OPERATING SYSTEM
WEEK 10 ASSIGNMENT

1. Given memory partitions of 100k,500k,200k,300k and 600k (in order), how would each of the First-fit, Best fit and worst –fit algorithms place processes of 212k,417k,112k and 426 k(in order)? which algorithm makes the most efficient use of the memory?

First-Fit:
212K is put in 500K partition.
417K is put in 600K partition.
112K is put in 288K partition (new partition 288K = 500K - 212K).
426K must wait.
Best-Fit:
212K is put in 300K partition.
417K is put in 500K partition.
112K is put in 200K partition.
426K is put in 600K partition.
Worst-Fit:
212K is put in 600K partition.
417K is put in 500K partition.
112K is put in 388K partition.
426K must wait.
In this example, Best-Fit turns out to be the best

2. Discuss in detail about

(i) Paging hardware - logical address to physical address mapping. (diagram)

(ii) TLB

(iii) External fragmentation with solution

Paging

· Physical address space of a process can be non-contiguous; process is allocated physical memory whenever the latter is available

- Avoids external fragmentation
- Avoids problem of varying sized memory chunks Divide physical memory into fixed-sized blocks called frames
- Size is power of 2, between 512 bytes and 16 Mbytes Divide logical memory into blocks of same size called pages\
- Keep track of all free frames To run a program of size N pages, need to find N -free frames and load program
- Set up a page table to translate logical to physical addresses

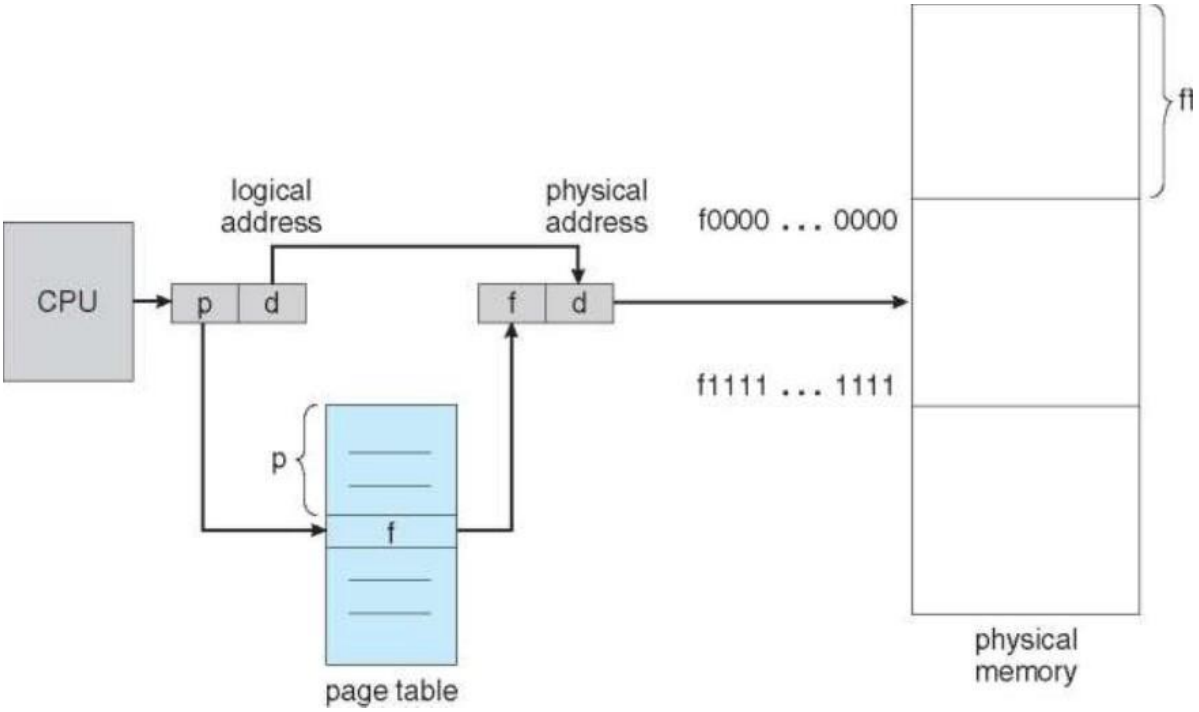
- Backing store likewise split into pages
- Still have Internal fragmentation

