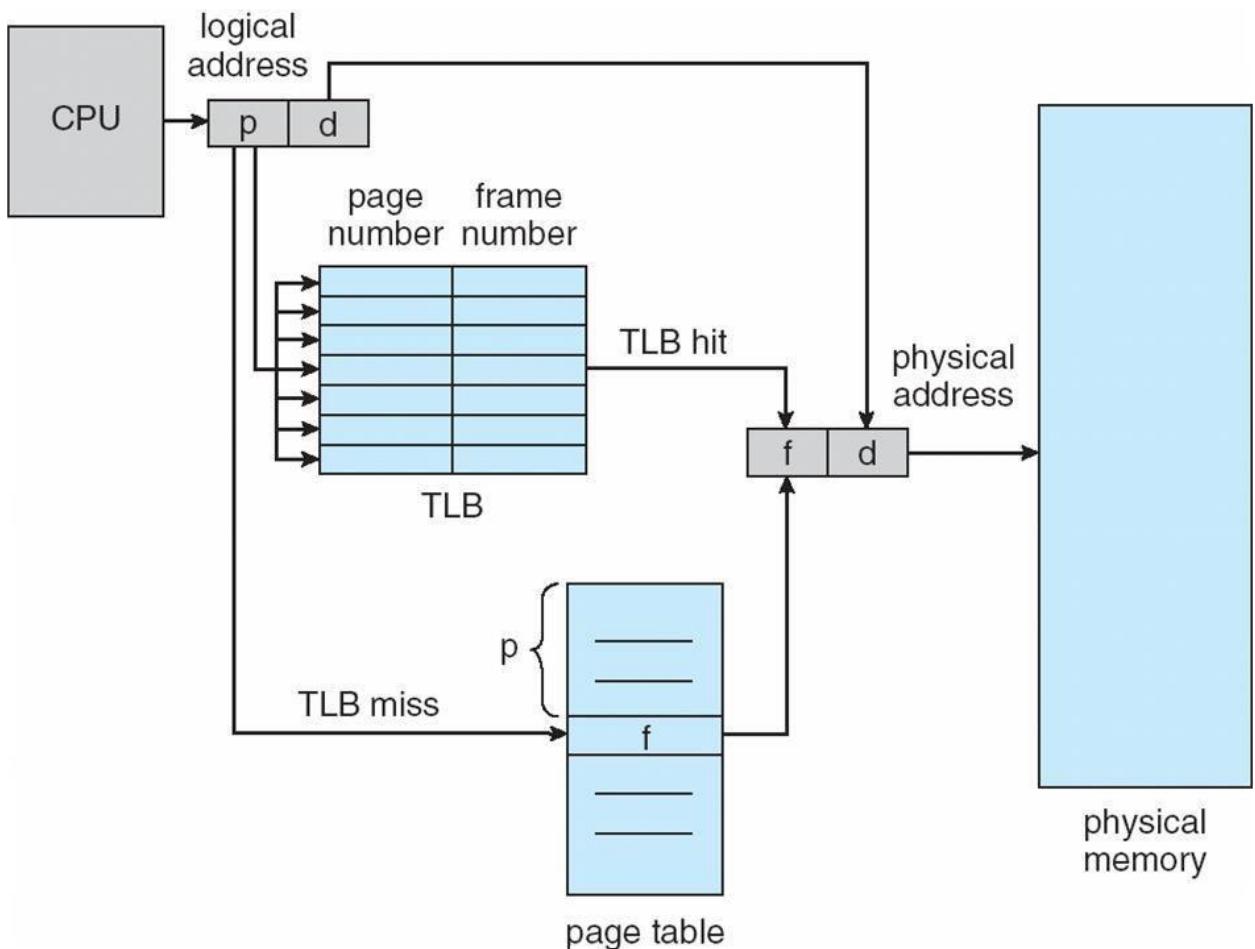


1. what is paging? Explain with a neat diagram Paging hardware with TLB

Ans:



- Paging is a **memory management technique** in which logical memory is divided into fixed-size blocks called **pages** and physical memory is divided into fixed-size blocks called **frames**.
- Page size and frame size are always **equal**.

