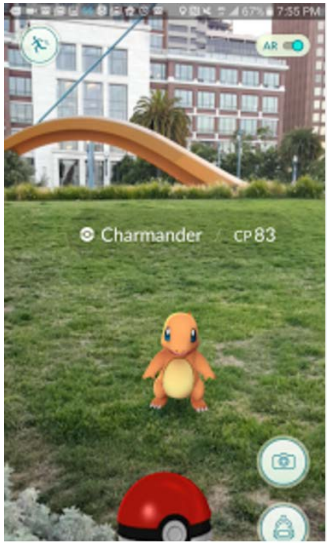
Android home screen

- Launcher icons for apps
- Self-updating widgets for live content
- Can be multiple pages
- Folders to organize apps
- "OK Google"

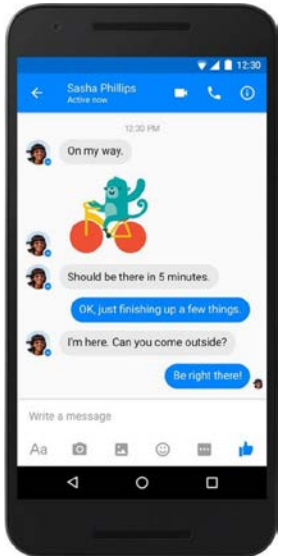


Android app examples

Pandora



Pokemon GO

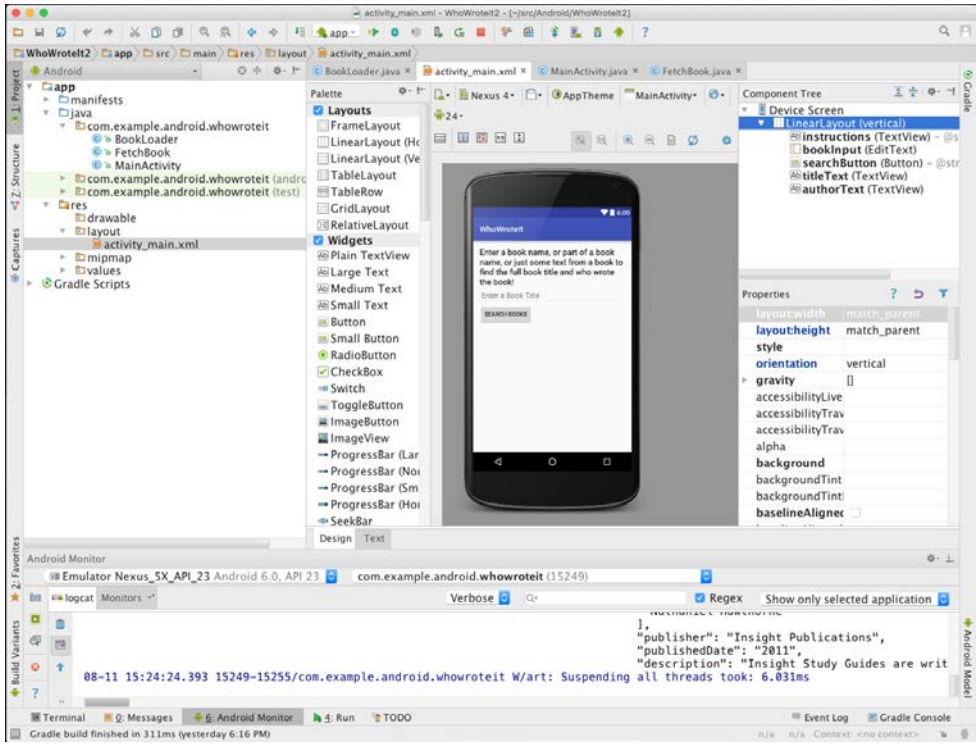


Facebook Messenger

Android Software Developer Kit (SDK)

- Development tools (debugger, monitors, editors)
- Libraries (maps, wearables)
- Virtual devices (emulators)
- Documentation (developers.android.com)
- Sample code

Android Studio



- Official Android IDE
- Develop, run, debug, test, and package apps
- Monitors and performance tools
- Virtual devices
- Project views
- Visual layout editor

