

Android



Application Development

A Tutorial Driven Course

Java



- Basic Java programming
 - Exceptions
 - Inner Class, Interface
- Advanced topics we will touch:
 - Java IO
 - Java Thread
 - Java Socket



Android Basics

Credit goes to Google!

Course Objectives



- Mobile Application Development (MAD)
- Intro to Android platform
- Platform architecture
- Application building blocks
- Development tools
- Textbook: Hello, Android

Few reasons to go MAD...



- Smart Phones
 - Internet access anywhere
 - Social networking
- Millions of mobile users
- Open standards

Introduction to Android



- Open software platform for mobile development
- A complete stack – OS, Middleware, Applications
- An Open Handset Alliance (OHA) project
- Powered by Linux operating system
- Fast application development in Java
- Open source under the Apache 2 license

APPLICATIONS

Home

Contacts

Phone

Browser

...

APPLICATION FRAMEWORK

Activity Manager

Window
Manager

Content
Providers

View
System

Package Manager

Telephony
Manager

Resource
Manager

Location
Manager

Notification
Manager

LIBRARIES

Surface Manager

Media
Framework

SQLite

OpenGL | ES

FreeType

WebKit

SGL

SSL

libc

ANDROID RUNTIME

Core Libraries

Dalvik Virtual
Machine

LINUX KERNEL

Display
Driver

Camera Driver

Flash Memory
Driver

Binder (IPC)
Driver

Keypad Driver

WiFi Driver

Audio
Drivers

Power
Management

Linux Kernel



- Works as a HAL
- Device drivers
- Memory management
- Process management
- Networking





Libraries

- C/C++ libraries
- Interface through Java
- Surface manager – Handling UI Windows
- 2D and 3D graphics
- Media codecs, SQLite, Browser engine



Android Runtime



- Dalvik VM
 - Dex files
 - Compact and efficient than class files
 - Limited memory and battery power
- Core Libraries
 - Java 5 Std edition
 - Collections, I/O etc...



Application Framework



- API interface
- Activity manager – manages application life cycle.

Applications



- Built in and user apps
- Can replace built in apps

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Application Building Blocks



- Activity
- IntentReceiver
- Service
- ContentProvider



Activities

- Typically correspond to one UI screen
- But, they can:
 - Be faceless
 - Be in a floating window
 - Return a value

IntentReceivers



- Components that respond to broadcast 'Intents'
- Way to respond to external notification or alarms
- Apps can invent and broadcast their own Intent

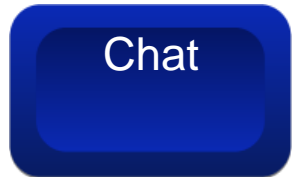
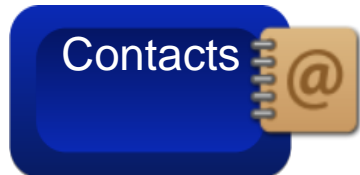


Intents

- Think of Intents as a verb and object; a description of what you want done
 - E.g. VIEW, CALL, PLAY etc..
- System matches Intent with Activity that can best provide the service
- Activities and IntentReceivers describe what Intents they can service



Intents



System picks best component for that action



"Pick photo"

Client component makes a request for a specific action

New components can use existing functionality

Services



- Faceless components that run in the background
 - E.g. music player, network download etc...

ContentProviders



- Enables sharing of data across applications
 - E.g. address book, photo gallery
- Provides uniform APIs for:
 - querying
 - delete, update and insert.
- Content is represented by URI and MIME type

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Development Tools



- Eclipse
- Android SDK 2.0 or higher
developer.android.com



The Emulator



- QEMU-based ARM emulator
- Runs the same image as the device
- Limitations:
 - No Camera support

