

android

MOBILE DEV PART I

Platform, Dev environment,
App fundamentals, Activity class,
Intent class, Permissions, Fragment class and
UI classes with TUNet demonstrated.

Lollipop

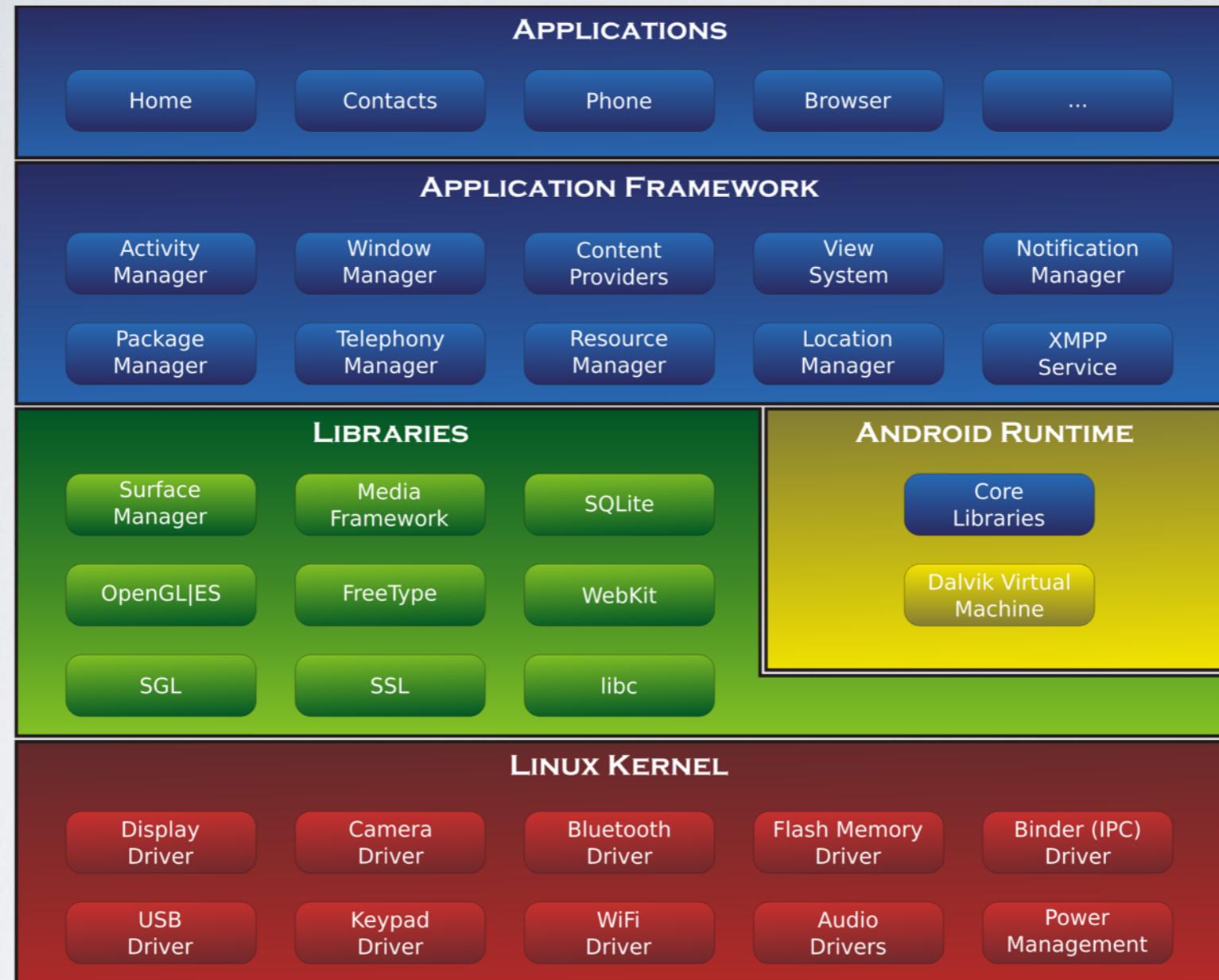
A sweet new take on Android.

[LEARN MORE](#)



Android, the world's most popular mobile platform

TUNet: THU's most popular network client!



THE ANDROID PLATFORM

a software stack for mobile devices

LINUX KERNEL

Standard Services

- Security
- Memory & process management
- File & network I/O
- Device drivers

Android Specific

- Power management
- Android shared memory
- Low memory killer
- Interprocess communication
- ...

LIBRARIES

- System C library
 - Bionic libc
- Surface Mgr.
 - Display management
- Media
- Framework
 - Audio/Video
- Webkit
 - Browser engine
- OpenGL
 - Graphics engines
- SQLite
 - Relational database engine

ANDROID RUNTIME

Core Java libraries

- Basic Java classes
 - java.* javax.*
- App lifecycle
 - android.*
- Internet/Web service
 - org.*
- Unit testing
 - junit.*

Dalvik Virtual Machine

- Apps are executed by the DVM
- $\text{java} \rightarrow \text{.class} \rightarrow \text{.dex}$
- Designed for resource constrained environments
- ~ART

isolation
compatibility

APPLICATION FRAMEWORK

Package Manager

(keeps track of app packages on device)

Window Manager

(manages the windows comprising an app)

View System

(provides common user interface elements)

Resource Manager

(manages non-compiled resources)

Activity Manager

(manages app lifecycle and navigation stack)

