Memory Management
Lecture 5

Segmentation

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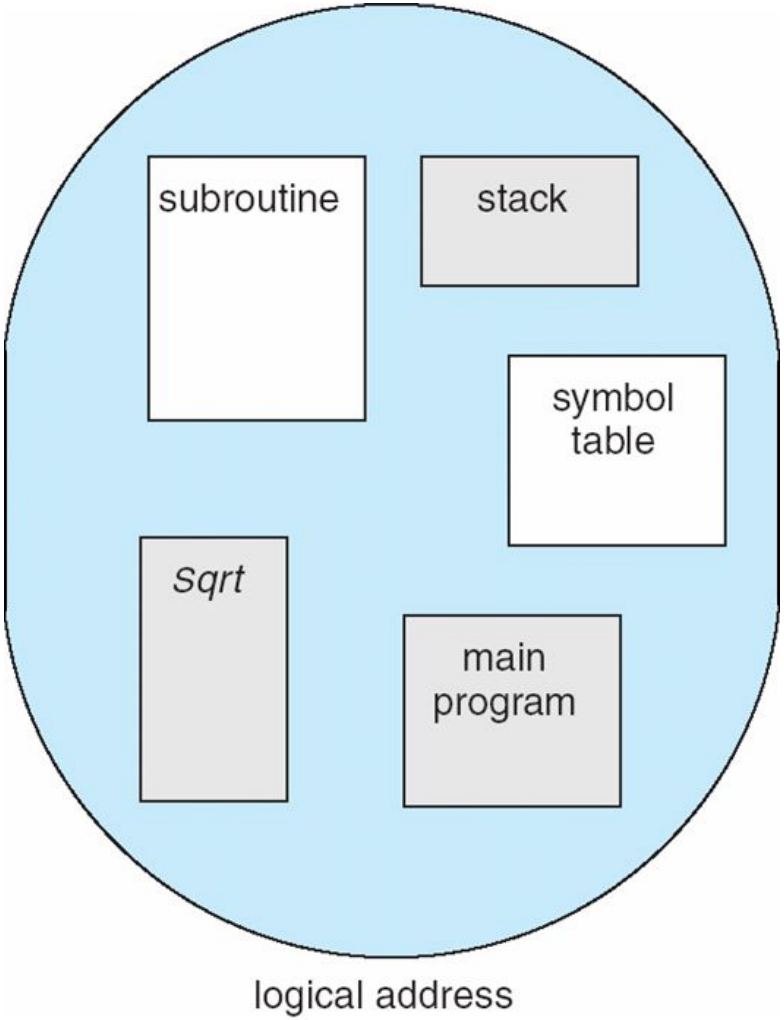
Operating System Concepts 8th edition silberschatz Galvin

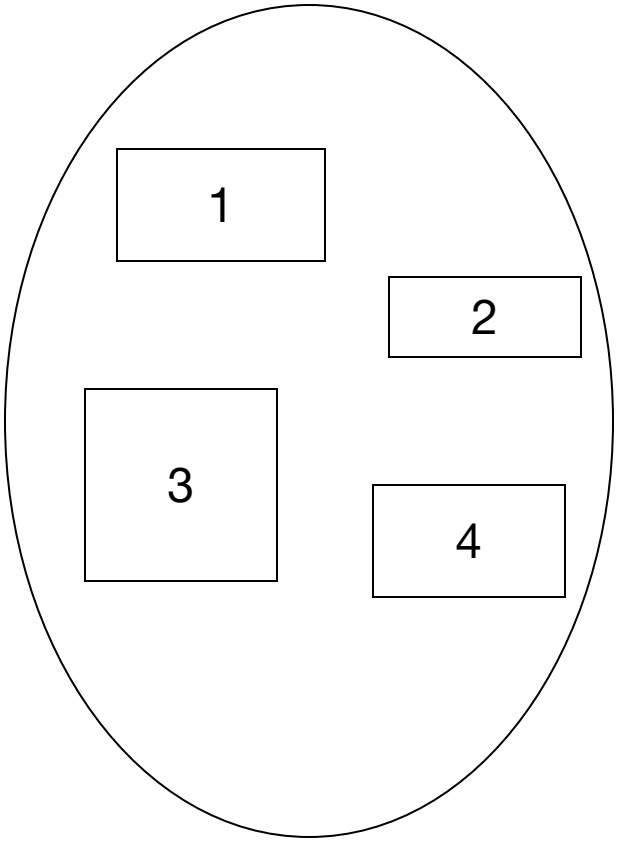
Segmentation

- ✔ 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
    - ❖ Stack
    - ❖ symbol table
    - ❖ arrays

