

Comparative Survey of UNIX, Linux, Windows7 Operating System

Nilam K. Nakod #1,

¹Assistant Professor, SS Jondahale College of Engineering, Asangaon, Mumbai, Maharashtra, India.

nilam_nakod@rediffmail.com

Abstract— Here I has given the Comparative Survey of Unix, Linux and Windows 7 Operating System. First in brief I has given their history. Then compared their Design principles and then compared the Security provided by Unix, Linux and Windows 7 O.S. Finally i illustrate the comparison between Unix and Linux and then between Unix/Linux and Windows 7. By these Comparative Review Linux is found to be most secure O.S. and Open Source since it is available freely. Thus becoming the more Popular than Unix.

Keywords— BSD UNIX, LINUX, Open Source, Time Sharing

1. History

1.1 UNIX O.S.

- First developed in 1969 by Ken Thompson and Dennis Ritchie of the research group at bell laboratories; incorporated features of other operating systems, especially multics
- The third version was written in c, which was developed at bell labs specifically to support unix
- The most influential of the non-bell labs and non-at&t unix development groups — university of california at berkeley (berkeley software distributions - BSD)
- 4BSD unix resulted from darpa funding to develop a standard unix system for government use
- developed for the VAX, 4.3BSD is one of the most influential versions, and has been ported to many other platforms

1.2 LINUX O.S.

- Linux is a modern, free operating system based on UNIX standards
- First developed as a small but self-contained kernel in 1991 by Linus Torvalds, with the major design goal of UNIX compatibility
- Its history has been one of collaboration by many users from all around the world, corresponding almost exclusively over the Internet
- It has been designed to run efficiently and reliably on common PC hardware, but also runs on a variety of other platforms

- The core Linux operating system kernel is entirely original, but it can run much existing free UNIX software, resulting in an entire UNIX-compatible operating system free from proprietary code Many, varying Linux Distributions including the kernel, applications, and management tools

1.3 WINDOWS 7

- 32-bit preemptive multitasking operating system for Intel microprocessors
- Key goals for the system:
 - portability
 - security
 - POSIX compliance
 - multiprocessor support
 - extensibility
 - international support
 - compatibility with MS-DOS and MS-Windows applications
- Uses a micro-kernel architecture
- Windows 7 is evolved after Windows Vista. Its detail evolution sequence is as follows.
 - Windows 1.0
 - Windows 2.0
 - Windows 3.0
 - Windows 3.1
 - Windows 95
 - Windows 4.0
 - Windows 98
 - Windows 2000
 - Windows XP
 - Windows Vista
 - Windows 7
- For Windows 7 current release of Windows, Microsoft learned its mistakes with Vista and created an operating system with speed, stability and minimal system requirements. Microsoft ditched the gadget bar from Vista, replacing it with a cleaner feel. This version was released in 2009.

2. Design Principles

2.1 UNIX O.S.

- Designed to be a time-sharing system

- Has a simple standard user interface (shell) that can be replaced
- File system with multilevel tree-structured directories
- Files are supported by the kernel as unstructured sequences of bytes
- Supports multiple processes; a process can easily create new processes
- High priority given to making system interactive, and providing facilities for program development

2.2 *LINUX O.S.*

- Linux is a multiuser, multitasking system with a full set of UNIX-compatible tools
- Its file system adheres to traditional UNIX semantics, and it fully implements the standard UNIX networking model
- Main design goals are speed, efficiency, and standardization
- Linux is designed to be compliant with the relevant POSIX documents; at least two Linux distributions have achieved official POSIX certification
- The Linux programming interface adheres to the SVR4 UNIX semantics, rather than to BSD behavior

2.3 *WINDOWS 7*

- Extensibility
- Portability
- Reliability
- Compatibility
- Performance —WINDOWS 7 subsystems can communicate with one another via high-performance message passing
 - Preemption of low priority threads enables the system to respond quickly to external events
 - Designed for symmetrical multiprocessing
- International support — supports different locales via the national language support (NLS) API.

