ST. LAWRENCE HIGH SCHOOL

A Jesuit Christian Minority Institution

STUDY MATERIAL - 7

Subject: COMPUTER SCIENCE **Class - 11**

Chapter: Operating System **Date: 10/08/2020**

Virtual Memory

Virtual Memory is a storage allocation scheme in which secondary memory can be addressed as though it were part of main memory. The addresses a program may use to reference memory are distinguished from the addresses the memory system uses to identify physical storage sites, and program generated addresses are translated automatically to the corresponding machine addresses.
The size of virtual storage is limited by the addressing scheme of the computer system and amount of secondary memory is available not by the actual number of the main storage locations.

It is a technique that is implemented using both hardware and software. It maps memory addresses used by a program, called virtual addresses, into physical addresses in computer memory.

1. All memory references within a process are logical addresses that are dynamically translated into physical addresses at run time. This means that a process can be swapped in and out of main memory such that it occupies different places in main memory at different times during the course of execution.
2. A process may be broken into number of pieces and these pieces need not be continuously located in the main memory during execution. The combination of dynamic run-time address translation and use of page or segment table permits this.

If these characteristics are present then, it is not necessary that all the pages or segments are present in the main memory during execution. This means that the required pages need to be loaded into memory whenever required. Virtual memory is implemented using Demand Paging or Demand Segmentation.

Spooling and Buffering

There are two ways by which Input/output subsystems can improve the performance and efficiency of the computer by using a memory space in the main memory or on the disk and these two are *spooling and buffering*.

Spooling –
Spooling stands for Simultaneous peripheral operation online. A spool is similar to buffer as it holds the jobs for a device until the device is ready to accept the job. It considers disk as a

huge buffer that can store as many jobs for the device till the output devices are ready to accept them.

Buffering –
The main memory has an area called buffer that is used to store or hold the data temporarily that is being transmitted either between two devices or between a device or an application. Buffering is an act of storing data temporarily in the buffer. It helps in matching the speed of the data stream between the sender and the receiver. If the speed of the sender's transmission is slower than the receiver, then a buffer is created in the main memory of the receiver, and it accumulates the bytes received from the sender and vice versa.

The basic difference between Spooling and Buffering is that Spooling overlaps the input/output of one job with the execution of another job while the buffering overlaps the input/output of one job with the execution of the same job.

Differences between Spooling and Buffering –

- The key difference between spooling and buffering is that Spooling can handle the input/output of one job along with the computation of another job at the same time while buffering handles input/output of one job along with its computation.
- Spooling stands for Simultaneous Peripheral Operation online. Whereas buffering is not an acronym.
- Spooling is more efficient than buffering, as spooling can overlap processing two jobs at a time.
- Buffering uses limited area in main memory while Spooling uses the disk as a huge buffer.

Introduction to DOS / WINDOWS

Though UNIX was a powerful operating system available, but it was not suitable for 8-bit 8086 microprocessor based Personal Computers. So there was a need for a small operating system that could work in 640K memory (RAM). DOS was variant of CP/M (Control Program/Monitor) which ran for the first time on IBM-PC in 1981. It is called so because it resides on Floppy or Hard disk and provides command level interface between user and the computer hardware. The different versions of MS-DOS have evolved over a period of time with Microsoft introducing new features in each new release. Starting with MS-DOS1.1, the latest version was MS-DOS6.22 released in 1994. There are various versions of DOS like MS-DOS(Microsoft), PC-DOS(IBM), Apple DOS, Dr-DOS etc.

WINDOWS was similar to APPLE Mach operating system interface on IBM-PC. The main features of windows are easy to use graphical user interface (GUI), device independent graphics and multitasking support. The first version of windows1.0 was introduced in 1985. Windows was an application of MS-DOS using the basic commands of DOS. Windows for Workgroup (WIN3.11) released in 1992 was an integrated windows and networking package with file and printer sharing capabilities, a network mail (Microsoft Mail) and a workgroup

scheduler (Schedule+) packages in windows environment. WINDOWS-95 released in 1995 is a 32-bit operating system which includes MS-DOS7.0 and takes control of computer system after starting.

The main features of WINDOWS-95 are:

- Windows 95 is easier to learn and use than any of its predecessors.
- Windows 95 and its applications run under the PCs protected mode, which mean that one will behaved program cannot compromise the memory and resources of another. This approach adds a large measure of reliability to the total operating environment. The crash of a single errant program does not automatically crash the operating system or any of other programs that you're running.
- Windows 95 is a pre-emptive multitasking means that programs running in the background do not significantly degrade the interactive program that you are running in the foreground e.g. you can comfortably type into word processors while your database system backs up all its files. Under Windows 3.1 the typed key displays lagged behind while the backup procedure logged the processor.
- Windows 95 integrates virtually all of your computing tasks and resources like networks, E-mail, multimedia, system administration, printing, faxing, applications into one common user interface.

Booting

When the computer is switched on, the firmware program in Read Only Memory(ROM) also called Basic Input-Output System(BIOS) reads programs and data i.e. Operating System and loads it into memory (RAM). This process is known Bootstrapping(Booting). The OS once loaded takes control of the computer, handles user interaction and executes application programs.

Booting Sequence

During booting process, computer loads the operating system into its memory. DOS booting involves reading following files into memory namely IO.SYS, MSDOS.SYS, and COMMAND COM. The Basic Input/Output Program (IO.SYS): This program provides interface between the hardware devices and software of the system. It takes care of the keyboard input, character output to monitor, output to printer and time of the day. The File and Disk Manager Program (MSDOS.SYS) : It contains the file management and the disk buffering management capabilities. It keeps track of all the disk access of an application program and remains permanently in memory. The Command Processor (COMMAND.COM) : It is also called command interpreter. It is the program that displays the system prompt and handles user interface by executing the command typed in by the user using keyboard.

