BASICS OF ANDROID FRAMEWORK

Isra University

OBJECTIVES:

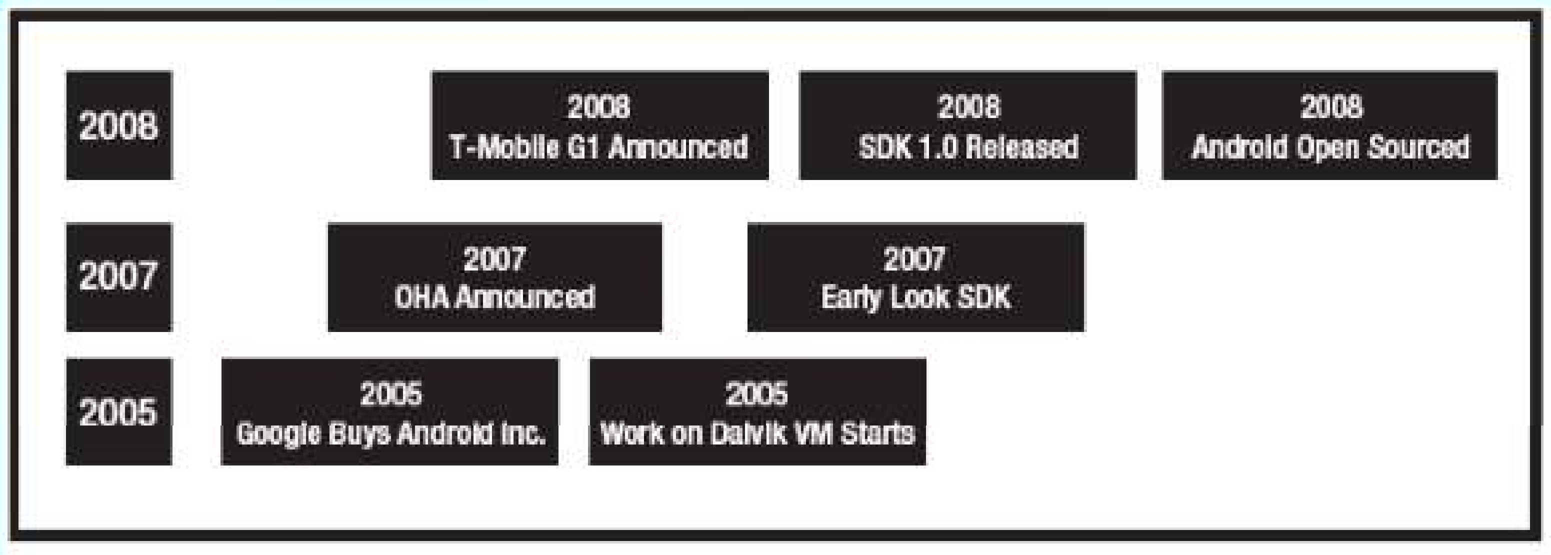
- warming up
- History of Android
- What is Open Handset Alliance
- PLATFORM
- Android’s Context: Mobile Market Players
- Platform - The Android Software Stack
- Software development
- Application Building Blocks

WARMING UP

What is Android?

- A software platform and operating system for mobile devices
- Based on the Linux kernel
- Developed by Google and later the Open Handset Alliance (OHA)
- Allows writing managed code in the Java language

