8.1 Communicating with Devices-Reading

Notebook:	How Computers Work [CM1030]		
Created:	2019-10-09 10:09 AM	**Updated:**	2019-11-20 4:29 PM
Author:	SUKHJIT MANN		

Cornell Notes	**Topic:** 8.1 Communicating with Devices-Reading	Course: BSc Computer Science
		Class: How Computer Work [CM1030]-Lecture
		Date: November 20, 2019

Essential Question:

What are peripherals and the various technologies that make their use possible?

Questions/Cues:

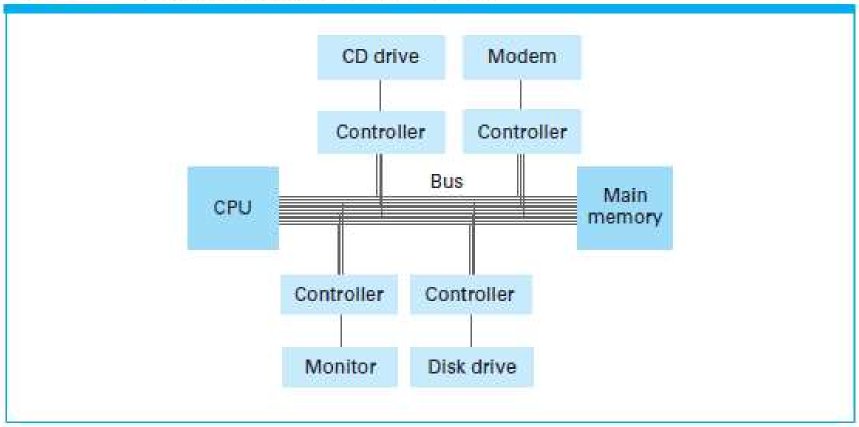
- What is Controller?

- What is USB/FireWire?
- What is Memory mapped IO?
- What is DMA?
- What is Handshaking?
- What is Serial/Parallel Communication?
- What is Multiplexing?

Notes

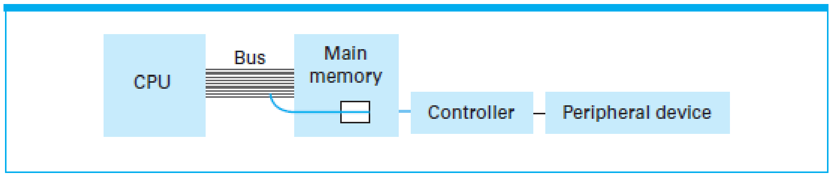
- Controller = handles comms between comp and other devices, may consist of circuitry permanently mounted on comp's mobo(motherboard) or it may take form of board that plugs into slot on mobo.
  - connects via cables to peripherals devices within case or perhaps to connector called a port on back of comp where external devices can be attached
  - sometimes each with own memory circuitry and simple CPU which performs program directing activities of controller
  - Each controller comms with comp itself by means of connections to same bus that connects CPU & Main memory. Like this controller can monitor signals between CPU & Main memory & inject its own

Figure 2.13 Controllers attached to a machine's bus



- USB(Universal Serial Bus)/Firewire = single controller to handle a variety of devices
- Memory-mapped IO = memory locations assigned to controller and peripherals, Comp's IO devices appear as memory address
    - Comp interacts directly with via memory address; main memory ignores this

Figure 2.14 A conceptual representation of memory-mapped I/O



- DMA (Direct Memory Access) = ability of controller to communicate directly with main memory with interact of CPU, which frees up CPU for other tasks
    - DMA also has effect of complicating communication over comp's bus since the data between CPU & Main memory, CPU & each controller and between each controller & main memory. Coordination of activity is major design issue as CPU & controller compete for bus access.
    - DMA impediment known as von Neumann bottleneck because it a consequence of underlying von Neumann architecture in CPU fetches instructions from memory over central bus
- Handshaking = comp & peripheral device exchange info about device's status & coordinate their activities
    - involves status word, a bit pattern that is generated by peripheral device & sent to controller. Status word is bit map in which bits reflect conditions of device
- Parallel Communication = several signals are transferred at the same time, each on separate "line"
    - Capable of transferring data fast but requires relatively complex comms path
- Serial communication = transferring signals one after the after over single line
    - requires single path for comms, this why is popular over parallel comms
- Rate at which bits are transferred from one computing component to another is measured in bits per second (bps)
    - Kbps (Kilo-bps, 1000 bps), Mbps(mega-bps = 1 millions bps) and Gbps(giga-bps = 1 billion bps)
    - Note distinction between bits and bytes 8 Kbps = 1 KB per second. Lower case b means bit whereas an uppercase B means byte
- Multiplexing = encoding or interweaving of data so that single comm path serves the purpose of multiple paths
- High bandwidth means comm path has the ability to transfer bits at high rate as well as capacity to carry large amounts of info simultaneously

Summary

In this week, we learned about peripherals or external devices connected to the computer outside its core mechanism and the various technologies that go into making connections with external devices possible.