



An Introduction to Android

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Outline

- Background
- What is Android?
- Development for Android

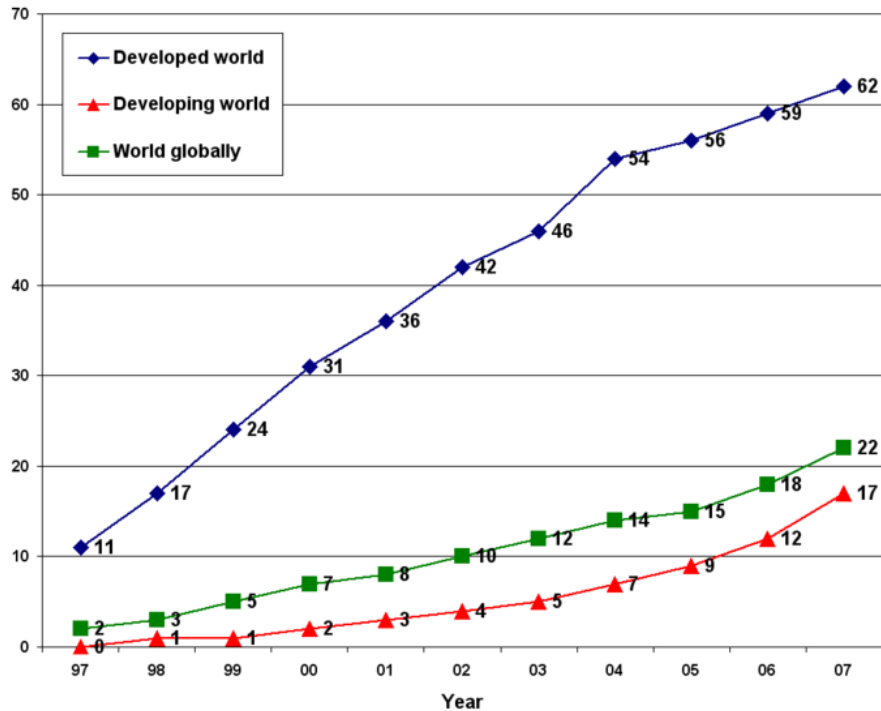




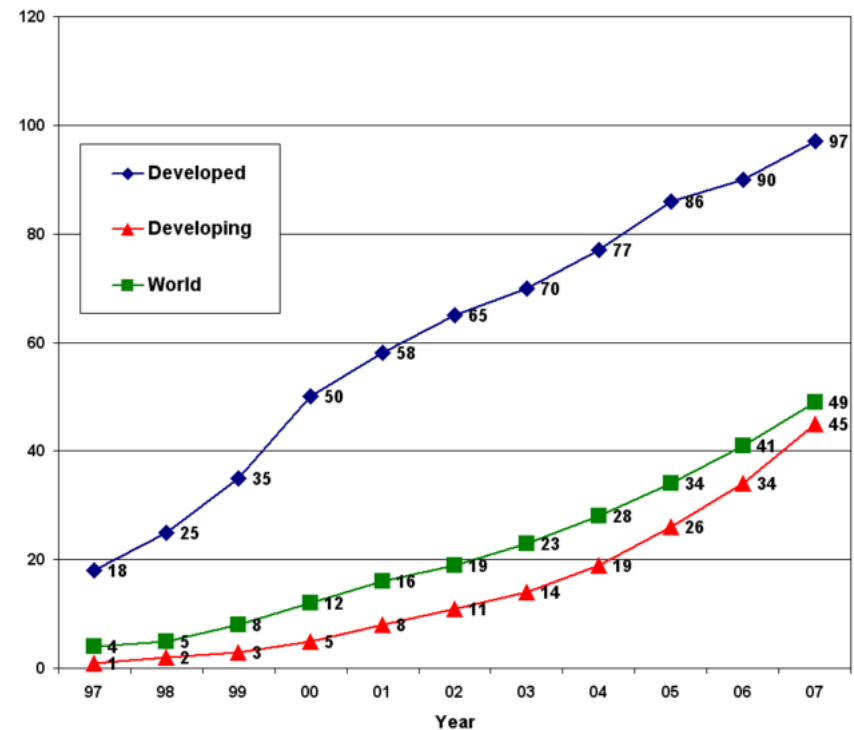
Background

Internet users and Mobile phone users

Internet users per 100 inhabitants 1997-2007 (Source: ITU)



