Operating System

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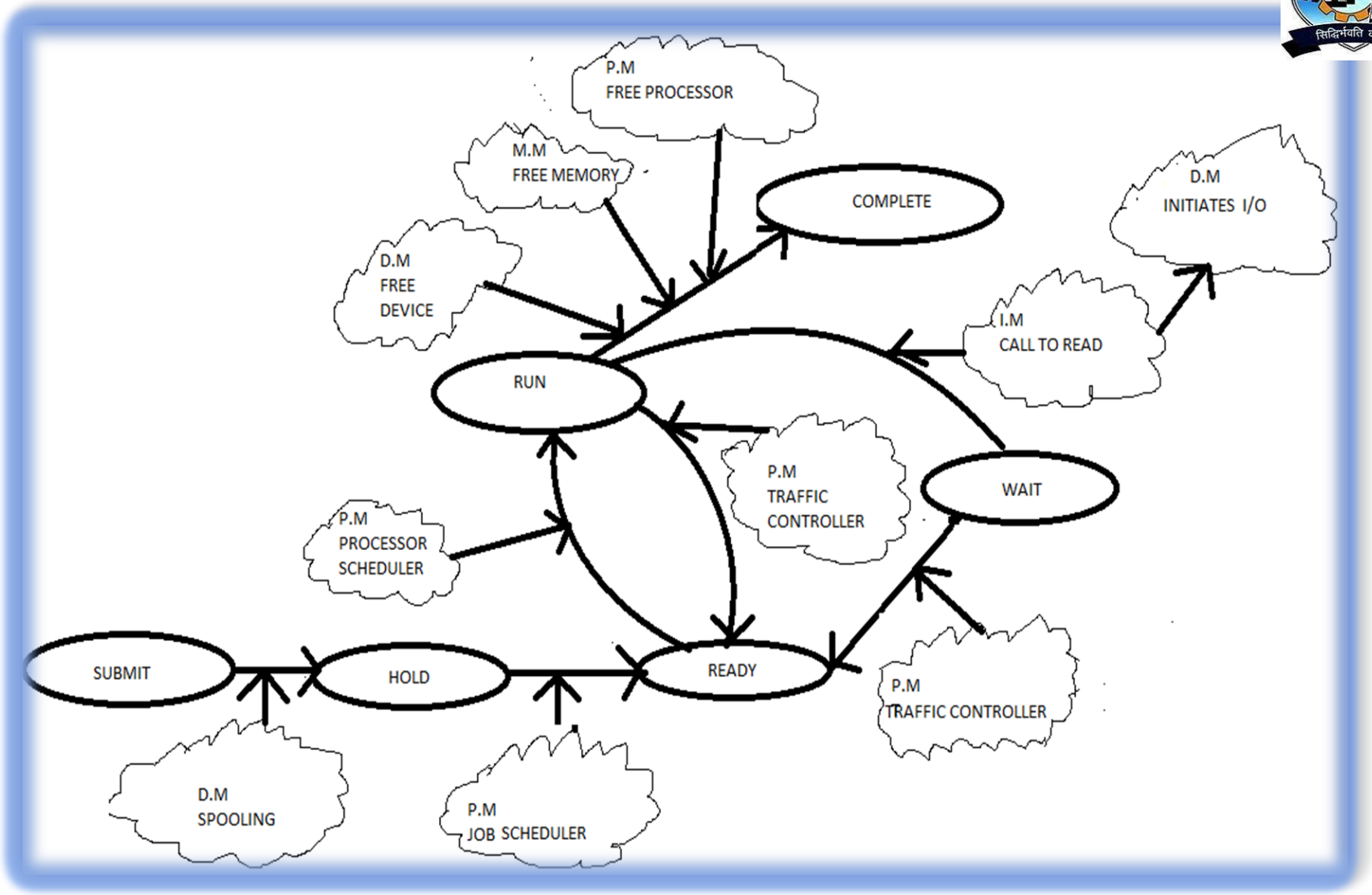
Outlines

