Android - First Steps

What is Android?

The basics are described in this wikipedia article:

> https://en.wikipedia.org/wiki/Android_(operating_system)

Development of Android started in 2003. Originally aimed at bringing location awareness to digital cameras, the focus was switched to mobile phones because they form a larger market. Android was bought by Google in 2005. The first Android product was released on 5th November 2007. Google makes Android available for free and allows hardware vendors to customise it, which, together with the easy path for application developers, helps to explain its rapid market penetration. (Google makes its money from the Google stuff that Android links its users to.)

The first commercial mobile phone running Android was the HTC Dream (22nd October 2008). Android reached 64% share of global mobile phone market in March 2013. By 3rd September 2013 one billion Android devices had been activated.

Most popular OS for developers (71% as of May 2013). HUGE number of third party applications, 'apps', available.

Android itself is now up to version 4.3 (Jelly Bean); version 4.4 (Kit Kat) was announced on 3rd September 2013, but is not yet released.

Is Android Linux?

> http://www.androidcentral.com/ask-ac-android-linux

YES! Android now runs on top of a standard Linux kernel, and uses many of the same kernel-space utilities and code that my desktop does. Essentially, that's what Linux is – the heart of many different systems. Google, and the Android partners like Samsung, HTC, and CyanogenMod, then build things out to present the user with an interface to interact with the kernel. The kernel does stuff, all our taps and swipes and presses are telling it the stuff we want it to do – just like any of the popular Linux distributions that you can install on your computer at home or work.

Android looks and acts a little different because it needs to look and act a little different to be useful on a small touch screen device.

Android is not, however, 'Embedded Linux' (the sort of OS that gets fitted to ovens and other fixed function devices).

All this means that if we aggregate all computing devices across the planet, Linux is the most common OS (even though it still hasn't conquered the desktop).

Android vs Linux

> http://handycodeworks.com/wp-content/uploads/2011/02/linux_versus_android.pdf

The GUI: Touch centred – takes a while to get used to NOT clicking the mouse – especially when running it in a Virtual Machine (VM) on a PC! None of the Xserver or other GUI stuff used on standard desktops.

Target architectures – Android is only aimed at ARM and x86 processors.

Kernel modifications: Android is based on the Linux, but does not use a standard Linux kernel. The kernel enhancements of Android include alarm driver, ashmem (Android shared memory driver), binder driver (Inter-Process Communication Interface), power management, low memory killer, kernel debugger and logger. All these kernel enhancements have been contributed back to the open source community under the GNU Public License (GPL).

C Library: Android has its own, 'Bionic', to get round memory constraint and licence problems.

Dalvik Virtual Machine: Enables developers to develop application in the Java language they are familiar with, but has its own VM – Oracle went to court over this and lost. The Dalvik VM is optimized for low memory compared to other VMs because:

- The VM was slimmed down to use less space;

- Dalvik has no just-in-time compiler;

- The constant pool has been modified to use only 32-bit indexes to simplify the interpreter;

- It uses its own byte code, not Java bytecode.

File System: Android uses Yet Another Flash File System (YAFFS), the first NAND optimized Linux flash file system. For mobile devices, hard disks are too physically large, too fragile and consume too much power to be useful. Flash memory provides fast read access time and better kinetic shock resistance than hard disks. There are fundamentally two different types of flash memory based on their construction technique: NOR and NAND. NOR is low density, offers slow writes and fast reads. NAND is low cost, high density and offers fast writes and slow reads. Embedded systems are increasingly using NAND flash for storage and NOR for code and execution. Flash memory file systems must deal with these limitations robustly..

YAFFS-Ext3 Comparison: YAFFS and ext3 have fundamental differences, since the design principles of these two file systems are based on the physical differences of each storage medium. These differences can be summarized as follows:

- **File accessibility**: disk file systems are optimized to avoid disk seeks whenever possible due to high latency; flash memory devices have no seek latency and can randomly access files.

- **Block erasing**: it is easy to erase a file on a disk; for flash devices it is quite time consuming therefore it should be done while the device is idle.

- **Wear levelling techniques**: only flash file systems have to deal with limited life time.

Power Management: In contrast with a standard Linux system, Android does not use APM or ACPI for power management. Android has its own Linux power extension, PowerManager, instead.

Networking

> http://stackoverflow.com/questions/16172474/does-android-have-any-networking-limitations-comparing-to-linux

The Android developers saved time and money by:

- Only allowing a network connection to one network at a time, e.g. you can't route IP traffic to a connected WiFi network and a 3G network simultaneously.

- Only allowing one network device driver to run at any point in time per connection type. So you might have one driver for 3G networking, another for WiFi networking, another for USB tethering, but you can't load two separate WiFi drivers at once.

- Not supporting multiple logical interfaces for a single physical network. In Linux you might have eth0 and net0 pointing to the same NIC, but Android doesn't support this.

These network features are fundamental for desktop and server OSes, but were seen as unnecessary on mobile systems and were therefore sacrificed.

Users

Of course, one of the first things to be stripped out of Linux when developing Android was support for multiple users. However, the super-user mode has been preserved.

Apps

Approaching a million apps available for Android. Many are free. Many are useless.

Google doesn't keep as tight control over app stores as Apple does, so there is more opportunity for 'bad' apps to get into your phone. (Because Google is giving Android away, it can't stop phone manufacturers, or indeed anyone else, setting up an Android app store.)

Malware

Due to the 'sandboxing' used by Android, anti-malware products are of limited use (sometimes no use at all). Vital not to allow root privileges. On latest Android versions each app is forced to ask for permission for what it wants to do. Think carefully before agreeing!

http://www.computerweekly.com/feature/Top-10-Android-security-tips

Follow these 10 security tips and Android will become a much more secure and reliable mobile operating system:

1. Disable app downloads from unknown sources

2. Upgrade to Android 3.0 or above

3. Download an anti-malware app

4. Do not connect to unsecured, unknown Wi-Fi networks

5. Install a remote wipe/lock app

6. Keep all sensitive data behind an extra encryption layer

7. Be aware of SMS threats

8. Use the Chrome browser

9. Put a lock on your lock screen

10. Stolen phone? Check out Plan B (an app on the Google Play website)

Android vs Other Smartphone Operating Systems

I haven't investigated but I think:

- Windows for smartphone is unlikely to be successful because Microsoft appear to have approached the problem by making a cut-down version of their general purpose desktop/ laptop operating system. A lot of the 'new thinking' engendered by the creation of the smartphone appears to have passed them by. The Windows smartphone OS still has (had?) to be general purpose as it was sod to OEMs who made the hardware. I don't think buying Nokia's mobile phone operations will save them.

- Apple has a good chance of a future. They have designed a specific smartphone OS with the advantage that it only has to run on hardware which Apple also controls. Reputedly, they offer a good user experience – although it is a 'walled garden'. However, iOS could be the new generation Betamax – better technically, but squeezed out of the bulk of the market by a better marketing approach.

- Android has the bulk of the smartphone market due to some smart moves by Google: it's free to the OEMs, they can modify it, and Google has ensured that there will be a massive quantity of apps available.

The Future

One view of the future is that most people will have an Android smartphone and that there will be growing pressure from these people for the ability to run Android applications on their other devices – tablets, netbooks, laptops, desktops. Linux may capture the desktop at last when someone puts together a Linux distro that can run Angry Birds natively!