COP 4640 – Operating System Environments and Administration

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**The Lynx You Never Xpected**

**Abstract**

The operating system is one of the most important parts of a computer system. There have been many OS’s in the past 30 years but only a few that have improved and kept up with the needs of today’s users. Windows 10 and Ubuntu Linux are the most used in PC’s today. In this paper we will investigate the many different aspects of the two OS’s. The major aspects we will focus on memory management, process management, concurrent processing, network technologies and system management.

We will discuss the ways Windows and Linux deal with memory management. Memory management in windows can vary quite a bit from Linux. Just the basic structure of the way processes and allocation is handled is quite different. Windows uses a tree data structure to handle memory management. Each node on the tree is called a “Virtual Address Descriptor” [13]. These “VADS” mark each node in the tree as occupied, free or reserved. Linux on the other hand uses a List data structure. It creates a list of “VM\_area\_structs” which is searched each time a page needs to be found. Even paging is done differently between the two operating systems. Linux uses on demand paging, that uses the LRU system. Meaning it only swaps pages when the page is needed decreasing swap time and reduces physical memory usage, removing the least recently used page in exchange. Windows uses cluster paging, that uses the FIFO system. where windows bring in eight pages simultaneously bringing in the entire assigned process and replacing the oldest pages accordingly. Another difference in memory management is that Linux distributes address space slightly different from windows. Both Operating systems have 4GB of physical memory, but the distribution of this space is different. Linux uses only 1GB for its kernel while windows uses double that. Which leave 3GB for the user in Linux and only 2GB for the user in windows.

Linux creates processes whenever a program is launched, either by the user or by Linux itself. It is a running instance of a program [10]. Linux has two types of processes, foreground processes and background processes and every process has an ID. In Linux, we have parent processes and child processes. The Init process is the mother of all processes on the system and it is the first program that is executed on start-up. It manages all other processes.

Windows and Linux have a lot of similarities and differences. In Windows, every process contains one or more threads and the thread is the executable. Every thread in a process shares code, global variables, environment strings, and resources [3]. Just like in Linux, every process has an ID. In Windows, a thread is an object that identifies which part of the program is running. The Windows kernel-mode process and thread manager handles the execution of all threads in a given process and is comparable to the Init process in Linux.

The use of concurrent processing in applications can drastically boost its efficiency if used correctly. Another factor to look into is how operating systems deal with concurrent processing. In Ubuntu Linux, processing threads is a relatively simple matter. Through the use of their monolithic kernel, having each thread share their information is quite simple since the use of global variables is already prevalent. Linux treats threads as any other processes and only has to designate which global resources are shared between the threads[5]. This is a very lightweight and efficient solution that takes advantage of how Ubuntu Linux already functions. Unfortunately, this easy solution can’t be used in other operating systems such as Windows 10 due to the different type of kernel that Windows 10 uses. Since Windows 10 is hybrid kernel model, a microkernel with global variables, it must account for more scenarios that might heavily affect other processes and hardware use that may cause malfunctions. These scenarios are avoided through the use of a thread manager [3]. The thread manager helps avoid situations of different threads trying to use the same hardware at the same time though the use of many synchronization techniques that handle each scenario.

The Linux Ubuntu OS is a free, open source software and free to modify to anyone who downloads it. It is a highly customizable software that can be configured by any user with the know-how to meet their needs. Ubuntu, like many other distributions of Linux, is reputable for other things as well. Resource friendliness, updating without restarting, and universally loved command line are just a few examples of the capabilities of Ubuntu’s possibilities [7]. Linux Ubuntu still isn’t perfect, despite all the positive hype. A drawback of the free, open source background is supposed poor support from the OS’ forums and beginner unfriendliness for Windows users transitioning to Linux [4].

