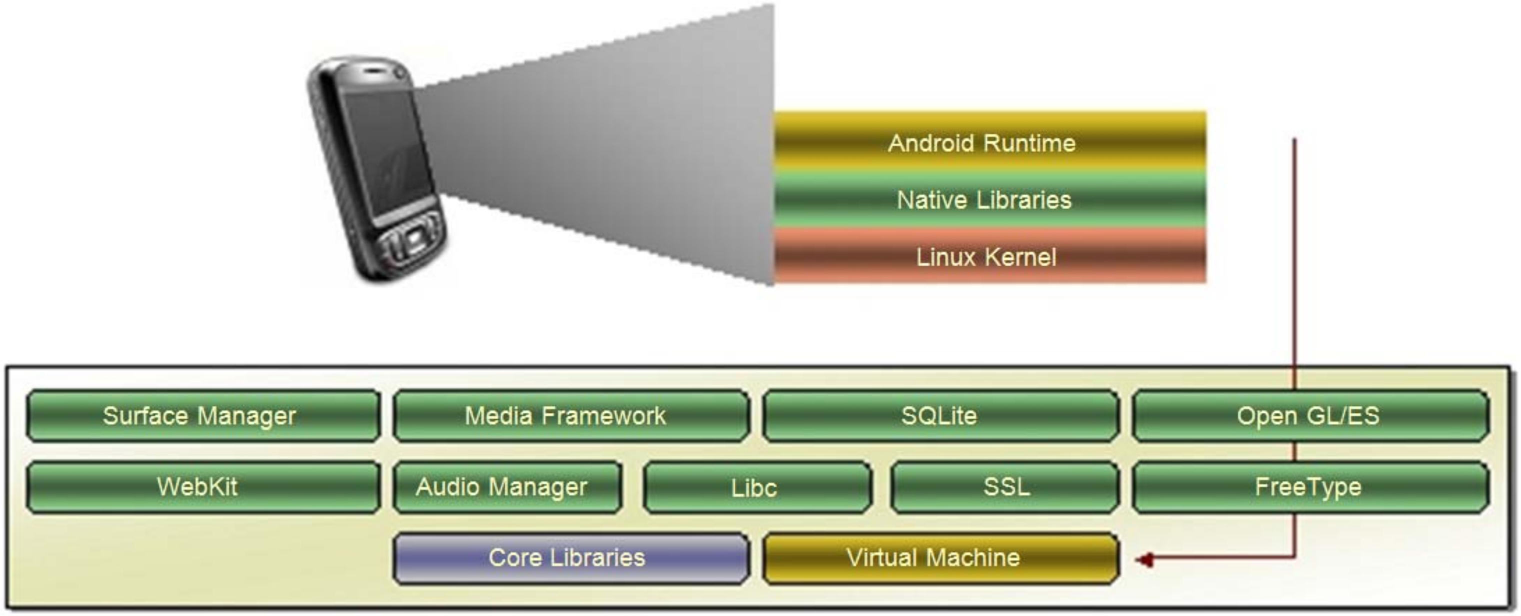
Lecture 23

Topic beyond Syllabus :

