CS & IT ENGINEERING

Operating Systems

Memory Management

Lecture No. 4

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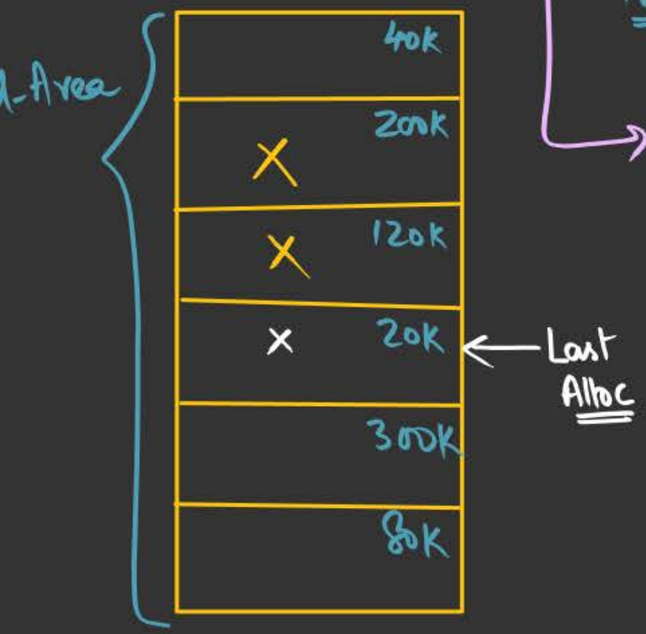
- Fixed Partitions
- Variable Partitions
- Address Space

1) Fixed Partitions (MFT: Multiprogramming with Fixed No. of Tasks)



P_{new} : "15K"

→ Static

Partition Allocation Policies

15K (i) First Fit : "First free big enough" (Int. Frag.)

20K (ii) Best Fit : "Smallest free big enough"

May work faster to FF (iii) Next Fit : Works like first fit, Search for free Partition begins from Last Alloc.

(iv) Worst Fit : "Largest free big enough"

Performance of Fixed Partitions

1. Int. Fragmentation : ✓ (IF)
2. Ext. Fragmentation : ✗ (E.F)
3. Degree of M.Pr : Limited
4. Max. Process Size : Ltd
5. Part. Alloc. Policy : B.F (less I.F)

2) Variable Partitions : (MVT: M. Pr. with variable Tasks) Dynamic Partitioning

Memory (free hole)

RQ: P1 ... P5

U-Area

P1	35K
	115K — free Hole
P3	315K
P5	15K — free Hole
	20K
	250K — free Hole

CPU

Total free Memory — Pmem: 280K

Process Req's : < 35K; 115K; 315K; 15K; 120K, ..
t0 — P1 P2 P3 P4 P5

Perf. Issues:

1) Int. Frag: ✗
2) Ext. Frag: ✓
3) Degree of M.Pr: FLEXI
4) Max. Process Size: FLEXI
5) Partl. Alloc Policy: W.F is better