Mobile phone subscribers per 100 inhabitants 1997-2007



Source: http://en.wikipedia.org/wiki/Digital_divide

Open Handset Alliance(OHA)

Mobile Operators



open handset alliance

Handset Manufacturers



Semiconductor Companies



Software Companies



Commercialization Companies





What is Android?

Android™ delivers a complete set of software for mobile devices: an operating system, middleware and key mobile applications.

ANDROID

- Open
- All application and Created equal
- Breaking down application boundaries
- Fast & easy application development

■ Fast & easy application development

History of Android

- 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 PlamSource (Dianne Hackborn, etc...)
- 2007 Nov 5: Android announced
- 2007 Nov 12: Android SDK released by OHA
- 2007 Dec 14: Bug-fix SDK released
- 2008 Jan 3: Android Developer Challenge I starts accepting submissions
- 2008 Feb 13: m5-rc15 SDK released
- 2008 Apr 14: 1788 total submissions for Challenge I
- 2008 May 12: Top 50 Applications in Challenge I announced
- 2008 Nov: Android Phone(G1 Phone by HTC/T-mobile)
- 2008 Nov: Full Source Open
- 2009 Apr: HTC Magic
- 2009 July: HTC Hero, Samsung i7500, Android Netbook, Set-top.....
- 2009 Aug: Android Developer Challenge II

Open



Industry

Industry

- Software stack open-sourced under Apache 2.0 license
- Source available after first handsets ship
- Anyone will be able to build a system image



Users

Users

- Users have control of their experience
- They control what gets installed
- They choose the defaults



Developer

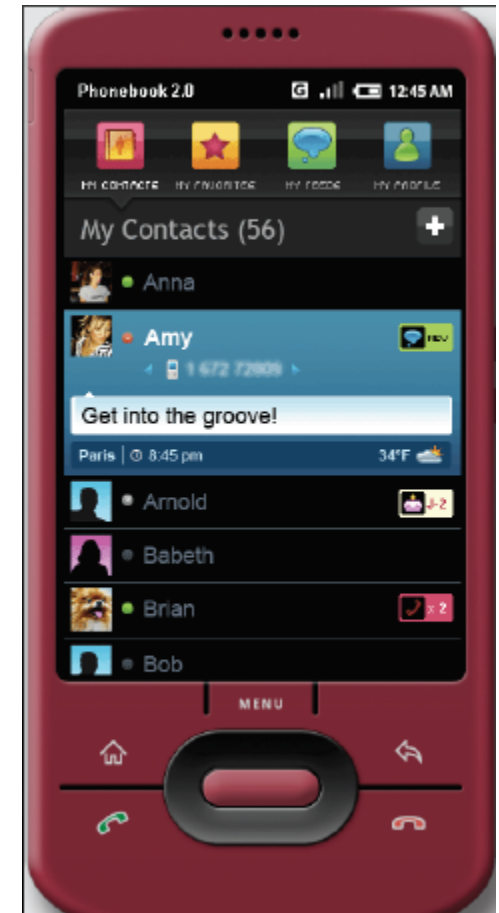
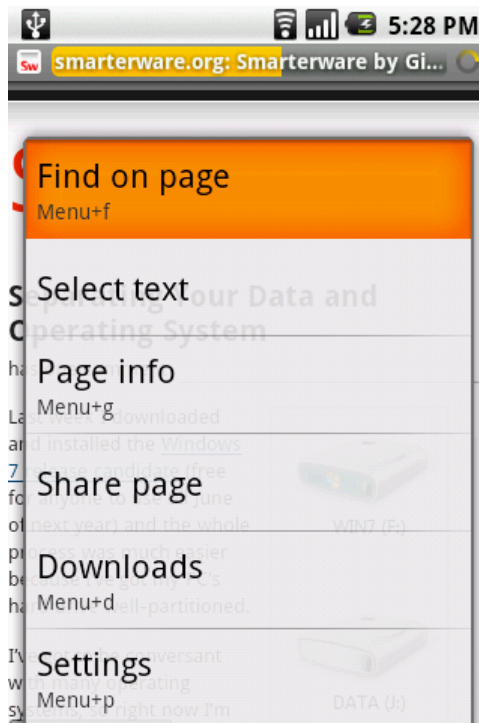
Developer

