App Fundamentals

ICT2105 Mobile Application Development

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Spring 2020

Overview

Android Application Intro

Application Process

Processes vs Threads (Recap)

Main App Components

Activity

Service

Intent

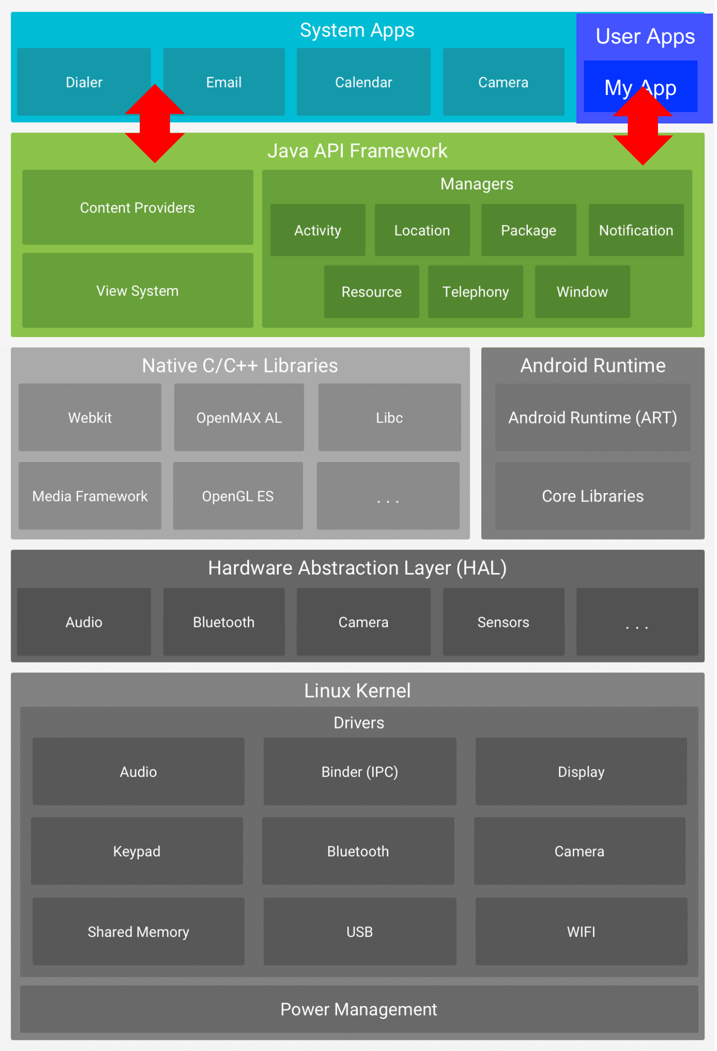
BroadcastReceiver

ContentProvider

OS Stack

Applications call the API framework

System and user apps use the same framework



Android Applications

Apps consist of components/building blocks

Each component has own purpose and APIs

Instantiated and run as needed

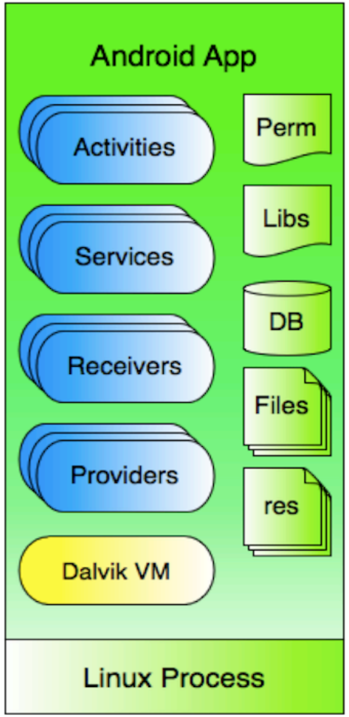
Usually one process (but not always!)

