How the operating system manages computer hardware:

Operating systems work as an interface between the user and the computer hardware. It is a software which performs the basic tasks like input, output, disk management, controlling peripherals etc. Windows, Linux etc. are some examples of operating systems.

These are some important tasks of the OS by which it manages the system hardware efficiently, which are as follows.

1) **Memory management:**
2) **Device management**
3) **Processor management**
4) **File Management**
5) **I/O Management**
6) **Fans and Cooling**
7) **Networking**

Memory management:

Memory management refers to the management of the primary memory

- Each executing process resides in main memory.
- OS keeps track of memory,
- Allocates memory between processes,
- Deallocates the memory when the process does not require the memory.

Device management

OS can communicate between devices using drivers in order to use the devices efficiently the

- OS keeps track of devices
- Allocates these devices to different processes as per the request made by the processes.
- De-allocates these devices to different processes as per the request made by the processes.

Processor management

- Like memory and devices, managing the processor is one of the important tasks of an OS.
- It allocates the processor to different processes in main memory to do so the OS uses some scheduling algorithms also these are like First Come First Serve, Priority Scheduling, Shortest job first, etc.

File Management

The operating system also keeps track of the file system of a computer normally the file system is divided in directories which can be handled by the OS.

I/O

- I/O management is one of the important tasks of the operating system. OS manages the IO devices like mouse, keyboard, printer, display, LED's etc.
- I/O devices can be of two types which are as follows −
- **Synchronous I/O** − Here, the CPU waits for the i/o device
- **Asynchronous I/O** − Here, the CPU execution takes place parallel to the IO device.
- The operating system helps the processor in communicating to the IO devices. These communications are Special instruction I/O, Memory-mapped I/O, Direct memory access.

Fans and Cooling

- In a computer system, one of the important hardware components is the cooling system. The CPU fan helps the CPU from overheating. Overheating sometimes causes permanent damage to a CPU.
- The operating system plays role in communicating with both the CPU and the fan which helps to ensure that the system stays cool.

- This process is also done by the motherboard's internal controls, called the BIOS, and can be overwritten by applications running in the OS.

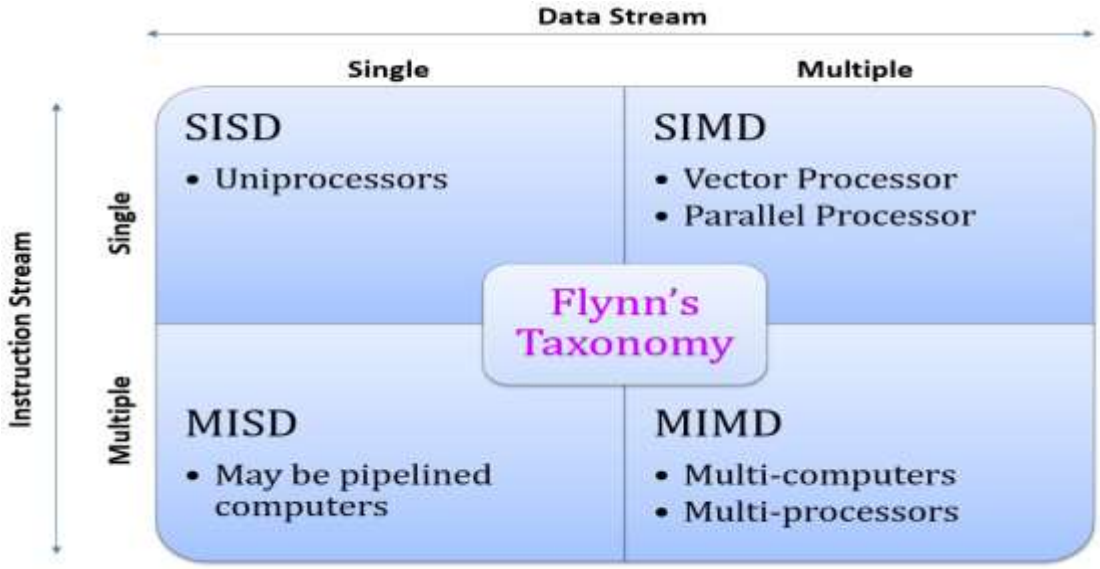
Networking

Networking plays an important role in distributed system environment where a group of processors can memory, hardware devices, or a clock. The processors communicate with one another with the help of the network only.

Flynn's Taxonomy:

Flynn's classic taxonomy (Flynn, 1966) depends on the number of control units and the multiple processors available in a computer. Flynn's introduced the following notion

SISD	Single instruction stream, single data stream
MISD	Multiple instruction streams, single data stream
SIMD	Single instruction stream, multiple data streams
MIMD	Multiple instruction streams, multiple data streams



Single Instruction Single Data (SISD):

In a SISD architecture, there is a single processor that executes a single instruction stream and operates on a single data stream. This is the simplest type of computer architecture and is used in most traditional computers.

Multiple Instruction Single Data (MISD):

In a MISD architecture, multiple processors execute different instructions on the same data stream. This type of architecture is not commonly used in practice, as it is difficult to find applications that can be decomposed into independent instruction

Single Instruction Multiple Data (SIMD):

In a SIMD architecture, there is a single processor that executes the same instruction on multiple data streams in parallel. This type of architecture is used in applications such as image and signal processing.

Multiple Instruction Multiple Data (MIMD):

In a MIMD architecture, multiple processors execute different instructions on different data streams. This type of architecture is used in distributed computing, parallel processing, and other high-performance computing applications.