



INTRODUCTION TO ANDROID

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Course Outcomes

At the end of the lesson students should be able to:

- ▶ Explain the android ecosystem
- ▶ Analyze android platform architecture
- ▶ Identify application development challenges

Topics



Android is an ecosystem



Android platform architecture



Android version



Application development





Android as an Ecosystem

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

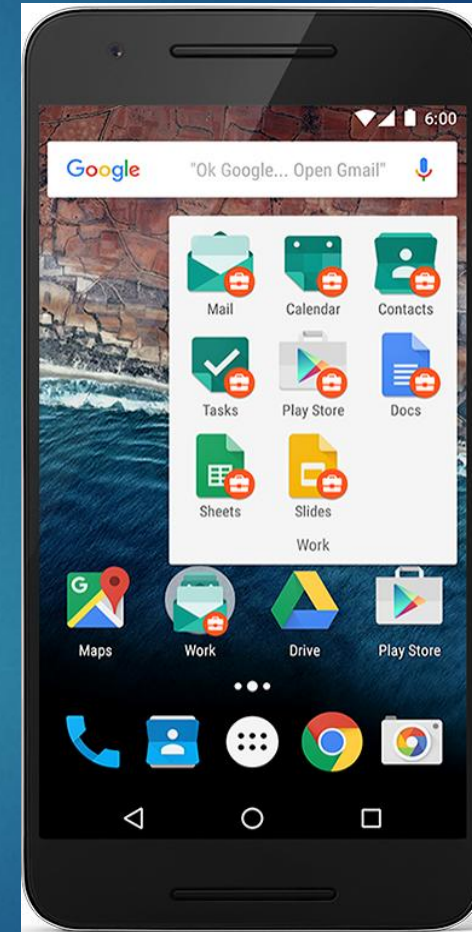
Android and Sensors

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"