App process

A process is a running instance of the app code

Each normally one process, but can consist of more than one process

There are many app processes running inside the phone



```
> ps

USER        PID    PPID  VSIZE  NAME
root         67       0      0  binder
system       82     820    272  /system/bin/servicemanager
root         83    4260    852  /system/bin/vold
root         84    4976    708  /system/bin/netd
root         85     684    252  /system/bin/debuggerd
system       86   20884   6900  /system/bin/surfaceflinger
root         87  419512  32228  zygote
app_20    13786      87  26304  com.google.android.apps.maps:NetworkLocationService
app_31    14558      87  25884  com.android.gallery3d
app_45    14571      87  25148  com.google.android.apps.books
app_55    14601      87  29560  com.twitter.android
app_16    16723      87  25384  com.google.android.music
```

Processes (Recap)

Each process provides the resources needed to execute a program.

A process has a virtual address space, executable code, open handles to system objects, a security context, a unique process identifier, environment variables, a priority class, minimum and maximum working set sizes, and at least one thread of execution.

Each process is started with a single thread, often called the primary thread, but can create additional threads from any of its threads.

http://msdn.microsoft.com/en-us/library/windows/desktop/ms681917%28v=vs.85%29.aspx

Threads (Recap)

A thread is the entity within a process that can be scheduled for execution.

All threads of a process share its virtual address space and system resources.

Each thread maintains exception handlers, a scheduling priority, thread local storage, a unique thread identifier, and a set of structures the system will use to save the thread context until it is scheduled.

http://msdn.microsoft.com/en-us/library/windows/desktop/ms681917%28v=vs.85%29.aspx

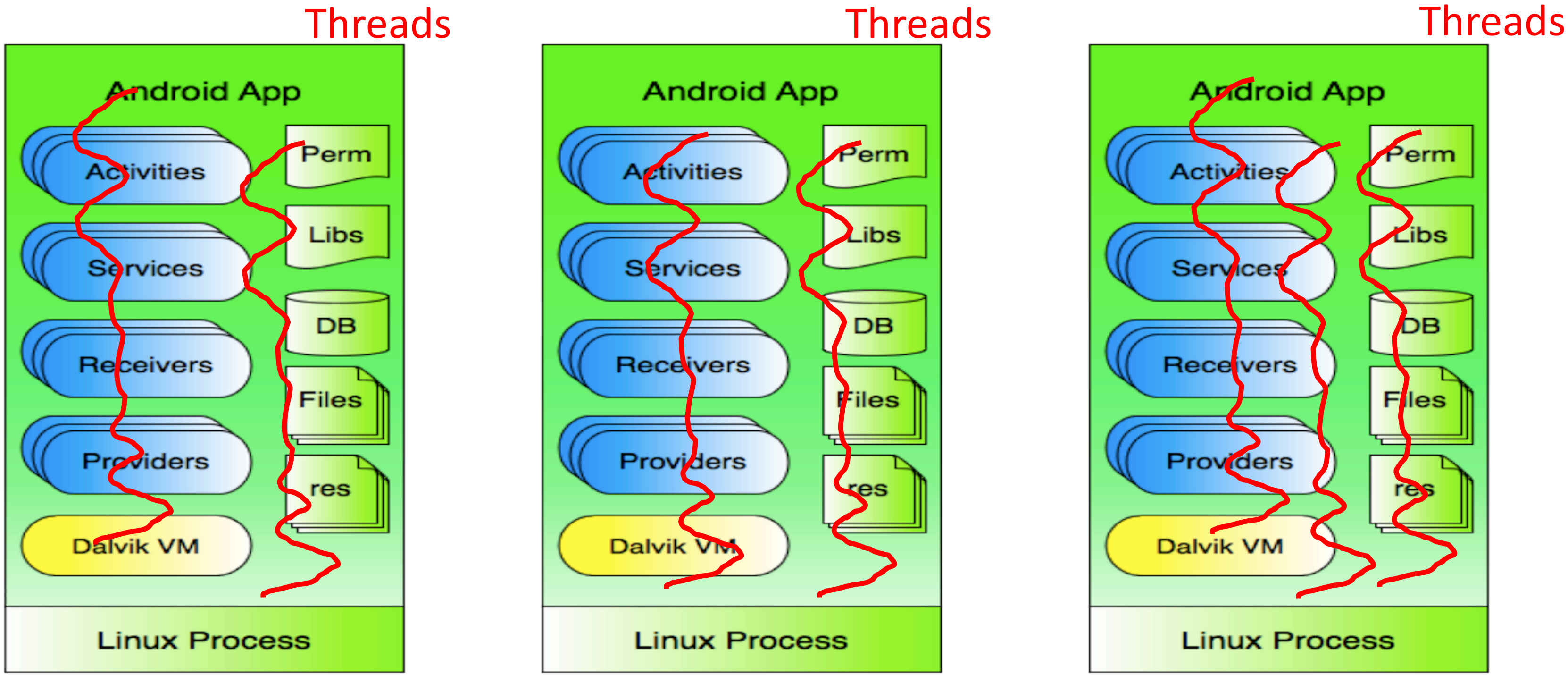
Processes vs Threads (Recap)

