Course Project Proposal: The Android OS

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1 Introduction

As the involvement of technology and users demands, modern mobile phones no longer function merely as phoning and texting devices. Instead, they can offer many advanced capabilities with PC-like functionality. Typical applications that can be run on a mobile include multimedia applications like playing music, making photos and videos, Internet applications like email and web browsing, or entertainment applications like gaming. With the presence of these complicated applications, an independent operating system is obviously needed for each mobile device.

Therefore, many mobile operating systems have been developed and used in the market so far. The most common ones among them include Symbian OS from Symbian Ltd. (47.1% Market Share Sales), RIM BlackBerry operating system (19.5% Market Share Sales), Windows Mobile from Microsoft (12.4% Market Share Sales), and iPhone OS from Apple Inc. (10.7% Market Share Sales) [3]. However, the mobile OS is still a very promising market with increasing demand of mobile users for it.

There are still several limitations for the current mobile OSes. First, some of them, like iPhone and BlackBerry OS, are designed for and can be used only in specific types of mobile devices. Second, expert users may need to develop their own applications that require an open platform. Closed source systems such as Windows Mobile are not flexible enough for this purpose. Finally, another important reason is that people want their cell phone functioning like a PC in that whatever they can access on a desktop, they should also be able to access on their cell phones. Therefore, an operating system running on a cell phone should be similar to a common desktop operating system. Symbian OS, while having the largest market share, is not.

For all above reasons, on 21 Oct 2008, Google released Android, an open source software platform and operating system, which can run on every mobile device, with the hope of reaching as many mobile users as possible. Android is based on the Linux 2.6 kernel, and it provides an open platform for users to develop their own applications in the Java programming language.

Although Android uses the Linux 2.6 kernel, there are significant differences between Android platform stack and the conventional desktop Linux stack. In fact, it is claimed by Google engineer Patrick Brady in a presentation at the Google IO conference that *Android is not Linux*. Therefore, in this project, we would like to investigate the Android kernel source code to see the differences between the way Android kernel manages CPU, memory, and other resources, and those in Linux 2.6 kernel.

In addition, if we still have enough time, we would like to compare Android with other mobile OS such as Symbian OS, Windows Mobile and iPhone OS and the approaches they use for resource management.

2 Research Idea

Our research plan involves essentially surveying the policies of the Android operating system, including scheduling, memory management, and other resource management policies. Primarily we plan to examine how the Android OS differs from the Linux 2.6 upon which it was based, though if time permits, we plan to compare stress tests between Android and other mobile operating systems.

3 Tools

To complete our survey of the Android OS, we will make use of the openly available Android and Linux 2.6 kernel source code. The Android SDK also includes an emulator for the phone for testing developer applications, which we may use to develop and run stress tests to determine experimental differences

between the Linux policies and those of Android.

4 Milestones

We expect each milestone to take between one and two weeks to achieve.

(1) Examine and compare Linux and Android source code to get a very basic level understanding of the various policies implemented. The low-level understanding of the policy differences will enable us to better design implementation tests later in the project.

(2) Review related work.

(3) Create stress tests and run on emulators.

(4) (Optional) Repeat (1), (2) and (3) for other mobile operating systems.

(5) Write the final document.

5 Related Work

During our preparation for this project we have encountered a number of related works, though very few in the academic sphere.

The most useful related works are likely to be the Google I/O Session videos, hosted on YouTube, which encompass a series of talks given at Google's annual developer gatherings. The relevant talks include "Introduction to Android", "Anatomy & Physiology of an Android", and "Dalvik VM Internals". The "Introduction to Android" video provides an overview of the Android system as far as an Android developer may be concerned. "Anatomy & Physiology of an Android" gets into the details of the operating system and is geared towards kernel developers. "Dalvik VM Internals" goes into detail regarding the virtual machine architecture upon which all Android applications are run.

Also readily available and potentially extremely useful are the source code repositories for both Linux 2.6 and the Android OS. The Linux 2.6 repository is available online at , and Android is available at , and we have built the Android kernel on a Linux workstation in the computer science building. Also included with the source code is developer written documentation, which may prove helpful in understanding the code.

For comparison to the Linux kernel, we will review the documentation by Josh Aas ([1]), *Understanding the Linux 2.6.8.1 Scheduler*. While this article focuses on the scheduling policies, we hope that it will also provide insight to other resource management.

For reviewing the Android kernel itself, we plan to use the Master's thesis by Benjamin Speckmann ([2]) for guidance. We are unsure as to the content of the thesis itself, but hope upon further review that it will provide useful insights as to Android's resource management policies and differences from Linux.

References

[1] Josh Aas. Understanding the Linux 2.6.8.1 scheduler. *Silicon Graphics, Inc.*, 2005.

[2] Benjamin Speckmann. The Android mobile platform. Master's thesis, Eastern Michigan University, 2008.

[3] Wikipedia. Smartphone. *http://en.wikipedia.org/wiki/Smartphone*, 2009.