Unit 5 System Software Questions

**Corey Crooks**

**Purdue University Global**

**IT190 – Marjorie Furay**

**January 13, 2021**

**What does an Operating System (OS) do?**

The operating system of your computer may come in many shapes and sizes. Some may use Microsoft Windows; some may use Apple’s macOS. Despite the numerous choices online, they all have one thing in common—their job. The OS acts as a sort of receptionist for all of your commands, and the program’s needs. “Most of the time, several different computer programs are running at the same time… The operating system coordinates all of this to make sure each program gets what it needs.” (Goodwill Community Foundation Inc., 2021). Simply put, it is the OS’s job to make sure each program runs smoothly, and that each program gets the resources required, or at least knows to wait if the resources need to be opened up.

**How does the OS manage the Processor (CPU)?**

This is where the ‘Receptionist’ analogy works very well. The OS is in charge of telling the processor, or central processing unit (CPU), which processes to run and when. The OS runs through what is called a ‘Scheduler’ and lines up a thousand different processes for each application every single second. From there, the OS can tell the processor what to work on when it is finished with each process, as well as how to start. On top of all that, the OS can issue commands called ‘Interrupts’ that do exactly what they seem. “Interrupts are special signals sent by hardware or software to the CPU. It's as if some part of the computer suddenly raised its hand to ask for the CPU's attention in a lively meeting.” (Coustan, 2021). When the user performs a command such as shutting down the program or PC, or even if the computer must wait on user input to act, the OS will tell the CPU to stop running all of those processes related to the application that is being shut down. The way the OS communicates a halt to the CPU is through an interrupt. These are just two of the many ways the OS and CPU can interact.

**What activities are coordinated by the OS?**

As best put by Sue Smith with azcentral, there are five major activities of a process managing an Operating System. 1.Creation and Deletion, 2. Suspension and Resuming, 3. Synchronization, 4. Communication, and 5. Deadlock handling (2021). Creation and Deletion are in charge of starting and ending applications and processes as they are finished or closed by the user. Suspension and resuming deal with those interrupts we talked about in the previous section. If the application needs to wait such as for input, then the OS will schedule that. Synchronization is in charge of running multiple programs at the same time. To the untrained eye, it may seem like your word document, and your internet browser may be running simultaneously with each other as you type, and surf the web. With our current technology, the CPU can't be running two different applications at the same time. To compensate for this, the CPU will switch between each program lightning fast to give the illusion of synchronized functions. The OS handles how the CPU switches processing each application, and in what timeframe. Communication is a vital part of that process. With proper communication between the software and hardware, the OS can determine if any process is ready for resource allocation and schedule the task to be completed. Finally, Deadlock occurs when multiple programs have been interrupted, and there is now a backlog of unprocessed applications. Without the OS to manage resources, and terminate overdrawn processes, the deadlock could grow larger and larger until eventually, your PC crashes due to the resources your deadlock is hogging up. Thankfully, the OS you are running knows exactly how to deal with this to keep the environment running smoothly.

**How does the OS manage the computer’s memory?**

No matter the program you are running, it will always need space to function. This space is reserved in your computer’s memory or RAM. When the application decides it needs to commit space to memory, it will ask the Operating System to allocate some for it, depending on how much it needs. The OS can determine that the computer has the resources required to fulfill the request and keep the train moving, or if there is not enough RAM to fulfill the request the OS can tell the program to either terminate, or suspend until other programs are done with the RAM they are using, and enough becomes available.

**What is Virtual Memory and how does it work?**

Technology is growing faster and faster as days go by. Due to this growth, programs are becoming more feature-rich, but also more resource-intensive. If your computer no longer has enough RAM to run a program, Virtual Memory can kick into high gear to ensure that not everything is a lost cause. Virtual Memory is a type of storage system that can look for data stored in memory that hasn’t been used, and copy that data directly to your hard drive, thus freeing up the precious space on your RAM stick or sticks. From there, your computer will have more space to work, and those programs could run much more smoothly than they would if they had to wait for that RAM to free up naturally.

**How does the OS manage peripheral devices?**

Peripheral devices are one of the many ways that a user can customize their PC. Using your computer for art and drawing? Plug in a tablet. Going to be on videocalls for work? Plug in a webcam. The ingenuity of the line of USB ports and what you can do with them is quite fascinating. It takes more than just a fancy port to run each of those devices, though. For everything connected to your computer, even the CPU and RAM, there is a driver there that tells the computer exactly how to run it. Think of them as a set of instructions. It used to be that these drivers would come in the form of a disk that you’d slot into your computer, and let it run for 30 minutes, but mostly gone are those days. Now, they’re mostly stored online. There are two usual ways of receiving drivers—either you can go to a website and download the driver directly from the manufacturer, or the driver can download from an instruction set the moment you plug the device in. On Windows 10 machines, you may see a little notification that pops up saying “We’re setting up this device” the moment you plug in your mouse or keyboard. This style of the driver is referred to as PnP, standing for Plug and Play. “Short for plug and play, PnP refers to a computer's ability to detect and configure hardware automatically without requiring the user to configure hardware with jumpers or dip switches.” (Computer Hope, 2019). This is due to the automatic nature of the device, seeing as though the user doesn’t need to perform any additional tasks to get it running other than simply plugging it in.

