CS & IT ENGINEERING

Operating Systems

Memory Management

Lecture No. 5

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- Logical Vs Physical Address Space
- Simple Paging
-

Q. 5

Consider a System Using Variable Partition with no Compaction

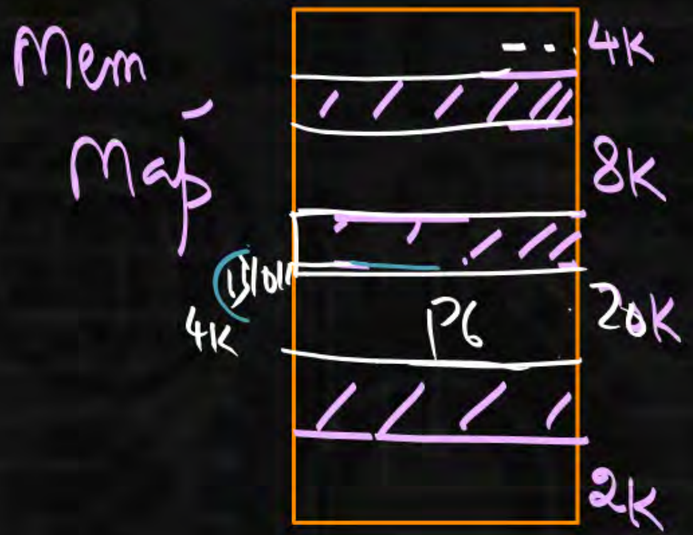
"Coelescing"

Free holes	4K; 8K; 20K; 2K
Program size	2K; 14K; 3K; 6K; 10K; 20K; 2K
Time for Execution	4; 10; 2; 1; 4; 1; 8

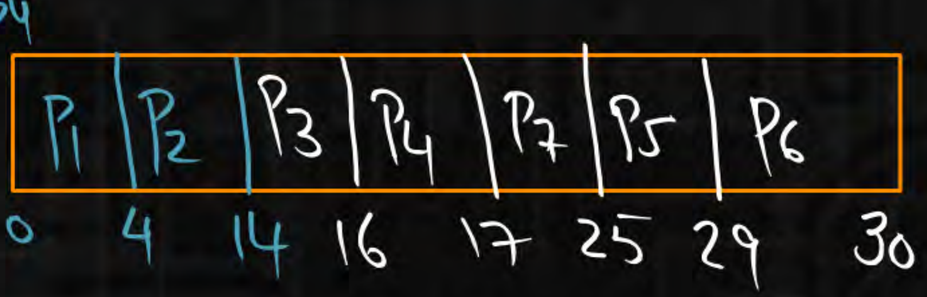
FF

Using Best Fit Allocation Policy and FCFS CPU Scheduling Technique, Find the Time of Loading & Time of Completion of each program. The Burst Times are in Seconds.

SJF



cpu scheduling



Pid	T.o.L	T.o.C
1	0	4
2	0	14
3	0	
4	0	
5	14	
6	29	
7	0	

Q. 6

Consider allocation of memory to a new process. Assume that none of the existing holes in the memory will exactly fit the process's memory requirement. Hence, a new hole of smaller size will be created if allocation is made in any of the existing holes. Which one of the following statements is TRUE?

