Chapter-6

[Memory Management]

→ There are two types of memories in comp system. Primary memory which include RAM, ROM, PROM, and EPROM.
Secondary memory is a mass storage which includes Hard disk, Floppy disk, CD, DVD or ~~CD~~.

→ The major activities of memory mgt component of an OS are →

1) To keep track of part of memory which are currently being used and by whom? This facilitates to know how much memory is free and occupied by which processes.

SAHYOG

② Decide which process is to be loaded into main memory when memory space become available.

③ Allocate & de-allocate memory space as per the requirement.

Logical & Physical Address Space →

→ A address produced by the CPU is called logical address, whereas an address loaded in the memory address register is called physical address.

→ All logical addresses generated by program are collectively referred to as a logical address space, similarly all physical addresses are collectively called physical address space.

→ The mapping from logical to physical addresses is done by memory management unit (MMU) at run time.

Loading → Creation of an active process requires loading a program into main memory.

The work of the loader is to place the load module in main memory.

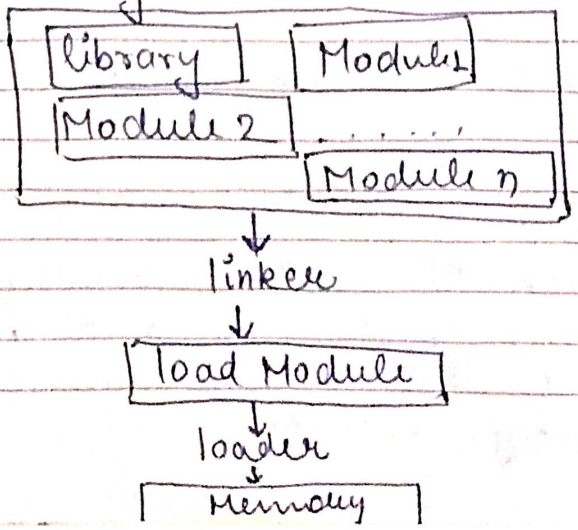

fig (a)

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In general loading is of three types →

→ Absolute loading
→ Relocatable loading
→ Dynamic loading

① Absolute Loading → Given load module is always be loaded into the same location in main memory. The assignment of specific address to memory within a program can be done either by the programmer or at compile or assembly time. The programmer must have the knowledge of assigment strategy for placing modules into main memory. And If any modification is done in the body of the module it cause change in all the address.

② Relocatable Loading → Load module need to be placed anywhere in main memory. This is possible if the assembler or compiler produce addresses that are relative to some known point. The loader calculates the physical address by simply adding the starting address and the relative address to place the load module.

③ Dynamic Loading → The main program is loaded in memory and is executed. when a program needs to call another program or subprogram, the calling program first check to see whether the program has been loaded. If it has not been, the relocatable loader is called to load the desired program / subprogram into memory

Linking → In fig(a) we have seen, the linker takes as input a collection of object module and produce a load module. This load module include all program and data pass to it. In each object module there may be a reference of other module. For eg. program A can call program B in its code. by writing "B();"

SWAPPING → A process resides in the memory when it is ready to execute. For continue process execution we can swap the position of this process from memory to back store. Again while execution we can bring this process back for execution. This process is called as. swapping

→ In multi-user OS when numbers of processes are in ~~que~~ queue, one by one process is executed using certain algorithm. Eg if Round Robin Algorithm is used, then time quantum is given to each process. CPU scheduler select one process for scheduling. If this processing time is more than time quantum then this process is swapped out. Then a control switch to next job and swap in is done.

→ While processing a job from queue, if high priority enters in the queue then memory manager swaps out the current process and swap in high priority process. When high priority process finishes execution, the lower pribrity process can swap back and continue.

→ A swapping process is called as roll in and roll-out. Generally the process, which is swapped out, occupies the same space in the memory when it is swapped back.

Memory Partitioning → Another method used for memory management is called as memory partitioning. This method divide the memory into several small ~~spa~~ parts. These parts are called as partitions.

→ For multiprogramming environment the memory is divided into various partition. An OS arranges the different processes in memory partitions. It keeps track of occupied partition as well as free partitions.

Advantage :-

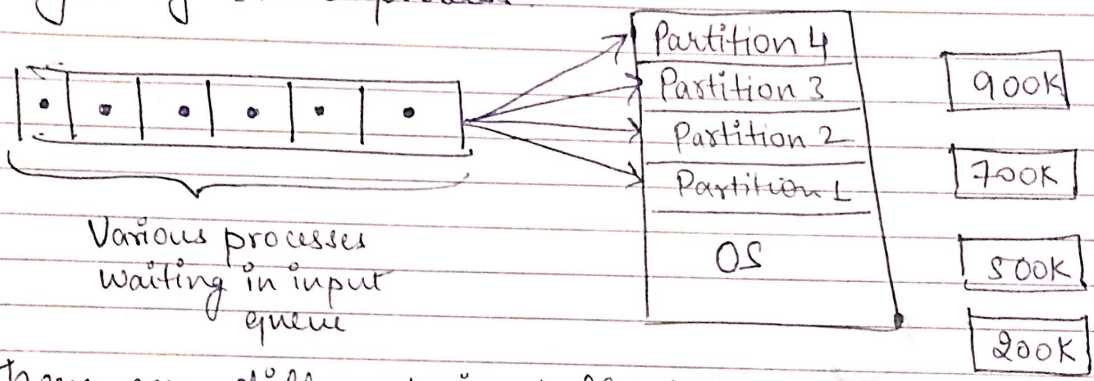
1) Useful for multiprogramming environment.
2) It is easy to access data from partitions.
3) Easy to access the partitions.

