Android - open source mobile platform

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overview

1. Android - the platform
2. G1 - the first hardware
3. Phone - the user experience
4. SDK - the developer perspective
5. Summary

Disclaimer:

I am working as a sysadmin for Google. I am not involved with the Android project. However, I am an enthusiastic Android user.

Open Handset Alliance

- alliance of mobile operators and handset manufacturers
- http://openhandsetalliance.com/
- Building a better phone for consumers
- Innovating in the open
- Android delivers the software stack

Android - overview

- a complete mobile software stack:
  - kernel (OS, hardware support, ...)
  - middleware (user interface, communications, storage, ...)
  - applications (dialer, contacts, browser, ...)
- easily extendable via 3rd party applications
- an open mobile platform
  - All applications are created equal.
  - Fast & easy application development.
  - Breaking down application boundaries.
- open source platfrom (mostly Apache 2.0 license)
- platform supports wide array of features, individual devices however may vary (depending on manufacturer, network)

feature checklist - hardware

- standard USB interface, including USB 2.0
- Bluetooth 2.0 EDR
- Camera for still image & video capture
- HVGA display (480x320), 16 bit color depth, touch screen
- QWERTY keyboard, extra buttons (call, camera, . . .)
- audio out via headphone jack
- GPS
- additional sensors (accelerometer, compass)
- removable storage

feature checklist - communications

- radio support: GPRS, EDGE, GSM, UMTS, HSDPA
- SMS, MMS
- international roaming
- emergency calls
- supplementary services (e.g. call waiting, conference calls)
- 802.11 b/g Wi-Fi
- support for TCP/IP

feature checklist - software environment

- Linux kernel and (reduced) user land
- Dalvik VM optimized for mobile devices
- optimized 2D graphics, OpenGL ES 1.0 for 3D graphics
- SQLite for structured storage
- media support: MPEG4, H.264, MP3, AAC, AMR, JPG, PNG, GIF
- Webkit based browser integrated
- email client: POP3, IMAP4, SMTP
- rich set of preinstalled applications
- user installable 3rd party applications via Android Market

HTC G1 - the first Android phone

- Qualcomm MSM7210A @ 528 MHz
- 256MB ROM / 192MB RAM
- Quad-band GSM/GPRS/EDGE
- Dual-band UMTS/HSDPA (3G)
- Full HSDPA (7.2 MBit/s ↓, 2 MBit/s ↑)
- WiFi 802.11 b/g
- Bluetooth 2.0 with EDR
- GPS capabilities
- 3.2-inch touchscreen @ 320 x 480 (HVGA)
- 3.2-megapixel camera
- microSD memory card (SD 2.0 compatible)
- Digital Compass, Motion Sensor
- Lithium-ion battery: 1150 mAh

HTC G1 ... continued

- also known as the HTC Dream
- first introduced in USA and UK
- now available in Germany, Austria, Singapore, Australia, ...
- branding (e.g. Amazon MP3 store in USA)
- localizations (e.g. QWERTZ keyboard in Germany)
- Android Dev Phone 1: fully unlocked (SIM-lock, root) G1

Android phone out of the box

- requires Google Account for all features (Google services)
- Google services well integrated: Calendar, Mail, Talk, Maps (including Street View), Youtube
- preinstalled applications:
  - Google Services (see above)
  - phone applications: contacts, dialer
  - media applications: music & media player, camera app
  - browser, email client
  - Android Market
  - ...
- easy installation of 3rd party applications via Android Market
- "connected phone" - data contract strongly recommended

Additional applications

- available via Android market (over the air from the phone)
- a lot of free applications, paid applications started in USA, UK
- both applications and games
- various very good & useful applications
- both "conventional" applications & extensions of the system:
  - e.g. SnapPhoto as a better camera application
  - e.g. PhotoBeam extends "Share Pictures" with upload

Google services integration

- Google Mail syncs mail to the phone
- read & write mail on the phone
- Google Calendar syncs between calendar & phone
- Google Talk: reachable for IM on the phone
- address book synced between phone and Google Mail
- sync in background, notification for IM, Mail, Calendar
- Youtube on the phone

development overview

- programming language for Android applications: Java
- no C or C++ – Android API only available via Java
- Dalvik VM on device, optimized for mobile systems
- Android SDK 1.1 available for Windows, Mac OS X, Linux
- SDK and documentation available for free
- SDK integrated with Eclipse, usable without it as well
- Android device emulator part of SDK
- extensive online documentation
- Android Developer Phone 1:
  - fully unlocked developer phone (SIM, root)
  - for registered developers, USD 399

application model

- each application runs in its own process and own VM
- Dalvik VM optimizes memory usage (page sharing, . . .)
- unique uid per application, application files are private
- but: mechanism for for data sharing exist
- applications can also extend existing functionality
- applications consist of well defined components

application components

- **activity**: visual user interface for one focused endeavour
  - example: music player control panel, media file selector
- **service**: runs in background, no user interface
  - example: play music in background
- **broadcast receiver**: listen for broadcast messages
  - example: low battery message
- **content provider**: make application data available to other applications, with standard syntax and result access
  - example: access to contact list entries

application lifecycle

- processes subject to GC, can be killed under memory pressure
- priority for survival:
  1. foreground (activity visible, interacting with user)
  2. visible (activity visible to user)
  3. service
  4. background (activity stopped, no interaction, not visible)
  5. empty (precreated to speed up application start or exited)
- intention: minimize user visible impact
- applications should be restartable, keep live state

Android Market

- user access via Market application on device
- howto publish applications to Android users:
  - register as developer (one time USD 25)
  - upload & publish
  - currently free applications globally
  - paid applications coming, currently USA and UK
  - payments handled via Google Checkout

Summary

- complete software stack for mobile devices
- platform under Open Source licenses
- well integrated with Google services
- easily available 3rd party software
- freely available SDK

URLs

- Open Handset Alliance
  http://www.openhandsetalliance.com/
- Android Developer http://developer.android.com/
- Android Source http://android.git.kernel.org/
- HTC http://www.htc.com/

Acknowledgements

- Android image from Android developer website
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- Android developer website

Questions?

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