- Introduction to Process Life cycle
- Privileged Instructions
- Overlays
- Time sharing system
- Buffering
- Batch Processing
- SPOOLING
- Real-time System
- Process management

Process states/Life Cycle of a process



AN OPERATING SYSTEM-PROCESS VIEW POINT

Submit:A user submits a job to the system. The system must respond the user's request.
Hold: The user's job has been converted into internal machine readable form, but no resources have been assigned to the process.
Ready: The process is ready to run but there are more processes than processors and it must wait for its turn on processor.
Run: The process has been assigned a processor as its programs are presently being executed.
Wait: The process is waiting for some event (an I/O operation to be completed).
Complete: The process has completed its computation all its assigned resources may be reclaimed.

Description of process life cycle

- A user submits job to the system by placing a deck into a card reader (submit state). The job consists of several decks of programs predicate by job card controller. The job card controller passes information to the operating system as to what resources the job will need. The spooling routine reads the job and places it into a disk (HOLD). The job scheduler determines the device requirements from the user's job card. Once the job scheduler decides that the job has to be assigned resources the traffic controller is called to create the associated process of information and memory management is called to allocate the necessary main storage. The job is then loaded into memory and the process is ready to run (READY STATE). When a processor becomes free the process scheduler scans the list of the ready process, choose a process and assign a processor to it(RUNNING STATE). If the running process requests access to read a file, information management will call device management to initiate the process reading of the file (device management would initiate the reading of the file). Device management would initiate the I/O operation and then call the process management to indicate that the process requesting the file is awaiting the completion of the I/O operation (WAIT STATE).
- When the I/O operation is completed the traffic controller places the process back into the ready state. If the process completes its computation when it is run again then it will be placed into completed state and the allocated resources will be freed.

Description of process life cycle Contd…

(1)PREVILEGED INSTRUCTION

- It is a special type of instruction which is executed only in monitor mode. Operating system can execute the privileged instruction as it executes in monitor mode. So it changes the system state from user mode to the monitor mode.
- To provide better service we have two separate modes of operations i.e., user mode and monitor mode (also called system mode).
- A bit is added to the hard ware of the computer to indicate the current mode is user (1), monitor (0). I/O instruction and instruction to modify the memory management registers or the timer are privileged instructions. The h/w allows privileged instruction to be executed only in the monitor mode. If an attempt is made to execute privileged instructions in the user mode the h/w will not execute but it treats it as an illegal instruction and trap to the resident monitor. So when a trap occurs the h/w switches from user mode to monitor mode. Example=HALT instruction` is privileged, as a user program should never be able to halt the computer. The instructions to turn the interrupt system on and off are also privileged.

Description of process life cycle Contd…

(2)OVERLAYS

When a programmer used to write a large program that could not fit into the main memory. It is necessary to divide the program into small portions, so each one could fit into the primary memory. These small portions are called overlays. A programmer has to design overlays so they are independent of each other. Under these circumstances one can successively bring each overlay into the main memory and execute them in a sequence. But it increases the program development time considerably.

