



08: Expansion Cards and System Interfaces

IT1206 – Computer Systems

Level I - Semester 1

Sub Topics

1. Expansion slots
 1. PCI
 2. ISA
 3. AGP
2. Expansion cards
 1. Graphics accelerator card
 2. Sound card
 3. Network card
 4. TV and Video capture card
 5. USB card and USB Hub
 6. Fire-wire card

Sub Topics

3. Interfaces

1. IDE with Master-slave setting
2. SATA
3. SCSI
4. Standard Serial and Parallel port
5. Universal serial bus
6. Fire-wire

PC Motherboard

- Please watch this video to understand key components of a PC Motherboard.

<https://www.youtube.com/watch?v=b2pd3Y6aBag>

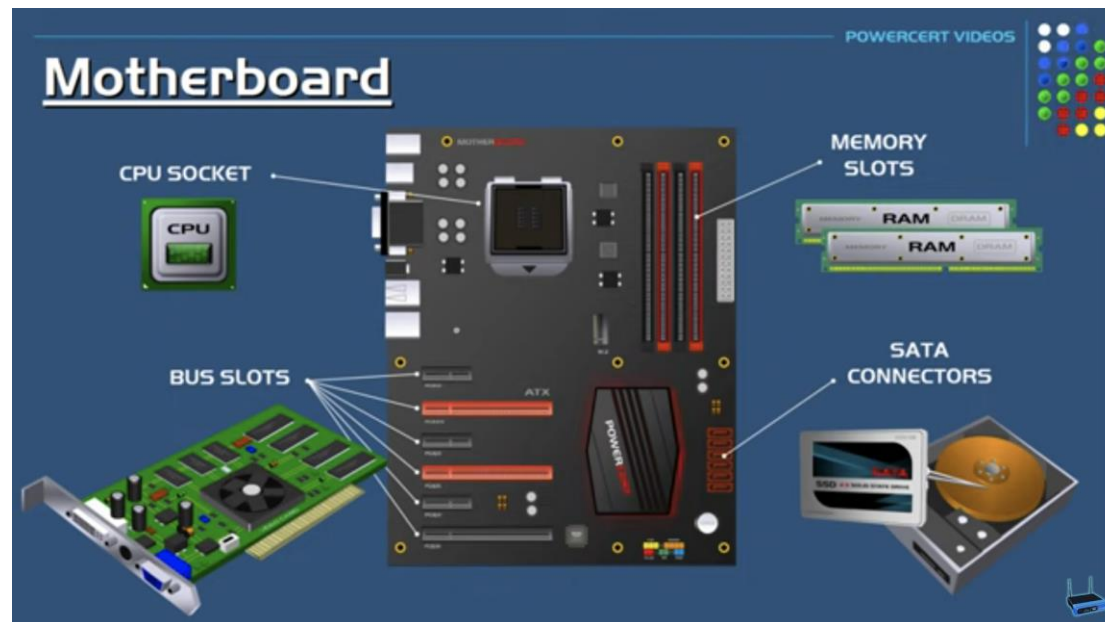


Image Source – “PowerCert Animated Videos” youtube video on “Motherboards Explained”
<https://www.youtube.com/watch?v=b2pd3Y6aBag>

Help Note

- You can search for online video materials such as YouTube videos for these topics.
- You will be able to find materials in your native language.



