Mobile Application Development with ANDROID

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Agenda

• Mobile Application Development (MAD)
• Intro to Android platform
• Platform architecture
• Application building blocks
• Development tools
• Hello Android
• SAM
• Resources
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
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
Intent Receivers

- 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

Client component makes a request for a specific action.

System picks best component for that 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
  developer.android.com
The Emulator

- QEMU-based ARM emulator
- Runs the same image as the device

Limitations:
  - No Camera support
Devices
Hello World

• Generating UIs
  – Views – building blocks
  – E.g. TextView, EditText, Button
  – Placed into Layouts
  – E.g. LinearLayout, TableLayout, AbsoluteLayout
SAM Demo
Interesting things to do

• Android is open source
• Opportunities for researchers
• Get the source, compile and update the device image
References

• http://developer.android.com
• http://sites.google.com/site/io