

# Introduction to Personal Computer

## Hardware



# The Computer consist from:

## Computer Hardware

The term hardware refers to the physical components of your computer such as the system unit ,mouse, keyboard ,monitor etc.

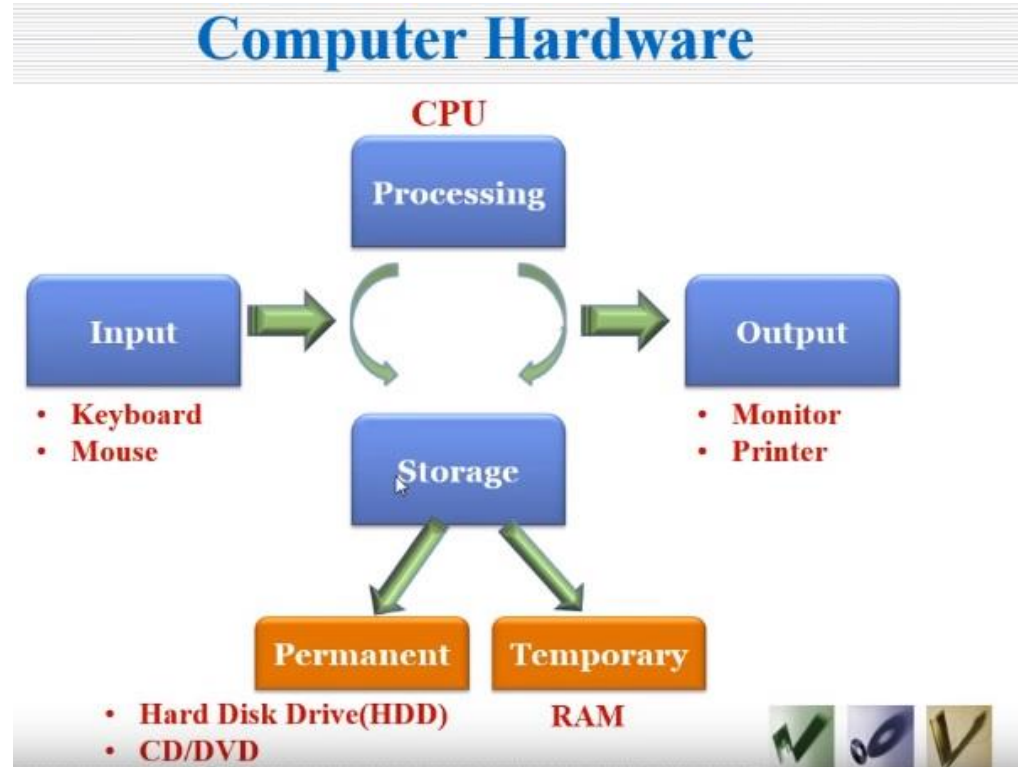


## Computer software

is a set of instructions and documentation that tells a computer what to do or how to perform a task . Software includes all different programs on a computer , such as **applications and operating system.**



# Computer Hardware classification



# Cases

- The case houses the internal components such as the power supply, motherboard, central processing unit (CPU), memory, disk drives, and assorted adapter cards.
- The term **form factor** refers to the physical design and look of a case. Common desktop computers are available in form factors including:
  - Horizontal case
  - Full-Size Tower
  - Compact Tower
  - All-in-one

**Many case manufacturers may have their own naming conventions, including super tower, full tower, mid tower, mini tower, cube case, and more.**



Cases



Horizontal case



Full-Size Tower



Compact Tower



All-in-one

# Power Supplies

- Computers use a power supply to convert AC power into a lower voltage DC power required by internal components.
- Desktop computer power supply form factors include:
  - **Advanced Technology (AT)** – original power supply for legacy computer systems
  - **AT Extended (ATX)** – updated version of the AT
  - **ATX12V** – the most common power supply on the market today
  - **EPS12V** – originally designed for network servers but is now commonly used in high-end desktop models.



# Power Supply Voltage

- The different connectors in a power supply also provide different voltages.
- The most common voltages supplied are 3.3 volts, 5 volts, and 12 volts.
- The 3.3 volt and 5 volt supplies are typically used by digital circuits, while the 12 volt supply is used to run motors in disk drives and fans.
- Power supplies can also be single rail, dual rail, or multi rail.
- A rail is the printed circuit board (PCB) inside the power supply to which the external cables are connected.