ContentProvider

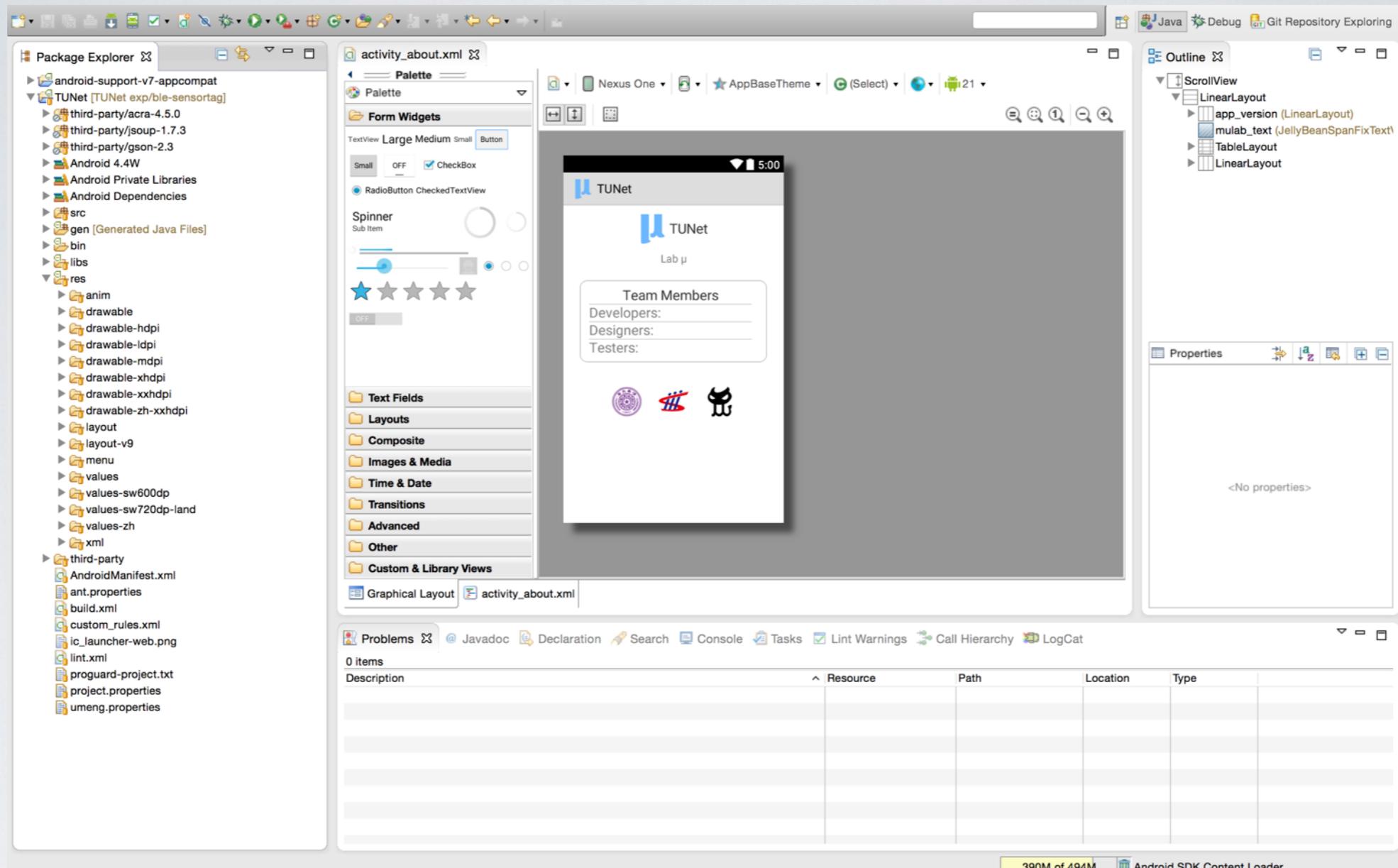
(inter-application data sharing)

LocationManager

(provides location & movement information)

NotificationManager

(place notification icons in the status bar when important events occur)