Operating System : Android

Android Runtime

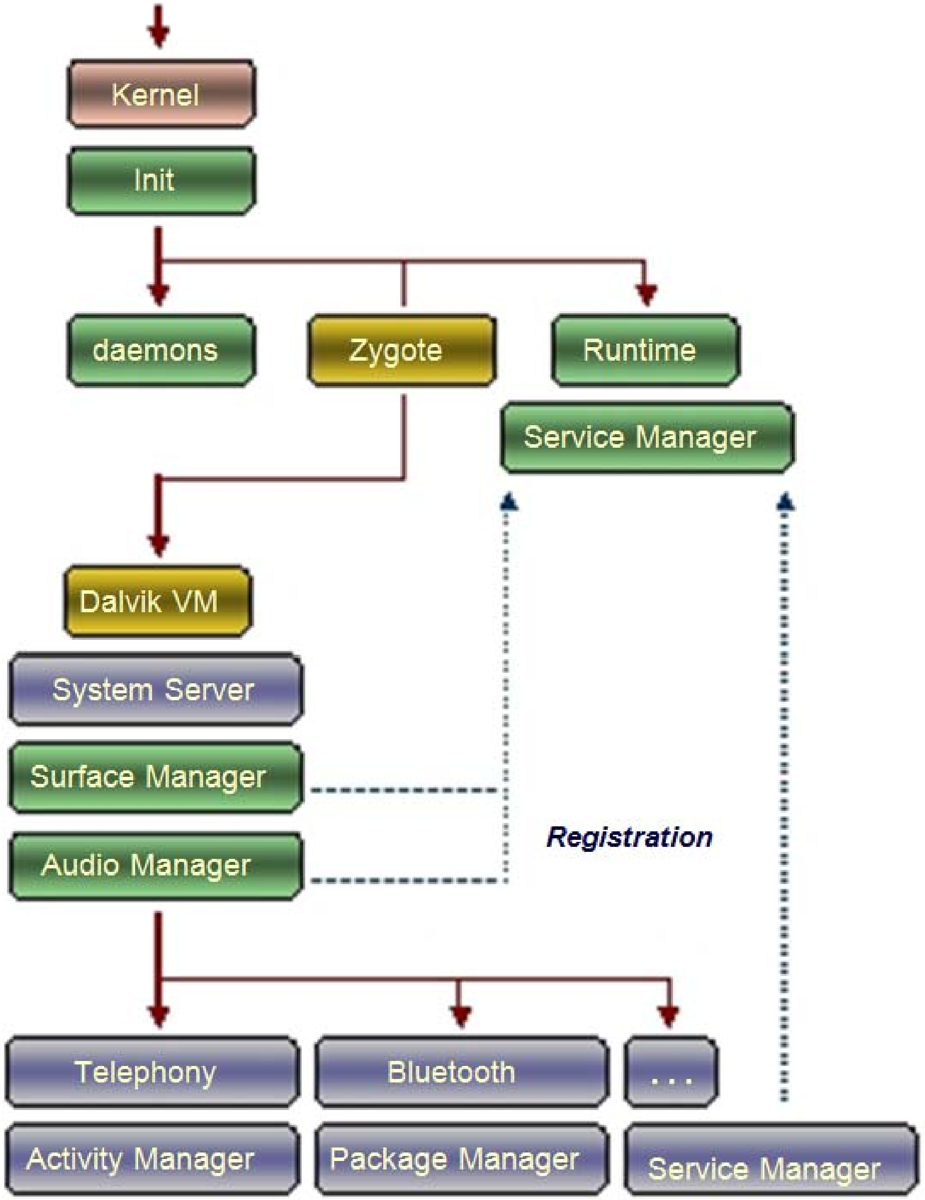


Dalvik Virtual Machine

An interpreter-only virtual machine (no JIT), register based.

- Optimized for low memory requirements
- Designed to allow multiple VM instances to run at one
- Relying on underlying OS for process isolation, memory management and threading support
- Executes Dalvik Executables (DEX) files which are zipped into an Android Package (APK)

Platform initialization



The bootloader loads the kernel and starts the init process

Daemons for handling low level hardware interfaces are started up (usb, adb, debugger, radio)

"Zygote", the initial Dalvik VM process is created

"Runtime" process initiates the "Service Manager", a key element for "Binders" and IPC communication

"Runtime" process requests "Zygote" to start a new instance of Dalvik for running the "System Server"

The two first processes are able to handle graphic and audio outputs

All the others android components are then started

Priorities: Android 2.2 Scheduling

Android – process priority is dynamic. Scheduler increases/decreases the priority.

- Static priority

  The **maximum size of the time slice** a process should be allowed before being forced to allow other processes to compete for the CPU.

- Dynamic priority

  The amount of **time remaining in this time slice**; declines with time as long as the process has the CPU.

  When its dynamic priority falls to 0, the process is marked for rescheduling.

- Real-time priority

  Only real-time processes have the real-time priority.

  Higher real-time values always beat lower values

Android Scheduling

- **Process Selection**
  - A process's scheduling class defines which algorithm to apply
  - most deserving process is selected by the scheduler
  - real time processes are given higher priority than ordinary processes
  - when several processes have the same priority, the one nearest the front of the run queue is chosen
  - when a new process is created the number of ticks left to the parent is split in two halves, one for the parent and one for the child
  - **priority** and **counter** fields are used both to implement time-sharing and to compute the process dynamic priority

