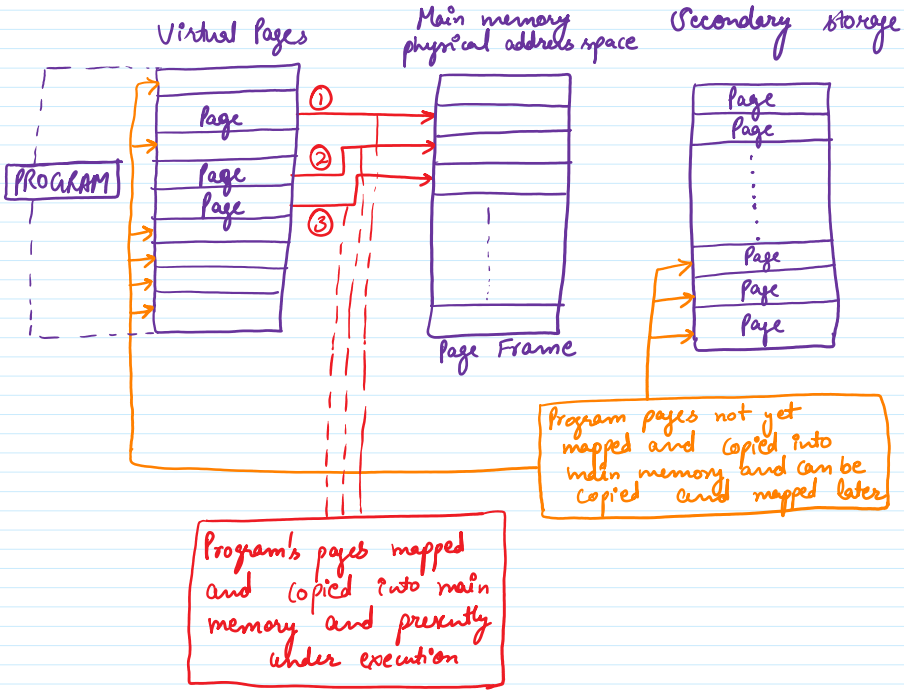
Textbook :- Abraham Silberschatz — Operating System Concepts

Physical Addresses :-

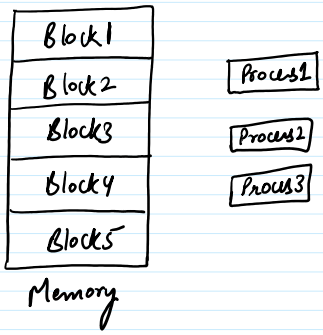
Set of addresses used to reference locations in the main memory

Virtual Addresses :- set of addresses that programs use for load and store operations.



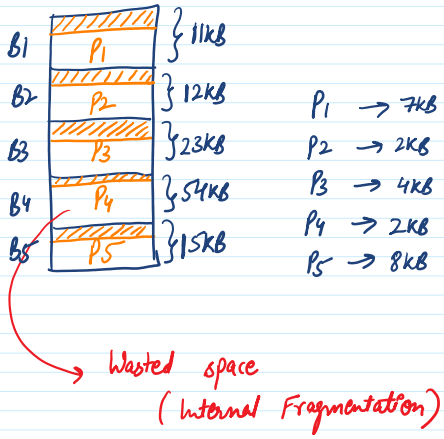
VIRTUAL MEMORY ORGANIZATION

Contiguous Memory Allocation :-

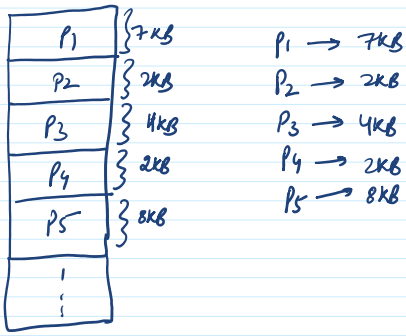


which process to assign to which block?

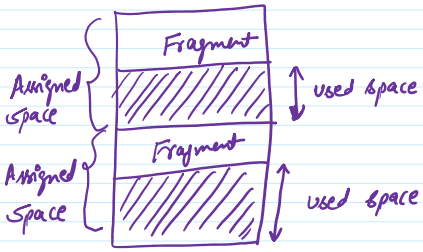
Fixed size Partitioning



Variable Size Partitioning



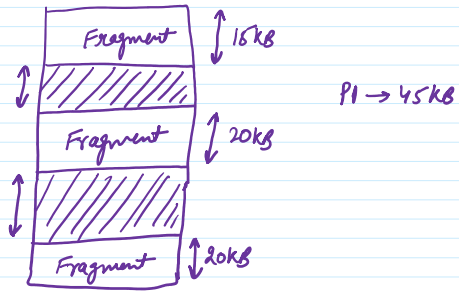
Internal & External Fragmentation:—



Internal Fragmentation is there is some fragment of space which is being wasted.