Google Play store

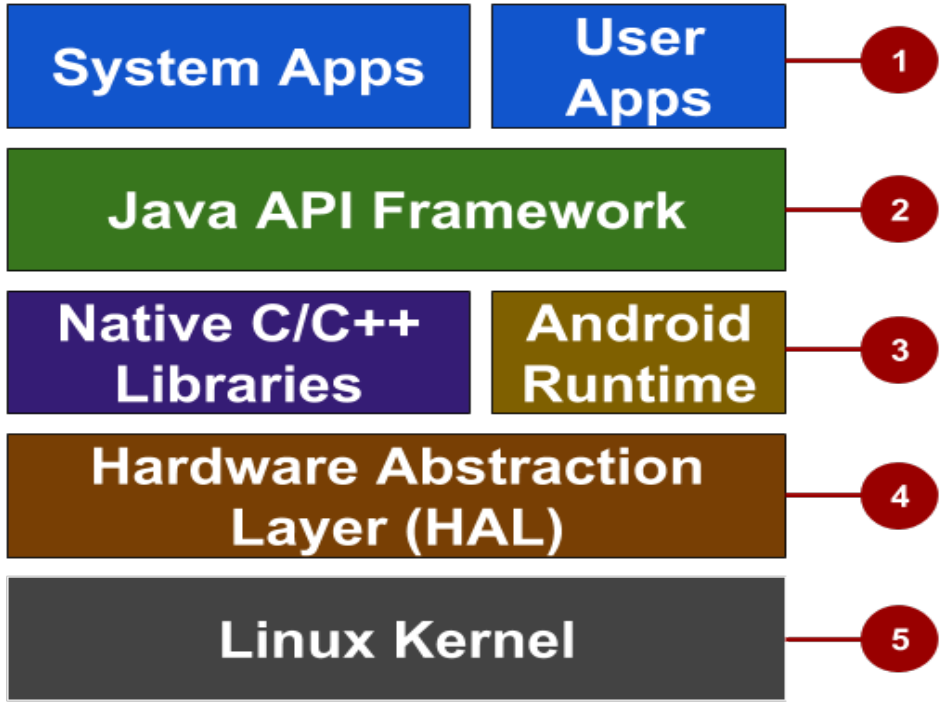
Publish apps through Google Play store:

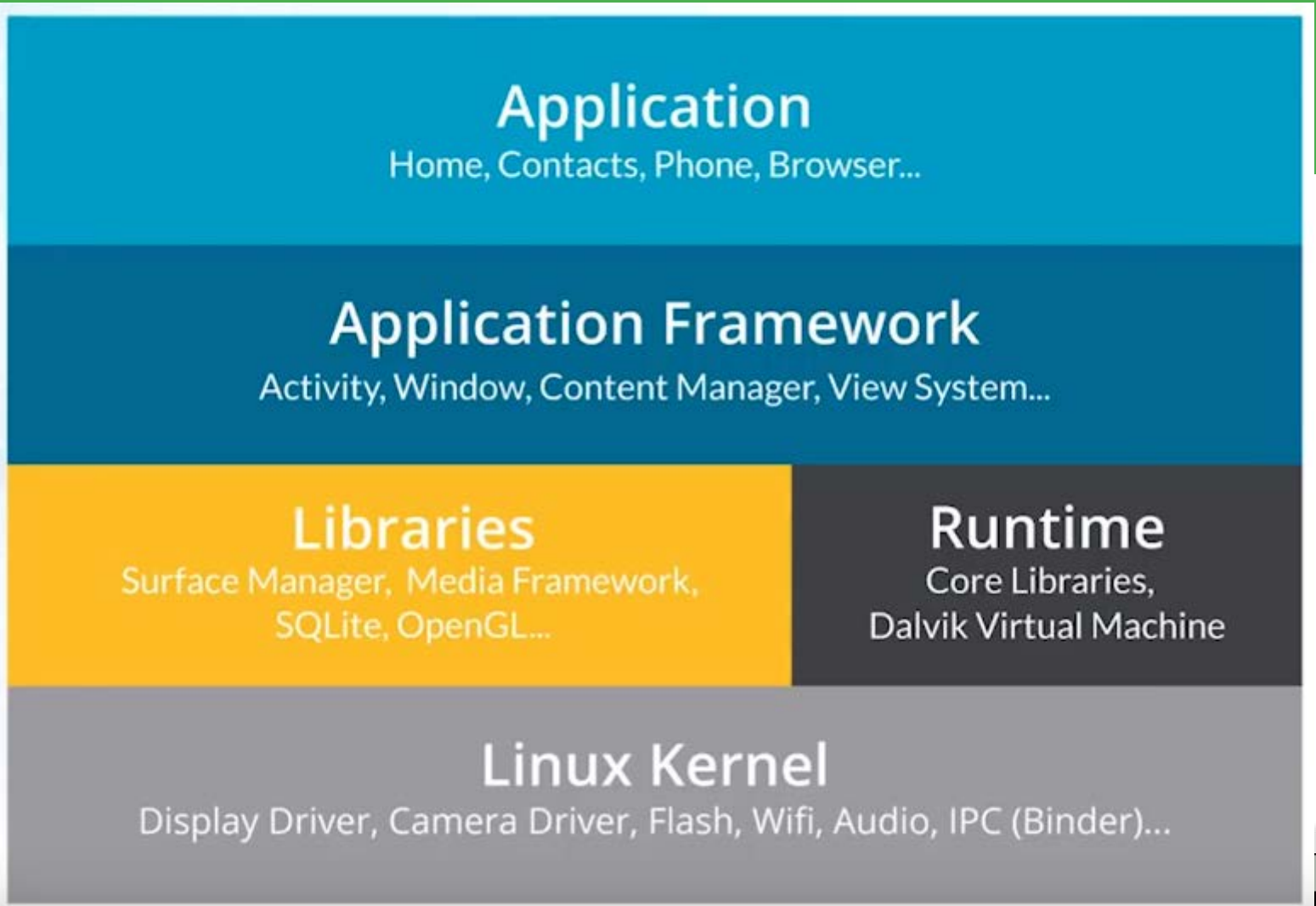
- Official app store for Android
- Digital distribution service operated by Google