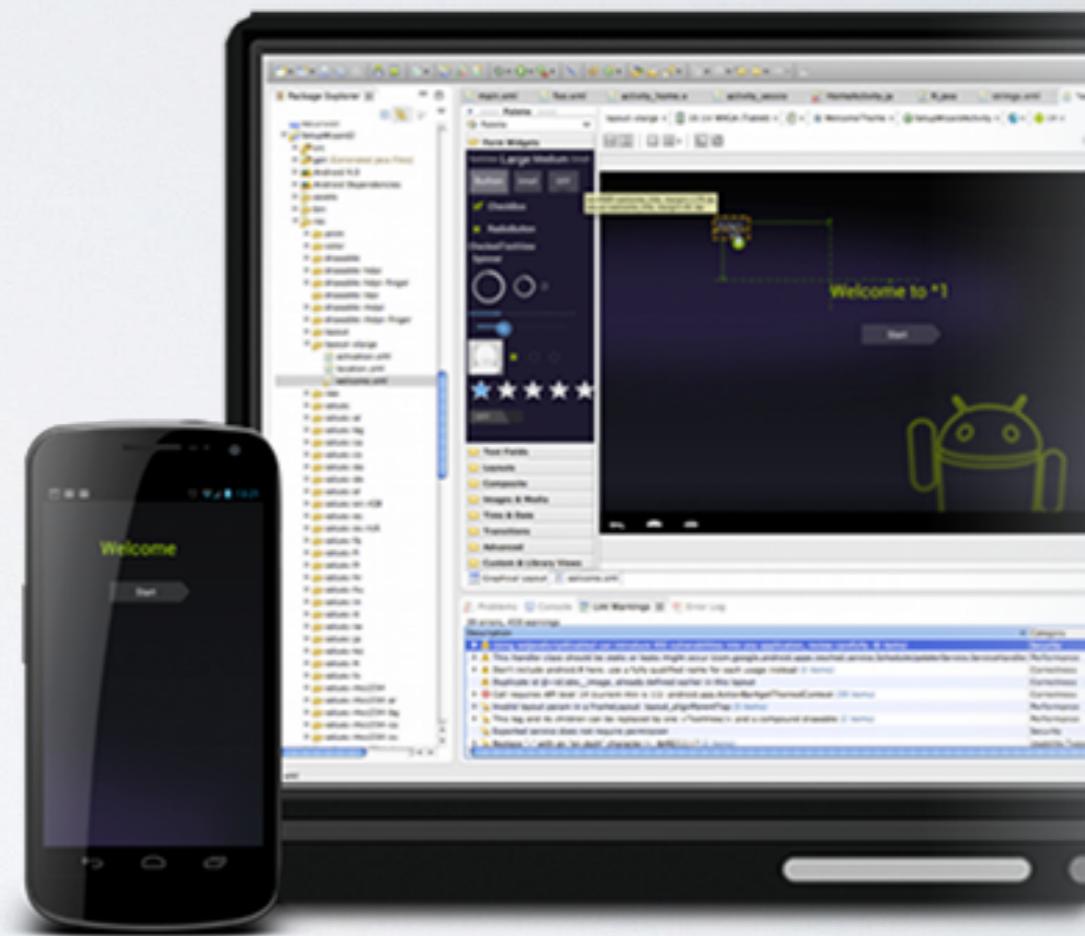


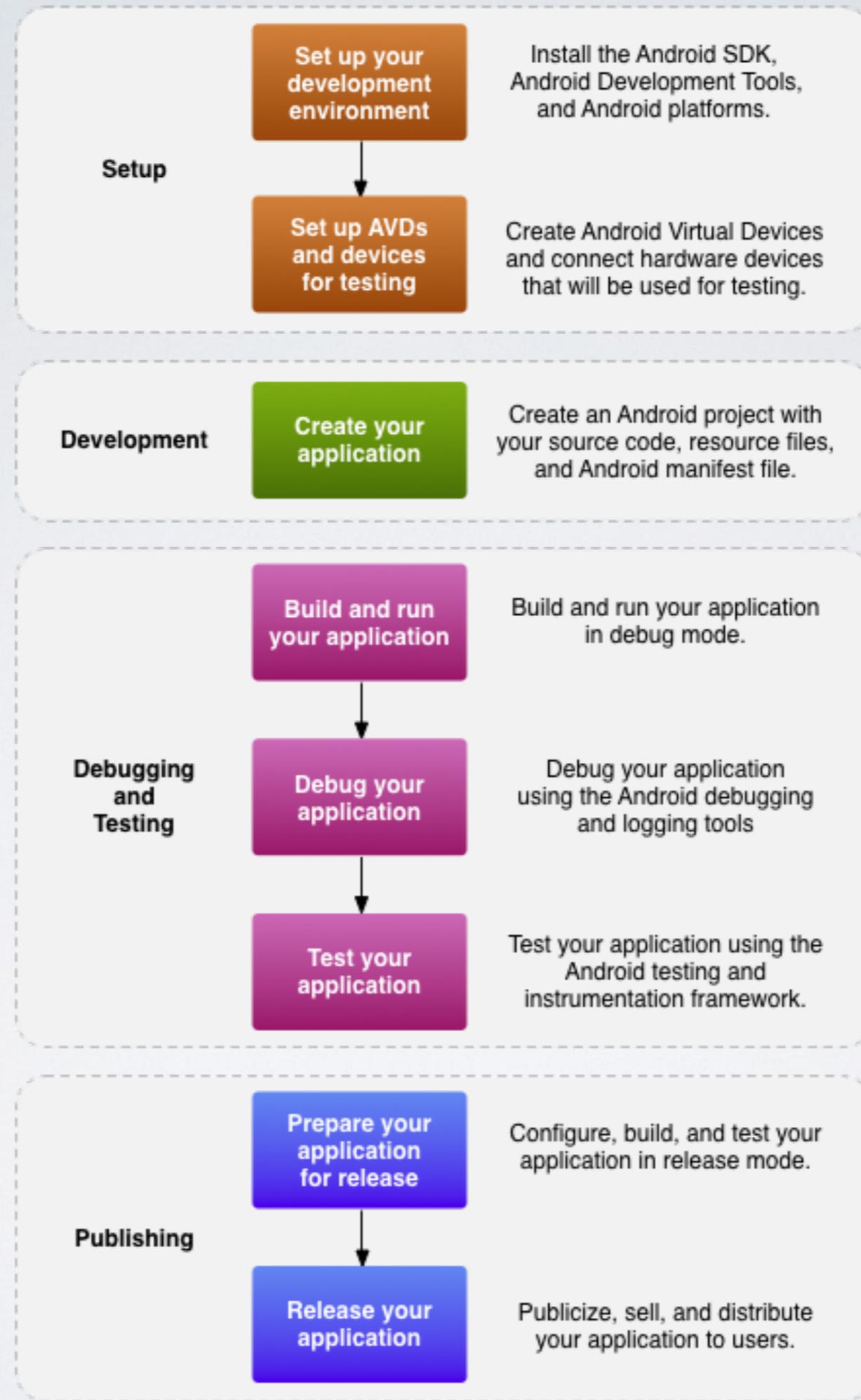
DEVELOPMENT ENVIRONMENT

Eclipse ADT Bundle, Android Studio, SDK Tools, Emulator, Debugging

BASIC

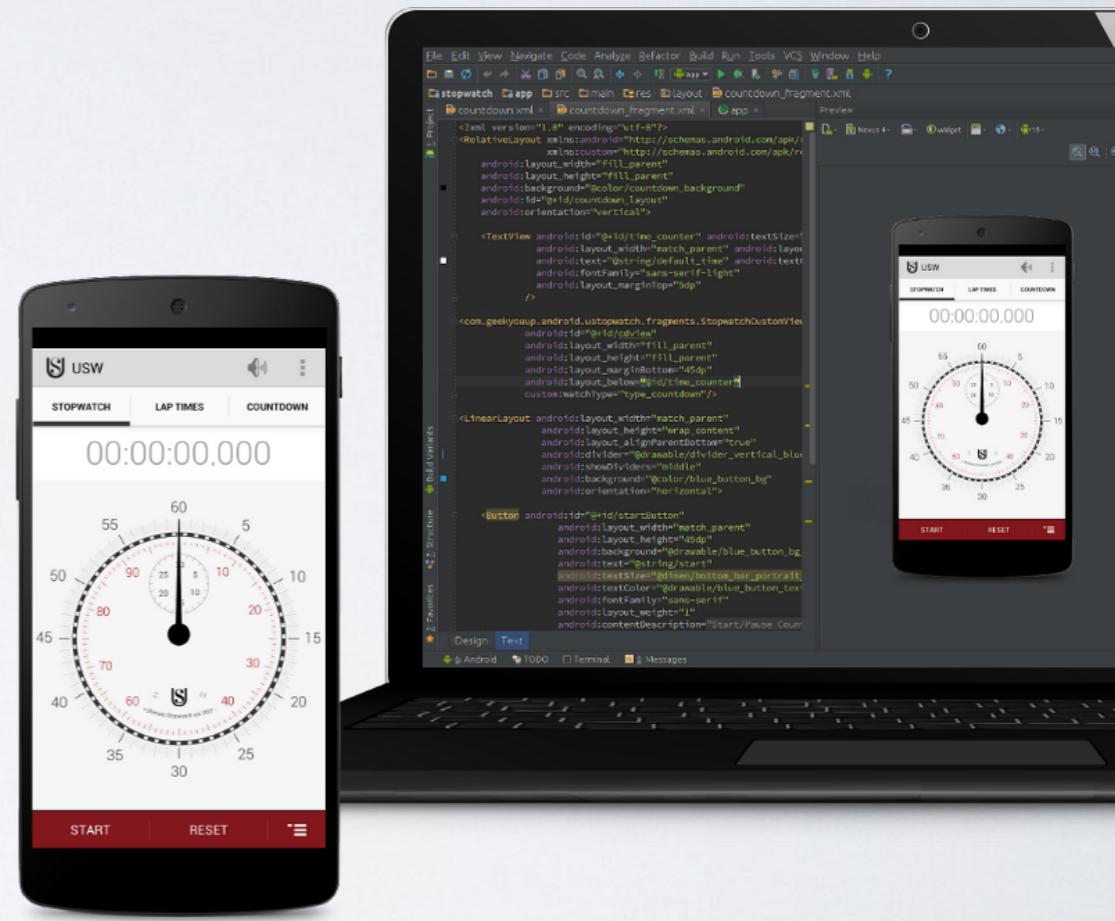
- JDK (<http://www.oracle.com/technetwork/java/javase/downloads/index.html>)
- Eclipse ADT (<http://developer.android.com/sdk/index.html>)
 - Eclipse + ADT Plugin
 - SDK: Platform, System Images etc.
 - tips: cross GFW, ipv6





ADVANCE

- Android Emulator
- Debugger
- **Dalvik Debug Monitor Service**
 - File Explorer + Logcat+ Traceview + Hierarchyview
- Android Studio, Support Library, NDK...





APPLICATION FUNDAMENTALS

components of an android application

APP COMPONENTS

Activities
Services
Content providers
Broadcast receivers

Apps are made from components
Android instantiates and runs them as needed
Each component has its own purpose and APIs

