A Comparison of Window 8 and Linux Operating System (Android) Security for Mobile Computing

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Abstract

Mobile computing is considered as low-cost computing systems. Now days it dominates almost every aspects of our lives from mobile banking to mobile purchasing to mobile browsing, etc. As the demands of mobile phone increase in our lives, making the system secure from authorized access, malicious threads etc is very important. In mobile computing one of the most important need is Mobile security or mobile phone security. Operating system plays an important role to gain both functionalities and quality (e.g., security) of a system. This paper briefly discuss both the operating systems in terms of security .Also this paper surveys the software architecture of two of the leading mobile operating systems such as Android (Linux), and Windows Mobile. Furthermore, at the end the result of survey we have conducted have been proved that Android is providing better security measures than Windows8**.**

Keywords: Software Architecture; Security Engineering; Mobile Computing; Android; Operating Systems; Mobile operating systems.

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1. Introduction

Mobile security or mobile phone security has become increasingly important in mobile computing. As mobile security relates to the security of personal and business information stored in mobile phone, so mobile security is of particular concern. Most of the users and businesses use smart phones as communication tools but also as a means of controlling, planning and organizing their important work and personal life. In many of the companies, these technologies are causing great changes in the organization of information systems and therefore they have become the source of new risks. Indeed, smart phones collect and compile an increasing amount of sensitive information to which access must be controlled to protect the privacy of the user and the intellectual property of the company. According to research of Allied Business Intelligence (ABI) the Mobile Security Services market will total around $1.88 billion by the end of 2013.

Similar to computers all Mobile phones, are major targets of attacks. These attacks misuse weaknesses related to smart phones that can come from source of communication like Short Message Service (SMS, aka text messaging),Multimedia Messaging Service (MMS), Wi-Fi networks, Bluetooth and GSM, the de facto global standard for mobile communications. There are also attacks that effect software vulnerabilities from both the web browser and operating system. When we talk about security in mobile phones the first layer of security is at the level of the operating system (OS) [3] mobile operating system or mobile OS is operating systems that operate mobiles, tablets, PDA. Modern mobile operating systems consist of both the features of a personal computer operating system along with other fundamental features, i.e. touch screen, cellular, Wi-Fi,GPS mobile navigation, camera, video camera, Bluetooth, voice recognition, voice recorder, music player. Operating system is executed on the top of a bare machine of hardware that allocates the basic resources of the system (e.g., CPU, memory, device driver, communication port, etc), and control the execution of all applications in the system. Some of the most popular closed source and Open Source operating systems are Microsoft Windows, different flavors of UNIX (BSD, AIX, HP-UX, Solaris, etc), Mac OS, and Linux [1].

Windows assert that Linux is full of security issues, inadequate technical support, inconsistent Interfaces and vulnerability. Linux developers, on the other hand, accuse Windows of being more liable to attack, unstable, inflexible, promoting proprietary lock-in, and of low quality [2].

A main idea exist in the mobile operating systems is the idea of a **sandbox**. A sandbox is a security mechanism to separate running process. It is mostly use to check unverified programs which contain virus, without allowing software to harm the host device. As mobile phones are currently being designed to support many applications, So they must carried out in secure platform to ensure these facilities are safe for themselves, also for other applications and data on the system, and the user side. If a malicious program succeed to reach a device, it is important that the vulnerable area presented by the system be as small as possible. Sandboxing enhance this idea to divide different processes into small compartments, stopping them from interacting and affecting each other privacy. Based on the history of operating systems, sandboxing has different implementations [3].

The following points highlight mechanisms implemented in operating systems.

1.1. Process Isolation

Process isolation is a mechanism use by android as it is property of Linux so android inherited this from Linux. Each application has a user linked with it through (UID, GID). This method serves as a sandbox. When malicious applications enter, they cannot get out of the sandbox reserved area for them by their identifiers, and thus they cannot interfere with the system functionalities. For example, as it is impossible for a process to stop the process of another user, so an application can thus not stop the execution of another.

1.2. File Permissions

In Linux, there are also file system permissions mechanisms. In file permission mechanism a process cannot edit any files it wants. It is not easy for a entering process to freely corrupt files necessary for the operation of another application or system. In Android there is the method of locking memory permissions. With locking memory it is not possible to edit the permissions of files installed on the SD card from the phone, and also it is impossible to install applications.

1.3. Memory Protection

In the same manner as on computer, memory protection fast enhances. Indeed, if a process managed to reach the area allocated to other processes, it could write in the memory of a process with rights superior to their own, but it happens in the worst case to affect the root of running process, and perform actions which are not permitted on the system.

In the next section 2, 3 an overview of the both Linux and window operating system. Comparing both the operating systems in terms of security in section 4.Arguments about the chosen operating system that why it is more secure for mobile device in section 5.