Android Platform Architecture

Android stack

1. System and user apps
2. Android OS API in Java framework
3. Expose native APIs; run apps
4. Expose device hardware capabilities
5. Linux Kernel




Application
Home, Contacts, Phone, Browser...
Application Framework
Activity, Window, Content Manager, View System...
Libraries
Surface Manager, Media Framework,
SQLite, OpenGL...
Runtime
Core Libraries,
Dalvik Virtual Machine
Linux Kernel
Display Driver, Camera Driver, Flash, Wifi, Audio, IPC (Binder)...

System and user apps

- System apps have no special status
- System apps provide key capabilities to app developers

Example:

Your app can use a system app to deliver a SMS message.

Java API Framework

The entire feature-set of the Android OS is available to you through APIs written in the Java language.

- View class hierarchy to create UI screens
- Notification manager
- Activity manager for life cycles and navigation
- Content Providers to give access to data from other apps.

Android runtime

Each app runs in its own process with its own instance of the Android Runtime.

C/C++ libraries

- Core C/C++ Libraries give access to core native Android system components and services.

Hardware Abstraction Layer (HAL)

- Standard interfaces that expose device hardware capabilities as libraries

  Examples: Camera, bluetooth module

Linux Kernel

- Threading and low-level memory management
- Security features
- Drivers

Older Android versions

Codename	Version	Released	API Level
Honeycomb	3.0 - 3.2.6	Feb 2011	11 - 13
Ice Cream Sandwich	4.0 - 4.0.4	Oct 2011	14 - 15
Jelly Bean	4.1 - 4.3.1	July 2012	16 - 18
KitKat	4.4 - 4.4.4	Oct 2013	19 - 20
Lollipop	5.0 - 5.1.1	Nov 2014	21 - 22

Android History and Platform Versions for more and earlier versions before 2011

Newer Android versions

Codename	Version	Released	API Level
Marshmallow	6.0 - 6.0.1	Oct 2015	23
Nougat	7.0 - 7.1	Sept 2016	24 - 25
Oreo	8.0 - 8.1	Sept 2017	26 - 27
Pie	9.0	Aug 2018	28

App Development

What is an Android app?

- One or more interactive screens
- Written using Java Programming Language and XML
- Uses the Android Software Development Kit (SDK)
- Uses Android libraries and Android Application Framework
  - Libraries that you install for specific purposes and do not come with SDK
- Executed by Android Runtime Virtual machine (ART)

Challenges of Android development

- **Multiple screen**
  - how to develop for different sizes and resolutions
- **Performance:**
  - How to make your apps responsive and smooth
- **Security:**
  - How to keep your app secure and also keep user data safe
- **Compatibility:**
  - How to make your app run well on older platform versions

App building blocks

- **Resources:** layouts, images, strings, colors as XML and media files
- **Components:** activities, services, and helper classes as Java code
- **Manifest:** information about app for the runtime
  - Information about app.
- **Build configuration:** APK versions in Gradle config files

- **Activity**: Any screen that a user can see on the screen is an activity.
- **Service:** Service run in the background and does not need any user interface to perform its task.
- **Content Provider:** A mechanism to share data between two applications.
- **Broadcast receiver:** App that receives classes that listens for specific messages.