Google Android

2008/3/10
NemusTech, Inc.
Lee Seung Min
Agenda

- Introduction
  - Mobile Platform Overview
  - Background: Current Linux Mobile Platform
  - What is Android?
    - Features
    - Architecture

- Technical Detail
  - Android SDK
  - Porting Android to Real Target
  - Future of Android
A conceptual model for mobile software

- Software Stack
  - **Kernel**
    - the core of the SW (HW drivers, memory, filesystem, and process management)
  - **Middleware**
    - The set of peripheral software libraries (messaging and communication engines, WAP renders, codecs, etc)
  - **Application Execution Environment**
    - An application manager and set APIs
  - **UI framework**
    - A set of graphic components and an interaction framework
  - **Application Suite**
    - The set of core handset application (IDLE screen, dialer, menu screen, contacts, calendar, etc)

**Diagram**

- **Hardware**
  - **Third party applications**
  - **Application Suite**
    - e.g. Oiigo, Jataaya, Access
  - **User Interface Framework**
    - e.g. GTK+, minGUI, Trolltech Qtopia, TAT, Digital Airways, MSX
  - **Application Execution Environment**
    - e.g. Java, Adobe Flash Lite, Openwave MIDAS, Trolltech Qtopia, Qualcomm BREW, .NET Compact Framework
  - **Middleware**
    - e.g. OpenPlug, SKY MobileMedia, Real, Gstreamer, mformation
  - **Kernel and Hardware Drivers**
    - e.g. Nucleus, MontaVista Moblin, Wind River, Qualcomm AMSS/REX, Symbian OS, ENEA OSE
  - **Hardware platform**
    - e.g. TI, Marvell (Intel), Infineon, Qualcomm, Freescale, Philips, Skyworks

Source: VisionMobile
Mobile Platforms

- Feature Phone
  - Vendor Platform: Mocha, PDK, WAVE, WISE, KX, etc......
  - Carrier Platform: SKTelecom TPAK, NTT i-Mode (WAP), Java, WIPI, BREW, etc......
  - 3rd Party Solution: TAT Cascade, Qualcomm uiOne

- Smart Phone
  - MicroSoft Windows Mobile
  - Nokia: Symbian, Series 60
  - Apple, iPhone – OSX 10.5 Leopard
  - Linux
Customers & Licensees

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Not all customers or licensees are shown

Source: Vendor data
Current Linux Mobile Platforms

- **LiMo Foundation**
  - [https://www.limofoundation.org/sf/sfmain/do/home](https://www.limofoundation.org/sf/sfmain/do/home)

- **TrollTech**
  - Qtopia GreenPhone
  - Acquired by Nokia

- **OpenMoko**: GNU/Linux based software development platform
  - Linux Kernel, GUI using X. Org Server, GTK+, Matchbox window manager
  - First Supported phone, Neo1973 (also support Qtopia)

- **ALP (Access Linux Platform)**
  - [http://alp.access-company.com/](http://alp.access-company.com/)

- **Nokia N810 – Maemo**
  - [http://maemo.org/](http://maemo.org/)
  - Exploring the technical details of N810

- **MontaVista – Mobilinux**

- **Google – OHA, Android OS**
  - Android: A complete set of SW for mobile devices
    - Operation System, Middleware, and Key mobile applications
Linux for mobile handsets

- Benefits
  - Linux is designed to avoid single-vendor domination
  - The Linux kernel has been ported to more than a dozen chipsets
  - Linux is cheap and open to innovation
  - Technically competent and cost-effective for converged devices
  - Several governments (most notably China) support Linux

- Challenges
  - The Linux kernel is optimized for desktop and embedded
  - Distribution lack the feature set requested by network operators (except Vodafone?)
  - No consensus on Linux’s APIs
  - Mitigating legal challenges
Google – OHA

open handset alliance
What is Android?

- **Android** is......
  - a software stack for mobile devices
  - that includes an operating system, middleware and key applications.
  - developing applications...
    - using the Java programming language.

**History**
- 2001 search service for wireless device
- 2005
  - Acquire Android (Andy Rubin : Danger CEO, Development Sidekick of T-Mobile)
  - Acquire Skia (2D Graphics for mobile device)
  - Acquire RegWireless (Browser and Email for mobile device)
  - Move Engineers from PalmSource (Dianne Hackborn, etc...)
- 2007.11 Android SDK Release, OHA
- 2008. 1H Android Developer Challenge
- 2008. 2H Android Phone
Features

- Application Framework
  - Enable reuse and replacement of components
- Dalvik Virtual Machine
  - Optimized for mobile device
- Integrated Browser
  - Based on the open source WebKit engine
- Optimized Graphics
  - Powered by a custom 2D/3D graphics
- SQLite
  - For structured data storage
- Media Support
  - For common audio, video, image formats (MPEG4,H.264,MP3,AAC,AMR,JPG,PNG,GIF)
- GSM Telephony
  - (hardware dependent)
- Bluetooth, EDGE, 3G, and WiFi
  - (hardware dependent)
- Camera, GPS, compass, and accelerometer
  - (hardware dependent)
- Rich Development Environment
  - Device emulator, Debugging Tools, Memory/Performance Profiling, Plugin for the Eclipse IDE
Android Architecture
Android Runtime

