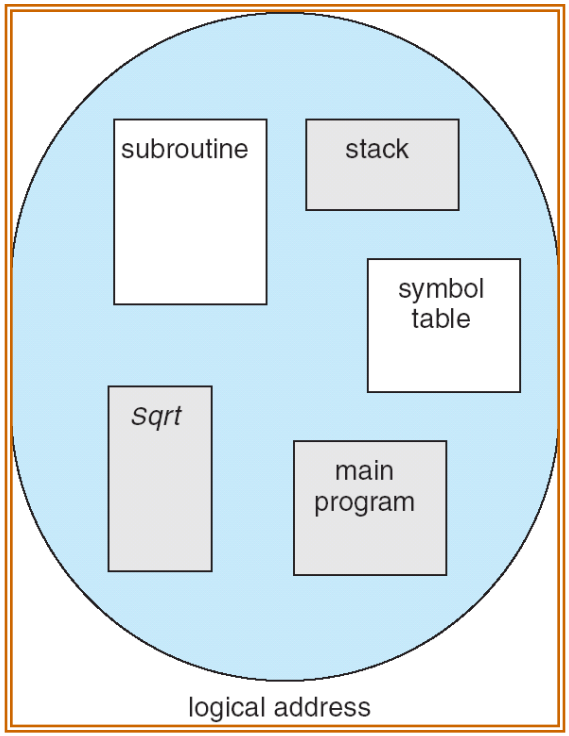
Segmentation

- An important aspect of memory management that became unavoidable with paging is the separation of the user's view of memory and the actual physical memory.
- Segmentation is a memory-management scheme that supports user view of memory.
- A logical address space is a collection of segments.
- Each segment has a name and a length.
- The addresses specify both the segment name and the offset within the segment.

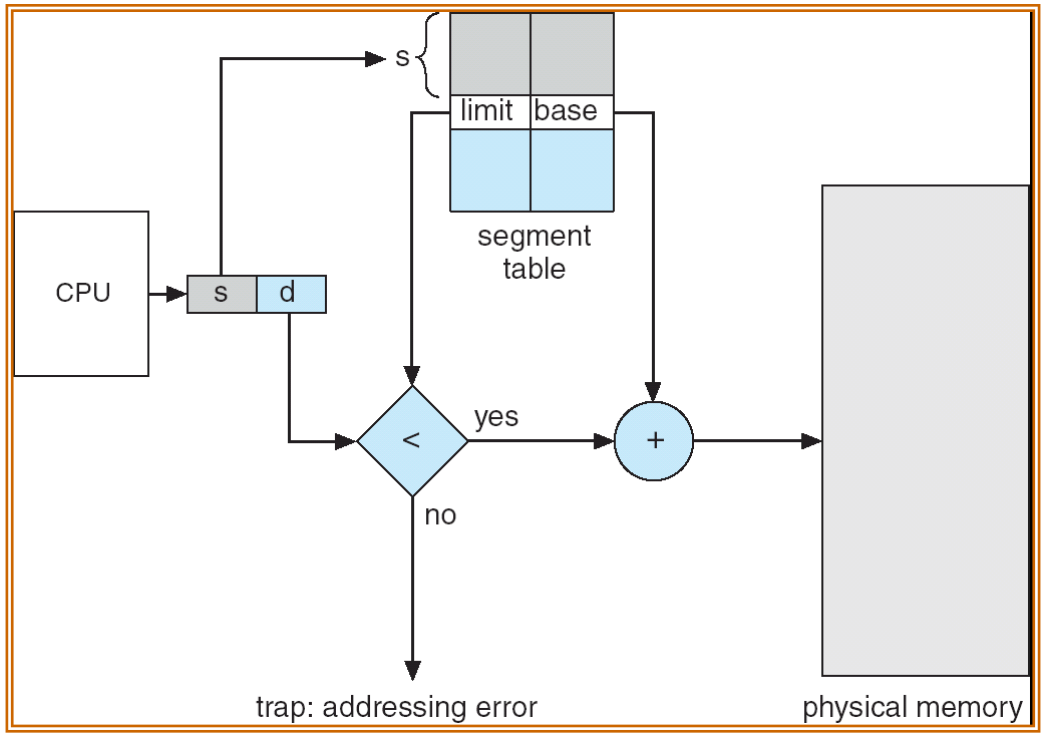
Users view of a program



- The user therefore specifies each address by two quantities: a segment name and an offset.
- Segments are numbered and are referred to by a segment number, rather than by a segment name.
- Thus, a logical address consists of a *two tuple:*
  <segment-number, offset >.

Hardware

- Mapping of two dimensional user-defined addresses into one-dimensional physical addresses is effected by a segment table.
- Each entry in the segment table has a segment base and a segment limit.
- The segment base contains the starting physical address where the segment resides in memory, whereas the segment limit specifies the length of the segment.


s
limit
base
segment
table
CPU
s
d
<
yes
+
no
trap: addressing error
physical memory

- A logical address consists of two parts: a segment number, s, and an offset into that segment, d.
- The segment number is used as an index to the segment table.
- The offset *d of* the logical address must be between 0 and the segment limit.
- If it is not, we trap to the operating system.
- When an offset is legal, it is added to the segment base to produce the address in physical memory of the desired byte.

Example of Segmentation