Basic Concept of Paging

1. Logical address space of a process is divided into **pages**.
2. Physical memory is divided into **frames**.
3. Pages of a process can be stored in **any free frame**.
4. OS maintains a **page table** for address translation.

Paging Hardware with TLB (Translation Lookaside Buffer)

TLB Definition

- TLB is a **high-speed associative memory**.
 - Stores **recently used page number–frame number pairs**.
 - Reduces effective memory access time
-

2. what is demand paging? Explain the steps in handling page fault using an appropriate diagram

Ans: • **Demand paging** is a virtual memory technique in which pages of a process are loaded into main memory **only when they are required** (on demand).

- Pages are **not loaded at process start**; instead, they are loaded **when a page fault occurs**.

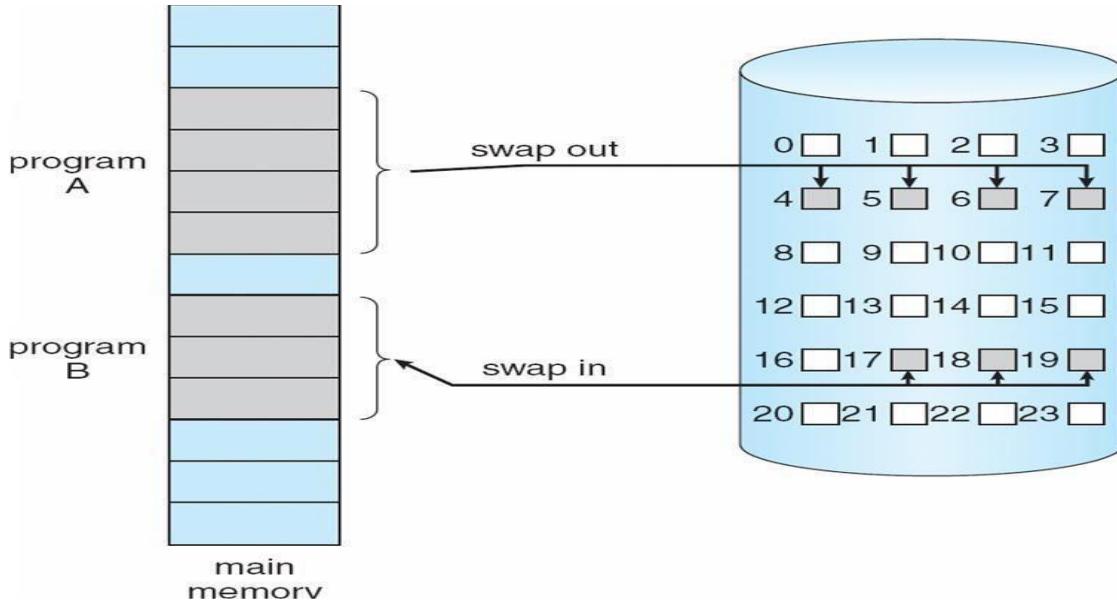
Page Fault

Definition

- A **page fault** occurs when a process accesses a page that is **not currently present in main memory**.

Steps in Handling a Page Fault

1. CPU generates a **logical address**.
2. Memory Management Unit (MMU) checks the **page table**.
3. If **valid bit = 0**, a **page fault** is generated.
4. Control is transferred to the **operating system**.
5. OS checks whether the memory reference is **valid**.
 - If invalid → process is terminated.
6. OS selects a **free frame** in main memory.
 - If no free frame → **page replacement algorithm** is used.
7. Required page is loaded from **disk** into the selected frame.
8. Page table entry is **updated** (frame number, valid bit = 1).
9. The **instruction is restarted** and execution continues.



