Module 12

Operating System

Module Twelve

- Operating System - Part Three
- In this presentation, we are going to talk about :

  Process Scheduling

  I/O Supervision

Overview

- Previously we talked about:

  Basic Operating System Functions

  Components

  Interrupt Processing

  Now: Process Scheduling

  I/O Supervision

What is a Process

- Also called a Task, is most often simply, a program in execution.
- Some Operating Systems allow programs to create sub-programs as separate processes.
- Some programs are written to divide into Threads. The same code processing on different data sets. Each Thread is a process.

Process Management

- Process management lies at the heart of operating system services.
- The operating system
  - Creates **Processes**,
  - Schedules their access to resources,
  - Deletes **Processes**, and
  - De-allocates resources that were allocated during execution.
- The operating system monitors the activities of each **Process** to avoid synchronization problems that can occur when **Processes** use shared resources.
- If **Processes** need to communicate with one another, the operating system provides the services.

Process Scheduling

- The operating system schedules **Process** execution.
- First, the operating system determines which **Process** shall be granted access to the CPU.

  This is ***long-term scheduling***.
- After a number of **Processes** have been admitted, the operating system determines which one will have access to the CPU at any particular moment.

  This is ***short-term scheduling***.
- ***Context switches*** occur when a **Process** is taken from the CPU and replaced by another **Process**.

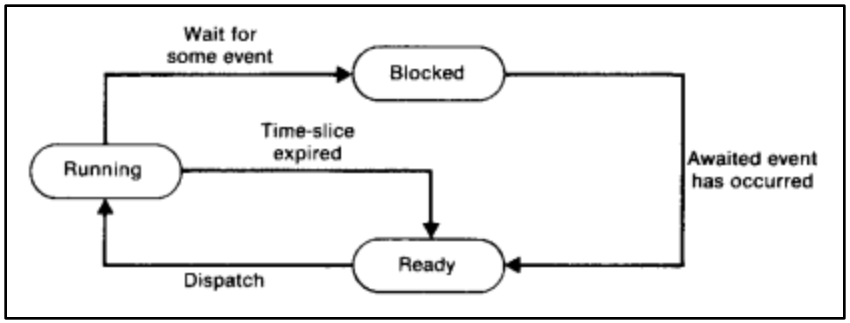
  Information relating to the state of the **Process** is preserved during a ***context switch***.

Process Scheduling (continued)

