

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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Lecture-6 By Vivek Dubey

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COMPUTER SCIENCE AND ENGINEERING

CS403PC

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

CS403PC

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Scheme of Operating System

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S. No.	Course Code	Course Title	L	T	P	Credits
3	CS403PC	Operating Systems	3	0	0	3
6	CS406PC	Operating Systems Lab	0	0	3	1.5

UNIT-1: *Operating System - Introduction*



- **Structures –**
 - Simple Batch, Multi-programmed, Time-shared,
- **Systems –**
 - Personal Computer, Parallel, Distributed Systems, Real-Time Systems
- **System components**
- **Operating System Services**
- **System Calls**

Computer Systems

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- ✓ Personal Computer
- ✓ Parallel System
- ✓ Distributed Systems
- ✓ Real-Time Systems

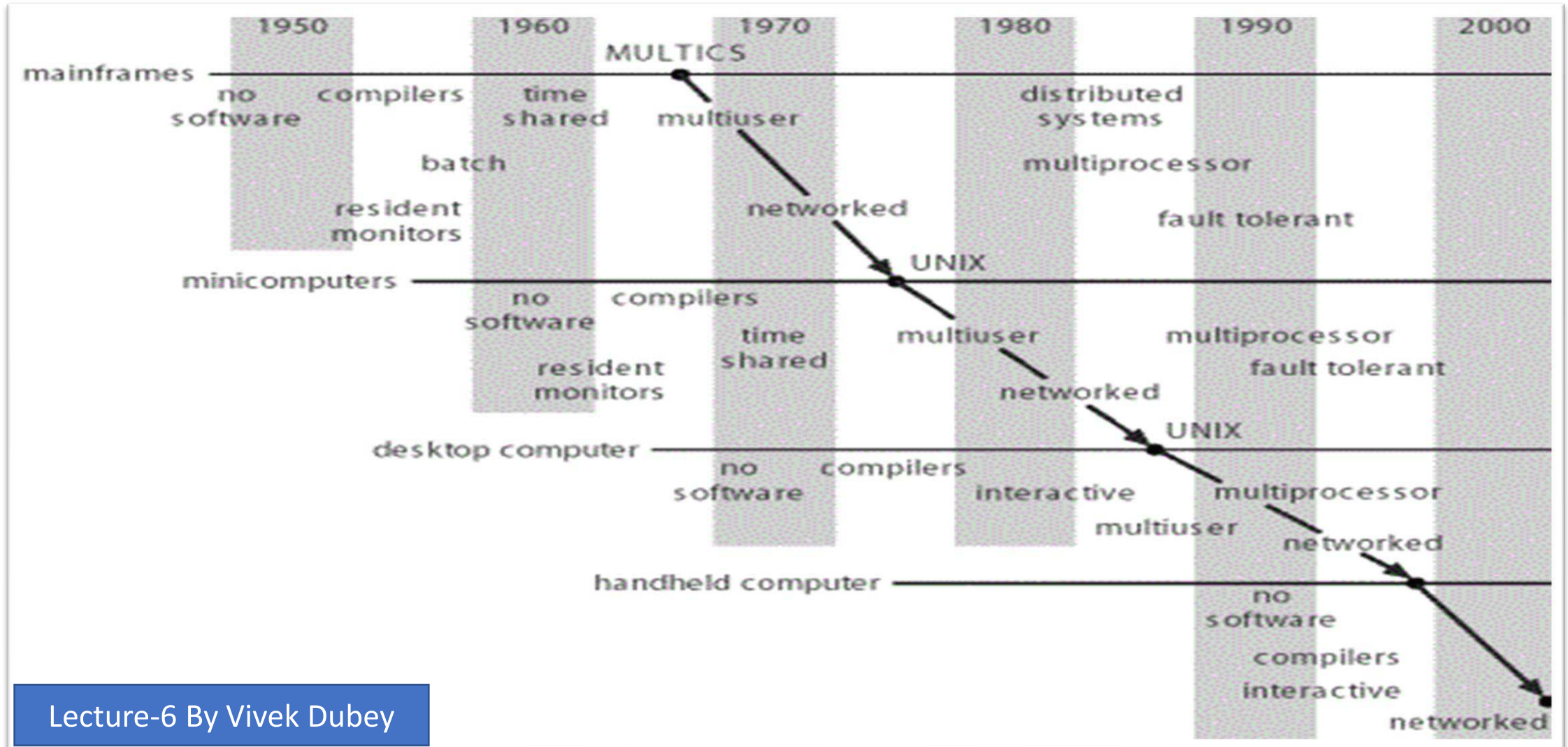
Personal Computer System

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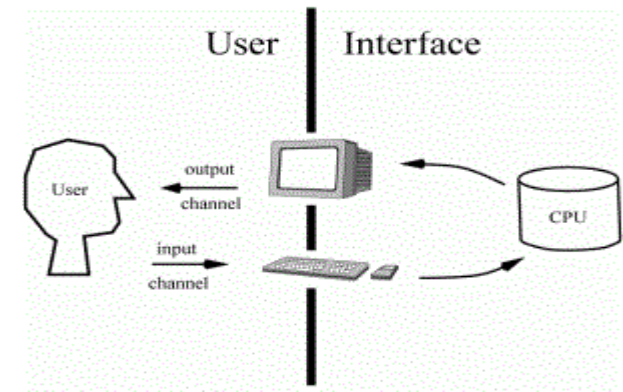
- Personal computers – computer system dedicated to a single user.
- I/O devices – keyboards, mice, display screens, small printers.
- User convenience and responsiveness.
- Can adopt technology developed for larger operating system often individuals have sole use of computer and do not need advanced CPU utilization of protection features.
- **Examples of single user operating system:**
 - There are some operating system examples like DOS, Windows 95, 97, 98. Also in mobile phone Symbian OS is single user OS

Migration of Operating-System Concepts and Features



Advantages of single user operating system

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- **Supports one user at a time:-**

- In these systems one user is only active at a time. So there will be no other user interfering with the applications. And in these systems all computer resources are used by a user requests.

- **Easy to maintain:-**

- These systems uses less resources and complexity of them is less so it is easy to maintain and debug. In multi user operating system there are higher resources needed and resources are in use most of time.

