

# 1. Introduction to Mobile Application Development



# Objectives

- Know current state of mobile application development
- Explain the Android Application Fundamentals
- Explain components of an Android app
- Explain the following terms :

Activities, Services, Content Providers, Broadcast Receivers, Intent, and Manifest File

# Types of Mobile Apps

Native



Hybrid

Web  
+  
Native

Web



# Programming Languages

Native



Hybrid

Web  
+  
Native

Web



# Development Tools - Native



Android Studio



Xcode



Tizen Studio



Visual Studio

# Development Tools – Cross Platform



React Native



Flutter



Xamarin



PhoneGap



Apache Weex



Native Script



Jasonette



Ionic

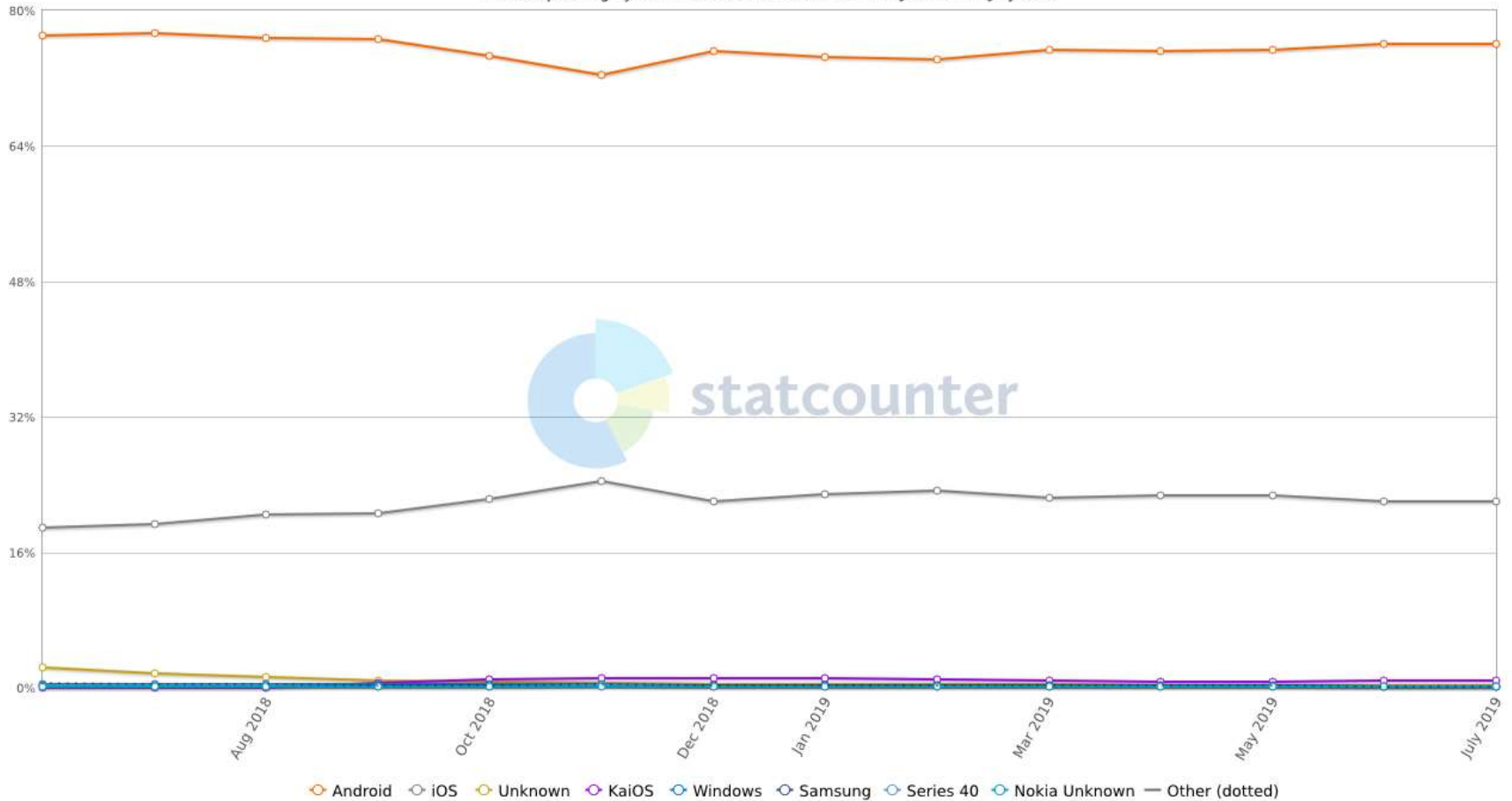
# Comparison of Apps

	Native	Hybrid	Mobile Web
Cost	High	Low	Low
Performance	Fast	Depending on speed of network	Depending on speed of network
Distribution	App stores	App stores	None
Device features	Wide	Limited	Very limited
Code maintenance	Multiple codebase	Single codebase	Single codebase

# Mobile OS

StatCounter Global Stats

Mobile Operating System Market Share Worldwide from June 2018 - July 2019



KaiOS





# Question?

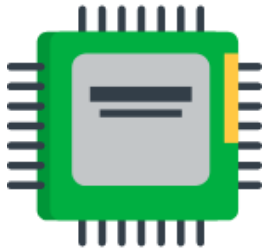
According to Medium (2019), the four market moving mobile app trends in 2019 are:

1. App store consumer spending will surpass USD 120 billion globally
2. Mobile gaming market share will increase to 60%
3. Users will spend 10 minutes of every hour consuming streaming video on a mobile device
4. Publishers will produce 60% more apps with in-app ads, making up 62% of the USD 250 billion global digital ad spend

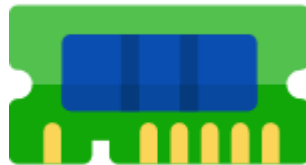
In your opinion, which mobile app development method (native, mobile web, and hybrid) is suitable for each the following entities?

