

CSc 360

Operating Systems

Segmentation

Jianping Pan

Summer 2015

Review

- Page table

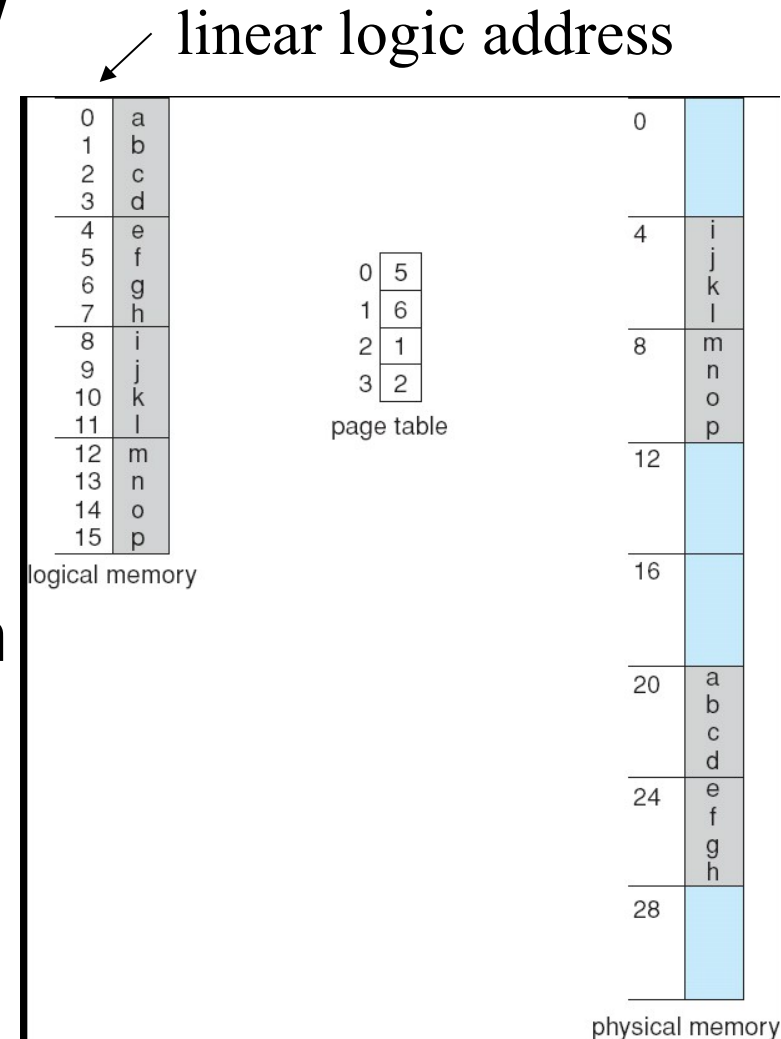
- page table and TLB

- invalid bit

- shared pages

- page table implementation

- hierarchical page table
- hashed page table
- inverted page table