Two types of Memory Partitioning

- Dynamic Memory Partioning
- Static Memory Partitioning

① Static Memory Partitioning → This method is also called as fixed partition. As name suggests, the partition made in this method are of fixed size.

→ If the process or part of process assigned to memory is less in size than partition size, then remaining space cannot be used by any other process



There are different sized fixed partitions are existing eg. partition 1 is of size 200K, partition 2 is of size 500K

→ Static Partition or fixed partition table will contain following information.

Base Address	Offset.

Advantage :-

1) Easy accessible processes
2) Not complicated algorithm

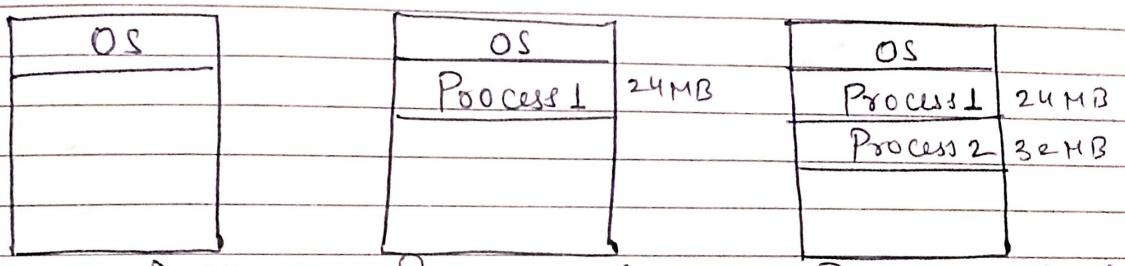
Disadvantage :-

1) Memory wastage.

(2) Dynamic Memory Partitioning → The memory partitioning done as per the requirement of process length or size is called as dynamic memory partitioning.

→ When a process arrives in a ready queue the OS check for the available enough size partition.

→ If the partition available is very large then OS divides that partition into parts. These process is kept in appropriate part of memory and remaining partition of memory is included in the partition availability list.



Initial Partitioning

Process 1 arrive and need 24MB of space

Process 2 arrive & needs 34MB.

Advantage →

1) Memory wastage is very less.
2) Maximum part of memory is utilized.

Disadvantage →

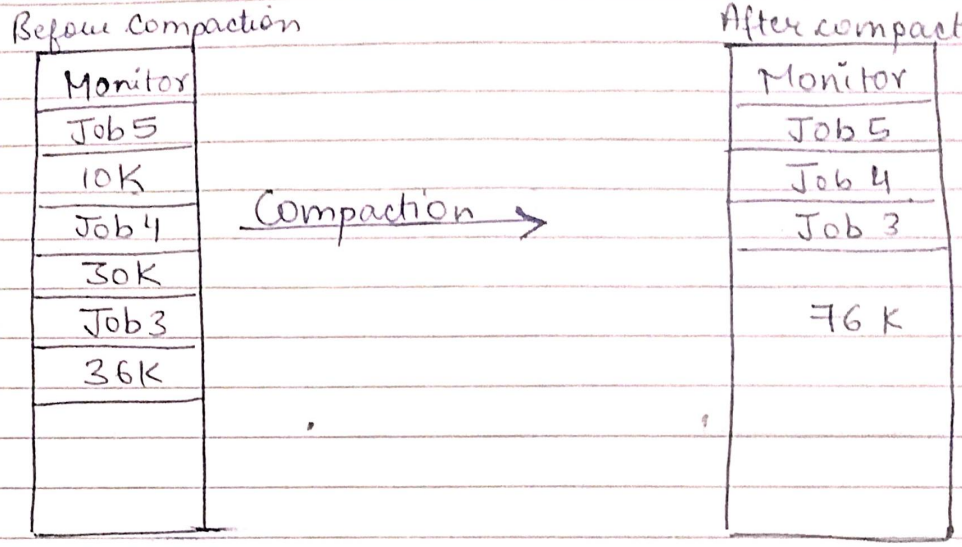
1) The main Drawback is external fragmentation. ie some small partitions remain unutilized. To overcome this problem of external fragmentation is compaction.

What is Compaction? →

Answer All the free space is compacted together to form a new block or partition for utilization.

OR

Compaction shuffles the free memory location together in one large block.



Paging → Dynamic memory partitioning suffer from external fragmentation. To overcome this problem either we can use compaction or paging.

→ In paging physical memory is broken into fixed size blocks called frames. Also logical memory is broken into fixed size blocks called as pages.

→ Every address generated by the CPU is divided into two ~~partition~~ parts a Page number (P) and a page offset (d)

| P | d |

Difference b/w Paging & Segmentation.

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Paging	Segmentation
→ Pages are used for swapping or managing memory.	→ Segments are used for memory mgt.
→ Page is indicated by its page number and offset	→ Segment is indicated by segment number & its offset
→ Page Table is formed	→ Segment Table is formed
→ Do not support user's view of memory	→ Support user's view of memory
→ Complicated than segmentat°	→ Relatively easy to implemt.