Both processes and threads are independent sequences of execution.

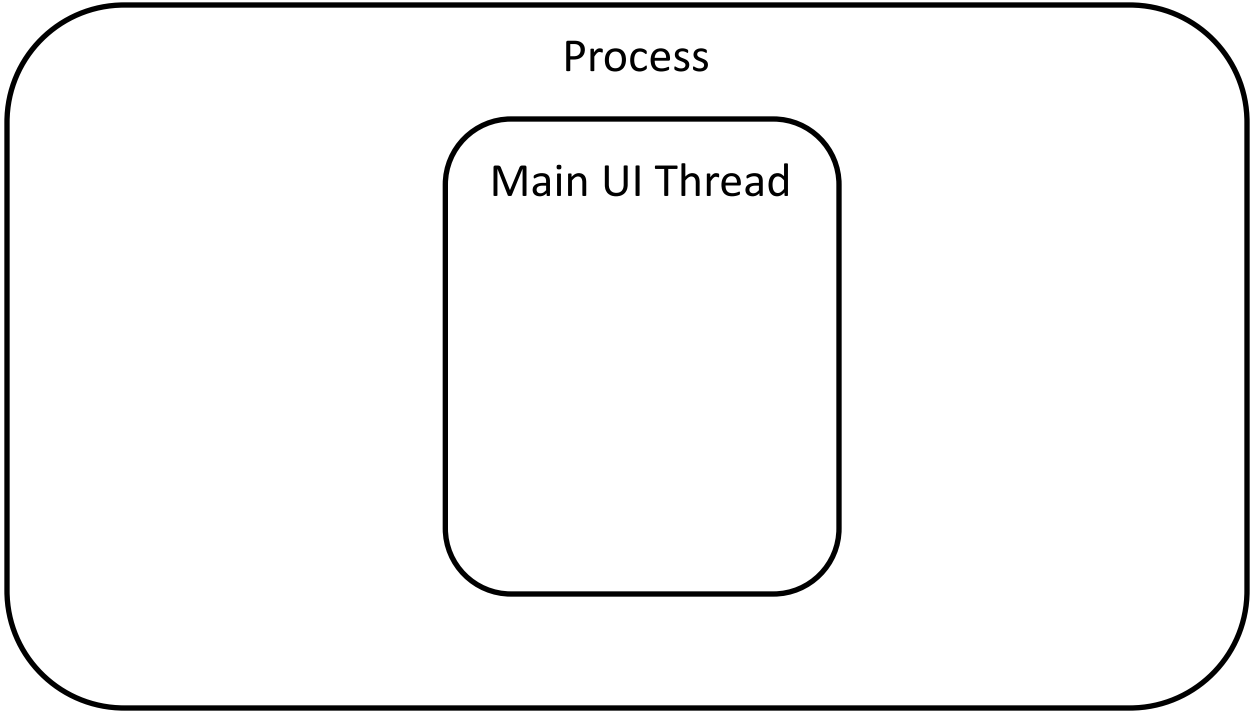
Threads (of the same process) run in a shared memory space

Processes run in separate memory spaces.

