Modes of Transfer in Computer Organization

In Computer Organization, data transfer between the CPU, memory, and I/O devices can occur in different ways. These are called modes of transfer. The choice of mode depends on speed requirements, device capability, and CPU involvement.

1. Programmed I/O (Polling)

• CPU repeatedly checks the status of the I/O device.
• Simple but wastes CPU time because it keeps waiting.
• Example: Keyboard input where CPU checks each key press.

2. Interrupt-Driven I/O

• CPU continues execution until the device interrupts when ready.
• Efficient compared to polling as CPU is not kept busy.
• Example: Printer notifying CPU when ready for next data.

3. Direct Memory Access (DMA)

• A separate DMA controller transfers data directly between I/O and memory.
• CPU is free for other tasks, improving performance.
• Best suited for high-speed data transfer like disk or graphics.

4. Memory-Mapped I/O

• I/O devices are assigned unique memory addresses.
• CPU communicates with devices using normal read/write instructions.
• Easy to program but reduces memory address space.

5. Isolated I/O (Port-Mapped I/O)

• I/O devices use a separate address space.
• Special instructions (IN, OUT) are used.
• Keeps memory and I/O separate, but requires different instructions.

Conclusion: Each transfer mode has its advantages and disadvantages. - Programmed I/O is simple but inefficient. - Interrupt-driven I/O improves efficiency. - DMA is the fastest and best for bulk transfers. - Memory-mapped and isolated I/O differ in addressing method.