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

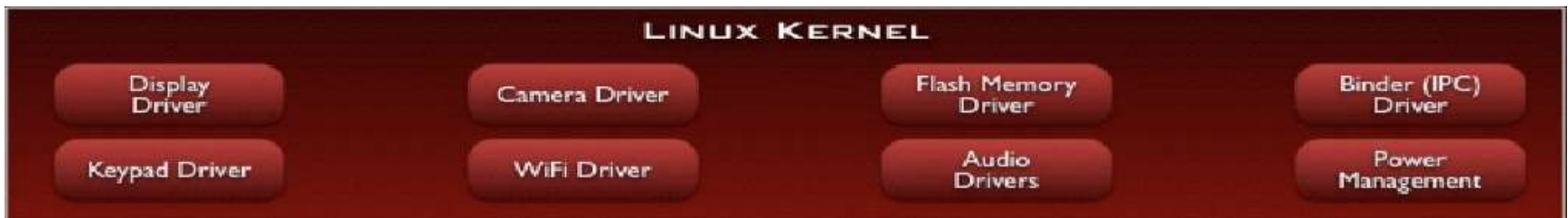| Display Driver	Camera Driver	Flash Memory Driver	Binder (IPC) Driver
Keypad Driver	WiFi Driver	Audio Drivers	Power Management

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

APPLICATION FRAMEWORK

| Activity Manager | Window Manager | Content Providers | View System |
| Package Manager | Telephony Manager | Resource Manager | Location Manager | Notification Manager |

- 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

Home

Contacts

GMail

Chat

Blogger

Photo Gallery

"Pick photo"

System picks best component for that action
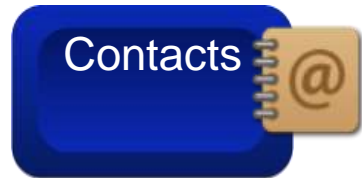
Client component makes a request for a specific action

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
  - Contacts
  - GMail

- 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…

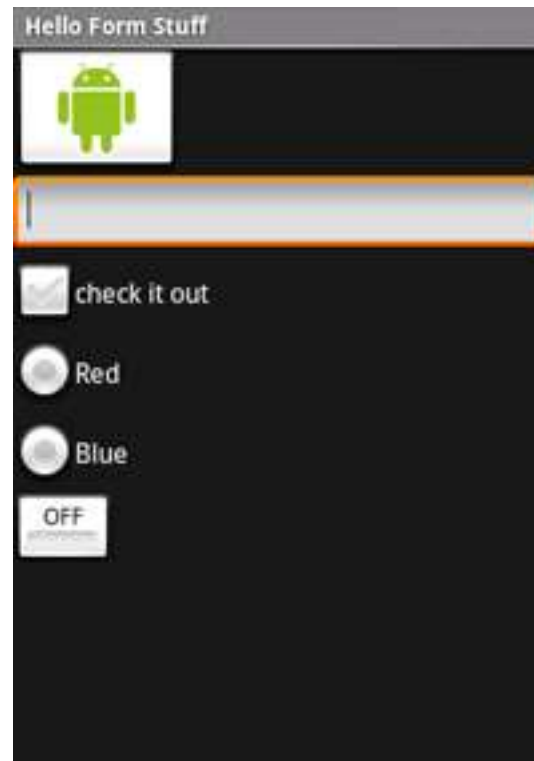- Can also build servers to deliver server-to-device messages