Pmem: 13K — P6

1) FF : 115K
2) BF : 15K (2K)
3) NF : 250K
4) WF : 250K

Adjacent free holes are automatically Merged to one free hole

External fragmentation

(i) Compaction

relocate → Time Consuming Opn → R.T Addr. Bind

50K	P1
P1	P2
80K	
P2	150K
20K	

Memory Map

(ii) N-CG Alloc

Pmem: 85K — 50K, 35K

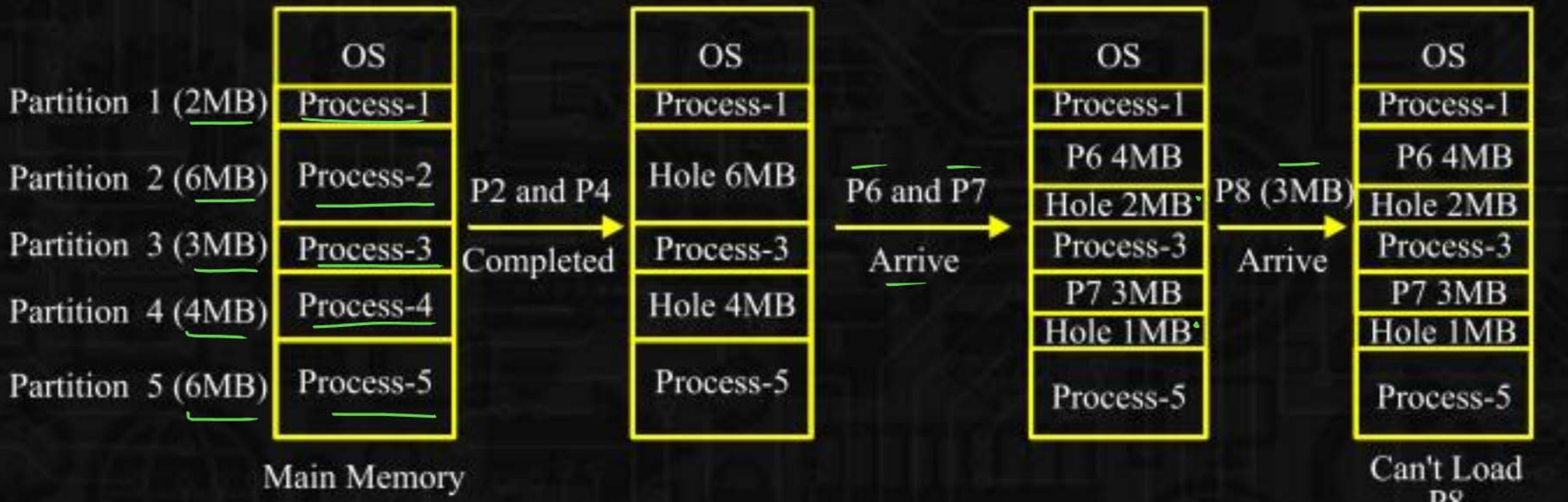
E.F: 150K

RQ → PCB1, PCB2, PCB3

Variable Partitions:

E-F : 3MB

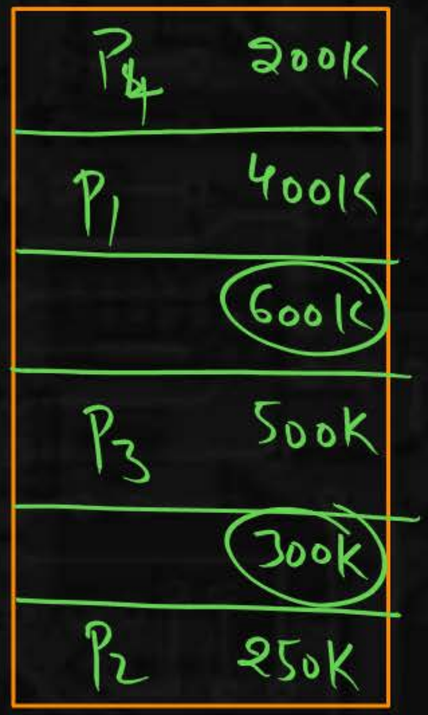
Memory:



Q. 1

Consider a Memory System having 6 Partitions of sizes 200K; 400K; 600K; 500K; 300K; 250K. There are 4 Processes of sizes: 357K; 210K; 468K; 49K. Using Best Fit Allocation Policy, what Partitions are not allocated/ remains Unallocated?

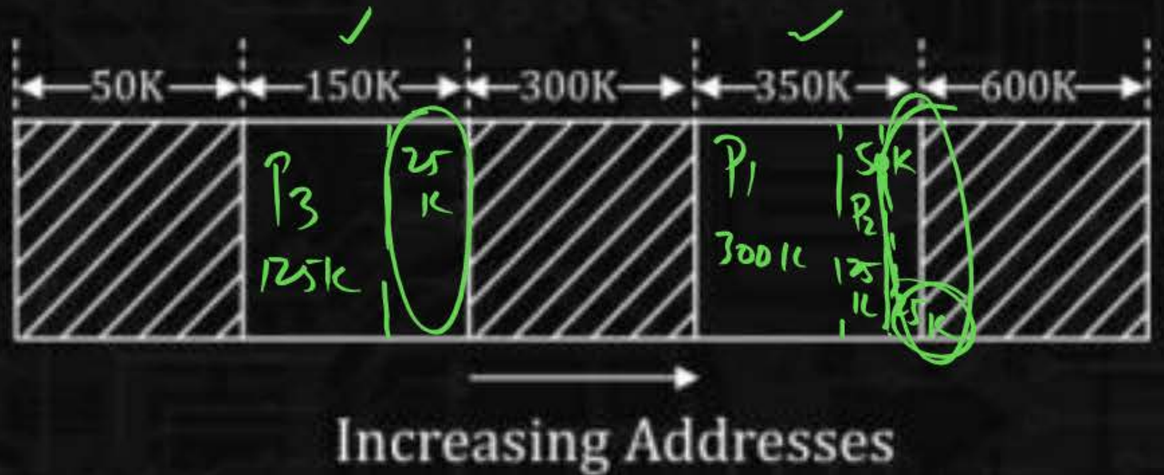
PYQ



600K , 300K

Q. 2

Consider the following Memory Map in which blank regions are not in use and hatched regions are in use. Using Variable Partitions with no Compaction:



The sequence of requests for blocks of sizes 300K, 25K, 125K, 50K can be satisfied if we use:

A. Either first fit or best fit policy (any one)

B. First fit but not best fit policy

C. Best fit but not first fit policy

D. None of the above.

F.F : ✓

B.F : X

Q. 3

Consider a System with Memory of size 1000KBytes. It uses Variable Partitions with no Compaction. Presently there are 2 partitions of sizes 200K & 260K respectively.

(i) What is the allocation request of the Process which would always be denied?

A. 131 K

B. 151 K

C. 181 K

D. 541 K

(ii) The smallest Allocation Request which could be denied is:

A. 131 K

B. 151 K

C. 181 K

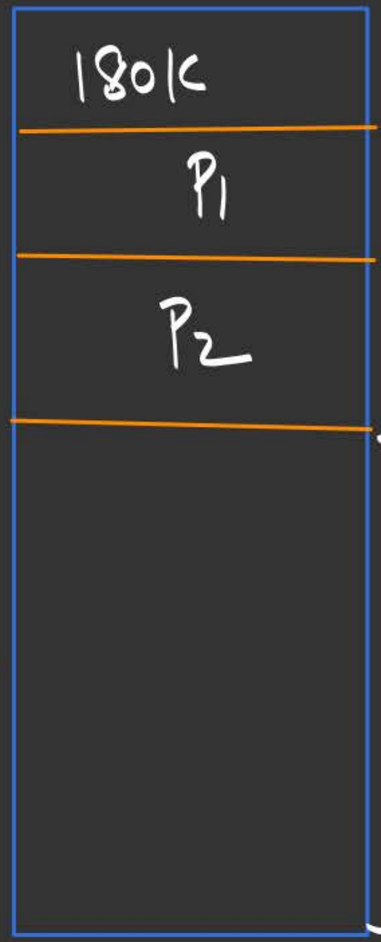
D. 541 K

Case I

1-free Hole

540K free Hole

541K



(540 - 180)

> 181K

541

$\frac{540}{3}$ = 180K

> 131K

181K ; 541K

Q. 4

Consider a System having Memory of size 2^{46} Bytes, uses Fixed Partitioning. It is divided into fixed size Partitions each of size 2^{24} Bytes. The OS maintains a Process Table with one entry per Process. Each entry has, two fields: First, is a pointer pointing to Partition in which the Process is loaded and Second, Field is Process ID(PID). The Size of PID is 4Bytes.

$500 \times 7B = 3500B$

Calculate

(a) The Size of Pointer to the nearest Byte. 3B

(b) Size of Process Table in Bytes if the System has 500 Processes.

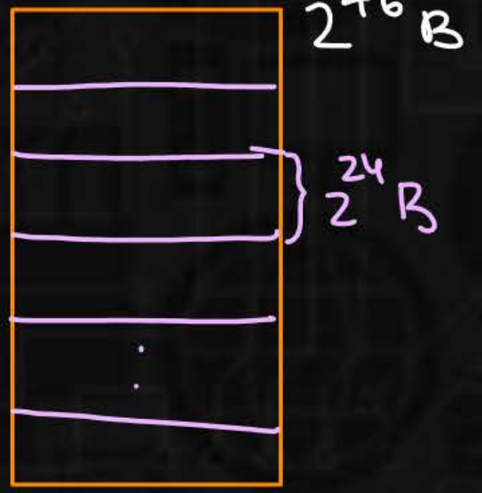
P.T

	Ptr (3B)	Pid (4B)
1		
2		
3		
:	:	:
5n		

7B

No. of Partitions (N): $\frac{2^{46}}{2^{24}} = 2^{22}$

Partition Addr (Ptr): 22 bits = 3B



Part. Size $= 2^{24}$

Q. 5

Consider a System Using Variable Partition with no Compaction

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

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.

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


THANK YOU GW
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