HISTORY OF ANDROID



2008

2008
T-Mobile G1 Announced

2008
SDK 1.0 Released

2008
Android Open Sourced

2007

2007
OHA Announced

2007
Early Look SDK

2005

2005
Google Buys Android Inc.

2005
Work on Dalvik VM Starts

Figure 1-3. *Android timeline*

WHAT IS OPEN HANDSET ALLIANCE

Quoting from www.OpenHandsetAlliance.com page

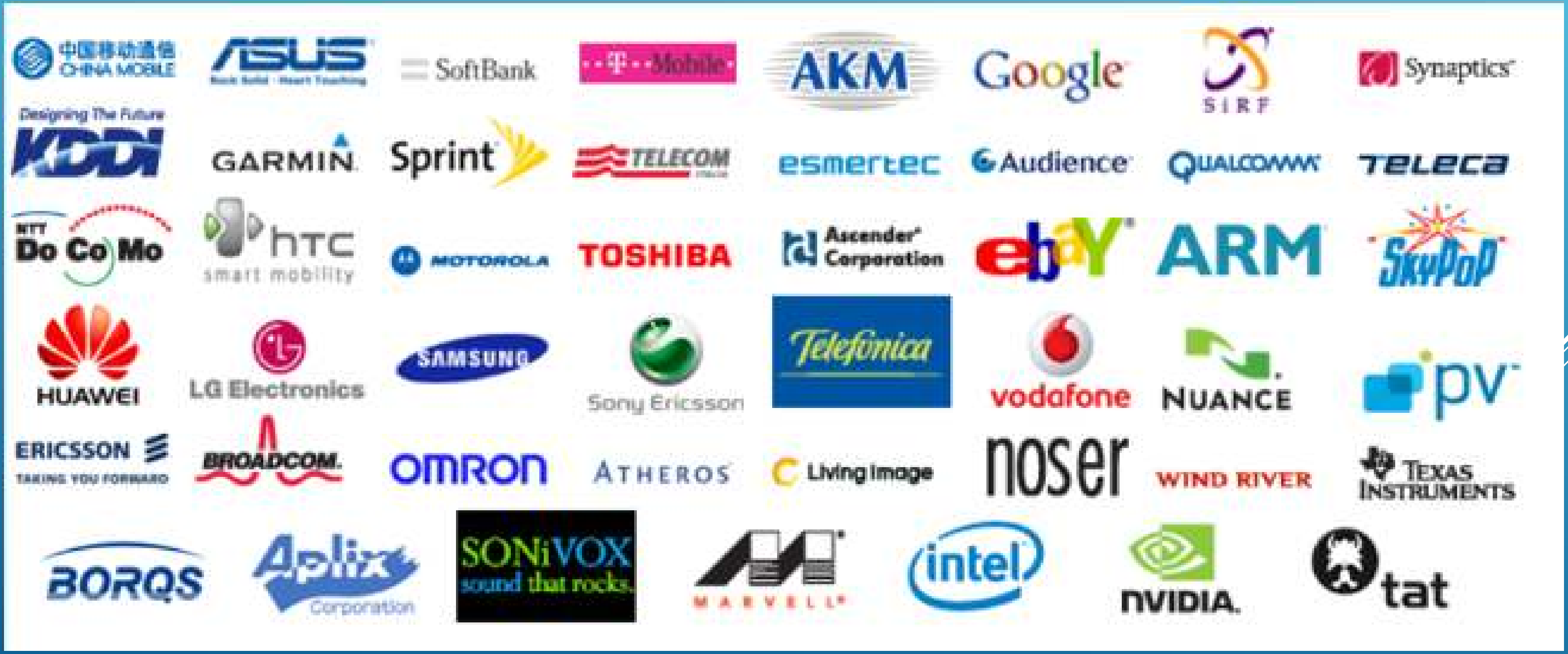
"… Open Handset Alliance™, a group of 47 technology and mobile companies have come together to accelerate innovation in mobile and offer consumers a richer, less expensive, and better mobile experience.

Together we have developed Android™, the first complete, open, and free mobile platform.

We are committed to commercially deploy handsets and services using the Android Platform. "

WHAT IS THE OPEN HANDSET ALLIANCE (OHA)?

→ IT'S A CONSORTIUM OF SEVERAL COMPANIES



PHONES

HTC G1,
Droid,
Tattoo
Motorola Droid (X)
Suno S880
Samsung Galaxy
Sony Ericsson
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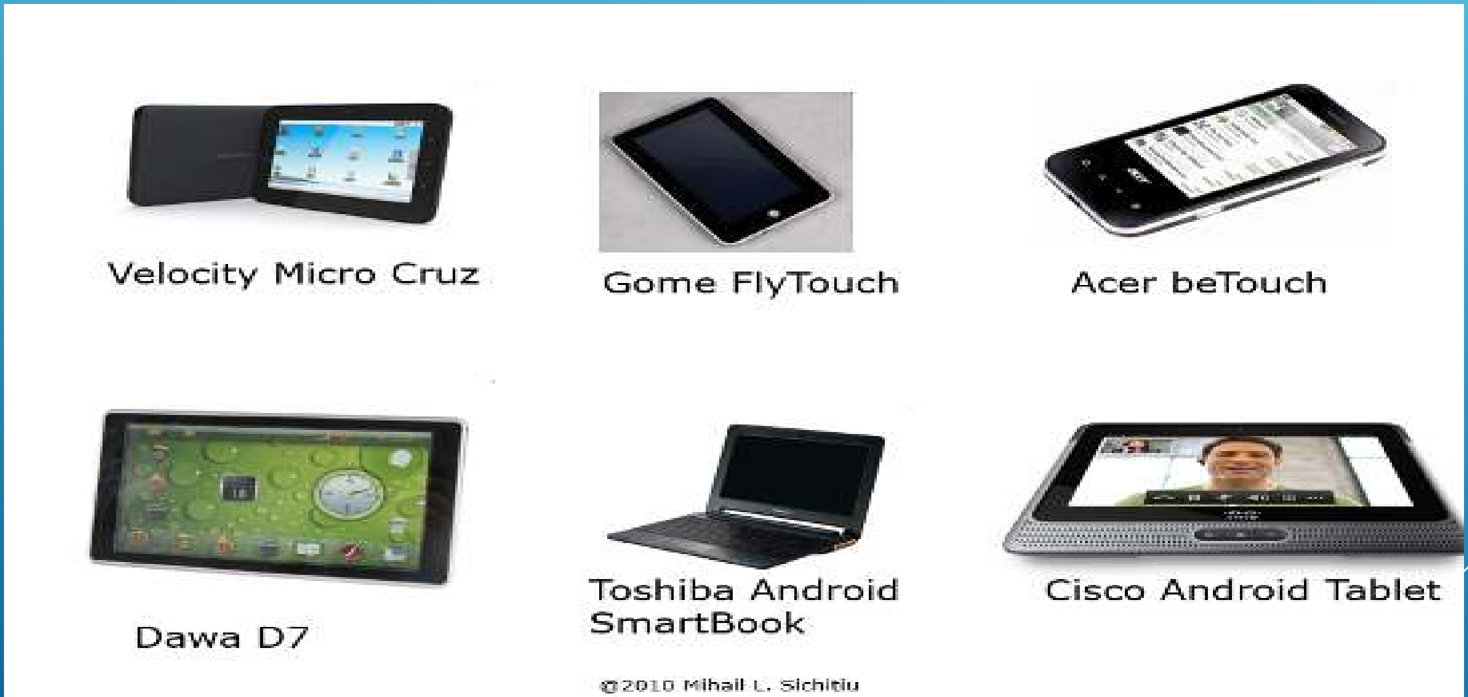
TABLETS