- **Less chance to damage:-**

- These system includes less requests to hardware and software at a time so they have less chance to damage. These system not make higher load time also.

- **Concentrate on one task:-**

- In modern operating system there are running multiple tasks at a time. Like many applications and tasks are running at a time but in single user OS only one task run at a time. So these systems are sometimes give less output result at a time.

Disadvantages of single user operating system

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- Tasks take longer time to complete:-

- As you know if no multiple tasks run at a time then many tasks are waiting for the CPU. This will make system slow and response time is higher. So these systems response to processes at higher time.

- Idle time is higher:-

- If only one task is running and this task don't require memory or I/O use then these devices remain idle. But other tasks need those devices. So only one task run at a time then other tasks have to wait till first task is finished. So CPU, memory and disk I/O not used properly.

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Parallel Systems



- Multiprocessor systems with more than one CPU in close communication.
- Tightly coupled system – processors share memory and a clock;
- Communication usually takes place through the shared memory.

- **Advantages of parallel system:**

- Increased throughput
- Economical
- Increased reliability
 - graceful degradation
 - fail-soft systems

Graceful degradation is the ability of a computer, machine, electronic system or network to maintain limited functionality even when a large portion of it has been destroyed or rendered inoperative.

A fail-soft system is a system designed to shut down any nonessential components on the computer in the event of a failure.

Contd..

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- Disadvantages of parallel system
 - Programming to target Parallel architecture is *a bit difficult.*
 - Various code modification has to be performed for *different target architectures for improved performance.*
 - Power consumption is huge by the *multi core architectures.*
 - Also, better cooling technologies are required in case of *clusters.*

Parallel Systems (Cont.)

