

Operating System: Segmented Paging

By: Vishvadeep Gothi



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**AIR- 19, 119, 440, 682
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**ME from IISc Bangalore
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**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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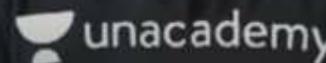
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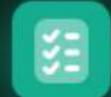


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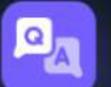
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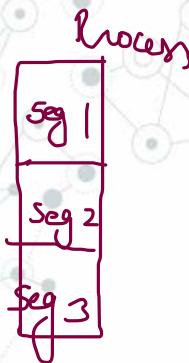
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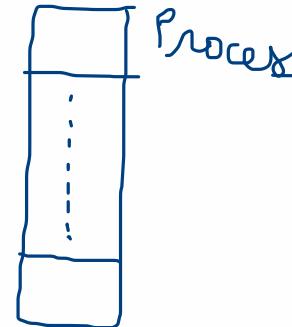
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Segmentation = ?

Paging = ?



Are You Ready??

Segmented Paging

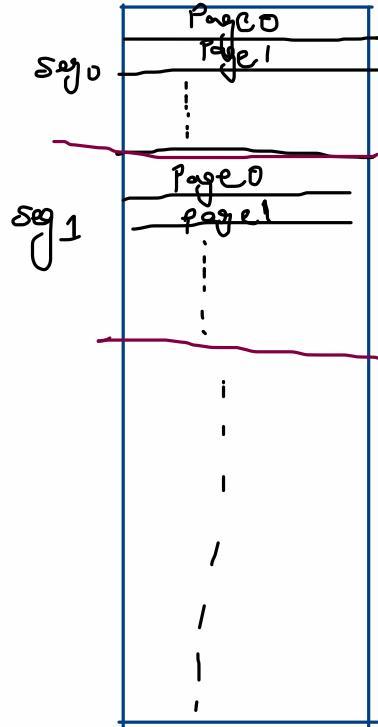
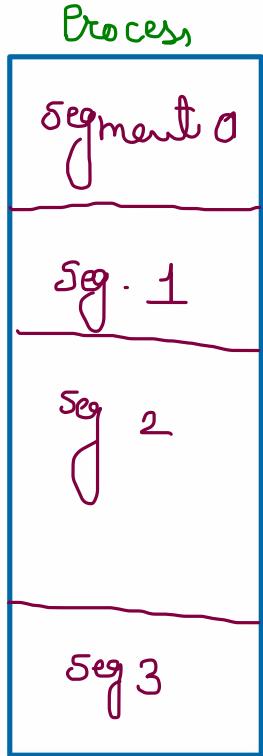
- ◎ Pure segmentation is not very popular and not being used in many of the operating systems.
- ◎ Segmentation can be combined with Paging to get the best features out of both the techniques.

Segmented Paging

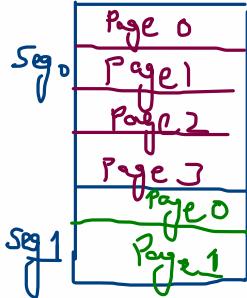
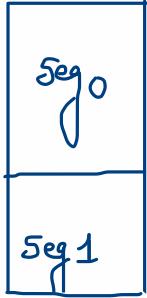
- ◎ Divide each segment into multiple pages
- ◎ Keep one page table for each segment
- ◎ Segment table entry points to the page table of the segment

MM has frames of size equal to page sizes &
each page can be kept on any frame.