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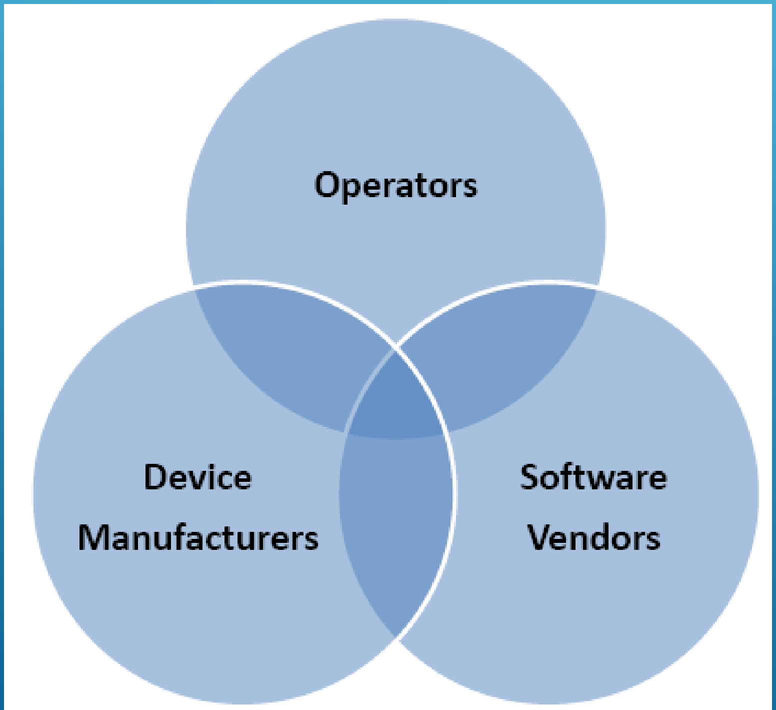
PLATFORM

Hardware:

Android is not a single piece of hardware; it's a complete, end-to-end software platform that can be adapted to work on any number of hardware configurations. Everything is there, from the bootloader all the way up to the applications.

