Overview of Computers

Dr. Piyush Joshi

Assistant Professor

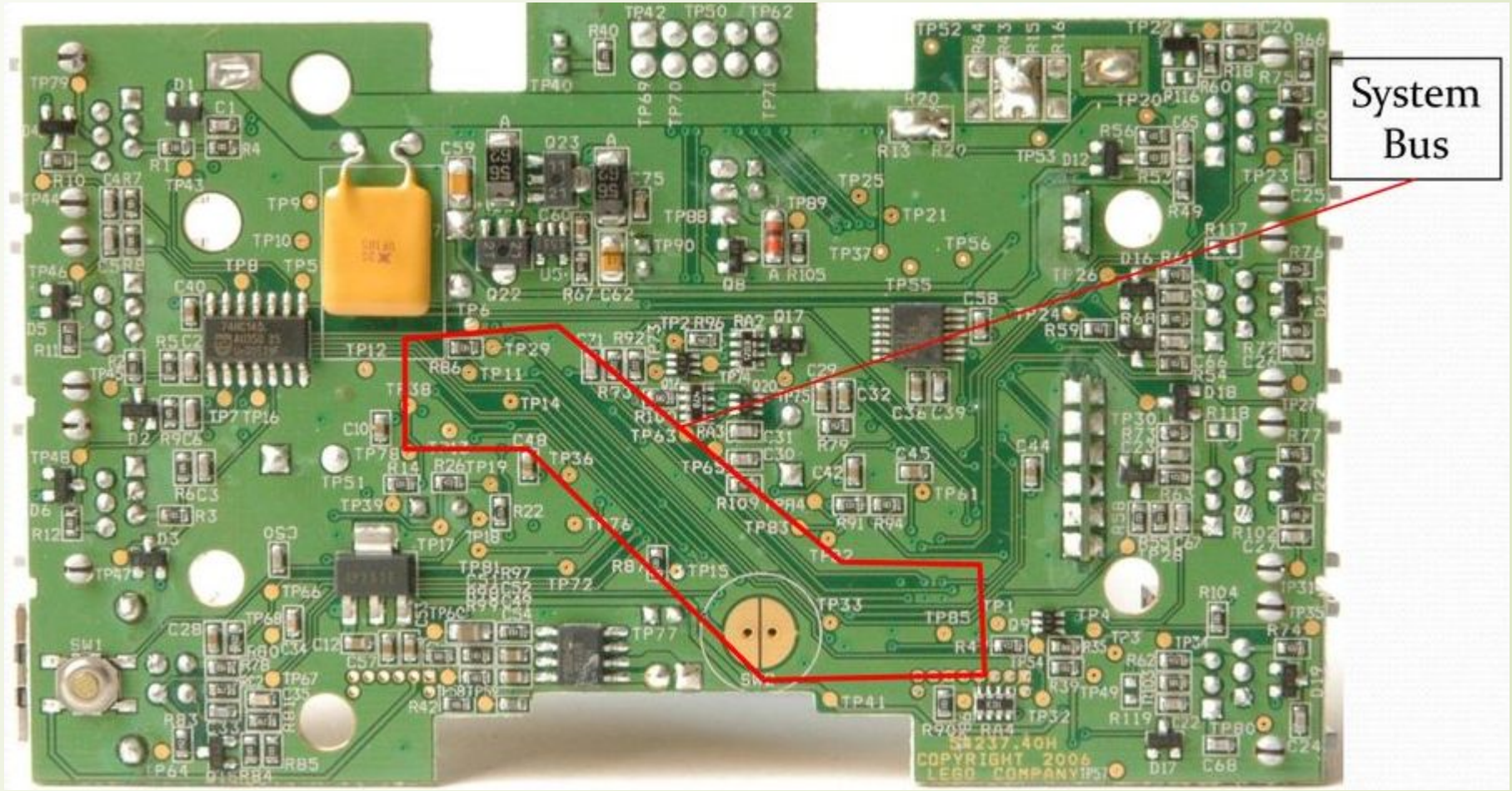
IIIT Sri City

System Bus in Computer Architecture

Bus

- The CPU sends various data values, instructions and information to all the devices and components inside the computer.
- If you look at the bottom of a motherboard you'll see a whole network of lines or electronic pathways that join the different components together.
- This network of wires or electronic pathways is called the 'Bus'

Bus



Bus

- A bus is a communication pathway connecting two or more devices.
- A key characteristic of a bus is that it is a shared transmission medium.
- Multiple devices connect to the bus, and a signal transmitted by any one device is available for reception by all other devices attached to the bus.
- If two devices transmit during the same time period, their signals will overlap and become garbled. Thus, only one device at a time can successfully transmit.