- Don not need permission to ship an application
- No hidden or privileged framework APIs
- Can integrate, extend and replace existing components

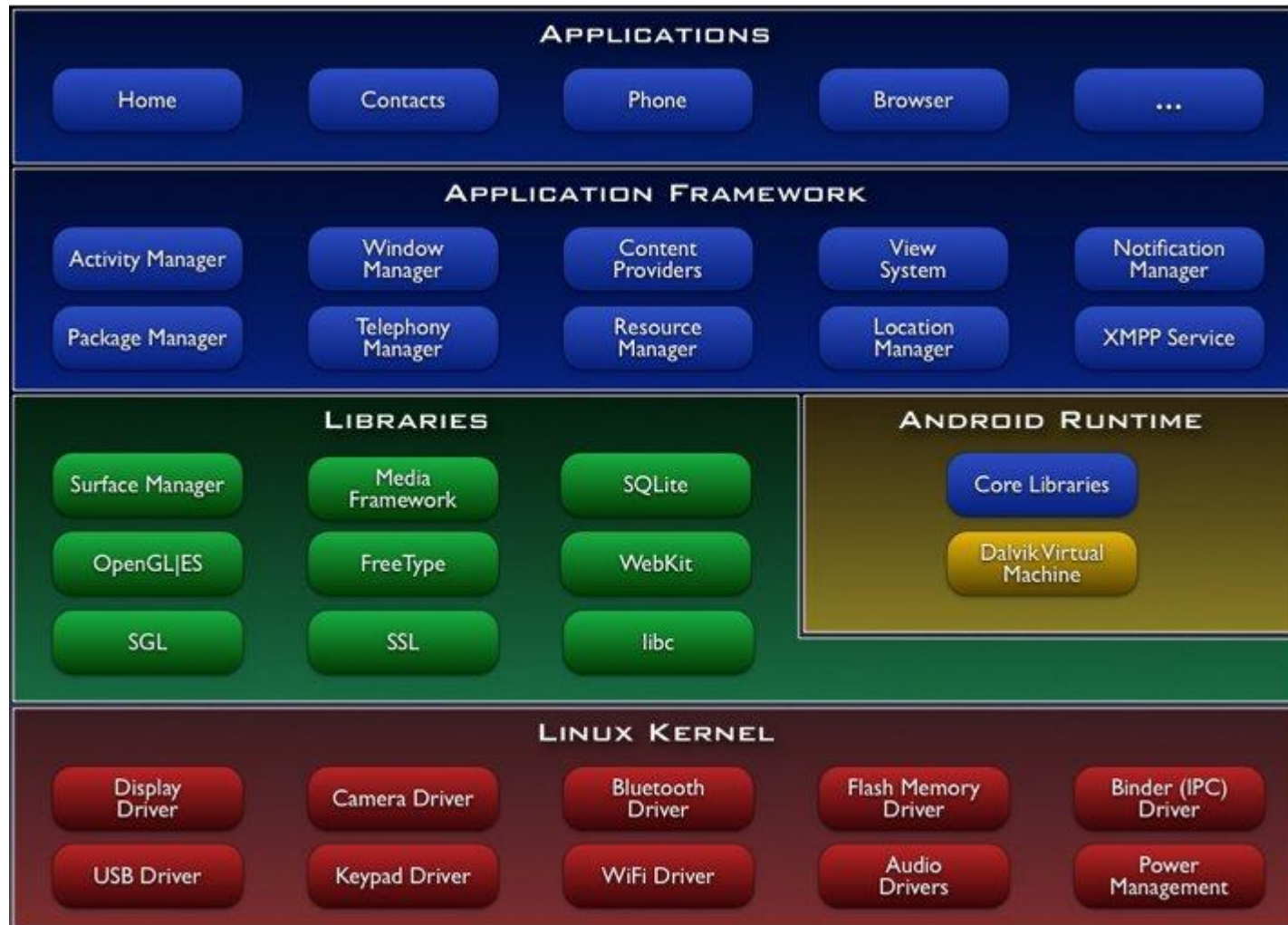
Integrate

Extended

Replace



Android Architecture



Details of Architecture(1/4)



- ❑ Linux Version 2.6.x for core system services
- ❑ Android uses only “Kernel” portion in Linux



❑ 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

Details of Architecture(2/4)

- Libc: c standard lib.
- SSL: Secure Socket Layer
- SGL: 2D image engine
- OpenGL|ES: 3D image engine
- Media Framework: Core part of Android multi-media
- SQLite: Embedded database
- WebKit: Kernel of web browser
- FreeType: Bitmap and Vector
- Surface Manager: Manage different windows for different applications



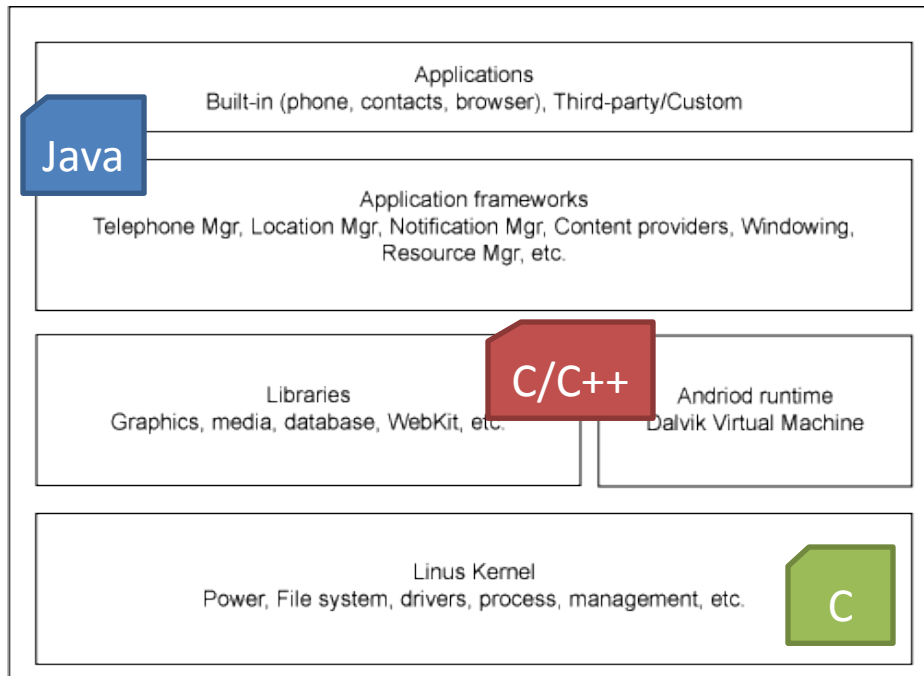
Details of Architecture(3/4)



- No limited application
- Equality of each apps.
- Easy to embedded web browser
- Parallel running

- Parallel running

Details of Architecture(4/4)