3. what is Segmentation? Explain the basic method of Segmentation with an example

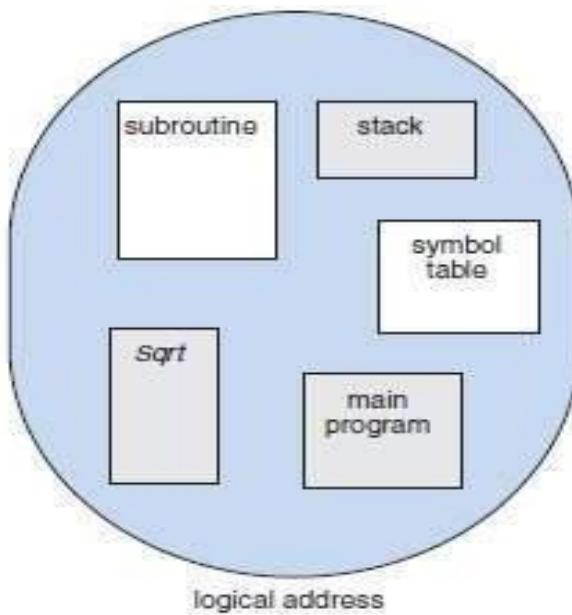
Ans: • Segmentation is a memory management technique in which a program is divided into variable-size logical units called **segments**.

- Each segment represents a **logical part of the program** such as code, data, stack, functions, etc.

Basic Method of Segmentation:

This is a memory-management scheme that supports user-view of memory (Figure 1).

- A logical-address space is a collection of segments.
- Each segment has a name and a length.
- The addresses specify both segment-name and offset within the segment.
- Normally, the user-program is compiled, and the compiler automatically constructs segments reflecting the input program.
- For ex: The code, Global variables, The heap, from which memory is allocated, The stacks used by each thread, The standard C library



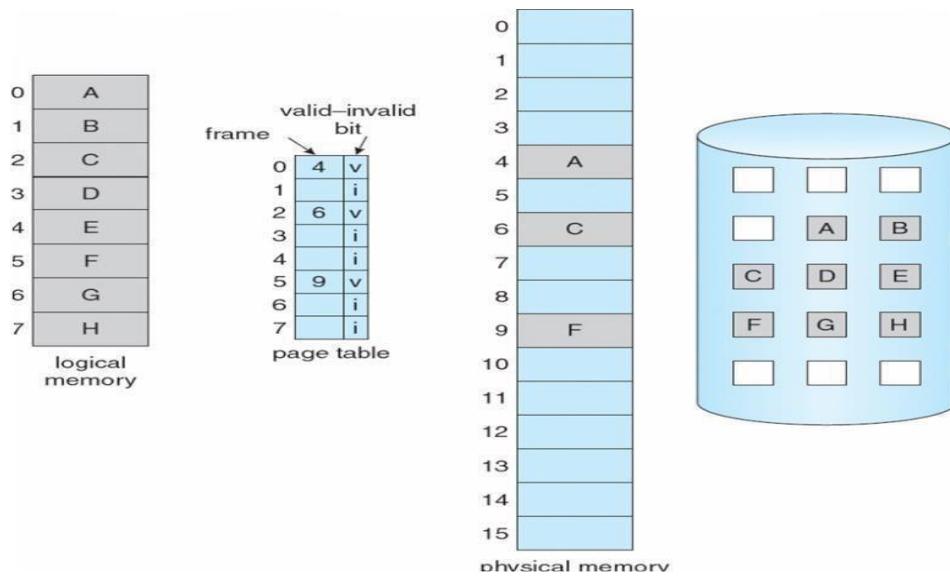
4. Discuss the Structure of the Page table with a Suitable diagram

Ans: • A page table is a data structure maintained by the operating system to map **logical page numbers** to **physical frame numbers**.

- It is used in **paging memory management** for address translation.