Devices





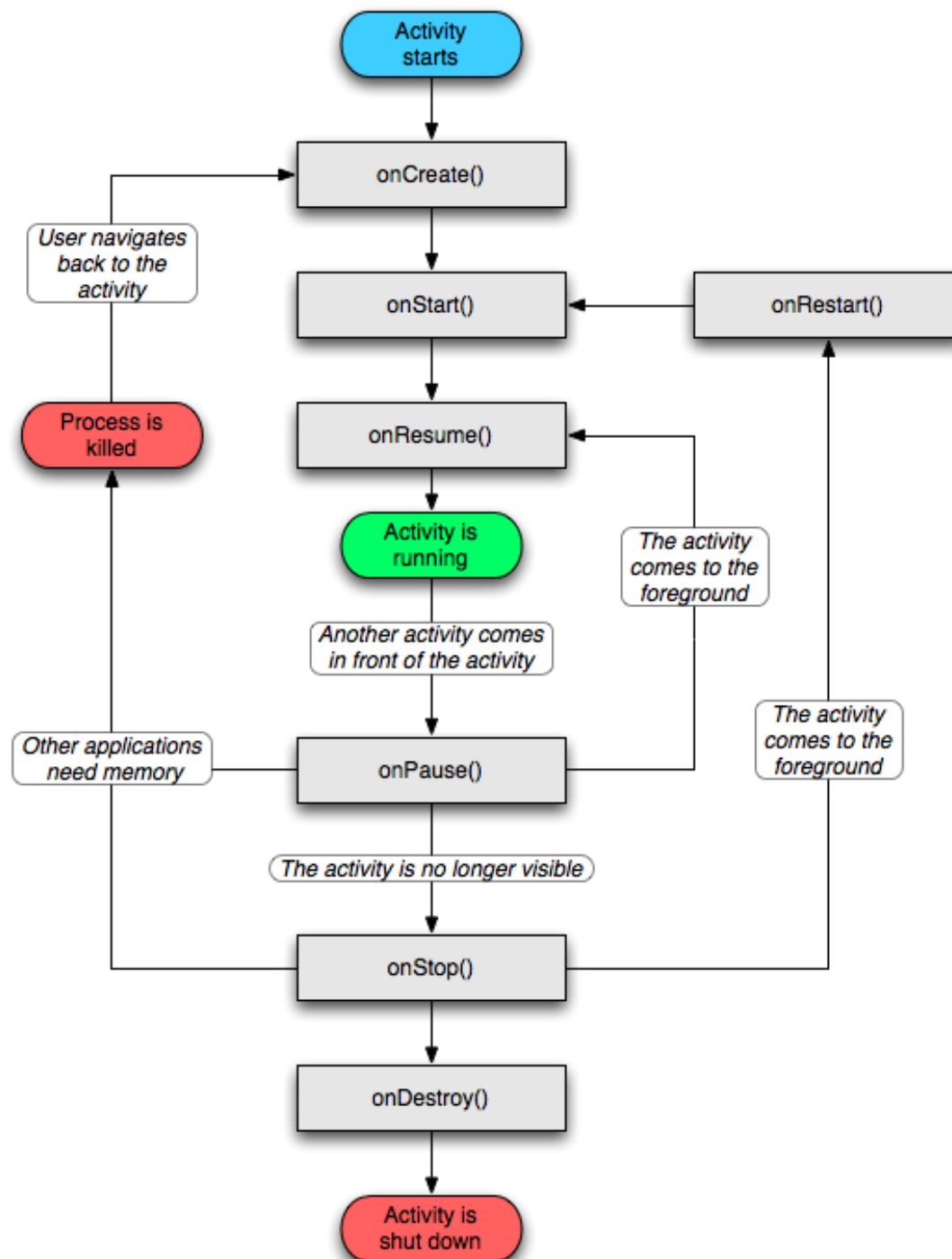
Hello World

- A great starting point:
<http://developer.android.com/guide/tutorials/hello-world.html>
- Generating UIs
 - Views – building blocks
 - E.g. TextView, EditText, Button
 - Placed into Layouts
 - E.g. LinearLayout, TableLayout, AbsoluteLayout

Application Lifecycle



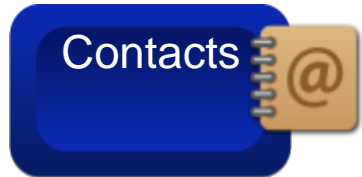
- Application run in their own processes (VM, PID)
- Processes are started and stopped as needed to run an application's components
- Processes may be killed to reclaim resources