A. The hole created by next fit is never larger than the hole created by best fit

B. The hole created by worst fit is always larger than the hole created by first fit

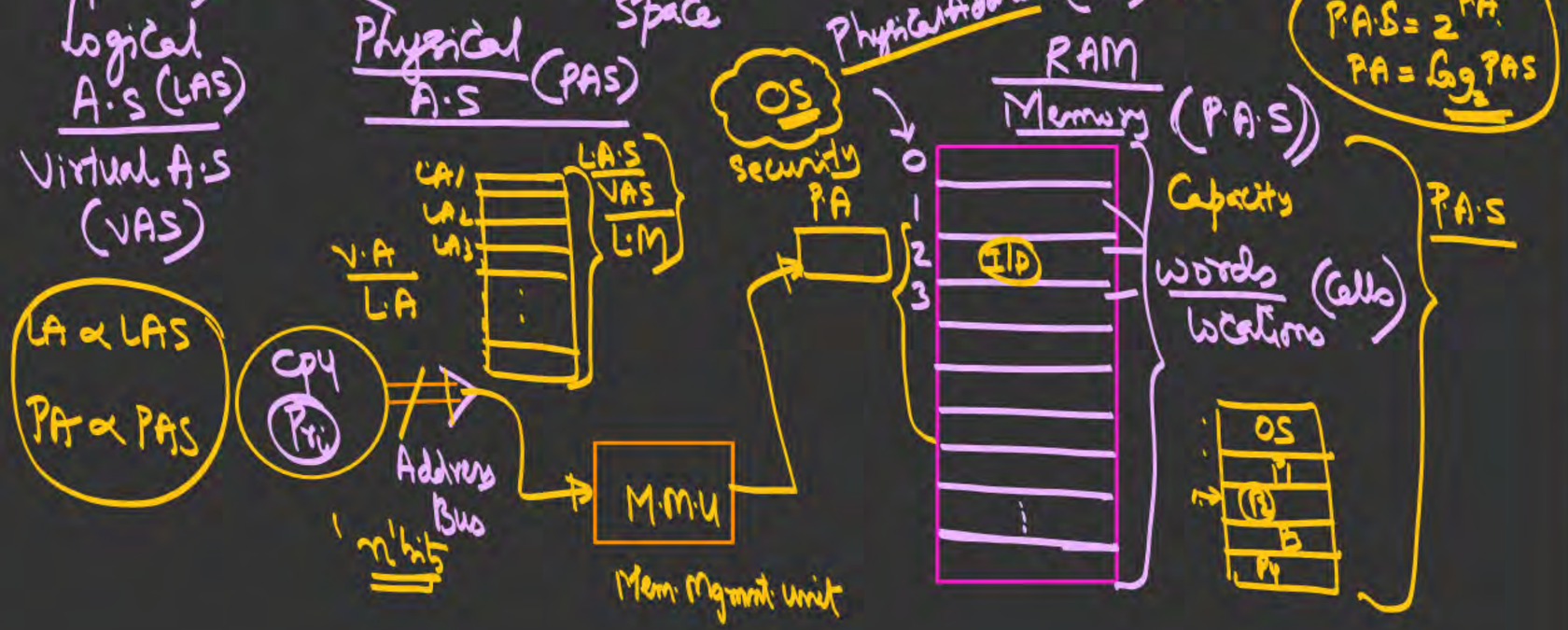
C. The hole created by first fit is always larger than the hole created by next fit

D. The hole created by best fit is never larger than the hole created by first fit

Non-Contiguous Allocation < to prevent Ext. Fragment >

Address Space (AS): { A set / group / space of words, associated with Addresses }

- Logical A.S (LAS) / Virtual A.S (VAS)
- Physical A.S (PAS)



Design & Impl of a N.CG Mem. Mgmnt. Technique

1. Orgnz of L.A.S
2. " " P.A.S
3. " " mmu

① LAS = 64MB ; PAS = 4MB

L.A = 26 bits

P.A = 22 bits

② L.A = 33 bits

LAS in Bytes, if word size is 64 bits = 8B

LAS(B) = 2^{33} * 8B = 8G x 8B = 64 GB ✓

P.A = 23 bits

PAS, W.S = 64 bits = 8B

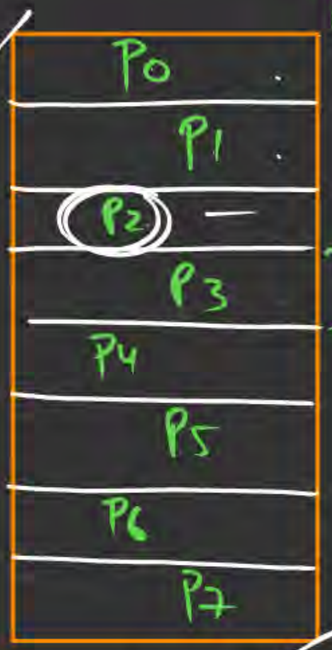
8M x 8B = 64MB ✓

1) SIMPLE PAGING :

L.A.S = 8KB; L.A = 13 bits → P.A.S = 4KB, P.A = 12 bits

Page Size = 1KB = 2^{10} B

a) Organization of L.A.S/V.A.S.



→ LAS is divided into equal Size units known as Pages.

→ Page Size is generally a Power of 2.