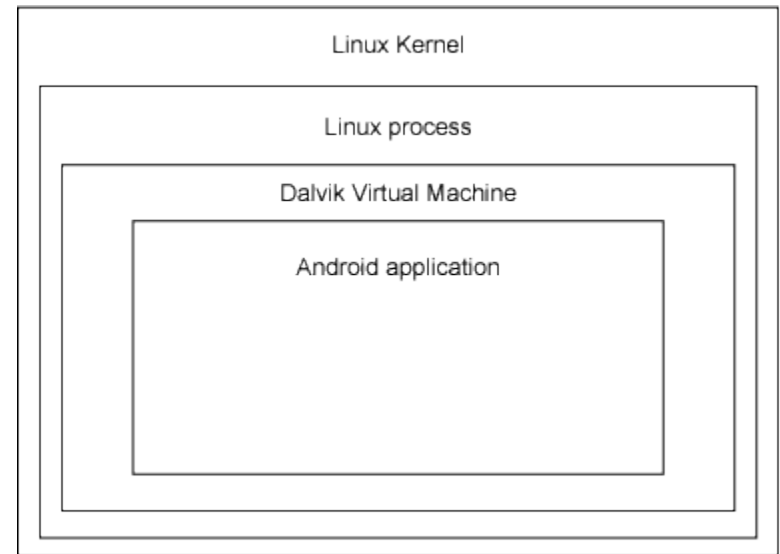
- The Design goal of Android: Openness
 - Be as flexible as possible
 - How it handles access to data: Mash up on the internet and everything else
 - Rapid development(XML, Java)
- Develop Language
 - App: Java
 - Framework: Java
 - Libraries: C/C++
 - OS & Driver: C



Develop for Android

Application Architecture

- Dev. Language: Java
- Virtual Machine:
 - Dalvik VM, not JVM.
 - Open source
- Application: consists of one or more of the following classifications
 - Activities
 - Services
 - Content providers
 - Broadcast receivers



Dalvik Virtual Machine

- Broadcast receivers
- Content providers
- Services
- Activities

Android SDK

- **android.jar** Java archive file containing all of the Android SDK classes necessary to build your application.
- **documentation.html and docs directory** The SDK documentation is provided locally and on the Web. It's largely in the form of JavaDocs, making it easy to navigate the many packages in the SDK. The documentation also includes a high-level Development Guide and links to the broader Android community.
- **Samples directory** The samples subdirectory contains full source code for a variety of applications, including Api Demo, which exercises many APIs. The sample application is a great place to explore when starting Android application development.
- **Tools directory** Contains all of the command-line tools to build Android applications. The most commonly employed and useful tool is the adb utility (Android Debug Bridge).
- **Usb driver** Directory containing the necessary drivers to connect the development environment to an Android-enabled device, such as the G1 or the Android Dev 1 unlocked development phone. These files are only required for developers using the Windows platform.

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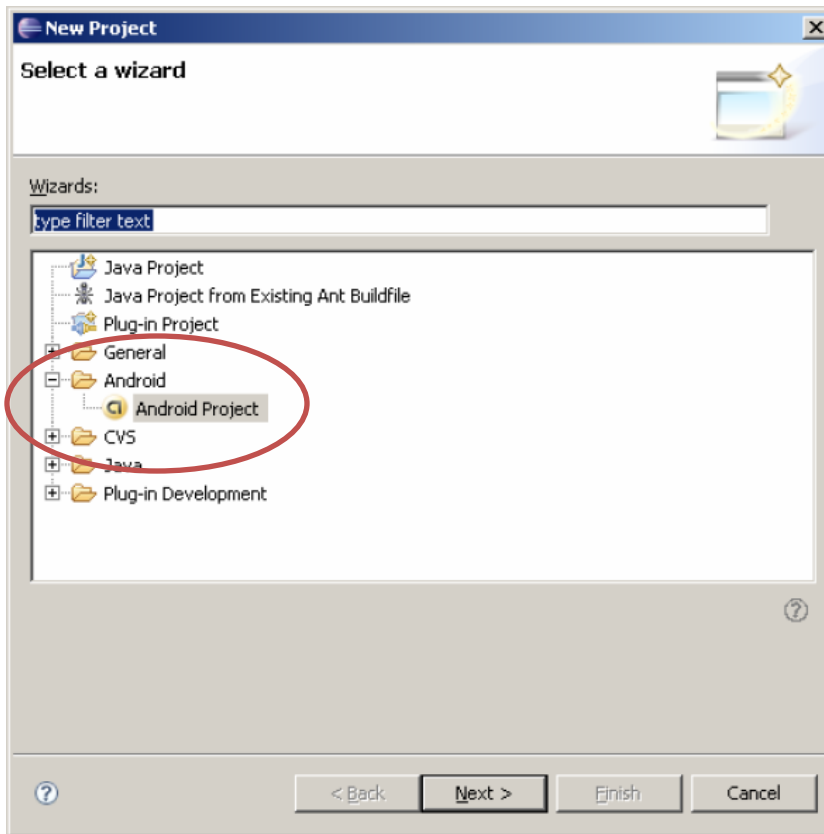
Tools