Despite the setbacks of Windows like security, having to pay for it and having less freedom with customization, many network admins love the familiarity that Windows provides for users. A GUI most certainly provides a comfortable and smooth experience for ordinary users and sys/network admins alike. Windows 10 and Windows Server share a familiar code and is GUI based (although it is recommended to be turned off and command line based). Despite expenses, larger companies may benefit from using Windows for their Networking needs over Ubuntu. It is important to bear in mind that Windows still allows the use of the command line for more complex tasks. Windows has plenty more of advantages over Linux, like regular software updates, more variety of compatible software and less complexity to setup and manage [8].

With numerous processes to run and limited resources, operating systems have to manage and optimize their resources to ensure the system can perform at its best. System management helps keep the efficiency of the machine consistent and can help with a lot of different aspects of computer usage such as reducing the time it takes to complete repetitive tasks. Ubuntu Linux and Windows 10 both have different collections of methods for managing the resources a machine has to offer, each set of features having their own benefits and drawbacks. Windows 10 has a program called SuperFetch that helps reduce boot times for other programs, which has been around since previous versions of Windows [2]. SuperFetch will cache programs that are routinely accessed during specific times in memory, reducing access times [2]. Ubuntu Linux, being built using the Linux kernel, does not have SuperFetch like Windows 10. It does, however, give the user control over other types of memory and performance optimization. Linux allows users to change the “swappiness” of their system, allowing performance to be better tuned by more technically savvy users [1]. While Windows 10 also uses swap space, it has its own approach to deciding what it is used for and, based on the specifications in the Paging File [15]. Both operating systems have solutions for the same issues, but Ubuntu and Windows 10 undoubtedly have considerable differences between these solutions.

**Focus of Research**

One of the most important operations of an operating system is memory management. Memory management is the function of the operating systems that allocates memory space to different processes or programs. Memory management keeps track of all the memory locations whether the locations are allocated to a program or process while keeping track whenever memory is freed up. It also checks how much memory is required to be allocated for other processes. It then decides which process will be executed and which memory location the process will need. Operating systems use many different techniques to handle memory. For instance, “swapping” which temporarily moves processes back and forth between main memory and virtual memory, freeing up memory that maybe needed for other process, during this execution [12].

Process Management plays a very essential and vital role in the efficiency of any modern day computer. This is one of the most important parts of any operating system. It involves the execution of tasks such as the creation of processes, scheduling of processes, and the termination of processes, all of which must be done in a timely manner to keep the computer running smooth [11]. How this is done depends on the operating system. Sometimes a process may be made up of multiple threads that contain instructions that get executed concurrently. A computer may have one processor or many more, and this can drastically change the speed in which a process will be executed. Evidently, operating systems manage processes in various ways and all of which depend on the type of operating system in use.

Concurrent processing is a great tool that applications can use to boost their effectiveness and even solve problems more efficiently as opposed to sequentially operated applications. This is done by parallelism and is greatly enhanced by computers with multiple core processors [9]. Operating Systems play a key role in how optimal concurrent processing is because they are what provide communication between the application the cores of the processor. The two operating systems that are being compared show two different solutions to achieve the same goal. Ubuntu Linux shows that it doesn’t require much change at all and takes advantage of its unique monolithic kernel type to handle the solution, while Windows 10 uses more overhead to ensure efficient use of the devices required for execution.

Networking technologies are vital for our day-to-day lives. They allow us to manage systems for businesses small and large, communicate over far distances and generally are important for computers to do what they do best: Making life easy for us. For Networking Technologies, we want to focus our research on the obvious advantages and disadvantages of the Linux Ubuntu OS and Windows 10 OS. Even seemingly banal things like interface type, can play an important role [14]. We plan to use a variety of online sources to determine the best approach to selecting a suitable operating system, and possibly consult the words of people on social media platforms who themselves had worked with these networking platforms. We want to fully understand each operating system’s networking capabilities and limitations.

The efficiency and performance of a computer relies heavily on how its operating system decides to manage the computer’s resources. Ubuntu Linux and Windows 10 have very different ways of handling the same issues and hardware, such as additional hard disk space [6]. Despite these differences, both operating systems leverage their services to make the most of whatever hardware they have will allow. It is necessary to understand the services both Ubuntu Linux and Windows 10 use to truly understand how they affect the performance of a machine. Features such as virtual memory management, disk management, and even caching vary between the two operating systems: all of which are very important for smooth operation of modern computing devices.