# Connectors

- A power supply includes several different connectors. They are used to power various internal components such as the motherboard and disk drives.
- Some examples are:
  - **20-pin or 24-pin slotted connector**
  - **SATA keyed connector**
  - **Molex keyed connector**
  - **Berg keyed connector**
  - **4-pin to 8-pin auxiliary power connector**
  - **6/8-pin PCIe power connector**



Connectors



A 20-pin or 24-pin slotted connector



SATA keyed connector



Molex keyed connector



Berg keyed connector

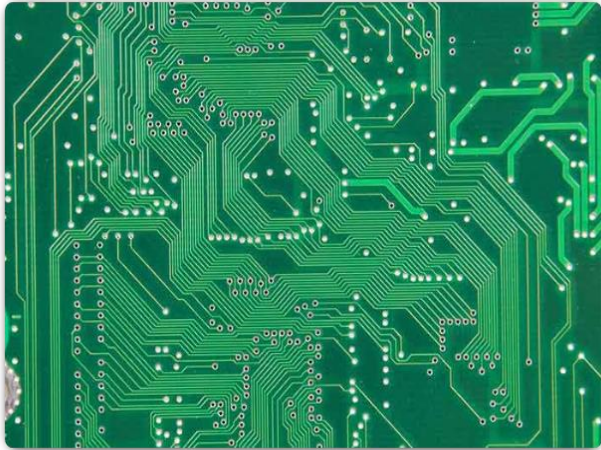


4-pin to 8-pin auxiliary power connector



6/8-pin PCIe power connector

# Motherboards

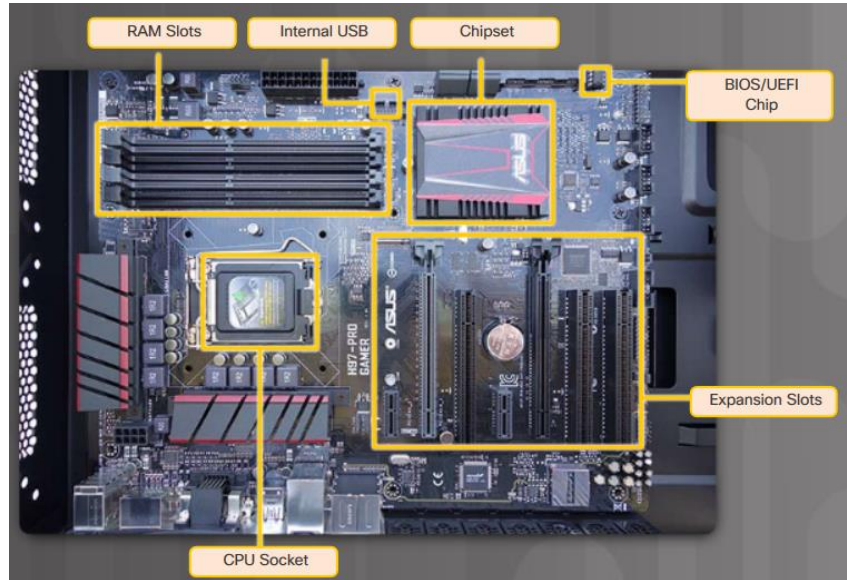


- The motherboard is the backbone of the computer.
- It is a printed circuit board (PCB) that contains buses, or electrical pathways, that interconnect electronic components.
- These components may be soldered directly to the motherboard, or added using sockets, expansion slots, and ports.