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Symmetric multiprocessing (SMP)

- Each processor runs an identical copy of the operating system.
- Many processes can run at once without performance deterioration.
- Most modern operating systems support SMP

Asymmetric multiprocessing

- Each processor is assigned a specific task; master processor schedules and allocates work to slave processors.

According to Flynn's Classification

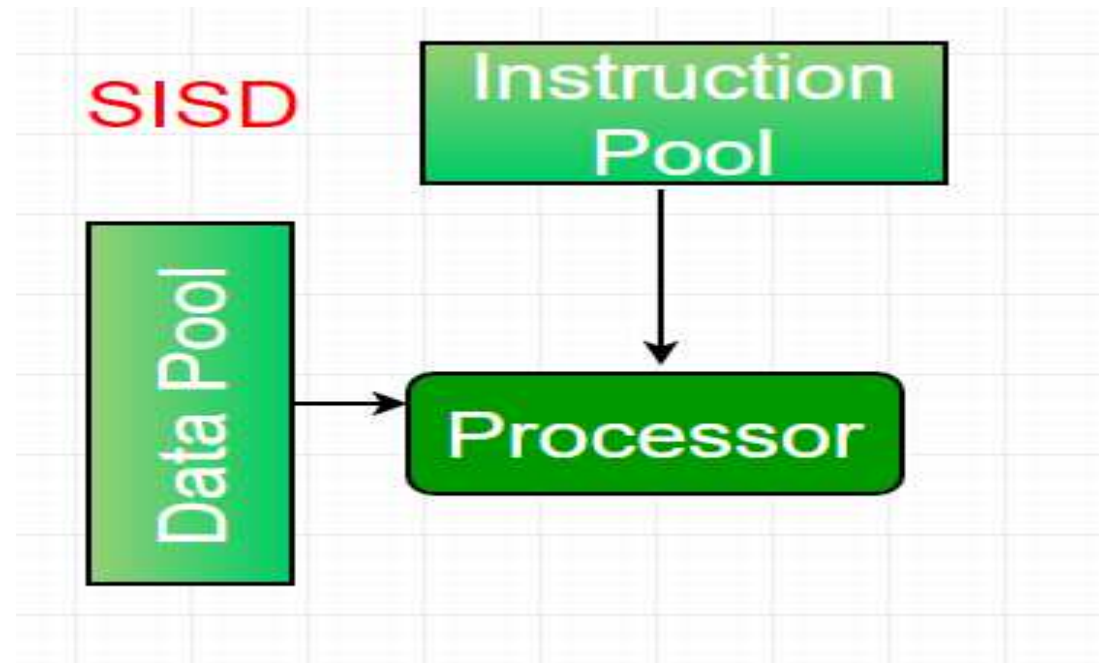
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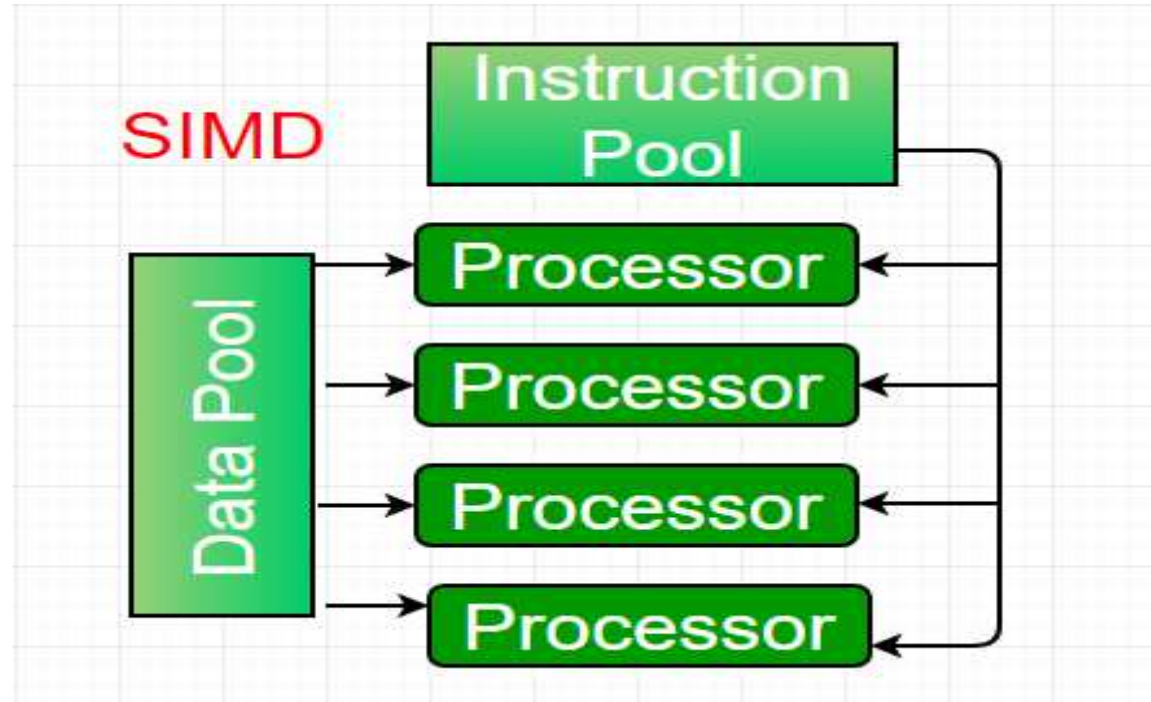
- Based on the number of *instruction* and *data* streams that can be processed simultaneously, computing systems are classified into four major categories:
 - Single-instruction, single-data (SISD) systems
 - Single-instruction, multiple-data (SIMD) systems
 - Multiple-instruction, single-data (MISD) systems
 - Multiple-instruction, multiple-data (MIMD) systems

