

## Q1. What is Segmentation?

**Segmentation** is a memory management technique which supports user's view of memory. This technique of division of a computer's primary memory into sections called segments.

## Q2. Why Segmentation is required?

Till now, we were using Paging as our main memory management technique. Paging is more close to Operating system rather than the User. It divides all the process into the form of pages regardless of the fact that a process can have some relative parts of functions which needs to be loaded in the same page.

Operating system doesn't care about the User's view of the process. It may divide the same function into different pages and those pages may or may not be loaded at the same time into the memory. It decreases the efficiency of the system.

It is better to have segmentation which divides the process into the segments. Each segment contain same type of functions such as main function can be included in one segment and the library functions can be included in the other segment.

## Q3. What are the advantages and disadvantages of Segmentation?

### Advantages of Segmentation

1. No internal fragmentation
2. Average Segment Size is larger than the actual page size.
3. Less overhead
4. It is easier to relocate segments than entire address space.
5. The segment table is of lesser size as compare to the page table in paging.

### Disadvantages

1. It can have external fragmentation.
2. it is difficult to allocate contiguous memory to variable sized partition.
3. Costly memory management algorithms.

Q4. Make a comparison chart between paging and segmentation.

Sr No.	Paging	Segmentation
1	Non-Contiguous memory allocation	Non-contiguous memory allocation
2	Paging divides program into fixed size pages.	Segmentation divides program into variable size segments.
3	OS is responsible	Compiler is responsible.
4	Paging is faster than segmentation	Segmentation is slower than paging
5	Paging is closer to Operating System	Segmentation is closer to User
6	It suffers from internal fragmentation	It suffers from external fragmentation
7	There is no external fragmentation	There is no external fragmentation
8	Logical address is divided into page number and page offset	Logical address is divided into segment number and segment offset
9	Page table is used to maintain the page information.	Segment Table maintains the segment information
10	Page table entry has the frame number and some flag bits to represent details about pages.	Segment table entry has the base address of the segment and some protection bits for the segments.

Q5. Discuss Segmentation.

- Basic method for Segmentation

In a computer system using segmentation, a logical address space can be viewed as multiple segments. The size of the segment may grow or shrink that is it is of variable length.

During execution, each segment has a name and a length. The address specifies both the segment name and the displacement within the segment. The user, therefore, specifies each address by two quantities; segment name and an offset.

Normally it is implemented as segments are numbered and are referred to by a segment number, in place of a segment name. Thus a logical address consists of two tuples:

< segment – number, offset >

**Segment number(s)** – It is the total number of bits required to represent the segment.

**Segment Offset(d)** – It specifies the number of bits required to represent the size of the segment.

- Hardware support for segmentation

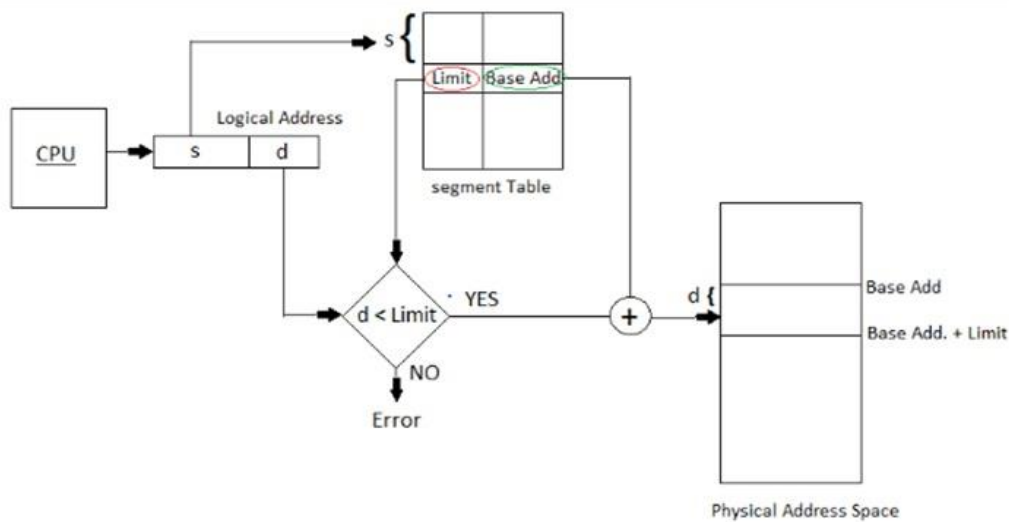
In the program, the user refers to objects by a two-dimensional address, the actual physical memory is still, of course, a one-dimensional sequence of bytes. Thus we have to define an implementation to map two-dimensional user-defined addresses into one-dimensional physical addresses.

This mapping is affected by a segment table. In the segment table, each entry has a segment base and a segment limit.

**Segment Base** – It contains the starting physical address where the segment kept in memory.

**Segment Limit** – It specifies the length of the segment.

The use of the segment table illustrated in this figure:



#### Segmentation Hardware

- The logical address consists of two parts: a segment number (s) and an offset (d) into that segment.
- The segment number used as an index into the segment table.
- The offset d of the logical address must be between 0 and the segment limit.
- If offset is beyond the end of the segment, we trap the Operating System.

- If offset is in the limit, then it is combined with the segment base to produce the address in physical memory, hence the segment table is an array of base limit and register pairs.