2. What is Linux: An Overview of Linux Operating System

The History of Linux started in 1991 with the completion of a personal project by a student name Linus Torvalds, he create a new free operating system kernel. He wrote the program specifically for the hardware he was using and independent of an operating system because he wanted to use the functions of his new PC with an 80386 processor. Linus Torvalds wanted to call his invention Freax, a portmanteau of "free", "freak", and "x" (as an allusion to Unix). Linus made Linux open source with GNU (GPL) (GENERAL PUBLIC LICENCE), so the other programmers download the source code in free of cost, and change the code according to their need. Over the year Linux from a simple text based clone of Linux, become powerful operating system .As Linux is open source so there are many different versions and distribution of Linux. Some of new distribution of Linux are Ubuntu, fedora and android.some of the characteristics of Linux operating system are:

2.1. Linux is Free

Linux can be downloaded free from internet, without any registration fee, per user cost, free updates and if you

want to change the behavior of system than source code is freely available.

2.2. Linux is Portable to any Computer

If a person buy a new computer and he doesn't know what kind of OS his new computer will run, than he can take the Linux kernel and run on his hardware device because documentation related to it is freely available.

2.3. Linux is Secure

As Linux is based on UNIX so the security model used in Linux is UNIX based, and UNIX is known for its robustness and secure architecture. Linux is not only secure from the enemy attacks from internet.

2.4. Linux Stability

Linux is designed to run cooperate servers. Linux inherits the same stability that UNIX established**.**

2.5. Linux Compatibility

Due to the availability and flexibility of code, Linux system can be customized to work with any network, and supported by number of hardware platforms**.**

2.6. *Android as Linux Distribution*

The first version of android beta is released in November 2007.Android 1.0 is released in 2008.The recant version of android is android 4.3 with the removal of "App ops" application permission control system and enhance features of security and bug fixes. Android is supported by Google and Open Handset Alliance (OHA).it consists of a kernel based on the Linux kernel long-term support (LTS) branch. Due the presence of the Dalvik virtual machine (custom built virtual machine (Dalvik) for the applications to run) Android is fast, its hardware is independent, which makes it portable [1].

3. What is Window OS: An Overview of Windows Operating System

The first independent version of Microsoft Windows, version 1.0, released on 20 November 1985.it is not complete operating system but an extension of "MS-DOS" having variety of flaws. The features added to the first version of Microsoft Windows included a simple graphics painting program called Paint, Windows, a simple processor, an appointment calendar, a card-filer, a notepad, a digital clock, a control panel, Clipboard, RAM driver and also a game called Reversi. Window 2.0 released in 9 December 1987, it become popular due to the feature of Microsoft word and Excel. Later many different versions of Microsoft windows are released with improvements .From a proprietary viewpoint, there are many advantages of the Windows platform. The major advantage of Windows is its user familiarity. Since it was the first mass marketed Operating system on PCs, Windows has become the computing standard. Almost everyone who taught how to use a computer is learning on a Windows system.

Along with familiarity, the other existing advantages of Windows over Linux include user friendliness, simplified installation, and a greater variety of software choices. So of the major features of windows operating systems are:

3.1. User-Friendliness

Window user-friendliness is because of its familiarity. Windows is the choice of most of the organization, business and educational institute.

3.2. Variety of Software Choices

As windows runs on different computer, so a vast variety of software's are designed to run on it, providing users with more application choices.

3.3. Simplified Installation

On Windows system Program installation is an independent process that guids the user step-by-step through each guide of the install requiring little user input.

Windows 8: Latest Windows Version

Window 8 is the latest version of Microsoft windows released in 2013, it is available in the following editions: Windows 8 pro, Windows 8 enterprise and windows RT. Windows 8 redesigned the user interface which is for touch screen user to use easily, also include redesigned startup menu. Mobile devices with 32 bit processor also support window 8 operating system. It is much faster than window 7 [4].

4. Comparing both Operating Systems in terms of Security

"Security through obscurity" may be an attractive phrase, but it's the only thing that's not found among Windows users.

The expression is intended to suggest that closed source software is more secure due to the reason of its closed nature. The hackers can't view the source code, so it becomes difficult for them to create danger for it.

Unluckily for the Windows users, that's only thing not true--as proved by the never-ending demonstration of patches coming out of Redmond. In fact, one of Linux major advantages over Windows is that it is much more secure. Security is particularly critical for small businesses and also for other organization [6].

4.1. Security Competition, Linux 2,Apple 0,Microsoft 0

There have only few of official "level playing field" competitions comparing the security of Linux with Microsoft. The first competition was held at a Hackers conference of CanSecWest 2008 in Vancouver, Canada. This competition called Pwn2Own, offering cash prize and free computers to annoy hacker who could hack into

an Apple, Microsoft or Linux computer publically at the conference. On the 2nd day of the three day competition, one of the 400 attendees was able to crack security of the Mac Apple computer who wins $20,000. On the 3rd day, another hacker was able to crack the Microsoft windows computer who win $10,000.No one was ever able to crack the Linux Ubuntu computer.

This competition also held in March 2013 – but this time offering cash prizes with over $3.14 million available. This time also Apple and Microsoft computers were hacked, but even with millions of dollars in prizes, no one was able to taking down the Linux-based Chrome OS. So Linux is always the best choice for security-conscious desktop users [7].

