Non-Contiguous Memory Allocation – Segmented Paging

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Recap

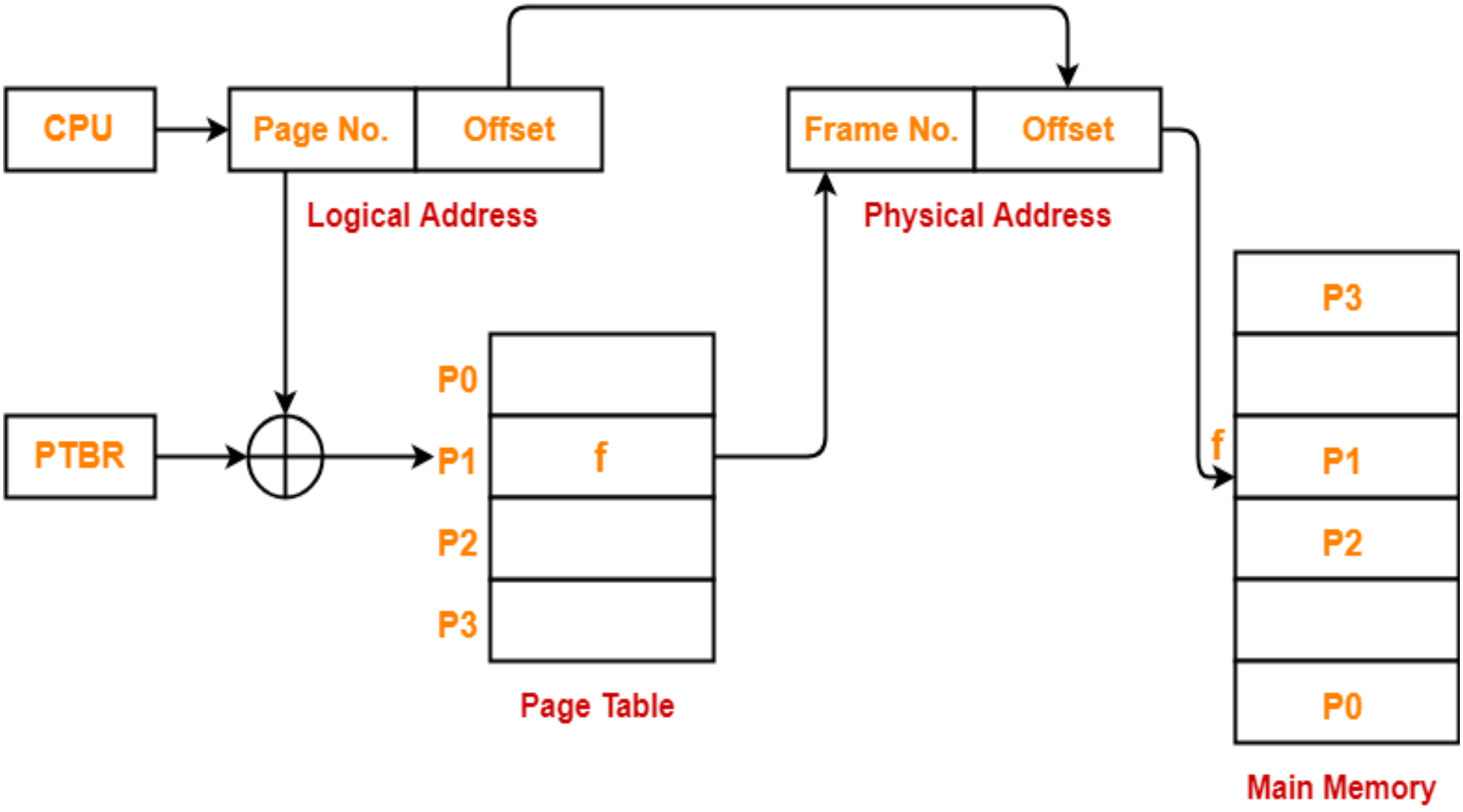
We have discussed-

- Paging and Segmentation are the non-contiguous memory allocation techniques.
- Paging divides the process into equal size partitions called as pages.
- Segmentation divides the process into unequal size partitions called as segments.