External Fragmentation

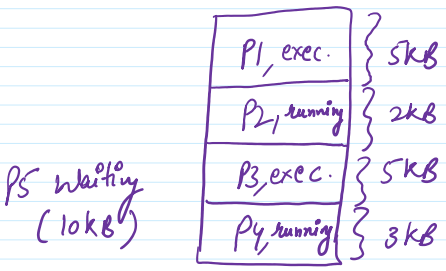
A process needs certain amount of space but there is no space in contiguous.



Fixed v/s Variable size Partitioning

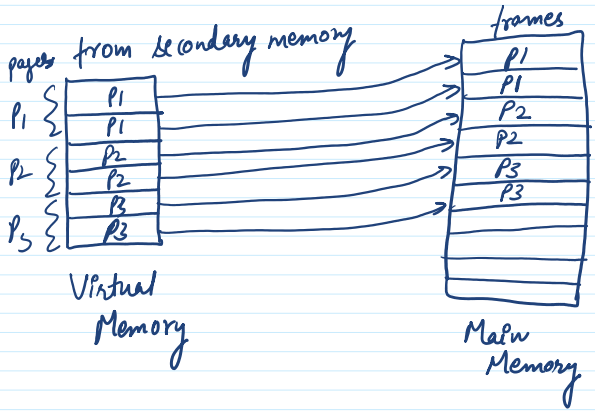
Fixed v/s Variable size Partitioning

→ External Fragmentation.

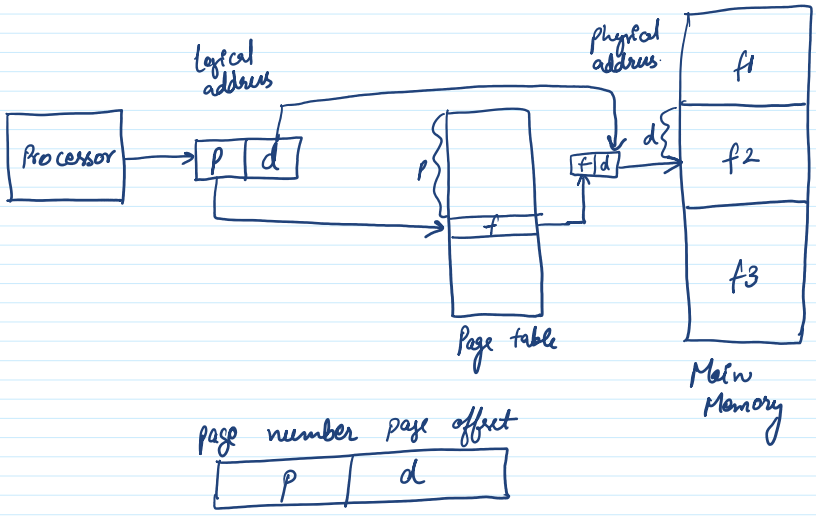


Solution :—

PAGING :— storage mechanism used in OS to retrieve processes from secondary memory to the main memory as pages.