- a. Bernama, the Malaysian national news-agency
- b. Super Mario Bros, a game developed by Sega
- c. Setapak Central, a shopping mall

# Key Mobile Challenges



Processing Power



Memory and  
storage



Battery



Network

# Key Mobile Challenges



Flagship



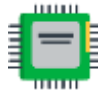
Mid Range



Entry



Basic



Octa-core (SD 855)  
Hexa-core (A12)



Quad-core



8 GB RAM / 256 GB ROM



1 GB RAM / 8 GB ROM



5000 mAh



2150 mAh

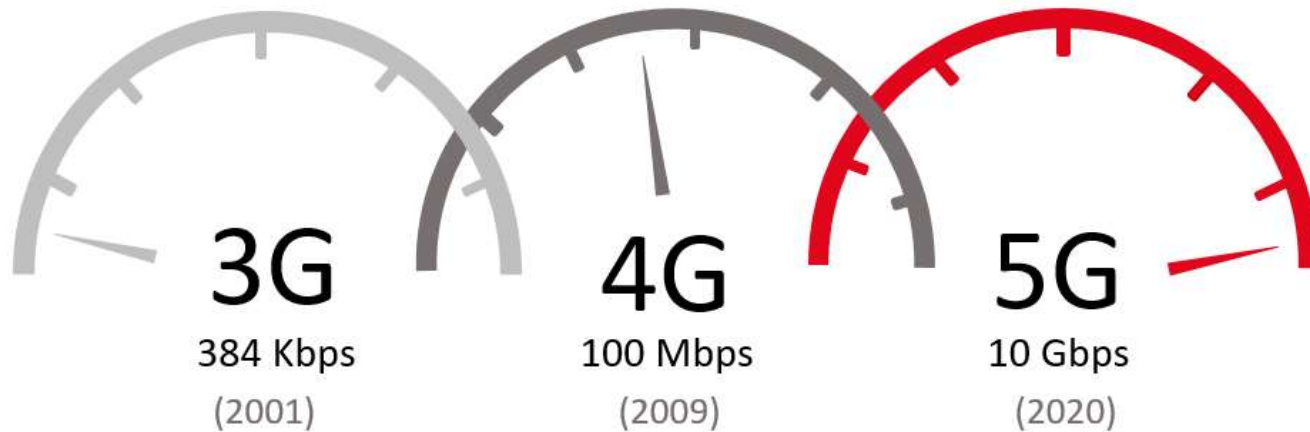


4G/5G Network



3G/4G Network

# Impact of 5G

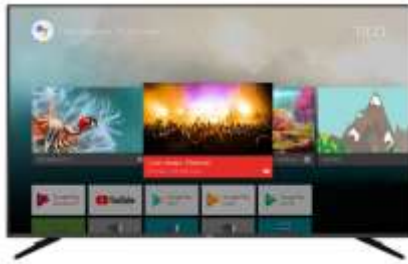


What can you do with 5G?

# Beyond Mobile App



Wearable



TV



Smart Vehicle



Internet of Things (IOT)

# Question?

India, a country with a large population base, low smartphone adoption and fast growth rate. Mobile phone shipments in the Indian market already exceed those in the US, making it the second largest phone market. The current Indian mobile phone market is still in the first batch of smartphone replacement. The problem for many people there is to have one (Sina Tech, 2018).

Considering the four challenges: processing power, memory and storage, battery, and network, how would you build apps to cater to the needs of users in emerging markets?



# Android Application Fundamentals

# App Components

- Android apps are written in:



