Understanding the working of NIC cards, Ethernet/Fast Ethernet/Gigabit Ethernet.

**What is nic**

A network interface card (NIC) is a hardware component without which a computer cannot be connected over a network. It is a circuit board installed in a computer that provides a dedicated network connection to the computer. It is also called network interface controller, network adapter or LAN adapter.

A NIC provides a computer with a dedicated, full-time connection to a network by implementing the physical layer circuitry necessary for communicating with a data link layer standard, such as Ethernet or Wi-Fi. Each card represents a device and can prepare, transmit and control the flow of data on the network. The NIC uses the OSI model to send signals at the physical layer, transmit data packets at the network layer and operate as an interface at the TCP/IP layer.

The network card operates as a middleman between a computer and a data network. For example, when a user requests a web page, the computer will pass the request to the network card which converts it into electrical impulses. Those impulses are received by a web server on the internet and responds by sending the web page back to the network card as electrical signals. The card gets these signals and translates them into the data that the computer displays.

**Working of NIC**

The **Functions of the network interface card** is, it acts like a bridge connecting multiple computers using LAN – local area network or router, which is plugged into the NIC card slot. Considering a live scenario of corporate offices, for a better understanding of the concept.

In a company there may be many computers provided with WiFi access, where each employee is assigned with one computer to work when the employee wants to access the company website to update his day to day work status, he is provided with his login credentials. He can only log in to his profile based on two scenarios, one is a proper internet connection which can be either wired or wireless connection and other correct login credentials.

These computers which are connected to NIC communicate over the internet where the incoming data travels along the media is received by NIC. These bits which are received formatted into frames, CRC (cyclic redundant code) is compared with CRC (cyclic redundant code) in the frame trailer and calculated using CRC (cyclic redundant code) algorithm. If CRC (cyclic redundant code) doesn’t match it means the frame is damaged/changed and it is discarded. This kind of situation is rarely observed in an electrically noisy environment.

**Types of nic**

While the standard NIC is a plastic circuit board that slides into a computer to connect with the motherboard, there are multiple ways this connection can occur:

* Wireless - These are NICs that use an [antenna](https://searchmobilecomputing.techtarget.com/definition/antenna) to provide wireless reception through [radio frequency](https://searchnetworking.techtarget.com/definition/radio-frequency) waves. Wireless NICs are designed for Wi-Fi connection.
* Wired - These are NICs that have input jacks made for cables. The most popular wired LAN technology is Ethernet.
* USB - These are NICs that provide network connections through a device plugged into the USB port.
* Fiber optics - These are expensive and more complex NICs that are used as a high-speed support system for network traffic handling on server computers. This could also be accomplished by combining multiple NICs.

**What is Ethernet**

Ethernet, pronounced "E-thernet" (with a long "e"), is the standard way to connect computers on a network over a wired connection. It provides a simple interface and for connecting multiple devices, such computers, routers, and switches. With a single router and a few Ethernet cables, you can create a LAN, which allows all connected devices to communicate with each other.

A standard Ethernet cable is slightly thicker than a phone cable and has an [RJ45](https://techterms.com/definition/rj45) connector on each end. Ethernet ports look similar to telephone jacks, but are slightly wider. You can plug or unplug devices on an Ethernet network while they are powered on without harming them.

Like [USB](https://techterms.com/definition/usb), Ethernet has multiple standards that all use the same interface. These include:

* 10BASE-T - supports up to 10 Mbps
* 100BASE-T - supports up to 100 Mbps
* 1000BASE-T (also called "[Gigabit](https://techterms.com/definition/gigabit) Ethernet") - supports up to 1,000 Mbps

Most Ethernet devices are backwards compatible with lower-speed Ethernet cables and devices. However, the connection will only be as fast as the lowest common denominator. For example, if you connect a computer with a 10BASE-T [NIC](https://techterms.com/definition/nic) to a 100BASE-T network, the computer will only be able to send and receive data at 10 Mbps. If you have a Gigabit Ethernet router and connect devices to it using 100BASE-T cables, the maximum [data transfer rate](https://techterms.com/definition/datatransferrate) will be 100 Mbps.

**Working of Ethernet**

Ethernet lies in the lower layers of the Open Systems Interconnection (OSI) model. It facilitates the operation of physical and data link layers. The OSI model, which is composed of seven layers, illustrates how various communication protocols work together.

The OSI’s seven layers are:

* Physical layer
* Data link layer
* Network layer
* Transport layer
* Session layer
* Presentation layer
* Application layer

The topmost layer is the application layer, which enables users to download and access data from a browser or mail client. Users enter their queries through the application, which forwards it to the next layer. The request comes in what’s called a “packet.” The packet contains data about the destination web address and information about the sender. This information includes the sender’s IP address, device version, and browser agent.

The packet is transmitted from the application layer until it reaches the bottom layer (now called an “Ethernet frame”). The bottom or first layer is the one closest to your device. The packet travels back and forth the OSI stack, being packed and unpacked in each layer for checking.

Types of Ethernet network (fast Ethernet, gigabit )

### Fast Ethernet

The Fast Ethernet standard (IEEE 802.3u) has been established for Ethernet networks that need higher transmission speeds. This standard raises the Ethernet speed limit from 10 Mbps to 100 Mbps with only minimal changes to the existing cable structure. Fast Ethernet provides faster throughput for video, multimedia, graphics, Internet surfing and stronger error detection and correction.

There are three types of Fast Ethernet: 100BASE-TX for use with level 5 UTP cable; 100BASE-FX for use with fiber-optic cable; and 100BASE-T4 which utilizes an extra two wires for use with level 3 UTP cable. The 100BASE-TX standard has become the most popular due to its close compatibility with the 10BASE-T Ethernet standard.

Network managers who want to incorporate Fast Ethernet into an existing configuration are required to make many decisions. The number of users in each site on the network that need the higher throughput must be determined; which segments of the backbone need to be reconfigured specifically for 100BASE-T; plus what hardware is necessary in order to connect the 100BASE-T segments with existing 10BASE-T segments. Gigabit Ethernet is a future technology that promises a migration path beyond Fast Ethernet so the next generation of networks will support even higher data transfer speeds.

### Gigabit Ethernet

Gigabit Ethernet was developed to meet the need for faster communication networks with applications such as multimedia and Voice over IP (VoIP). Also known as “gigabit-Ethernet-over-copper” or 1000Base-T, GigE is a version of Ethernet that runs at speeds 10 times faster than 100Base-T. It is defined in the IEEE 802.3 standard and is currently used as an enterprise backbone. Existing Ethernet LANs with 10 and 100 Mbps cards can feed into a Gigabit Ethernet backbone to interconnect high performance switches, routers and servers.

From the data link layer of the OSI model upward, the look and implementation of Gigabit Ethernet is identical to that of Ethernet. The most important differences between Gigabit Ethernet and Fast Ethernet include the additional support of full duplex operation in the MAC layer and the data rates.