Comparative Study on Smartphone Based Operating System

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ABSTRACT: Several mobile phone operating systems are currently available today, but mobile phones with android OS have now become a domestic product which was once an expensive product. The reason for this change is due to its varied features, user-friendliness and utility. There are several activities on it, such as calling, sending or receiving SMS, music, billing, online shopping, online booking, playing games, web browsing, using various apps such as whatsapp, facebook or Applock, etc. Therefore a great deal of user-sensitive data is stored inside the devices. Increased smartphone use has led to greater concerns over user-private data security. As an open source mobile platform, android makes it easy for users to install third-party applications from markets, and even from unreliable sources. Android devices are a strong intrusion option for privacy. Whenever the user wants to install some program, it is firstly the overview and screenshots of the application that give an insight into its functionality. Before deployment the user checks the summary and a list of requests for approval. When malicious attack styles and levels increasing, the challenge of pre-examining whether an app is malicious or not through its descriptions has increased numbers. Author reviewed and examined android software stack in this paper, and compared smartphone-based operating system such as Android, IOS, blackberry, Symbian, Windows Phone, WebOS, Ubuntu, and Firefox.

KEYWORDS*:* Android, Operating System, Security, Mobile system, Windows, iPhone, Applications.

INTRODUCTION

Mobile phone apps are among the most commonly used telecommunication technologies. Mobile phone device includes numbers of portable things such as call phones, Personal Digital Assistants (PDAs), palm-tops, laptops, global positioning systems, and so on. Over the course of time, this mobile technology is growing rapidly around the world. During our daily lives, everyone can clearly see close to many that even a poor person can make use of a mobile phone or have access to a mobile phone [1]. Mobile phones are commonly used both within the business environment and in daily lives. Individuals used to go to banks, offices or any other departments for their desired tasks in the past few years, but in this present period one can easily perform one's task with the help of mobile phone [2]. Operating System (OS) is a set of software that regulates computer hardware resources and offers important services to computer programs. The operating system within a computer system is an essential component of the system software. Application programs typically involve running on an operating system. Operating System can be defined as "A program that acts as an intermediary between a user of a computer and the computer hardware" Objectives of Operating System Are:

- Run user programs and facilitate user problem solving.
- Make user friendly operating program.
- Effectively use the computer hardware.

ARCHITECTURE OF OPERATING SYSTEM

Kernel Mode:
Under kernel mode, complete and unlimited access to the underlying hardware is given by the executing code. Each CPU instruction can be executed and any memory address referenced. Kernel mode is usually reserved for the operating system's lowest-level, most trusted functions [3].

User Mode:
The running code in User mode does not have the ability to directly access hardware or reference memory. Code running in user mode must assign a hardware or memory link to system APIs.
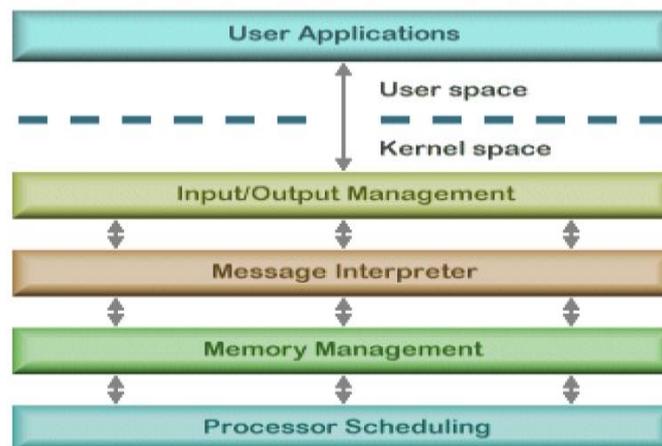

Fig. 1: User Mode

TYPES OF OPERATING SYSTEM

Real-time Operating System:
A real-time operating system is a multitasking operating system designed to run applications in real-time. Real-time operating systems also use expert scheduling algorithms to achieve a deterministic type of behavior. The main goal of operating systems in real time is their quick and predictable response to events [4]. These have an event-driven or time-sharing nature, and sometimes both types. An event-driven system switches among tasks focused on priorities or external events while operating system time-sharing switches tasks based on clock interruptions.