Java



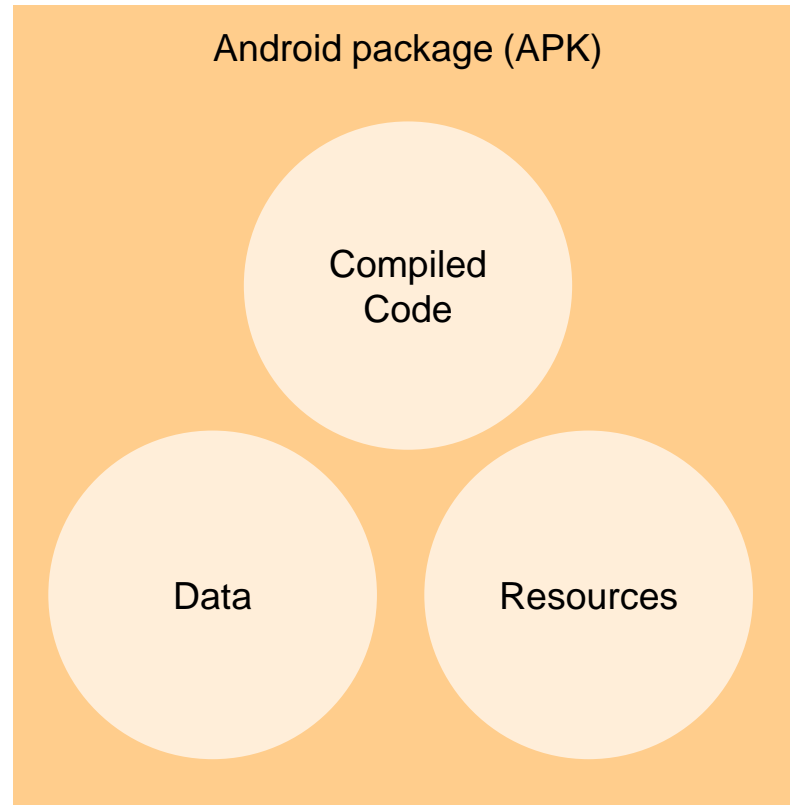
Kotlin



C++



# App Components

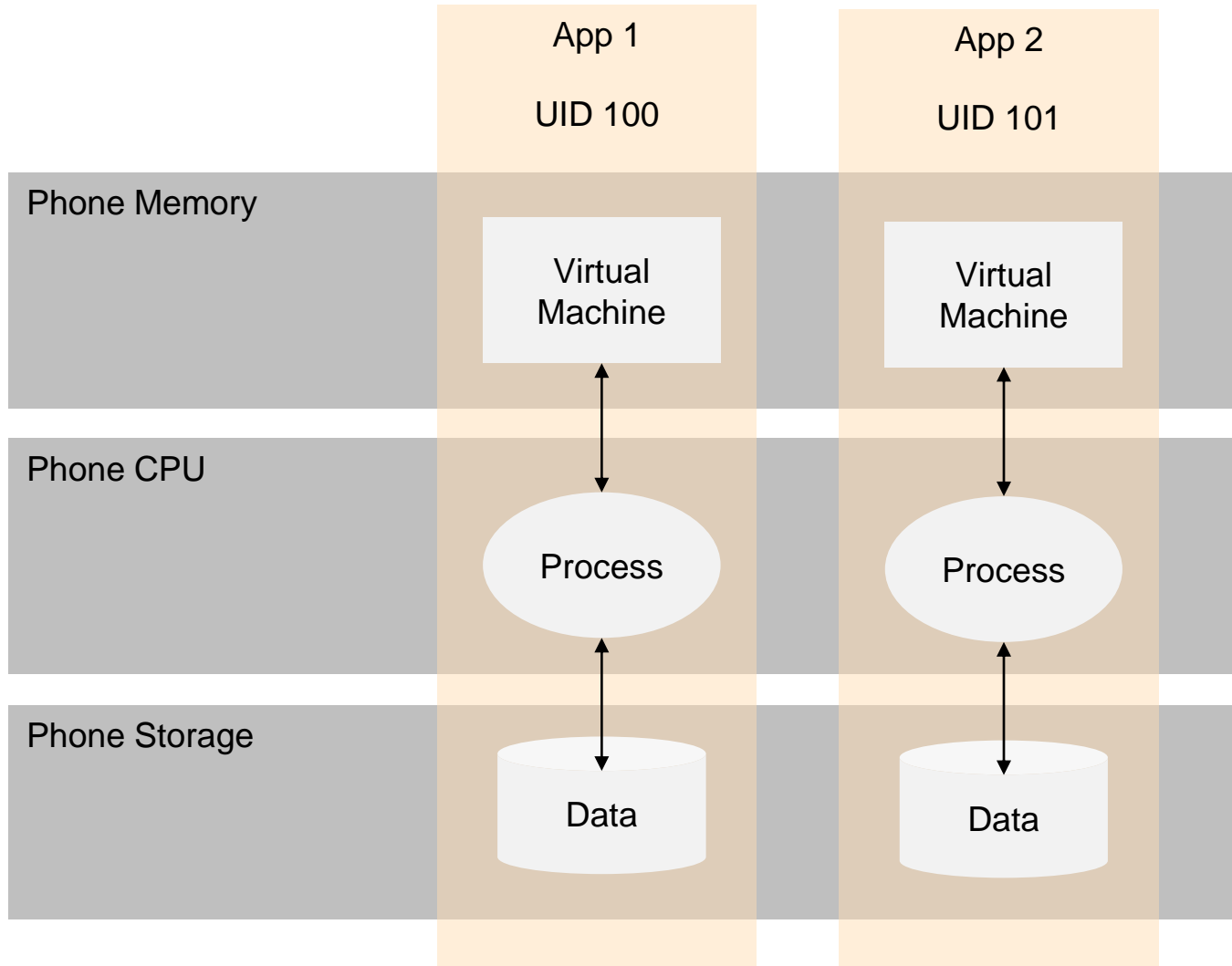


# Android Application Fundamentals

Each Android app lives in its own security sandbox

- Each app is a different user to the OS
- The system assigns each app a unique Linux ID
- The system sets permission for all the files in an app
- Each app runs in its own Linux process
- Each process has its own virtual machine (VM)

# Android Security



# Android Application Fundamentals

## The Principle of Least Privilege

Each app, by default, has access only to the components that it requires to do its work and no more