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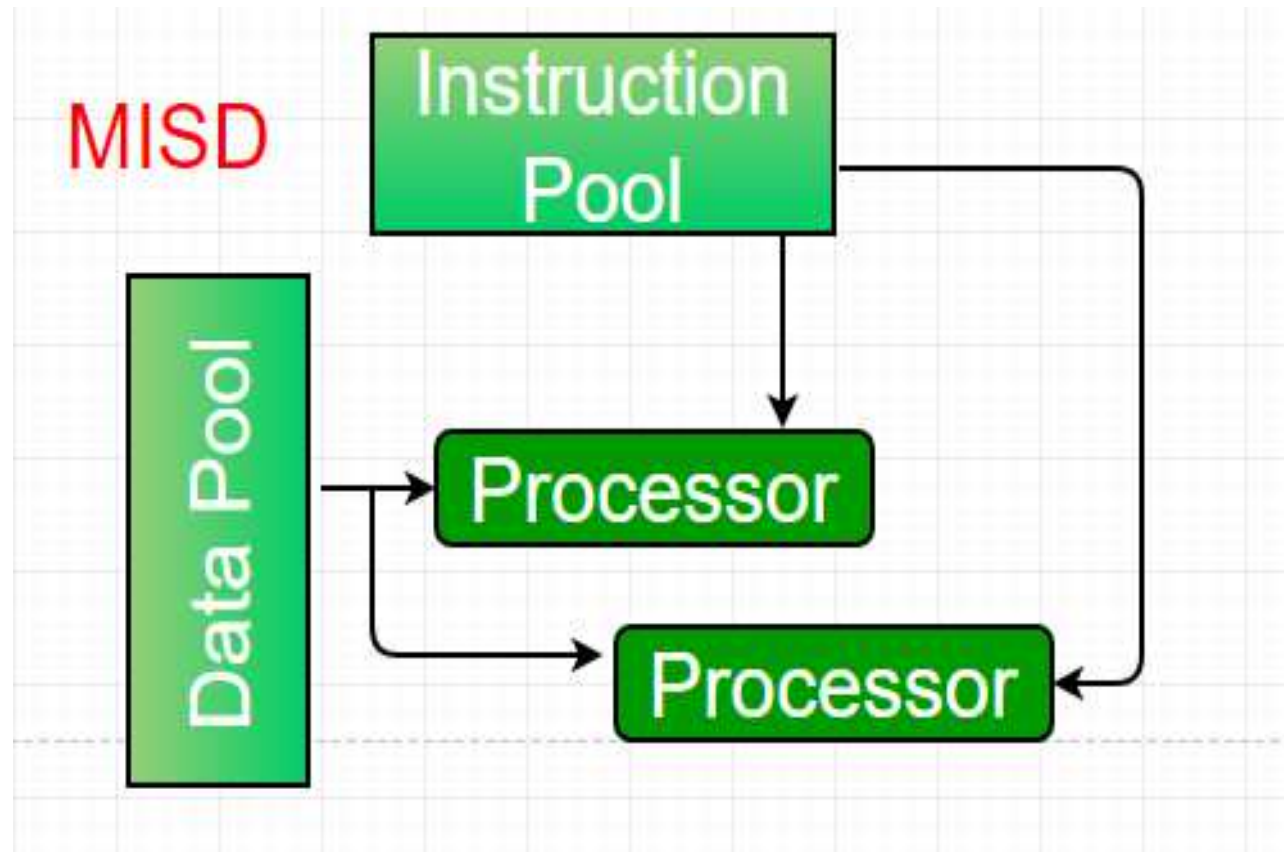
Single-instruction, single-data (SISD) systems



