# A Survey on Wired and Wireless Network

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**Abstract**

The wireless industry is going very fast nowadays. We can easily see the evolution from 2G to 3G and now advance to the 4G and 5G network. Before wireless networks, wired networks were commonly used in every field. But there were some disadvantages regarding mobility, quality of service and connectivity. Wired network bounded the region of the working area for the internet and it requires multiple wires to connect computer from one device to another. While on the other hand wireless network is an open source for everyone to use the internet. There is no limitation of the region and no issue regarding connectivity because data is transfer through signal which includes frequency in the form of waves. But there are also some disadvantages of wireless network regarding cost, speed, coverage, bandwidth etc. If we talk about the better network so it depends on the situation and problem.

**Keywords:** Wired, Wireless, Network, Security, Internet

## 1. INTRODUCTION

The network is a set of communication devices connected by media links. There are two types of network wired network and wireless network [1]. Bob Metcalfe and D.R. Boggs are the two engineers who developed the Ethernet (Wired network) [2].They started their work in 1972 and established their development in 1980 under the standards IEEE (802.3).Wired network defines as a low-level transfer of data and for its usage, they build the cards and cables, through which data can be transfer from one PC to another computer. The term wired refer some solid thing which consists of the cable. Wired network means that connection through cables, modem or any other source. The data transfer from one place to another through the cables. The cables are consists of copper, fiber optic, and twisted pair. In a wired network internet connection is taken up from only one source (single wire), modem or any other kind of means. The wired network also includes Ethernet in it. Ethernet wire has been using for a long time period. The wired network usually transfers the data up to 10 Mbps. Fast Ethernet and Giga Ethernet also used in the wired network. The speed of fast Ethernet is 100 Mbps and the speed of Giga Ethernet is 1000 Mbps and

CAT 5, CAT 6 both wires used for fast and gigabit Ethernet [3]. The wireless network was also established by IEEE in 1997 with standard 802 [4], its first connection was of 2 Mb and that time it was not so much advance and familiar to anyone but later with the generating of new versions of wireless, it become famous over the world. Wireless network refers to a medium such as electromagnetic waves or infrared waves through which data passes. All the wireless network devices have antennas and sensor in them [5]. The wireless network is based upon on frequency without using any kind of wire .it is an open source for every person. In a wired network, the region is bound for the user to use the internet and to communicate with another computer. But because of the wireless network region is not bound for the user and connectivity to become easy. Wired network is inexpensive and has high reliability and high bandwidth with high speed. Whereas wireless network is expensive, have lower quality and lower bandwidth. Wireless network infrastructure requires little more than the single access point. On the other hand, the wired network has more difficulty and complexity with the cable connections. Using wireless network many people can access the internet but in wired

network additional user need the additional wiring. There are some problems in the wired network which we are going to discuss in detail in a wireless network which works as a solution.

## 2.    LITERATURE REVIEW

A network is a device which is used to connect by a communication link. The device through which it is connected is also called Node which can be a printer, scanner, and computer. It may be any kind of devices which have the ability to send or receive the data generated by the other devices on the network [6]. All the network work upon the protocols (which are the set of rules made for the network). all the networks must have the following:

- Resource
- Transmission medium

### 2.1.  Reasons for Using Network

There are the following main reasons for using the network:

- Provide service
- Reduce equipment cost
- Sharing the files from one to another medium
- Sharing the printers and other devices
- Manage the security of the resources
- · Support the network application

### 2.2.  Performance of the Network

The most important performances of the network are:

- Reliability
- Security

#### 2.2.1. Reliability

The network is reliable [7] because if the data is lost due to the failure then the network has the capacity to recover the data. It provides the accuracy and failure of the network can be measured by the frequency.

#### 2.2.2. Security

It provides the facility of recovering of the lost data. It secures the data from damage and protects it from external resources. It implies the different policies due to which the data is secure and cannot be easily hacked by the other [8].

### 2.3.  Type of Connection

There are two main and important connections [9] of the network as follow:
- Point to point
- Multipoint

#### 2.3.1. Point to Point Connection

A point to point connection provides the path between two devices. The transmission of the data is reserved between those two points. It uses the length of the cable.

