INTERFACES

A boundary across which two independent systems meet and act on or communicate with each other. In computer science, an interface is the point of interaction with software, or computer hardware, or with peripheral devices such as a computer monitor or a keyboard. Some computer interfaces such as a touch screen can send and receive data, while others such as a mouse or microphone can only send data.

There are several types of interfaces:

1. User Interfaces.
2. Hardware Interfaces.
3. Software Interfaces

USER INTERFACES: The keyboard, mouse, menus of a computer system. The user interface allows the user to communicate with the operating system.

HARDWARE INTERFACES: Hardware interfaces exist in computing systems between many of the components such as the various buses, storage devices, other I/O devices, the wires, plugs and sockets that hardware devices use to communicate with each other etc.

SOFTWARE INTERFACES:  The languages and codes that the applications use to communicate with each other and with the hardware. A software interface may refer to a range of different types of interface at different "levels": an operating system may interface with pieces of hardware. Applications or programs running on the operating system may need to interact via streams, and in object oriented programs, objects within an application may need to interact via methods.

Interfaces based on data transfer-

SERIAL INTERFACE: A serial interface is a communication interface that transmits data as a single stream of bits, typically using a wire-plus-ground cable, a single wireless channel or a wire-pair.   
The serial interface acts as a communication interface between two digital systems that send data as a series of voltage pulses over a wire. In contrast, a parallel interface transmits multiple bits simultaneously using different wires. Some devices that use the serial interface include the Universal Serial Bus (USB), Recommended Standard No. 232 (RS-232), 1-Wire and I2C.

PARALLEL INTERFACE: A parallel interface refers to a multiline channel, with each line capable of transmitting several bits of data simultaneously. Before USB ports became common, most personal computers (PCs) had at least one parallel interface for connecting a printer using a parallel port. Computer buses like ISA, PCI, and SCSI etc. are examples of parallel interface.

PORTS

In computer hardware, a port serves as an interface between the computer and other computers or peripheral devices. Physically, a port is a specialized outlet on a piece of equipment to which a plug or cable connects. Electronically, the several conductors making up the outlet provide a signal transfer between devices.

There are two main types of computer ports:

* Physical ports.
* Virtual ports.

PHYSICAL PORTS

Physical ports are used for connecting a computer through a cable and a socket to a peripheral device. Physical computer ports list includes serial ports (DB9 socket), USB ports (USB 2.0 or 3.0 socket / connector), parallel ports (DB25 socket / connector), Ethernet / internet ports (RJ45 socket / connector).



VIRTUAL PORTS

Virtual ports are data gates that allow software application (network) to use hardware resources without any interfering. This computer ports ( network ports ) are defined by IANA ( Internet Assigned Numbers Authority ) and are used by TCP ( Transmission Control Protocol ), UDP ( User Datagram Protocol ), DCCP ( Datagram Congestion Control Protocol ) and SCTP ( Stream Control Transmission Protocol ).



TYPES OF PORTS

Ports are basically categorized in two categories:

* Parallel ports
* Serial ports

PARALLEL PORTS

Parallel ports send multiple bits at the same time over several sets of wires. Parallel ports can be used to connect a host of popular computer peripherals:

* Printers
* Scanners
* CD burners
* External HDD
* Network Adapters

SERIAL PORTS

Serial ports send and receive one at a time via a single wire pair. Although many of the newer systems have done away with the serial port completely in favor of USB connections, most modems still use the serial port, as do some printers, PDAs and digital cameras.

CHIPSET

A chipset is the component which routes data between the computer's buses, so that all the components which make up the computer can communicate with each other. The chipset originally was made up of a large number of electronic chips, hence the name. It generally has two components:

* The North Bridge (also called the memory controller) is in charge of controlling transfers between the processor and the RAM, which is way it is located physically near the processor. It is sometimes called the GMCH, for Graphic and Memory Controller Hub.
* The South Bridge (also called the input/output controller or expansion controller) handles communications between peripheral devices. It is also called the ICH (I/O Controller Hub). The term bridge is generally used to designate a component which connects two buses.



## SYSTEM RESOURCE

A resource, or system resource, is any physical or virtual component of limited availability within a computer system. Every device connected to a computer system is a resource. Every internal system component is a resource.

## Interrupt:

In systems programming, an interrupt is a signal to the processor emitted by hardware or software indicating an event that needs immediate attention. An interrupt alerts the processor to a high-priority condition requiring the interruption of the current code the processor is executing, the current thread. The processor responds by suspending its current activities, saving its state, and executing a small program called an interrupt handler (or interrupt service routine, ISR) to deal with the event. This interruption is temporary, and after the interrupt handler finishes, the processor resumes execution of the previous thread.

## Purpose of Interrupt in Computer Organization:

Interrupt is a mechanism by which i/o or memory may interrupt the normal processing by CPU. It may be either clicking by mouse, dragging a cursor, printing a document etc the case where interrupt is getting generated.

## Why required?

External devices are comperetively slower than CPU. So if there is no interrupt, CPU would waste a lot of time waiting for external devices to matche its speed with CPU. This decreases the efficiency of CPU. Hence, interrupt is required to eliminate these limitations. With interrupt,

1. Suppose CPU instruct to print a certain document
2. While printer does its task, CPU can execute another task
3. While printer is done, it tells to CPU that it has done (tells= interrupt)

## Advantages:

1. Increases the efficiency of CPU
2. Decreasing the waiting time of CPU
3. Stops the wastage of instruction cycle
4. Enable multitasking by allowing the CPU to quickly switch between different processes
5. Simplify i/o operations by allowing devices to communicate with CPU directly

## Disadvantages:

1. CPU has to do lot of works to handle interrupts (overhead: resume previous states)
2. Overhead required to handle the interrupt request can reduce the efficiency of the system
3. Interrupt storms can occur when there is high level of interrupt activity
4. Priority inversion can occur when a low priority task hold a resource of high priority task.

There are two types of interrupts:

1. hardware interrupt is an electronic alerting signal sent to the processor from an external device, either a part of the computer itself such as a disk controller or an external peripheral. For example, pressing a key on the keyboard or moving the mouse triggers hardware interrupts that cause the processor to read the keystroke or mouse position. Unlike the software type (below), in hardware interrupts are asynchronous and can occur in the middle of instruction execution, requiring additional care in programming. The act of initiating a hardware interrupt is referred to as an interrupt request **(IRQ).**
2. Software interrupt is caused either by an exceptional condition in the processor itself, or a special instruction in the instruction set which causes an interrupt when it is executed. The former is often called a trap or exception and is used for errors or events occurring during program execution that are exceptional enough that they cannot be handled within the program itself. For example, if the processor's arithmetic logic unit is commanded to divide a number by zero, this impossible demand will cause a divide-by-zero exception, perhaps causing the computer to abandon the calculation or display an error message. Software interrupt instructions function similarly to subroutine calls and are used for a variety of purposes, such as to request services from low level system software such as device drivers. For example, computers often use software interrupt instructions to communicate with the disk controller to request data be read or written to the disk. Each interrupt has its own interrupt handler. The number of hardware interrupts is limited by the number of interrupt request (IRQ) lines to the processor, but there may be hundreds of different software interrupts.

Interrupts are a commonly used technique for computer multitasking, especially in real-time computing. Such a system is said to be interrupt-driven.