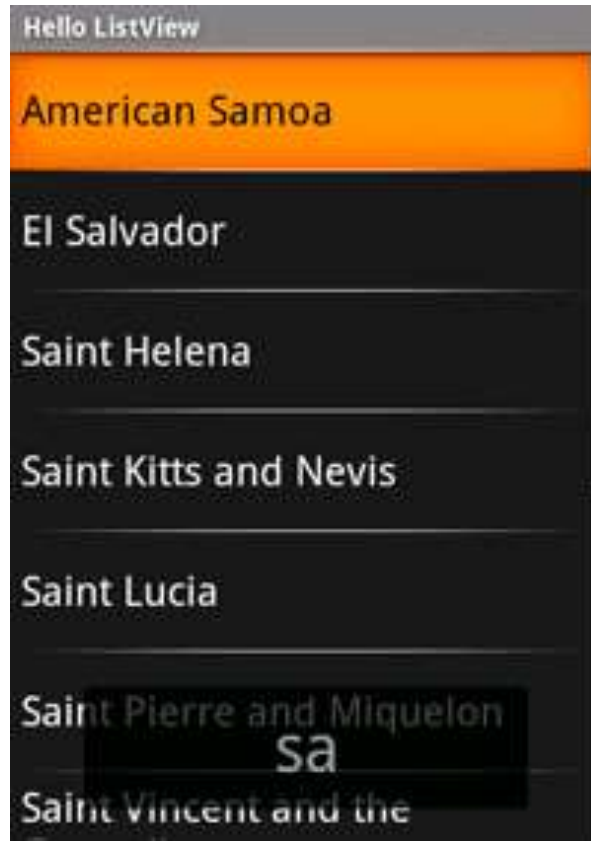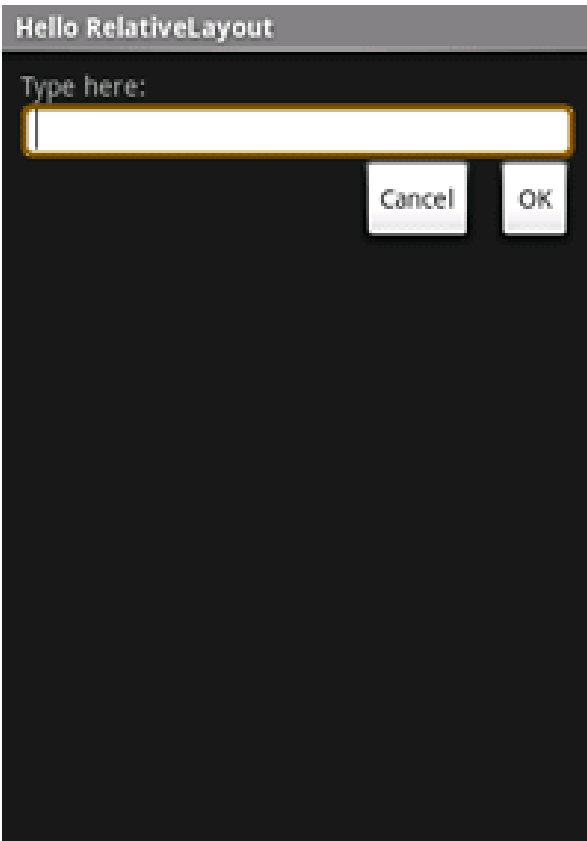# Notification Manager
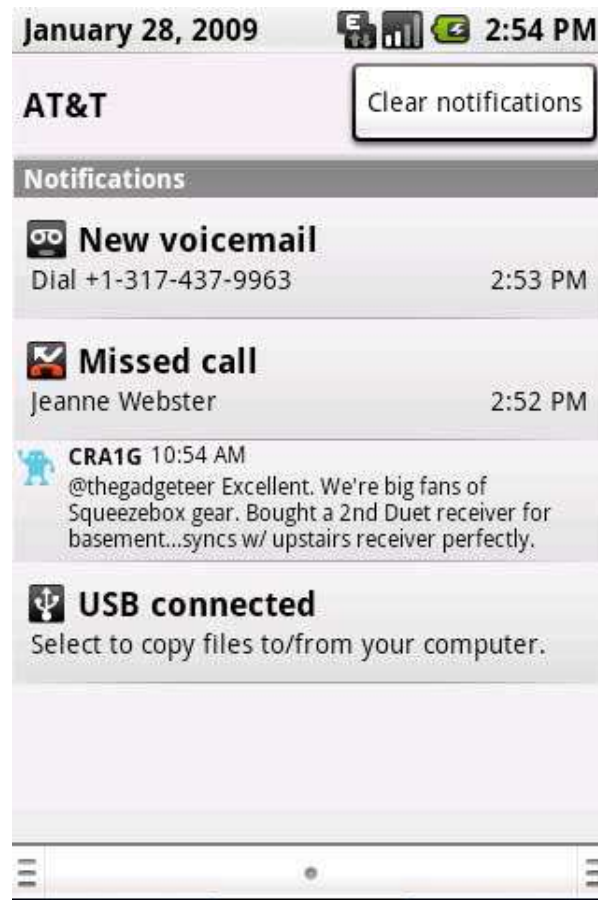
Notification Manager

- How background app interact with users

- Consistent notification presentation

Views

Views

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.