Computer Fundamentals

Lecture 6

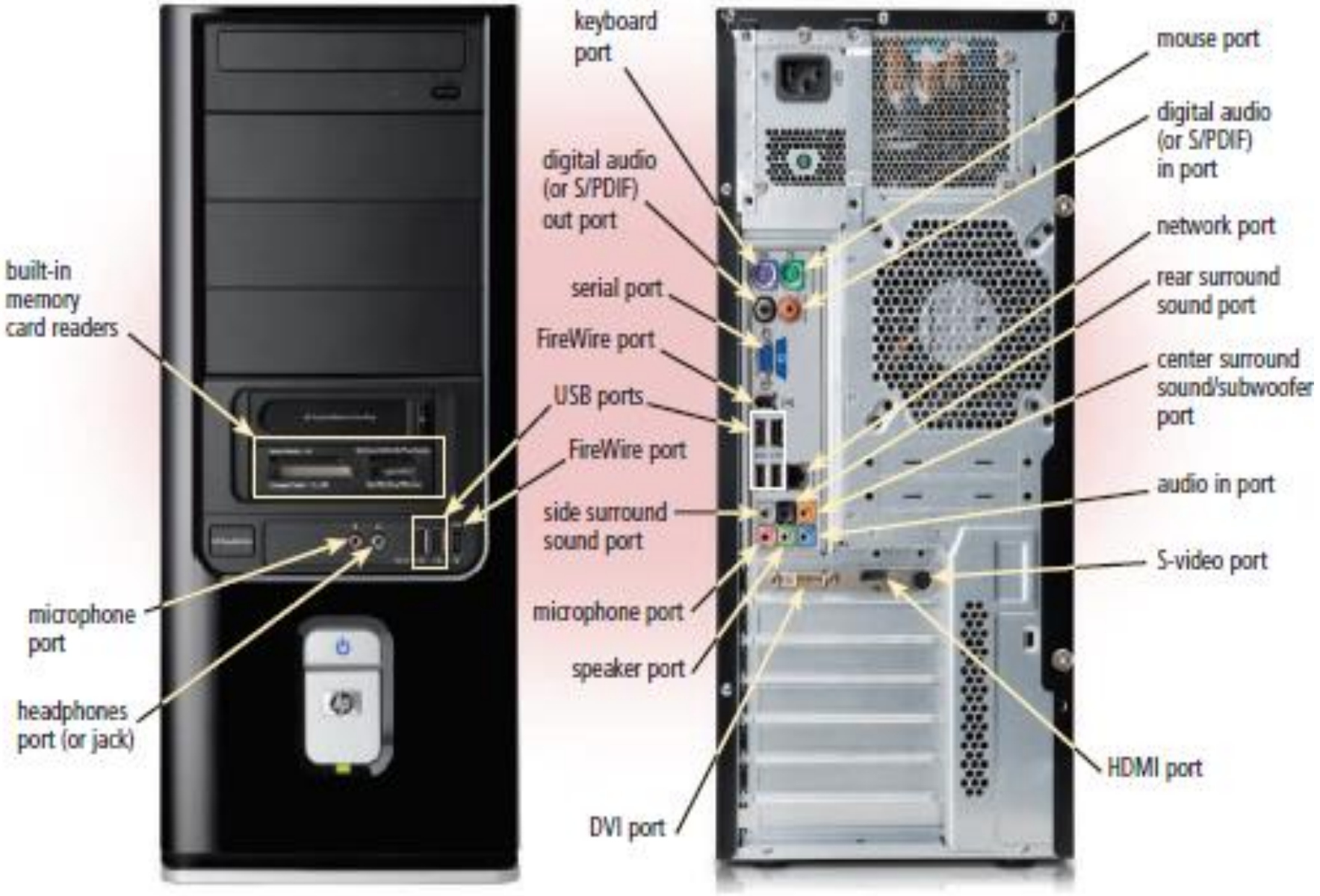
Ports and Connectors

Ports in Motherbord

Ports and Connectors

A **port** is the point at which a external device attaches to or communicates with a system unit (sometimes referred to as a **jack**)

A **connector** joins a cable to a port


built-in memory card readers
microphone port
headphones port (or jack)
keyboard port
digital audio (or S/PDIF) out port
serial port
FireWire port
USB ports
FireWire port
side surround sound port
microphone port
speaker port
DVI port
mouse port
digital audio (or S/PDIF) in port
network port
rear surround sound port
center surround sound/subwoofer port
audio in port
S-video port
HDMI port

USB Port

- A **USB port**, short for **universal serial bus** port.
- It can connect up to 127 different Devices together with a single connector.
- Devices that connect to a USB port include the following: mouse, printer, digital camera, scanner, speakers … etc.