Multi-user Operating System:
A multi user operating system allows multiple users to simultaneously access a computer system. Time-sharing systems and Internet servers can be categorized as multi-user systems as they allow multi-user access through time sharing to a computer. Single-user operating systems only have one user but may allow multiple programs to run simultaneously [5].

Multi-tasking Operating System:
A multi-tasking operating system enables more than one program to run simultaneously, from a human time scale viewpoint. Multi-tasking can be of two different types: preventive and cooperative. The operating system cuts the CPU time in pre-emptive multitasking, and dedicates one slot to each of the programs. As with AmigaOS, Unix-like operating systems like Solaris and Linux support preemptive multitasking. Cooperative multitasking is accomplished

by depending on each process to give a given amount of time to the other processes. 16-bit versions of Microsoft Windows used multi-tasking cooperatives. Windows NT and Win9x all 32-bit models used pre-emptive multi-tasking.

Distributed Operating System:
A distributed operating system intends an independent group of computers and makes them look like a single computer. The development of networked computers which could be connected and communicated with each other has given rise to distributed computing. Distributed calculations are performed on over one machine. Once computers cooperate in a group, they create a distributed network [6].

Embedded Operating System:
Embedded operating systems are intended for use in built-in computer systems. They are designed to operate on smaller, less autonomous machines, such as PDAs. Operating with a limited number of resources, they can. They are very compact and designed to be extremely efficient.

Time Sharing Operating System:
Time-sharing operating systems scheduled activities for efficient device use, and may include accounting software for processor time allocation, data storage, printing, and other resources. Types of popular operating systems include Android, BSD, IOS, Linux, OS X, QNX, Microsoft Windows, Windows Phone, and IBM z / OS. They all share origins in UNIX except Windows, Windows Phone, and z / OS.

COMPARISON OF OPERATING SYSTEM

Android:
Android is an operating system based on Linux, designed for mobile devices such as mobile phones and tablet PCs with e-readers. Its first public version was released on November 12th, 2007 and on September 23rd, 2008; the first mobile phone with this operating system entered the business market. It is an open source operating system based on the Linux kernel that allows the developers to initially write and modify applications in Java. It is C / C++ support, as well. It provides users with easy access to public websites such as YouTube, Face book and smooth integration with Gmail and Google calendar etc. In recent years it is becoming more popular among hardware manufacturers as well as in the general public [7]. One best thing which play a very important role in its popularity that it is absolutely free operating system for mobile devices and it has been selected by many hardware manufactures to run it on several devices like mobile phones, net books tablet PCs and others.

iPhone OS:
Apple released its first-generation iPhone on 29 June 2007 in the USA and iPhone 5 released on 21 September 2012. The mobile device that uses the iPhone OS is similar to Mac OS X. Figure 2 illustrates the fundamental organization of the iPhone OS.
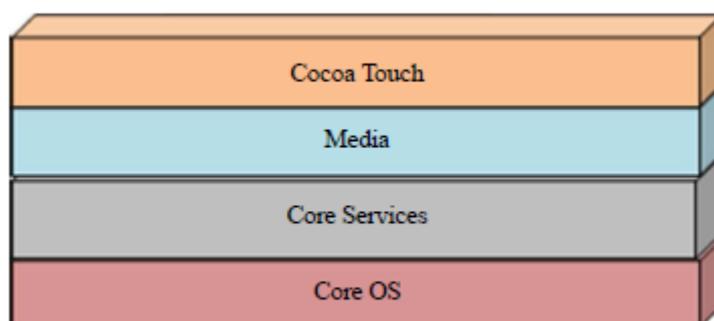

Fig. 2: Architecture of iPhone OS

The core layer of the OS remains in the architecture of the iPhone OS below. Core layer of services includes an additional layer of abstraction, media, and cocoa touch. The Core OS layer also contains the scheduler, Mach kernel, file system, hardware drivers and is responsible for controlling the memory system, network and inter-process communication and security mechanism in order to secure device and program data. As said, the core layer of services includes a framework for abstraction. This includes access to network compatibility, simple Objective-C programming system, state of the mobile device, access to location information, and address book. Media layer includes different structures to manage audio, video, 2D and 3D graphics. The Cocoa Touch layer lies at the top level of iPhone OS architecture and provides the iPhone OS with basic building blocks for creating graphical event based applications [8].