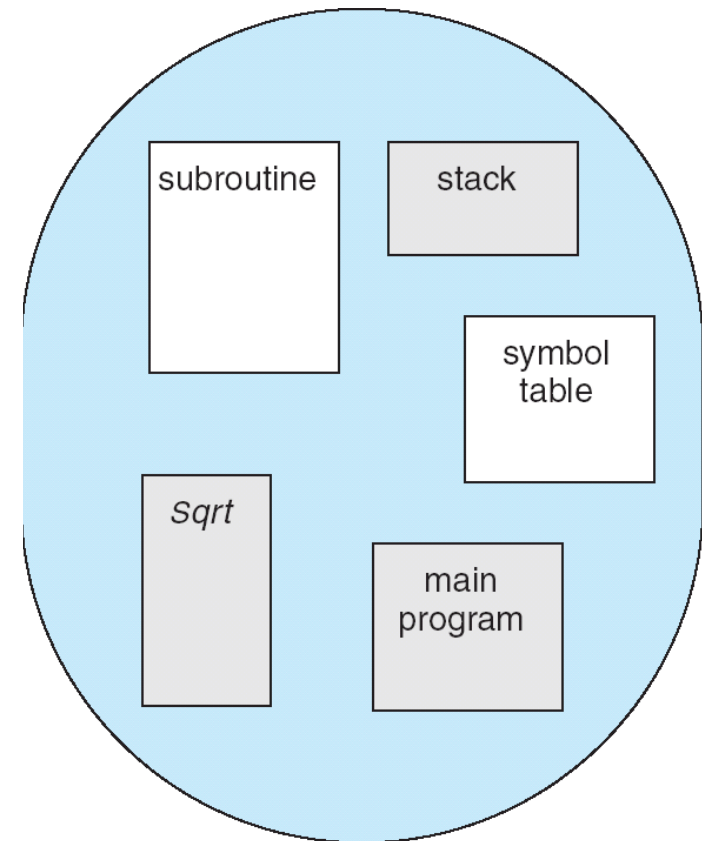


What's next?

- Today's topics
 - segmentation and paging
 - examples in Intel Pentium and Linux

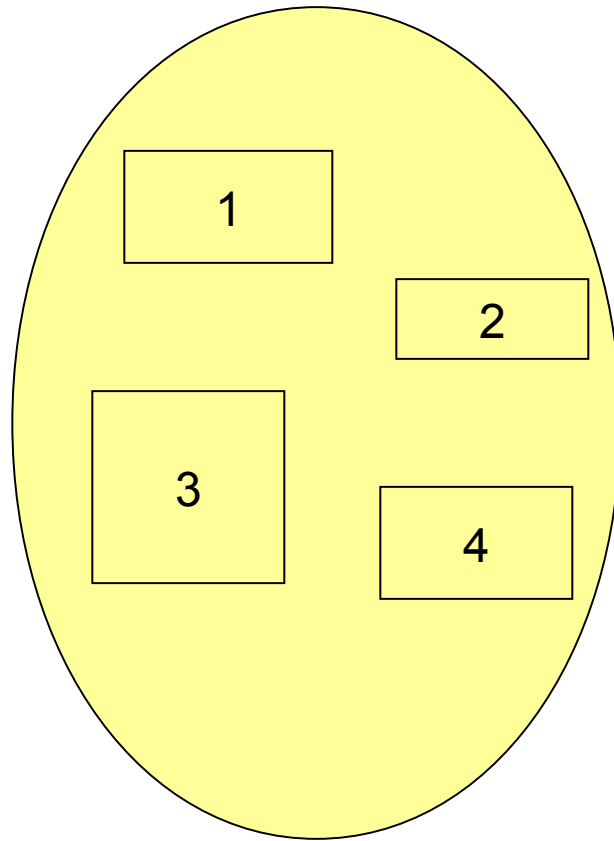
User's view of a program

- A collection of segments
 - main program
 - symbol table
 - procedures/functions
 - data
 - stacks
 - heaps