An app cannot access parts of the system for which it is not given permission

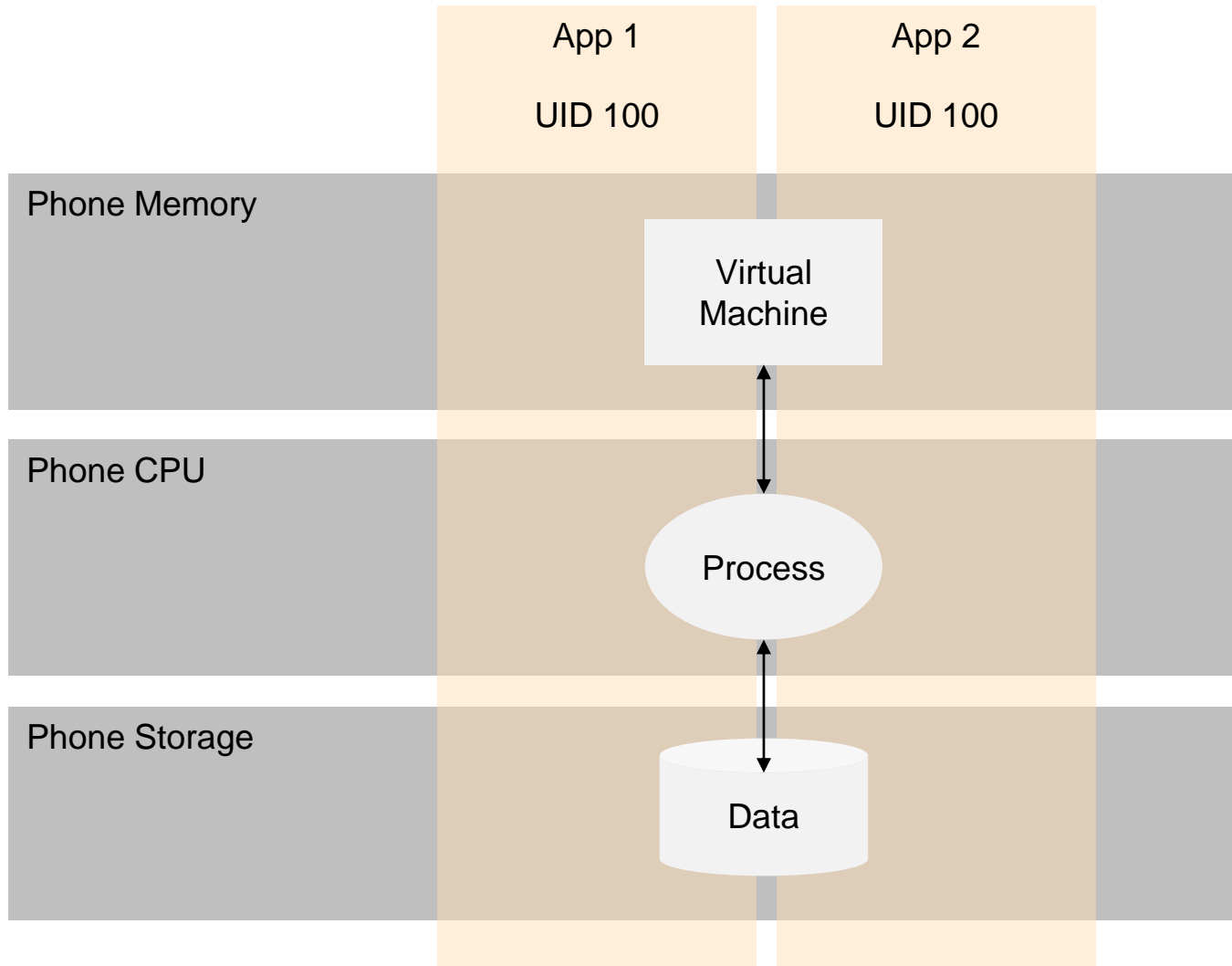
# Android Application Fundamentals

## To share data

- Two apps could share the same Linux user ID to allow access each other's files
- The two apps must be signed with the same certificate

Reason: to conserve system resources; apps run in the same Linux process and share VM