Implementation of Paging :—

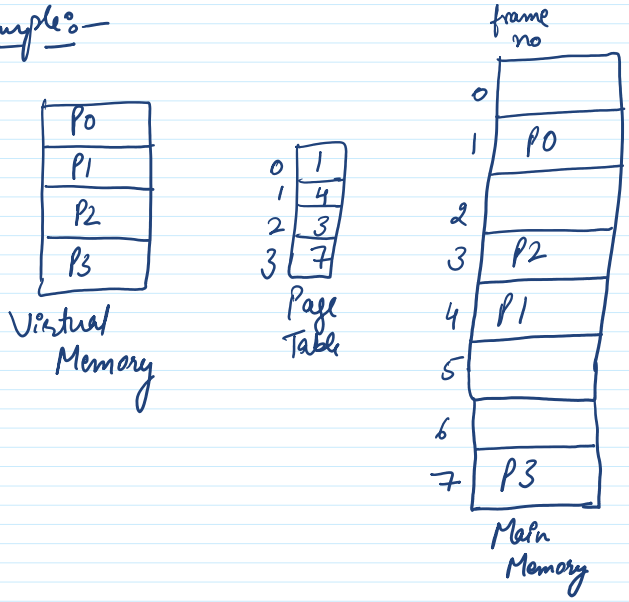


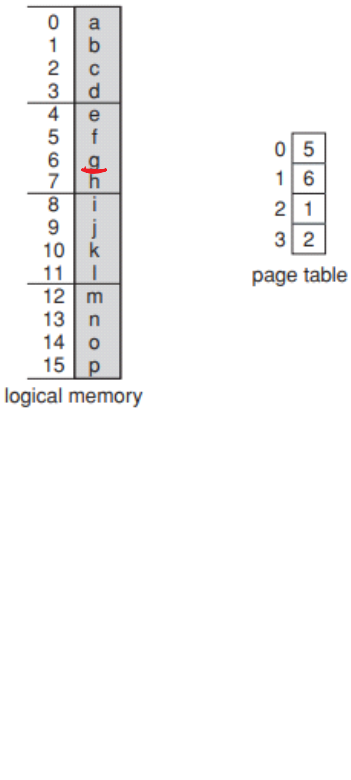
frame → blocks of Main Memory

page → blocks of Secondary Memory

Page Table is a data structure used by OS to keep track of pages and frames.

Example :-

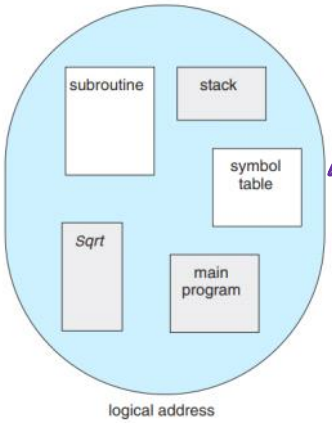




Example :- 32-bytes memory with 4-bytes pages.
Let frame-size = page-size = 4 bytes
CPU produces virtual address 11.
How will this be translated to physical address?

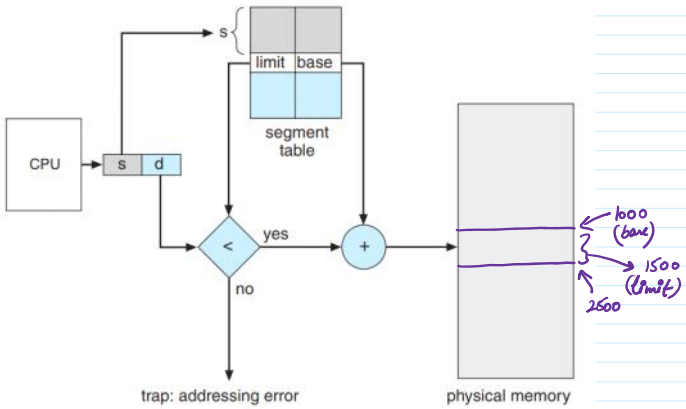
SEGMENTATION :-

Process broken into segments of variable sizes.

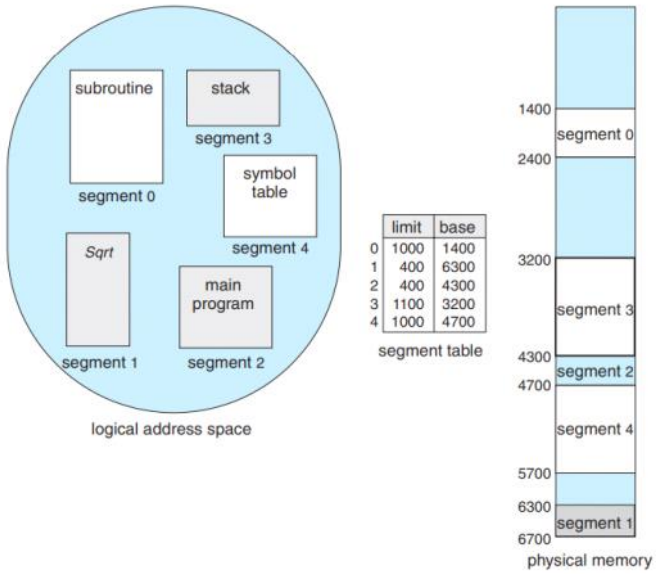


← Program/ Process

How to implement segmentation:-



base:- where segment starts in main memory.
limit:- end of space allocated for segmentation.



⇒ Processors example Intel Pentium uses both paging and segmentation to reduce fragmentation.

Q:- A system has 48-bit virtual address, 36-bit physical address, and 128 MB of main memory. If the system uses 4096-bytes pages, how many virtual and physical pages can the address space support?