Lifecycle

- System Process



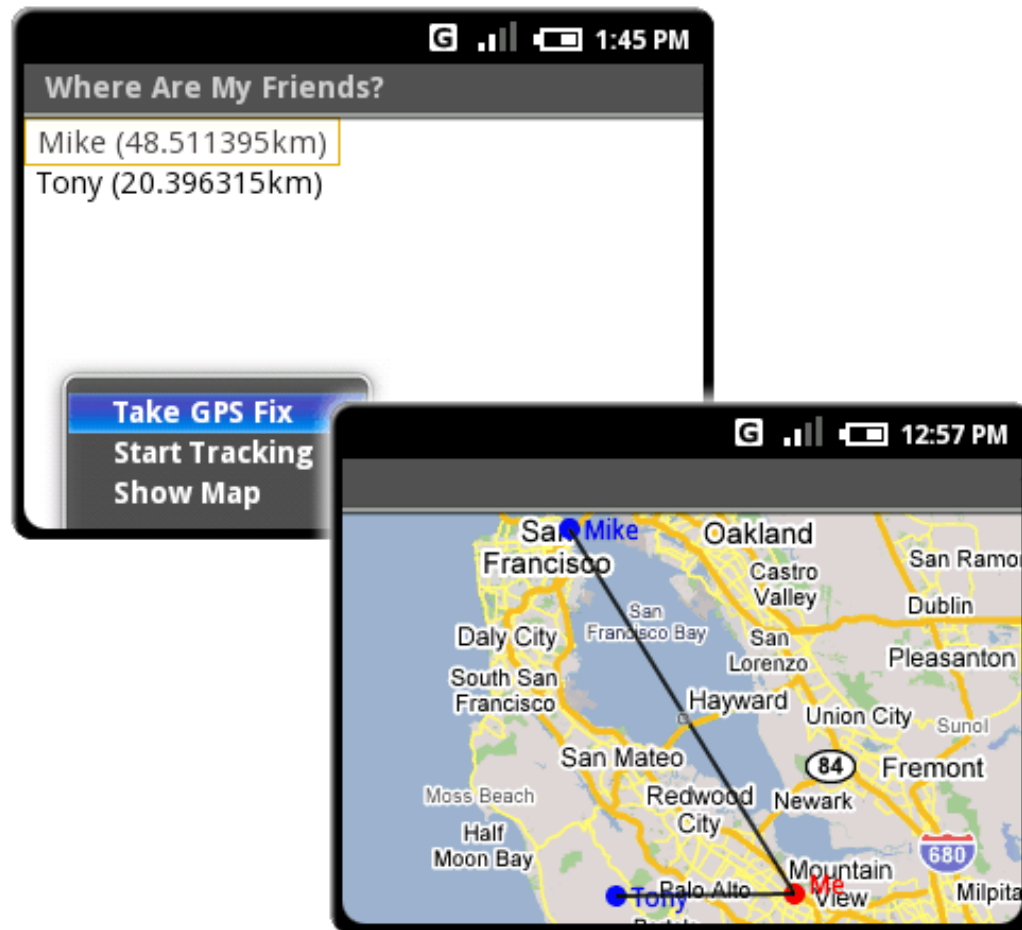
- Home

- Mail

- Map

- Browser

Location Manager

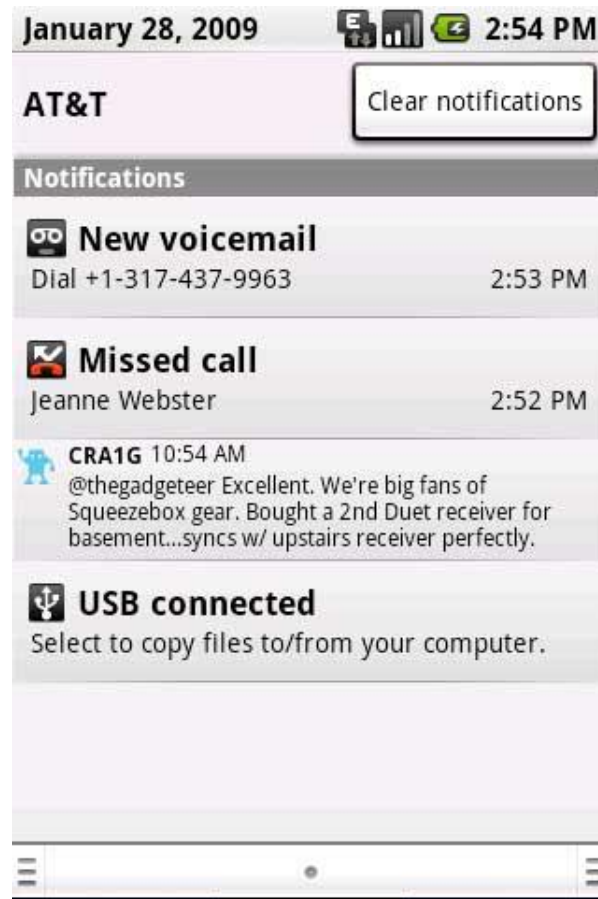


XMPP Services



- Allows any app to send device-to-device messages to other android users
- Data Messages are Intents with name/value pairs
- Works with any gmail account...
- Can also build servers to deliver server-to-device messages