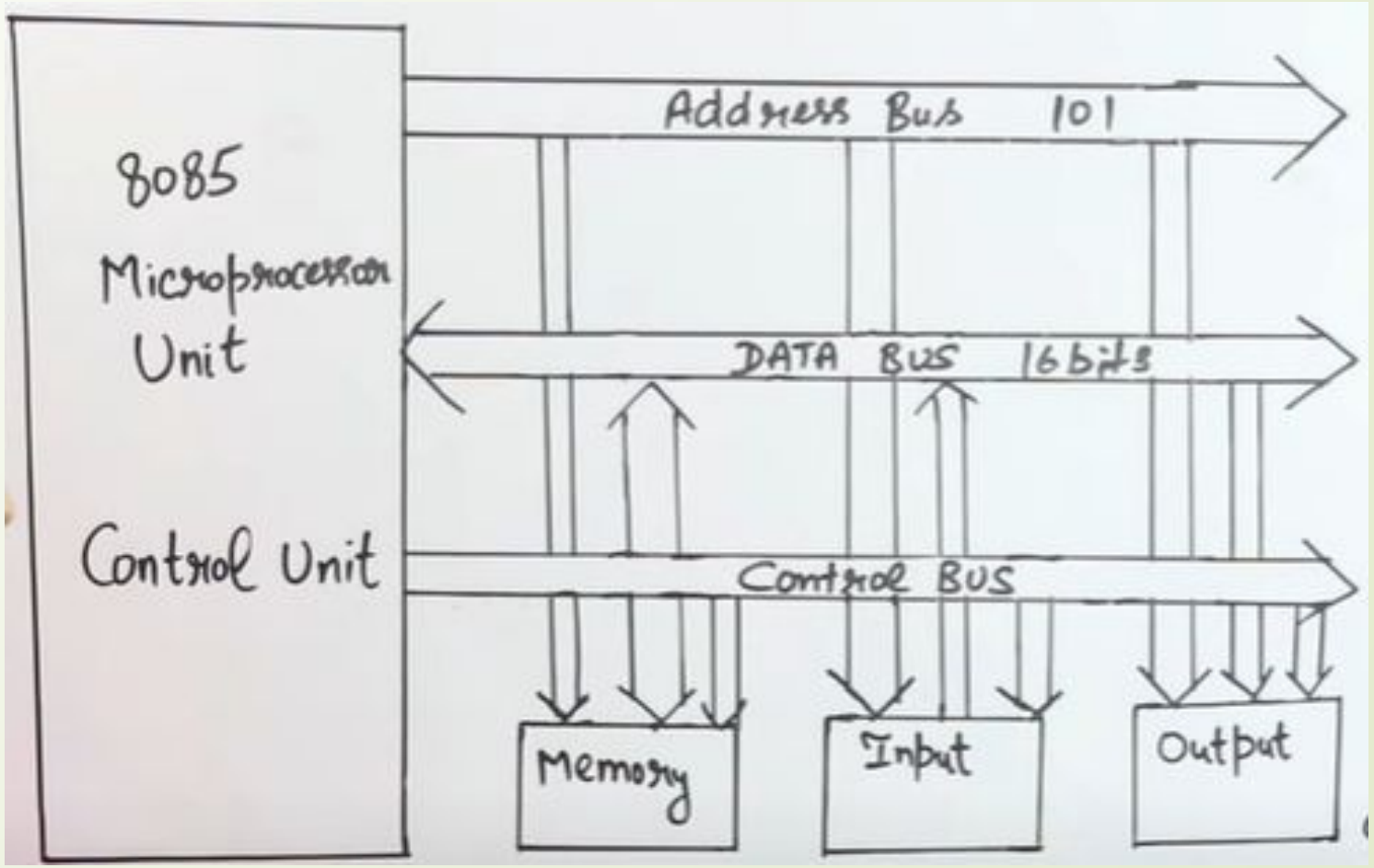
Bus

- Typically, a bus consists of multiple communication pathways, or lines.
- Each line is capable of transmitting signals representing binary 1 and binary 0.
- Several lines of a bus can be used to transmit binary digits simultaneously (in parallel).
- For example, an 8-bit unit of data can be transmitted over eight bus lines.
- Computer systems contain a number of different buses that provide pathways between components at various levels of the computer system hierarchy.