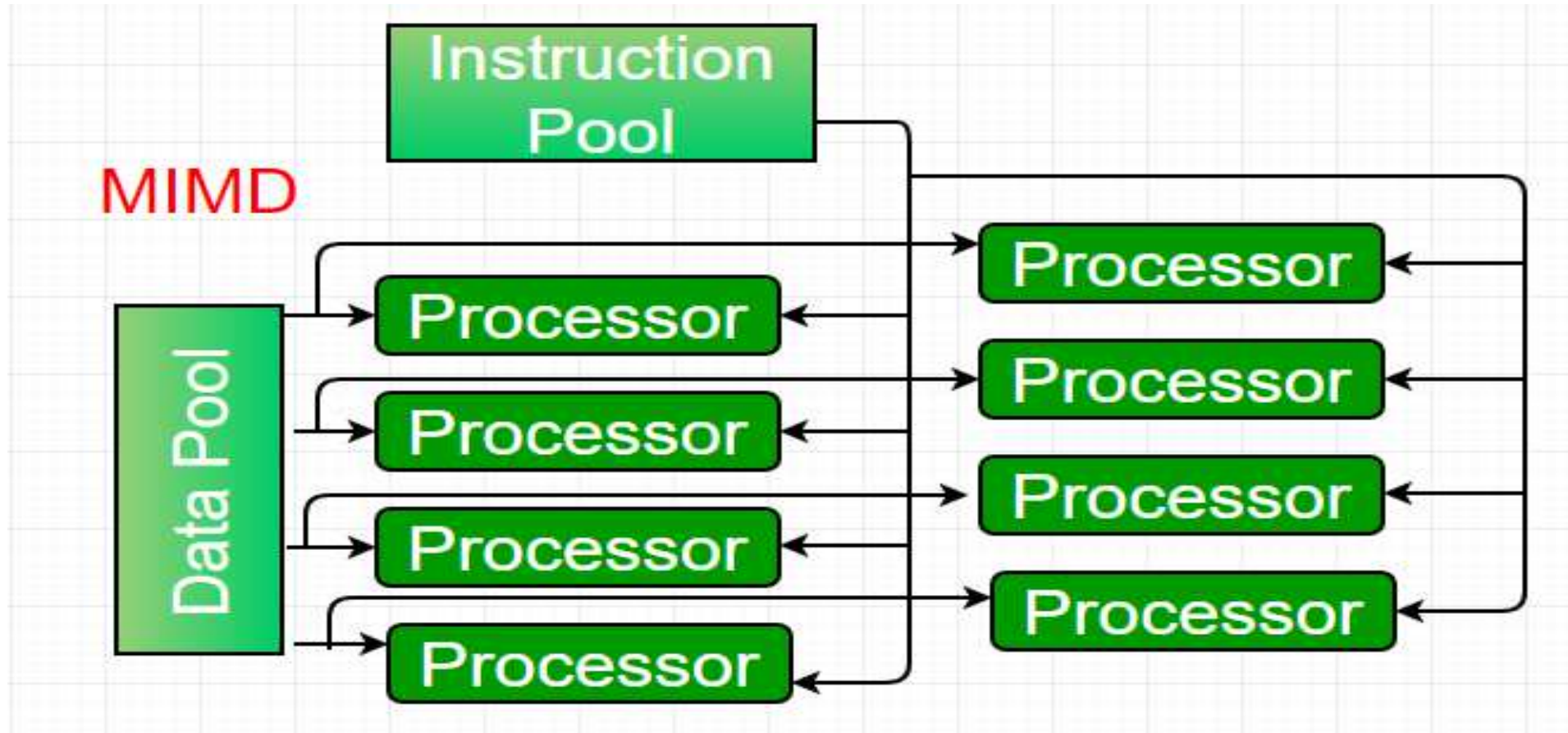
Single-instruction, multiple-data (SIMD) systems