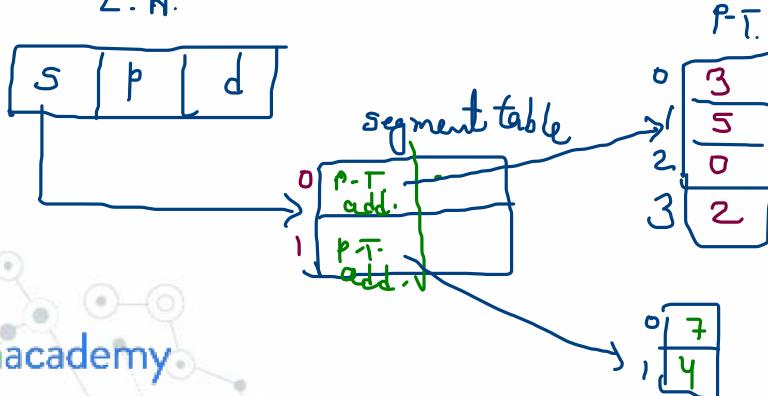
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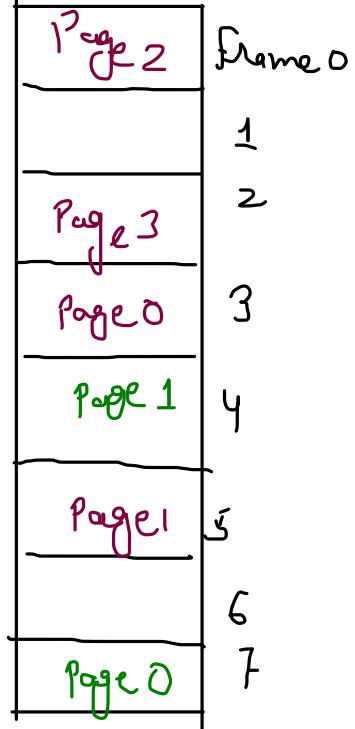
Segmented Paging



L. A.



m.m.



Virtual Address in Segmented Paging



no. of bits in $S \Rightarrow$ depends on no. of segments

no. of bits in $p \Rightarrow$ depends on no. of pages in segment

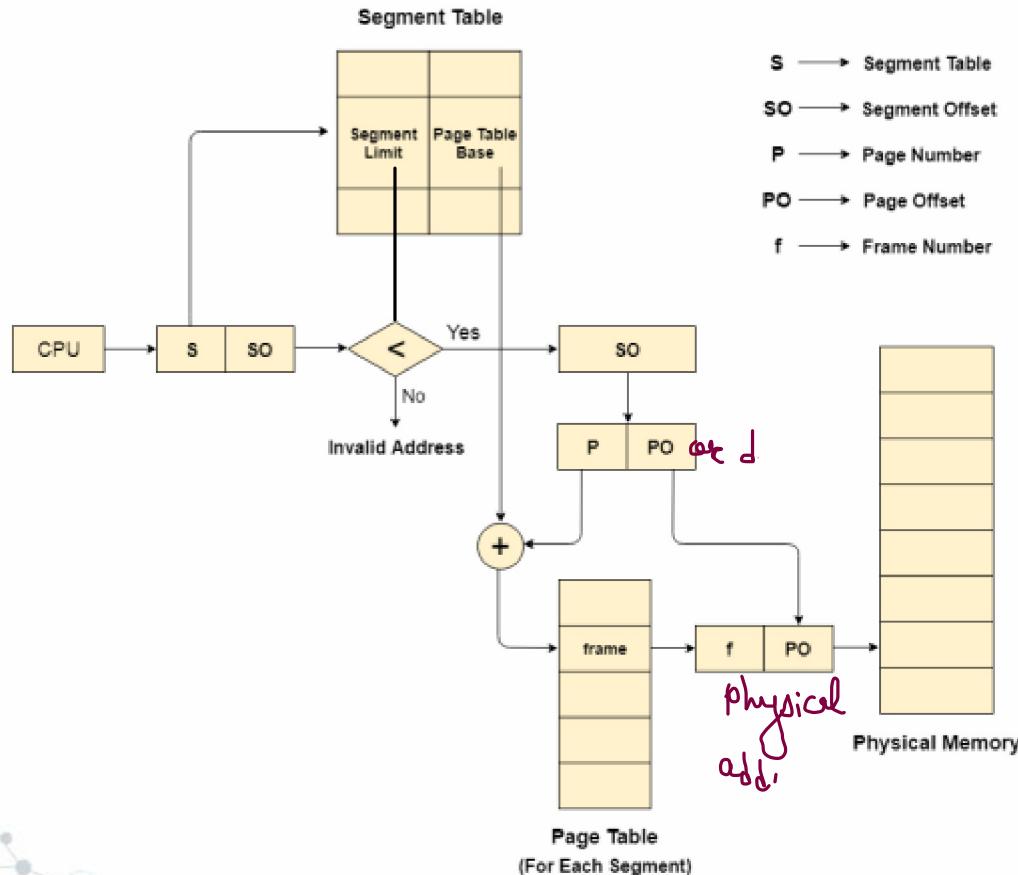
no. of bits in $d \Rightarrow$ depends on page table