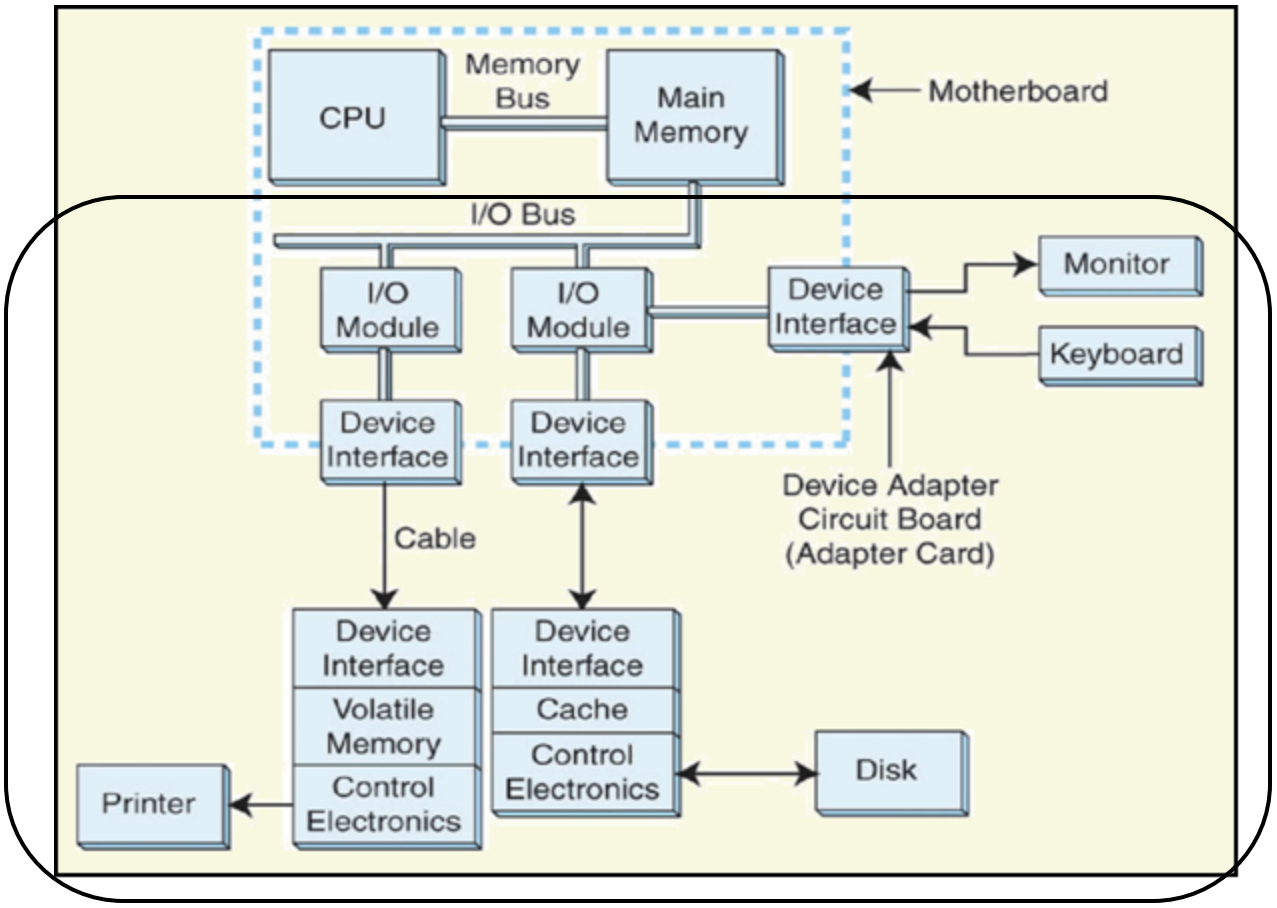
- Short-term scheduling can be ***nonpreemtive*** or ***premptive***.
- In ***nonpreemptive*** scheduling, a process has use of the CPU until either it terminates, or must wait for resources that are temporarily unavailable.
- In ***preemptive*** scheduling, each process is allocated a ***timeslice***. When the ***timeslice*** expires, a ***context switch*** occurs.
- A ***context switch*** can also occur when a higher priority process needs the CPU.

Processes Summary

- DISPATCHING
- Process Status Block
  - Process State: Running
  - Blocked
  - Ready
  - Register Storage
  - Resources used / held
- Select Next Process
  - Round Robin
  - Priority Scheme
  - PreEmtive