**How does OS coordinate Software?**

Software coordination can get complex very fast. When your computer is running a word processing application, multiple instances of Google Chrome, a tab of File Explorer, and a real-time gaming application all at once, how does it not get mixed up? How can it tell 3 different Google Chrome tabs apart from each other? Well, the Operating system doesn’t necessarily distinguish each program the way we humans do. It doesn’t see the fancy icon or clever name. Instead, there is a program index associated with each application upon startup. “Rather than having the same blocks of code appear in each software application, the OS includes the blocks of code to which software applications refer. These blocks of code are called application programming interfaces (APIs).” (Incomputer Solutions, 2021)

**What is the BIOS?**

The BIOS is a firmware from your motherboard that controls the startup of your hardware and then passes onto a boot drive to handle software bootup. An upgrade of such firmware is the modernized UEFI, which has more features, such as larger capacity boot drive support, secure boot, and overclocking components (Hoffman, 2018). Bother BIOS and UEFI need to first run through a check to make sure the hardware isn’t malfunctioning in a way that could harm the rest of the system, such as an improper connection or bad conductors. This test is called a POST, and it’s usually one of if not the first processes when starting up your computer. The POST is a way for your computer to make all the necessary checks to look for potential problems, and if any arise, some motherboards will offer troubleshooting solutions in the form of beep codes. These codes will beep a certain amount of times to signify a specific problem to ensure the user knows how to fix it before damage spreads to the rest of the system due to an improper startup. When the computer has passed the POST and the BIOS or UEFI is ready to proceed to a boot, it will pass on to the boot drive and initiate the startup of the operating system. This will come in the form of a kernel launch. The kernel is essentially the core of an operating system. It manages memory timing and CPU functions (Pankaj, 2020). The kernel is a very powerful tool that can help the system from boot up to shut down in handling logistics and timings.

**What are the Advantages of Different Operating Systems?**

As mentioned previously, there are a whole host of different operating systems to suit user needs. One extremely popular option would be Microsoft’s Windows OS. Windows has the advantage of an extremely long and rigorous development path ever since the early consumer machines. Because of this, Windows has an extremely user-friendly and feature-rich environment. Today, Windows has the support of many of the worlds leading technological industries. You can create works of art in your preferable image manipulation software like Photoshop or GIMP, switch to some 3D modeling on one of the myriad applications of your choice such as Blender or 3DMax, then finish the day with unparalleled support for your favorite videogames in GOG, steam, or any other launcher of your choice. Equally popular, and equally compelling is apple’s macOS. If you have a premium budget and expect to use your computer to create your art, MacOS may be the option for you. Windows Machines feature a large variety of different specs. You can make a box the size of a small speaker with slower components with higher portability, or you can make an absolute behemoth with the latest and greatest specs out there. Macs, however, are always pre-built. This means that you can’t quite get the level of customizability that you do with a competing OS. Though this also has its advantages too. With a Mac, you always know what you’re getting. You always know that at this price, your MacBook Air will be the same as the one your friend has, which can save you a great many headaches in the future. Another topic to consider is Mac’s ability to art-focused content. Due to their superb screens and monitors, work on a Mac is nearly guaranteed to be color accurate, and look stunning when you put the proper work into it. Due to this, Macs are commonly seen in professional workplaces. Neither of these OS’s quite capture the true capabilities of experimental modern technology though. If you’re looking for some current generation, open-sourced Operating Systems, my recommendation would be Ubuntu. Ubuntu runs on the Linux kernel and is completely community-developed. Due to the open-source nature of Ubuntu development, the options and features of this OS are limitless. And even if you don’t see a feature that you are motivated for you can always make it yourself and add it to your operating system, that’s simply impossible to do on Windows or Mac. Due to the diverse nature of these Operating Systems, it’s quite difficult to choose one in particular as a recommendation for everyone. If you are a casual user who relies on your computer for entertainment and work that you simply need to be stable, Windows may be a good option for you. If you don’t care much about playing videogames, but need your computer to make dazzling pieces of art, Mac would be something to consider. If you want to dig deep to explore the trenches of the unknown to see what your computer is truly capable of, and don’t mind consistent head scratches and crashes on the way there AND already knew all the terms in this document, Ubuntu may be for you. The choice of an OS comes down to strategically thinking about how you will use your machine.

# **References**

Computer Hope. (2019, November 16). *PnP*. Retrieved from Computer Hope: https://www.computerhope.com/jargon/p/pnp.htm

Coustan, C. F. (2021, January 11). *How Operating Systems Work*. Retrieved from howstuffworks: https://computer.howstuffworks.com/operating-system5.htm

Goodwill Community Foundation Inc. (2021, January 11). *Computer Basics - Understanding Operating Systems*. Retrieved from GCFGlobal LearnFree.org: https://edu.gcfglobal.org/en/computerbasics/understanding-operating-systems/1/

Hoffman, C. (2018, October 12). *What Does a PC’s BIOS Do, and When Should I Use It?* Retrieved from How-To Geek: https://www.howtogeek.com/179789/htg-explains-what-is-bios-and-when-should-i-use-it/

Incomputer Solutions. (2021, January 11). *How Does The Operating System Coordinate Software?* Retrieved from incomputersolutions: https://incomputersolutions.com/qa/how-does-the-operating-system-coordinate-software.html

Pankaj. (2020, July 28). *Kernel in Operating System*. Retrieved from Geeks for Geeks: https://www.geeksforgeeks.org/kernel-in-operating-system/

Smith, S. (2021, January 11). *Five Major Activities of an Operating System With Respect to Process Management*. Retrieved from azcentral: https://yourbusiness.azcentral.com/good-processor-multitasking-24887.html