3. Threats and Security

Both of the operating systems are vulnerable to bugs but Linux is far more responsive in dealing with the threats. Linux incorporated many of the same characteristics and functions found in UNIX, including the segmentation of the user domain in a multi-user environment, the isolation of tasks in a multi-tasking environment, a password system that can be encrypted and/or located remotely and much more. As Linux is an open system OS, the bugs can be reported by anyone in the user/developers forum, and within days it can be fixed. But for UNIX, this is not the case, and user has to wait for a while, to get the proper bug fixing patch.

The open source community delivers faster because it does not have to go through the endless development cycles of commercial-based operating systems.

4. Illustration

Here I have illustrated the difference between Unix, Linux and Windows 7 Operating System. Linux is an open source, free to use operating system widely used for computer hardware and software, game development, tablet PCS, mainframes etc. Unix is an operating system commonly used in internet servers, workstations and PCs by Solaris, Intel, HP etc.

Table 1: Illustration showing comparison between LINUX and UNIX Operating System

	Linux	Unix
What is it?	Linux is an example of Open Source software development and Free Operating System (OS).	Unix is an operating system that is very popular in universities, companies, big enterprises etc.
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.	Different flavors of Unix have different cost structures according to vendors

	Linux	Unix
User	Everyone. FROM HOME users to developers and computer enthusiasts alike.	Unix operating systems were developed mainly for mainframes, servers and workstations except OSX, Which is designed for everyone. The Unix environment and the client-server program model were essential elements in the development of the Internet
Manufacturer	Linux kernel is developed by the community. Linus Torvalds oversees things.	Three biggest distributions are Solaris (Oracle), AIX (IBM) & HP-UX Hewlett Packard. And Apple Makes OSX, an unix based os..
Usage	Linux can be installed on a wide variety of computer hardware, ranging from mobile phones, tablet computers and video game consoles, to mainframes and supercomputers.	The UNIX operating system is used in internet servers, workstations & PCs. Backbone of the majority of FINANCE infrastructure and many 24x365 high availability solutions.
Development	Linux is	Unix systems are

	Linux	Unix
and Distribution	developed by Open Source development i.e. through sharing and collaboration of code and features through forums etc and it is distributed by various vendors.	divided into various other flavors, mostly developed by AT&T as well as various commercial vendors and non-profit organizations.
GUI	Linux typically provides two GUIs, KDE and Gnome. But there are millions of alternatives such as LXDE, Xfce, Unity, Mate, twm, ect.	Initially Unix was a command based OS, but later a GUI was created called Common Desktop Environment. Most distributions now ship with Gnome.
File system support	Ext2, Ext3, Ext4, Jfs, ReiserFS, Xfs, Btrfs, FAT, FAT32, NTFS	jfs, gpfs, hfs, hfs+, ufs, xfs, zfs format
Text mode interface	BASH (Bourne Again SHell) is the Linux default shell. It can support multiple command interpreters.	Originally the Bourne Shell. Now it's compatible with many others including BASH, Korn & C.
Price	Free but support is available for a price.	Some free for development use (Solaris) but support is available for a price.

	Linux	Unix
Security	Linux has had about 60-100 viruses listed till date. None of them actively spreading nowadays.	A rough estimate of UNIX viruses is between 85 -120 viruses reported till date.
Threat detection and solution	In case of Linux, threat detection and solution is very fast, as Linux is mainly community driven and whenever any Linux user posts any kind of threat, several developers start working on it from different parts of the world	Because of the proprietary nature of the original Unix, users have to wait for a while, to get the proper bug fixing patch. But these are not as common.
Processors	Dozens of different kinds.	x86/x64, Sparc, Power, Itanium, PA-RISC, PowerPC and many others.
Examples	Ubuntu, Fedora, Red Hat, Debian, Archlinux, Android etc.	OS X, Solaris, All Linux
Architectures	Originally developed for Intel's x86 hardware, ports available for over two dozen CPU types including	is available on PA-RISC and Itanium machines. Solaris also available for x86/x64 based systems.OSX is PowerPC(10.0-

	Linux	Unix
	ARM	10.5)/x86(10.4)/x64(10.5-10.8)
Inception	Inspired by MINIX (a Unix-like system) and eventually after adding many features of GUI, Drivers etc, Linus Torvalds developed the framework of the OS that became LINUX in 1992. The LINUX kernel was released on 17th September, 1991	In 1969, it was developed by a group of AT&T employees at Bell Labs and Dennis Ritchie. It was written in "C" language and was designed to be a portable, multi-tasking and multi-user system in a time-sharing configuration.