**Updated Schedule**

Note: Work should always be divided into sections and by intensity, not word count.

|  |  |
| --- | --- |
| **Important Date** | **Milestone** |
| September 24th, 2019 (Tuesday) | The group should have half the midterm report by then. |
| October 1st, 2019 (Tuesday) | At this point, references should be in and the group should be well aware of how they’re going to piece everything together for the rough draft. |
| October 4th, 2019 (Friday) | Collab day for last-day work on assignment. |
| October 7th, 2019 (Tuesday) | Have half the discussion work (Half of references mention and research in paper) done. |
| October 14th, 2019 (Tuesday) | Wrap-up discussion, move on to extras like the intro. |
| October 28th, 2019 (Tuesday) | Have half of all the introduction work done. Conclusion and Future Developments should be started as well. |
| November 5th, 2019 (Tuesday) | Finish up Introduction work, begin marking Glossary terms and proofreading. |
| November 12th, 2019 (Tuesday) | The conclusion and future developments section should be finished at this point. The next week should be used to tie up any loose ends. |
| November 22th, 2019 (Friday) | Last collab day to finish up rough draft. |
| November 26th, 2019 (Tuesday) | Divide up remaining work if a final draft is required from us. |
| November 29th, 2019 (Friday) | Wrap-up remaining work for final draft, and submit. |

**References**

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**Duty Assignments**

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| --- | --- | --- | --- |
| **Title** | **Desc** | **Members** | **Criteria** |
| Logo | Create a fitting logo for the title page and team | **Eric Netland** | The logo is present on the paper |
| Introduction (History and evolution,Target Audience) | Describe the progression and development of both the operating systems, and the intended audience | **Guneet Jandir** | An ‘essay’ is finished by the team member, exceeds the minimum word count and has valid sources **(600 words)** |
| Introduction (Key Limitations, Key Features) | Describe the feats and the drawbacks of both operating systems in detail | **Nicolas Martinez** | An ‘essay’ is finished by the team member, exceeds the minimum word count and has valid sources **(600 words)** |
| Introduction (Current and historical market share percentages) | Describe the economic success and failures of the operating systems. | **Eric Netland** | An ‘essay’ is finished by the team member, exceeds the minimum word count and has valid sources **(300 words)** |
| Discussion / Focus of Research (Memory Management) | Research this topic for both operating systems | **Guneet Jandir** | Research is reviewed by the team and minimum word count is exceeded |
| Discussion / Focus of Research (Process Management) | Research this topic for both operating systems | **Cody Pafford** | Research is reviewed by the team and minimum word count is exceeded |
| Discussion / Focus of Research (Concurrent Processing) | Research this topic for both operating systems | **Nicolas Martinez** | Research is reviewed by the team and minimum word count is exceeded |
| Discussion / Focus of Research (Network Technologies) | Research this topic for both operating systems | **Mike Jurendic** | Research is reviewed by the team and minimum word count is exceeded |
| Discussion / Focus of Research (System Management) | Research this topic for both operating systems | **Eric Netland** | Research is reviewed by the team and minimum word count is exceeded |
| Future Developments | Using all researched information, speculate the future for both the Linux and Windows operating systems | **Cody Pafford** | The section |
| Conclusion | Summarize all material of the paper in a smooth ending. | **Mike Jurendic** | The conclusion is deemed well-written and exceeds minimum word count |
| References | Format and double-check all references before submission | **Eric Netland** | All references are confirmed in proper format and finalized on the paper |
| Glossary | Compile Glossary terms and ensure proper formatting | **Eric Netland** | Minimum requirements for the Glossary are met |
| Biographies | All team members write out their own biography for the section | **Everyone** | All biographies are present and meet the minimum requirements |
| Research Integration | Final review of all work and combining all research to ensure smooth appearance | **Everyone** | All team members give the OK and the file is submitted before the due date |