→ No. of Pages (N) = LAS / PS

→ Page No (P) = $\log_2 N$ bits, where $N = 2^P$

→ Page offset / displacement (d) = $\log_2 PS$ bits, where $PS = 2^d$ B

→ L.A/V.A format

L.A : 13 bits

P	d
3	10

① LAS = 32MB

PS = 4KB = 2^{12}

N = $\frac{32MB}{4KB}$ = 8K [2^{13}]

P = 13 bits

d = 12 bits

LA | P | d | = 25 bits

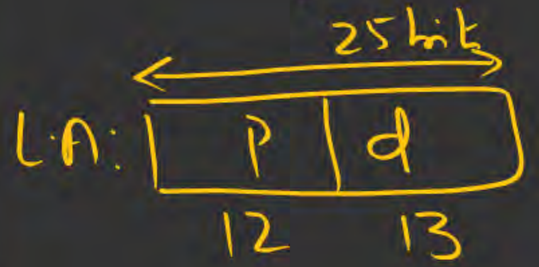
13 12

LAS = 2^{25} = 32MB

② LA = 25 bits

d = 13 bits

What are the No. of Pages in the System

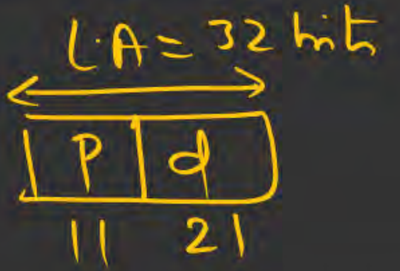


N = 2^{P} = 2^{12} = 4K ✓

③ System has 2K Pages and LA of 32 bits; What is PS?

N = 2K

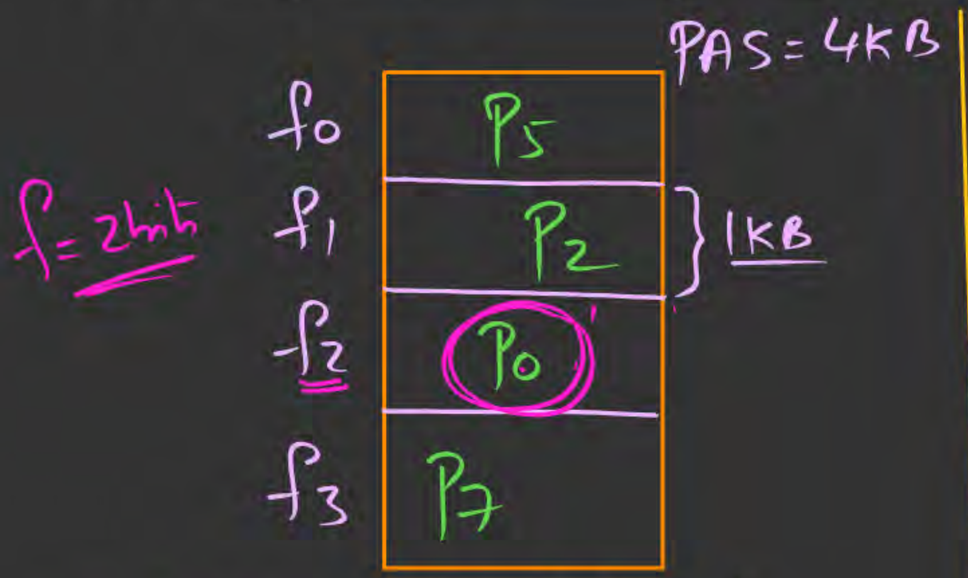
P = 11 bits



d = 21

PS = 2^{d} = 2^{21} = 2MB ✓

2) Organization of P.A.S (4KB) / F.S = 1KB



→ P.A.S is divided into equal size units known as frames [Page frames]

→ Frame Size = Page Size

→ Each frame holds one Page

→ Any Page can be stored in any frame (NCG)

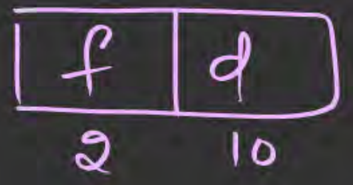
→ $\text{No. of frames (M)} = \frac{\text{P.A.S}}{\text{FS}}$

→ $\text{frame NO (f) bits} = \log_2 M$

$M = 2^f$

→ frame offset = Page offset = d

P.A : 12 bits



Q1) LA = 31 bits

PA = 20 bits

PS = 4KB

$N = \frac{LAS}{PS} = \frac{2^{31}}{2^{12}} = 2^{19} = 512K$

$m = \frac{2^{20}}{2^{12}} = 2^{8} = 256$

P = 19 bits

f = 8 bits

d = 12 bits

LA | P | d | 19 + 12 = 31

PA | f | d | = 20 bits

8 12

Q2) System has 4K Pages and 1K frames, Calculate the size of PAS, if LA = 32 bits