- Emulator
 - Android applications may be run on a real device or on the Android Emulator, which ships with the Android SDK.
- ADB (Android Debug Bridge)
 - The ADB utility lets you connect to the phone itself and issue rudimentary shell commands, such as copying files to and from the device.



```
C:\WINDOWS\system32\cmd.exe
M:\tools>adb -d shell
$
$ netcfg
netcfg
lo UP 127.0.0.1 255.0.0.0 0x00000049
dummy0 DOWN 0.0.0.0 0.0.0.0 0x00000082
rnnct0 DOWN 25.1.184.133 255.255.255.252 0x00001002
rnnct1 DOWN 0.0.0.0 0.0.0.0 0x00001002
rnnct2 DOWN 0.0.0.0 0.0.0.0 0x00001002
tiulan0 UP 192.168.2.105 255.255.255.0 0x00001043
$
$ echo $PATH
echo $PATH
/sbin:/system/sbin:/system/bin:/system/xbin
$
$ su
su
#
# cd /data/app
cd /data/app
#
# ls -l
ls -l
-rw-r--r-- system system 8615 2009-03-22 18:38 com.nsi.flashlight.apk
#
# ping google.com
ping google.com
PING google.com (74.125.45.100) 56(84) bytes of data:
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=1 ttl=241 time=99.3 ms
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=2 ttl=241 time=110 ms
64 bytes from yx-in-f100.google.com (74.125.45.100): icmp_seq=3 ttl=241 time=126 ms
^C
M:\tools>
```

Development Environments



- Eclipse 3.2.3.3
- Eclipse JDT Plugin
- JDK 5 or 6
- **ADT: Android Development Tools plug-in**