Segmented Paging-

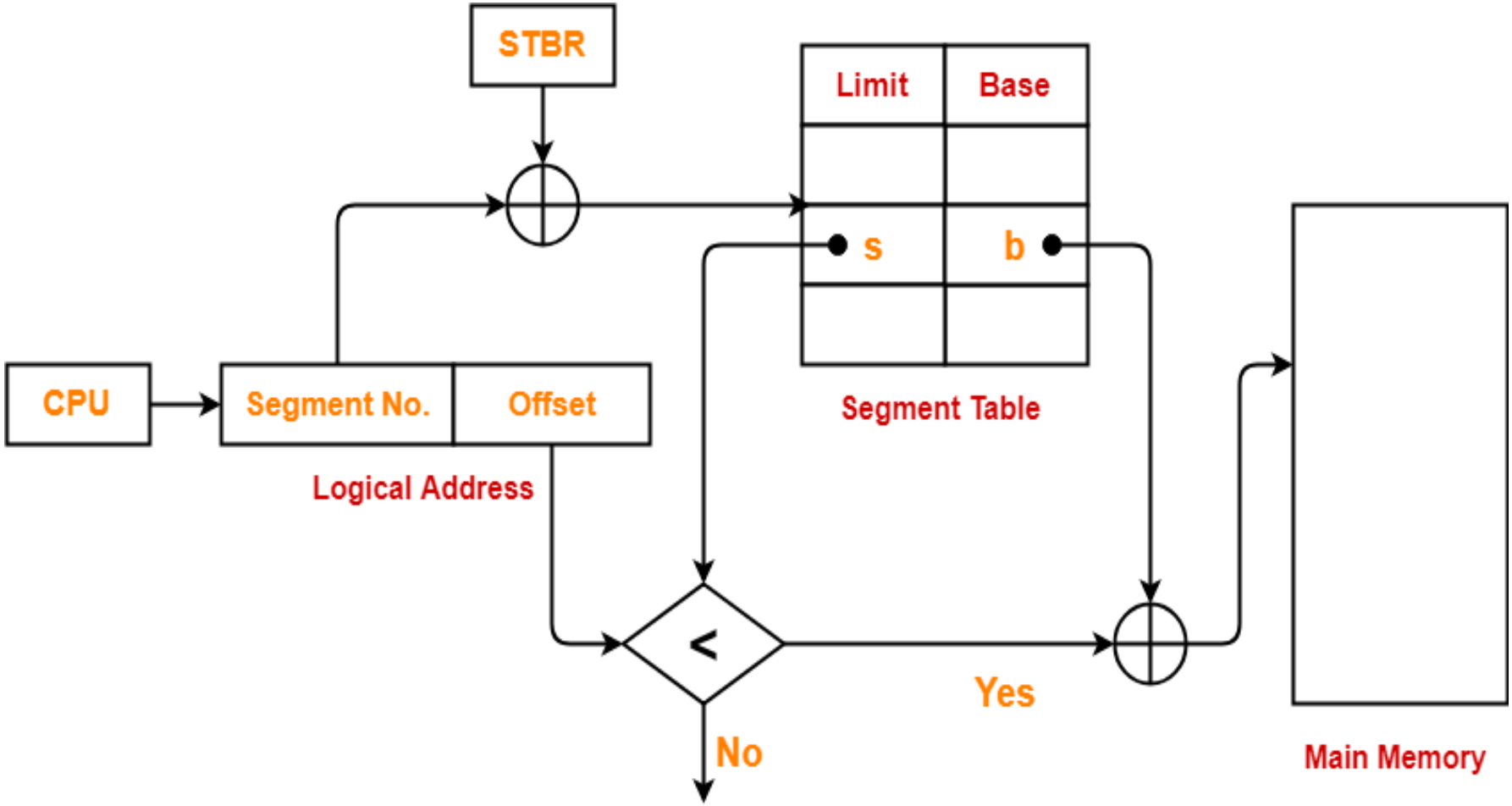
Segmented paging is a scheme that implements the combination of segmentation and paging.