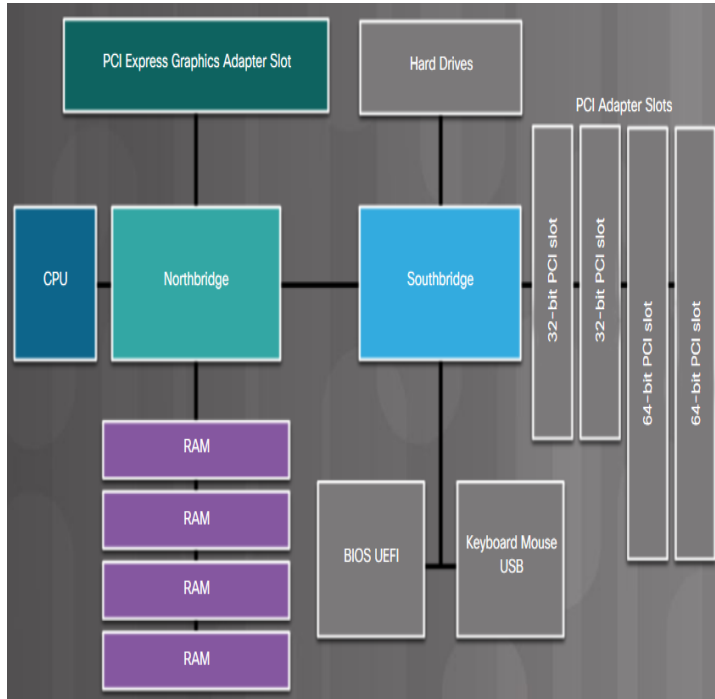


# Motherboard Components

- Major components on a motherboard include:
  - **Central Processing Unit (CPU)**
  - **Random Access Memory (RAM)**
  - **Expansion slots**
  - **Chipset**
  - **Basic input/output system (BIOS) chip and Unified Extensible Firmware Interface (UEFI) chip**
  - **SATA connectors**
  - **Internal USB connector**



# Motherboard Chipset



- **Chipset** consists of the integrated circuits on the motherboard that control how system hardware interacts with the CPU and motherboard.
- Most chipsets consist of the following two types:
  - **Northbridge** – Controls high speed access to the RAM and video card.
  - **Southbridge** – Allows the CPU to communicate with slower speed devices including hard drives, Universal Serial Bus (USB) ports, and expansion slots.

# Motherboard Form Factors

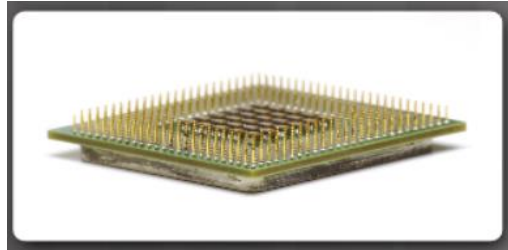
- The form factor of motherboards pertains to the size and shape of the board.
- There are three common motherboard form factors: Advanced Technology extended (ATX), Micro-ATX, and ITX.

Form Factor	Description
ATX	<ul style="list-style-type: none"><li>• Advanced Technology eXtended</li><li>• Most popular form factor</li><li>• 12 in X 9.6 in (30.5 cm X 24.4 cm)</li></ul>
Micro-ATX	<ul style="list-style-type: none"><li>• Smaller footprint than the ATX</li><li>• Popular in desktop and small form factor computers</li><li>• 9.6 in X 9.6 in (24.4 cm X 24.4 cm)</li></ul>
Mini-ITX	<ul style="list-style-type: none"><li>• Designed for small devices such as thin clients and set-top boxes</li><li>• 6.7in X 6.7 in (17cm X 17 cm)</li></ul>
ITX	<ul style="list-style-type: none"><li>• Comparable form factor to Micro-ATX</li><li>• 8.5 in X 7.5 in (21.5 cm X 19.1 cm)</li></ul>

**The choice of motherboard form factor determines how individual components attach to it, the type of power supply required, and the shape of the computer case.**

# What is CPU?

- The central processing unit (CPU) is responsible for interpreting and executing commands.
- The CPU is a small microchip that resides within a CPU package.
- The CPU socket is the connection between the motherboard and the processor.