Example: *HelloWorld*
Running on Emulator

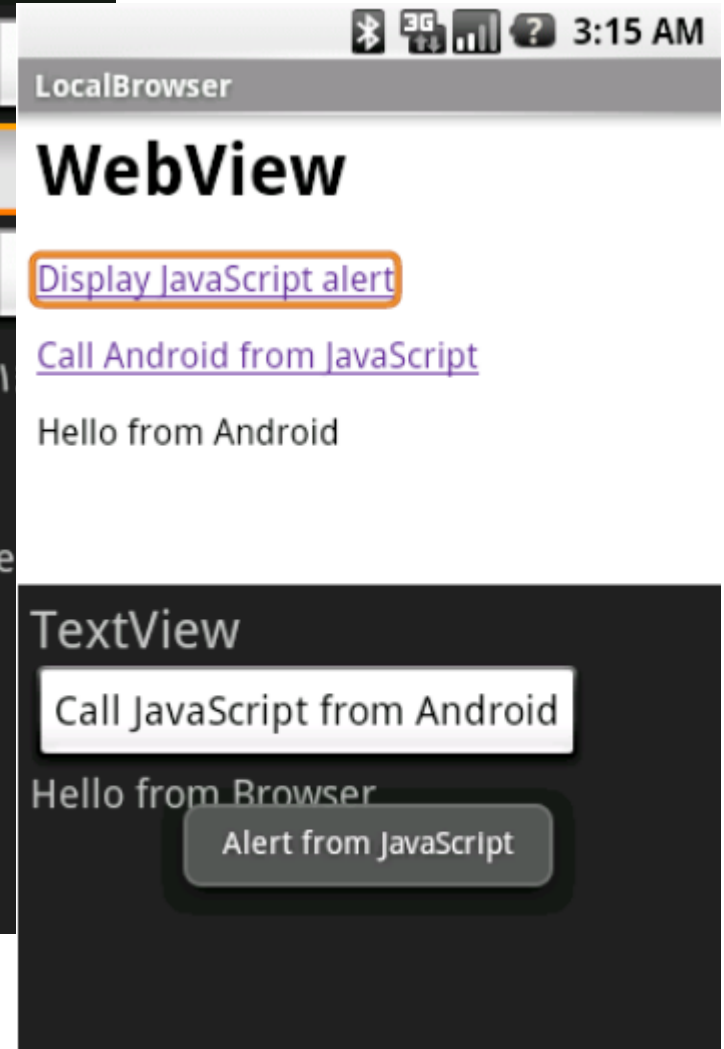
