ETHERNET: SOME THINGS YOU NEED TO KNOW AND STUDY

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Abstract: In moment's business world, dependable and effective access to information has come an important asset in the hunt to achieve a competitive advantage. Train closets and mountains of papers have given way to computers that store and manage information electronically. Co-workers thousands of country miles piecemeal can partake information presently, just as hundreds of workers in a single position can contemporaneously review exploration data maintained online. Computer networking technologies are the cement that binds these rudiments together. The public Internet allows businesses around the world to partake information with each other and their guests. The global computer network known as the World Wide Web provides services that let consumers buy books, clothes, and indeed buses online, or transaction those same particulars off when no longer wanted. In this composition, we will take a veritably close look at networking, and in particular the Ethernet networking standard, so you can understand the factual mechanics of how all of these computers connect to one another.

Keywords : Computer networks , WWW, Ethernet

1. INTRODUCTION TO ETHERNET

Ethernet is one of the original networking technologies, having been invented nearly 50 years ago. And yet, because of the simplicity by which the communications protocol can be deployed and its ability to incorporate modern advancements without losing backwards compatibility, Ethernet continues to reign as the de facto standard for computer networking. At its core, Ethernet is a protocol that allows computers (from servers to laptops) to talk to each other over wired networks that use devices like routers, switches and hubs to direct traffic. Ethernet works seamlessly with wireless protocols, too.Its ability to work within almost any environment has led to its universal adoption around the world. This is especially true because it allows organizations to use the same Ethernet protocol in their local area network (LAN) and their wide-area network (WAN). That means that it works well in data centers, in private or internal company networks, for internet applications and almost anything in between. It can even support the most complex forms of networking, like virtual private networks (VPNs) and software-defined networking deployments.

Who invented Ethernet?

The original Ethernet standard was created in 1973 by Xerox PARC engineers Robert Metcalfe and David Boggs, and was inspired by a project being conducted at the University of Hawaii, called ALOHAnet. Primitive by today's standards, it could only achieve 2.94 Mb/sec in raw speed, but it was one of the first times that computers were actually linked into a network.

Outside of a university setting, the public would not see Ethernet until 1980, when Xerox made it available to everyone. By then there were other competing standards such as Token Ring, ARCNET and others. But Metcalfe, who had since left the company to found 3Com, convinced many of the major industry players, including Digital Equipment Corporation (DEC), Intel and Xerox, to work with 3Com to push Ethernet as a unified standard.

As part of that agreement, Xerox dropped its trademark of the Ethernet name, allowing any company to use Ethernet with its products. Bandwidth and throughput was also increased to 10 Mb/sec, which was more than enough to handle most networking tasks at the time, with room to spare. All of that helped Ethernet to become the dominant standard worldwide.

Ethernet is a type of communication protocol that is created at Xerox PARC in 1973 by Robert Metcalfe and others, which connects computers on a network over a wired connection. It is a widely used LAN protocol, which is also known as Alto Aloha Network. It connects computers within the local area network and wide area network. Numerous devices like printers and laptops can be connected by LAN and WAN within buildings, homes, and even small neighborhoods.

It offers a simple user interface that helps to connect various devices easily, such as switches, routers, and computers. A local area network (LAN) can be created with the help of a single router and a few Ethernet cables, which enable communication between all linked devices. This is because an Ethernet port is included in your laptop in which one end of a cable is plugged in and connect the other to a router. Ethernet ports are slightly wider, and they look similar to telephone jacks.

With lower-speed Ethernet cables and devices, most of the Ethernet devices are backward compatible. However, the speed of the connection will be as fast as the lowest common denominator. For instance, the computer will only have the potential to forward and receive data at 10 Mbps if you attach a computer with a 10BASE-T NIC to a 100BASE-T network. Also, the maximum data transfer rate will be 100 Mbps if you have a Gigabit Ethernet router and use it to connect the device.