ANDROID'S CONTEXT: MOBILE MARKET PLAYER$

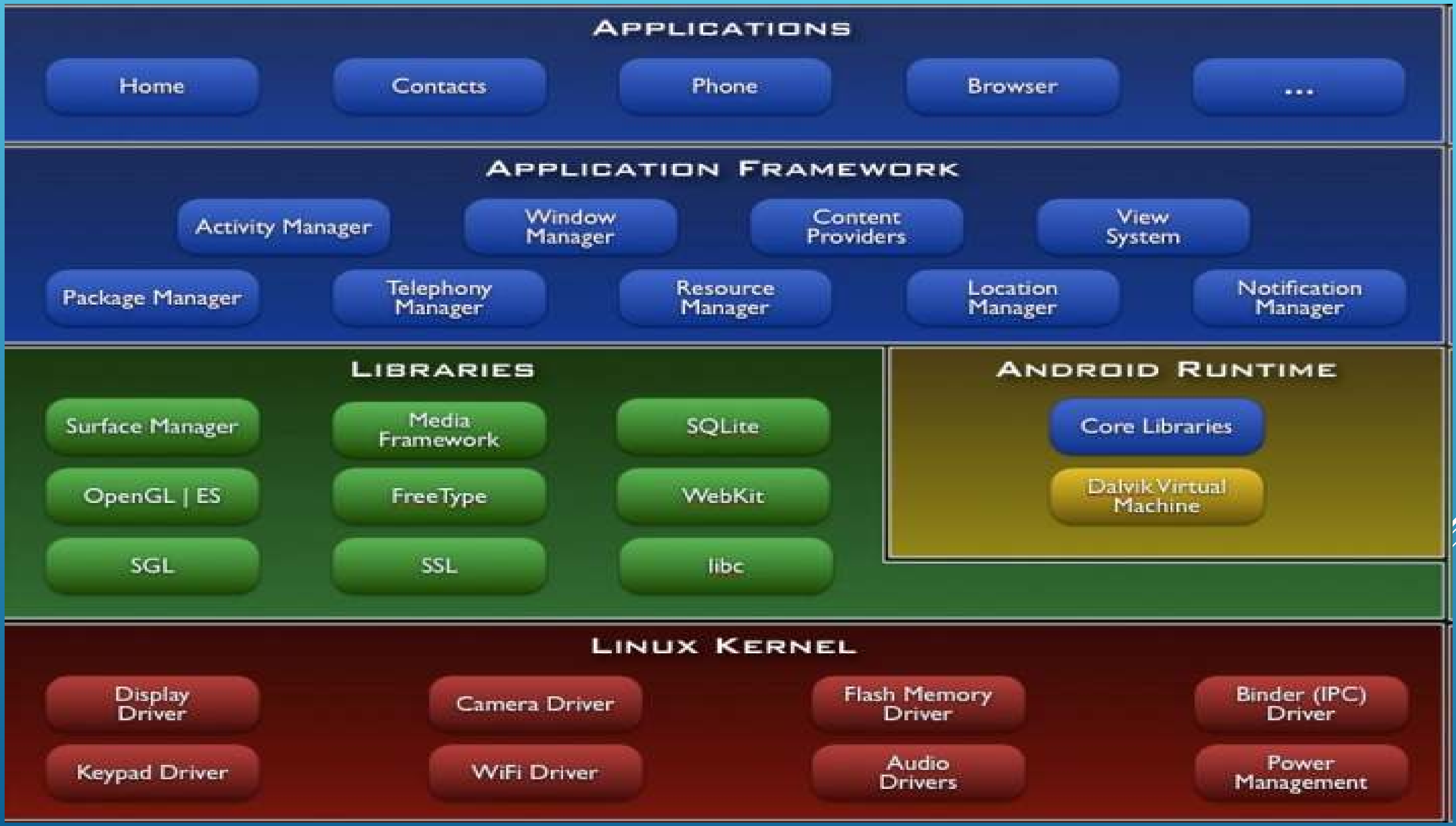


Stakeholders: Mobile network operators want to lock down their networks, controlling and metering traffic.

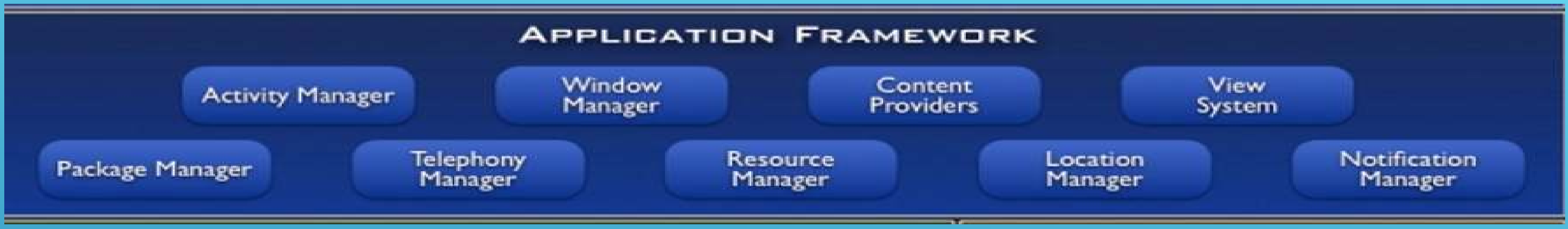
Device manufacturers: want to differentiate themselves with features, reliability, and price points.

Software vendors: want complete access to the hardware to deliver cutting-edge applications.