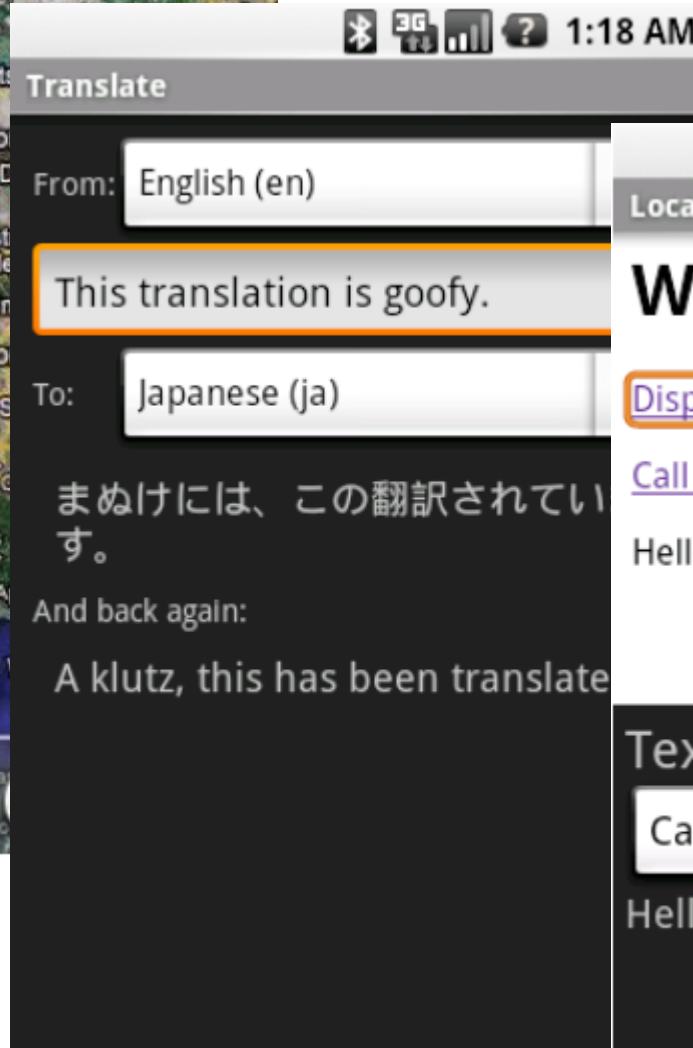
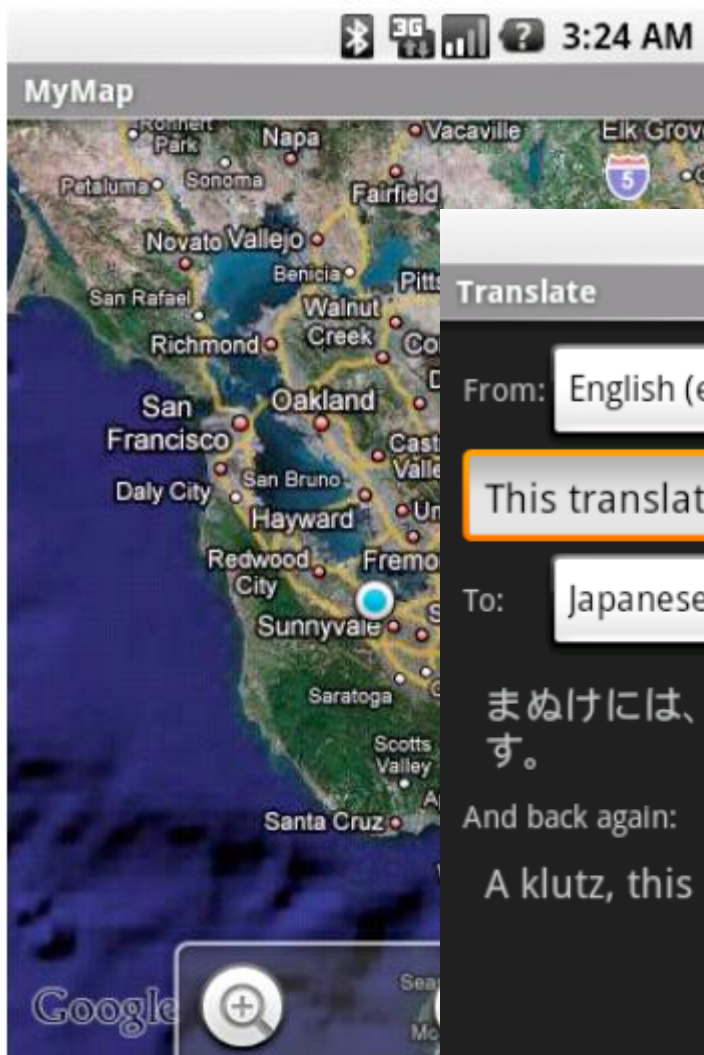
Cases