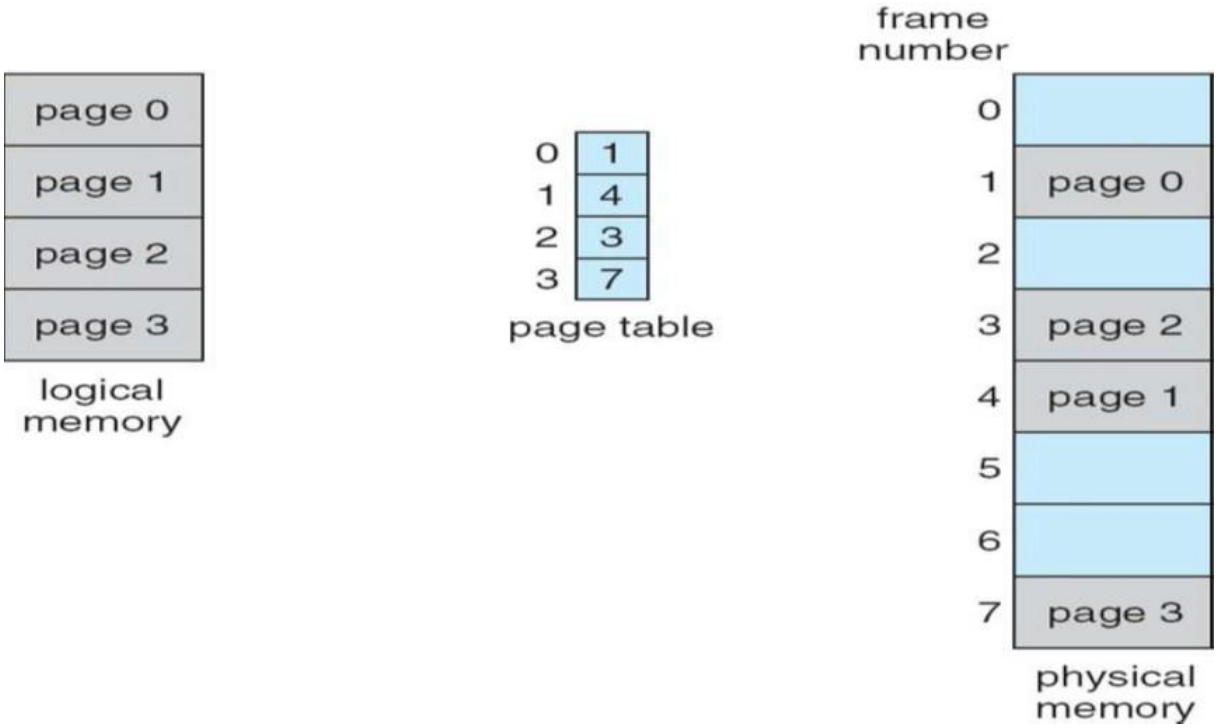
4.1 Address Translation Scheme

· Address generated by CPU is divided into:

- Page number (p) – used as an index into a page table which contains base address of each page in physical memory
- Page offset (d) – combined with base address to define the physical memory address that is sent to the memory unit