BlackBerry:
BlackBerry's operating system is a modest operating system that was developed through work in motion to be used exclusively in conjunction with BlackBerry's mobile phone family. In the starting Black-Berry mobile phone was developed with business experts, and in terms of functionality, providing wireless synchronization with Microsoft exchange. In this current period, BlackBerry is still widely used in the current market, but in the past few years, numerous new mobile devices with different operating systems have been introduced in the business market, having a great impact on BlackBerry devices [9].
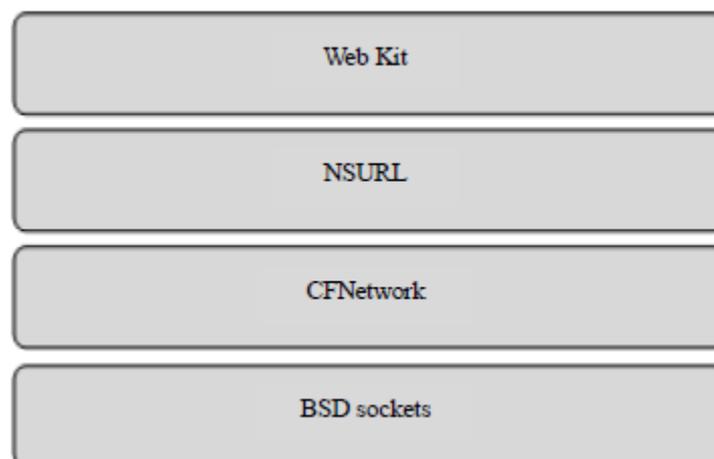

Fig. 3: CFNetwork and other software layers on Mac OS X

As shown above, BlackBerry OS is a modest operating system and there is not much information about the operating system's internal functionality that RIM has revealed. Software Development Kit (SDK) has course documents that is available for operating system application development but does not provide technical information about the operating system in question. Developers can create Java applications first by using propriety JVM to run on BlackBerry device. Numerous Java APIs for tasks such as networking, data storage, and device integration are also available. Second, developers will be able to create Mobile Data Service (MDS).

Windows Mobile:
Microsoft has developed the Windows Mobile operating system to run this OS on a variety of mobile phones. Window Mobile OS is Win32 API-based and designed to provide services similar to desktop PCs. Figure 5 illustrates a general structure of the Windows Mobile kernel.
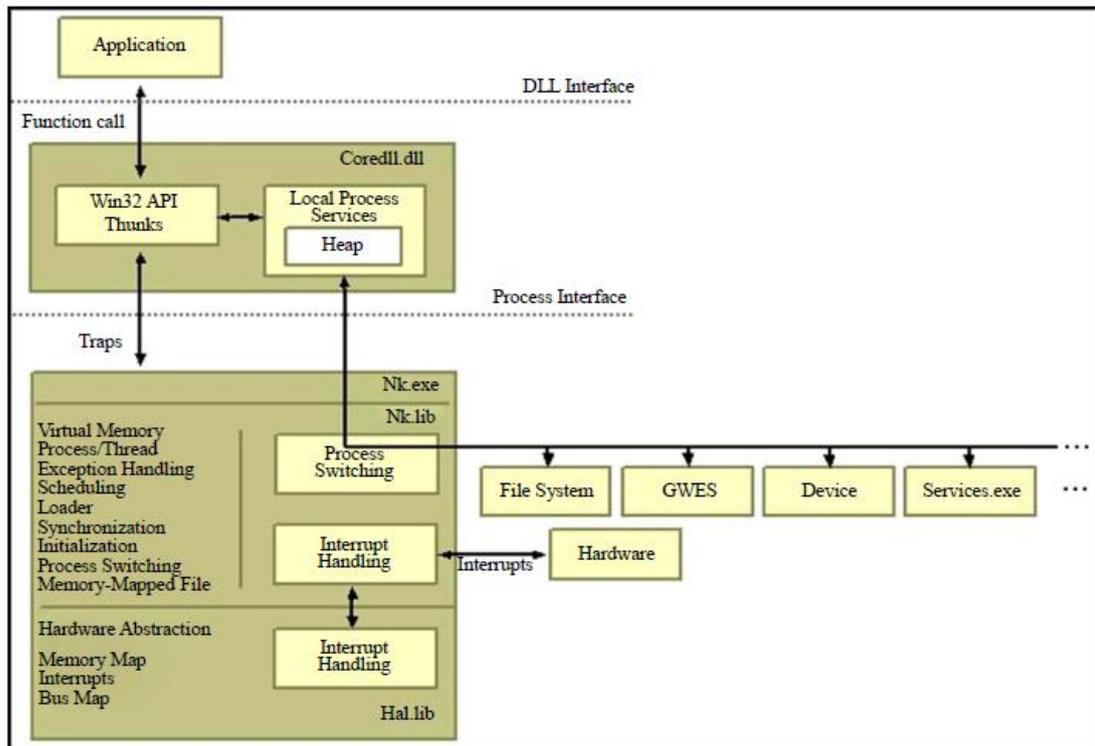
Fig. 4: Schematic Overview of Windows Mobile Kernel