PLATFORM - THE ANDROID SOFTWARE STACK

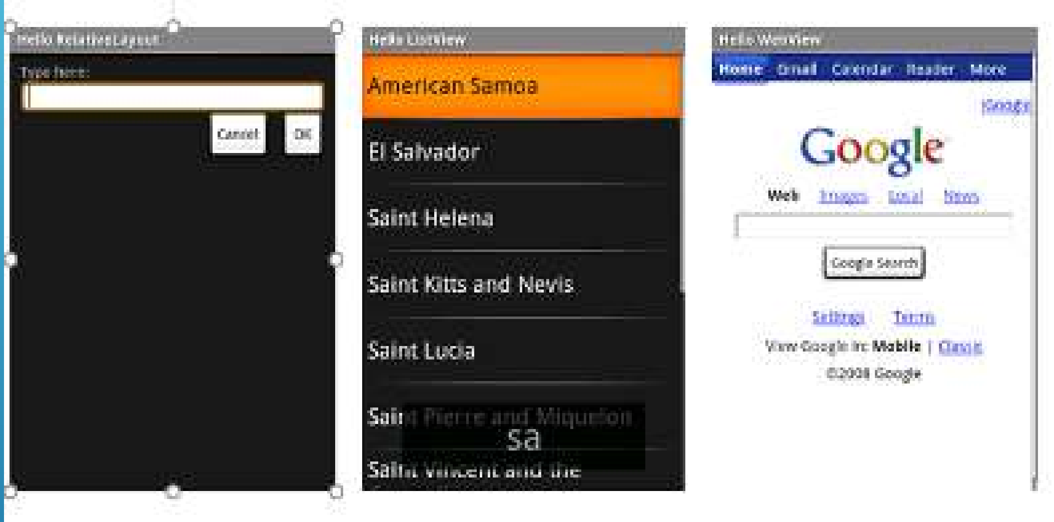


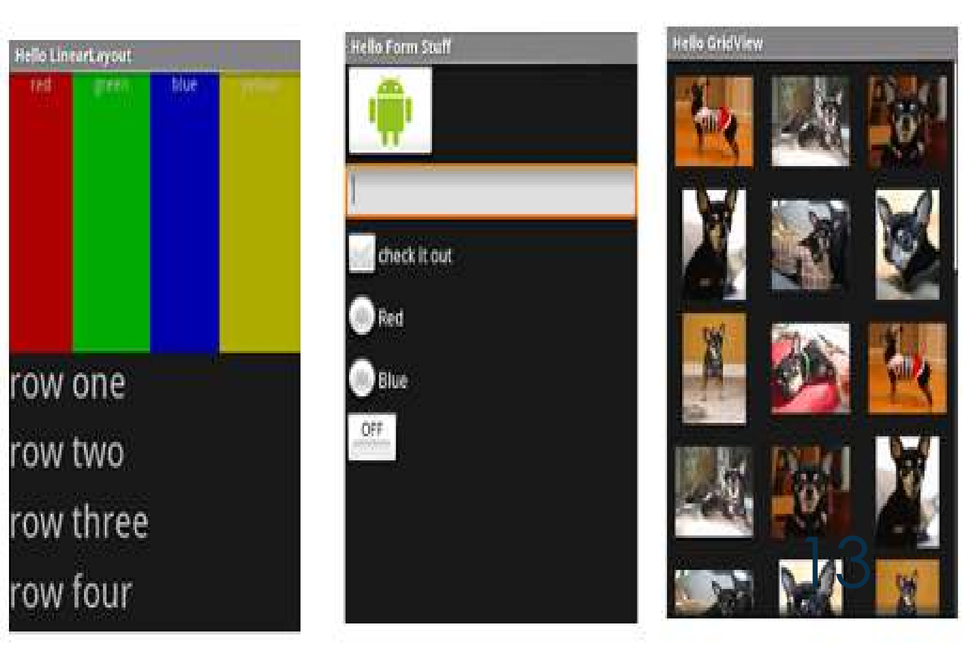
ANDROID S/W STACK – APP FRAMEWORK (CONT)



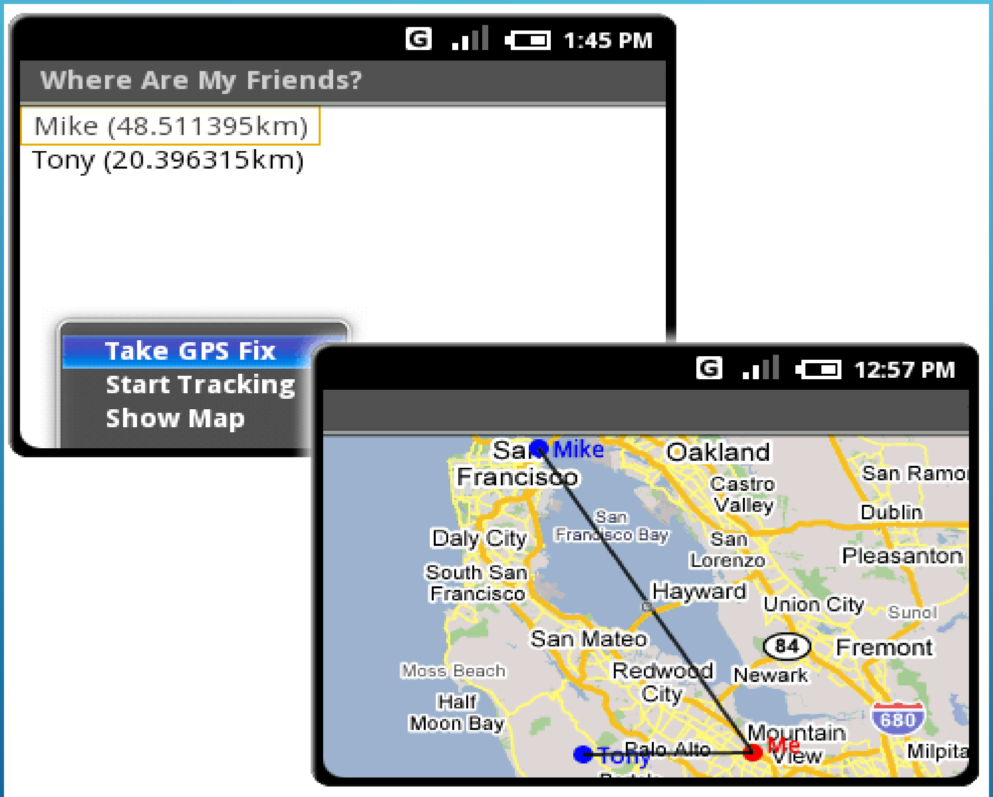
Feature	Role
View System	Used to build an application, including lists, grids, text boxes, buttons, and embedded web browser
Content Provider	Enabling applications to access data from other applications or to share their own data
Resource Manager	Providing access to non-code resources (localized string , graphics, and layout files)
Notification Manager	Enabling all applications to display customer alerts in the status bar
Activity Manager	Managing the lifecycle of applications and providing a common navigation backstock

VIEW SYSTEM


Hello RelativeLayout
Type here:
Cancel
OK
Hello ListView
American Samoa
El Salvador
Saint Helena
Saint Kitts and Nevis
Saint Lucia
Saint Pierre and Miquelon
sa
Saint Vincent and the
Hello WebView
Home
Gmail
Calendar
Reader
More
iGoogle
Google
Web
Images
Local
News
Google Search
Settings
Terms
View Google in: Mobile | Classic
©2008 Google