System Bus

- A bus that connects major computer components (processor, memory, I/O) is called a system bus.
- A system bus consists, typically, of from about fifty to hundreds of separate lines. Each line is assigned a particular meaning or function.
- System bus usually is separated into three functional groups .
  - **1. Data Bus**
  - **2. Address Bus**
  - **3. Control Bus**
- In addition, there may be power distribution lines that supply power to the attached modules.

System Bus Architecture



Data Bus

- A collection of wires through which data is transmitted from one part of a computer to another.
- Data Bus can be thought of as a highway on which data travels within a computer.
- This bus connects all the computer components to the CPU and main memory.
- The data bus may consist of 32, 64, 128, or even more separate lines.
- The number of lines being referred to as the width of the data bus. Because each line can carry only 1 bit at a time, the number of lines determines how many bits can be transferred at a time.

Data Bus

- Bidirectional bus connects with memory.

- The size (width) of bus determines how much data can be transmitted at one time.
- A 16-bit bus can transmit 16 bits (2 bytes)of data at a time.
- 32-bit bus can transmit 32 bits(4 bytes) at a time.

- The size (width) of bus is a critical parameter in determining system performance.

- The wider the data bus, the better, but they are expensive.

Address Bus

- A collection of wires used to identify particular location in main memory is called Address Bus.
- Or in other words, the information used to describe the memory locations travels along the address bus.
- Clearly, the width of the address bus determines the maximum possible memory capacity of the system.
- N address lines directly address 2^N memory locations.

Address Bus

- It is an unidirectional bus.
- The CPU sends address to a particular memory locations and I/O ports.
- The address bus consists of 16 , 20 , 24 or more parallel signal lines.

Control Bus

- Because the data and address lines are shared by all components, there must be a means of controlling their use.
- The control lines regulates the activity on the bus.
- Control signals transmit both command and timing information among system modules.
- The control bus carries signals that report the status of various devices.

Control Bus

- Typical control bus signals are :
- Memory Read : causes data from the addressed location to be placed on the data bus.
- Memory Write : causes data on the bus to be written into the addressed location
- I/O write: causes data on the bus to be output to the addressed I/O port
- I/O read: causes data from the addressed I/O port to be placed on the bus

I/O Interface

- Direct Communication b/w processor and devices is not possible.