Notification Manager

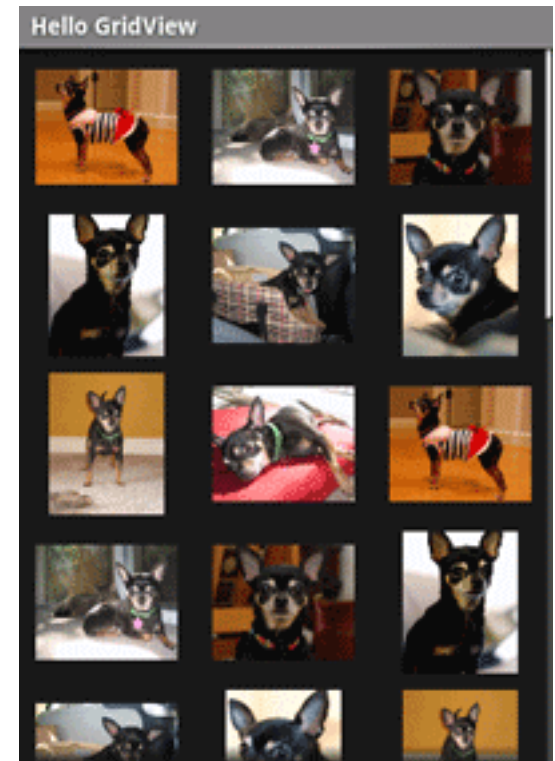
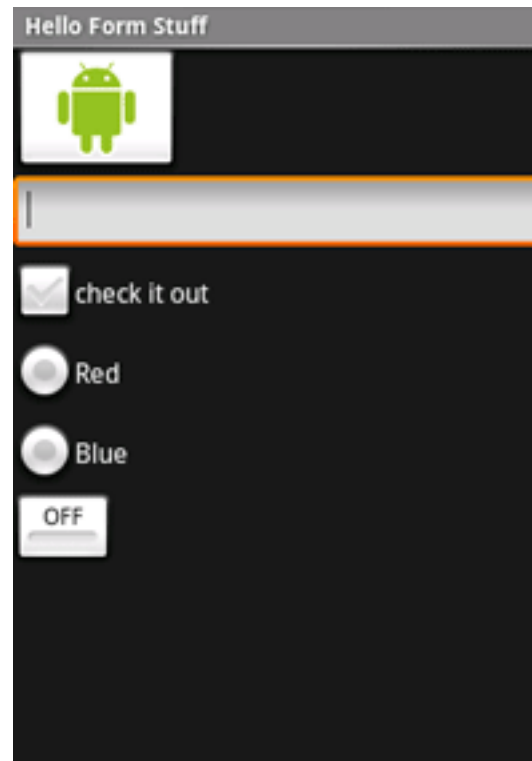
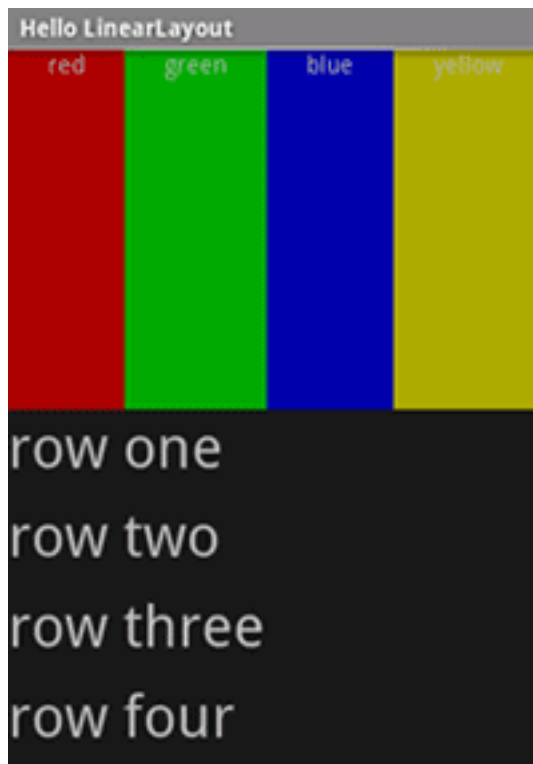


Notification Manager



- How background app interact with users
- Consistent notification presentation

Views



Views



Hello RelativeLayout

Type here:

Cancel OK

- Hello ListView
- American Samoa
 - El Salvador
 - Saint Helena
 - Saint Kitts and Nevis
 - Saint Lucia
 - Saint Pierre and Miquelon
 - Saint Vincent and the

Hello WebView

Home Gmail Calendar Reader More

[iGoogle](#)

Google™

Web [Images](#) [Local](#) [News](#)

Google Search

[Settings](#) [Terms](#)

View Google In: **Mobile** | [Classic](#)

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Location Manager



End of Lecture



- First task, install the SDK and Eclipse for instructions detailed in Assignment #1
- Will be performed in class as well.