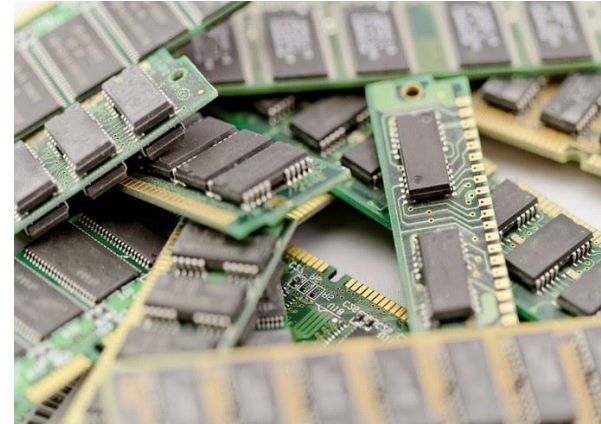
# Cooling Systems

- Computer components perform better when kept cool.
  - Computers are kept cool using active and passive cooling solutions.
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- Active solutions require power while passive solutions do not.
  - Passive solutions for cooling usually involve reducing the speed at which a component is operating or adding heat sinks to computer chips.
  - A case fan is considered as active cooling.



# Types of Memory

- A computer might use different types of memory chips.
- All memory chips store data in the form of bytes.
  - A byte is a block of eight bits stored as either 0 or 1 in the memory chip.
- **Read-Only Memory (ROM)** – such as ROM chip.
- **Random Access Memory (RAM)** is the temporary working storage for data and programs that are being accessed by the CPU. RAM is volatile memory.
- Adding more RAM in a computer enhances the system performance. However, the maximum amount of RAM that can be installed is limited by the motherboard.



# Types of ROM

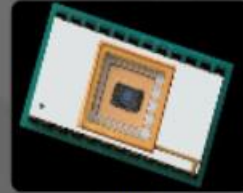
- Types of Read-only Memory (ROM) include:
  - ROM chips.
  - PROM chips.
  - EPROM chips
  - EEPROM chips.



ROM



PROM



EPROM



EEPROM

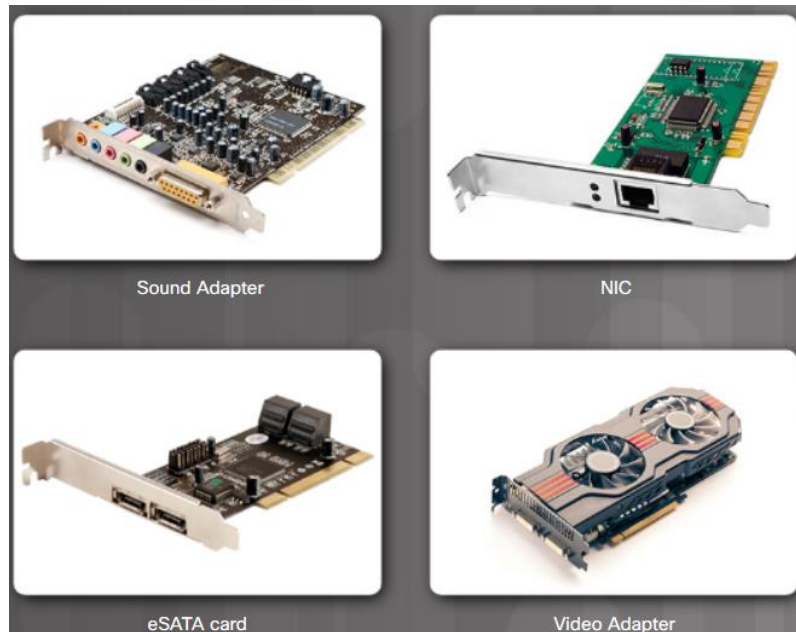
# Types of RAM

- Types of Random Access Memory (RAM) include:
  - Dynamic RAM (DRAM)
  - Static RAM (SRAM)
  - Synchronous Dynamic RAM (SDRAM)
  - Double Data Rate Synchronous Dynamic RAM (DDR SDRAM)
  - DDR2 Synchronous Dynamic RAM (DDR2 SDRAM)
  - DDR3 Synchronous Dynamic RAM (DDR3 SDRAM)
  - DDR4 Synchronous Dynamic RAM (DDR4 SDRAM)
  - GDDR Synchronous Dynamic RAM (GDDR SDRAM)



# Adapter Cards

- Adapter cards increase the functionality of a computer by adding controllers for specific devices or by replacing malfunctioning ports.
- Common adapter cards include:
  - Sound adapter
  - Network Interface Card (NIC)
  - Wireless NIC
  - Video adapter or display adapter
  - Capture card
  - TV tuner card
  - Universal Serial Bus (USB) controller card
  - eSATA card



# Adapter Cards (Cont.)

- Computers have expansion slots on the motherboard to install adapter cards.
- The type of adapter card connector must match the expansion slot.
- Common expansion slots include:
  - Peripheral Component Interconnect (PCI)
  - Mini-PCI
  - PCI eXtended (PCI-X)
  - PCI Express (PCIe)
  - Riser card
  - Accelerated Graphics Port (AGP)



# Types of Storage Devices

- Data drives provide non-volatile storage of data.
- Some drives have fixed media, and other drives have removable media.