#### 2.3.2. Multipoint Connection

A multipoint connection is used to connect two or more devices by a single link. The channel shared the capacity with each other in the environment.

### 2.4.  Physical Topology of Network

The word physical topology refers to the way in which network is carried out physically, when two or more devices connect with each other with the help of some certain path then it forms a topology [10]. It is basically a geometric representation between the devices.

#### 2.4.1. Types of Topology

- Mesh
- Star
- Bus
- Ring

### 2.5.  Network Models
There are two main models in networks:
- Open system interconnect(OSI)
- Internet model

These models are depending upon the standard. Standards are needed to connect the heterogeneous network with other computer/devices.

### 2.6.  Categories of Networks

- LAN (higher bandwidth and limited in size up to few kilometers)
- WAN (lower bandwidth, have long distance

and multiple of different LAN)
• MAN(size between LAN and WAN and accessible inside the town)
• Now let discuss in detail about the network types on is wired network and the other is a wireless network.

## 3. ORIGIN OF WIRED NETWORK (ETHERNET)

Robert Metcalfe develops the first Ethernet (wired) system at Xerox PARC [11]. It connected more than 100 workstations by using the 1 km cable length at the speed of 2.94Mbits/sec. In 1983 the IEEE 802.3 gave it the specification. It is used for the long distance and the fiber optical cable is used for this purpose for two decades. Now a day's Ethernet gave us the reliability, higher speed, higher bandwidth. But it is the beginning because Ethernet is becoming faster and faster up to 400Gbit to 1Tbit.in future it will further simplify by automated service and delivery etc. The speed of the Ethernet (wired) depends upon the cable we used.

## 4. WIRED NETWORK

The word wired [12] refers to any kind of physical medium which is consisting of the cable. The cables made up of the copper, fiber optics, and twisted pair. Wired network is mostly used to carry different types of signals in the form of electricity from one medium to another. In a wired network, only one internet connection is used in the cable. Only one device is attached to one internet cable and data is shared among the different devices by using this same concept of wire network.



*Figure 4.1: Diagram of Wired Network*

### 4.1 Protocols of Wired Network
Wired network has the following protocols and let's discuss this protocols one by one:

• Ethernet
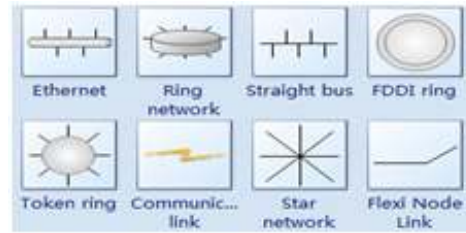• Fast Ethernet
• Local talk
• Token ring
• FDDI



*Figure 4.2. Protocols of Wired Network*

### 4.1.1. Ethernet

It is one of the protocols of a wired network and it is mostly used in the world. Ethernet uses the access method which is called CSMA/CD (carrier sense multiple access/collision detection). This is basically a system in which each computer before sending some information/data through the network must listen to the cable. In this only one by one link is made. If there is multiple networks in a single line then computer have to wait until the line is clear after that it sends the data to the receiver. If two devices send the data through the cable, this work is done by one by one. First, one device receives the data from the sender and the other device have to wait until the first data transfer completed and wait for his turn and try again later. When the first receiver receives the data the second will start. Because of this sometimes collision occurs and the computer has to wait and lots of time consumes. But this collision is occurring for a very small time and it does not affect the transmission of the network. The Ethernet protocol uses the method of bus, star and tree topologies [13]. Data can be transferred through the coaxial wire, optical fiber wire at a speed of 10Mbps up to 1000Mbps.

### 4.1.2. Fast Ethernet

It is another type of protocol which is used to increase the speed of transmission and it develops the new standards that have the speed of 100Mbps [14].this is called fast Ethernet. Fast Ethernet requires the hub, networks interface cards and category 5(CAT5), fiber optics and twisted pair cable is required. This Ethernet is commonly used in school nowadays.