- It is due to:
- Different manner of operation

- Data transfer rate

- Difference in word format

- Difference in operating modes of peripherals

I/O Interface

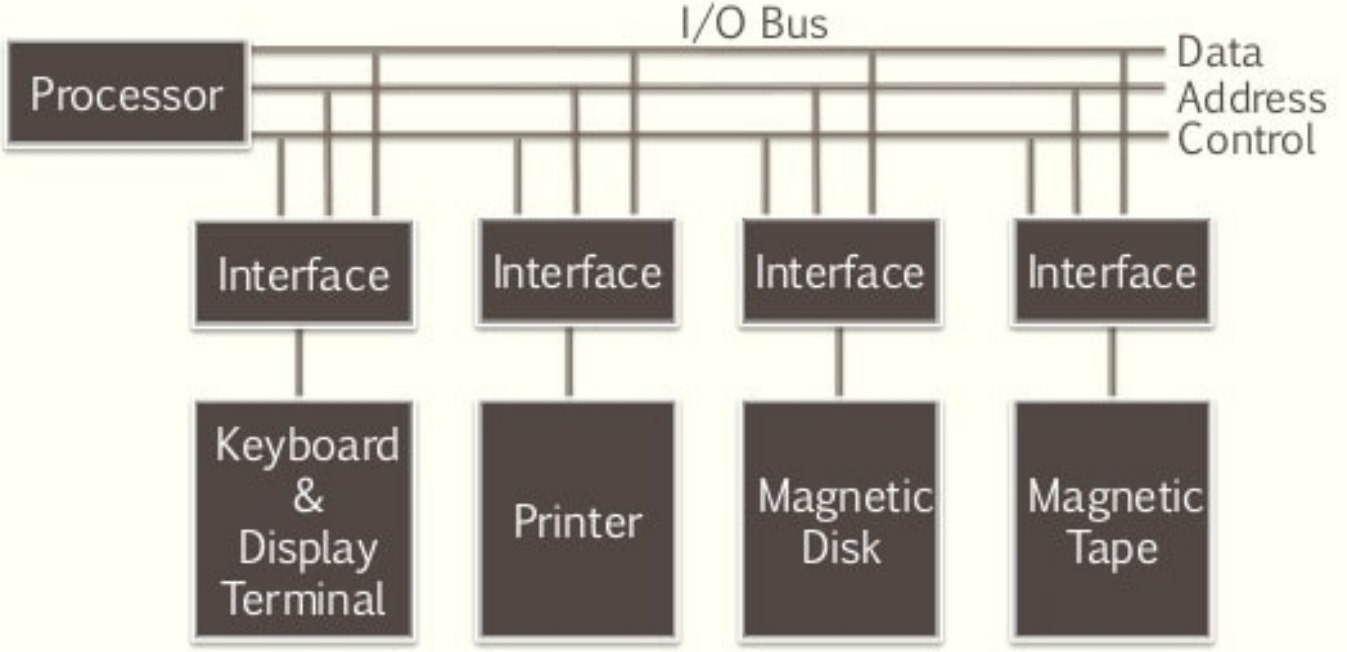
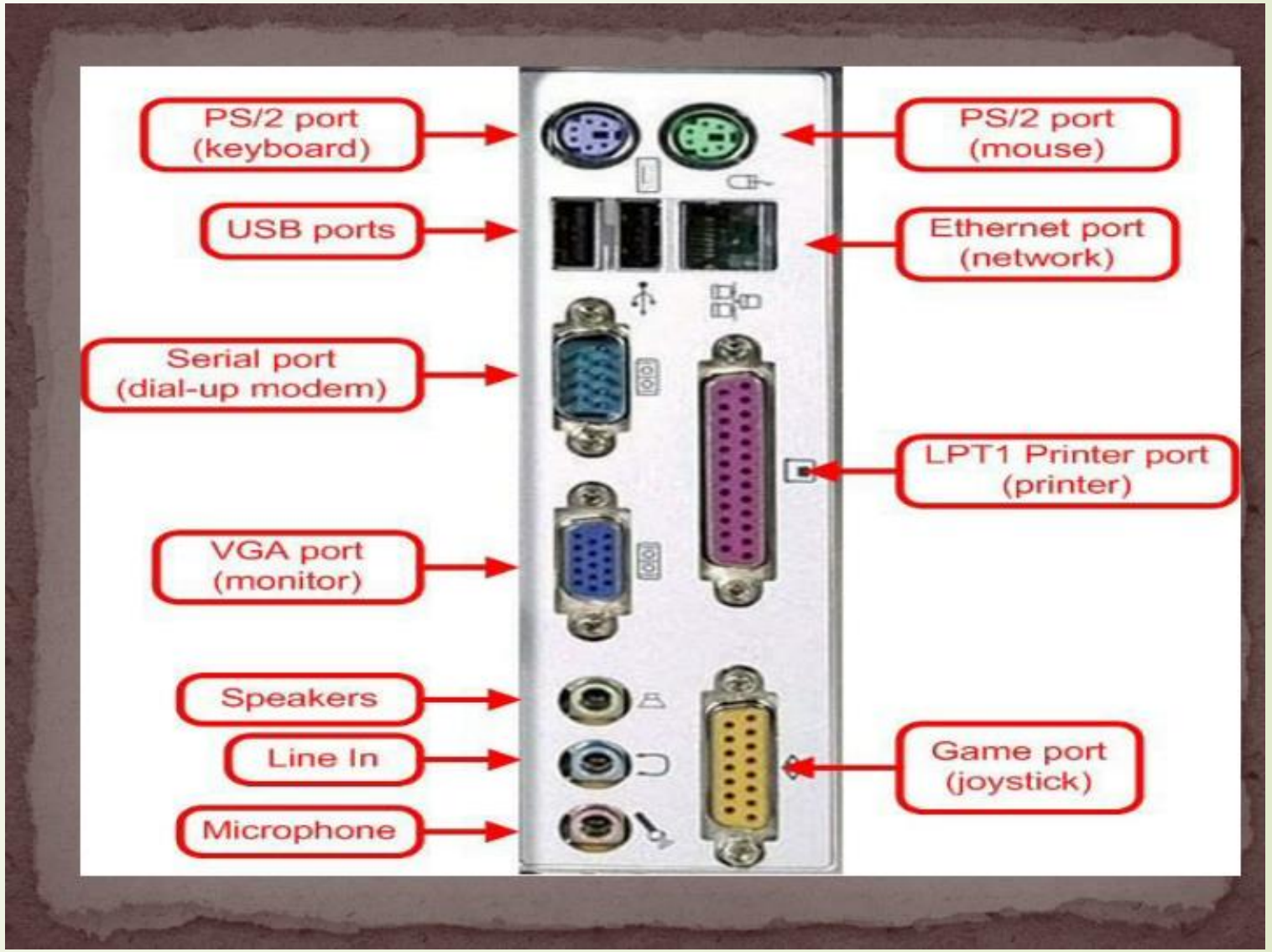


