

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

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Lecture-20 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-2:

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- **Process and CPU Scheduling –**
 - Process concepts and scheduling, Operations on Processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, **Multiple-Processor Scheduling**.
- **System call interface for process management–**
 - fork, exit, wait, waitpid, exec

Define Multiple-Processor Scheduling



- In single processor scheduler, there is a one available and in multiple processor scheduling, there are multiple CPUs are available.
- In single processor scheduling, load sharing is not possible but in multiple scheduling becomes possible.
- Multiple processor scheduling is more **complex** as compared to single processor scheduling, because as there is more than one CPU which must be always kept busy and in effective use.

Define Multiple-Processor Scheduling



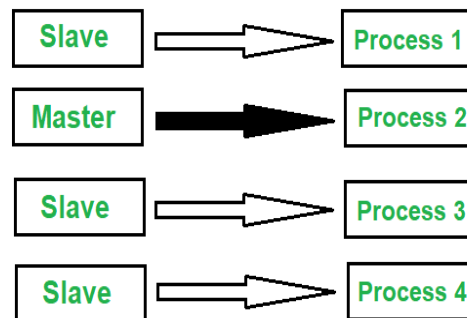
- Multi-processor systems may be
 - Heterogeneous Multi-Processor System
 - Homogenous Multi-Processor System
- Heterogeneous Multi-Processor System
 - In this system, there may be different kinds of CPUs.
- Homogenous Multi-Processor System
 - In this system, there are similar kinds of CPUs.

Approaches to Multiple-Processor Scheduling

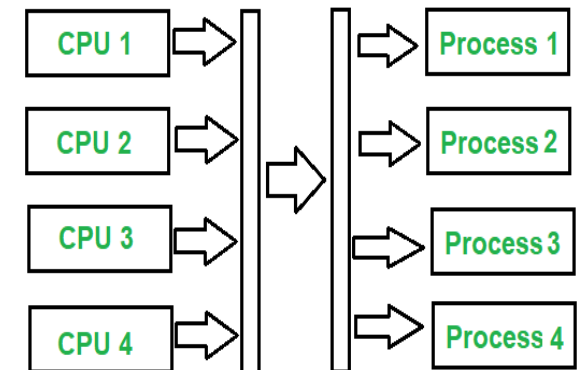


- Asymmetric multiprocessing: One processor is the master, controlling all activities and running all kernel code, while the other runs only user code.
- Symmetric multiprocessing (SMP): Each processor schedules its own jobs, either from a common ready queue or from separate ready queues for each processor.

Asymmetric Multiprocessing



Symmetric Multiprocessing



Processor Affinity

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- Processor affinity means you can specify which processor(s) a given process or thread should run on.
- If the process migrates to another processor the contents of cache memory invalidated for the first processor, and the cache for the second processor must be repopulated.
- However, there is high cost due to mig
- There are two different variations of processor affinity ration:
 - Soft Affinity
 - Hard Affinity

Contd..

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- Soft affinity - OS will attempt to keep a process running on the same processor, however there is no guarantee.
- Hard affinity - OS will force a process to continue running on the same processor.

Load Balancing

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- It keep the workload balanced among all processors to fully utilize the available processors.
- Two approaches to load balancing –
 - Push migration - a specific task periodically checks the load on each processor and rebalances the load if necessary.
 - Pull migration - an idle processor can pull waiting tasks from a busy processor.

Multicore Processors

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- Recently, the architectural trend is to place multiple processor cores on same physical chip –
 - Faster and consume less power than system where each processor has its own physical chip
- A quad-core processor with two threads per core appears as 8 processors to the operating system
 - $4 \text{ physical processors} \times 2 \text{ hardware threads} = 8 \text{ logical processors}$