- Core Libraries
  - Provides the functionality of the Java Programming Language
  - Android Application runs in its own process, with its own instance of the Dalvik virtual machine
  - Dalvik VM: Java based license free VM
    - Register based VM, optimization for low memory requirements
    - Executes files in the Dalvik Executable (.dex) format
    - DX tool converts classes to .dex format

- Why Dalvik, Why Java?
  - Separate HW layer/ SW layer
    - Kernel is responsible for Security
  - Allow Multiple VM instance
  - To insure compatibility
    - Support different HWs (LCD, Keypad, ...etc)
  - Avoid License Issues
Architecture in detail

- **The Design goal of Android – Openness**
  - Be as flexible as possible
  - How it handles access to data (Mashups on the internet and everything else)
  - Rapid development (XML, Java)

- **IPC/Data Sharing Method**
  - **AIDL** (Android Interface Definition Language)
    - COM/CORBA like IDL ↔ Binder
  - SQLite
  - Content Provider
  - FileSystem

- **Dev Language?**
  - App: Java
  - Framework: Java
  - Libraries: C/C++
  - OS & Driver: C

- **Creating Native C Applications**
  - Possible, but not supported
Views Sample
Android SDK

- **Tools**
  - Emulator: QEMU 0.8.2 + libSDL 1.2.12
    - Provide emulator console, telephony emulation, skins
  - DDMS (Dalvik Debug Monitor Service)
    - Thread/Heap/Process/Log Monitor
    - File Explorer
  - ADB Shell
  - Logcat, Android Log, Traceview
- **Samples/Docs**
- **System and Software Requirements**
  - Supported Operating Systems
    - Windows XP/Vista
    - Mac OS X 10.4.8 or later (x86 only)
    - Linux (tested on Linux Ubuntu Dapper Drake)
  - Supported Development Environments
    - Eclipse IDE
      - Eclipse 3.2,3.3 (Europa)
      - Eclipse JDT Plugin
      - JDK 5 or JDK 6
      - ADT (Android Development Tools plugin), optional
    - Other IDEs
      - JDK 5 or JDK 6
      - Apache Ant
    - GCJ (Gnu compiler for Java) not compatible
Porting Android to Real Target

- **Board Spec.**
  - Acumen Evaluation Board
  - CPU: PXA270 (ARMv5 based)
  - RAM: 128MB
  - NAND: 32MB

- **Porting Procedure**
  - Make file system image
    - Ramfs (rootfs), yaffs2 system, data image
  - Linux 2.6.23.8 porting (make android patch)
    - EABI(Embedded Application Binary Interface) Support
    - OpenBinder (google added)
  - Device Driver Setting
    - FrameBuffer
    - Keyboard
    - TouchScreen
    - Network
  - Tune scripts and settings
  - Porting Tools
    - strace, busybox, log, network, /init
Future of Android

- Business model
  - Organize the world's information and make it universally accessible and relevant
  - No direct-advertising component in the platform
  - Search and Advertisement (Network+Desktop → Mobile+Phone)
  - Will NOT make A gPhone
  - Google 700Mhz bid?

- A broad developer community
  - ASL (Apache Software License)
  - Linux Kernel is licensed under GPLv2

- Developer Challenge
  - $10 million in awards
    - Challenge I : Emulator Version (Jan 2, 2008~)
    - Challenge II : Handset Version (The second half of 2008)
  - Opened Project (~12/12)
    - Social Network (with 2d&3d animation)
    - FPS : Wi-Fi Army
    - Location Search : with google map
    - Drive By Ad. : Location base Ad.
    - Car Navigation
    - Mobile Shopping
    - Ebook with full text index : google phone search?

- Location Base!
  - Almost Location Base Service except ebook, Social Network (over 80%)
  - Small group is discussing game/PDA apps
Mash Up

- **Mash-up**
  - New service with existing information
  - Not supported directly yet

- **Source**
  - Google: [www.google.com](http://www.google.com)
    - ride finder
    - maps: street view
    - search by location
    - video & youtube
    - mash-up editor
    - gtalk
  - GoogleMobile: [www.google.com/m](http://www.google.com/m)
    - gmail
    - calendar
    - notebook
    - docs
    - reader
    - picasaweb
  - 3rd Party?

- **Android**
  - H/W Support
    - GPS Location
    - Compass Direction Sensor
    - Accelerometer
    - Camera(Still/Video)
  - Network Support
    - GPRS
    - 700MHz W–MAN
    - Wi-Fi
  - Intent
    - Access Service via URL
  - XMPP
    - Google Instant Message
Mash Up Example