Multiple-instruction, single-data (MISD) systems



Multiple-instruction, multiple-data (MIMD) systems



Real-Time Systems

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- Often used as a **control device in a dedicated application** such as controlling scientific experiments, medical imaging systems, industrial control systems, and some display systems.
- Well-defined fixed-time constraints.
- **Hard real-time system**
 - Secondary storage limited or absent, data stored in shortterm memory, or read-only memory (ROM)
 - Conflicts with time-sharing systems, not supported by general-purpose operating systems.
- **Soft real-time system**
 - Limited utility in industrial control or robotics
 - Useful in applications (multimedia, virtual reality) requiring advanced operating-system features.

Advantages and Disadvantages of real time system



Advantages

- Priority Based Scheduling
- Abstracting Timing Information
- Maintainability/Extensibility
- Modularity
- Promotes Team Development
- Easier Testing
- Code Reuse
- Improved Efficiency

Disadvantages

- Limited Tasks
- Use Heavy System resources
- Complex Algorithms
- Device driver and interrupt signals
- Thread Priority

Contd..

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- **Limited Tasks**

- Very few tasks run at the same time and their concentration is restricted to few applications to avoid errors

- **Use Heavy System resources**

- Sometimes the system resources are not efficient and can be quite expensive

- **Complex Algorithms**

- The Algorithms are very complex and can create difficulties for developers when trying to edit the Algorithm.

- **Device driver and interrupt signals**

- It needs specific device drivers and interrupt signals in order for it to respond to interrupts at its earliest opportunity.

- **Thread Priority**

- It is not good to set thread priority as these systems are less prone to switching tasks.

Distributed Systems

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- Distribute the computation among several physical processors.
- Loosely coupled system – each processor has its own local memory; processors communicate with one another through various communications lines, such as high-speed buses or telephone lines.

Advantages of distributed systems.

- Resources Sharing
- Computation speed up – load sharing
- Reliability
- Communications

Disadvantages of Distributed Systems

- It is difficult to provide adequate security in distributed systems because the nodes as well as the connections need to be secured.
- Some messages and data can be lost in the network while moving from one node to another.