The Audience Component

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# The Audience Component: Comparison of Multics, Unix, & Linux

Computers have influenced many aspects of the lives people live today. Many people would say that they could not go a day without using one, whether it be work related or simply for pleasure. However, many people do not realize the depth of the hardware and software that is behind these everyday actions. One component that people (who are not familiar or take interest in) often overlook the operating platform and the differences that are within each.

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## Operating Platforms

Operating Platforms, also known as the operating system, or OS, it is a software on the hard drive that enables the computer hardware to communicate and operate with the computer software (Hope, 2017). Each one is unique in the ways that it communicates and therefore the results and functions between the different operating systems are varying. Operating systems have also advanced and improved over time (along with computers) which is another cause of variation between them. Examples that show the variations and improvements made overtime are Multics, Unix, and Linux.

## Multics, Unix, & Linux

Multics, also known as Multiplexed Information and Computing Service is a timesharing operating system begun in 1965 that was used until 2000 (Multicians.org, 2017). The system began as a joint project between MIT’s Project MAC, Bell Telephone Laboratories, and General Electric Company’s Large Computer Products Division(GE) (Multicians.org, 2017). Bell Labs withdrew in 1969 and in 1970 GE sold its computer business to Honeywell (Multicians.org, 2017). Honeywell the offered Multics as a commercial product and sold systems until 1985 when it was cancelled (Multicians.org, 2017). The last Multics system that was running was the Canadian Department of National Defense in Halifax, Nova Scotia, Canada and was shut down in October of 2000 (Multicians.org, 2017). In 2007, Multics was made available "for any purpose and without fee" at MIT. A Multics CPU simulator was built and is available to download in 2014, with a community of developers making bug fixes and adding features (Multicians.org, 2017). The purpose of Multics was to provide controlled sharing, user authentication, inter-user isolation, supervisor-user protection, user-written proprietary programs, and control of special privileges (Saltzer, 1974). The initial goal was simply controlled sharing of information but grew and expanded with the influence of controlled sharing (Saltzer, 1974). Segmentation was used to provide the basis for direct access and sharing of on-line information. The two design features that made this possible were that on-line information was stored in the system and is addressed directly by a processor (it can be referenced directly by any computation) and that it is possible to control access, at each reference, to the on-line information within the system (Bensoussan, Clingen and Daley, 1972).

Unix is a multi-user, multiprocessing, multitasking, and multithreading operating platform. When Bell Labs, otherwise known as AT&T, decided to withdrawal from the development of multics in 1969, they developed and started UNICS or UNiplexed Information and Computing Service (History and Hope, 2017)(Merlino et al., 2005)). By the summer of 1969 Unix was developed and well on its way, with direction under Ken Thompson and Dennis Ritchie (Merlino et al., 2005). They developed the first versions of Unix on the PDP-7 (Albion.com, 2017). The V6 version in 1975 was the first to become available outside of Bell Labs and Berkley University formed the basis for Unix (Albion.com, 2017). System V was released in 1989, however, Berkley students had developed the Berkeley Standard Distribution or BSD (Albion.com, 2017). It was a variant of Unix since it was based off the version that was released outside of Bell Labs (Albion.com, 2017). In the 1990’s, the source code licensing had a thriving market and there were hundreds of Unix variants by different manufacturers (Albion.com, 2017). Unix was sold to Novell in 1993 and they sold it two years later (Albion.com, 2017). Meanwhile to open Unix to the public (open Source) a clone known as GNU was being developed by Richard Stallman (Albion.com, 2017). The GNU project and it had reached a point of being complete except for one component, a working kernel (Albion.com, 2017). Thus, leading to the creation of Linux.

Linux is the combination of the GNU and a free kernel created by Linus Torvalds in 1991 (Linux Training Academy, 2017). By 1994, people could pair the two together and have a completely free operating system (Linux Training Academy, 2017). Linux runs on several differing chip architectures and has been easily adopted to various extents (Linux Training Academy, 2017). Hewlett-Packard, Silicon Graphics, Sun Microsystems, Compaq, Dell, Oracle, and IBM have all adopted or supported the Linux system in some capacity (Linux Training Academy, 2017). Today, Linux is still quite popular and is widely used. This is due simply to the fact that it works well and that it is free to use. Also, it is common to add and improve up since the source code is available (Linux Training Academy, 2017).