Hard Disk Drive



Optical Drive



Solid State Drive



Tape Drive

- Data storage devices can be classified according to the media on which the data is stored:
  - Magnetic – like hard disk drive and tape drive
  - Solid state – like solid state drive
  - Optical – like CD and DVD

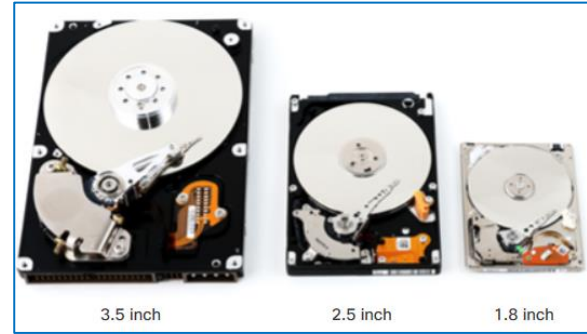
# Storage Device Interfaces

- Storage devices inside a computer connect to the motherboard using Serial AT Attachment (SATA) connections. The legacy interface is Parallel ATA (EIDE).
- The interface standards define the way that data is transferred, the transfer rates, and physical characteristics of the cables and connectors.
- There are three main versions of the SATA standard: SATA 1, SATA 2, and SATA 3.
- The cables and connectors are the same, but the data transfer speeds are different.

ATA	Parallel (PATA)	IDE	8.3 Mb/s
		EIDE	16.6 Mb/s
	Serial (SATA)	SATA 1	1.5 Gb/s
		SATA 2	3.0 Gb/s
		SATA 3	6.0 Gb/s

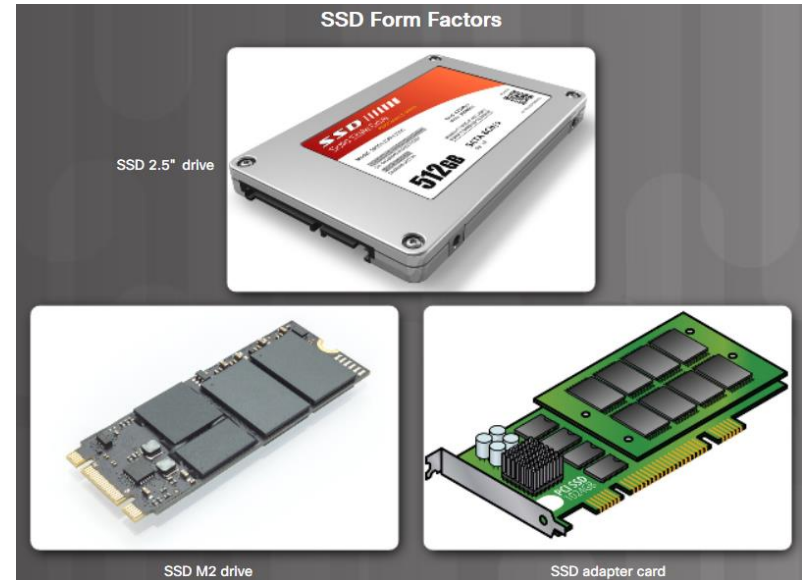
# Magnetic Media Storage

- This type of storage represents binary values as magnetized or non-magnetized physical areas of magnetic media.
- Common types of magnetic media storage drives:
  - Hard Disk Drive (HDD) – the traditional magnetic disk devices with storage capacity ranging from gigabytes (GBs) to terabytes (TBs).
  - Tape Drive – most often used for archiving data.
    - Tape drives use a magnetic read/write head and removable tape cartridge.
    - Common tape storage capacities vary between a few GBs to many TBs.



