Master of Computer Applications

CAPOL403R01: Computer Organization & Architecture

Unit V: Lecture 7
External Interconnection Standards

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External interconnection standards

- **Universal Serial Bus (USB)**
  - USB 1.0 defined a *Low Speed* data rate of 1.5 Mbps and a *Full Speed* rate of 12 Mbps
  - USB 2.0 provides a data rate of 480 Mbps
  - USB 3.0 includes a new, higher speed bus called *SuperSpeed* in parallel with the USB 2.0 bus
  - The data rate of Super-Speed is up to 4 Gbps
  - The most recent specification is USB 3.1, which has *SuperSpeed+*
  - This transfer mode achieves a theoretical data rate of 9.7 Gbps.
  - USB system is controlled by a root host controller,
    - It creates a local network with a hierarchical tree topology

External interconnection standards

- **Fire wire serial bus**
  - FireWire uses a daisy-chain configuration, with up to 63 devices connected off a single port.
  - Hot plugging is used
    - It is connecting and disconnecting peripherals without having to power the computer system down or reconfigure the system.
  - FireWire provides for automatic configuration
    - it is not necessary manually to set device IDs or to be concerned with the relative position of devices.
  - The physical layer defines the permissible transmission media and the electrical and signalling characteristics of each.
    - Data rates from 25 Mbps to 3.2 Gbps are defined.
  - The link layer describes the transmission of data in the packets
  - The transaction layer defines a request–response protocol that hides the lower- layer details of FireWire from applications

External interconnection standards

- **Small Computer System Interface (SCSI)**
  - The physical organization of SCSI is a shared bus
  - It can support up to 16 or 32 devices
  - The bus provides for parallel transmission
    - Bus width: 16 bits (earlier generations) or 32 bits (later generations)
- **Thunderbolt**
  - The technology combines data, video, audio, and power into a single high-speed connection for peripherals
- **InfiniBand**
  - The standard describes an architecture and specifications for data flow among processors and intelligent I/O devices
  - InfiniBand enables servers, remote storage, and other network devices to be attached in a central fabric of switches and links

External interconnection standards

- **PCI Express**
  - PCI Express is a high-speed bus system for connecting peripherals of a wide variety of types and speeds
- **SATA**
  - Serial ATA (Serial Advanced Technology Attachment) is an interface for disk storage systems
  - It provides data rates of up to 6 Gbps
  - It provides a maximum data rate of 300 Mbps *per device*
  - SATA is widely used in desktop computers, and in industrial and embedded applications.

External interconnection standards

- **Ethernet**
  - With a bus system, all of the attached devices, connect to a common coaxial cable
  - As technology has advanced, Ethernet has moved from bus-based to switch-based
    - There is a central switch, with all of the devices connected directly to the switch
- **Wi-Fi**
  - Wi-Fi is the predominant wireless Internet access technology, used in homes, offices, and public spaces
  - Wi-Fi in the home now connects computers, tablets, smart phones, and a host of electronic devices, such as video cameras, TVs, and thermostats.
  - Wi-Fi in the enterprise has become an essential means of enhancing worker productivity and network effectiveness.
  - Public Wi-Fi hotspots have expanded dramatically to provide free internet access in most public places

Thank you