Hello LinearLayout
red
green
blue
yellow
row one
row two
row three
row four
Hello Form Stuff
check it out
Red
Blue
OFF
Hello GridView

Location Manager

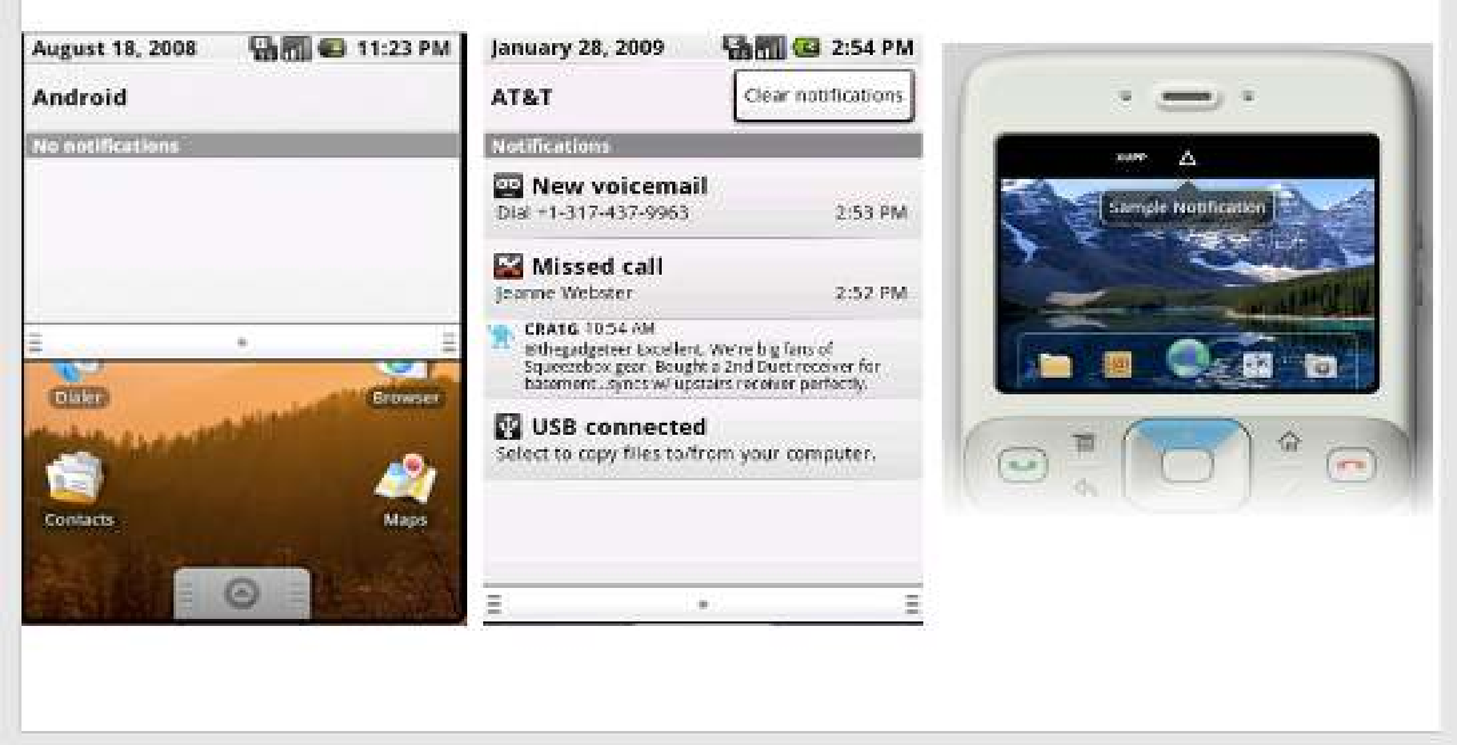


Where Are My Friends?

Mike (48.511395km)

Tony (20.396315km)

NOTIFICATION MANAGER



August 18, 2008 11:23 PM

Android

No notifications

January 28, 2009 2:54 PM

AT&T

Clear notifications

Notifications

New voicemail
Dial +1-317-437-9963 2:53 PM

Missed call
Jeanne Webster 2:52 PM

CRAIG 10:54 AM
@thegadgeteer Excellent. We're big fans of Squeezebox gear. Bought a 2nd Duet receiver for basement...syncs w/ upstairs receiver perfectly.

USB connected
Select to copy files to/from your computer.

Sample Notification

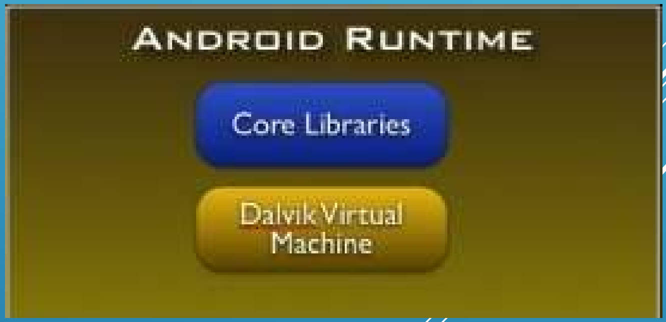
ANDROID S/W STACK - LIBRARIES

- The media libraries are based on PacketVideo's (http://www.packetvideo.com/) OpenCORE. These libraries are responsible for recording and playback of audio and video formats.
- A library called Surface Manager controls access to the display system and supports 2D and 3D.
- The WebKit library is responsible for browser support; it is the same library that supports Google Chrome and Apple Inc.'s Safari.
- The FreeType library is responsible for font support.
- SQLite (http://www.sqlite.org/) is a relational database that is available on the device itself. SQLite is also an independent open source effort for relational databases and not directly tied to Android. You can acquire and use tools meant for SQLite for Android databases as well.