The CONFIG.SYS file: This file contains reference to device drivers which are loaded when OS takes control of the computer. These device drivers are required for configuring operating system for running special devices.

The AUTOEXEC.BAT file : This is a special batch program that is automatically executed when the system is started. It can be used to define keys, define the path that MS-DOS uses to find files, display messages on the screen etc. It will be executed only if it exists in the root directory or the diskette from which the system is loaded. Each time the system is started, MS-DOS executes the commands stored in AUTOEXEC.BAT file. One can run it without restarting the system by typing AUTOEXEC at the command prompt.

Warm and Cold Reboot:

Cold Booting:We are familiar with what the booting process is, in a common way. Now, question is, what is cold booting? This is the very first step that a computer takes when it is turn ON from OFF position. In the very first step, the microprocessor is initialized.

Warm Booting:
It is different from the Cold Booting because it is not done in the very first phase of starting the device. It doesn't do the POST test. If the computer hangs because of some reason while working, and demands to be restarted to make it working. The process of reset/restart of the computer system is called as warm booting. It is done with the help of reset button or keys (Ctrl+Alt+Del). This testing doesn't test the booting RAM because no power is performed on self-test.

Types of DOS commands

Any instruction given to the computer to perform a specific task is called command. The DOS has several commands, each for a particular task and these are stored in DOS directory on the disk. The commands are of two types : (a)Internal Commands : These are in built commands of MS-DOS i.e. these are stored in Command interpreter file (COMMAND.COM). These commands reside in the memory as long as the machine is at he system prompt(C:\>) level. To use these commands no extra /external file is required. E.g. DATE, TIME, DIR, VER etc. (b) External commands : These are separate program (.com) files that reside in DOS directory and when executed behave like commands. An external command has predefined syntax. for e.g. HELP, DOSKEY, BACKUP, RESTORE, FORMAT etc.

BASIC DOS COMMANDS :

a) Directory Commands :

DIR : To list all or specific files of any directory on a specified disk.

MD : To make directory or subdirectory on a specified disk/drive.

CD or CHDIR : Change DOS current working directory to specified directory on specified disk or to check for the current directory on the specified or default drive.

RMDIR or RD : Removes a specified sub-directory only when it is empty. This command cannot remove root directory (C:\) or current working directory.

TREE : Displays all of the directory paths found on the specified drive.

PATH : Sets a sequential search path for the executable files, if the same are not available in the current directory.

SUBST : Substitutes a string alias for the pathname and creates a virtual drive.

b) File Management Commands :

COPY : Copies one or more files from source disk/drive to the specified disk/drive.

XCOPY : Copies files and directories, including lower-level directories if they exists.

DEL : Removes specified files from specified disk/drive.

REN : Changes the name of a file(Renaming).

ATTRIB : Sets or shows file attributes (read, write, hidden, Archive).

BACKUP : Stores or back up one or more files/directories from source disk/drive to other destination disk/drive.

RESTORE : Restores files that were backed up using BACKUP command.

EDIT : Provides a full screen editor to create or edit a text file.

FORMAT : Formats a disk/drive for data storage and use.

c) General Commands :

TIME : sets or displays the system time.

DATE : Sets or displays system date.

TYPE : Displays the contents of at the specified file.

Answer the following questions:

1. **Differentiate between cold booting and warm booting.**
   Ans:

Cold Boot	Warm Boot
Cold booting commonly goes by hard booting in computer terminology.	Warm booting is also called as soft booting.
The system starts up from a completely powerless state.	The system returns to its original state without interrupting power.
It completely resets the hardware and clears the system off the temporary memory.	It doesn't necessarily reset the components and the power source, thereby keeping the memory intact even after a reboot.
A cold boot is usually done when the system doesn't respond to a warm boot.	A warm boot is generally done when a program fails to respond and the system freezes in between a session.
Shutting it off from the power source or unplugging the supply resets the system.	Pressing the ctrl, alt and delete keys simultaneously or initiating a reset command will reboot the system without hampering power.
It runs self-diagnosis tests thereby resetting the hardware and memory.	It forbids a full system diagnosis thereby reducing the reboot time.

2. **Write a short note on virtual memory.**
   Ans:

Virtual Memory is a storage scheme that provides user an illusion of having a very big main memory. This is done by treating a part of secondary memory as the main memory.

In this scheme, User can load the bigger size processes than the available main memory by having the illusion that the memory is available to load the process.

Instead of loading one big process in the main memory, the Operating System loads the different parts of more than one process in the main memory.

By doing this, the degree of multiprogramming will be increased and therefore, the CPU utilization will also be increased.

3. **Explain the following DOS commands briefly:**
   a. **CHDIR:** The chdir command is used to display the drive letter and folder that you are currently in. Chdir can also be used to change the drive and/or directory that you want to work in.
   b. **CD :** The cd command is the shorthand version of the chdir command.
   c. **CLS :** The cls command clears the screen of all previously entered commands and other text.
   d. **DEL:** The del command is used to delete one or more files. The del command is the same as the erase command.

e. **REN:** The ren command is used to change the name of the individual file that you specify.
f. **TIME:** The time command is used to show or change the current time.
g. **DATE:** The date command is used to show or change the current date.

4. **Differentiate between spooling and buffering.**

	SPOOLING	BUFFERING
Basic Difference	It overlap the input/output of one job with the execution of another job.	It overlaps the input/output of one job with the execution of the same job.
Full form (stands for)	Simultaneous peripheral operation online	No full form
Efficiency	Spooling is more efficient than buffering.	Buffering is less efficient than spooling.
Consider Size	It considers disk as a huge spool or buffer.	Buffer is a limited area in main memory.