Types of USB Port

- There are different types of USB connectors. They come in different shapes, sizes and speed.
- There are different versions of USB according to their data transfer speeds.:
  - **USB 1.0** (1996)
  - **USB 2.0** (2001)
  - **USB 3.0** (2011)
    - **USB 3.1** (2014)
    - **USB 3.2** (2017)
  - **USB 4.0** (2019)

Types of USB

Connectors	USB 1.0	USB 2.0	USB 3.0	USB 3.1	USB 3.2	USB 4
Data rate	**1.5 Mbit/s** (Low Speed) **12 Mbit/s** (*Full Speed*)	**1.5 Mbit/s** (Low Speed) **12 Mbit/s** (Full Speed) **480 Mbit/s** (High Speed)	**5 Gbit/s** (SuperSpeed)	**10 Gbit/s** (SuperSpeed+)	**20 Gbit/s** (SuperSpeed+)	**40 Gbit/s** (SuperSpeed+)

Data rate for USB

Types of USB Cables

The types of USB Cable

- USB **type A**
- USB **type B**
- USB **type C**
- USB **Mini**
- USB **Micro-A**
- USB **Micro-B**

USB 3.0 **– type A**

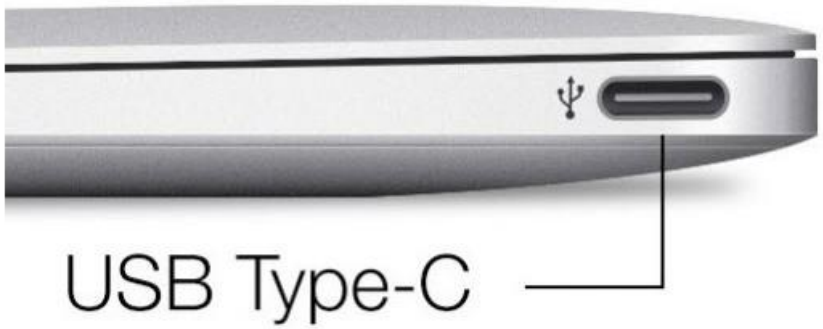
USB 3.0 - **type B**

USB 3.0 **type C**

Types of USB Cables

USB 3.0 **Micro-B**

USB 2.0 **Micro-A**



Know Color Coding Of USB Ports

USB Color Convention

USB 1.0	White	
USB 2.0	Black	
USB 3.0	Blue	
USB 3.1	Teal	
	Yellow	
Sleep or standby Charging capable	Red	
	Orange	

USB hub

- To attach multiple devices using a single port, you can use a **USB hub**.

Video Connectors

- **There are many types of Video connectors such as**
  - **VGA -** Video Graphics Array
  - **DVI -** Digital Visual Interface
  - **HDMI -** High-Definition Multimedia Interface

Video Connectors

- **VGA**
  - Stand for **Video Graphics Array** (VGA)
  - First introduced in 1987 by IBM
  - The 15-pin VGA connector was provided on many video cards, computer monitors, laptop computers and projectors.
- **DVI**
  - Digital Visual Interface (DVI) was introduced in 1999.
  - It's the first widely used digital video standard for computers, but it also supports analog signals

VGA

DVI connector

Video Connectors

- **HDMI**
  - High-Definition Multimedia Interface (HDMI)
  - It was introduced in 2002
  - it used to transmit digital **video** and **audio** signals between electronic components
  - it's a great, fast and reliable connector
  - HDMI Versions:
    - **HDMI 1** (2002) has a data rate of 4.95 Gbps
    - **HDMI 2.0** (released in 2013) has a data rate of 18 Gbps
    - **HDMI 2.1** (2017) has a data rate of 48 Gbps

FireWire Ports

- **FireWire port** is similar to a USB port in that it can connect multiple types of devices that require faster data transmission speeds, such as digital video cameras, digital VCRs, color printers, scanners, digital cameras, and DVD drives, to a single connector.

FireWire Ports

FireWire Port

Ethernet Port

- This port allows your computer to interact or communicate with other computers and networking devices where Ethernet networking is required
- The connector of this port known as **RJ-45**.