ACTIVITY

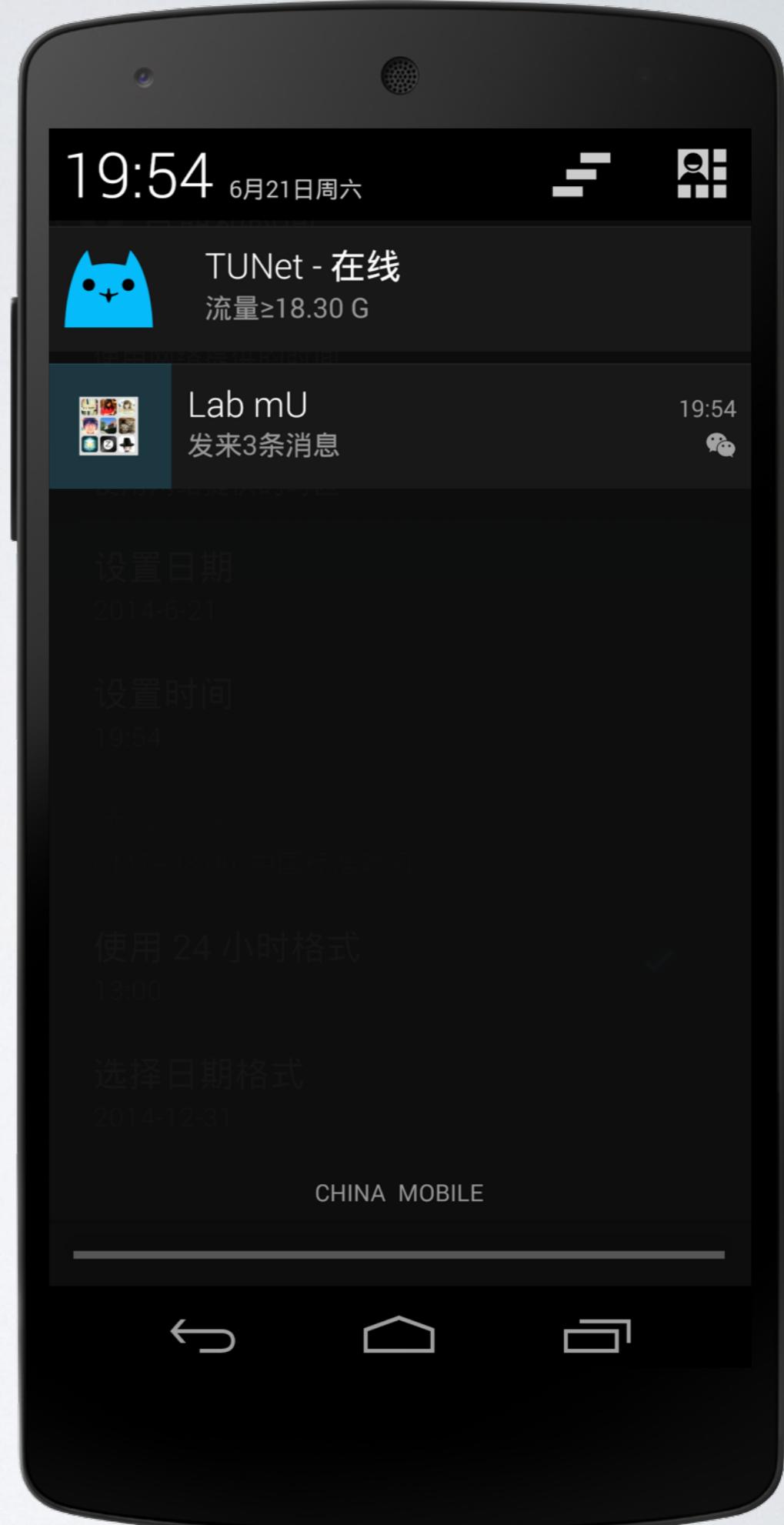
- Primary class for user interaction.
- Usually implements a single, focused task that the user can do.



SERVICE

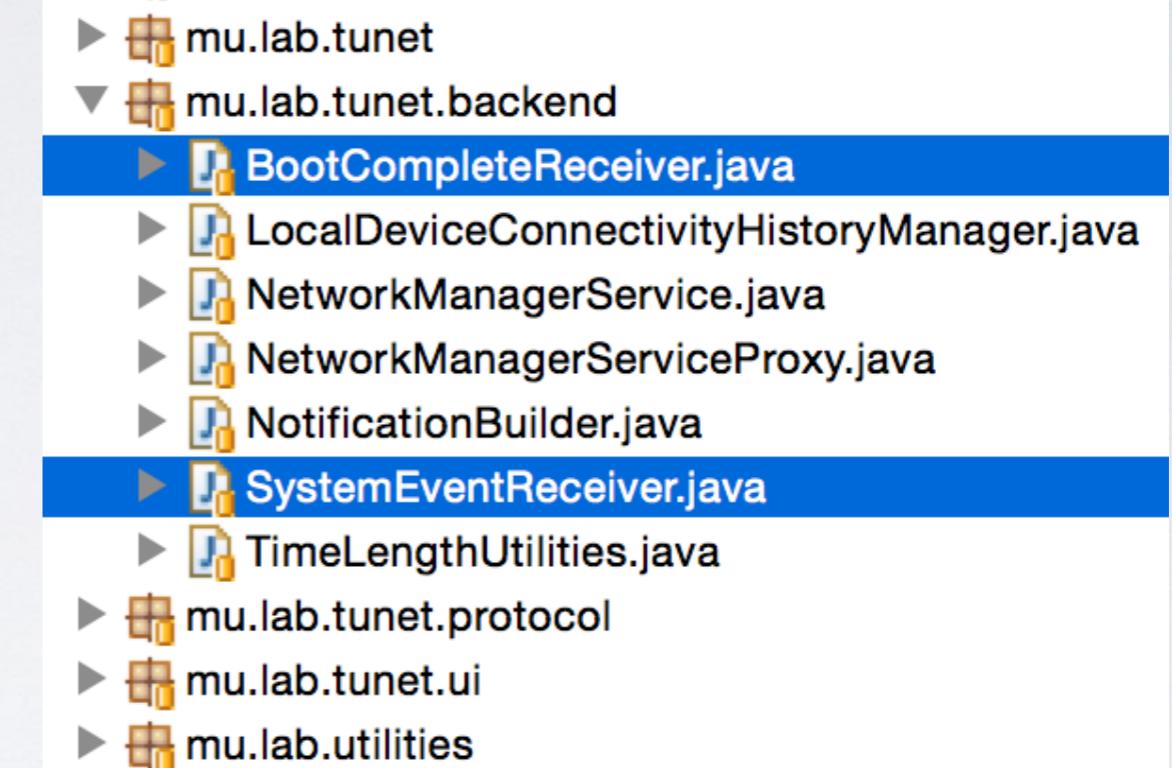
Runs in the background

- to perform long-running operations
- to support interaction with remote processes



BROADCAST RECEIVER

- Component that listens for and responds to broadcast events.
- The subscriber in publish/subscribe pattern.



CONTENT PROVIDERS

- Store & share data across applications
- Uses database-style interface
- Handles interprocess communication



MANIFEST FILE

- Declaring components
- Declaring component capabilities
- Declaring app requirements

TUNet Manifest

```
1 <?xml version="1.0" encoding="utf-8"?>
2<manifest xmlns:android="http://schemas.android.com/apk/res/android"
3   package="mu.lab.tunet"
4   android:versionCode="23"
5   android:versionName="1.3.1" >
6
7   <uses-sdk
8     android:minSdkVersion="9"
9     android:targetSdkVersion="20" />
10
11  <uses-permission android:name="android.permission.INTERNET" />
12  <uses-permission android:name="android.permission.ACCESS_WIFI_STATE" />
13  <uses-permission android:name="android.permission.ACCESS_NETWORK_STATE" />
14  <uses-permission android:name="android.permission.READ_PHONE_STATE" />
15  <uses-permission android:name="android.permission.READ_LOGS" />
16  <uses-permission android:name="android.permission.RECEIVE_BOOT_COMPLETED" />
17  <uses-permission android:name="android.permission.WRITE_EXTERNAL_STORAGE" />
18
19+    <application>
155
156  </manifest>
```