Description of process life cycle Contd…

(2)OVERLAYS

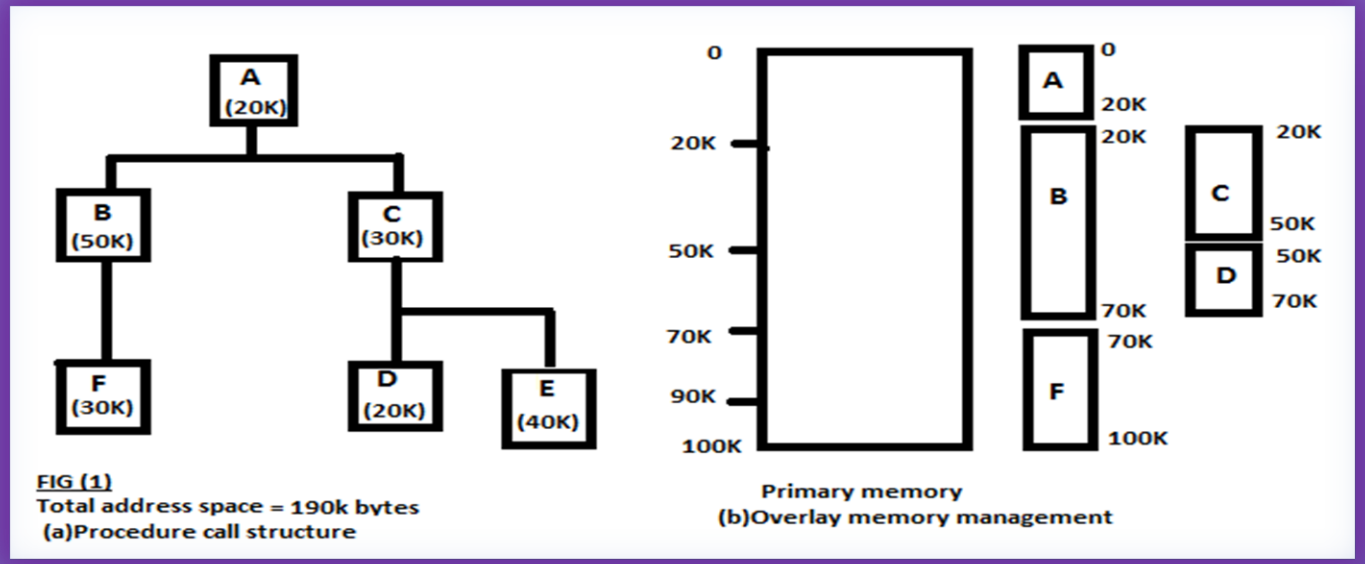


FIG (1)
Total address space = 190k bytes
(a)Procedure call structure

(b)Overlay memory management

Fig (1) illustrates the relation between the procedures in a job's address space. This diagram indicate that procedure 'A' call only procedure 'B' and 'C', procedure 'B' call only procedure 'F', where as procedure 'C' call only procedure 'D' and 'E'. Thus procedure 'B' and 'C' do not have to be in memory at the same time. So instead of using 190k bytes to hold the job's address space in memory, maximum of 100k bytes are needed.

Description of process life cycle Contd…

(3)TIME SHAIRING SYSTEM

- Multiprogramming system that process many user programs concurrently in an interactive manner are called time sharing system. Here interactive manner means the computer and terminal user may communicate with each other.
- In such a system a clock is used to divide up processor time into “time slices” and these time slices are shared between users in an appropriate way. This is called time sharing. If a job is not completed at the end of its time slice, then it is interpreted and returned to the end of a queue to wait for another “time slice”. This policy guarantees fast response to user’s request, which can be processed with a single time slice.

Description of process life cycle Contd…

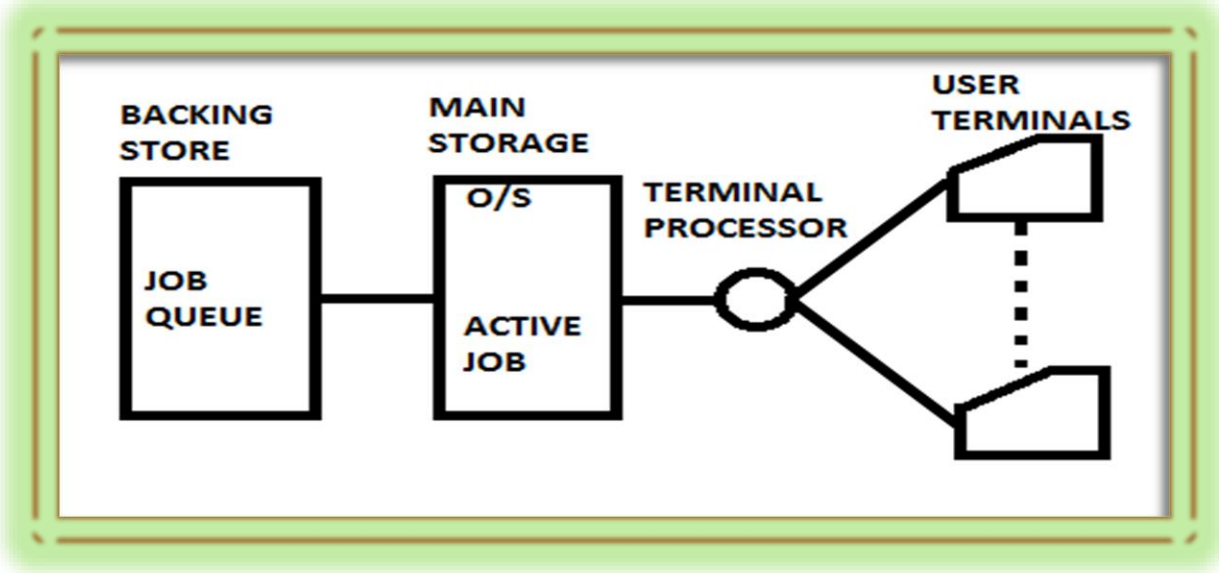
(3)TIME SHAIRING SYSTEM CONTD….