Android makes mobile Java easier

Well, sort of…

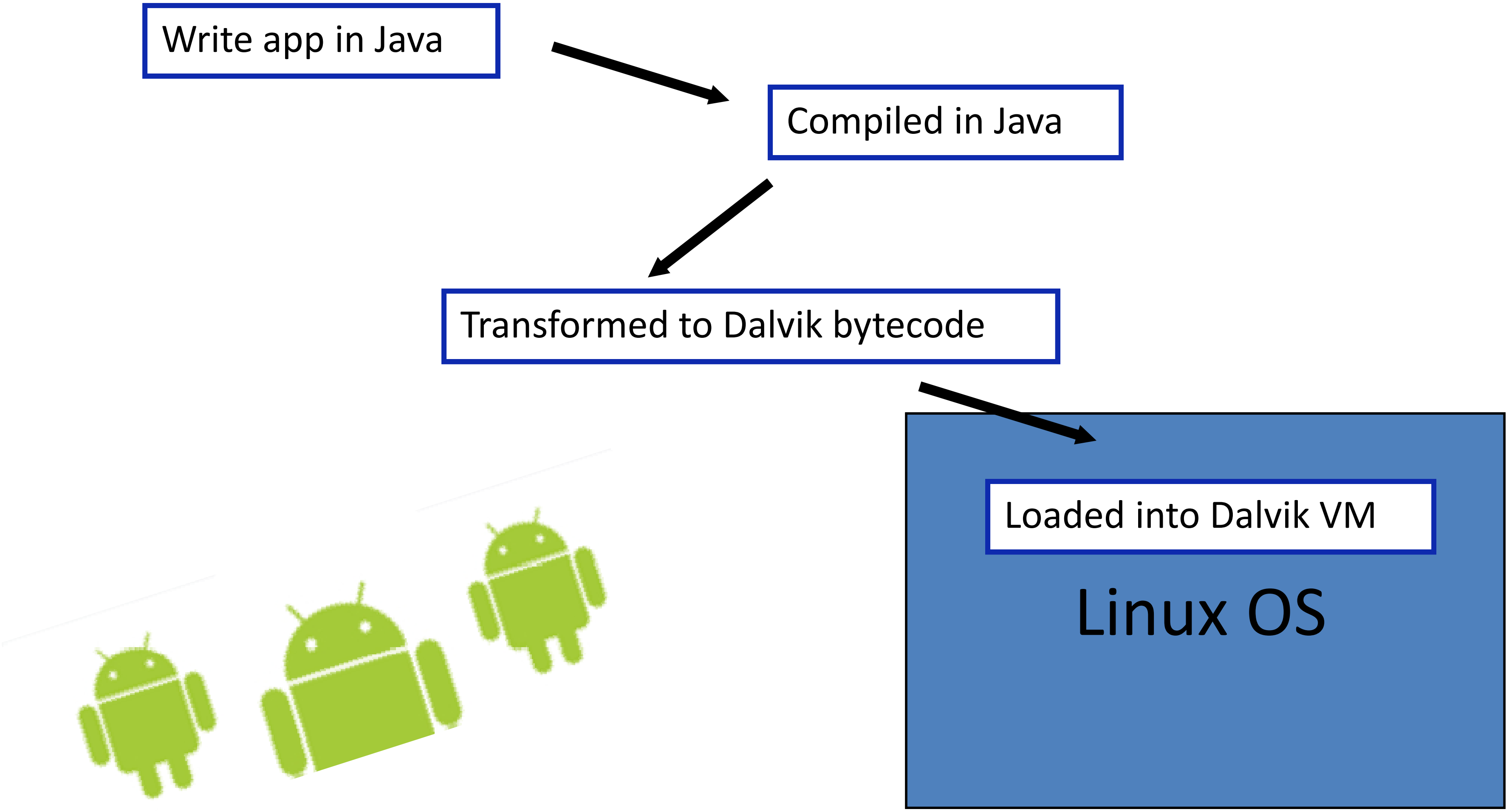
Android applications are written in Java

```
package com.google.android.helloactivity;

import android.app.Activity;
import android.os.Bundle;

public class HelloActivity extends Activity {
    public HelloActivity() {
    }
@Override
    public void onCreate(Bundle icicle) {
        super.onCreate(icicle);
        setContentView(R.layout.hello_activity);
    }
}
```