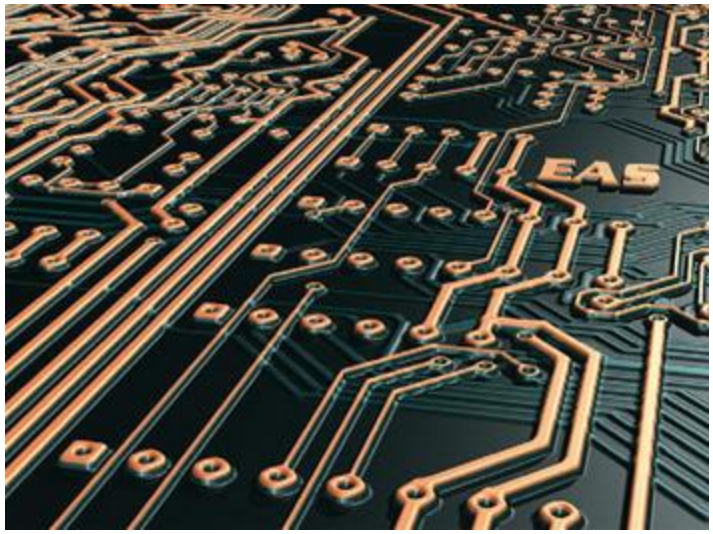
Ethernet Port

Bluetooth

- **Bluetooth Port Bluetooth** technology uses radio waves to transmit data between two devices.
  - Bluetooth devices have to be within about 33 feet of each other.