Example: let us take a system having following details

The average time slice is about 40 msec. at the end of this intervals, the active job is transferred to the drum and another job is loaded into the internal store. This exchange of jobs between two levels of storage is called swapping.

It takes roughly 40 msec. so provide fast response needs 80 ms for one job(i.e., one terminals)

Let us take that the system has 25 terminals so a user can expect response to a simple system request (with a single time slice only) in 25x80 msec = 2sec. so here we see that the time sharing system provide fast response to user request.



Description of process life cycle Contd…

(4)BUFFERING

- It is the name to the technique of transferring temporary storage tri processing thus enabling the simultaneous operations of the device can be achieved because of the autonomous operation of the peripheral which leaves the CPU free from other work. It performs.

  (*) Offline operations,

  (*) Computation of one program, and output of the same program.

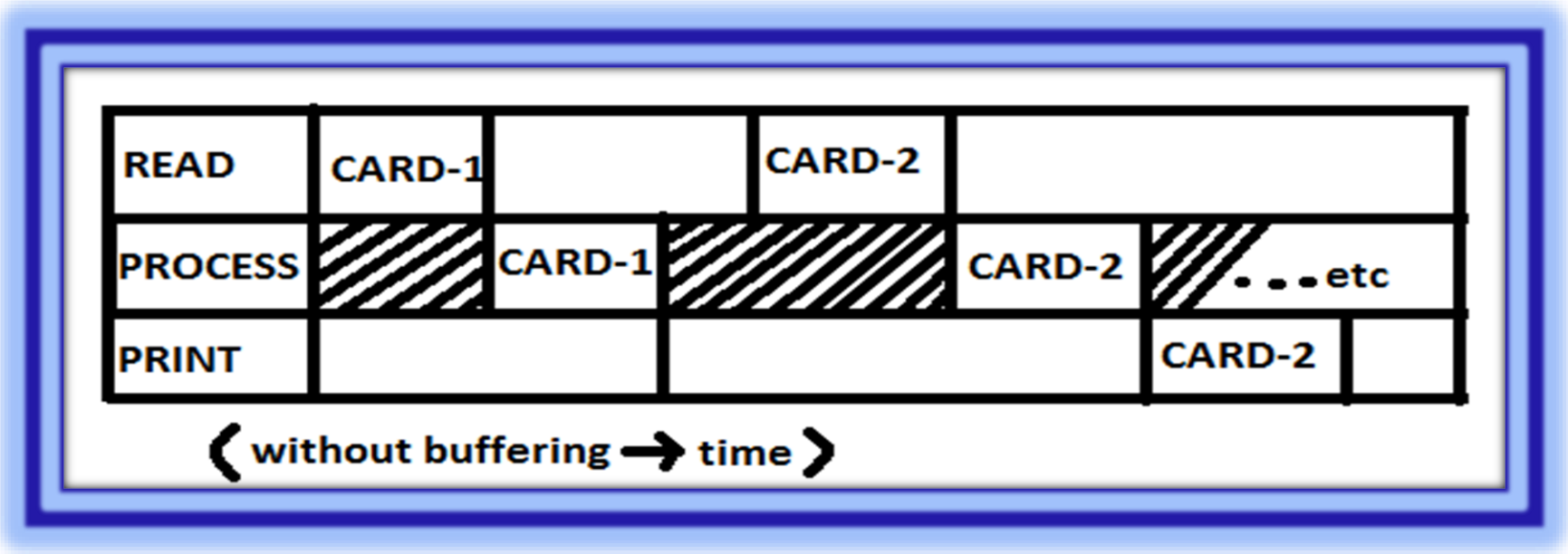
  Buffering keeps both the CPU and its I/O device busy all the time, it means if the CPU is working on one record while I/p device is working on another, either the CPU or I/P device will finish first. If the CPU finishes first then it must wait. It can't proceed until the second record is read. The CPU will remain idle for a long time. If the I/P device finishes first then either it must wait or it may proceed with reading the next record. So if the buffering technique is used then the I/P device can read several records ahead of the CPU.