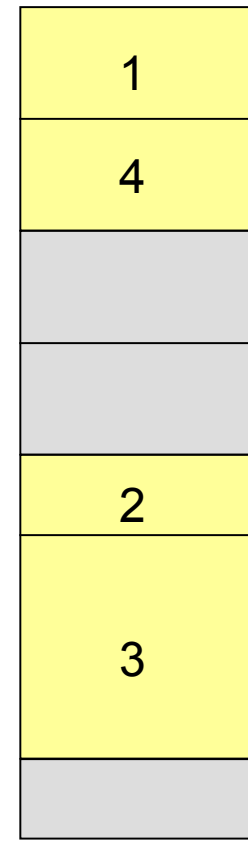


logical address

Logical view of segmentation



user space



physical memory space

6/25/15

CSc 360

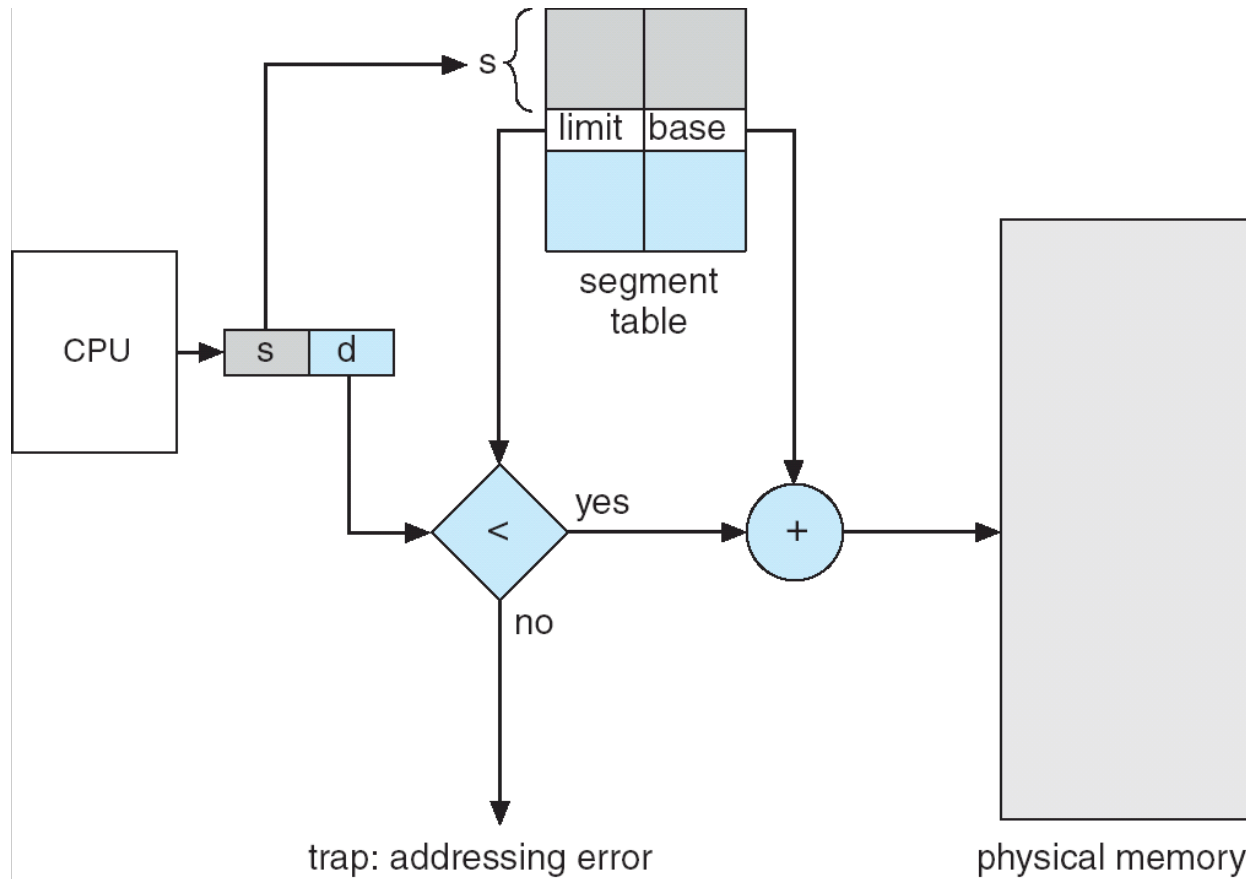
5

Segmentation Architecture

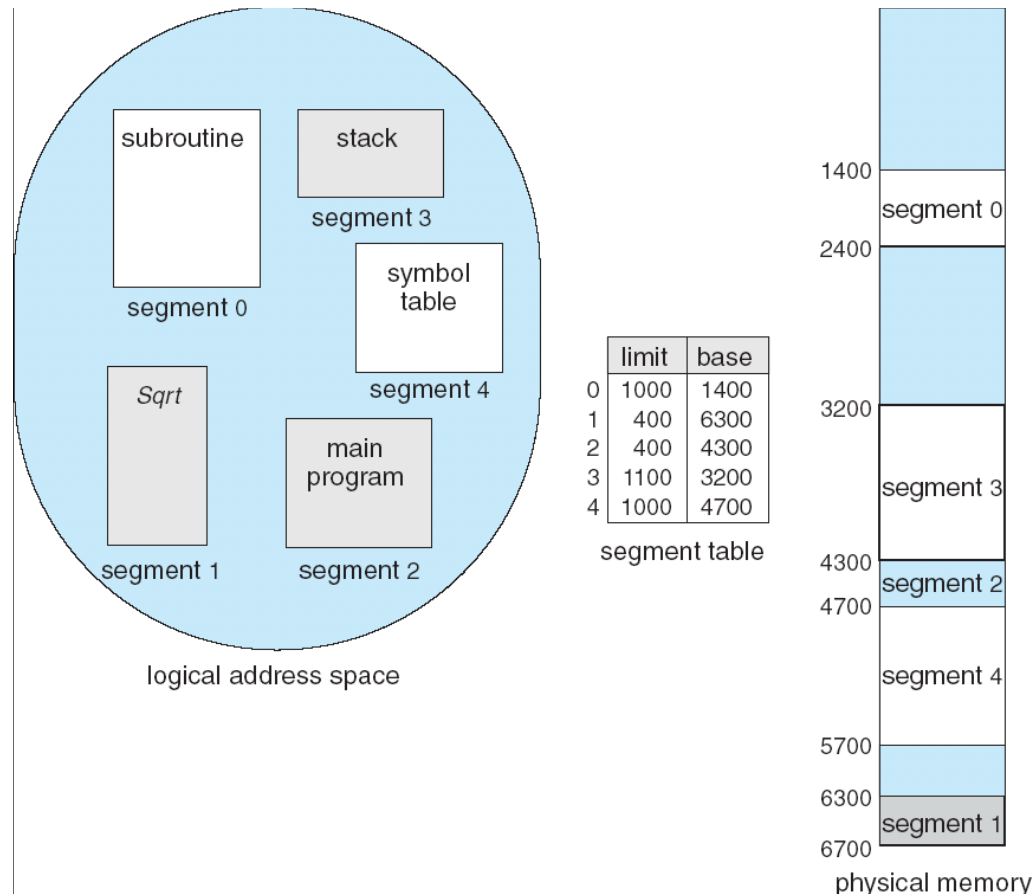
- Logical address consists of a two tuple:
 <segment-number, offset>,
- **Segment table** – maps two-dimensional physical addresses; each table entry has:
 - **base** – contains the starting physical address where the segments reside in memory
 - **limit** – specifies the length of the segment
- **Segment-table 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;