H/W Support for Paging



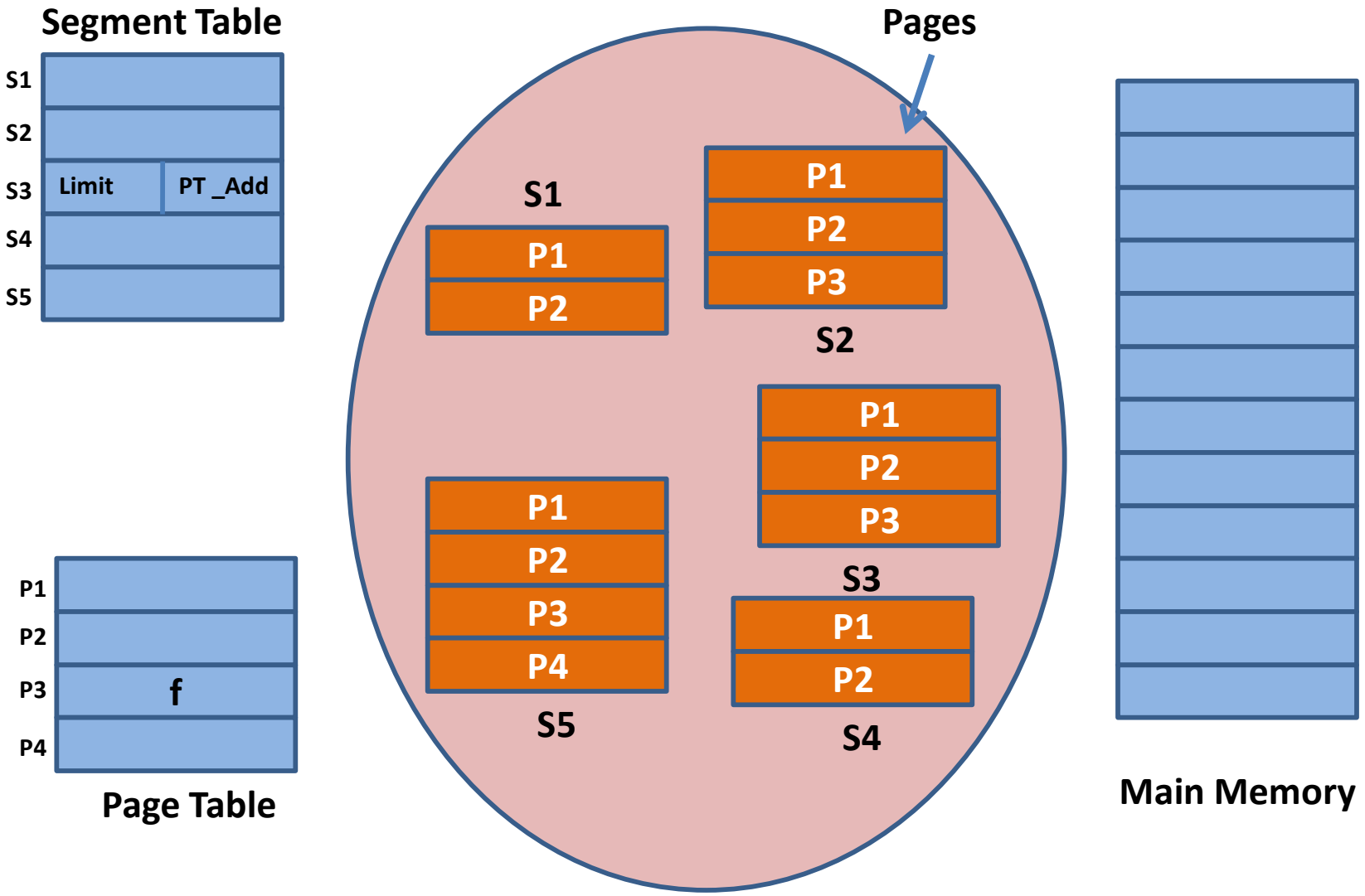
Translating Logical Address into Physical Address

H/W Support for Segmentation



Translating Logical Address into Physical Address

Basics of Segmented Paging



Basics of Segmented Paging

Working

1. Process is first divided into segments and then each segment is divided into pages. These pages are then stored in the frames of main memory.
2. 1 Page Table for 1 segment which keep track of frame storing the page.
3. Each page table occupies one frame in the main memory.
4. Number of entries in the page table of a segment = Number of pages that segment is divided.
5. A segment table exists that keeps track of the frames storing the page tables of segments.
6. Number of entries in the segment table of a process = Number of segments that process is divided.
7. The base address of the segment table is stored in the segment table base register.