4.2. Why Linux is more Secure than Windows

Security development is much more robust in an open development model than in a closed secret model. As windows is top down or cooperative driven model. So they only want to protect their current status, with allowing very little changes and innovations. On the other hand Linux is open source, and using bottom up development in which programmer come up with their own solution of problems, then these solutions shares with the others and all benefits with this innovation. Also Linux works as a family so it is difficult to crack a family rather than individual. Linux consist of core which is surrounded by 8 security modules to which a lot of application extensions are attached like Firefox, Libre word processing. So if someone hack one security wall than there is also another security wall. Furthermore, different families of Linux are using different security walls so because of diversity it is also difficult to hack Linux based OS [8].

4.3. Some of the Security reasons at kernel Level

Windows only run file with the extension of .exe, while Linux does not run file with .exe extension .so in this way Linux is not allowing malicious programs to run as most of the viruses comes with .exe extension. When you are installing Linux Os there are two types of authentications i.e. administrator password and root password. Root password is a unique password and without this password there is no way to change the system. On the other hand Microsoft always wants to access your device to check whether you are using pirated version of their software, so they allow changing or disabling program without root access. Another reason is that Linux have single kernel for the reason of simplicity and enhancing security while window have many kernels so allowing threads to damage other sub- kernel.

5. Why Android is more Secure for Mobile Device

Linux is almost always a free operating system with multiple sources distribution. In contrast, Windows and Mac OS X are some of the most expensive operating systems available. If you want to cut on costs, you can definitely benefit from choosing Linux for your everyday needs.

As mobile phones are our everyday need, so a lot of peoples are confused about which mobile phone is chosen. So raw data about windows and android

5.1. Privileges

Linux systems are by no means infallible, but one of their key advantages lies in the way account privileges are assigned. In Windows operating system users have administrator access by default, which means that they have much access to everything on the system, even its most critical parts. So, the virus are more common in windows OS. It's just like assigning terrorists high-level government positions.

On the other hand, With Linux, users do not commonly have such "root" privileges, they only given lower-level accounts. Its means that even if a Linux system is on danger, the virus won't have the root access it would need to do damage system wide more likely, just the user's local files and programs would be affected. That can make the difference between a minor annoyance and a major catastrophe in any business setting.

Table 1: Table of comparison

Facts	Android-Google	Window phones-Microsoft
Market share	52.2%	6.29%
No of apps	700,000+	130,000+
Free app	72%	66%
Mobile developer interest	55-77%	36 %
No. of device choices	Samsung ,Sony, Nexus	Nokia, Samsung , Hawaii
Device sale	82.2% in 2014	10-18% in 2014

Five key factors underlie Linux superior security

5.2. Social Engineering

Most of the Viruses and worms often spread by allowing mobile users to do something they shouldn't, like open attachments that carry viruses and worms. This is called social engineering. It's all quit easy on Windows systems. It just happens by sending an e-mail with a malicious attachment and a subject line like, "Check out these adorable items!"--and some of users are bound to click without thinking. Then what happens? A door is open for the attached malware, malicious viruses, which potentially have bad consequences organization wide.

Its big advantage of Linux, that most Linux users don't have root access, although, it's too hard to accomplish any real damage on a Linux system by pushing them to do something foolish. Before any real damage occurs, a Linux user would have to read the e-mail and save the attachment than give it executable permissions and run the executable.

5.3. Monoculture Effect

If we want to argue the total numbers of users, than there's no doubt that Microsoft windows is on the top in most of the computing world. In the case of e-mail, so too do Outlook and Outlook Express. It's normally a monoculture, which is not good in technology than it is in the natural world. Just like genetic diversity is a good thing in the natural world because it lower the effects of a deadly virus, so a diversity of computing environments better to protect users.

Thanks to Linux, a diversity of environments is also another benefit that Linux offers. There's Debian, Ubuntu, there's fedora, there's Gentoo, there is android and there are many other distributions. There are also many different shells, different packaging systems, and a lot of mail clients. Even Linux can runs on much architecture.

5.4. Usage

Hand-in-hand with this monoculture effect comes the not particularly surprising fact that the majority of viruses target Windows. As Linux is community driven, developed by people collaboration and checked constantly by the developers from every corner of the earth, if any new problem occurs, that problem can be solved within few hours and the necessary first aid can be ready at the same time.

Also Linux is based on the UNIX architecture which is a multi-user OS, so it is much more stable than Single user OS Windows.

However, when it comes to security, there's no doubt that Linux users have a lot less to worry about.

5.5. Cost

Linux can be freely distributed, downloaded freely, distributed through magazines, Books etc. There are priced versions for Linux also, but they are normally cheaper than Windows.

For desktop or home use, Windows can be expensive. A single copy can cost around $50 to $ 450 depending on the version of Windows.

6. Conclusion

Same as the computer security, Mobile security is all about trade-offs and manage the threads and risk. It's about how programmers can reduce and minimize the risks for users. The mobile user must also want to have a choice between comfort and privacy of data .Operating system have major role in operating device, so the security precautions are made at that level, to minimize risks. Windows is choice of majority of users because it is easy to use, but if we want to make our data secure than our first choice is Linux. In conclusion of the above discussion I found that android which is Linux based is more advantageous as compared to windows operating System in term of security.

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