

# Operating System: Frame Allocation, Thrashing

By: Vishvadeep Gothi



# VISHVADEEP GOTHI SIR

**AIR- 19, 119, 440, 682  
in GATE**



**ME from IISc Bangalore  
Mtech BITS Pilani in Data  
Science**



**14+ Years of Teaching Experience,  
10+ Years in GATE/IES**



**Subjects Taken:**  
Computer Organization & Architecture,  
data structure, operating system,  
C-Programming, Data science,  
Machine Learning, Python,  
coding interview problems,





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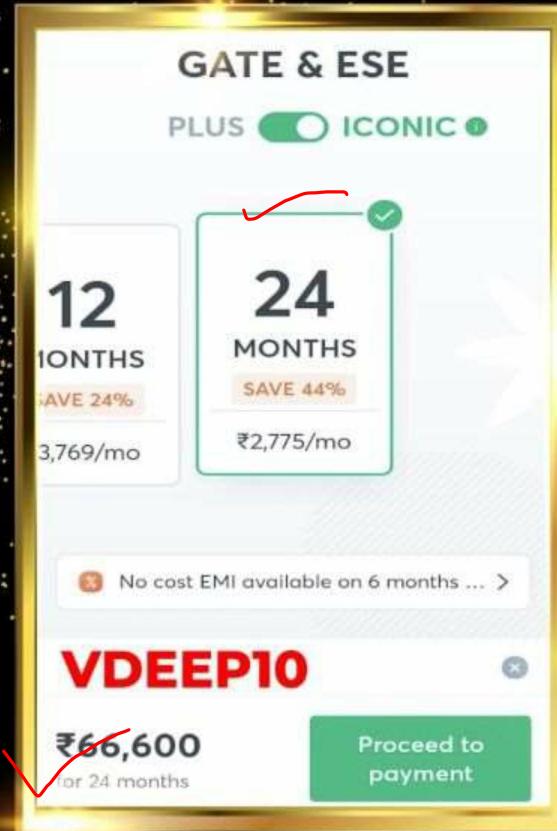
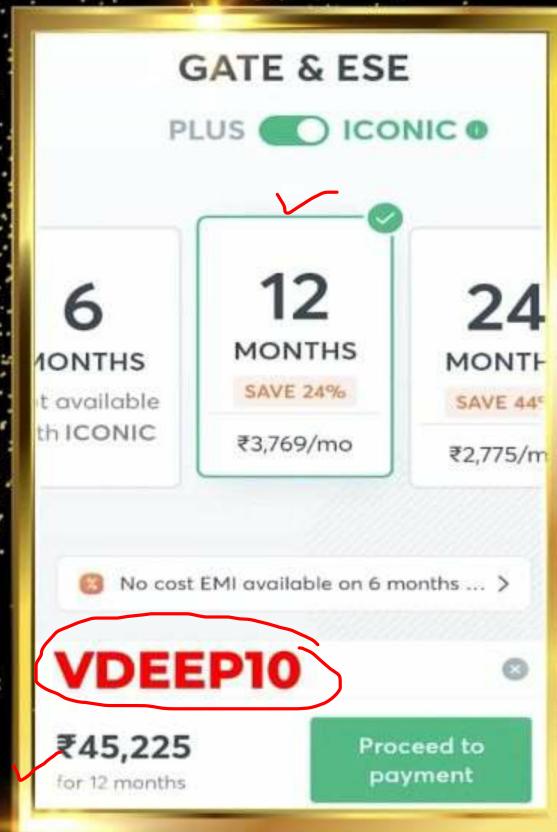
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# Frame Allocation



# Frame Allocation

How many frames do we allocate per process?



# Frame Allocation

How many frames do we allocate per process?

- ◎ If it is a single-user, single-tasking system, it's simple – all the frames belong to the user's process



# Frame Allocation

2 Questions

- What is the minimum number of frames that a process needs?
- Is page replacement global or local?

# Minimum Number of Frames

Every process must have enough pages to complete an instruction.