Game

7:26 PM

3	6							
		4	2	3		8		
					4	2		
	7		4	6				3
8	2						1	4
5				1	3		2	
		1	9					
		7		4	8	3		
							4	5





Summary

- Benefits
 - Open Platform/License Free
 - Robust OS Kernel, Innovative Library Packages
 - Ease App. Development
 - Rapid Improvement
- Challenges
 - Performance Consideration
 - Hard to Integrate for Vendors
 - Too Much Google Dependent
- Key Factor: Market Response



References

- An Introduction to Android. Jason Chen, 2008
- Introduction to Android Development. Frank Ableson, May 12, 2009
 - http://www.ibm.com/developerworks/opensource/library/os-android-devel/index.html?S_TACT=105AGX52&S_CMP=content
- Homepage of OHA
 - <http://www.openhandsetalliance.com/>
- Introduction to Android Development. Ed Burnette, 2009
- Android Overview. 이승민, Oct 27, 2009



Resources

- <http://developer.android.com>
 - Home page for Android development and documentation
- <http://groups.google.com/group/android-beginners>
 - Forum for development questions (beginner)
- <http://groups.google.com/group/android-developers>
 - Forum for development questions (advanced)
- <http://www.planetandroid.com>
 - Blogs and news from around the Android community
- <http://pragprog.com/titles/eband>
 - <book> Hello, Android: Introducing Google's Mobile Development Platform



- Videos

Android 1.6 office show: <http://www.youtube.com/watch?v=MBRFkLKRwFw>

Android architecture:

I: <http://www.youtube.com/watch?v=QBGfUs9mQYY>

II: <http://www.youtube.com/watch?v=fL6gSd4ugSI>

III: <http://www.youtube.com/watch?v=MPukbH6D-IY>

Android Introduction by google I/O 2008: http://www.youtube.com/watch?v=x1ZZ-R3p_w8