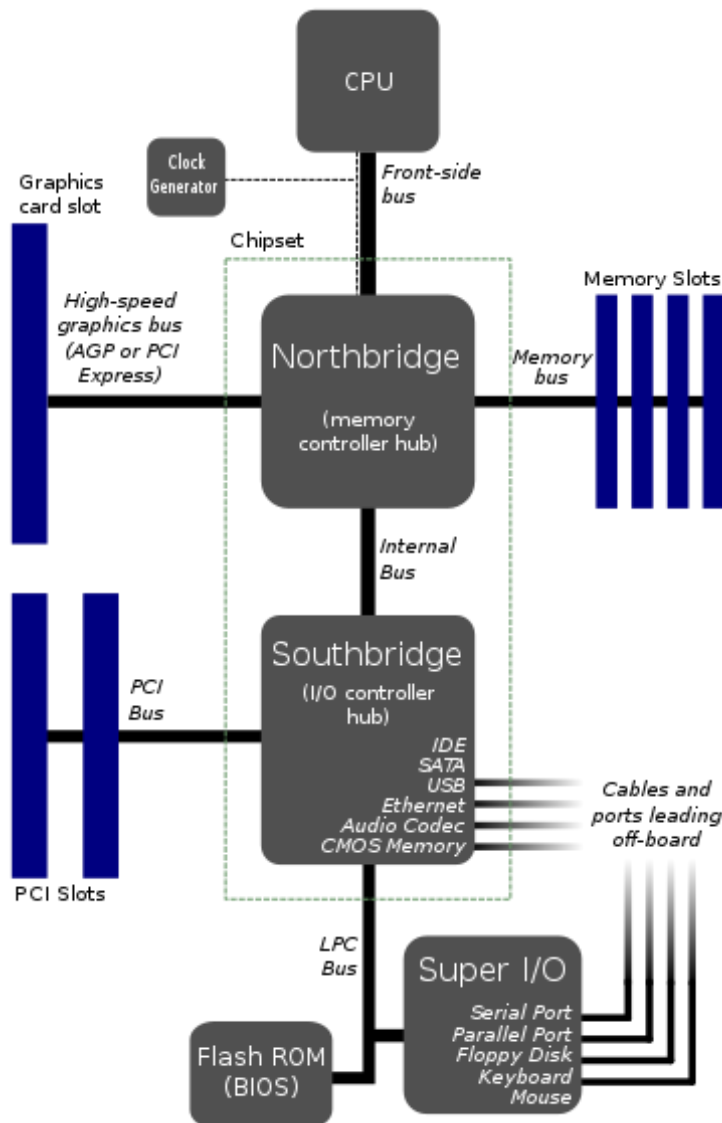
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8.1 Expansion Slots

- In a typical PC motherboard there are sockets which we can plug additional **hardware units** to extend the functionalities of the PC.
- These pluggable hardware units are typically referred as expansion cards.
 - Sound Card
 - Graphics Accelerator Card
 - Network Card
- The sockets that are used to plug these expansion cards are called "**Expansion Slots**".
 - PCI - ISA - AGP

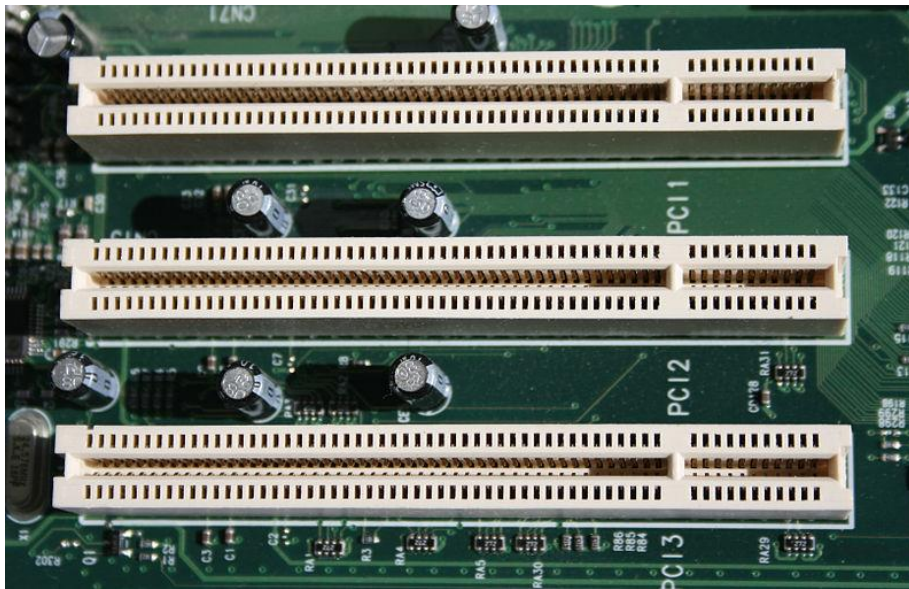
Bus Architecture

- Common bus architecture is given in this figure.



8.1.1 PCI Slot

- PCI stands for **P**eripheral **C**omponent **I**nterconnect
- PCI standard was introduced in 1990s
- It's a hybrid standard of ISA and VL-Bus (earlier buses)
- Compatible expansion cards can be plugged