I/O Configuration



I/O Supervision

- Very Simple Machine

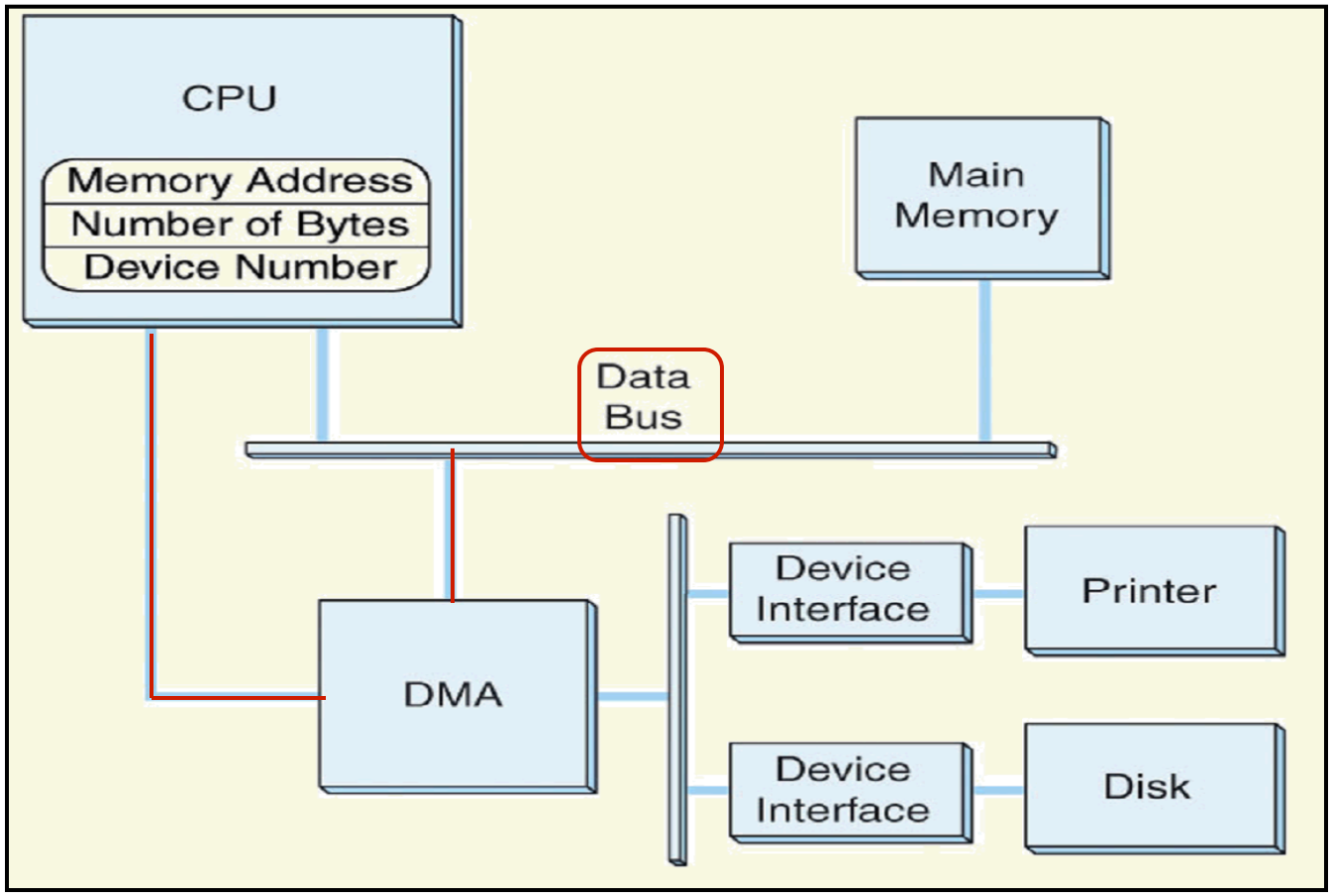
  Program controlled
  one byte at a time
  loop: test, read data, wait
  code is part of the Operating System or user program

I/O Supervision

- Program controlled
  - Control register assigned to each device. Operating System polls, checks, for changed status.
- Interrupt Driven
  - I/O started, and an interrupt sent at completion of each step.
- DMA
  - I/O started, DMA process monitors, interrupt at completion.
- I/O Channel
  - Special dedicated hardware monitors and controls.