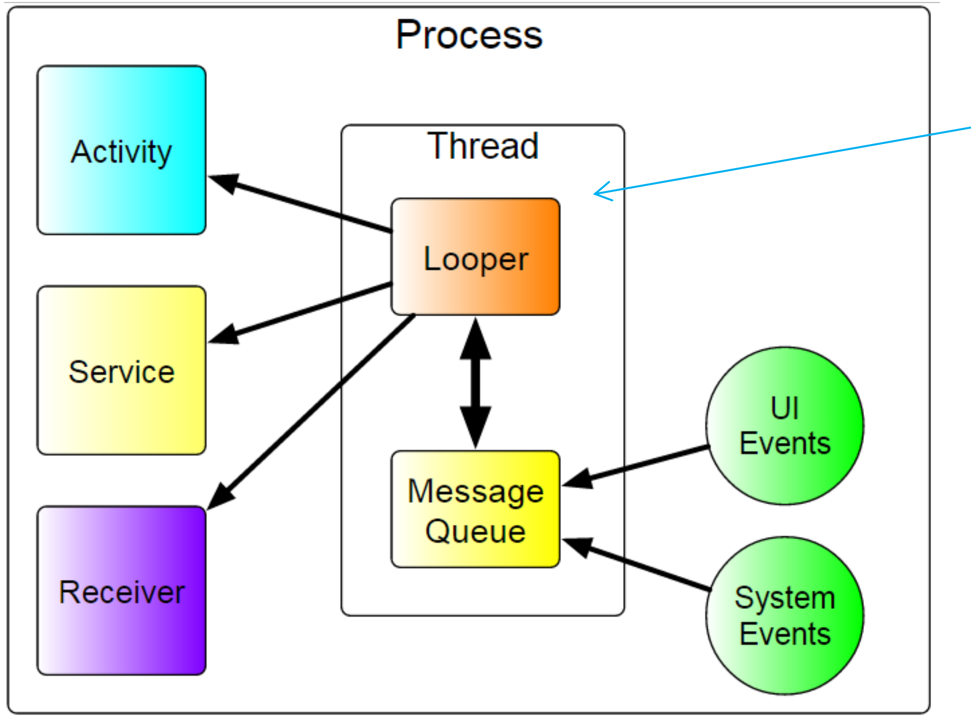
Processes running on phone



App Process & Main UI Thread



Main UI Thread (Detailed View)



Main UI Thread

© Marakana

App process

Start a new Linux process for app (fork from zygote)

All components of app run in same process and main thread

If process already exists, component is started within that process

Main thread handles incoming events

Dispatches events to the UI widgets

Main App Building Blocks

Component Name	Description
Activity	UI component typically corresponding to one screen
Service	Component that runs in the background to perform long-running operations, no UI
Intent	Events or messages used to start components or send broadcasts
BroadcastReceiver	Responds to system-wide broadcast announcements
ContentProvider	Manages a shared set of application data across boundaries