Fig. Connection of I/O Bus to input-output devices

Ports

- The point at which a peripheral attaches to.
- Communicates with a system unit so that the peripheral can send data to or receive information from the computer.
- The term JACK is sometimes is used to identify audio and video ports.
- The front and back of system unit on desktop personal computer contain many ports.


PS/2 port (keyboard)
PS/2 port (mouse)
USB ports
Ethernet port (network)
Serial port (dial-up modem)
LPT1 Printer port (printer)
VGA port (monitor)
Speakers
Line In
Microphone
Game port (joystick)

Connectors

- Joins a cable and a port.
- A connector at one end of the a cable attaches to a port on the **system unit.**
- A connector at the other end of the cable attaches to a port on the **peripheral**.

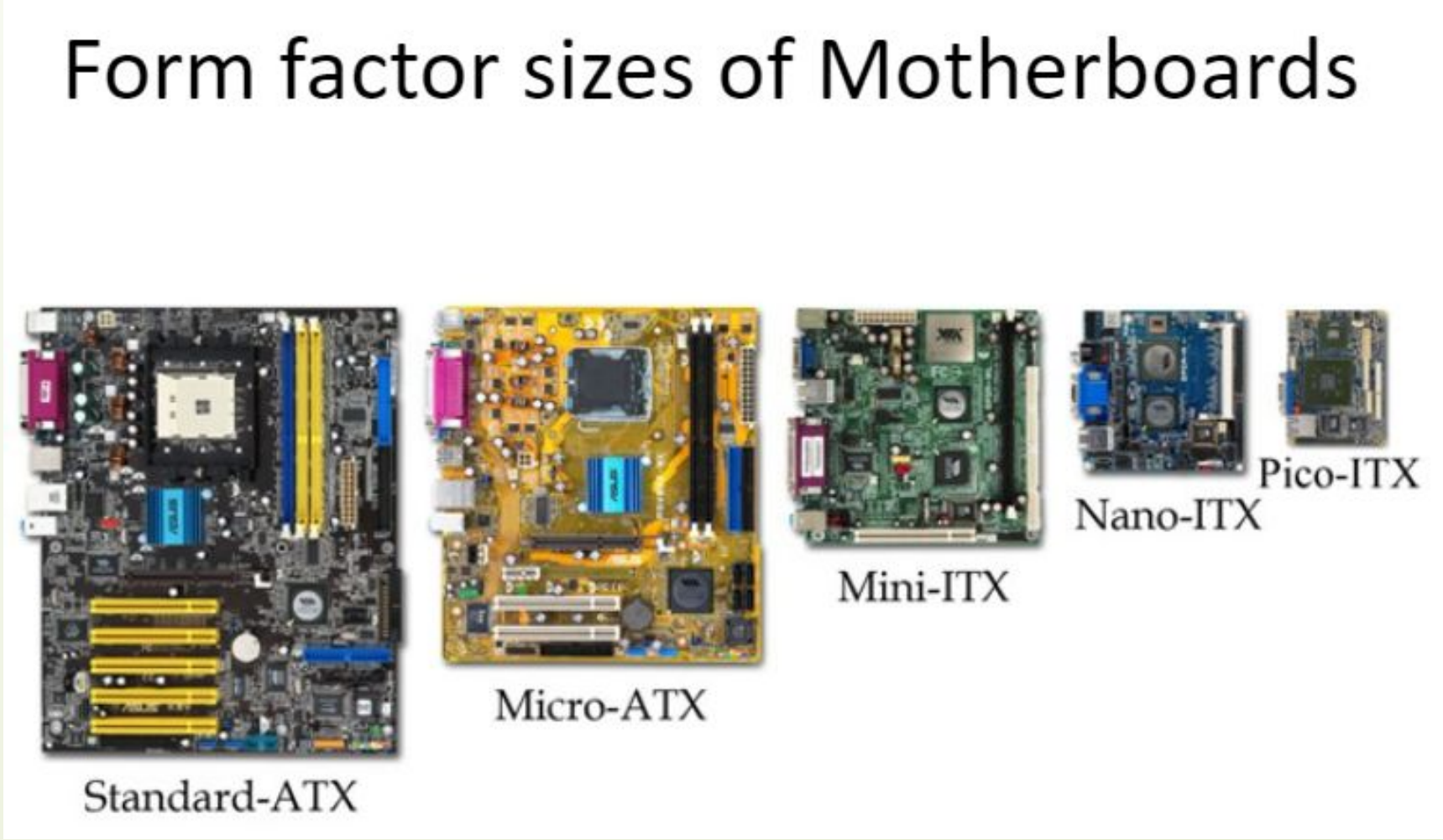
Motherboard

- A motherboard sometimes called the “Mobo” is the main circuit board found in computers and other advanced electronic devices.

Motherboard

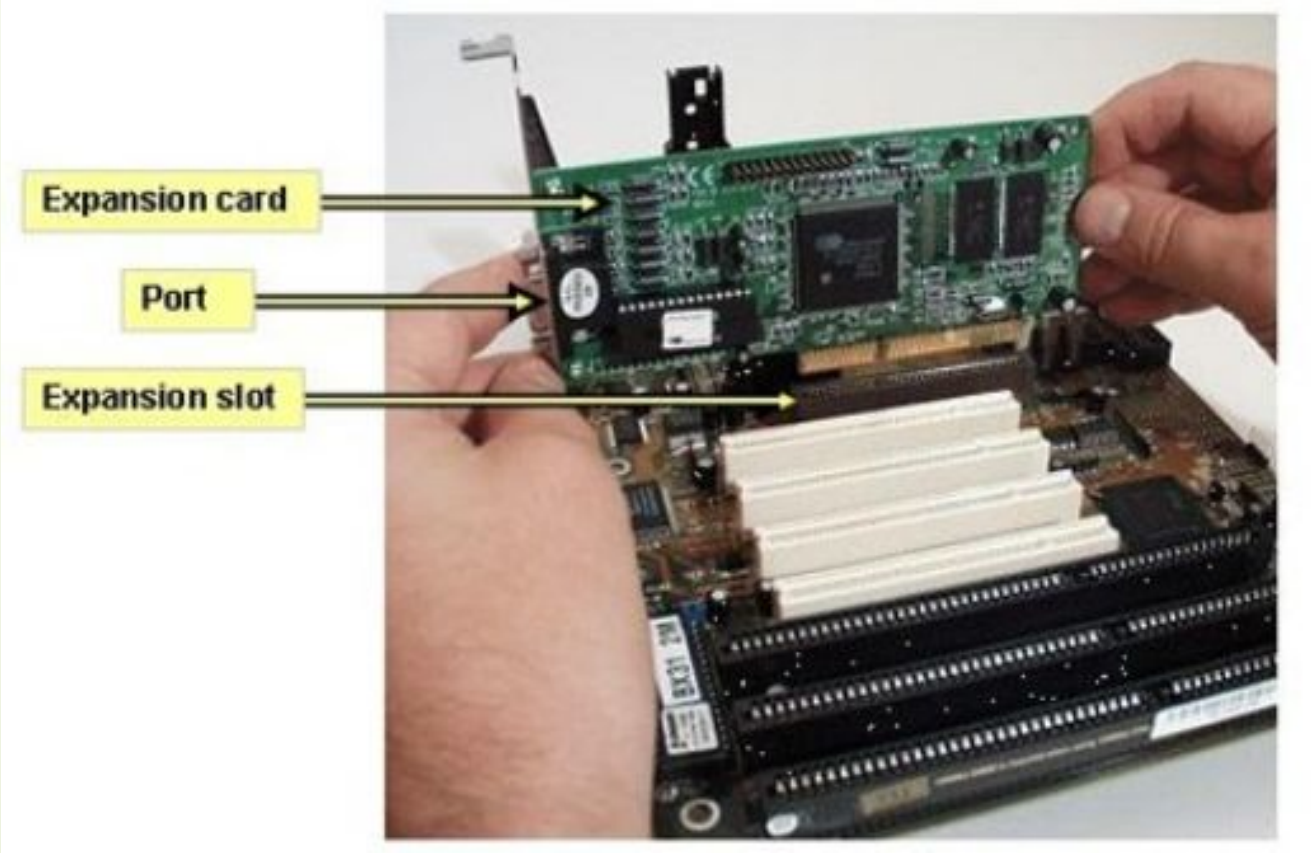
- **The motherboard gets its name because it is like a mother to all of the other circuit boards.**
- The motherboard is the largest circuit board in the computer case and may have many smaller boards plugged into it.
- It’s the glue that holds all of the most important parts of the computer together.