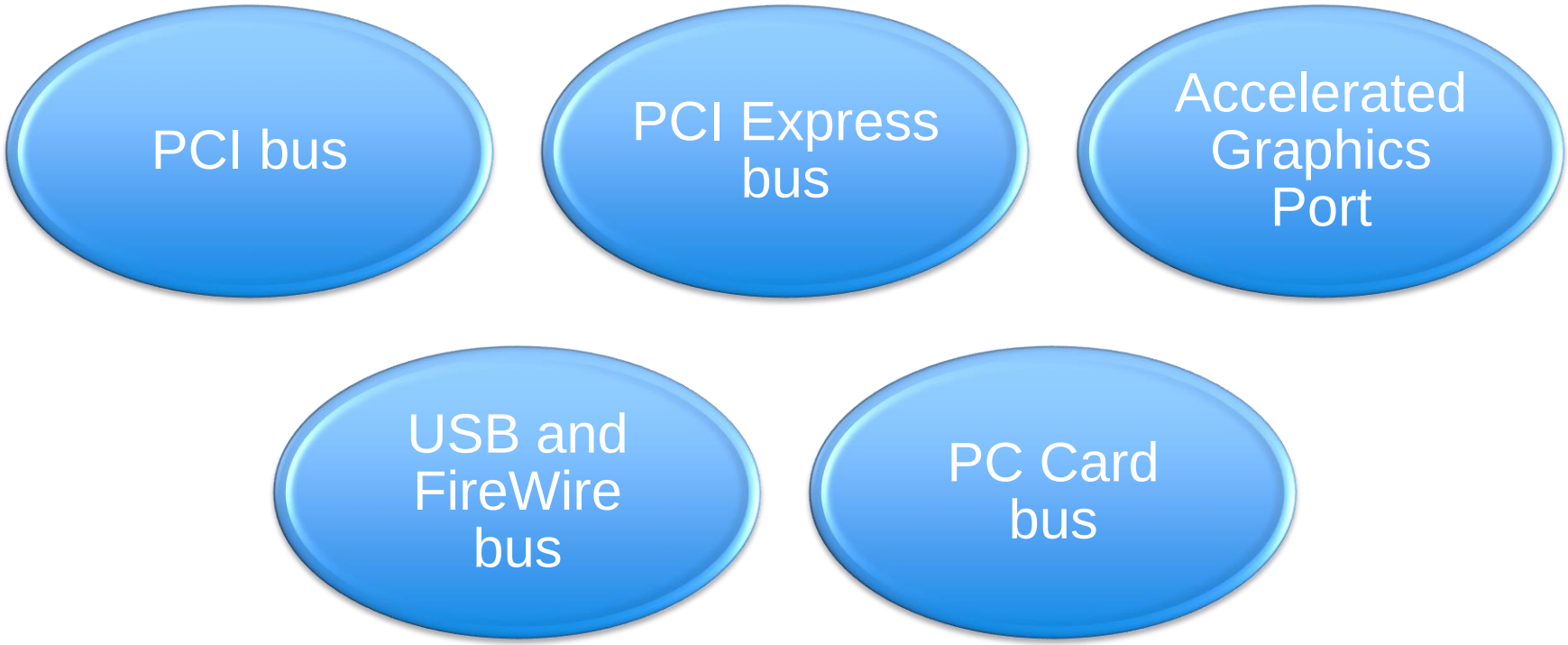
Buses

- Information travels between components on the motherboard through wires called ***internal buses*** or just ***buses***.
  - Typically the bus width is 32bit or 64bit (data paths)
- Buses: Bridges between processor and RAM.
- Bus speed is one of the most important factors in determining a computer's performance!!
- Buses connect to:
  - Storage devices in bays
  - Expansion slots
  - External buses and ports



Buses

- Expansion slots connect to expansion buses
- Common types of expansion buses include:



Buses - clock speed

- Every bus also has a **clock speed**.
- Just like the processor, manufacturers state the clock speed for a bus in hertz.
- One Megahertz (MHz) is equal to one million ticks per second.
- Today's processors usually have a bus clock speed of 400, 533, 667, 800, 1066, 1333, or 1600 MHz

Power Supply

The **power supply** converts the wall outlet AC power (220v) into DC power (5-15v)

التيار المستمر

- Note: Computer components require **Direct Current (DC)** power, whereas the electrical power systems across the world provide **Alternating Current (AC)**.

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Power Supply

AC adapters

A desktop power supply

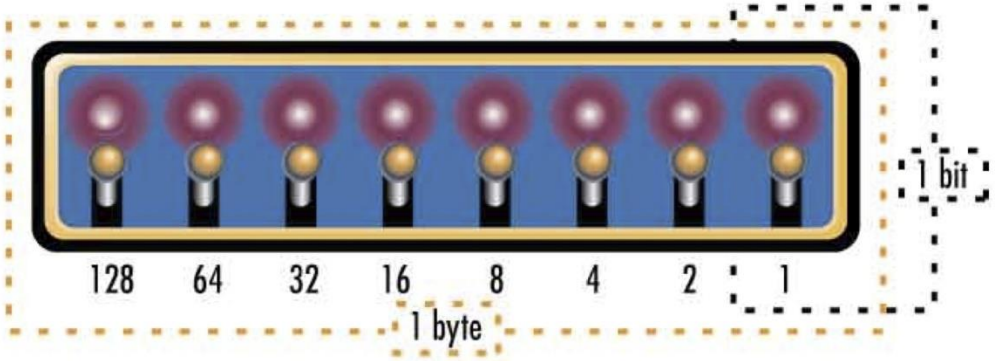
Desktop computers use power supply units
Notebooks and handhelds use AC adapters

How do computer circuits manipulate data?

- ALL computers are electronic, digital devices
  - **Digital devices** work with discrete data, such as digits 1 and 0, or like a light switch – on or off
- These 1s and 0s are referred to as *bi*nary dig*its* or shortened to ***bits***
- Computers use sequences of bits to digitally represent numbers, letters, punctuation marks, music, pictures, and videos

Bit Basics

- ***Bit:*** From **B**inary dig**it**
  - Smallest unit of information computer can process
  - Can have one of two values: 0 or 1
- ***Byte***
  - Collection of 8 bits
  - Can represent 256 different messages ($256 = 2^8$)



Bits as Numbers

- Denotes all numbers with combinations of 0s and 1s
- Decimal numbers automatically converted to binary
- Binary number processing hidden from user

Decimal	Binary	Decimal	Binary
0	0000	5	0101
1	0001	6	0110
2	0010	7	0111
3	0011	8	1000
4	0100	9	1001

Bits as Codes

- Codes represent each letter, digit, and special character
- ***ASCII:*** Most widely used
  - Each character is a unique 8-bit code
  - 256 unique codes for 26 letters, 10 digits, special characters

Character	ASCII binary code
A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000
I	01001001
J	01001010
K	01001011
L	01001100
M	01001101
N	01001110
O	01001111
P	01010000
Q	01010001
R	01010010
S	01010011
T	01010100
U	01010101
V	01010110
W	01010111
X	01011000
Y	01011001
Z	01011010
0	00110000
1	00110001
2	00110010
3	00110011
4	00110100
5	00110101
6	00110110
7	00110111
8	00111000
9	00111001