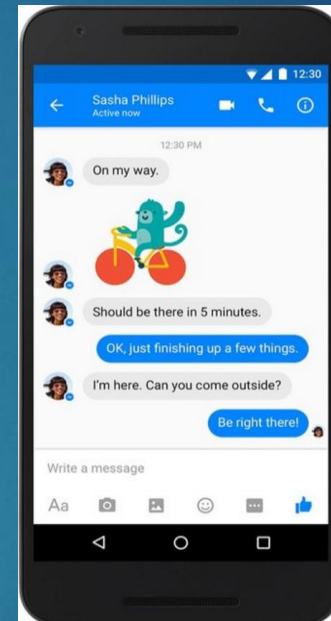
Android App Examples



Pandora



Pokemon GO

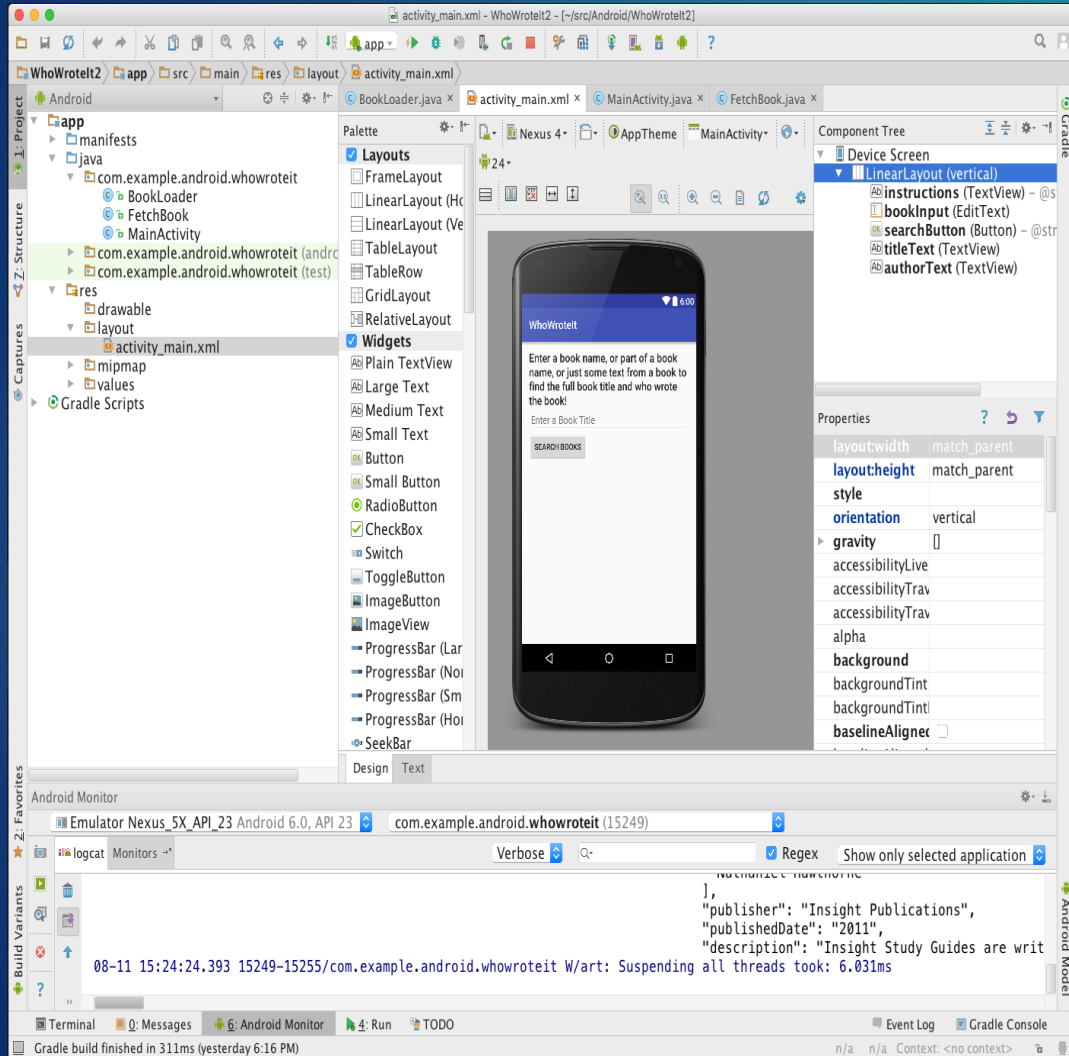


Facebook
Messenger

Android Software Development 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