Address Translation

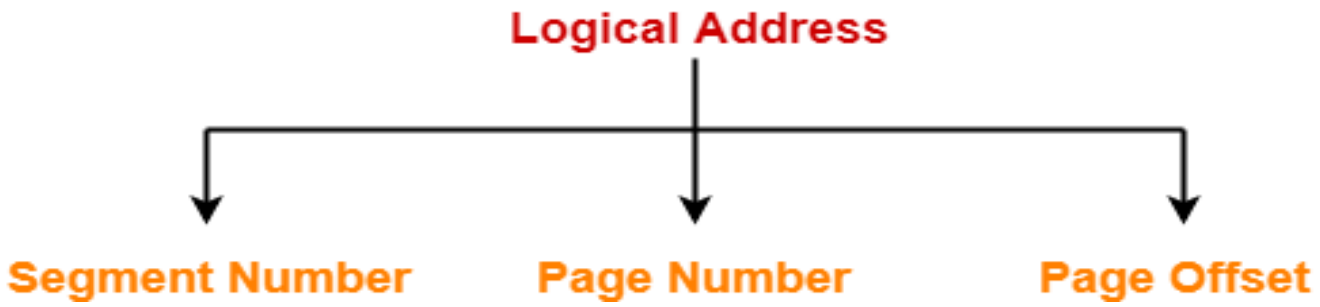
Step-01:

CPU generates a logical address consisting of three parts-

- Segment Number: Segment Number specifies the specific segment from which CPU wants to reads the data.

- Page Number: Page Number specifies the specific page of that segment from which CPU wants to read the data.

- Page Offset: Page Offset specifies the specific instruction on that page that CPU wants to read.



Address Translation

Step-02:

- For the generated segment number, corresponding entry is located in the segment table.
- Segment table provides the frame number of the frame storing the page table of the referred segment.
- The frame containing the page table is located.

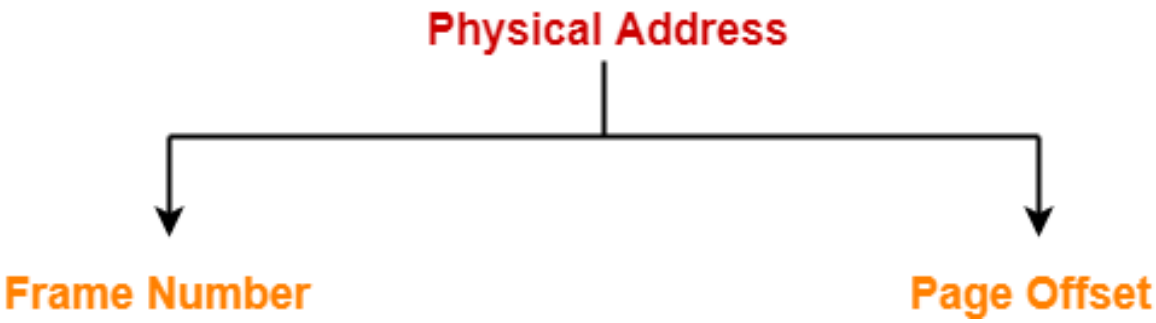
Step-03:

- For the generated page number, corresponding entry is located in the page table.
- Page table provides the frame number of the frame storing the required page of the referred segment.
- The frame containing the required page is located.