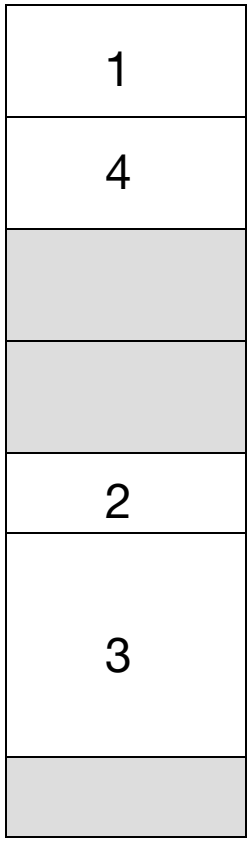
User's View of a Program



Logical View of Segmentation



user space

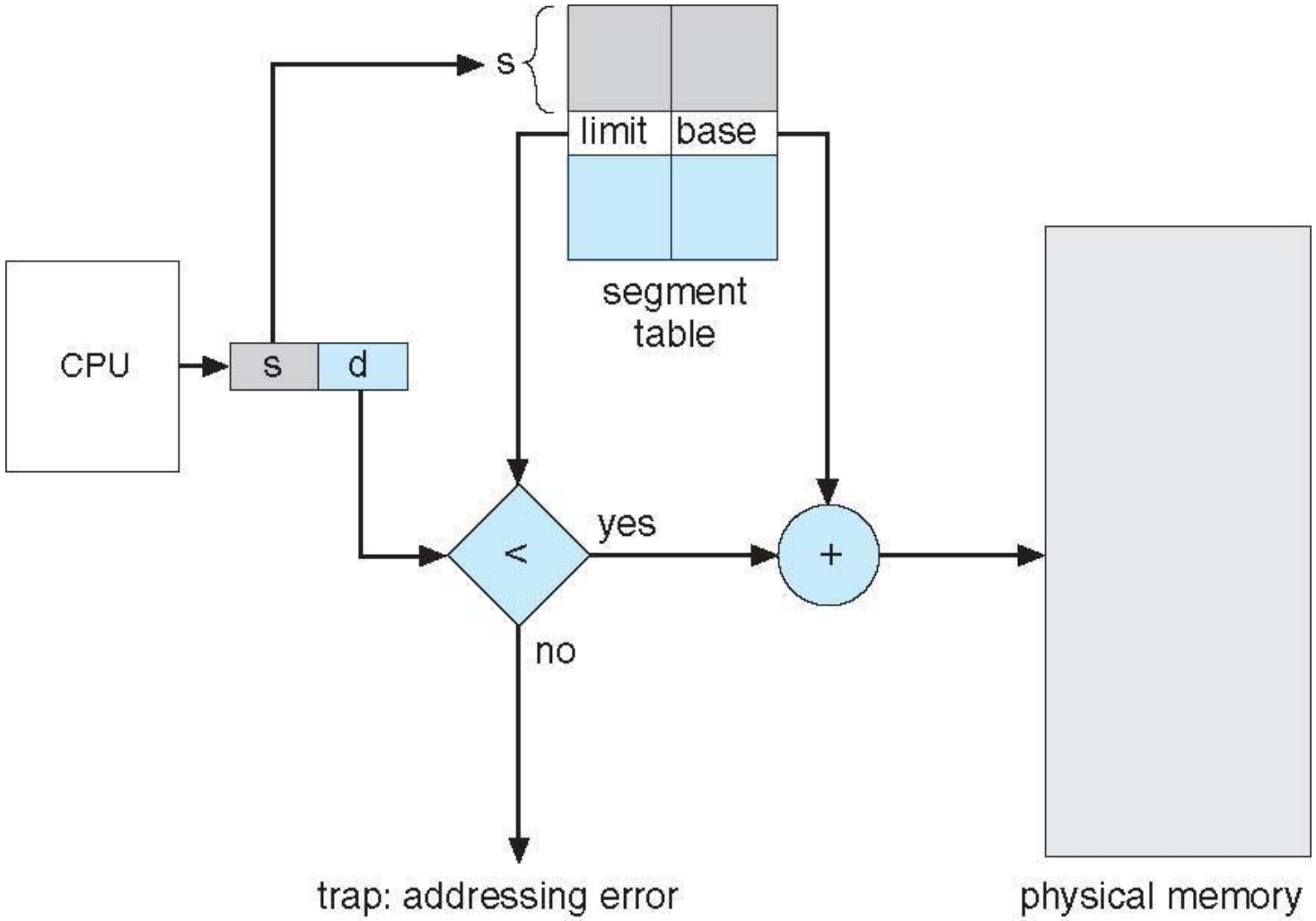


physical memory space

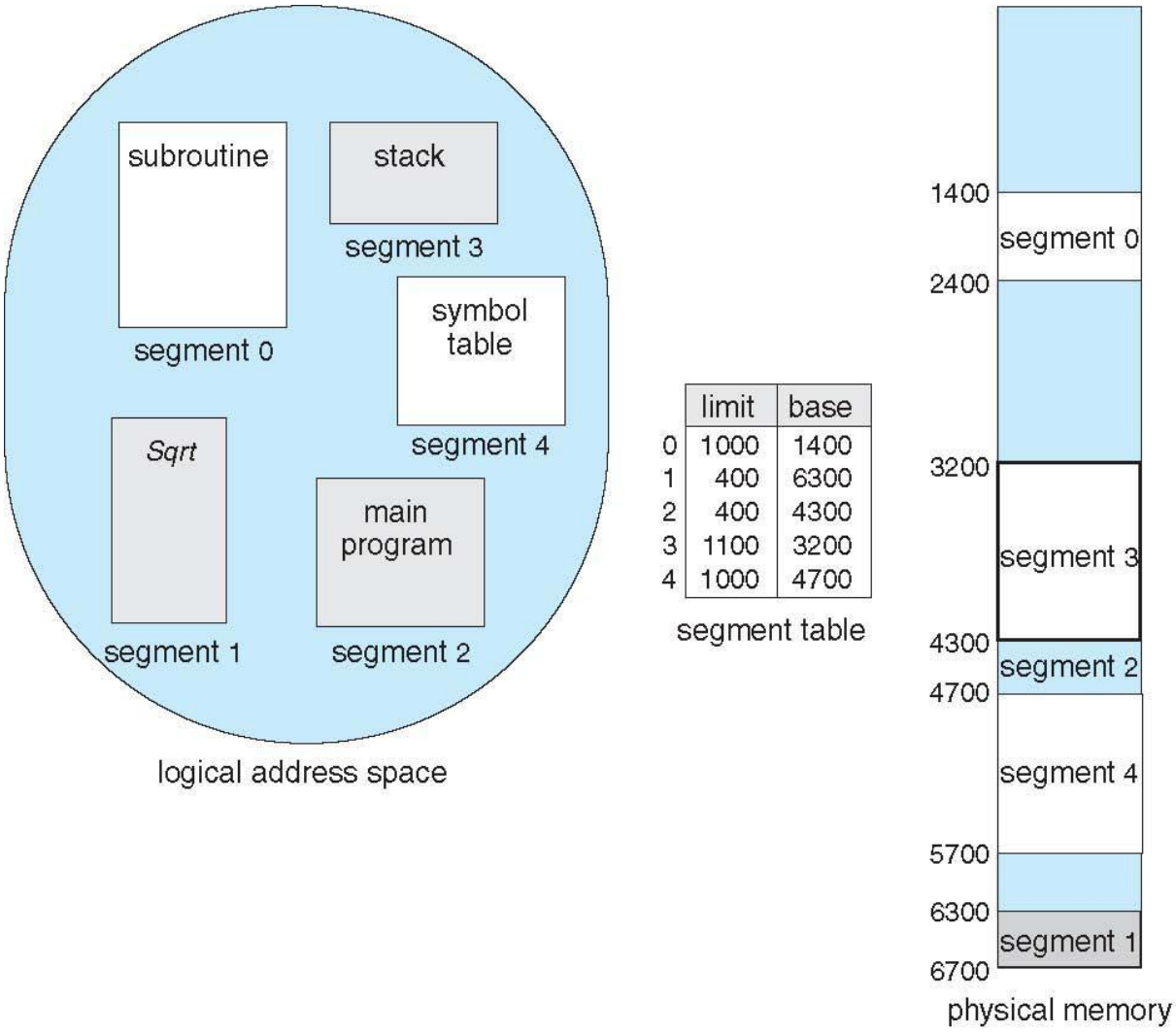
Segmentation Implementation & Hardware Requirement

- ✔ 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**

Segmentation Hardware



Example of Segmentation



Segmentation Protection & Sharing

- ✔ Protection
  - With each entry in segment table associate:
    - ❑ validation bit = 0 ⇒ 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