$S =$ segment number

$p =$ page number of the segment

$d =$ offset or displacement or line number

Segmented Paging



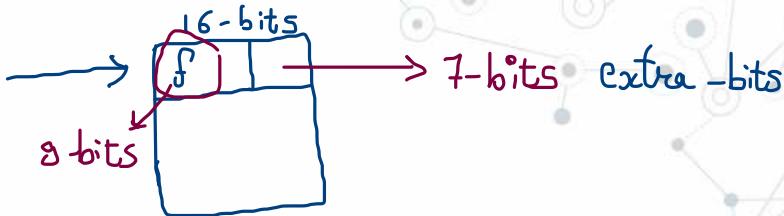
Advantages of Segmented Paging

- ◎ The page table size is reduced as pages are present only for data of segments, hence reducing the memory requirements
- ◎ Gives a programmers view along with the advantages of paging
- ◎ Reduces external fragmentation in comparison with segmentation
- ◎ Since the entire segment need not be swapped out, the swapping out into virtual memory becomes easier

Disadvantages of Segmented Paging

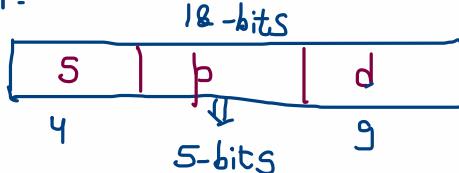
- ◎ Internal fragmentation still exists in pages
- ◎ Extra hardware is required
- ◎ Translation becomes more sequential increasing the memory access time
- ◎ External fragmentation occurs because of varying sizes of page tables and varying sizes of segment tables in today's systems.

Question

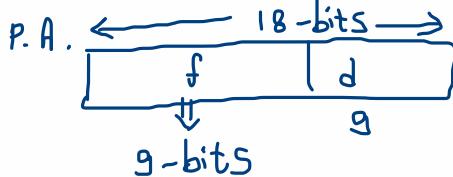


A certain computer system has the segmented paging architecture for virtual memory. The memory is byte addressable. Both virtual and physical address spaces contain 2^{18} bytes each. The virtual address space is divided into 16 equal size segments. Assume that page size is 512 bytes. The memory management unit (MMU) has a segment table, each entry of which contains the physical address of the page table for the segment. Page tables are stored in the main memory and consists of 2-bytes page table entries. How many bits are available in page table entry for storing the paging information for the page?

L.A -



P. A .



Question

Home-Work

Consider a system using segmented paging architecture. The segment is divided into 1k pages, and each page is having 512entries. The segment number requires 13 bits to represent all the segments of las, and the frame number requires 18 bit to represent all the frame of pas. The memory is word addressable and page table entry is 4 word. Then what is the size of each page table? What is the size of all page tables?

Next Class

{ Questions on Paging & Virtual Memory }

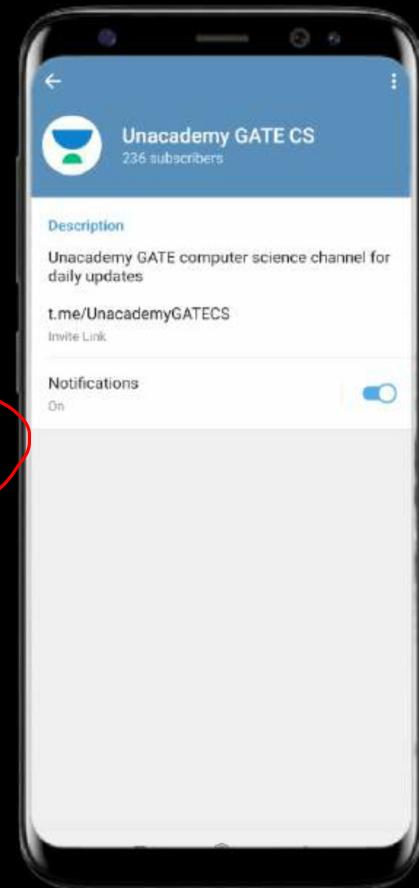


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