**Multics, Unix, and Linux Comparison**

Between Multics, Unix, and Linux there are other details and differences that attract or deter users. One detail being the timeframe in which each were developed. Multics being the earliest was the basis of operating systems. However, due to the lack of development and advances it was soon too large to be used on mini computers such as the PDP-7. Thus, Unix became popular because it was size and space appropriate to use on such computers. Its downfall was the fact that it did not have a kernel or a buffer between the software and the hardware. It however, did not lose popularity but gained advancements in this area that lead to the creation of Linux. Linux started as just a kernel or buffer, it was later adopted to be the name of the operating system when it was combined with the Unix clone, GNU (Ward, 2015). The package then became known as the Linux operating platform.

A detail that impacted and is a difference between the success and failure of each system is the audience to which they were marketed. Multics is a sustaining technology or one that listened to their customers and building the technology with that focus (Cole, 2017). However, with Multics the hardware was expensive, it required lots of resources, and was targeted towards a small group of people (Cole, 2017). They aimed for a commercial audience and completed a system that consumers asked them too. The problem being that as time moved on and the economics of a different technology eclipsed the goodness of the Multics system (Cole, 2017). Unix was a disruptive technology, meaning that is was targeted to a different group of people that value the technology with a different perspective (whether or not it is well made) (Cole, 2017). In this case it was targeted to the users of the inexpensive mini computer users, who were interested in a platform for programming and experimentation (Cole, 2017). It had modest goals, ran on modest hardware and was freely shared (Cole, 2017). Unix received positive feedback from customers and began to work on better, more powerful, and cost-effective hardware (Cole, 2017). Therefore, generating a wider and developed more potential in their customer base than Multics did, allowing for faster growth as well (Cole, 2017). There were also difference within each system's code. For example, "evaluated commands" in the original Multics shell were commands that return a value into the command line, which used square brackets. In Unix, backticks are used to perform this action (Multicians.org, 2017). Other than miniscule code formatting differences Multics and Unix were similar in some functions but marketed and developed differently.

Unix and Linux have their differences and similarities in purpose and function, even while Linux is promoted as a clone of Unix. Also, both Unix and Linux systems within the realm of administration is purposeful supposed to be a creative process, which generates differences on the administrator level (Keller, 2004). Linux is an open source, or free to use operating system, that can be used on different types of devices (Ward, 2015)(Diffen.com, 2017). These devices include computer hardware and software, game development, tablet PCS, and Mainframes (Diffen.com, 2017). Unix is an operating system used commonly for internet servers, workstations, and PCs by Solaris, Intel, and HP (Diffen.com, 2017). Linux can be and is freely distributed while also having priced versions. Is developed and maintained by open source development or the sharing and collaboration of code and features through forums and can be distributed by varying vendors (Diffen.com, 2017). The Linux kernel was also developed b community with oversight from Linus Torvalds (Diffen.com, 2017). The great thing about Linux is that it can be used by anyone from home users, developers, and computer enthusiasts (Diffen.com, 2017). It can be used and installed on a variety of computer hardware, ranging from mobile phones and video game consoles, to mainframes and supercomputers (Diffen.com, 2017). Unix can cost different amounts according the vendor that is distributing it. Its three biggest distributors are Solaris, AIX, and HP (Diffen.com, 2017). it was developed for the use within mainframes, workstations, and servers (Diffen.com, 2017). All except for OSX, which is designed for everyone. Unix is used as the backbone for the majority of finance infrastructure and high availability solutions (Diffen.com, 2017).

The elements of each Unix and Linux also vary. Linux default shell is the Bourne Again Shell and supports multiple command interpreters (Diffen.com, 2017). It usually uses two GUIs. which are KDE and Gnome, however, alternatives are available to use (Diffen.com, 2017). Security wise, Linux is stable because viruses are listed and none are actively spreading now (Diffen.com, 2017). Threat detection and solution is also fast with Linux due to the community drive and the instant development of a solution (Diffen.com, 2017). As for Unix it originally started with the Bourne Shell and is now compatible with many others. It was also initially command based OS but later a GUI was created, now most distributors will pair it with Gnome (Diffen.com, 2017). There are about 85-120 viruses reported up to this time, however, users must wait a while to get the proper bug fixing patches (Diffen.com, 2017).

Operating platforms are important to the computing history and realm of today. Throughout time advancements have been made which has led to the development and implementation of Multics, Unix, and Linux respectively. Each has their unique purpose and audience that they are adjusted to meet the computing needs and desires of. Multics with large corporations and universities in mind, Unix with internet servers, workstations, and Personal Computers, and Linux with everyone in mind, but especially home users, developers, and computer enthusiasts. Thus, it is obvious that they also all have elemental differences due to the audiences they were marketed towards.

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