o For given logical address space 2^m and page size 2^n



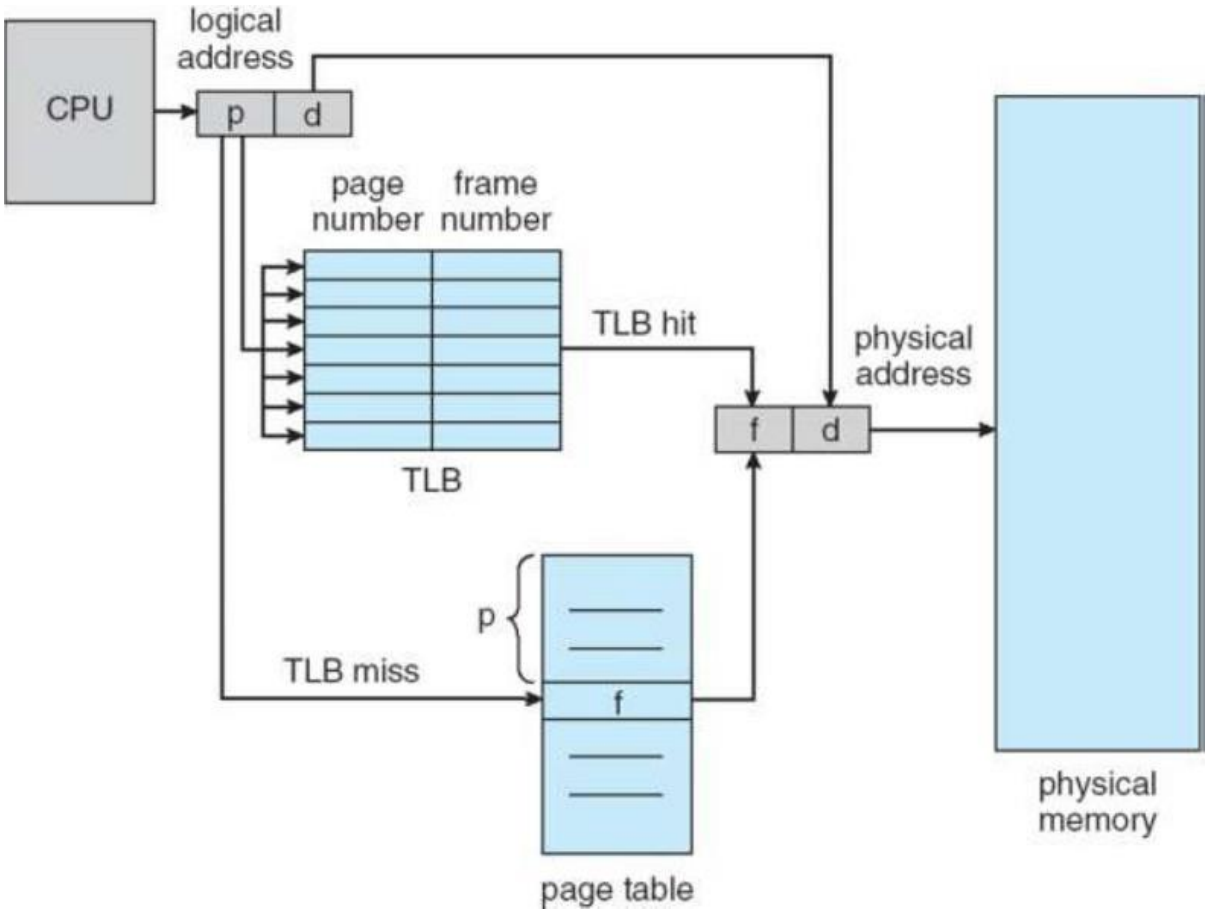


logical address to physical address mapping

Effective Access Time

- Associative Lookup = time unit
    - Can be < 10% of memory access time
- Hit ratio = α
    - Hit ratio –percentage of times that a page number is found in the associative registers; ratio related to number of associative registers
- Consider α = 80%, = 20ns for TLB search, 100ns for memory access
- Effective Access Time(EAT)
- EAT = (1 +) α + (2 +)(1 – α) = 2 + – α
- Consider α = 80%, = 20ns for TLB search, 100ns for memory access
    - EAT = 0.80 x 100 + 0.20 x 200 = 120ns
- Consider more realistic hit ratio -> α = 99%, = 20ns for TLB search, 100ns for memory access

EAT = 0.99 x 100 + 0.01 x 200 = 101ns



TLB

EXTERNAL FRAGMENTATION

- External fragmentation exists when there is enough total memory space to satisfy a request but available spaces are not contiguous.
- First-fit and best-fit memory allocation suffers from external fragmentation.
- Systems with variable-sized allocation units, such as the multiple partitions scheme and segmentation suffer from external fragmentation.