Description of process life cycle Contd…

(4)BUFFERING

Example:

Suppose 2000 cards need to be input and the detail on the cards printed out on a line printer (one is being used for each card read). The card reader operates at 1000 cards per minute and the printer at 500 times per minute. The processing cycle and time required would be illustrated in fig (1), if buffering were not used and as illustrated in fig (2), if buffering were used.



Description of process life cycle Contd…

(4)BUFFERING

Here one activity takes place at a time i.e., as the card is processed the reade and printer idle.

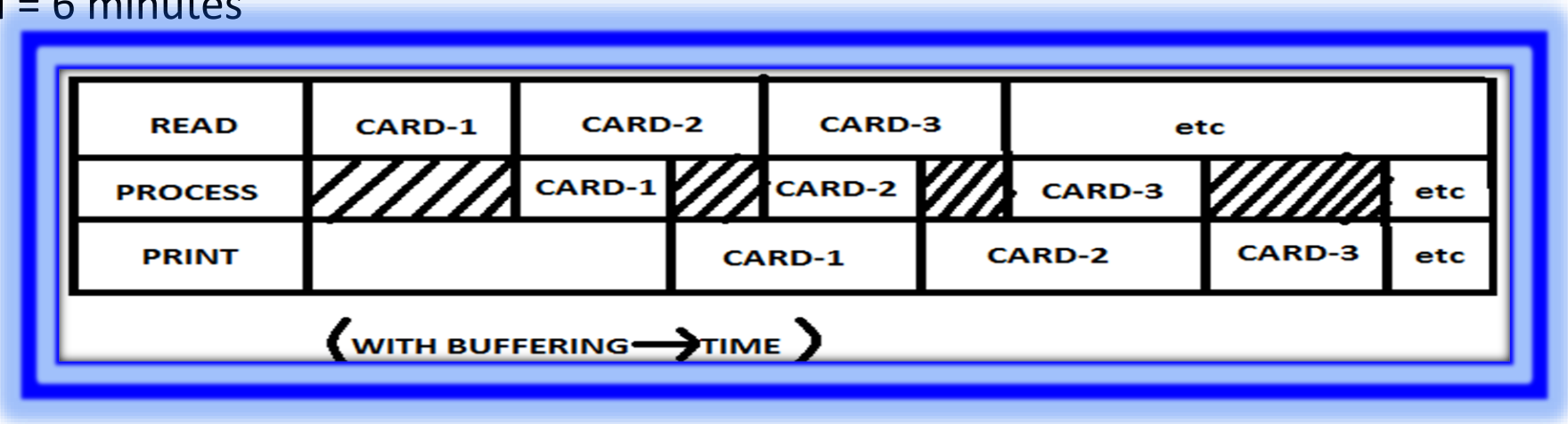
Total time required:-

Read = 2000 x (1/2000) = 2 min.

Write =negligible

Print = 2000 x (1/500) = 4 minutes

Total = 6 minutes



TOTAL TIME :After reading the first card all subsequence reading, processing and processing and printing can be overlapped . time required is a little over the speed of the device i.e., just over 4 minutes.