### 4.1.3. Local talk

Local talk is a wired network protocol which was developing by the Apple computer for Macintosh computer [15]. The data is transfer by using the special twisted pair cable. It allows the linear bus, star or tree topologies using twisted pair cable. Disadvantages of the local talk are the low speed of transmission which is 230Kbps.

### 4.1.4. Token ring

The token ring [16] protocol was developing by IBM in 1980 mid. The information is carried out in the form of token and move round in the circle/ring. Two computer cannot connect to each other until the will finish the task. After that, it connects with the other system and its application on 2,23 computers system and rarely used because its performance is very low and lots of time is consumed and lots of trouble is there .its speed is 4Mbps 0r 16Mbps.

### 4.1.5. FDDI

Fiber distributed data interface (FDDI) [17] is another protocol of a wired network that is used to connect two or more LAN. This is far away over a long distance. It is used as the token ring method. But it uses the two rings for the transfer of the data. If one system is busy then the other systems are automatically activated and transmit the data. Its advantages are high speed and it works on the fiber optic cable at 100Mbps.

### 4.2. Advantages of the wired network

• Power is not consumed so much.
• Wired network is easy to use, plug in the wire and ready to use the internet.
• There are varieties of cables available in the market nowadays. The user can choose according to its need and budget.
• It provides the constant, stable and faster speed because it provides one to one connection.
• Security is very strong in a wired network.
• It is beneficial for small area network like at home or at the office.
• It is most reliable than a wireless network.
• It is good for business, home, office, school etc.
• Bandwidth is higher.
• It can extend to the longer distance by using the optical fiber.

### 4.3. Disadvantages of the wired network

• It is not useful for the mobile or Smart-phone. Because it requires some physical sort of connection to use the internet.
• One wired network cable is attached to only one computer so it does not facilitate another computer by single wire.
• Cable can be easily damaged after some time, so the user has to be very careful while arranging and connect the cable with PC and protect the cable from any cuts and water.
• It messes the room where you are gathering the wire
• If you want to connect more devices with each other you need an Ethernet connection. But it also requires more wires to connect and if you are doing this then it is difficult for you to find out that which wire is connected to which PC and it takes your lots of time.
• If you want to expand your network then you need more cables and it becomes more costly and takes lots of time to establish the network. If you want to expand your network widely then you have to rewire all the devices and then again establish the wider network.
• There is no freedom of movement for users.
• Wired network is not suitable for openly public usage.
• Lots of cables need to connect to the certain port.
• Set up is difficult sometimes but it's expensive.

## 5.   WIRELESS NETWORK

The wireless network was also established by IEEE in 1947 with a standard 802. It first connection was of 2Mb and that time it was not so much advance and familiar to anyone but later with the passage of time and generating the new version of wireless, it becomes famous over the world. Wireless word is used to refer to medium which is made up of electromagnetic waves or infrared waves. All the devices, which are wireless that has sensor or antennas embedded in them. It includes mobile, wireless sensor, TV remote, laptop etc. It does not use the wire for the connection between two devices or to transfer the data. It uses the radio frequency waves. Fiber optic and broadband ADSL are also used.

*Figure 5: Diagram of the Wireless Network*

### 5.1. Types of wireless protocols:

There are three protocols of wireless network:
• Long range (measured in miles)
• Medium range (measured in tens or hundreds of feet)
• Short range (less than 10 feet)

#### 5.1.1. Long range

Long range protocols are used for speed to transfer the data over the longer distance. It may be used as back-haul between two sites such as Smart-phone etc. GSM (Global System for Mobile Communication) is the most important protocol of wireless network which is using in all world and its connections are between the cellular phones and mobiles.

#### 5.1.1.1. LTE

Before newer Smart-phone, older generation used GPRS, EV-DO for the communication. Because of that companies and industry have to spend lots of money to upgrade it and made it supportive for 4G. LTE (long-term evaluation) is used to improve the low data rates and other issues that occur in older phone . The protocol can carry the 100Mbps of data which is divided into the users to use and each user gave the 10Mbps.