Three 5-volt 32-bit PCI expansion slots on a motherboard

Image Source – Wikipedia article on “Peripheral Component Interconnect”

https://en.wikipedia.org/wiki/Peripheral_Component_Interconnect

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8.1.2 ISA Slot

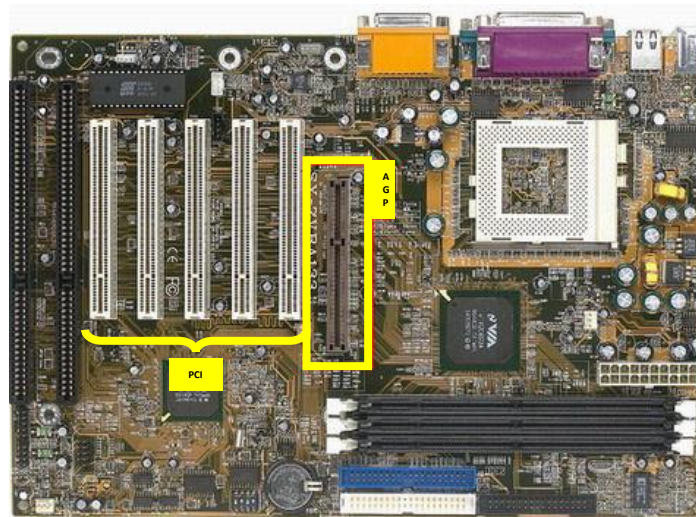
- ISA stands for **I**ndustry **S**tandard **A**rchitecture
- Slots in 8 bit and 16 bit were available
- PCI was introduced as a successor standard (ISA was much slower in data transmission)
- ISA is no longer in use



Five 16-bit and one 8-bit ISA slots on a motherboard.

8.1.3 AGP Slot

- AGP stands for **A**ccelerated **G**raphic **P**ort
- An improved version of PCI to cater the requirement of accelerated graphic processing
- AGP was gradually replaced by PCI-Express slot which is more advanced version of graphics processing



AGP Slot on a motherboard

8.2 Expansion Cards

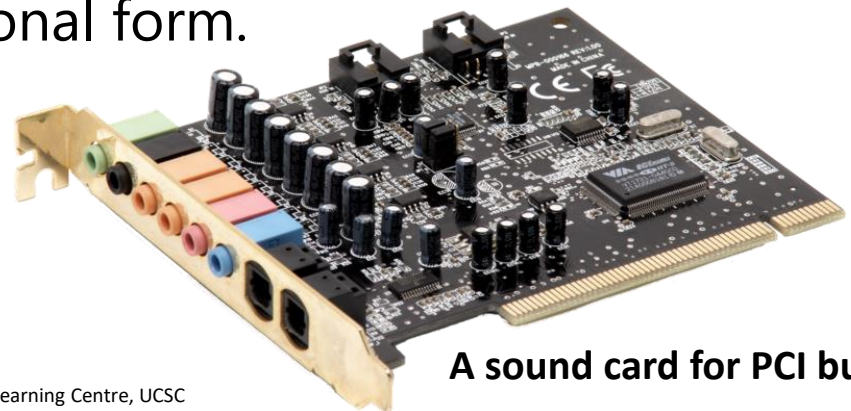
- An electronic circuit unit that builds into a circuit board and can be inserted into an expansion slot on a motherboard is referred to as an Expansion Card.
- Expansion cards can be installed and removed according to the requirements.
- Ex.
 - Sound Card
 - Network Card

8.2.1 Graphics Accelerator Cards

- These cards are inserted into PCI, AGP or PCI-Express slots
- Graphics processing involves with computationally intensive operations. Thus, that burden is transferred to Graphics Accelerator unit while CPU handling general computational operations.
- Modern graphics cards have its own processor and RAM

8.2.2 Sound Cards

- Sound card manipulate audio signals
- It uses Digital-to-Analog converter to transfer digital audio form to analog signals that can be issued through speackers.
- Similarly, Analog-to-Digital coverter is used to transfer analog form of a signal to digital form that can be represented in a computational form.



