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Part A: Windows and Unix Operating Systems

Windows is an operating system developed by Microsoft. First released in 1985, the latest version, Windows 7, was released in 2009. Windows is a single-user operating system, and is important because it is the most widely used operating system globally. Unix is a multi-user operating system that was developed by AT&T’s Bell Laboratories. It is the parent of many derived operating systems, the most popular of which are BSD, Linux, and Apple’s Macintosh OS X.

Windows is a single user system; meaning only one user could be operating on a machine at a given time. It is also closed-source, proprietary software. The significance of the Windows is operating system is its large share of the desktop user market share, making it the de facto OS for most home personal consumers. The size of its user base is due to the fact that it ships with most consumer personal computers.

A benefit of it s high level of usage is that it provides a standard platform for development. A software developer who is hoping to target the most potential users will most likely develop an application that works on Windows before porting it to other operating systems. Prior to Windows 7, Windows XP was the operating system of choice for many users. Windows XP offered features such as improved built-in driver support, improved Internet security with an included firewall, and faster performance over previous versions. Windows 7, the current Windows system, provides a much improved graphical user interface, providing a smoother experience for the end user.

Unix was developed as a multi-user, multi-tasking system. As such, many users are able to connect to the same host machine. This allows institutions to save on cost by allowing less powerful terminals to connect to a more powerful central server, with each user being offered the illusion that he or she is the sole user of the machine. The makes Unix and its derived operating systems popular for web and file hosting environments.

One of the key features of Unix is the modularity afforded by its command interpreter in conjunction with shell scripts. Shell scripts are programs that consist of a series of shell commands. Users are able to add functionality to the operating system by writing scripts that can be executed by the command interpreter. The scripts can be as fully functional as the commands that ship with the system.

Unlike Windows, there are several Unix-based free and open source operating systems in use today. Linux, which was developed by software engineer Linus Torvalds, was designed to emulate the functionality of Unix, while being composed entirely of free and open source software. Today, there are a variety of Linux distributions deployed in a range of areas. For example, there is Ubuntu Linux, which is popular among desktop users. This variety of Linux centers on ease of use and supports a graphically intense Windows like experience. Other Linux variants, such as Puppy Linux, are incredibly small and use a minimal amount of system resources, and as such are able to run on low-powered by and be stored on flash drives.

Part B: Real-Time and Embedded Systems

A real-time operating system is one that has rigid has stringent and predictable time requirements. Windows CE is Microsoft’s operating system that targets low-powered and embedded systems. Several real-time variants of Linux exist as well. One example is RTLinux, which allows the Linux kernel to be run in a fully predictable way by making the kernel compact and having as many process run as user applications as possible.

An embedded system is a combination of hardware and software that is designed to accomplish a highly specialized task. This is in contrast to general purpose computer systems, such as modern person computers, that are designed to accomplish a wide variety of tasks. An embedded system may be of greatly varied size or complexity, depending on the job that it is tasked with.

For example, a microwave oven is an embedded system. The hardware is specifically designed to accommodate food processing. As such, the hardware is usually able to rotate a tray, turn the light in the oven on and off, and control the duration and intensity of the microwaves being emitted using dedicated buttons, among other related functionality. The software that accompanies the devise allows the user to control these tasks.

Embedded systems are not the same as real-time systems. Embedded systems may feature real-time operating functionality, but a real-time system is not necessarily embedded.

Terminate and Stay Resident (TSR) commands that allowed pseudo-multitasking in DOS is no longer in use in today’s computing environments. However, TSRs are somewhat analogous to background processes, which live in memory and are usually not terminated until the operating system itself terminates. The Windows implementation of this concept is called a service, while in Unix, they are called daemons. An example of this may be anti-virus software, which stays in memory and checks for malicious software.

Part C:

An interrupt is a way for hardware or software to indicate to the processor that the device or software requires attention. There are two types of interrupts: synchronous and asynchronous. An interrupt is asynchronous if it is made outside of the currently executing process. It is synchronous if it is made as a result of the instruction being currently executed. When an interrupt is issued, and interrupt request is made to the processors. An interrupt request contains a level of priority. This ensures the completions of jobs in a timely manner.

During an interrupt, the processor will halt its current operation and perform some functionality of the interrupting device or software. An example of a hardware interrupt is a storage device indicating that it has completed an I/O task, thereby freeing the resource to be used by other processes that may have been waiting to use it. A software interrupt may come from a device driver, must communicate with system hardware when their functionality is needed.

The “man” command is used to access the manuals for Linux commands. Executing the “man trap” command in the terminal returns the list of commands built into the Bash shell, including a detailed description of each command as well as the arguments that, if any, that they accept. For example, the operator “.”, which is used to execute a commands from a shell script in the current directory, is actually a command that is built into the bash shell.