ANDROID S/W STACK - RUNTIME

Core Libraries

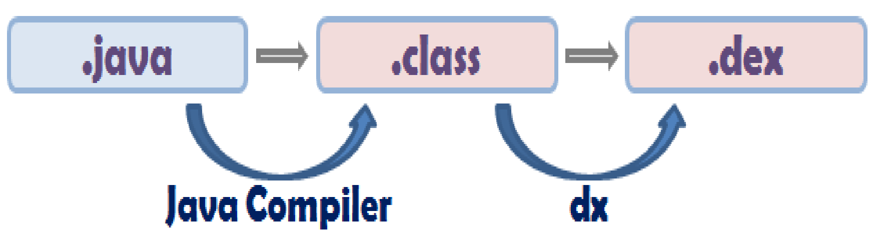
- ✓Providing most of the functionality available in the core libraries of the Java language
- ✓APIs
  - ➢Data Structures
  - ➢Utilities
  - ➢File Access
  - ➢Network Access
  - ➢Graphics
  - ➢Etc



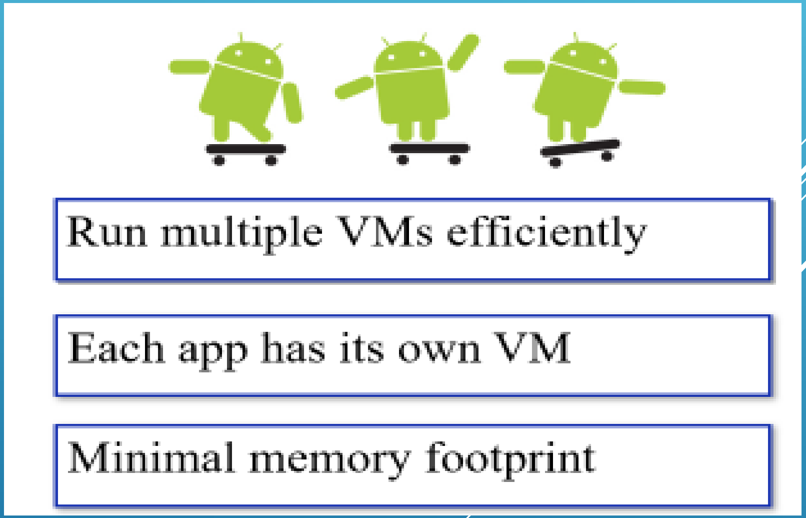
THE DALVIK RUNTIME IS OPTIMIZED FOR MOBILE APPLICATIONS

Dalvik Virtual Machine (Cont)

- ✓Executing the Dalvik Executable (.dex) format
  - ➢.dex format is optimized for minimal



- ✓Relying on the Linux Kernel for:
  - ➢Threading
  - ➢Low-level memory management