A sound card for PCI bus

8.2.3 Network Card

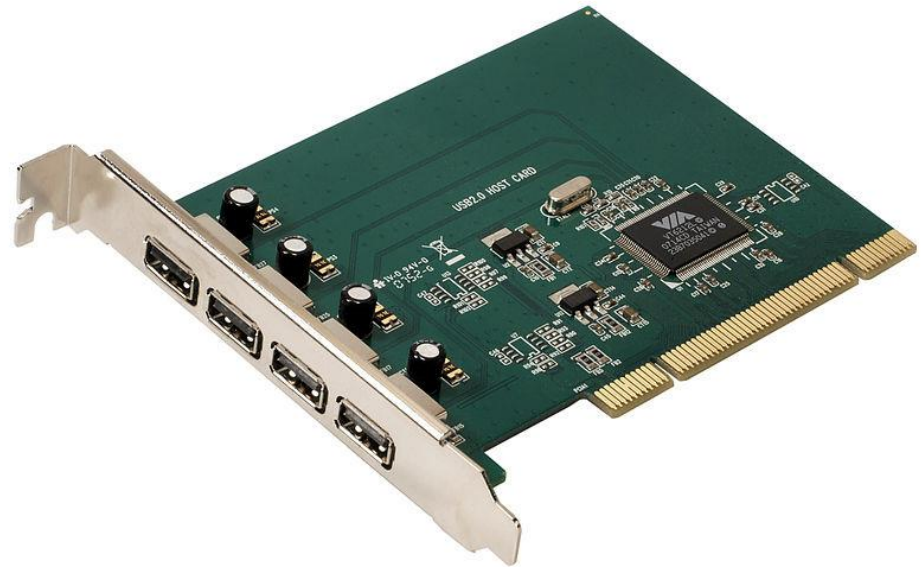
- Network card assists the host computer to communicate with an external device through network connectivity.
- There can be wired and wireless network cards that facilitate wired and wireless network connectivity.
- Through a network connectivity, a computer can access shared resources, communicate with external entities, etc.
 - https://simple.wikipedia.org/wiki/Network_card
 - https://en.wikipedia.org/wiki/Network_interface_controller

8.2.4 TV and Video Capture Card

- These cards allows a computer to receive television signals. As a result, a user can watch TV programs in a computer.
- Video capture feature allows the computer to record TV programs.
- Sometimes, these TV cards can be used with FM radio frequencies. Thus, a user can listen to FM radio channels.

8.2.5 USB Card and USB Hub

- USB stands for **U**niversal **S**erial **B**us
- In order to add one or more USB sockets to the computer, a USB card can be plugged into an expansion socket.
- Many devices can be connected via USB interfaces.
 - Mouse/ Keyboard
 - Printer/ Scanner
 - Camera



A four USB 2.0 socket expansion card for PCI

8.2.6 Fire-wire card

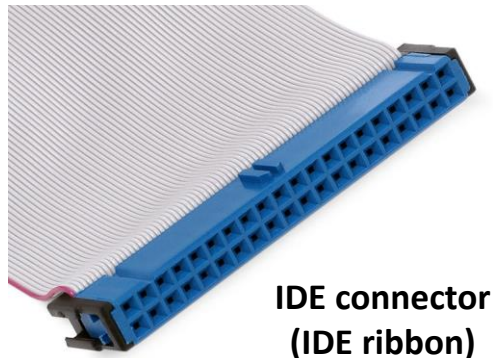
- Fire-wire is an interface standard which was introduced for faster data transfer.
- Fire-wire card allows a Fire-wire device or peripheral to be connected to a computer.
- The Fire-wire cable supplies the electricity to the device it is connected with. Thus, a device with moderate power requirement can operate without a separate power supply.

8.3 Interfaces

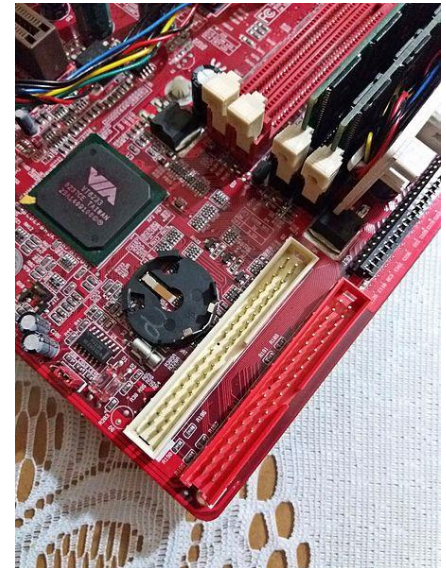
- In communication, interface is an electronic circuit that allows sending and receiving data according to a well defined standard.
- There are different types of communication interfaces are available in a computer.
 - IDE
 - SATA
 - Network Interface
 - USB

8.3.1 IDE

- IDE stands for **I**ntegrated **D**rive **E**lectronics and it is formally called the AT Attachment (ATA) interface.
- Commonly used to connect Hard Disks and CD/DVD drives to the motherboard.
- Three main components
 - Device with IDE interface
 - IDE Connector
 - IDE Socket



IDE connector
(IDE ribbon)