Android applications are compiled to Dalvik bytecode



Write app in Java

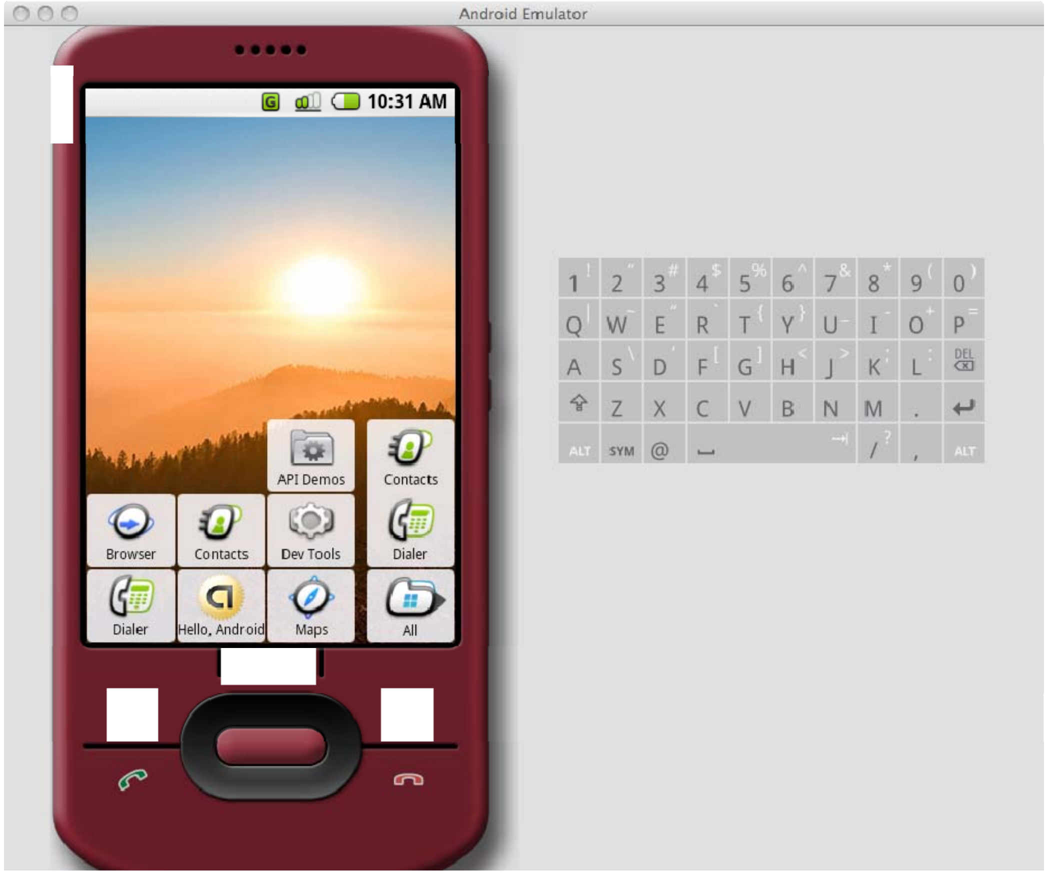
Compiled in Java

Transformed to Dalvik bytecode

Loaded into Dalvik VM

Linux OS

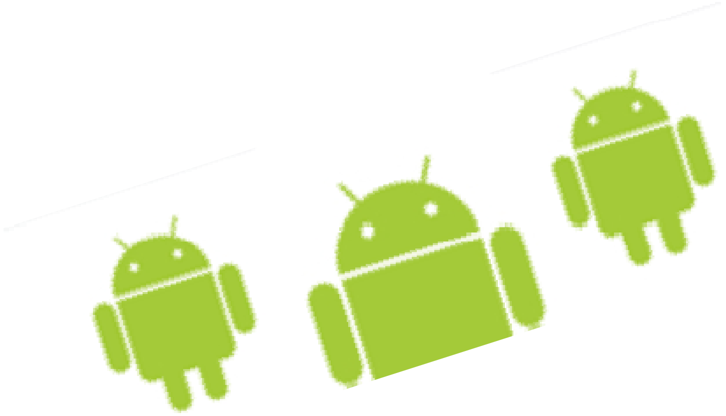
Android has a working emulator



Software development

Development requirements

- Java
- Android SDK
- Eclipse IDE (optional)



Software development (Contd..)

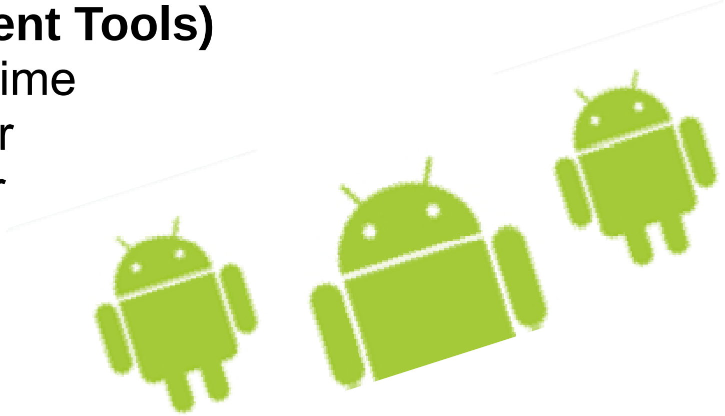
IDE and Tools

Android SDK

- Class Library
- Developer Tools
    - dx – Dalvik Cross-Assembler
    - aapt – Android Asset Packaging Tool
    - adb – Android Debug Bridge
    - ddms – Dalvik Debug Monitor Service
- 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