Activity

Primary class for user interaction

Usually implements a single focused task a user can do

One Activity usually corresponds to a single screen

Typical application may have many activities

Laid out as a stack

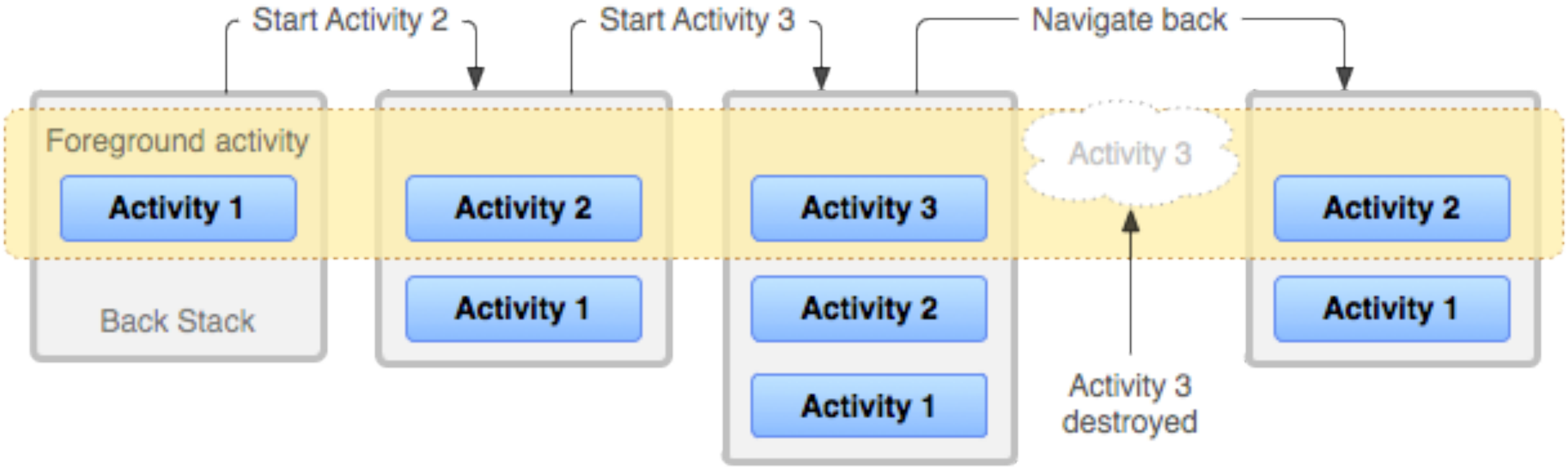
Activity on the top is visible/in foreground