# Frame Allocation

1. Equal Allocation
2. Proportional Allocation

example:-

6 frames

2 processes

$P_1 \Rightarrow 8 \text{ kB}$

$P_2 \Rightarrow 4 \text{ kB}$

1. equal

$$P_1 \Rightarrow 3 \text{ frames}$$

$$P_2 \Rightarrow 3 \text{ frames}$$

2. Proportional

$P_1$

$$\frac{8 \text{ kB}}{(8+4) \text{ kB}} = \frac{2}{3}$$

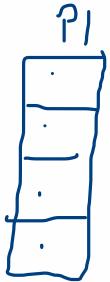
$P_2$

$$\frac{4}{8+4} = \frac{1}{3}$$

$$P_1 \Rightarrow \frac{2}{3} * 6 = 4 \text{ frames}$$

$$P_2 \Rightarrow \frac{1}{3} * 6 = 2 \text{ frames}$$

# Local Vs Global Allocation



# Local Allocation

1. Local replacement requires that the page being replaced be in a frame belonging to the same process
2. The number of frames belonging to the process will not change
3. This allows processes to control their own page fault rate

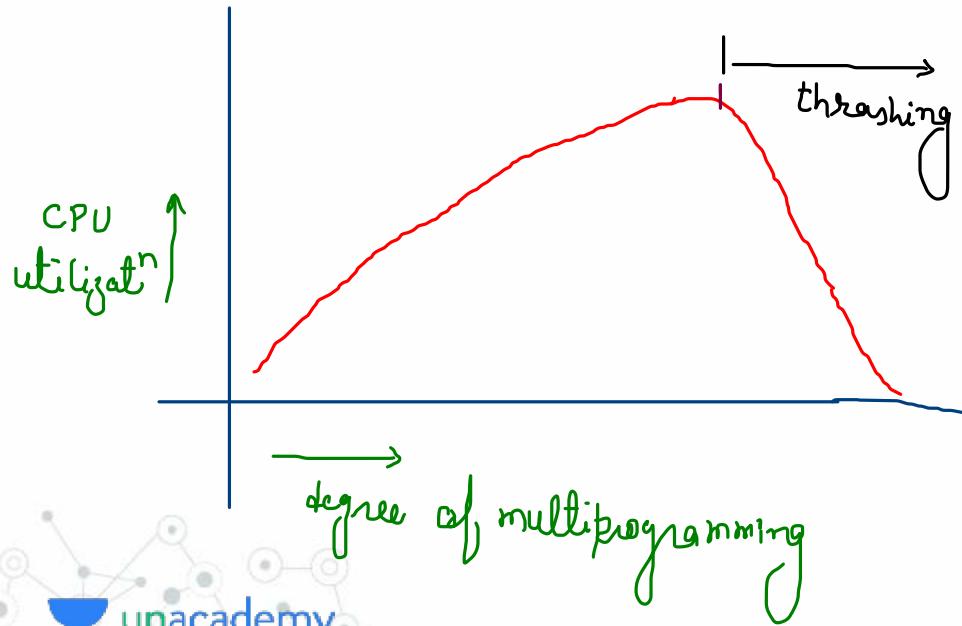
# Global Allocation

1. The process can replace a page from a set that includes all the frames allocated to user processes
2. High-priority processes can increase their allocation at the expense of lower-priority processes
3. Global allocation makes for more efficient use of frames and their better throughput



# Thrashing

↳ high-level paging activities



Thrashing

↳ CPU spends too much time for page fault service as compared to the process execution (productive work)

# How to Handle Thrashing

# Locality Model

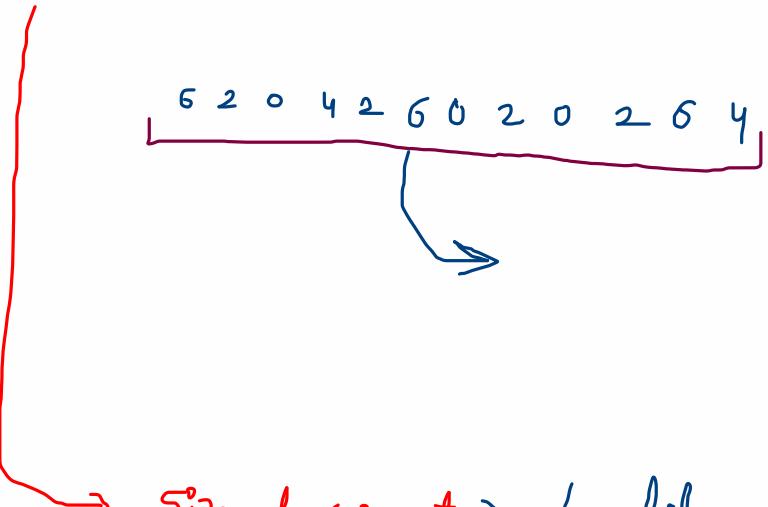
1. Working Set Model
2. Page Fault Frequency