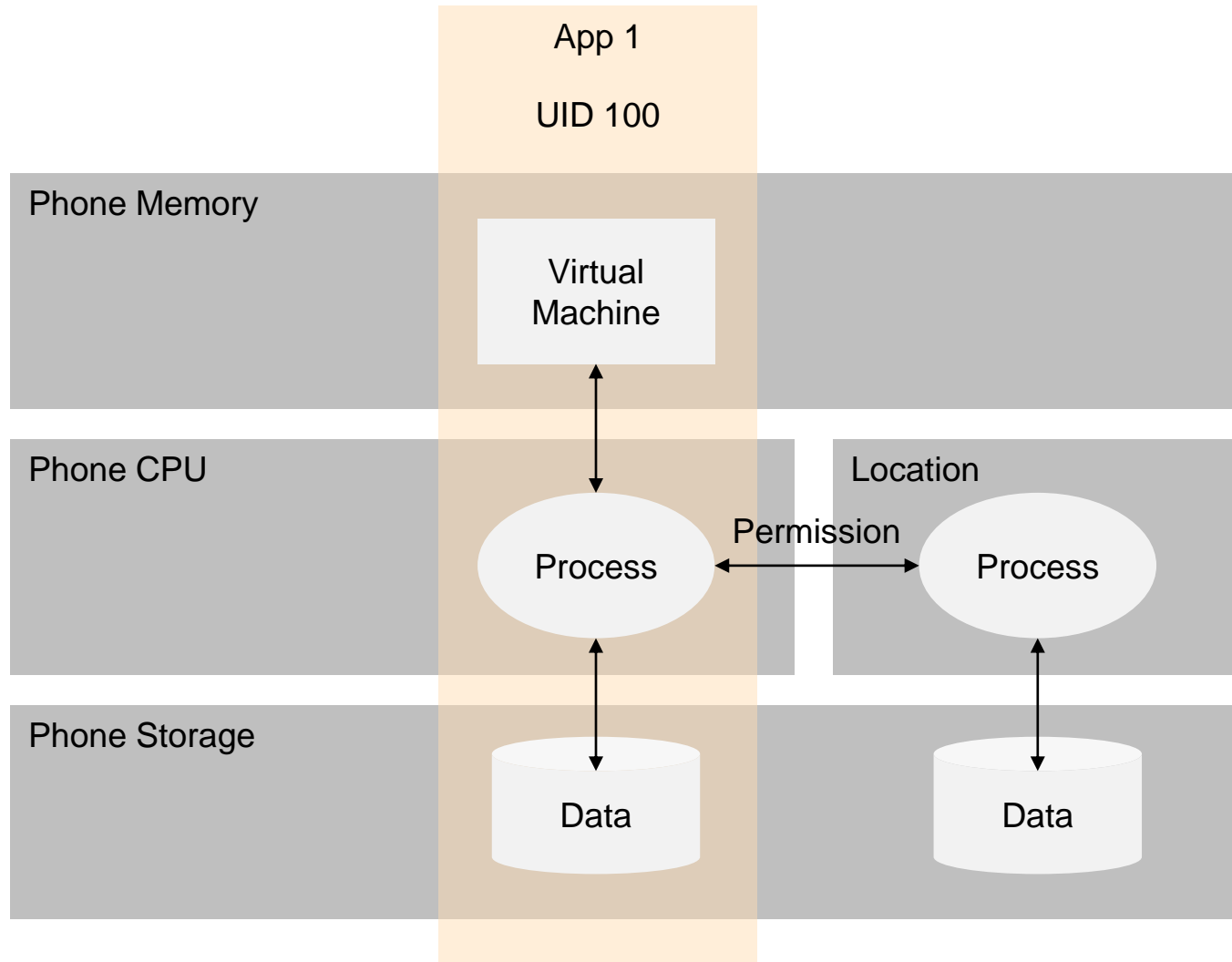
# Two apps with the same ID



# Android Application Fundamentals

- To access system services
  - An app can request permission from a user to access device data. E.g. contact, SMS, storage, camera, Bluetooth, and etc
  - All app permissions must be granted by the user at install time (version 5 and below) or during runtime (version 6 and above)

# App to access system service





# Question?

1. Why Android's application package (APK) file contains three different components?
2. Explain two ways the Android applied to protect app data and user's security

# App Components

- Four types of app components: ABCS

Activities



Broadcast Receiver



Content Provider



Services



# Activities



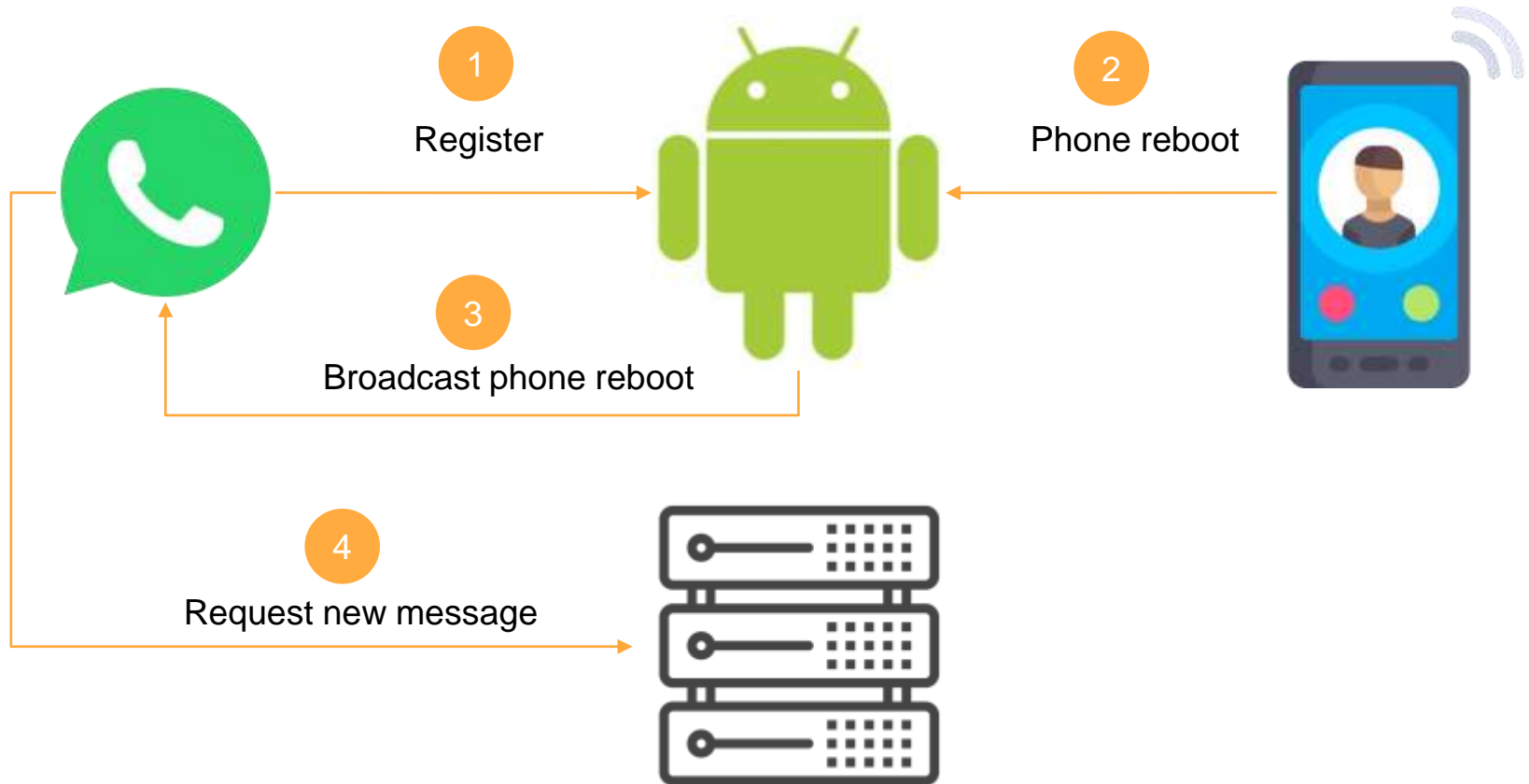
- An activity = a screen
- A window in which to draw its user interface (UI)
- An app may consist of multiple activities
- One of the activity is the “main” activity that launching an app