Basic Structure of Page Table

- Each process has its **own page table**.
- The page table is stored in **main memory**.
- Each entry in the page table is called a **Page Table Entry (PTE)**.
- Page table is indexed using the **page number**.



5. What is file ?What are its attributes?Explain file operations.

Ans: • A file is a **named collection of related information** stored on secondary storage devices such as hard disks or SSDs.

- Files provide a way to store data **permanently** and access it efficiently.

File Attributes

Each file has a set of attributes maintained by the operating system.

1. **Name**
 - Human-readable file name.
2. **Identifier**
 - Unique number (file ID) used internally by OS.
3. **Type**
 - Indicates file type (text, executable, source code, etc.).
4. **Location**
 - Pointer to the device and location of the file.
5. **Size**
 - Current size of the file in bytes.
6. **Protection**
 - Access rights such as read, write, execute.
7. **Time and Date**
 - Creation time, last modification time, last access time.

8. Owner/User ID

- Identifies the owner of the file.

File Operations

The operating system provides several operations to manage files.

1. Create

- Creates a new empty file.
- Allocates space and adds entry in the directory.

2. Open

- Opens an existing file.
- Loads file metadata into memory.

3. Read

- Reads data from file starting at current file pointer.

4. Write

- Writes data to file at current file pointer.
- May increase file size.

5. Reposition (Seek)

- Changes the current file pointer position.

6. Close

- Closes the file and updates file metadata.

7. Delete

- Removes file from directory.
- Frees allocated disk space.

8. Truncate

- Removes file contents but keeps file attributes.
-

6. Given the following disk request sequence

95,180,34,119,11,123,62,64.

Standing track 50.

Linding track 199

Find FCFS, SSTF, Look and C-Look

Ans: Given

- **Disk request queue:** 95, 180, 34, 119, 11, 123, 62, 64
- **Starting track (Head position):** 50
- **Ending track:** 199

1. FCFS (First Come First Serve)

Service Order

50 → 95 → 180 → 34 → 119 → 11 → 123 → 62 → 64

Head Movements

Movement	Distance
50 → 95	45
95 → 180	85
180 → 34	146
34 → 119	85
119 → 11	108
11 → 123	112
123 → 62	61
62 → 64	2

Total Head Movement = 644 tracks

2. SSTF (Shortest Seek Time First)

Service Order

$50 \rightarrow 62 \rightarrow 64 \rightarrow 34 \rightarrow 11 \rightarrow 95 \rightarrow 119 \rightarrow 123 \rightarrow 180$

Head Movements

Movement Distance

$50 \rightarrow 62$	12
$62 \rightarrow 64$	2
$64 \rightarrow 34$	30
$34 \rightarrow 11$	23
$11 \rightarrow 95$	84
$95 \rightarrow 119$	24
$119 \rightarrow 123$	4
$123 \rightarrow 180$	57

Total Head Movement = 236 tracks

3. LOOK Algorithm

Service Order

$50 \rightarrow 62 \rightarrow 64 \rightarrow 95 \rightarrow 119 \rightarrow 123 \rightarrow 180 \rightarrow 34 \rightarrow 11$

Head Movements

Movement	Distance
$50 \rightarrow 62$	12
$62 \rightarrow 64$	2
$64 \rightarrow 95$	31
$95 \rightarrow 119$	24
$119 \rightarrow 123$	4
$123 \rightarrow 180$	57
$180 \rightarrow 34$	146
$34 \rightarrow 11$	23

Total Head Movement = 299 tracks

4. C-LOOK (Circular LOOK)

Service Order

50 → 62 → 64 → 95 → 119 → 123 → 180 → 11 → 34

Head Movements

Movement Distance

50 → 62	12
62 → 64	2
64 → 95	31
95 → 119	24
119 → 123	4
123 → 180	57
180 → 11	169
11 → 34	23

Total Head Movement = 322 tracks