#### 5.1.1.2. 60 GHz protocol

Most of the video which is running on the computer needs 60GHz and they are using it as well. It requires a lot of bandwidth. There are two different standard called wirelesses HD and WiGig. It gives the best high-quality definition for the video streaming.

#### 5.1.2. Medium Range

WLAN is usually used for the medium range protocol which is used for the communication between the computers to enhance wired LAN or replace it. These all protocols are the parts of IEEE (Institute of electrical and electronics engineers) 802.11 standards.

#### 5.1.2.1. Wi-Fi

Wi-Fi is mostly used nowadays because of its range and access to another device. It provides the facility of a hotspot as well. It becomes popular in 1990 for the hardware usages. Wi-Fi can be controlled in the environment according to the range. Its speed is lower as compared to the other wireless network protocols speed but mobile device easily support the Wi-Fi and LTE and give the flexibility to the user.

#### 5.1.2.2. WAP

The wireless application protocol is standardizing a protocol for communication. It is used to provide the security and privacy to the network. There are other types of protocols .one is WEP and the other is WPA. Both used for security.

#### 5.1.3. Short range

Wireless Personal Area network or WPAN is also called short wireless protocols. Which work on the lower frequencies between the devices which are just a few feet away from each other? Bluetooth is an example of a short range protocol. Its common usage is that it allows the wireless headset to communicate with a portable phone. Infrared data association or IRDA is older and used for every short range protocol.

#### 5.1.3.1. Bluetooth

It is the oldest wireless network protocol which is commonly used now a day. It transfers the data from one device to another device. It needs a lower amount of power to work then Wi-Fi and from most other wireless protocols. It is a short distance wireless network protocol. Wi-Fi has been replaced with the Bluetooth [18] but some Smart-phone still has the features of Bluetooth in their system.

### 5.1.3.2. Wireless Home Automation protocols

It is used to control the remote control of light, home appliances, and gadgets. Two basic protocols for home automation are z-wave and Zigbee. They have low data rates and support the low energy consumption for home automation .0.25Mbps for Zigbee and 0.01Mbps for Z-wave.

### 5.1.3.3. Ultra Wide Band

It is UWB and also called digital pulse wireless. It used for short distance and have a wide frequency band with lower power. And take that kind of data which was bend due to some obstacle or due to some higher power.

### 5.2. Factor affecting the performance of the wireless network

- Physical obstruction
- The range of the network and distance between the devices
- Sharing of signal
- Usage of network and load on the network
- Poor antennas
- Reflection back of the signal
- Spectrum channel limitation
- Restriction of the wireless signal
- The polarization of the signal
- Speed loss due to wireless overhead
- Lower performance

### 5.3. Uses of wireless network

- We can easily use the wireless network [19] in medical science without any kind of issue or danger. It is used in the remote monitoring of the patient, biometric data of wireless network and dispensers application.
- We can also use the wireless technology while traveling with the help of an airline. Now we can travel from place to another without any ticket. Because all documentation is available on your mobile and can be accessed by using the hotspot wireless.
- We can also use the wireless network on hotels. [20]It enhances the business of the hotel. The management uses the wireless internet as wireless network checking of hotel .we can check the guest list through mobile or tablet. Opening and closing of the door are also because of the wireless network.

- We can also use the network in business because everyone can easily access each other; no matter where they are now and what are they doing. Because of this, they can run they're smaller to smaller business and larger also and earn lots of profit.
- We can use the wireless network in mobile communication. By using this technology multimedia approach, interconnection and transfer of data and all other things related to wireless are in your control and range.
- We can also use this technology in voice communication. It gave the facility to in contact with two or more users via video calls or text messaging.
- We can also use the technology in the remote control. There are many different uses of a remote control system such as doorbell at home, TV, car, remote, garage opener etc.
- We can use this technology in entertainment and also in the navigation system.



**Figure5.3. open source Wi-Fi usage**

### 5.4. Properties of wireless network

- Home
- Space
- Performance
- Wireless network element

### 5.4.1. Home

Wireless technologies are effective for sharing printer, scanner, and high-speed internet connection. It saves the cost and time and creates the mobility for the devices which are connected to the devices.