# Broadcast Receiver

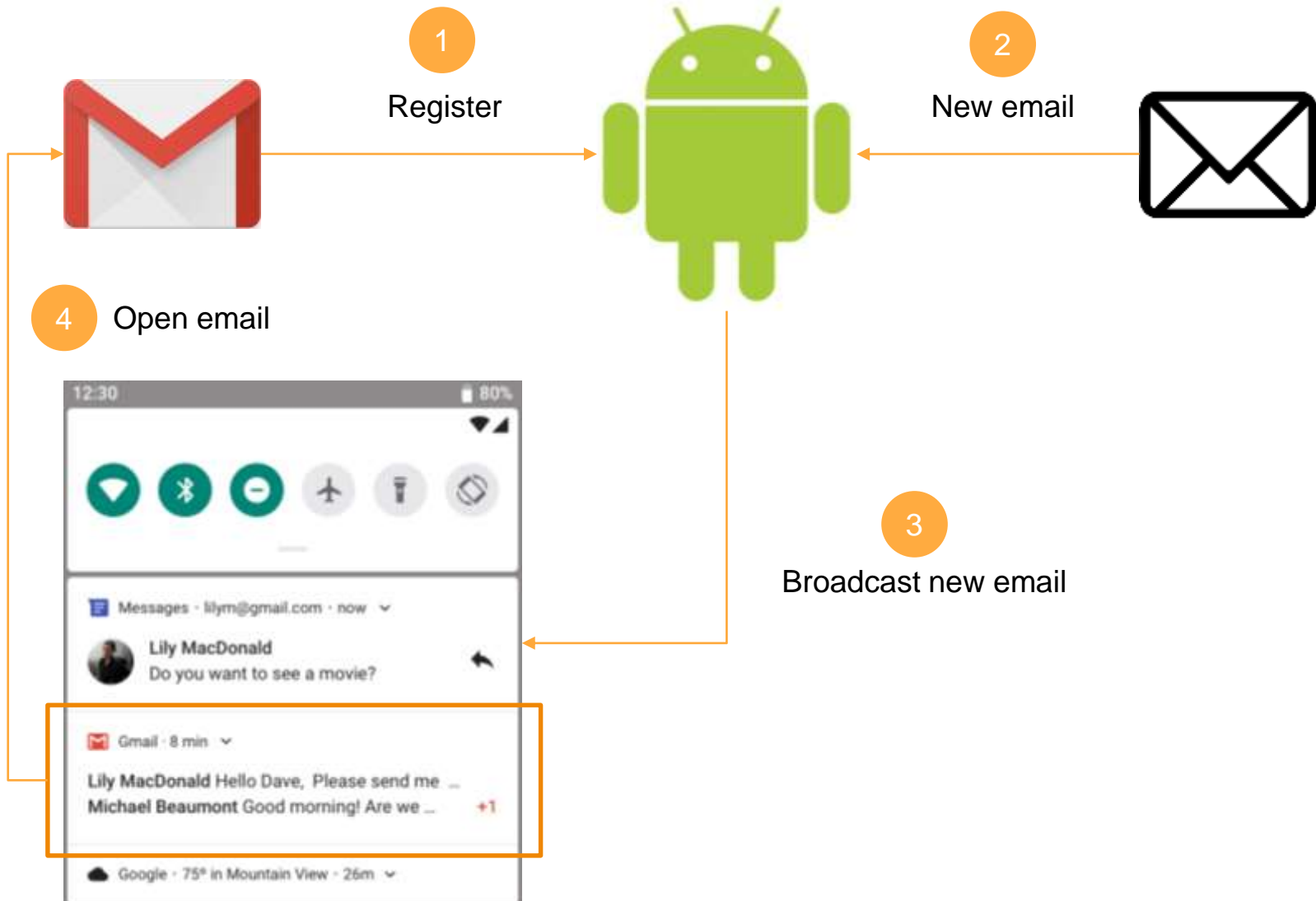


- A messaging system used by the system and apps
- No UI, but could create status bar notification
- An app must register to receive an event
- A system broadcast is sent to all apps that subscribed to receive the event. E.g. battery low, system reboot