segment number **s** is legal if **s** < **STLR**

Segment table

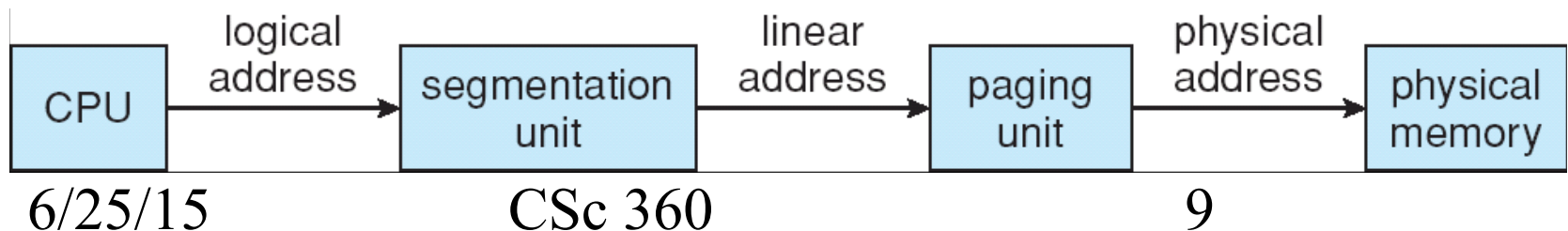


Example of segmenting

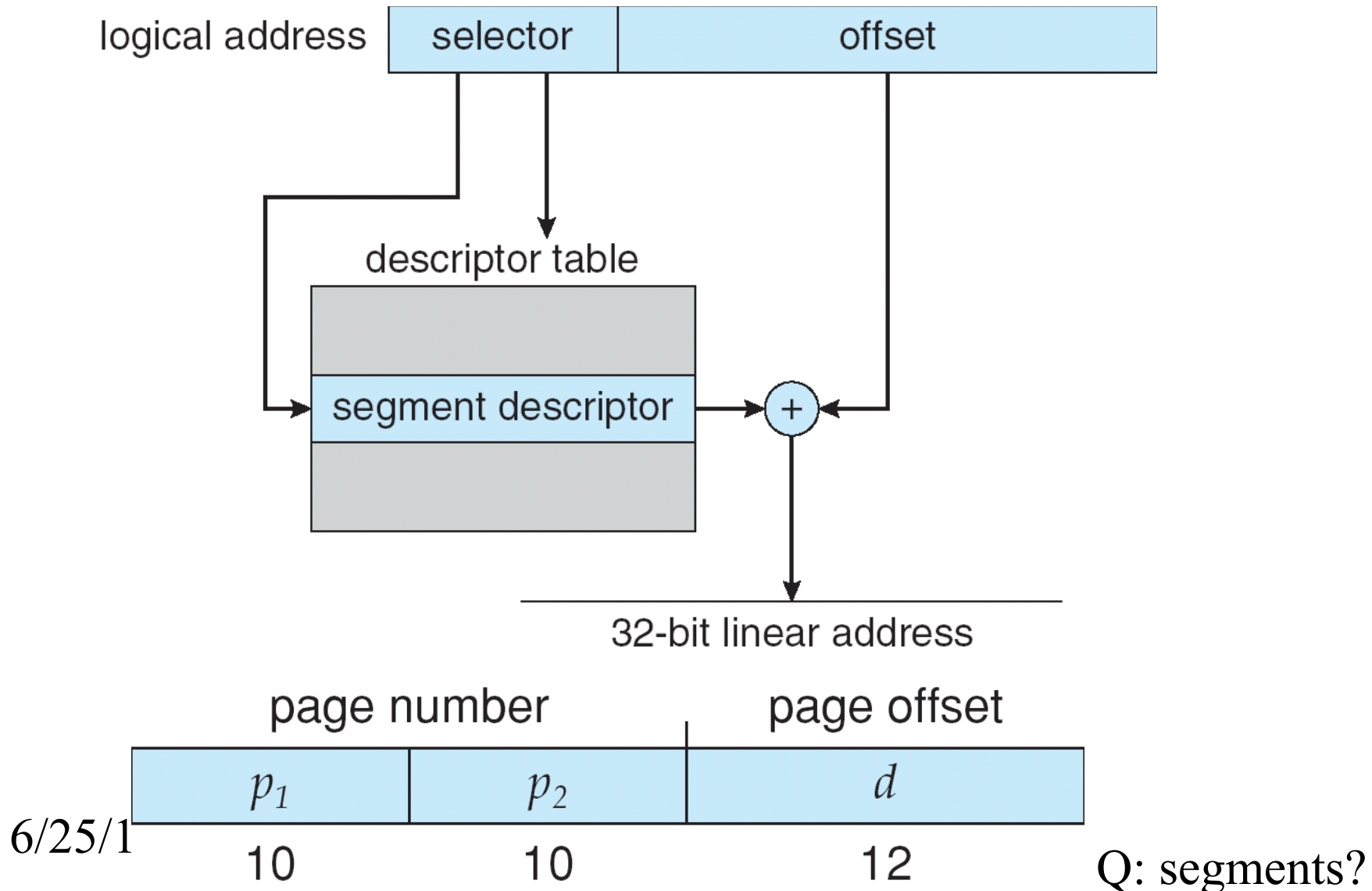


Examples: Intel Pentium

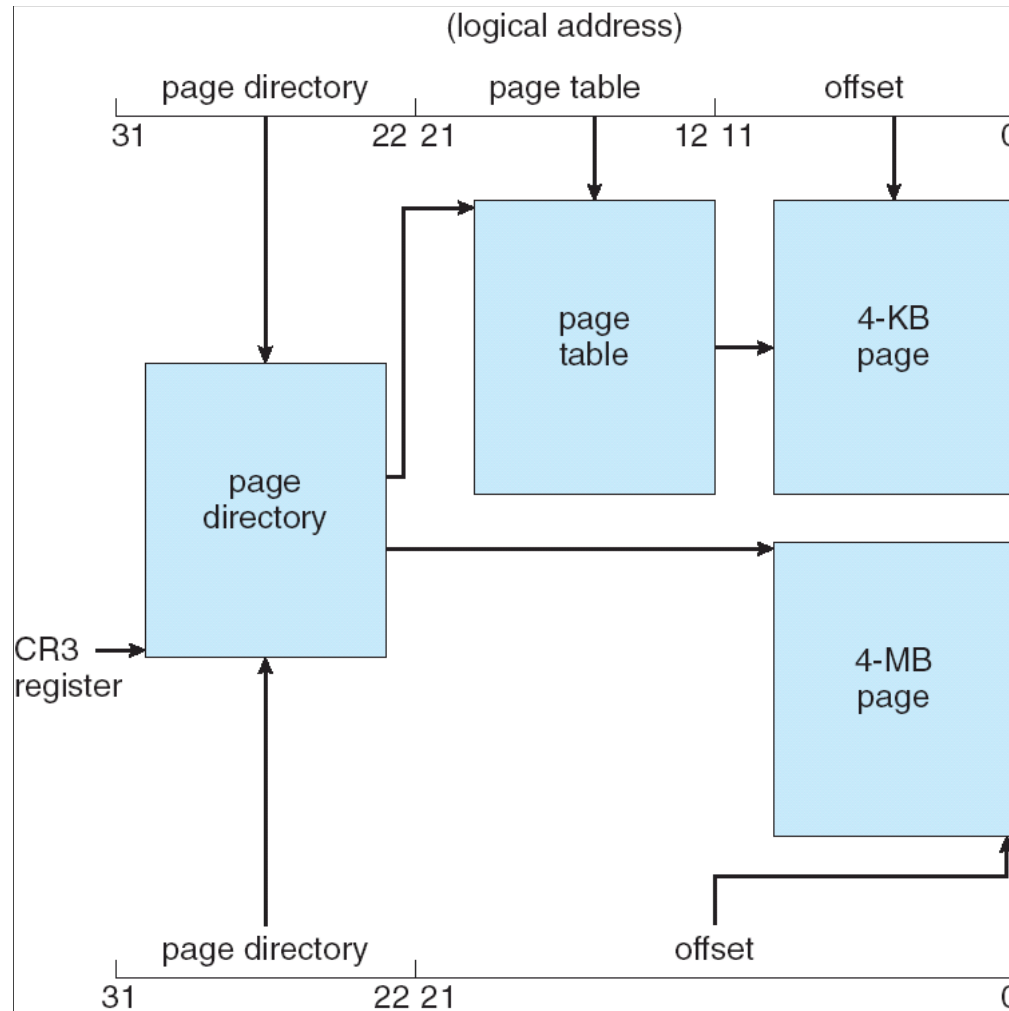
- Supports both segmentation and segmentation with paging
- CPU generates logical address
 - Given to segmentation unit
 - Which produces linear addresses
 - Linear address given to paging unit
 - Which generates physical address in main memory
 - Paging units form equivalent of MMU



