

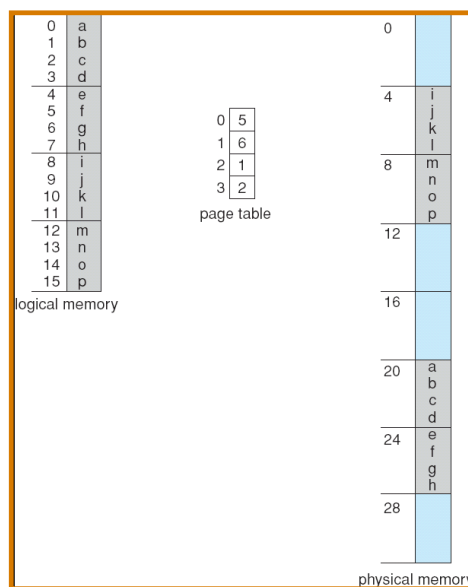
CSC 4103 - Operating Systems
Spring 2008

LECTURE - XIV
MAIN MEMORY - II

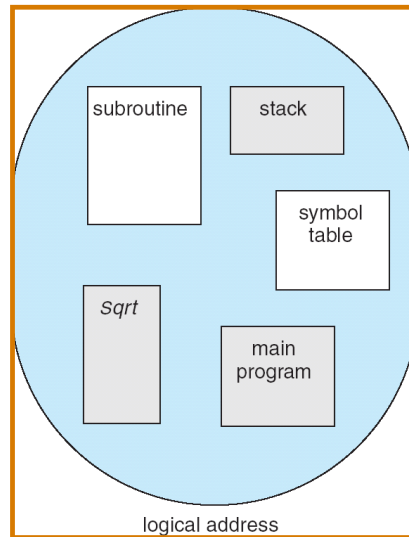
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March 27th, 2008

Paging Example



User's View of a Program



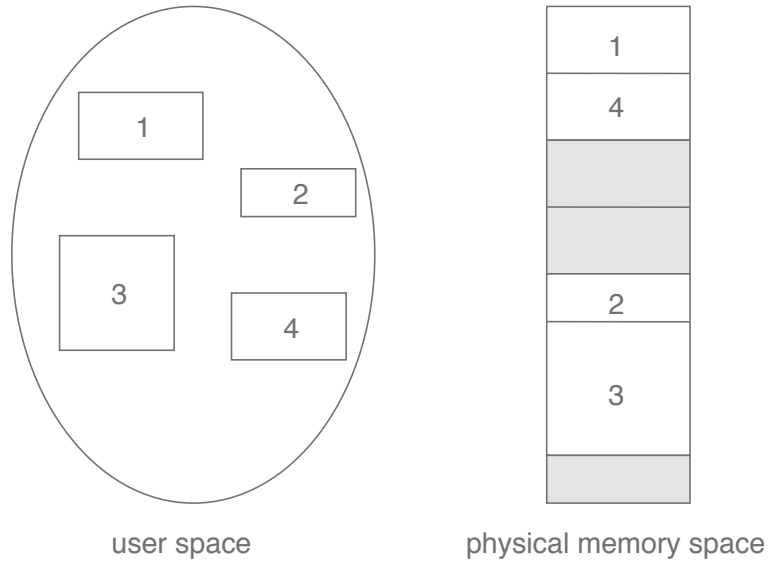
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Segmentation

- **Memory-management scheme that supports user view of memory**
- A program is a collection of segments. A segment is a logical unit such as:
 - main program,
 - procedure,
 - function,
 - method,
 - object,
 - local variables, global variables,
 - common block,

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Logical View of Segmentation



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Segmentation Architecture

- Logical address consists of a two tuple:
 <segment-number, offset> ,
- **Segment table** - maps two-dimensional physical addresses; each table entry has:
 - *base* - contains the starting physical address where the segments reside in memory
 - *limit* - specifies the length of the segment
- **Segment-table base register (STBR)** points to the segment table's location in memory
- **Segment-table length register (STLR)** indicates number of segments used by a program;

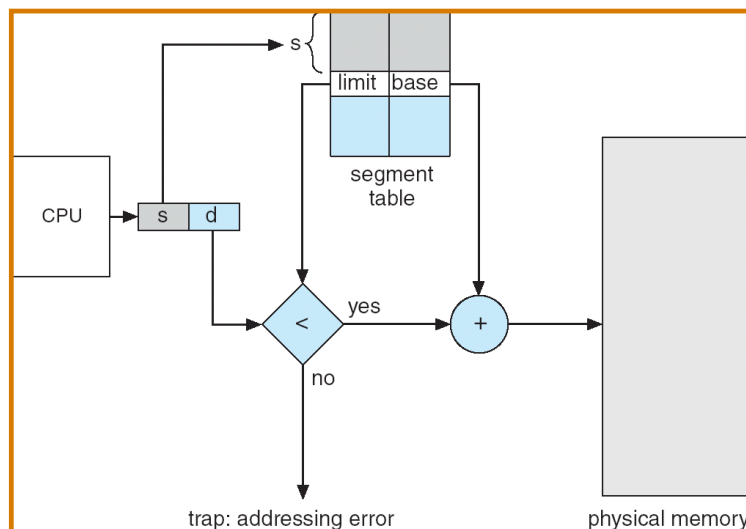
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Segmentation Architecture (Cont.)