Manifest

Application

Permissions

Instrumentation

AndroidManifest.xml

```
19 ⊕ <application>
20     android:name="TUNetApplication"
21     android:allowBackup="true"
22     android:icon="@drawable/ic_launcher"
23     android:label="@string/app_name"
24     android:theme="@style/AppBaseTheme" >
25     <meta-data
26         android:name="UMENG_APPKEY"
27         android:value="[REDACTED]" />
28     <meta-data
29         android:name="UMENG_CHANNEL"
30         android:value="source_code" />
31
32 ⊕ <activity
33     android:name="mu.lab.tunet.ui.BootActivity"
34     android:label="@string/app_name"
35     android:screenOrientation="portrait" >
36     <intent-filter>
37         <action android:name="android.intent.action.MAIN" />
38
39         <category android:name="android.intent.category.LAUNCHER" />
40     </intent-filter>
41 </activity>
42 ⊕ <activity
43     android:name="mu.lab.tunet.ui.MainActivity"
44     android:launchMode="singleTask"
45     android:screenOrientation="portrait"
46     android:windowSoftInputMode="adjustPan" >
47     <meta-data
48         android:name="IS_CLOSED_BETA_VERSION"
49         android:value="false" />
50 </activity>
51 ⊕ <activity
52     android:name="mu.lab.tunet.ui.RouterClassificationActivity"
53     android:label="@string/NAT_dialog_title"
54     android:parentActivityName="mu.lab.tunet.ui.MainActivity"
55     android:screenOrientation="portrait" >
56     <meta-data
```

```
119     android:name="com.umeng.tb.ConversationActivity"
120     android:parentActivityName="mu.lab.tunet.ui.MainActivity"
121     android:screenOrientation="portrait" >
122     <meta-data
123         android:name="android.support.PARENT_ACTIVITY"
124         android:value="mu.lab.tunet.ui.MainActivity" />
125   </activity>
126   <activity
127     android:name="com.umeng.fb.ContactActivity"
128     android:screenOrientation="portrait" />
129   <activity
130     android:name="com.umeng.update.UpdateDialogActivity"
131     android:theme="@android:style/Theme.Translucent.NoTitleBar" >
132   </activity>
133   <activity
134     android:name="org.acra.CrashReportDialog"
135     android:excludeFromRecents="true"
136     android:finishOnTaskLaunch="true"
137     android:launchMode="singleInstance"
138     android:theme="@android:style/Theme.Dialog" />
139
140   <service
141     android:name="mu.lab.tunet.backend.NetworkManagerService"
142     android:stopWithTask="false" >
143   </service>
144   <service
145     android:name="com.umeng.update.net.DownloadingService"
146     android:process=":DownloadingService" >
147   </service>
148
149   <receiver android:name="mu.lab.tunet.backend.BootCompleteReceiver" >
150     <intent-filter>
151       <action android:name="android.intent.action.BOOT_COMPLETED" />
152     </intent-filter>
153   </receiver>
154 </application>
155
156 </manifest>
```

APP RESOURCES

- more than just code
- generate unique ID
 - mu.lab.tunet.R
 - R.drawable.ic_launcher
- allows alternative resources for different device configurations (based on qualifiers)

► android-support-v7-appcompat

▼ TUNet [TUNet master]

- third-party/acra-4.5.0
- third-party/jsoup-1.7.3
- Android 4.4W
- Android Private Libraries
- Android Dependencies
- src
- gen [Generated Java Files]
- bin
- libs
- res
- third-party
- AndroidManifest.xml
- ant.properties
- build.xml
- custom_rules.xml
- ic_launcher-web.png
- lint.xml
- proguard-project.txt
- project.properties
- umeng.properties

► res

- anim
- drawable
- drawable-hdpi
- drawable-ldpi
- drawable-mdpi
- drawable-xhdpi
- drawable-xxhdpi
- drawable-zh-xxhdpi
- layout
- layout-v9
- menu
- values
- values-sw600dp
- values-sw720dp-land
- values-zh



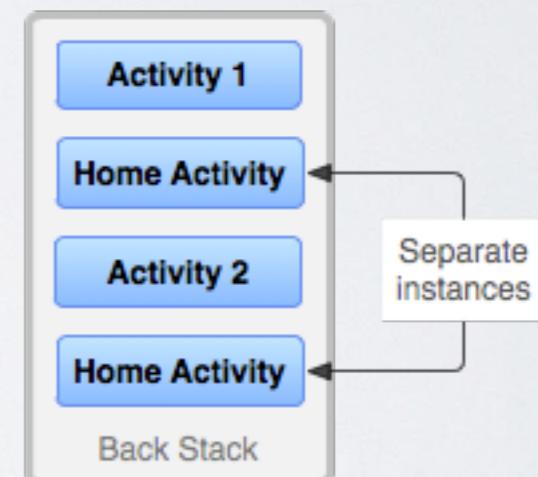
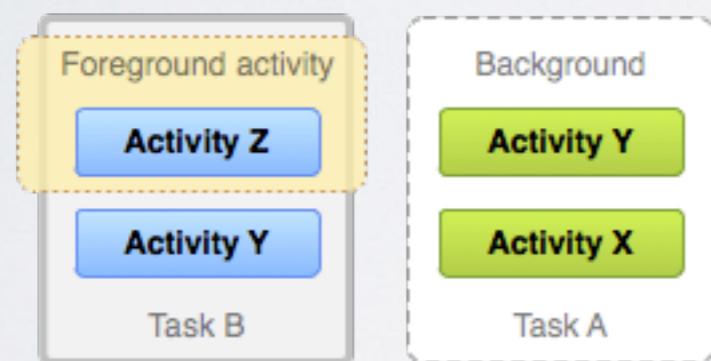
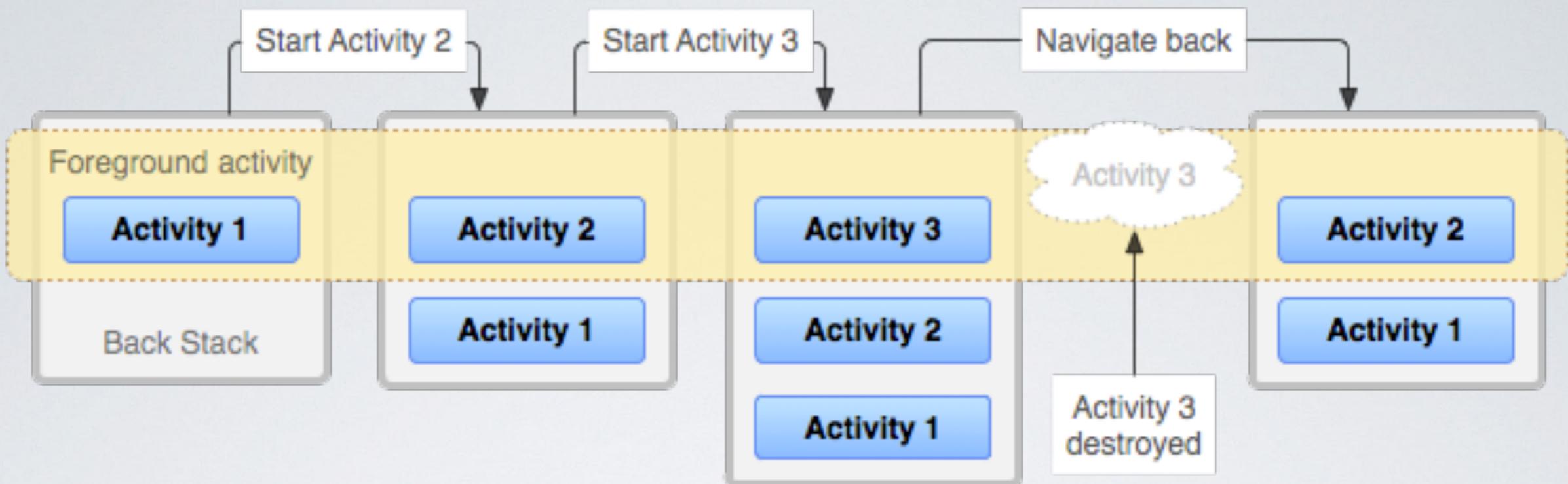
THE ACTIVITY CLASS

a single, focused thing that the user can do

- Activity provides a visual interface for user interaction.
- Each activity typically supports one focused thing a user can do.
- Applications often comprise several activities.
- e.g. mu.lab.tunet.ui.AboutActivity