Motherboard



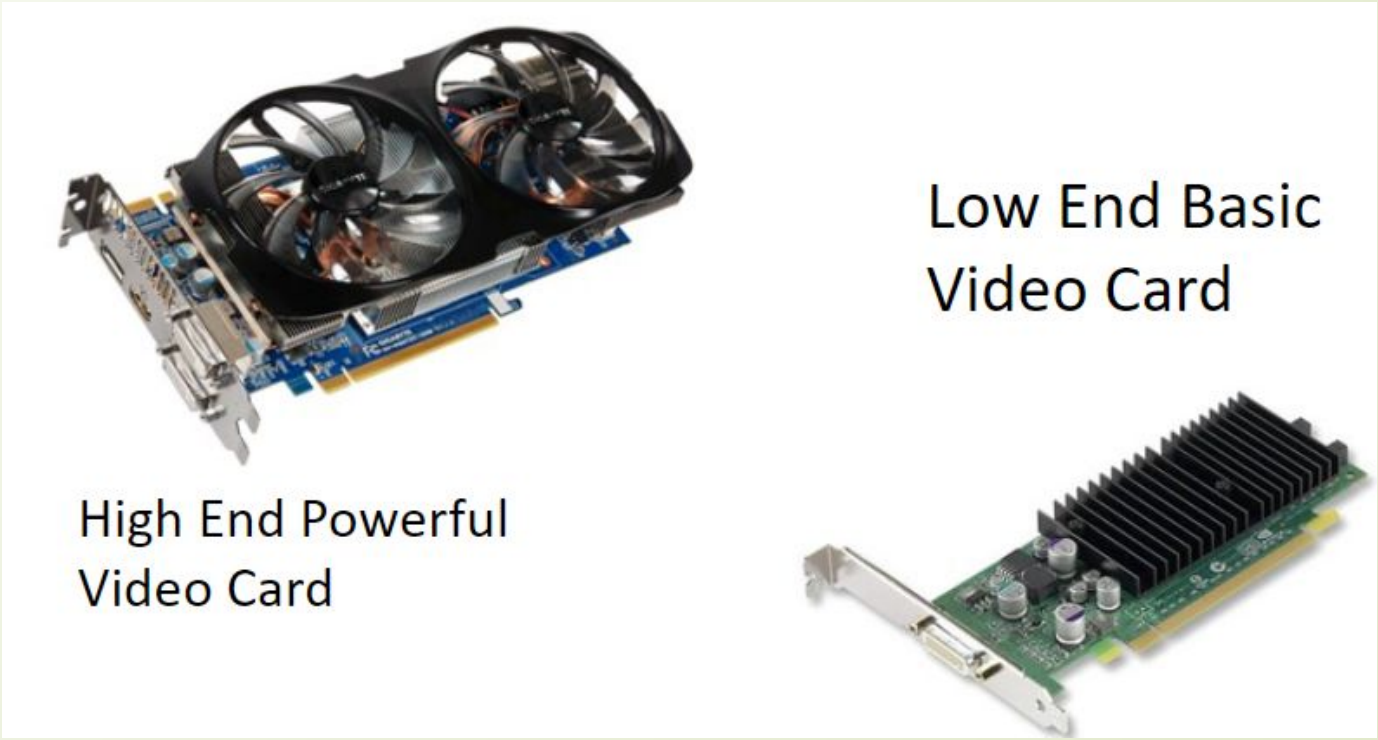
Motherboard cards

- On the motherboard, you will find several expansion cards. Each of these cards has a special purpose

