



Non-Contiguous Memory Allocation – Paging

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Non-Contiguous Memory Allocation

- Non-contiguous memory allocation is a memory allocation technique.
- It allows to store parts of a single process in a non-contiguous fashion.
- Thus, different parts of the same process can be stored at different places in the main memory.

Techniques-

There are two popular techniques used for non-contiguous memory allocation-

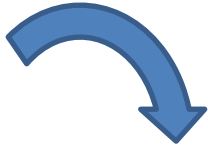
1. Paging
2. Segmentation

Paging

- Paging is a fixed size partitioning scheme.
- In paging, secondary memory and main memory are divided into equal fixed size partitions.
- The partitions of secondary memory are called as **pages**.
- The partitions of main memory are called as **frames**.
- Each process is divided into parts where size of each part is same as page size.
- The size of the last part may be less than the page size.
- The pages of process are stored in the frames of main memory depending upon their availability.

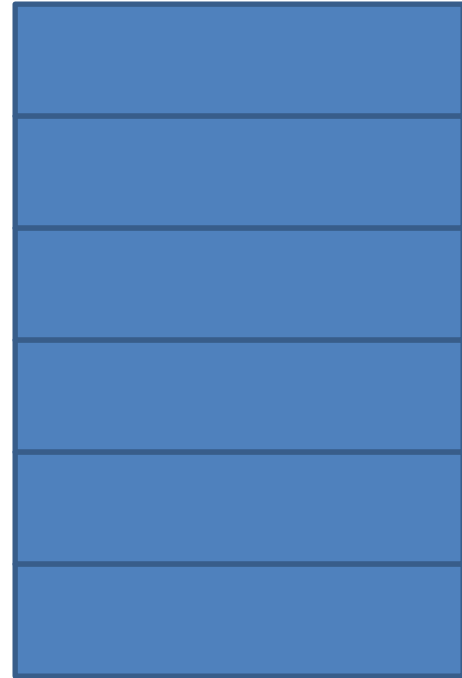
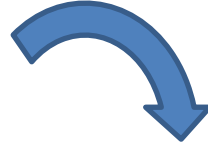
Paging

Frames



Main Memory

Pages



Secondary Memory

Address Translation

CPU always generates a logical address.

A physical address is needed to access the main memory.

Following steps are followed to translate logical address into physical address-

Step-01

CPU generates a logical address consisting of two parts-

1. **Page Number:** specifies the specific page of the process from which CPU wants to read the data.
2. **Page Offset:** specifies the specific instruction on the page that CPU wants to read.

Address Translation

Step-02:

- For the page number generated by the CPU, **Page Table** provides the corresponding frame number (base address of the frame) where that page is stored in the main memory.
- Page table is a data structure.
- It maps the page number referenced by the CPU to the frame number where that page is stored.

Characteristics of Page Table-

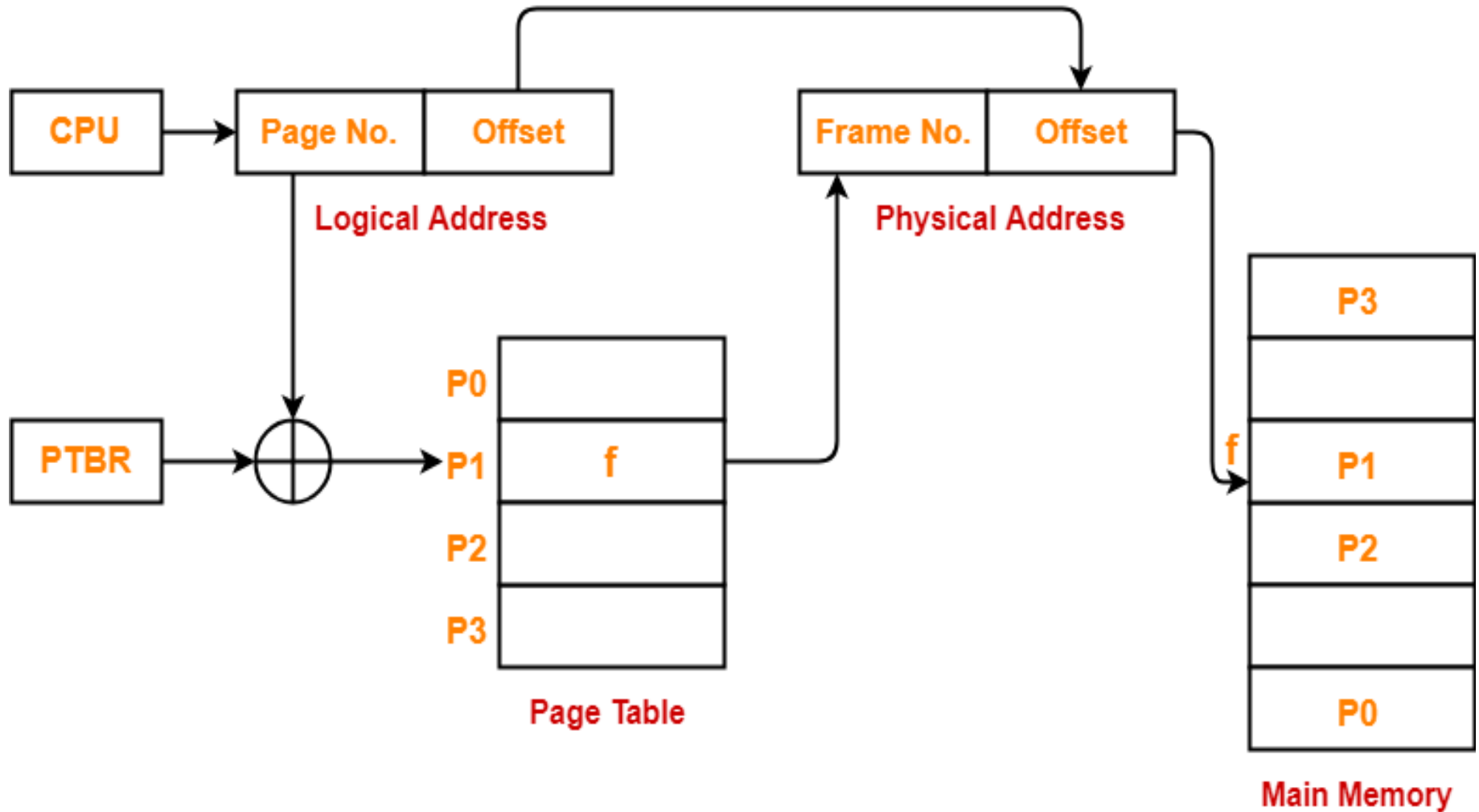
- Page table is stored in the main memory.
- Number of entries in a page table = Number of pages in which the process is divided.
- Page Table Base Register (PTBR) contains the base address of page table.
- Each process has its own independent page table.

Address Translation

Step-03:

- The frame number combined with the page offset forms the required physical address.
- Frame number specifies the specific frame where the required page is stored.
- Page Offset specifies the specific instruction that has to be read from that page.

Address Translation



Translating Logical Address into Physical Address

Paging

Advantages-

- The advantages of paging are-
- It allows to store parts of a single process in a non-contiguous fashion.
- It solves the problem of external fragmentation.

Disadvantages-

- The disadvantages of paging are-
- It suffers from internal fragmentation.
- There is an overhead of maintaining a page table for each process.
- The time taken to fetch the instruction increases since now two memory accesses are required.

Thank You