

Operating System: Inverted & Hashed Page Table

By: Vishvadeep Gothi



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**14+ Years of Teaching Experience,
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Subjects Taken:
Computer Organization & Architecture,
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Machine Learning, Python,
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Types of page tables

1. Hierarchical P-T. (multilevel page table)

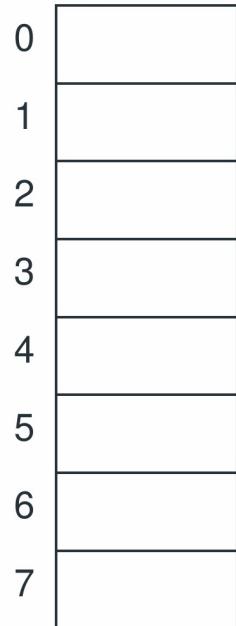
2. Inverted P-T.

3. Hashed P-T,

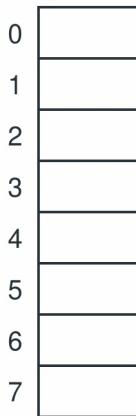


Virtual Memory

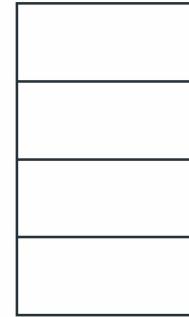
Process



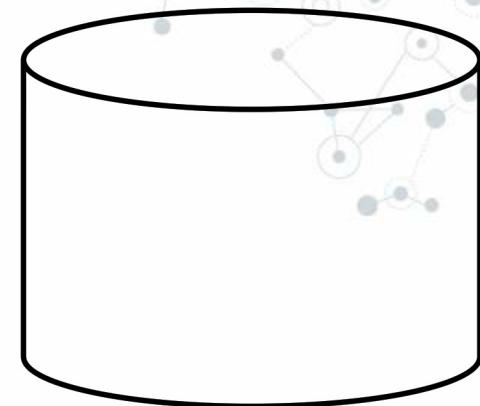
Page Table



Physical Memory



Secondary Memory

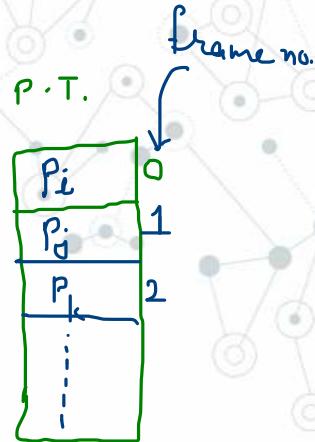
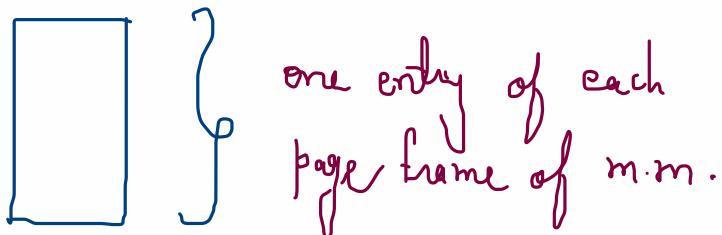


Problem in Virtual Memory

Page table is too large and so many page table entries are invalid.