NAVIGATION THROUGH ACTIVITIES

- Android supports navigation in several ways:
 - Tasks
 - The task back stack
 - Suspending & resuming activities



A Task is a set of related Activities
These related activities don't have to be part of the same application
Most tasks start at the home screen

When an Activity is launched, it goes on top of the backstack
When the Activity is destroyed, it is popped off the backstack

LIFE CYCLE

User behavior Android system

entire lifetime
visible
visible & in foreground

`onCreate: super.onCreate; set Activity's content view; retain ref to UI views; configure views.`

onRestart: <-> onStop()

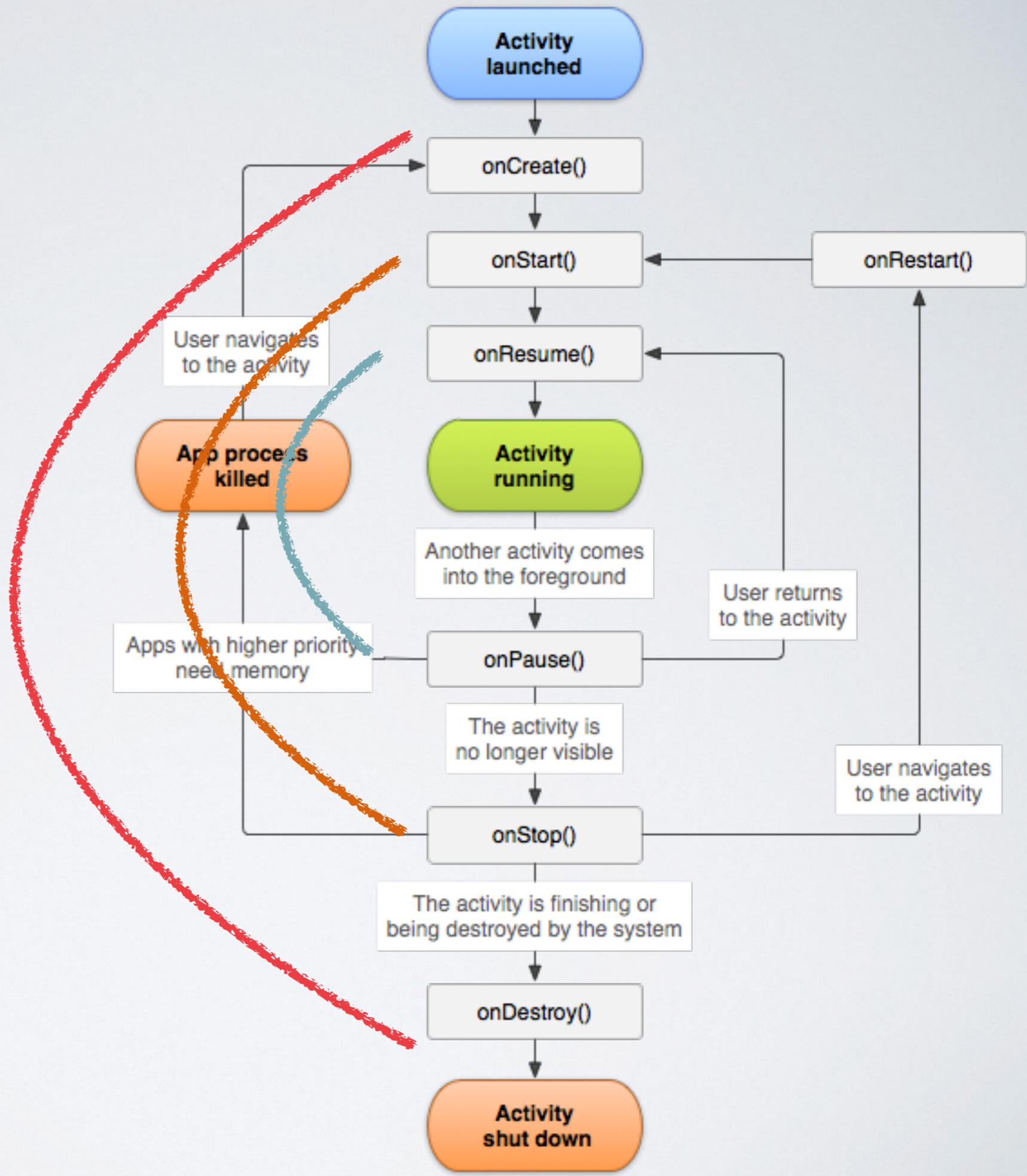
`onStart`: visible-only behaviors; load persistent application state.

onResume: foreground-only behaviors

onPause: shutdown foreground-only;
save persistent state.

onStop: cache state. MAY NOT BE CALLED when KILLED.