# Semiconductor Storage

- Solid-state drives (SSD) store data as electrical charges in semiconductor flash memory. This makes SSDs much faster than magnetic HDDs.
- SSDs have no moving parts, make no noise, are more energy efficient, and produce less heat than HDDs.
- Solid State Hybrid Drives (**SSH**Ds) are a compromise between a magnetic HDD and an SSD.
  - They are faster than an HDD but less expensive than an SSD.
  - They combine a magnetic HDD with onboard flash memory serving as a non-volatile cache.



# Types of Optical Storage Devices

- Optical drives are removable media storage devices that use lasers to read and write data on optical media.
- They were developed to overcome the storage capacity limitations of removable magnetic media such as floppy discs.
  - There are three types of optical drives:
    - Compact Disc (CD) - audio and data
    - Digital Versatile Disc (DVD) - digital video and data
    - Blu-ray Disc (BD) - HD digital video and data



# Types of Optical Storage Devices (Cont.)

- CD, DVD, and BD media can be pre-recorded (read only), recordable (write once), or re-recordable (read and write multiple times).
- DVD and BD media can also be single layer (SL) or dual layer (DL). Dual layer media roughly doubles the capacity of a single disc.

Optical Media	Description	Storage Capacity
CD-ROM	CD read-only memory media that is pre-recorded	700 MB
CD-R	CD recordable media that can be recorded one time	
CD-RW	CD rewritable media that can be recorded, erased, and re-recorded	
DVD-ROM	DVD read-only memory media that is pre-recorded	4.7 GB (Single-Layer)
DVD-RAM	DVD rewritable media that can be recorded, erased, and re-recorded	8.5 GB (Dual-Layer)
DVD+/-R	DVD recordable media that can be recorded one time	
DVD+/-RW	DVD rewritable media that can be recorded, erased, and re-recorded	
BD-ROM	Blu-ray read-only media that is pre-recorded with movies, games, or software	25 GB (Single-Layer) 50 GB (Dual-Layer)
BD-R	Blu-ray recordable media that can be recorded one time	
BD-RE	Blu-ray rewritable media that can be recorded, erased, and re-recorded	



# Video Ports and Cables

- A video port connects a monitor to a computer using a cable.
- Video ports and monitor cables transfer analog signals, digital signals, or both.
- Video ports and cables include:
  - Digital Visual Interface (DVI)
  - DisplayPort
  - High-Definition Multimedia Interface (HDMI)
  - Thunderbolt 1 or 2
  - Thunderbolt 3
  - Video Graphics Array (VGA)
  - Radio Corporation of America (RCA)



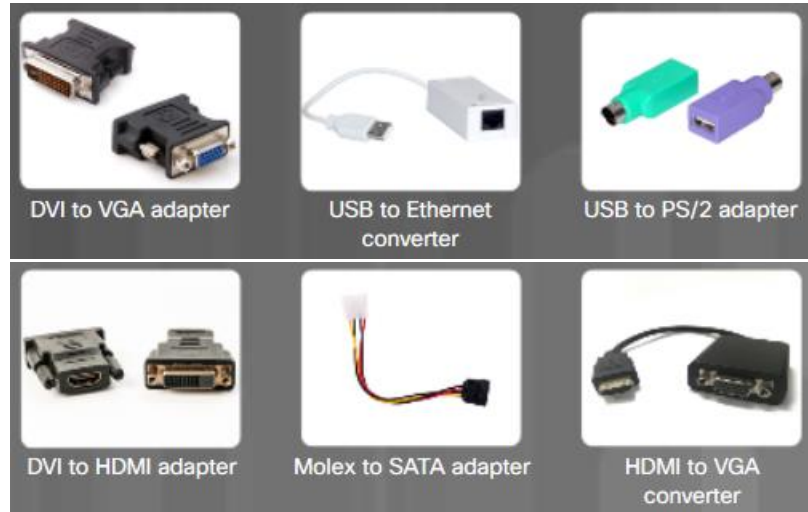
# Other Ports and Cables

- Input/output (I/O) ports on a computer connect peripheral devices, such as : printers, scanners, and portable drives.
- A computer may have other ports:
  - Personal System 2 (PS/2)
  - Audio and game port
  - Network
  - Serial AT Attachment (SATA)
  - Integrated Drive Electronics (IDE)
  - The Universal Serial Bus (USB)