The wireless networks replaced Ethernet in many areas; however, Ethernet is still more common for wired networking. Wi-Fi reduces the need for cabling as it allows the users to connect smartphones or laptops to a network without the required cable. While comparing with Gigabit Ethernet, the faster maximum data transfer rates are provided by the 802.11ac Wi-Fi standard. Still, as compared to a wireless network, wired connections are more secure and are less prone to interference. This is the main reason to still use Ethernet by many businesses and organizations.
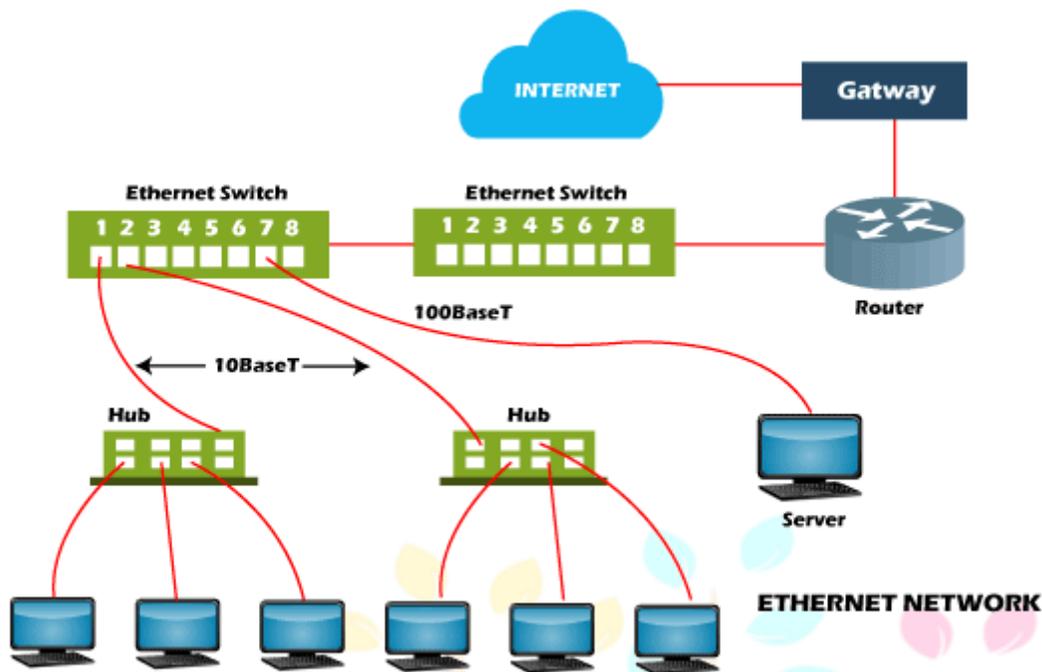
2. DIFFERENT TYPES OF ETHERNET NETWORKS

An Ethernet device with CAT5/CAT6 copper cables is connected to a fiber optic cable through fiber optic media converters. The distance covered by the network is significantly increased by this extension for fiber optic cable. There are some kinds of Ethernet networks, which are discussed below:

- Fast Ethernet: This type of Ethernet is usually supported by a twisted pair or CAT5 cable, which has the potential to transfer or receive data at around100 Mbps. They function at 100Base and 10/100Base Ethernet on the fiber side of the link if any device such as a camera, laptop, or other is connected to a network. The fiber optic cable and twisted pair cable are used by fast Ethernet to create communication. The 100BASE-TX, 100BASE-FX, and 100BASE-T4 are the three categories of Fast Ethernet.
- Gigabit Ethernet: This type of Ethernet network is an upgrade from Fast Ethernet, which uses fiber optic cable and twisted pair cable to create communication. It can transfer data at a rate of 1000 Mbps or 1Gbps. In modern times, gigabit Ethernet is more common. This network type also uses CAT5e or other advanced cables, which can transfer data at a rate of 10 Gbps.

The primary intention of developing the gigabit Ethernet was to full fill the user's requirements, such as faster transfer of data, faster communication network, and more.

- 10-Gigabit Ethernet: This type of network can transmit data at a rate of 10 Gigabit/second, considered a more advanced and high-speed network. It makes use of CAT6a or CAT7 twisted-pair cables and fiber optic cables as well. This network can be expended up to nearly 10,000 meters with the help of using a fiber optic cable.

- Switch Ethernet: This type of network involves adding switches or hubs, which helps to improve network throughput as each workstation in this network can have its own dedicated 10 Mbps connection instead of sharing the medium. Instead of using a crossover cable, a regular network cable is used when a switch is used in a network. For the latest Ethernet, it supports 1000Mbps to 10 Gbps and 10Mbps to 100Mbps for fast Ethernet.

3. ETHERNET STANDARDS

There are different standards of Ethernet, which are discussed below with additional information about each of them.