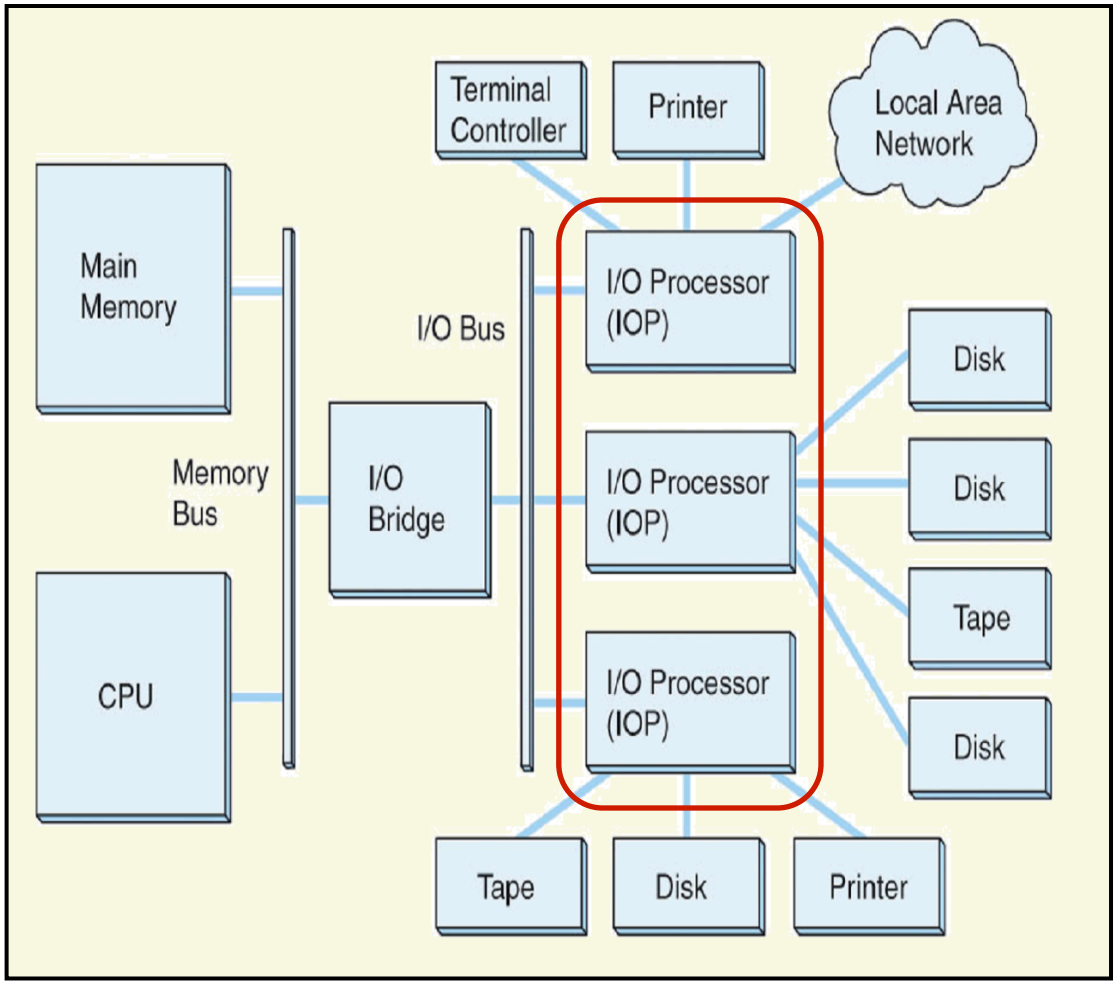
Direct Memory Access - DMA

- Note: the connections of DMA Processor with CPU and Main Memory
- CPU provides command information, DMA does work, sends interrupt when completed.



I/O Channel

- Used by more complex main frame machines and servers
- The I/O Processor (IOP) is a special purpose hardware processor that can manage all the details of the data movement.
  - Bus usage
  - Device protocols
  - Error recovery
  - Data buffering



I/O Channels

- User requests input or output help from the Operating System
  - Syscall , for example
- User waits for I/O to complete
- User code ‘Channel Program’ - directives to I/O Channel Processor
- Error Recovery done by I/O Channel Processor
  - Disc errors
  - Printer alerts

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Summary

- Process Scheduling
- I/O Supervision

- Next: Memory Management