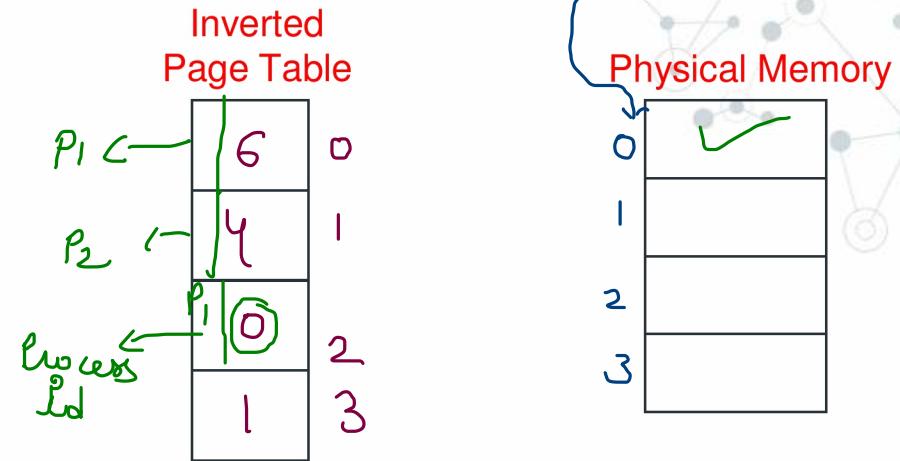
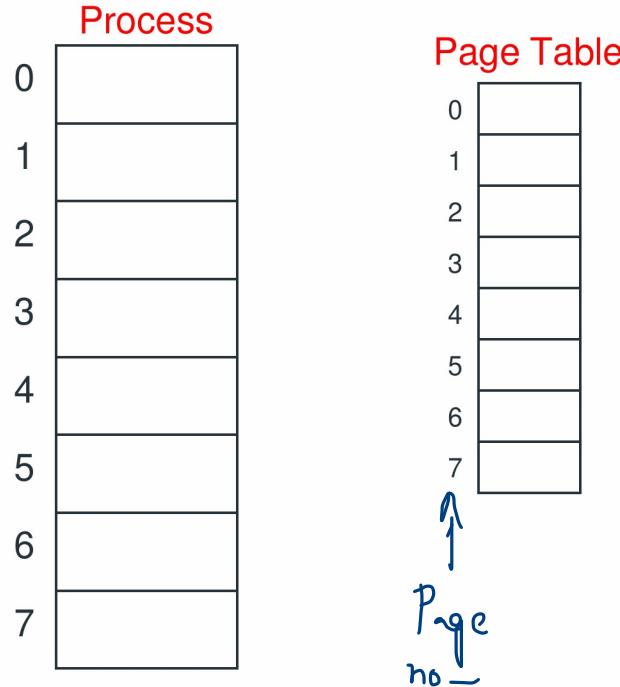
Inverted Page Table



\max
no. of entries = No. of frames in m.m.

→ Smaller p-T. size as compared to general page tables.

Inverted Page Table

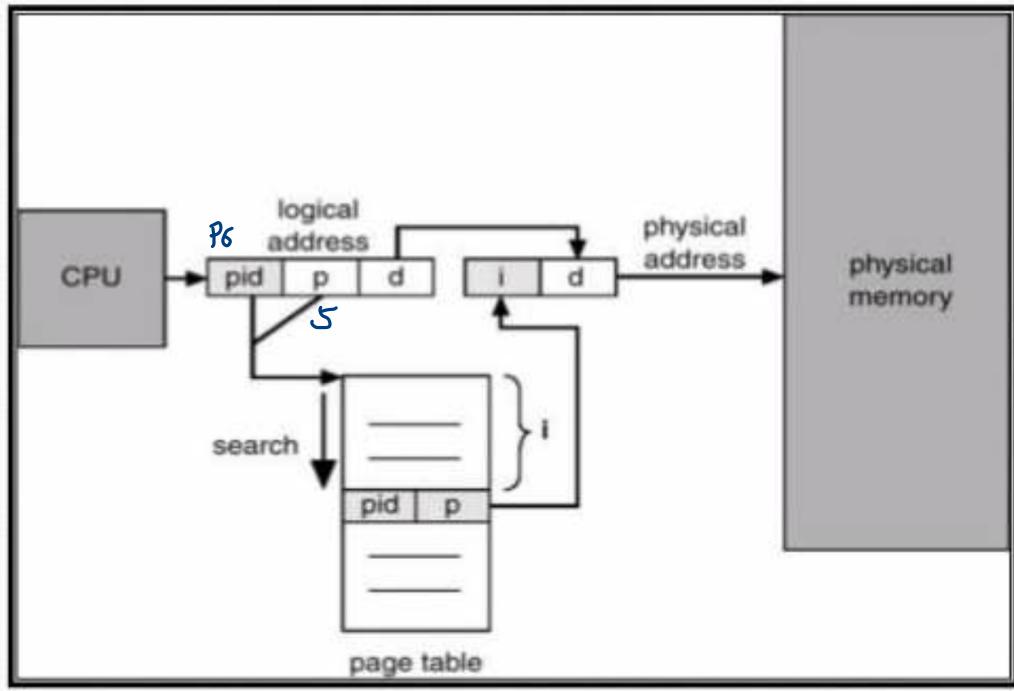


Inverted Page Table

Each entry in the page table contains the following fields:

1. Page number ✓
2. Process id ✓
3. Control bits ✓
4. Chained pointer ✓

Inverted Page Table



A hand-drawn diagram of an inverted page table. It consists of four rows, each representing an entry in the table. Each entry has two columns: 'pid' and 'p'. The first row has 'pid' as P5 and 'p' as 6, with a circled '0' at the top right. The second row has 'pid' as P5 and 'p' as 2, with a circled '1' at the top right. The third row has 'pid' as P4 and 'p' as 5, with a circled '2' at the top right. The fourth row has 'pid' as P6 and 'p' as 5, with a circled '3' at the top right. A green arrow points from the circled '3' to the text '3rd frame'.