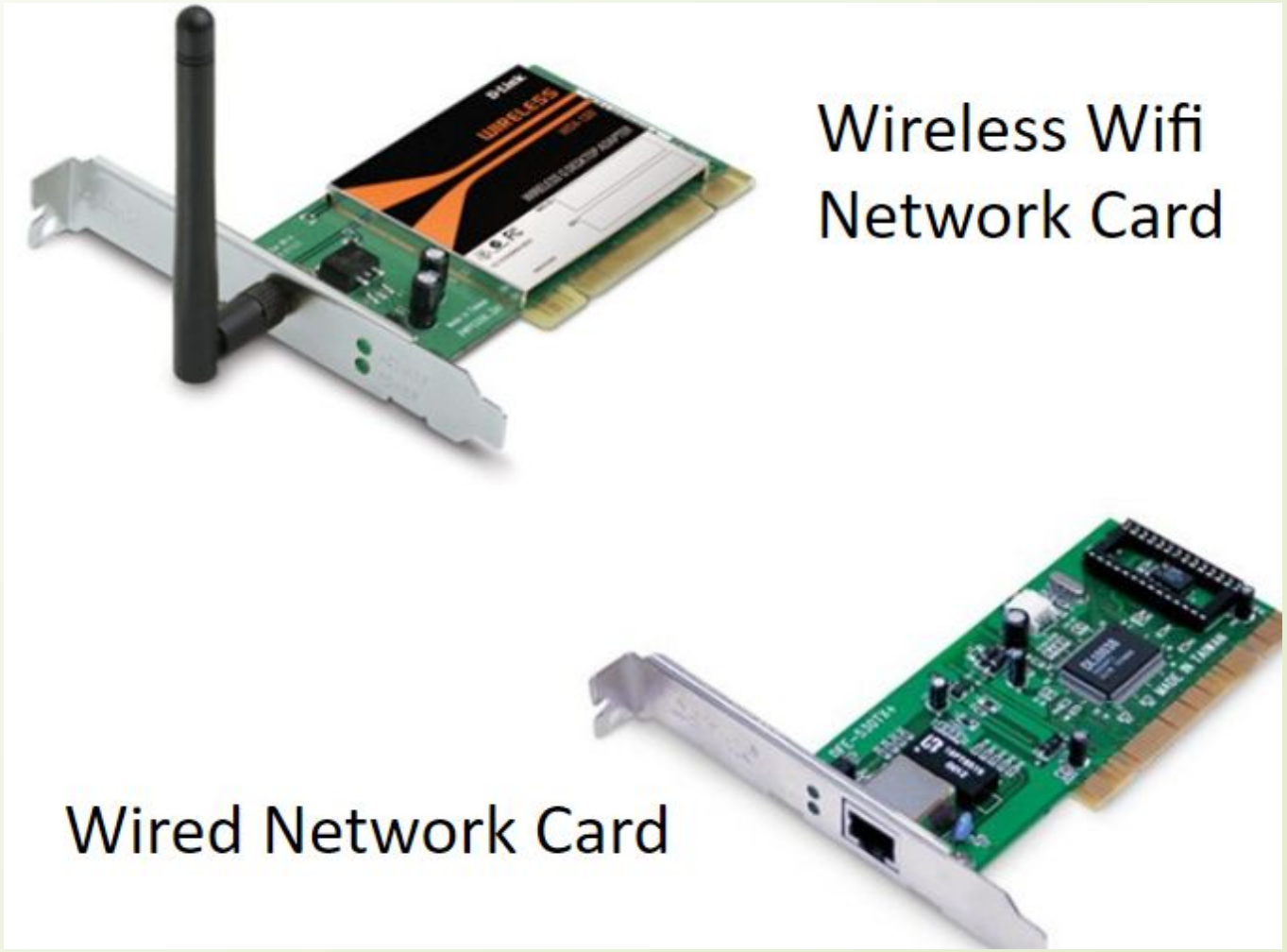


Video card

- A video card is an type of card which generates a feed of images to a monitor or display.
- Cheaper computer systems may have integrated video capabilities. These built in video capabilities are less powerful than stand alone video cards.



Network card



Jumpers

- **Jumpers** allow the computer to close an electrical circuit, allowing the electricity to flow on a circuit board and perform a function.
- Jumpers consist of small pins that can be covered with a small plastic box (**jumper block**).

- For example, if a jumpe it may mean that the hard drive is to be the primary hard drive on the system.
- If the jumper is in "Position B" it may mean that the hard drive is to be the secondary hard drive in the computer.

- Jumpers are rare on most newer hardware today because of automatic configurations and software-controlled settings.