# Adapters and Converters

- There are many connection standards in use today. These components are called adapters and converters:
  - **Converter** – performing the same function as an adapter but also translates the signals from one technology to the other.
  - **Adapter** – physically connecting one technology to another
    - Example of adapters include:
      - DVI to VGA Adapter
      - USB to Ethernet adapter
      - USB to PS/2 adapter
      - DVI to HDMI adapter
      - Molex to SATA adapter
      - HDMI to VGA converter



# The Original Input Devices

- Input devices allow the user to communicate with a computer.
- Some of the first input devices include:
  - Keyboard and Mouse – these are the two most commonly used input devices
  - ADF / Flatbed Scanner – these devices digitize an image or document
  - Joystick and Gamepad – these devices are used for playing games
  - KVM Switch – a hardware device that can be used to control more than one computer while using a single keyboard, monitor, and mouse



Keyboard and Mouse



ADF / Flatbed Scanner



Joystick and Gamepad



KVM Switch

# New Input Devices

- Some new input devices include touch screen, stylus, magnetic strip reader, and barcode scanner:
  - **Touch screen** – input devices with touch or pressure sensitive screens
  - **Stylus** – a type of digitizer that allows a designer or artist to create artwork by using a pen-like tool
  - **Magnetic strip reader** – a device that reads information magnetically encoded on the back of plastic cards
  - **Barcode scanner** – a device that reads the information contained in the barcodes affixed to products



Touch screen



Stylus



Magnetic Stripe Reader



Barcode Scanner

# More New Input Devices

- A few newer input devices:
  - **Digital camera** – devices that capture digital images and videos
  - **Webcams** – video cameras that can be integrated into a computer
  - **Signature pad**– a device that electronically captures a person's signature
  - **Smart card reader** – a device used on a computer to authenticate the user. A smart card may be the size of a credit card with an embedded microprocessor that is typically under a gold contact pad on one side of the card.
  - **Microphone** – a device that allows a user to speak into a computer and have their voice digitized



# Most Recent Input Devices

- The newest input devices include NFC devices and terminals, facial recognition scanners, fingerprint scanners, voice recognition scanners, and virtual reality headsets:
  - **NFC devices and terminals** – Near Field Communication (NFC) tap to pay devices
  - **Facial recognition scanners** – devices identifying a user based on unique facial features
  - **Fingerprint scanners** – devices identifying a user based on unique fingerprint
  - **Voice recognition scanners** – devices identifying a user based on unique voice
  - **Virtual reality headset** – used with computer games, simulators, and training applications with virtual reality functionalities.



NFC Devices and  
Terminals



Facial Recognition  
Scanners



Fingerprint Scanners



Voice Recognition  
Scanners



Virtual Reality Headset

# What are Output Devices?

- An output device takes binary information from the computer and converts it into a form that is easily understood by the user.
- Examples of output devices include monitors, projectors, VR headsets, printers, speakers, and headphones.



VR Headset



Printer



Monitor



Projector



Speakers



Headphones



# Monitors and Projectors

- Most monitors use one of three types of technology:
  - Liquid crystal display (LCD)
  - Light-emitting diode (LED)
  - Organic LED (OLED)



- Most video projectors use LCD or DLP technology.
  - DLP stands for Digital Light Processing
  - Different projectors have different numbers of lumens, which affects the level of brightness of the projected image.

# Printers

- Printers are output devices that create hard copies of files.
- A hard copy might be on a sheet of paper. It could also be a plastic form created from a 3D printer.
- Different types of printers:
  - Inkjet, impact, thermal, laser, and 3D printers
  - Printers use wired or wireless connections
  - All printers require printing material (such as ink, toner, liquid plastic, etc.)
  - Printers use a driver to communicate with OS



Inkjet Printer



Impact Printer



3D Printer



Thermal Printer

## Speakers and Headphones



Speakers



Headphones

- **Speakers** are a type of auditory output device.
- Most computers and mobile devices have audio support either integrated into the motherboard or on an adapter card.
- **Headphones**, earbuds, and the earphones found in headsets are all auditory output devices.
- These may be wired or wireless. Some are Wi-Fi or Bluetooth-enabled.