`onDestroy`: release activity resources.
MAY NOT BE CALLED

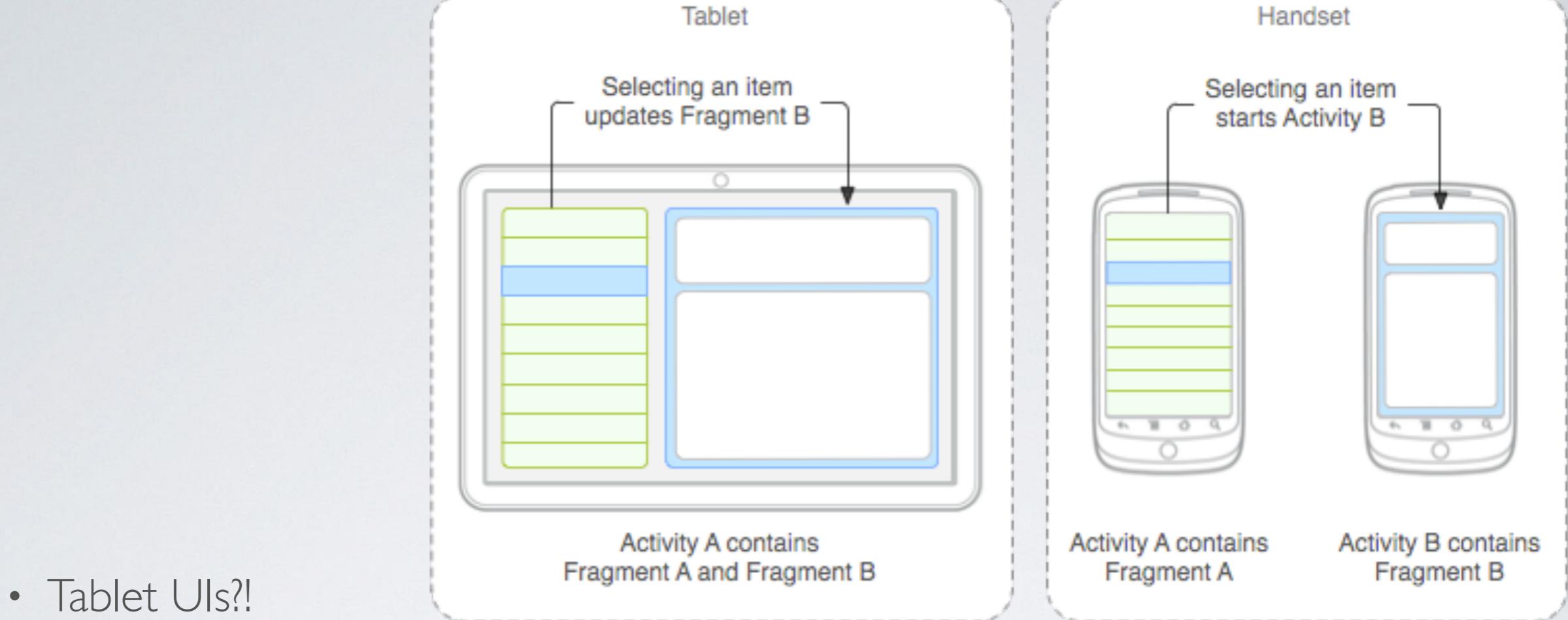


MORE ABOUT ACTIVITIES

- Starting activities (send intent via `startActivity()` or `startActivityForResult()`)
- Configuration changes (`onConfigurationChanged()`)
- Saving persistent state
- <http://developer.android.com/guide/components/activities.html>
- <http://developer.android.com/training/basics/activity-lifecycle/index.html>
- <http://developer.android.com/reference/android/app/Activity.html>



THE FRAGMENT CLASS



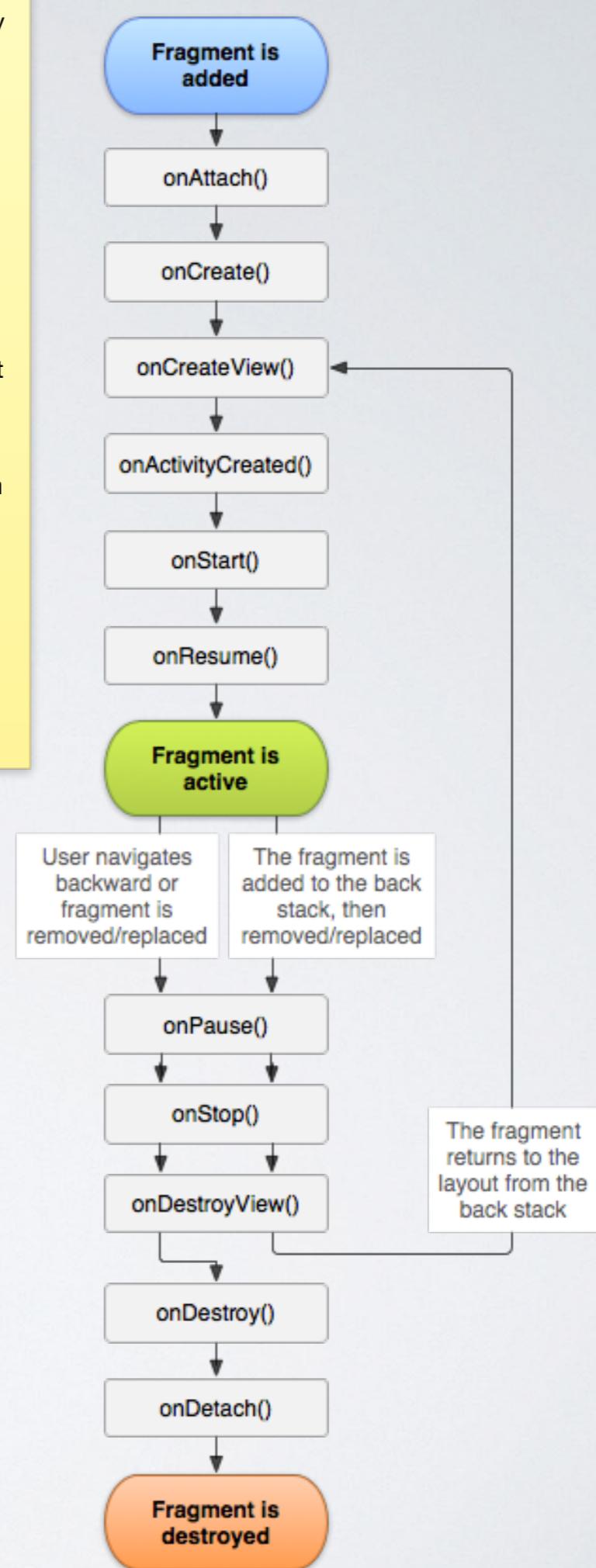
- Tablet UIs?!
 - They can support multiple UI panes / user behaviors at the same time
 - Fragment
 - Represents a behavior / portion of UI within an Activity
 - Multiple Fragments can be embedded in an Activity to create a multi-pane UI
 - A single Fragment can be reused across multiple Activities

LIFE CYCLE

Fragment lifecycle is coordinated with the lifecycle of its containing Activity.
Fragments have their own lifecycles and receive their own callbacks.