Table 2: Illustration showing comparison between UNIX / LINUX & WINDOWS 7 Operating System

	Linux / Unix	Windows -7
What is it?	Linux is an example of Open Source software development and Free Operating System (OS).	Windows 7 is the family of operating system (OS) from Microsoft, which is the most famous OS in the world.
Cost	Linux can be freely distributed, downloaded freely, distributed through magazines, Books	For desktop or home use, Windows can be expensive. A single copy can

	Linux / Unix	Windows -7
	etc. There are priced versions for Linux also, but they are normally cheaper than Windows.	cost around \$50 to \$ 450 depending on the version of Windows.
User	Everyone. from home users to developers and computer enthusiasts alike.	Everyone. From home users to developers and computer enthusiasts alike.
Manufacturer	Linux kernel is developed by the community. Linus Torvalds oversees things.	Microsoft created the Windows 7 operating system, but allows other computer manufactures to distribute their own computers with Windows pre-installed.
Usage	Linux can be installed on a wide variety of computer hardware, ranging from mobile phones, tablet computers and video game consoles, to mainframes and supercomputers.	On PC's desktops, laptops, servers and some phones.
Development and Distribution	Linux is developed by Open Source development i.e. through sharing and	Windows 7 is developed and distributed by Microsoft.

	Linux / Unix	Windows -7
	collaboration of code and features through forums etc and it is distributed by various vendors.	
GUI	Linux typically provides two GUIs, KDE and Gnome. But there are millions of alternatives such as LXDE, Xfce, Unity, Mate, twm, ect.	The Windows 7 GUI is an integral component of the OS and is not replaceable. This can be a con when it comes to Windows 8's Metro.
File system support	Ext2, Ext3, Ext4, Jfs, ReiserFS, Xfs, Btrfs, FAT, FAT32, NTFS	FAT, FAT32, NTFS, exFAT
Text mode interface	BASH (Bourne Again SHell) is the Linux default shell. It can support multiple command interpreters.	Windows 7 uses a command shell and each version of Windows 7 has a single command interpreter with dos-like commands, recently there is the addition of the optional PowerShell that uses more Unix-like commands.
Price	Free but support is available for a price.	\$50-\$450

	Linux / Unix	Windows -7
Security	Linux has had about 60-100 viruses listed till date. None of them actively spreading nowadays.	According to Dr. Nic Peeling and Dr Julian Satchell's "Analysis of the Impact of Open Source Software" there have been more than 60,000 viruses in Windows. Anti Virus cost about \$20 to \$400
Threat detection and solution	In case of Linux, threat detection and solution is very fast, as Linux is mainly community driven and whenever any Linux user posts any kind of threat, several developers start working on it from different parts of the world	After detecting a major threat in Windows OS, Microsoft generally releases a patch that can fix the problem and it can take more than 2/3 months. Sometimes sooner, Microsoft releases patches and updates weekly.
Processors	Dozens of different kinds.	Limited but most (80%)
Examples	Ubuntu, Fedora, Red Hat, Debian, Archlinux, Android etc.	Windows 7
Gaming	Very few games	Almost all games