Background activities are stopped, state retained

Back button resumes previous Activity in stack

Home button moves app and activities into background

Activity Stack



Views

Building blocks of the Activity/UI

There are many subclasses of View

TextView

EditText

Button

ListView

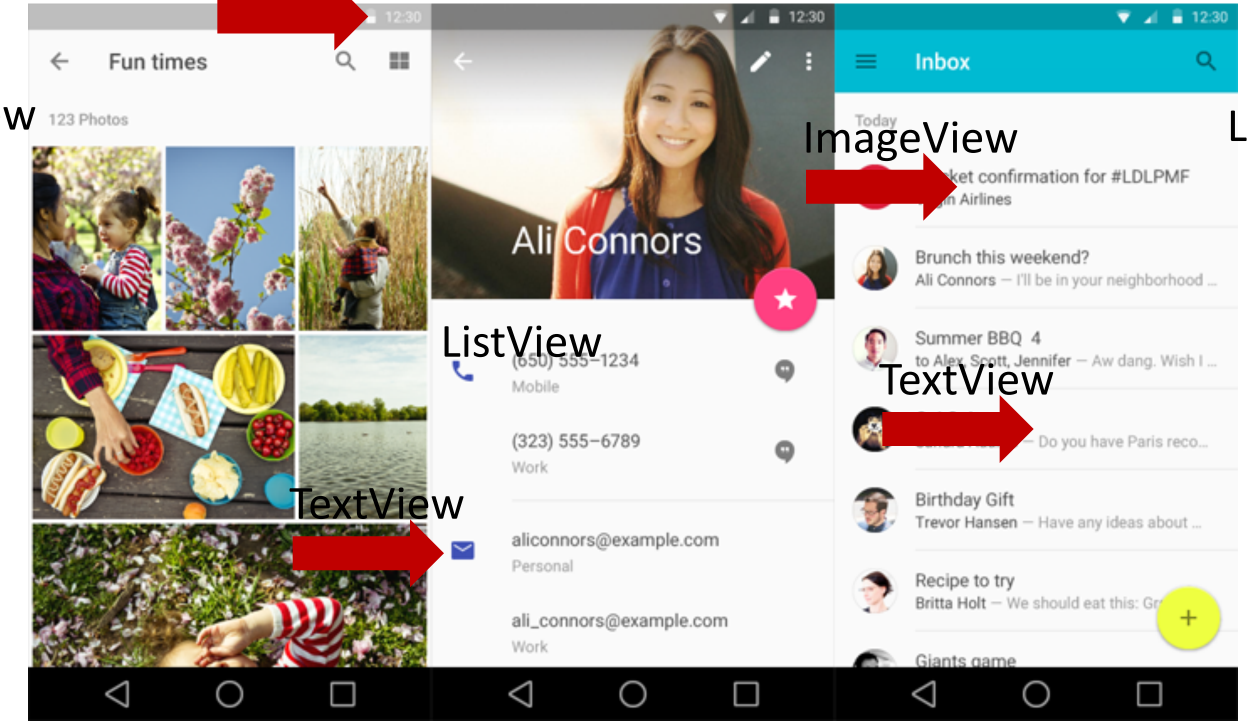
ImageView

WebView

MapView

ImageView

ImageView



123 Photos

Ali Connors

(650) 555-1234
Mobile

(323) 555-6789
Work

aliconnors@example.com
Personal

ali_connors@example.com
Work

Today

ket confirmation for #LDLPMF
in Airlines

Brunch this weekend?
Ali Connors — I'll be in your neighborhood ...

Summer BBQ 4
to Alex, Scott, Jennifer — Aw dang. Wish I ...

— Do you have Paris reco...

Birthday Gift
Trevor Hansen — Have any ideas about ...

Recipe to try
Britta Holt — We should eat this: Gr

Giants game

ImageView

ListView

ListView

TextView

TextView

Service

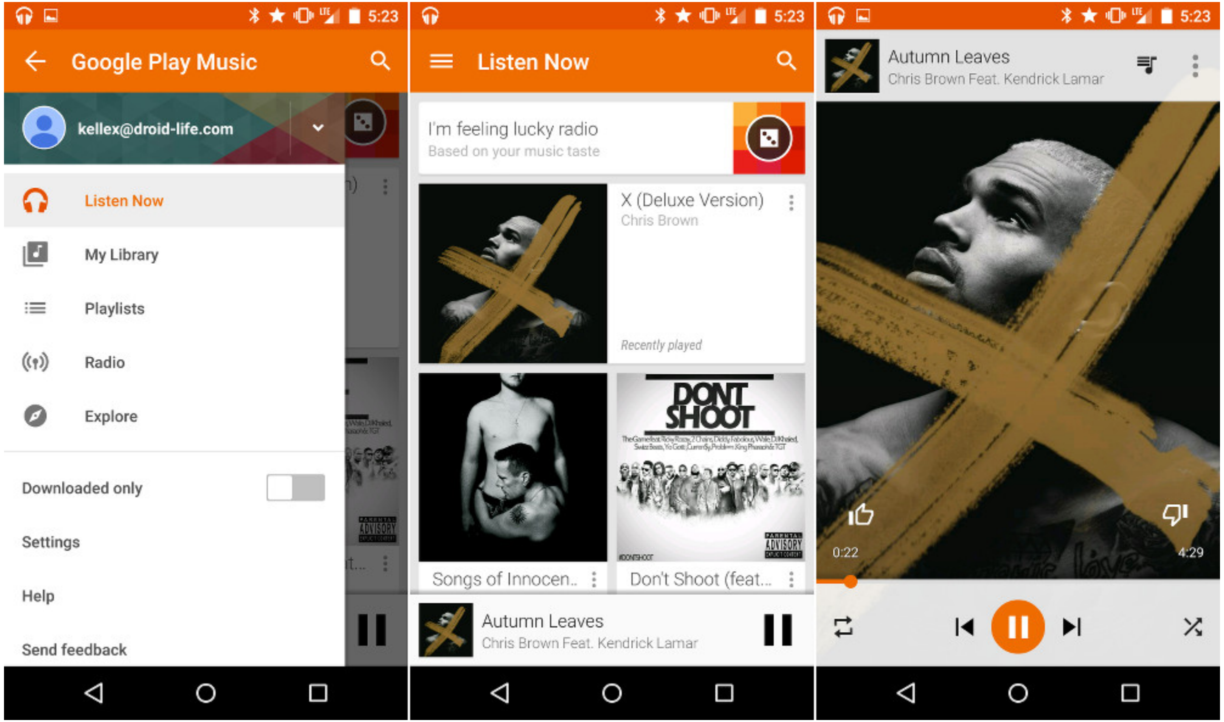
UI-less component that runs in the background (invisible to user)