# Broadcast Receiver



# Broadcast Receiver

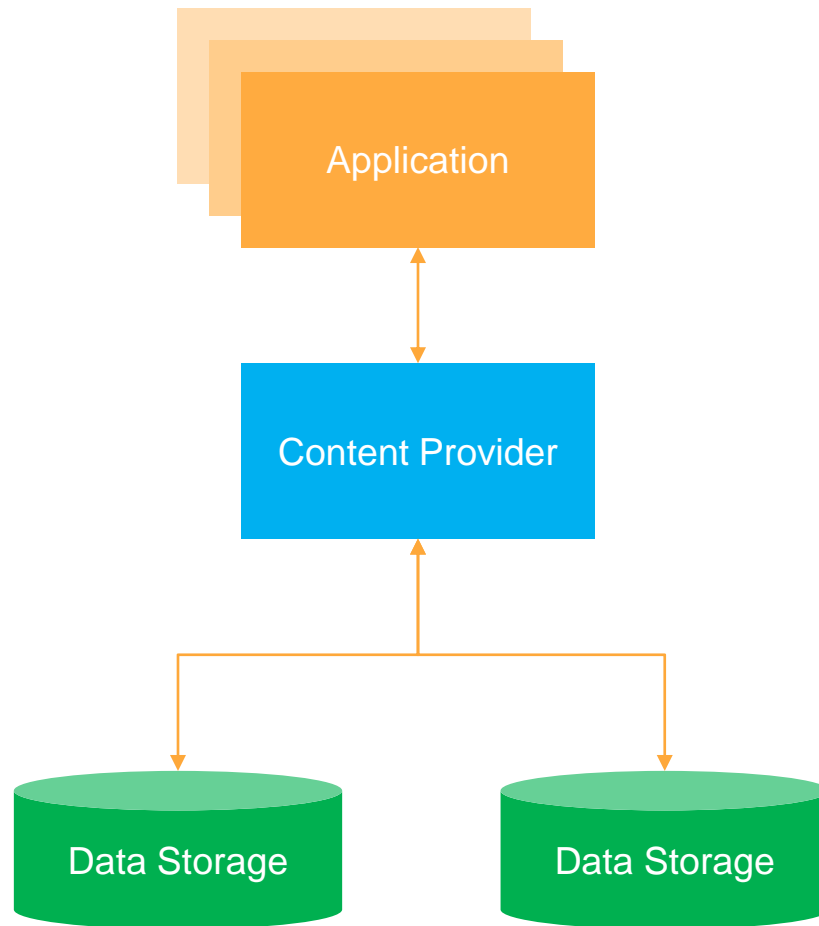


# Content Providers



- Manages access to a central repository of data
- Data formats:
  - File system
  - SQLite database
  - On the web/ cloud
  - Persistent storage location
- Other apps can query or even modify the data (with permission)
- E.g. User dictionary

# Contents Providers





# Services



- No UI. Runs in the background
- Performs long-running operations or works for remote processes.
- E.g. play music in the background or fetch data over network
- Another component can start the service

# Question?

Identify a type of app component suitable for each of the following:

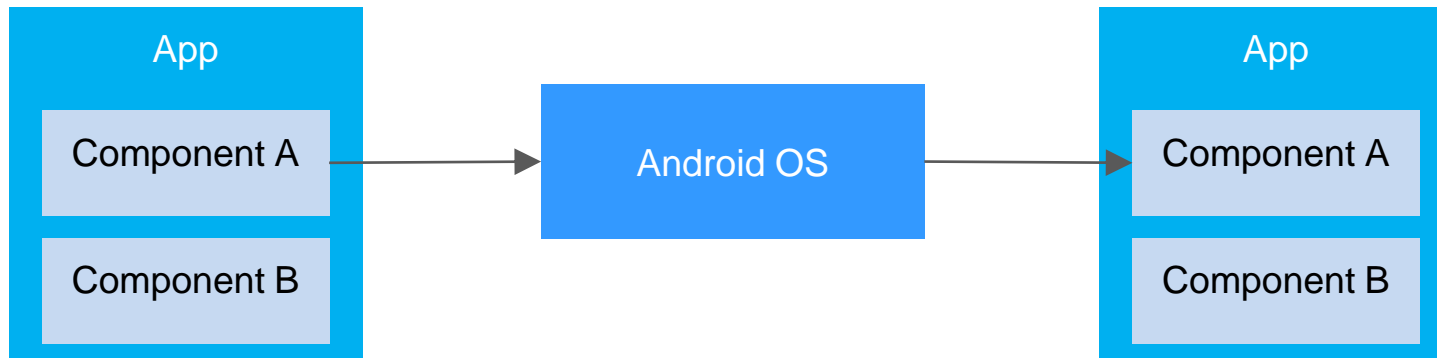
- a. Login screen
- b. Sync data from an app to a server
- c. Manage a shared set of app data on a local storage
- d. Schedule an alarm to post a notification