- **Protection.** With each entry in segment table associate:
 - validation bit = 0 \Rightarrow illegal segment
 - read/write/execute privileges
- Protection bits associated with segments; code sharing occurs at segment level
- Since segments vary in length, memory allocation is a dynamic storage-allocation problem
- A segmentation example is shown in the following diagram

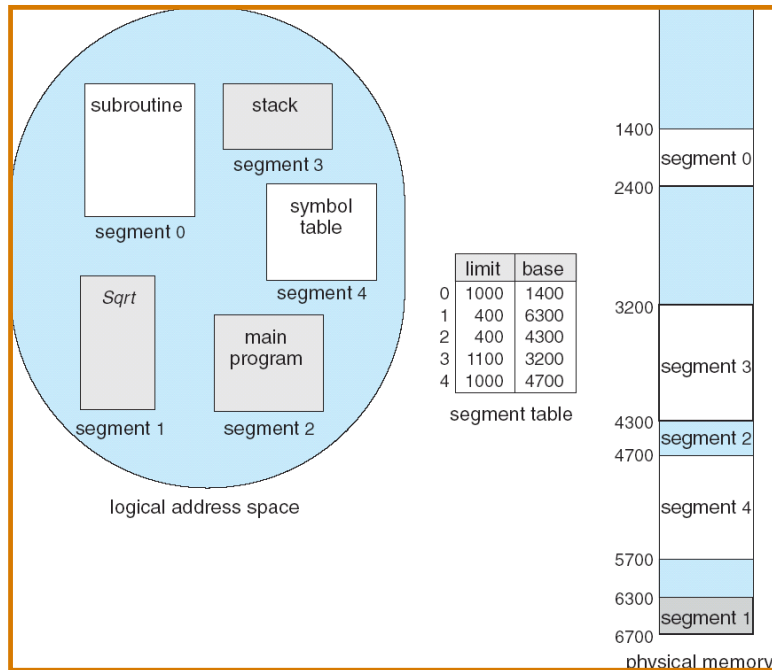
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Address Translation Architecture



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Example of Segmentation



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Exercise

- Consider the following segment table:

<u>Segment</u>	<u>Base</u>	<u>Length</u>
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

a. 1, 100

b. 2, 0

c. 3, 580

Solution

- Consider the following segment table:

<u>Segment</u>	<u>Base</u>	<u>Length</u>
0	219	600
1	2300	14
2	90	100
3	1327	580
4	1952	96

What are the physical addresses for the following logical addresses?

a. 1, 100

illegal reference (2300+100 is not within segment limits)

b. 2, 0

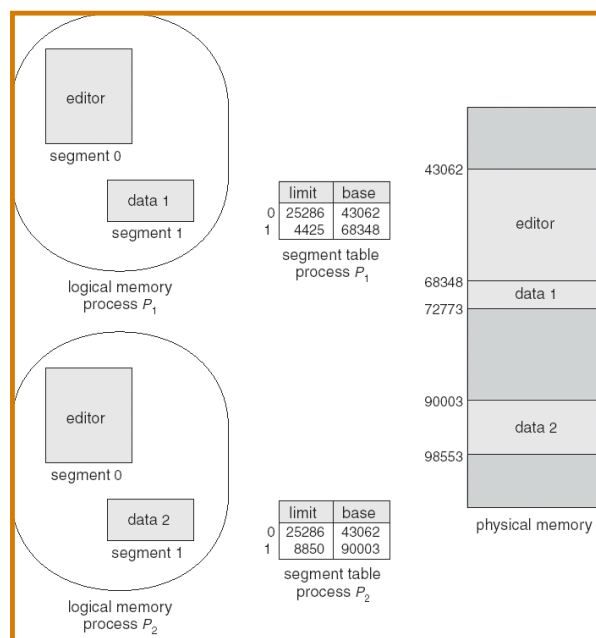
physical address = $90 + 0 = 90$

c. 3, 580

illegal reference (1327 + 580 is not within segment limits)

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Sharing of Segments

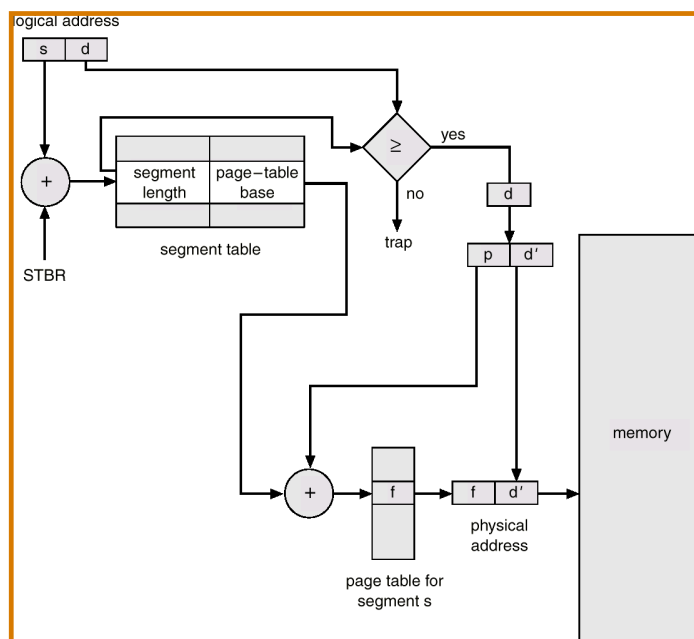


Segmentation with Paging

- Modern architectures use segmentation with paging (or paged-segmentation) for memory

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MULTICS Address Translation Scheme



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Acknowledgements

- “Operating Systems Concepts” book and supplementary material by A. Silberschatz, P. Galvin and G. Gagne
- “Operating Systems: Internals and Design Principles” book and supplementary material by W. Stallings
- “Modern Operating Systems” book and supplementary material by A. Tanenbaum
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