Ethernet II / DIX / 802.3

A studied edition of Ethernet, Ethernet II, also called as DIX. The DIX stands for Digital, Intel, and Xerox. And, 802.3, which is rewritten by Digital Equipment Corp, Xerox, and Intel.

Fast Ethernet / 100BASE-T / 802.3u

Fast Ethernet (100BASE-T or 802.3u) is a communications protocol, which is usually supported by a twisted pair or CAT5 cable.

The 100BASE-T standards have two types. The 100BASE-T is the first standard that makes use of CSMA/CD.

Three different kinds of cable technologies are available with 100BASE-T.

1. 100BASE-T4: It is utilized for a network that requires a low-quality twisted-pair on a 100-Mbps Ethernet.
2. 100BASE-TX: It makes use of two-wire data grade twisted-pair wire, developed by ANSI 100BASE-TX, which is also called 100BASE-TX and 100BASE-X.
3. 100BASE-FX: It uses 2 stands of fibre cable and developed by ANSI.

Gigabit Ethernet / 1000BASE-T / 802.3z / 802.ab

Gigabit Ethernet has the potential to transmit data up to 1 Gbps, which makes use of all four copper wires in category 5, which is also called 1000BASE-T or 802.3z / 802.3ab.10 Gigabit Ethernet / 802.3ae

10 Gigabit Ethernet (10GE or 10 GbE or 10 GigE) is a new standard that defines only full-duplex point-to-point links. It supports up to 10 Gb/s transmissions that were published in 2002, which is also known as 802.3ae. The hubs, CSMA/CD, and half-duplex operation do not exist in 10 GbE.

How to connect or plug in an Ethernet cable

The process will be the same, whether you are connecting an Ethernet cable to your computer or setting up a home network. As the below image is representing that it appears to be a large telephone cord jack. Once you have located it, then, until you hear a click, you have to push the cable connector into the port. You will see a green light that indicates a signal is found if the connection is properly established on the other end.
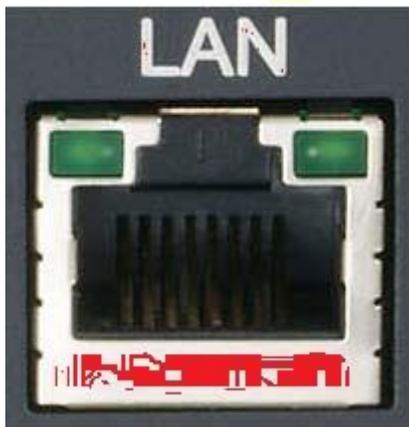
Why is Ethernet used?

Ethernet is still a common form of network connection, which is used for its high speed, security, and reliability. It is used to connect devices in a network that is used by specific organizations for local networks, organizations such as school campuses and hospitals, company offices, etc.

As compared to technology such as IBM's Token Ring, due to Ethernet's low price, it initially grew popular. As gradually network technology advanced, Ethernet ensured its sustained popularity as it has the potential to develop and deliver higher levels of performance with maintaining backward compatibility. In the mid-1990s, the original ten megabits per second of Ethernet increased to 100 Mbps. Furthermore, up to 400 gigabits per second can be supported by current versions of Ethernet.

How Ethernet Works

The Ethernet, in the OSI model, facilitates the operation of physical and data link layers and resides in the lower layers of the Open Systems Interconnection. There are seven layers available in the OSI model, which are as follow:

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

The application layer is the topmost layer that makes capable of users to download and access data from a mail client or a web browser. Users enter their queries with the help of the application; then, it is sent to the next layer, where the request is known as a "packet." The information about the sender and the destination web address is contained by the packet. Until the packet is reached the bottom layer, called the Ethernet frame, the packet is transmitted from the application layer. The layer closest to your device is the first or bottom layer.

4. CONCLUSION AND FUTURE WORK:

Ethernet is moving into the WAN along with a growing range of real-time network services. The cost of deploying full services in each corporate location may well exceed the cost of simply providing WAN-borne access. VPLS is a promising approach to the provision of a rich mix of WAN-based services

Terabit Ethernet is still in the future, but the term refers to Ethernet above 100 Gbps. The IEEE 802.3bs task force defines 200 Gigabit (200GBASE) and 400 Gigabit Ethernet (400GBASE) as Terabit Ethernet. Carriers and large enterprises are working to reach 200Gb and 400Gb in 2020

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