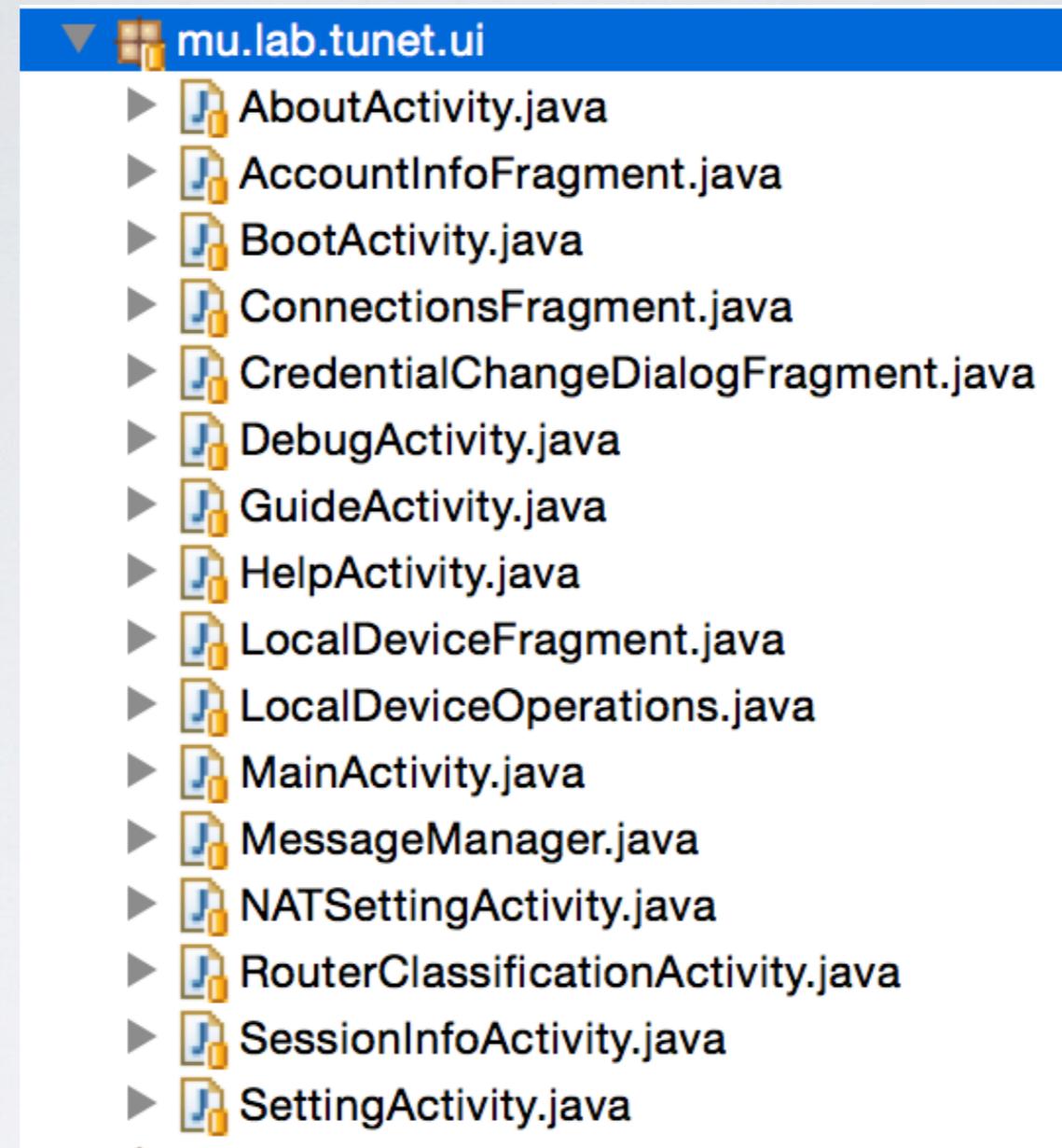
- * Fragment is first attached to its activity
- * Initialize the fragment
- * Fragment sets up & returns its user interface
- * Containing activity has completed `onCreate()` and the fragment has been installed
- * Hosting Activity about to become visible
- * Hosting Activity is about to become visible and ready for user interaction

- * Hosting Activity is visible, but does not have focus
- * Hosting Activity is no longer visible
- * View previously created by `onCreateView()` has been detached from the Activity —> Clean up view resources
- * Fragment is no longer in use —> Clean up fragment resources
- * Fragment no longer attached to its activity —> Null out ref to Hosting Activity



MORE ABOUT FRAGMENTS

- Add to Activities (statically in layout file / programmatically using FragmentManager), Dynamic Layout
 - Layout inflated/implemented in onCreateView()
 - FragmentManager, FragmentTransaction (begin, add, commit)
- Configuration Changes (setRetainInstance())
- <http://developer.android.com/guide/components/fragments.html>
- <http://developer.android.com/reference/android/app/Fragment.html>



USER INTERFACE CLASSES

VIEW

Button
ToggleButton
Checkbox
RatingBar
AutoCompleteTextView

- Key building block for UI components
- Occupy a rectangular space on screen
- Responsible for drawing themselves and for handling events

COMMON VIEW OPERATIONS

- Set visibility: show or hide view
- Set Checked state
- Set Listeners: Code that should be executed when specific events occur
- Set properties: opacity, background, rotation
- Manage input focus: allow view to take focus, request focus

Event SRC:

- * User interactions
- * System control

View Events usually Handled by
Listeners (numerous interfaces)

DISPLAYING VIEWS

- Views are organized in a Tree
- Displaying has multiple steps
- Measure – get dimensions of each View
- Layout – Position each View
- Draw – Draw each view

You can also override!

VIEWGROUP

RadioGroup
TimePicker
DatePicker
WebView
MapView
Gallery
Spinner

- An invisible View that contains other views
- Used for grouping & organizing a set of views
- Base class for view containers & layouts

ADAPTERS & ADAPTERVIEWS

- AdapterViews are views whose children and data are managed by an Adapter
- Adapter manages the data and provides data views to AdapterView
- AdapterView displays the data Views

ListView
Spinner
Gallery

LAYOUTS

LinearLayout
RelativeLayout
TableLayout
GridView

- A generic Viewgroup that defines a structure for the Views it contains

MENUS & ACTIONBAR

- Activities support menus
 - Options, Context, Submenu
- Activities can
 - Add items to a menu
 - handle clicks on the menu items
- Similar to Application Bar in many desktop applications
- Enables quick Access to common operations

DIALOGS

- Independent subwindows used by Activities to communicate with user

AlertDialog
ProgressDialog
DatePickerDialog
TimePickerDialog

MORE TO EXPLORE

- Intent class
 - <http://developer.android.com/guide/components/intents-filters.html>
- Permissions
 - <http://developer.android.com/guide/topics/security/permissions.html>
 - <http://developer.android.com/guide/topics/manifest/permission-element.html>

COURSERA



Programming Mobile Applications for Android Handheld Systems

¡Muchas Gracias!

<https://www.coursera.org/course/android>

by Dr. Adam Porter

PROJECT I

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

PROJECT II

- Usereg History
 - Traffic Graphs
 - Summary by IP
 - Summary by Mac
 - ...

入流量	出流量	IP	上线时间	下线时间	MAC
50.52M	12.85M	183.173.46.113	2014-10-24 12:59:56	2014-10-24 16:12:34	00:00:00:00:00:00
		59.66.82.190	2014-10-23 23:38:18	2014-10-24 13:11:02	00:00:00:00:00:00
89.77M	42.90M	101.5.89.107	2014-10-23 21:10:40	2014-10-23 22:45:57	00:00:00:00:00:00
		101.5.222.43	2014-10-23 19:18:42	2014-10-23 21:09:47	00:00:00:00:00:00
45.04M	31.53M	166.111.82.88	2014-10-23 14:04:05	2014-10-23 21:09:35	00:00:00:00:00:00
		59.66.81.244	2014-10-22 23:12:13	2014-10-23 14:28:14	00:00:00:00:00:00
167.65M	175.38M	59.66.77.100	2014-10-22 21:29:07	2014-10-22 23:12:27	00:00:00:00:00:00
		183.173.58.219	2014-10-22 19:13:18	2014-10-22 22:01:04	00:00:00:00:00:00
384.17M	36.75M	59.66.81.213	2014-10-22 15:01:46	2014-10-22 20:04:09	00:00:00:00:00:00
		183.173.37.94	2014-10-22 10:02:41	2014-10-22 13:20:12	00:00:00:00:00:00
154.75M	685.45M	59.66.81.227	2014-10-21 16:48:44	2014-10-22 10:43:04	
		101.5.219.91	2014-10-21 09:43:13	2014-10-21 12:35:05	
18.06M	1.83M	101.5.186.162	2014-10-21 08:03:10	2014-10-21 09:43:52	
6.56M	2.80M				
105.96M	23.25M				
12.58M	4.66M				
1.68G	80.44M				



REAL WORLD EXAMPLES