# Working Set

→ set size =

6 2 0 4 2 6 0 2 0 2 6 4 0 3 1 3 | 0 3 1 3 | 3 1 0 5



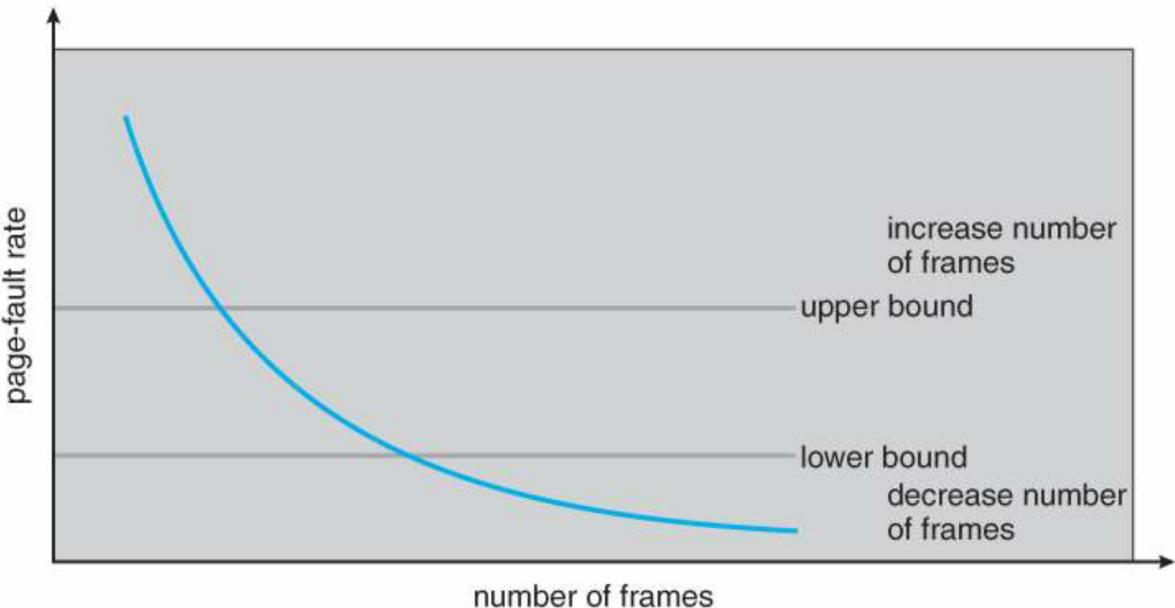
→ Size of w.set > locality

Size of w.set < locality



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# Page Fault Frequency



# Next Class

Inverted Page Table



Hashed Page Table





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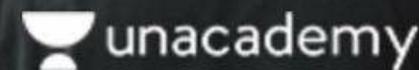