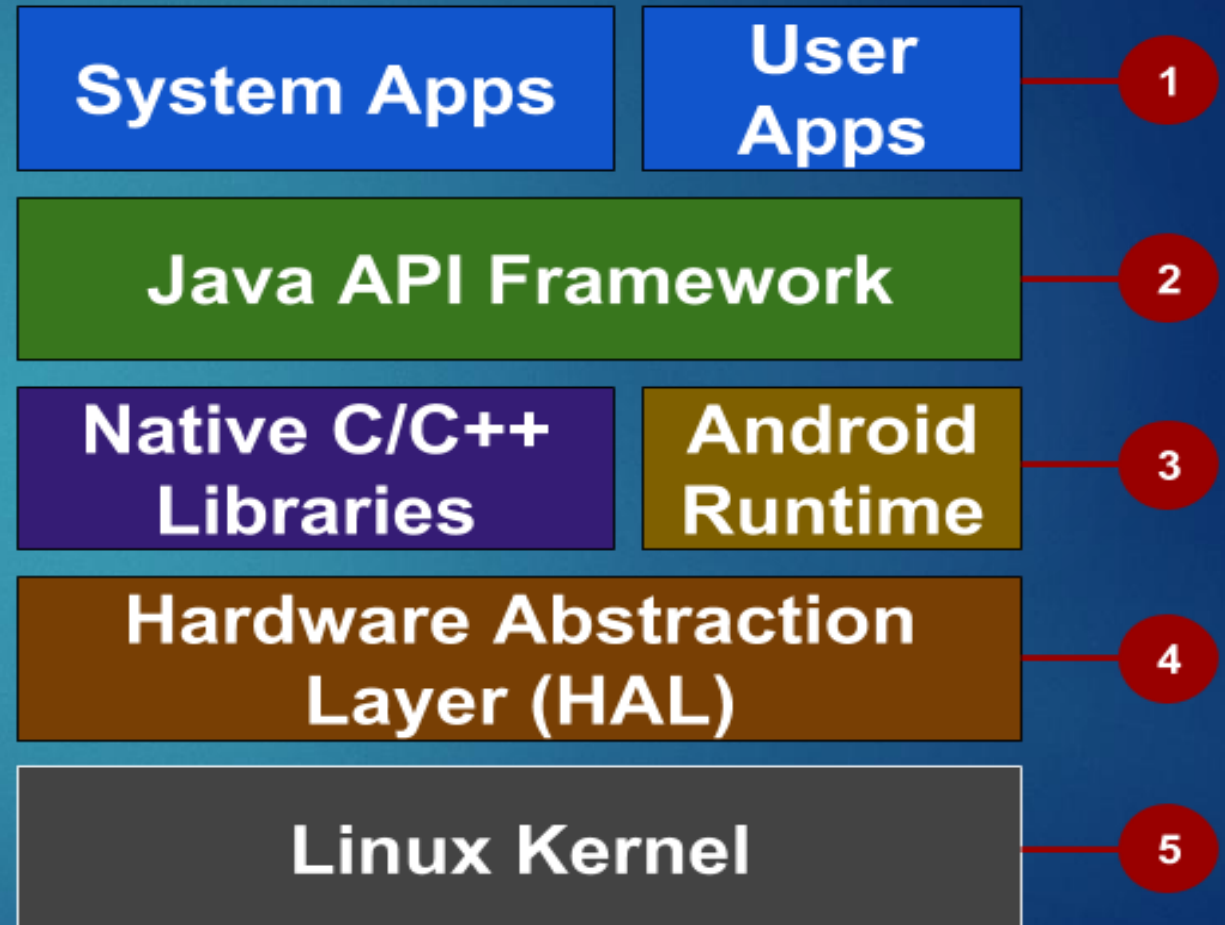




Android Platform Architecture

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



System and User Applications

- ↴ 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

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



Android Versions

Older Android Versions

| Codename | Version | Released | API Level |
|---------------------------|-------------|-----------|-----------|
| <i>Honeycomb</i> | 3.0 - 3.2.6 | Feb 2011 | 11 - 13 |
| <i>Ice Cream Sandwich</i> | 4.0 - 4.0.4 | Oct 2011 | 14 - 15 |
| <i>Jelly Bean</i> | 4.1 - 4.3.1 | July 2012 | 16 - 18 |
| <i>KitKat</i> | 4.4 - 4.4.4 | Oct 2013 | 19 - 20 |
| <i>Lollipop</i> | 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 |
|--------------------|-------------|-----------|-----------|
| <i>Marshmallow</i> | 6.0 - 6.0.1 | Oct 2015 | 23 |
| <i>Nougat</i> | 7.0 - 7.1 | Sept 2016 | 24 - 25 |
| <i>Oreo</i> | 8.0 - 8.1 | Sept 2017 | 26 - 27 |
| <i>Pie</i> | 9.0 | Aug 2018 | 28 |



Application Development

What is Android Application?

- ↴ 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
- ↴ Executed by Android Runtime Virtual machine (ART)

Challenges of Android Development

- ↴ Multiple screen sizes and resolutions
- ↴ Performance: make your apps responsive and smooth
- ↴ Security: keep source code and user data safe
- ↴ Compatibility: run well on older platform versions
- ↴ Marketing: understand the market and your users
(Hint: It doesn't have to be expensive, but it can be.)

Application 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
- ↴ Build configuration: APK versions in Gradle config files



Thank You!