# App Components

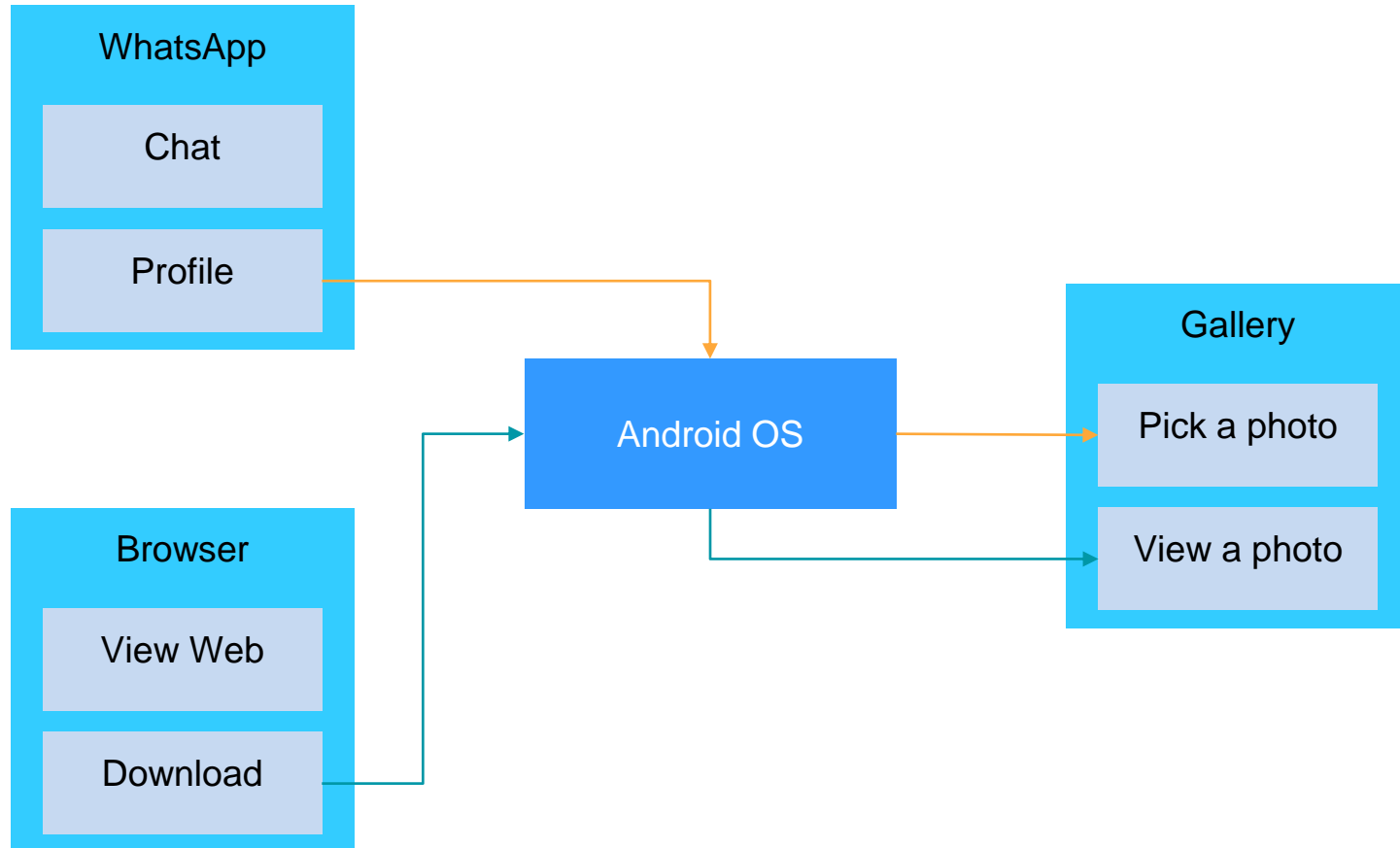
- Android system runs each app in a separate process with file permissions that restrict access to other apps, how can an app activate a component from another app?

# App Components

- An app can start another app's component
- An app does not have a single entry point; no `main()` function

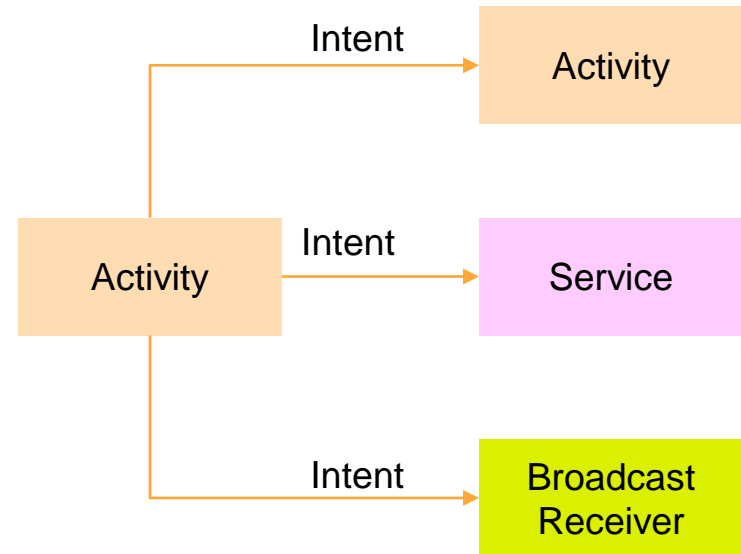


# App Components



# Intent

- Use Intent to activate Activities, Services, and Broadcast Receivers
- Intent defines a message to activate a specific component or type of component (will be discussed in Chapter 3)



# The Manifest File

- The first file read by the Android before it starts an app component
- To know the components exists of an app
- Components NOT declared in the manifest file are NOT visible to Android; can NEVER run

# The Manifest File

- Contains:
  - Permission
  - Minimum App Programming Interface (API) level
  - Hardware and software features used
  - App components
  - Linked libraries
  - etc



# The Manifest File

- Permission :
  - A restriction limiting access to:
    - code
    - data on the device
  - Protects critical data and code from misuse or damage

# App Resources

- Contents:
  - Animation/Image
  - Menu
  - Style
  - Colour
  - String
  - Layout (UI)
  - etc

# Question?

1. What is the purpose of the Intent class?
2. Describe three common use cases for using an Intent.
3. Why is the manifest file important to every Android app?