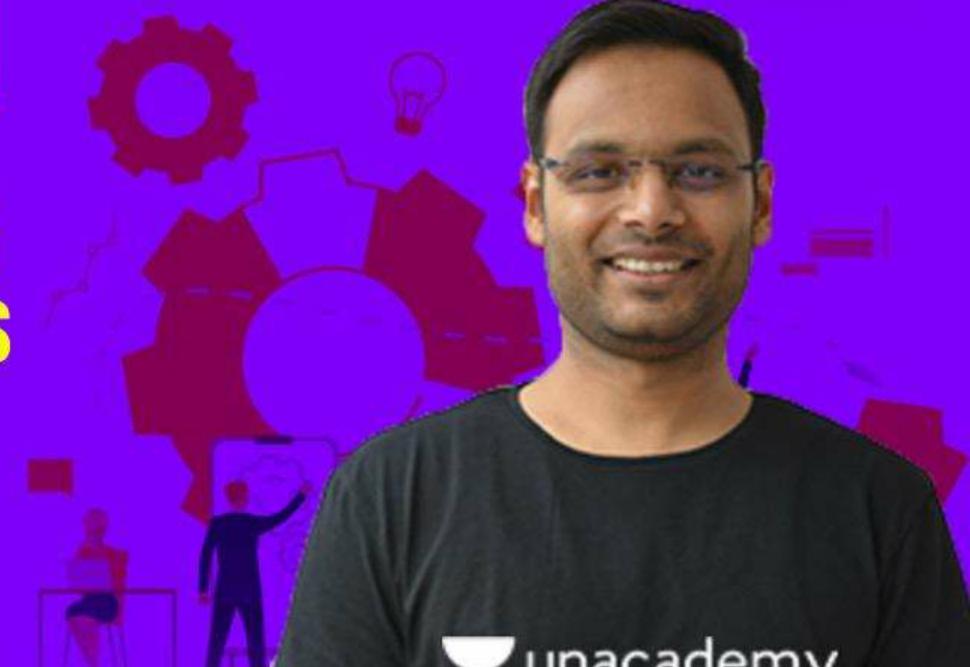
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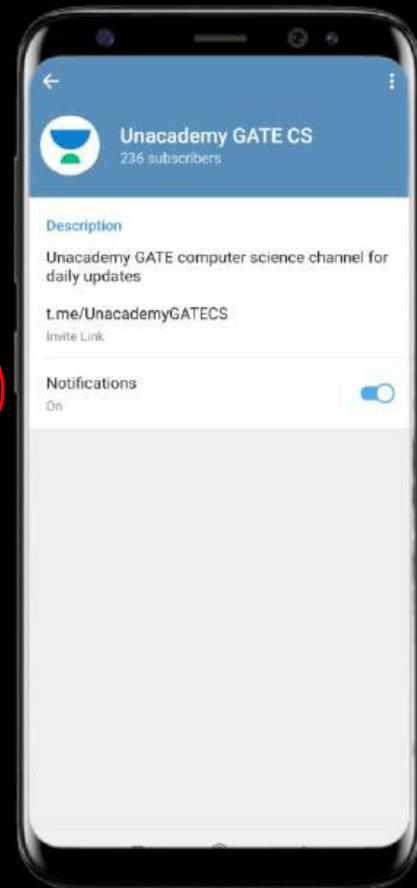
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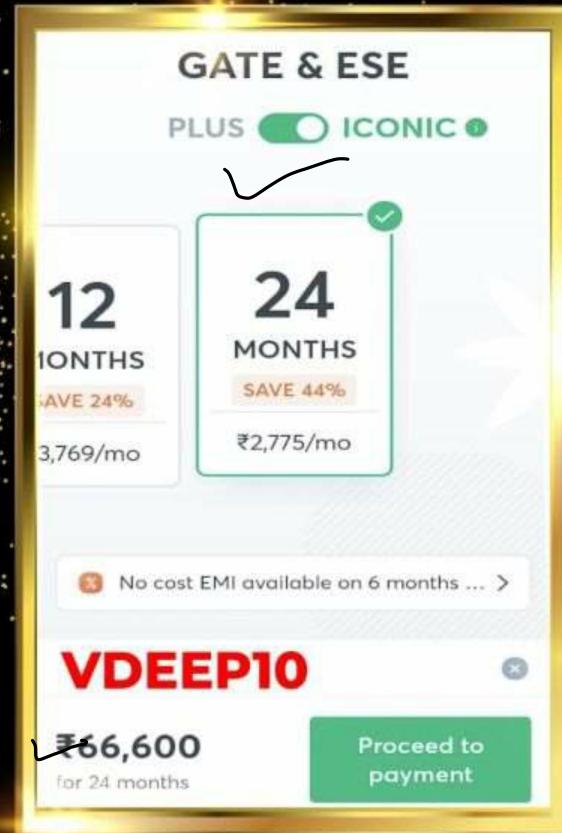
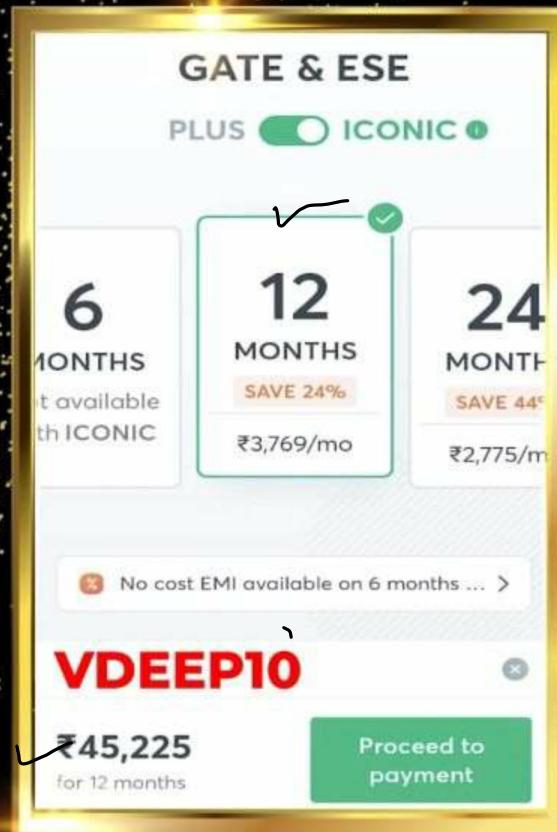
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