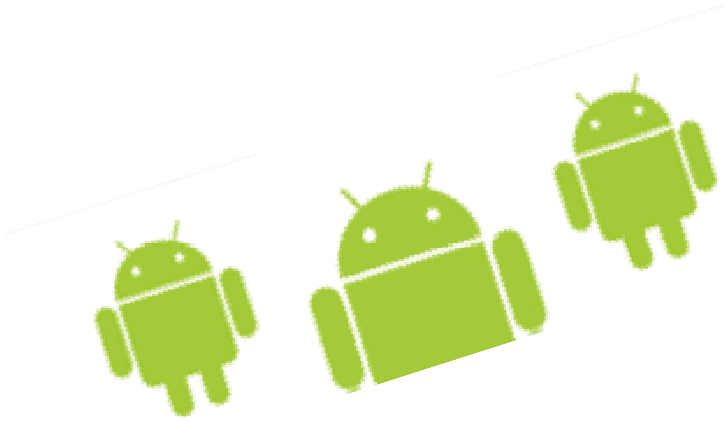
Overall evaluation

Advantages

There are a host of advantages that Google's Android will derive from being an **open source software**. Some of the advantages include:

- The ability for anyone to customize the Google Android platform
- The consumer will benefit from having a wide range of mobile applications to choose from since the monopoly will be broken by Google Android
- We will be able to customize a mobile phones using Google Android platform like never before
- Features like weather details, opening screen, live RSS feeds and even the icons on the opening screen will be able to be customized
- In addition the entertainment functionalities will be taken a notch higher by Google Android being able to offer online real time multiplayer games

Overall evaluation



Limitations

Bluetooth limitations

- Android doesn't support:
  - Bluetooth stereo
  - Contacts exchange
  - Modem pairing
  - Wireless keyboards

But it'll work with Bluetooth headsets, but that's about it

Firefox Mobile isn't coming to Android

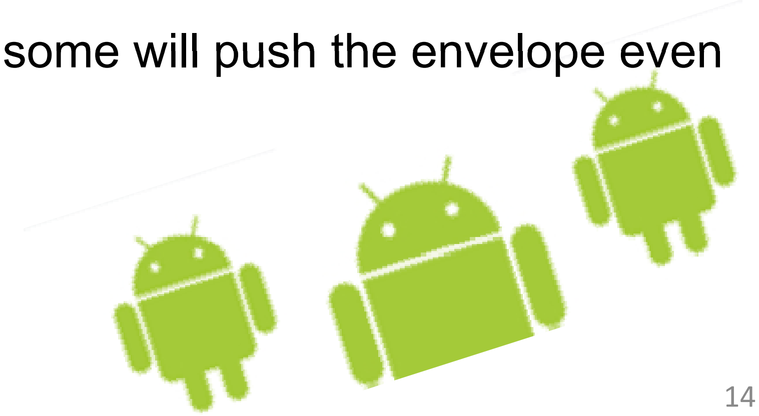
Apps in Android Market need to be programmed with a custom form of Java

→ Mozilla and the Fennec won't have that

Platform

Future possibilities

- Google Android Sales to Overtake iPhone in 2012
- The OHA is committed to make their vision a reality: to deploy the Android platform for every mobile operator, handset manufacturers and developers to build innovative devices
- Intel doesn't want to lose ownership of the netbook market, so they need to prepare for anything, including Android
- Fujitsu launched an initiative to offer consulting and engineering expertise to help run Android on embedded hardware, which aside from cellphones, mobile internet devices, and portable media players, could include GPS devices, thin-client computers and set-top boxes.
- More Android devices are coming and some will push the envelope even further



Conclusion

- We can only hope that the next versions of Android have overcome the actual limitations and that the future possibilities became a reality
- There are lots of sources of information
  - The sdk comes with the API references, sample applications and lots of docs
  - Blog http://android-developers.blogspot.com/ which has lots of useful examples, details
  - There is http://www.anddev.org