Used to perform long-running operations

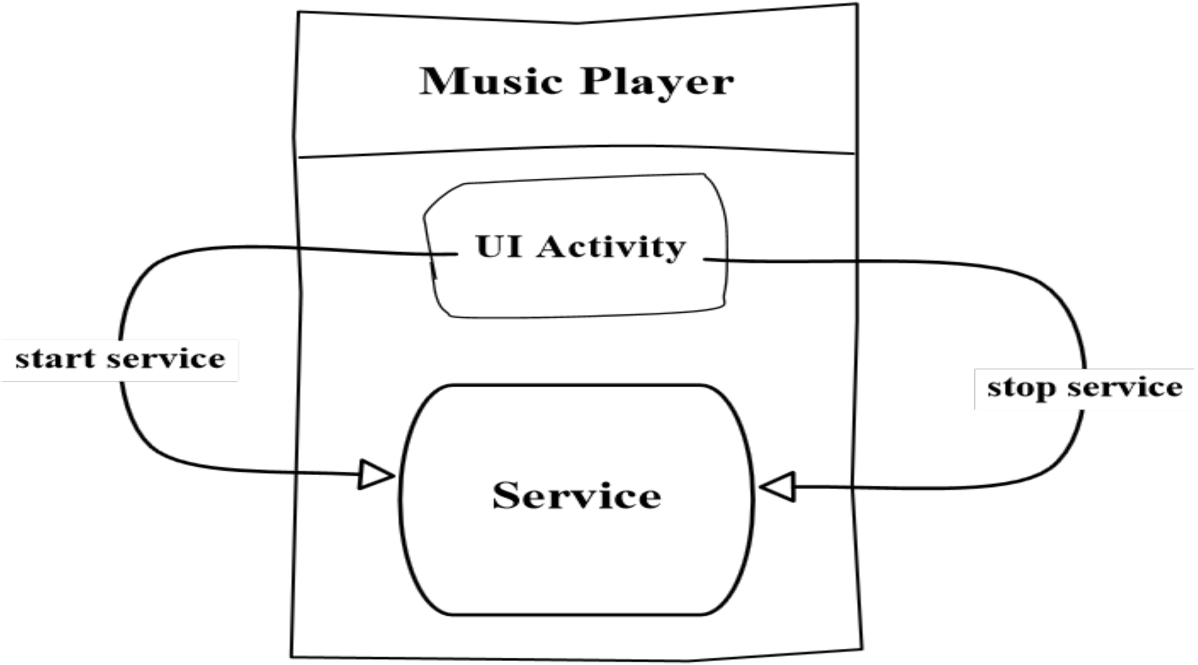
Can be started and stopped

Service runs on the main application thread, the UI thread

Music Player Service Example



Service Example



Intent

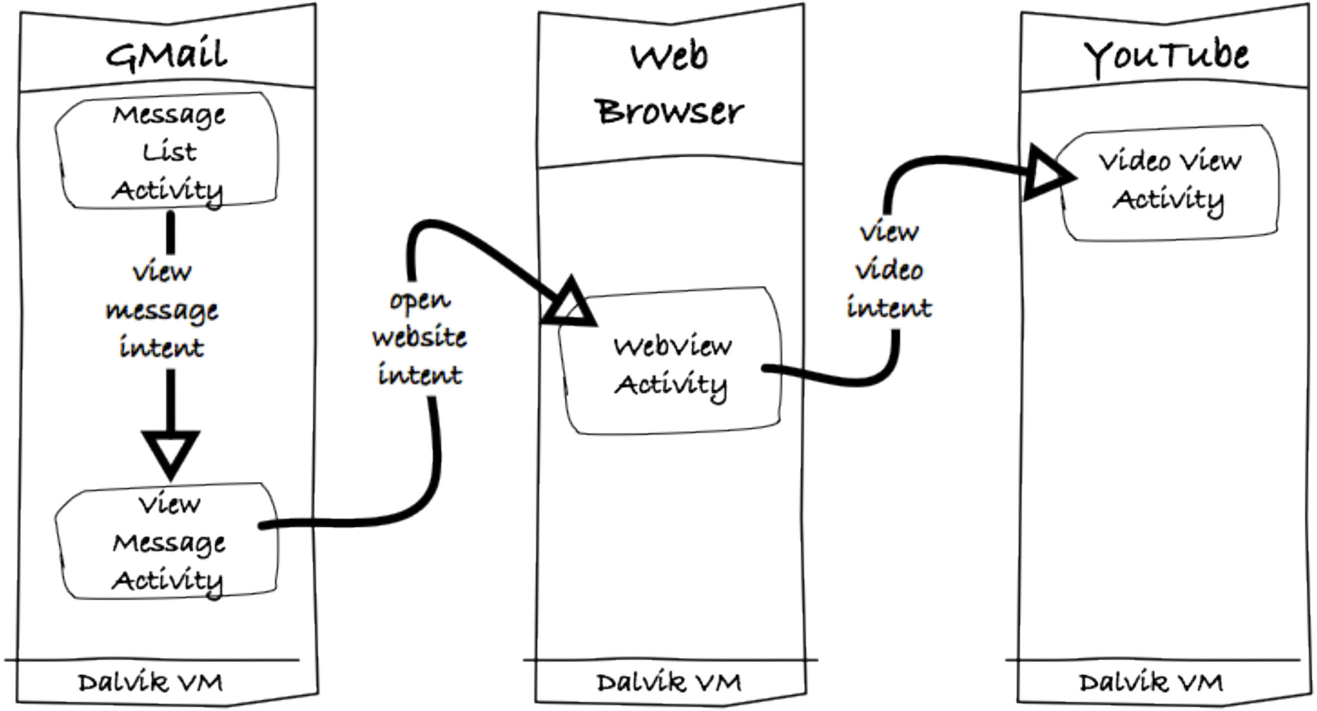
Intents are like events or messages

Used to start components or send broadcasts

Intents can be implicit or explicit

A form of IPC in Android

Intent Example



BroadcastReceiver

Component that listens for and responds to events (i.e. broadcast messages)

Can receive from system:

New phone call comes in

Battery level change

Can receive from other applications

Apps have to define their own

BroadcastReceiver

Events are represented by the Intent class