P5	6	0
P5	2	1
P4	5	2
P6	5	3

Inverted Page Table

Advantages & Disadvantages:

1. Reduced memory space 
2. Longer lookup time 
3. Difficult shared memory implementation

→ only single page table for all processes.



Hashing

key : Value

$$\text{location} = H(\text{key})$$

H = Hash functⁿ

location contains value

Hashed Page Table

In this virtual page, the number is hashed into a page table

This Page table mainly contains a chain of elements hashing to the same elements.

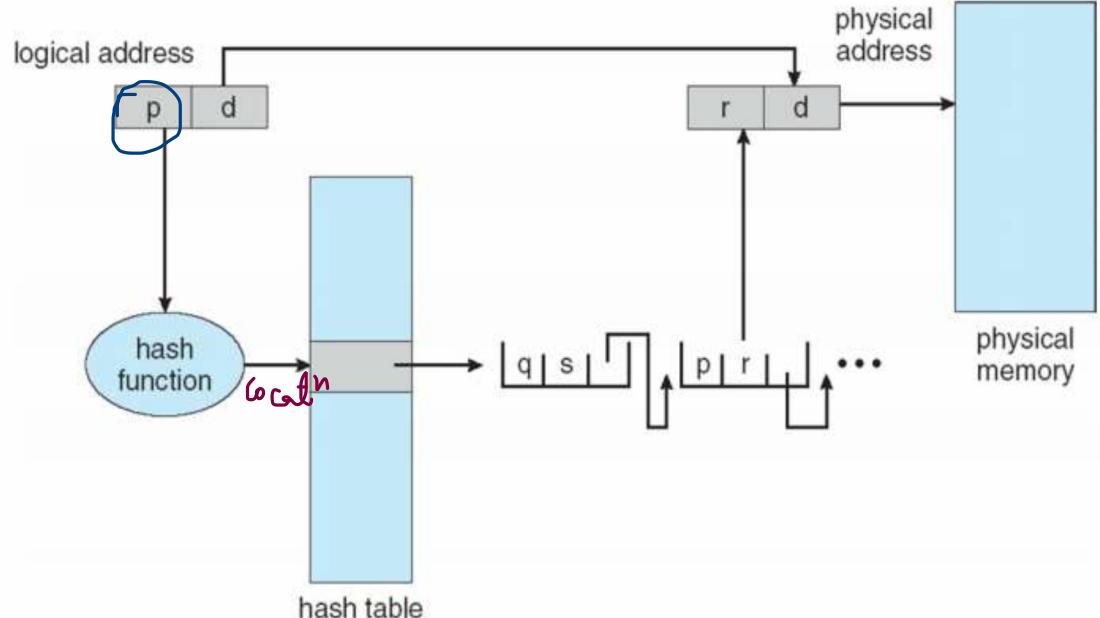
Hashed Page Table

Each element mainly consists of :

1. The virtual page number
2. The value of the mapped page frame.
3. A pointer to the next element in the linked list.



Hashed Page Table



Next Class

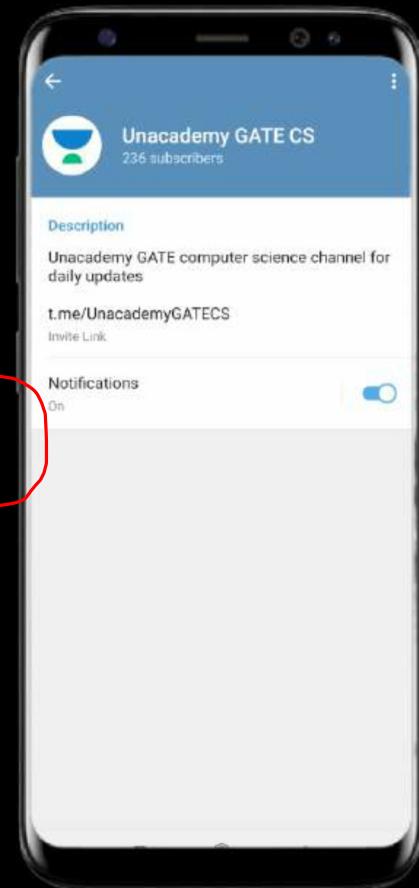
✓ Segmented Paging

→ segments & paging

✓ Questions on Paging & Virtual Memory



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