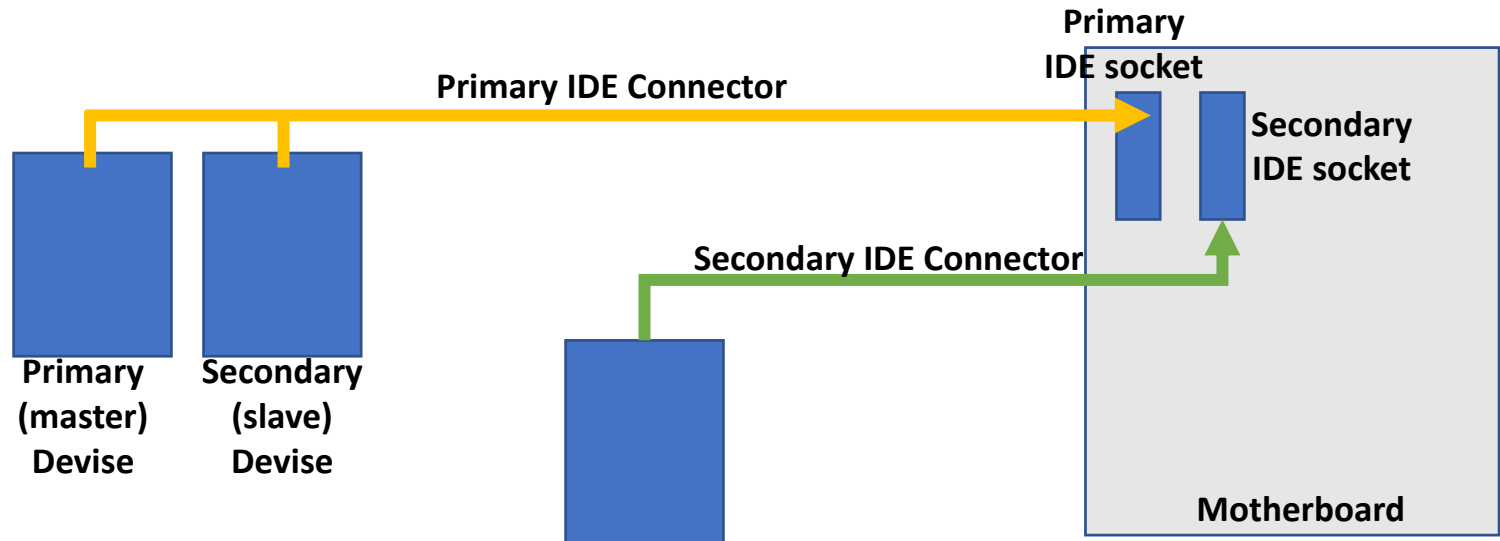
Two IDE interface
on a motherboard

8.3.1 IDE (Cont.)

- A single IDE interface and a connector can connect two devices to a computer. In such configuration, one device is designated as primary (or master), and the other device is designated as secondary (or slave).
- Typically, desktop motherboards came with two IDE sockets. Each socket can connect can connect two devices with master-slave configuration.

8.3.1 IDE Master-Slave Configuration

- Following figure depicts master-slave configuration of devices using a IDE connector.
- Jumper settings at the device help to determine the master and slave devices connected to a IDE ribbon.



8.3.2 SATA

- SATA stands for **Serial ATA** which was introduced as a efficient data transfer compared to ATA (IDE).
- No master/slave configurations and hence easier to use.

With all these benefits, SATA replaced the use of IDE (ATA) from desktop computers.



Seven pin SATA connector

8.3.3 SCSI

- SCSI stands for **S**mall **C**omputer **S**ystem **I**nterface.
- SCSI is an older technology compared to IDE and SATA. But it is still in use for some of the advantages it has over other technologies.
- There are different variants of SCSI and Serial Attached SCSI (SAS) is regarded as a norm for data centres due to higher data rate, reliability and simplicity.

8.3.4 Standard Serial and Parallel port

- Both Serial and Parallel ports are old fashioned ports that are non-existent in modern computers.
- Serial port was used to connect modems, terminal and other peripherals.
- Parallel port was used to connect printers.



Parallel Port



Serial Port Connector

8.3.5 Universal serial bus

- USB stands for **Universal Serial Bus**.
- USB has mainly replaced the use of Serial and Parallel ports from computers and many other interface types are being replaced due to fast, reliable and simple use.
- Allows plug & play for many devices.
- Watch the video **USB Ports, Cables, Types, & Connectors**
<https://www.youtube.com/watch?v=pIZREjck9jg>

8.3.6 Fire-wire

- The IEEE 1394 standard is commonly known as Fire-wire. It was introduced to faster and realiable data transfer.
- The connector cable carries both power and data that allows devices to operate without a separate power supply.
- Fire-wire was popular among multimedia community due to its extremely faster data transfer which enables connecting audio/video devices to a computer.

External References

- Expansion Cards [YouTube]
 - <https://www.youtube.com/watch?v=5wmBu7f5PCs>