Then they are broadcast

BroadcastReceiver receives and then responds to Intent

Register for system or application events you want to receive

Publish-Subscribe model

ContentProvider

Store and share content with applications across application boundaries

Use database style interface

Handle inter-process communication (IPC)

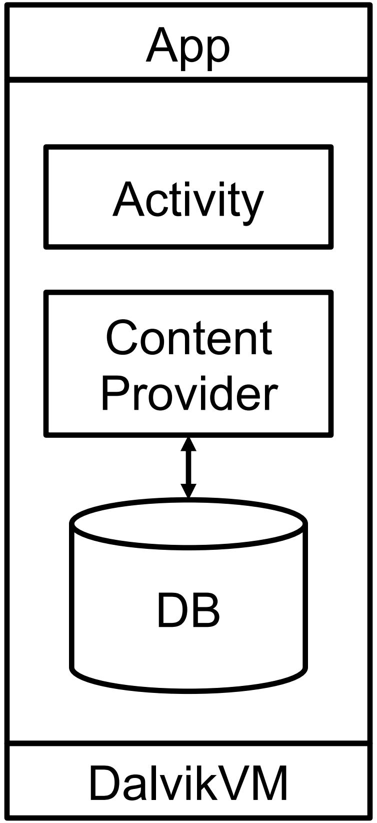
Examples of built in content providers:

Contacts

MediaStore

Settings

ContentProvider



Summary

Apps consist of different components or building blocks

An app normally runs in one process (but could be more than one)

Components are instantiated as needed

Main app building blocks are:

Activity

Service

Intent

BroadcastReceiver

ContentProvider