	Linux / Unix	Windows -7
	available natively. Some games can be played through Wine, but often not all features are available.	are compatible with Windows. Some CPU intensive and graphics intensive games are exclusive to Windows PC's.
User experience	Although there are many GUI applications, most of the work is done through Terminal (a console window), and if a problem arises GUI is rarely usable to fix them.	Everything can be controlled through GUI and incompatibility problems are rare.
Graphics performance	Because hardware manufacturers, such as NVidia, often does not provide documentation for linux developers, drivers can not use full card performance.	Combined with newest DirectX versions and full graphics card support the performance is almost as good as it can get.
Company / developer	Linus Torvalds	Microsoft
Introduction (from Wikipedia)	Linux is a Unix-like and POSIX-compliant computer operating system assembled under the model of free and open source software	Microsoft Windows 7 is a series of graphical interface operating systems

	Linux / Unix	Windows -7
	development and distribution. The defining component of Linux is the Linux kernel, an operating system kernel first released	developed, marketed, and sold by Microsoft. Microsoft introduced an operating environment named Windows 7 as a graphical operating system shell for MS-DOS.
Available language(s)	Multilingual	Multilingual
License	GNU/Free	Proprietary
Supported platforms	All	PowerPC: versions 1.0 - NT 4.0; DEC Alpha: versions 1.0 - NT 4.0; MIPS R4000: versions 1.0 - NT 4.0; IA-32: versions 1.0 - 8; IA-64: version XP; x86-64: versions XP - 8; ARM: version RT;
Default user interface	Gnome or KDE (Depends on distro)	Graphical (Windows Aero)
Preceded by	Basic Terminal (CLI)	MS-DOS

	Linux / Unix	Windows -7
Source model	Open Source	Closed / Shared source
Update method	Many	Windows Update
Terminal	Multi Terminal Windows	--

5. Conclusions

Here I have given the Comparative Review of Unix, Linux and Windows 7 Operating System. First given the history, then compared their Design principles and then compared the Security provided by Unix, Linux and Windows 7 O.S. Finally I illustrate the comparison between Unix and Linux and then between Unix/Linux and Windows 7. Linux is an open source, free to use operating system widely used for computer hardware and software, game development, tablet PCS, mainframes etc. Unix is an operating system commonly used in internet servers, workstations and PCs by Solaris, Intel, HP etc. The Unix and Linux are more secure operating System than Windows 7. But among Unix and Linux, the Linux is found to be Most Secure than unix as well as Windows 7.

References

- [1] Bershad and Pinkerton 1988, B. N. Bershad and C. B. Pinkerton, "Watchdogs: Extending the Unix
- [2] Coulouris et al. 2001, G. Coulouris, J. Dollimore, and T. Kindberg, Distributed Systems Concepts and Designs, Third Edition, Addison Wesley (2001).
- [3] Farrow 1986a, R. Farrow, "Security for Superusers, or How to Break the UNIX System", UNIXWorld (May 1986), pages 65-70.
- [4] Farrow 1986b, R. Farrow, "Security Issues and Strategies for Users", UNIX World (April 1986), pages 65-71.
- [5] Filipski and Hanco 1986, A Filipski and J. Hanco, "Making UNIX Secure", Byte (April 1986), pages 113-128
- [6] Forrest et al. 1996, S. Forrest, S. A. Hofmeyr and T. A. Longstaff, "A Sense of Self for UNIX Processes", Proceedings of IEEE Symposium on Security and Privacy (1996), pages 120-128.
- [7] Cramp and Morris 1984, F. T. Cramp and R. H. Morris, "UNIX Operating-System Security", AT&T Bell Laboratories Technical Journal, Volume 63, Number 8 (1984), pages 1649-1672.
- [8] Gray 1997, Gray, Interprocess Communications in UNIX, Prentice Hall (1997)
- [9] Harish and Owens 1999, V. C. Harish and B. Owens, "Dynamic Load Balancing DNS", Limtx Journal, Volume 1999, Number 64 (1999).
- [10] Ousterhout et al. 1985, F. K. Ousterhout, H. D. Costa, D. Harrison, J. A. Kunze, M. Kupfer and J. G. Thompson, "A Trace-Driven Analysis of the UNIX 4.2 BSD File System", Proceedings of the ACM Symposium on Operating Systems Principles (1985), pages 15-24.