P = 12

N = 4K ; M = 1K ⇒ f = 10

LA = 32 bits

LA | P | d

12 20

PA | f | d

10 20

30 bits

$PAS = 2^{30} = 1GB$

3) Organization of M-M.U [Page Table (P.T) / Page Map Table / Address Trl. Table]

→ Each Process has its own P.T

→ P.T's are Stored in Memory

→ Page Table is organized as Set of entries, known as Page Table Entries (PTE)

→ **No. of entries in PT = No. of Pages**

→ P.T.E Contains frame No. in which Page is Present.

→ P.T.E is denoted as 'e' Bytes.

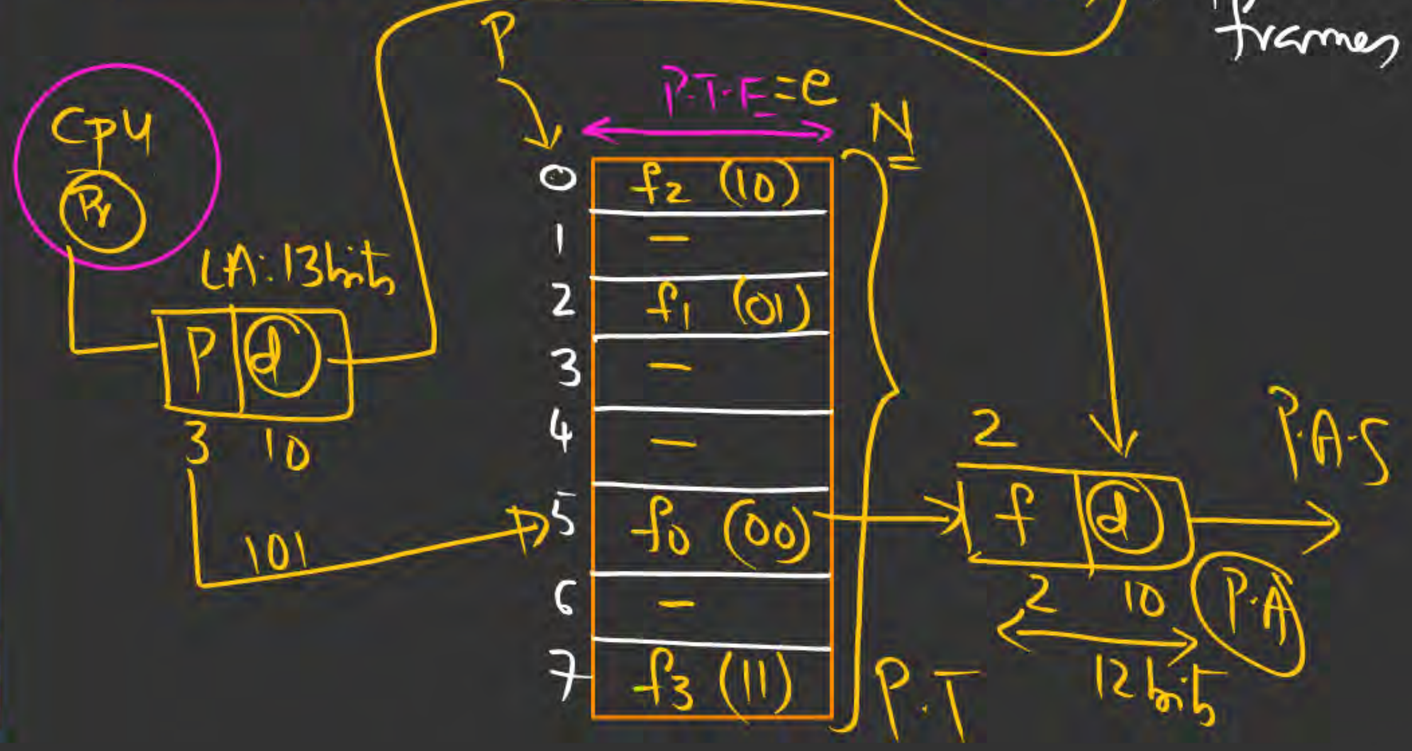
→ **P.T.Size = (N * e) Bytes**

9: 00 and

N pages

'e' ≥ 1By

M frames




THANK YOU GW
SOLDIERS !