The kernel in this operating system is based on Windows Compact Edition (CE), an operating system developed for embedded and handheld devices [10]. Windows CE is a modular operating system where the developers choose the features they want. The operating system size including kernel is just a few hundred KB, but developers can add or support components such as web browser. NET Framework. The main difference between Windows mobile and Windows CE is that the community of modules that Microsoft fixes and uses so that the APIs between all Windows Mobile Phone apps are secure. Those APIs aren't the same though. All mobile devices must maintain a minimum set of functionalities, but the mobile phone manufactures include the additional APIs openly in the picture of the operating system.

Table 1:Quality Comparison of Operating Systems

Operating System	Concurrency	Memory Use	Network	Security
Android	***	**	***	***
iPhone OS	*	***	**	**
BlackBerry	***	**	**	***
Windows Mobile	***	***	***	**

CONCLUSION

Mobile device operating systems discussed have both strong and weak points. It's certainly not possible to say which one of these is the best operating system. Nonetheless, the least suitable operating system in the list may be found. Table 1 summarizes the strengths and weaknesses of the exploited operating system discussed. In order to run the background process that makes the latest version of iPhone OS, unnecessary constraints are enforced by Apple with observations and such version is not appropriate for most old applications. The remaining four operating systems have no trouble running different programs at the same time or running the processes in the background, and they score three points.

REFERENCES

[1] F. M. Tseng, Y. L. Liu, and H. H. Wu, "Market penetration among competitive innovation products: The case of the Smartphone Operating System," J. Eng. Technol. Manag. - JET-M, 2014, doi: 10.1016/j.jengtecman.2013.10.002.

[2] K. Bala, S. Sharma, and G. Kaur, "A Study on Smartphone based Operating System," Int. J. Comput. Appl., 2015, doi: 10.5120/21504-4351.

[3] J. S. MarcanoBelisario, J. Jamsek, K. Huckvale, J. O'Donoghue, C. P. Morrison, and J. Car, "Comparison of self-administered survey questionnaire responses collected using mobile apps versus other methods," Cochrane Database of Systematic Reviews. 2015, doi: 10.1002/14651858.MR000042.pub2.

[4] R. T. E. Ltd., "FreeRTOS - Market leading RTOS (Real Time Operating System) for embedded systems with Internet of Things extensions," https://www.freertos.org/, 2018.

[5] A. S. Tanenbaum and H. Bos, Modern Operating Systems. 2014.

[6] P. Exercises, "Operating- System Structures," System, 2011.

[7] S. Bhardwaj, Android Operating Systems. 2013.

[8] T. Apple et al., "Apple iOS," Apple, 2012.

[9] N. Ahmad, M. W. Boota, and A. H. Masoom, "Comparative Analysis of Operating System of Different Smart Phones," J. Softw. Eng. Appl., 2015, doi: 10.4236/jsea.2015.83012.

[10] T. Zhao, G. Zhang, and L. Zhang, "An overview of mobile devices security issues and countermeasures," in Proceedings - 2014 International Conference on Wireless Communication and Sensor Network, WCSN 2014, 2014, doi: 10.1109/WCSN.2014.95.