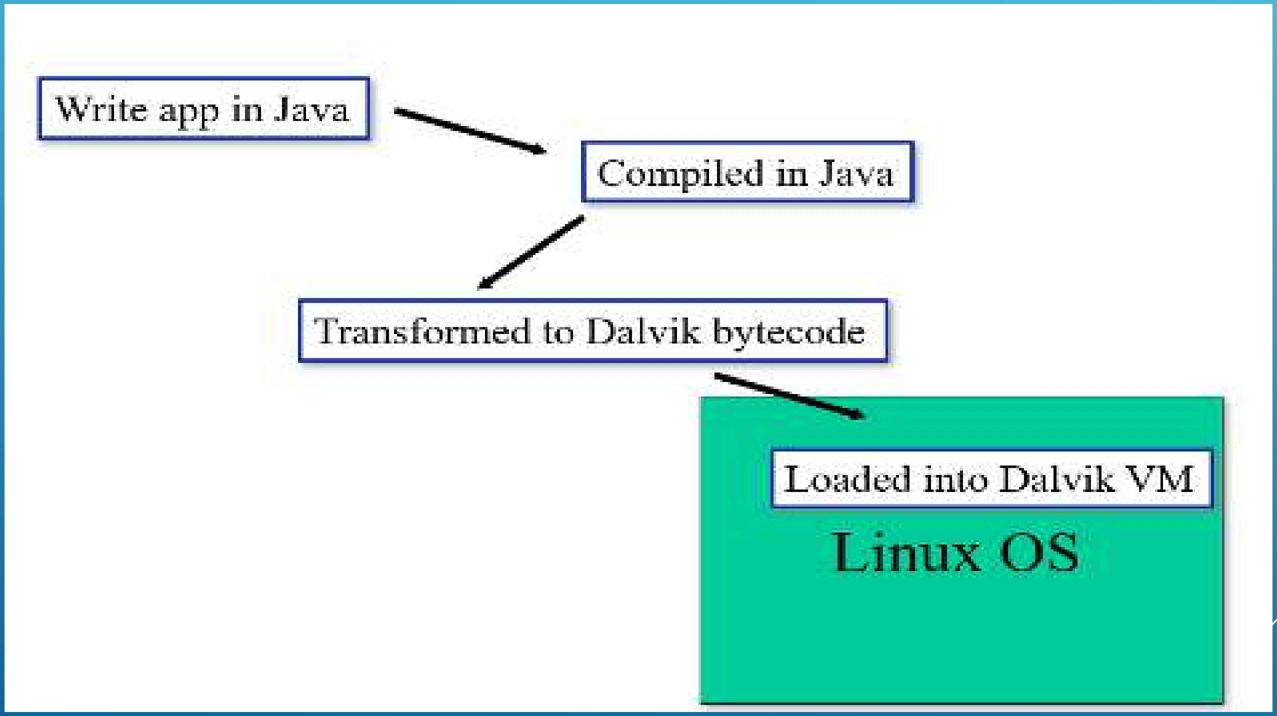


Run multiple VMs efficiently

Each app has its own VM

Minimal memory footprint

ANDROID APPLICATIONS ARE COMPILED TO DALVIK BYTECODE



Write app in Java

Compiled in Java

Transformed to Dalvik bytecode

Loaded into Dalvik VM

Linux OS

SOFTWARE DEVELOPMENT

Development requirements:

- Java
- Android SDK

IDE and Tools:

Android SDK

- Class Library
- Developer Tools
- Emulator and System Images
- Documentation and Sample Code

Eclipse IDE + ADT (Android Development Tools)

- Reduces Development and Testing Time
- Makes User Interface-Creation easier
- Makes Application Description Easier

APPLICATION BUILDING BLOCKS

- Activity
- IntentReceiver
- Service
- ContentProvider

ACTIVITIES

Activities provide a user interface for one specific task, Basic component of most applications.

- Most applications have several activities that start each other as needed.
- Each is implemented as a subclass of the base Activity class.
- Typically correspond to one UI screen but, they can:
  - ➢ Be faceless
  - ➢ Be in a floating window
  - ➢ Return a value

INTENTRECEIVERS/ BROADCAST RECEIVER

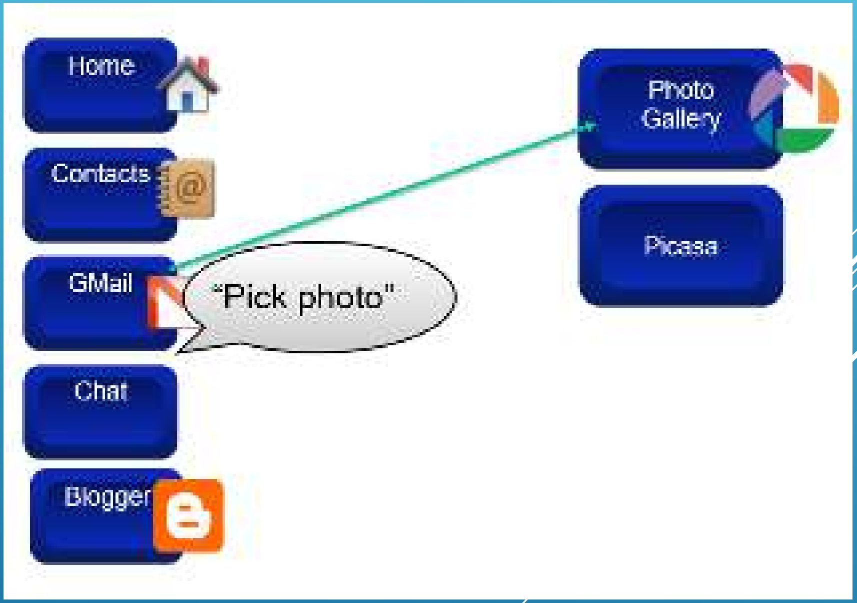
Intent receivers act as mailboxes for messages from other applications. It receives and reacts to broadcast announcements
If an app registered the receiver in adv., the event will notify and call back the registered software

Ex: Low battery, power connected, shutdown, timezone changed, etc.

- 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



SERVICES

- **Services** execute background processing, no visual interface.
- Ex: Downloads, Playing Music, TCP/UDP Server
- You can bind to an existing service, control its operation, and run in background
- Play music, alarm clock, etc.
- Secured if using permissions
- Callers may need to verify that service is the correct one.

CONTENTPROVIDERS

Content providers are data storage facilities which supports data exchange between applications.

- Generally SQL backend Used to share content between apps
- Make data available to other applications
- Transfer data between applications in Android
- Other applications use a ContentResolver object to access the data provided via a ContentProvider
- Enables sharing of data across applications
  - E.g. address book, photo gallery
- Provides uniform APIs for:
  - querying
  - delete, update and insert.

IN GENERAL

Activities – visual user interface focused on a single thing a user can do

Services – no visual interface – they run in the background

Broadcast Receivers – receive and react to broadcast announcements

Content Providers – allow data exchange between applications

SOURCES

https://www.utc.edu/faculty/li-yang/2.androidoverview.ppt

file:///D:/Downloads/Android%20Application%20Development.ppt