From logical to physical address



From logical to physical II



6/25/15

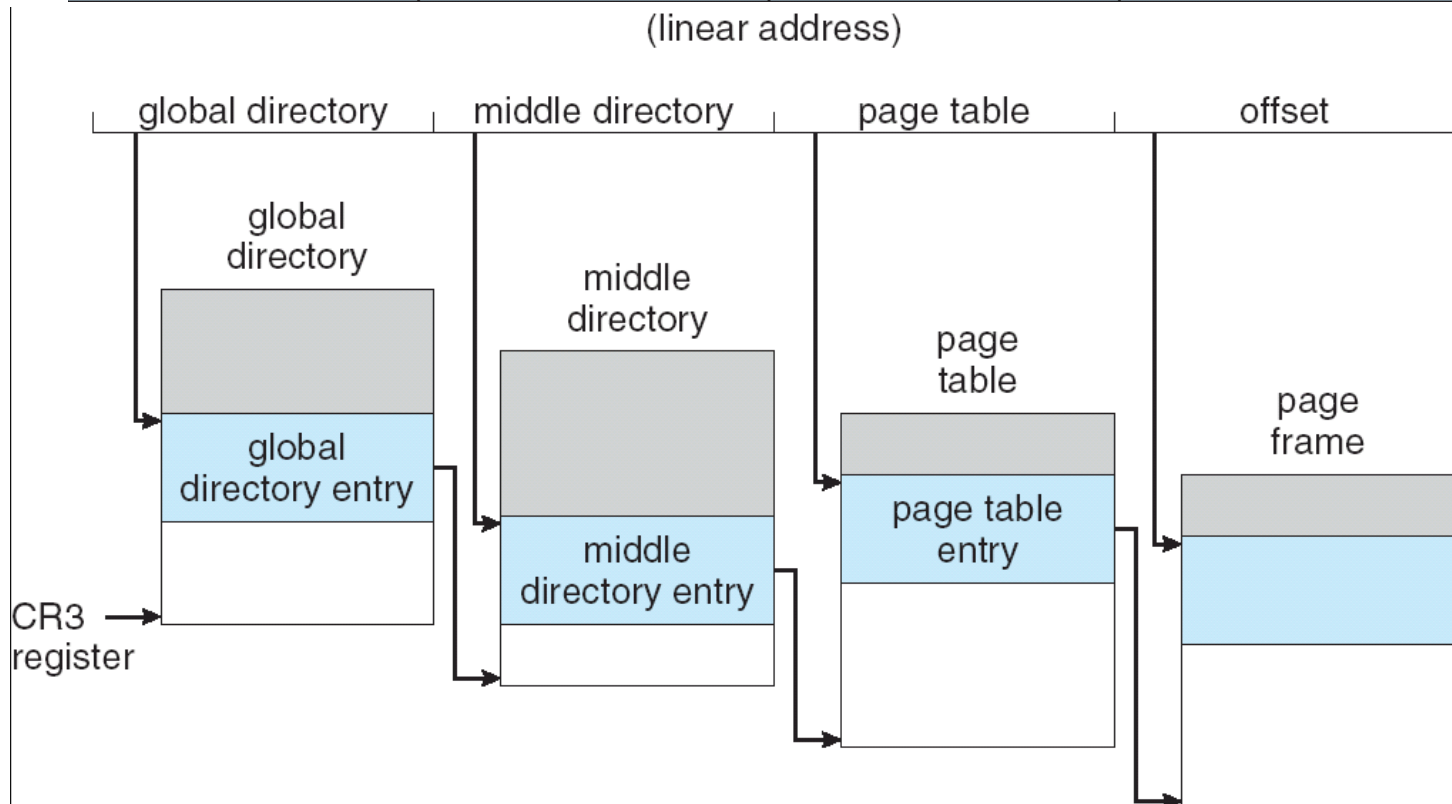
CSc 360

Q: why different page size?

Examples: Linux paging

global directory	middle directory	page table	offset
------------------	------------------	------------	--------

(linear address)



This lecture

- Segmentation and paging
 - user/program's view
 - segment table
 - examples
 - Intel Pentium
 - Linux

Next lecture

- Virtual memory
 - what if the main memory is not enough?
 - read OSC7Ch9