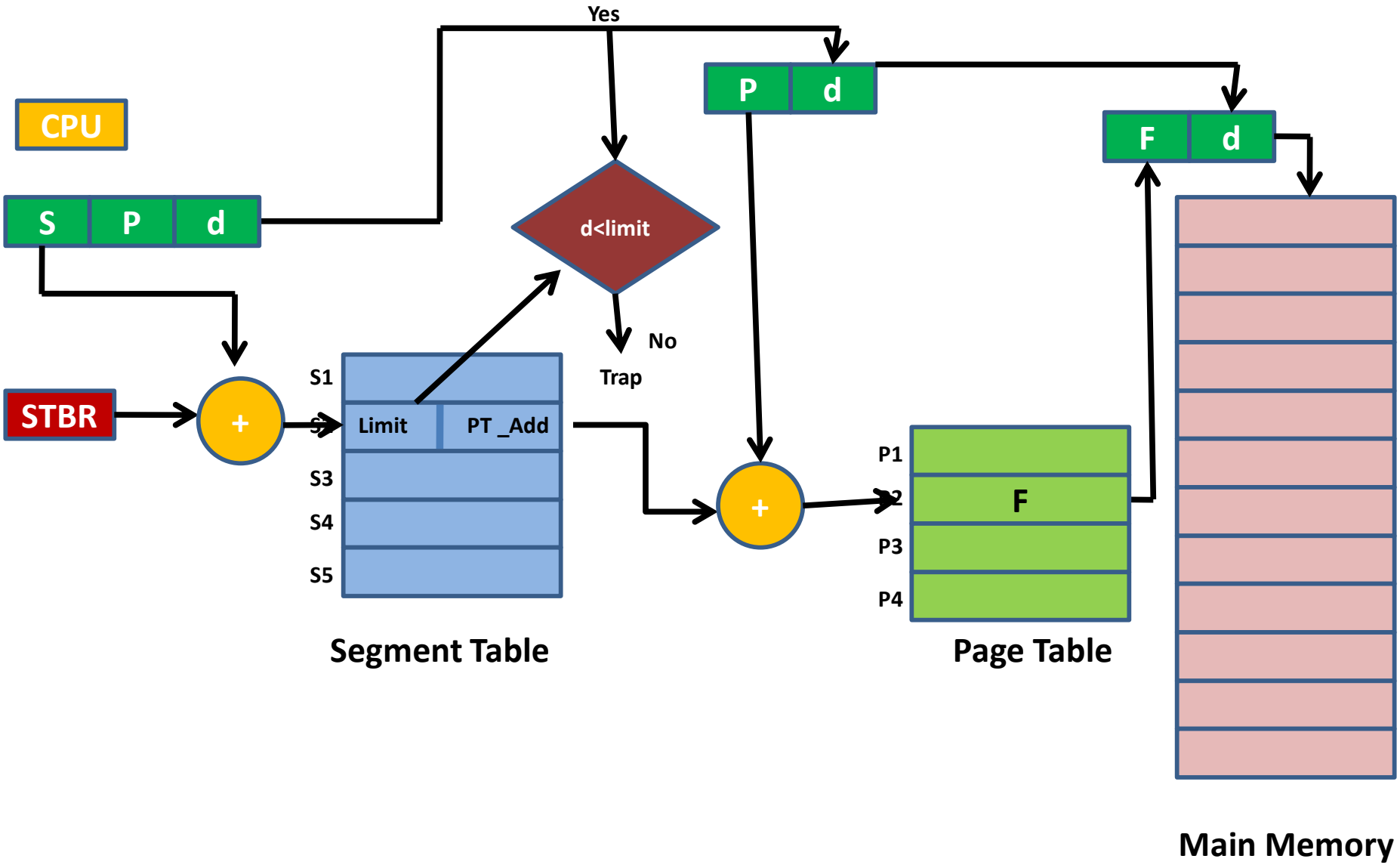
Address Translation

Step-04:

- The frame number combined with the page offset forms the required physical address.
- For the generated page offset, corresponding instruction located in the page and read.



Address Translation



Translation of Logical Address to Physical Address

Segmented Paging

Advantages-

- Segment table contains only one entry corresponding to each segment.
- It reduces memory usage.
- The size of Page Table is limited by the segment size.
- It solves the problem of external fragmentation.

Disadvantages-

- Segmented paging suffers from internal fragmentation.
- The complexity level is much higher as compared to paging.

Thank You