### 5.4.2. Space

It is sometimes become difficult to connect the wires and cables. Wireless technology allows a specific space to the user through which it will be able to communicate with the other device.

### 5.4.3. Wireless Network Element

It is a device used by a carrier to support for the back-end network and it also supports the mobile switching center. Wireless technologies depend upon the network element. It is used in a wireless network in the physical layer.

### 5.4.4. Performance

It enhances the performance of network from 2G to 3G and now mostly using the 4G network with high speed.

### 5.5. Advantages of wireless network

• Users are free to move with a wireless network and can easily access the internet anywhere with their laptop and other handsets devices.
• The user can easily share the files with other devices without any connection of cables.
• There is no need of cable connection. [5] So it is cheap and not a time consumer.
• Easily connected to more than one PC or device at the same time.
• They are convenient and easily accessible.
• It handles a large number of users because it is an open source and unlimited to use.
• By using the wireless network social media information becomes easy to access and become easy to transfer.
• It is convincing because the user can access from any nearly located resources.
• It is useful to enhance the productivity.
• In wireless network number of user connect with each other easily but in wired they all need their wire to connect
• It is cheap.
• Network security is becoming good and stronger than the system cannot be easily hacked because they insert the strong password in hardware and in software.
• Although it is slow in speed it fulfills the requirement of the user and the user easily gets the desired thing from the internet.
• Healthy and safe.
• Wi-Fi is cost effective.

### 5.6. Disadvantages of wireless network
• It can require extra cost and other equipment to set up.
• The person who is not so much familiar with a computer for that type person setting up the wireless becomes difficult.
• Speed is effective and slower while sending some sort of file.
• If you go far away from the router it becomes difficult for you to access the internet. The range is limited.
• Less secure because anyone can steal your internet bandwidth if your password is not secure and not protected.
• Easily hacked the information.
• It depends upon the wave-like radio.

### 5.7. How Wi-Fi has changed the world

Before the internet, nobody familiar with each other but after the internet has arrived people started using it and it becomes so popular that it demands increases day by day. And Wi-Fi becomes the life of people more easily because anyone can access the internet through laptop, mobile and can be accessed by the nearest Wi-Fi, hotspot or booster. Now a day 88% people come online according to the research through Wi-Fi.it played a most important and significant role in human life. With the help of Wi-Fi, we can improve our society and as well as ourselves steadily and speedily. Through Wi-Fi two or more cities are now able to connect to each other .it provide the online shopping facility to the people and this type of shopping criteria is very common in Europe because with the help of this technology people compare the prizes and purchase the item. Wi-Fi [14] is also giving facility of the communication and communication become easier through this technology. Healthcare center is also available for the people online; people can easily connect to the hospital through this technology because now a day's doctor carries Personal Digital Assistant (PDA), through which they can communicate with the people easily, no matter where are they, at home or outside. Wi-Fi is the best solution for a whole geometric location and they can share their data easily. It going forward and forward and day by day its technologies is increases and its speed also up to 866.7Mb/s because of 802.11ac and 802.11n.



*Figure5.7. Wi-Fi advance technology*

### 5.8. Future of wireless technologies

Wireless technology has changed the mean of communication .business industry are running and highly progressed because of the wireless network. It is now more suitable for the business because of its awesome features like speed, security, mobility, and Wi-Fi hotspot. Voice application can be successfully running because of the wireless network. By using this you can easily access the internet with high speed and including text, audio, video messages, and many more things become easier due to the wireless network.



*Figure 5.8 5G network latest technology*

Wireless technology is going faster and faster each year and day by day. [9]In Europe large number of people are using 4G internet and it is not so much common yet in some countries but now they looking forward for a new and advance generation of network which is 5G.it is probably introduced into the market in 2020 and it provides the more services to the people and lots of data with extremely high speed of 10 Gigabit per second and best quality of data with response time below one millisecond which is most beneficial for the internet things. After 5 to 10 years, billions of billions of new devices will use the facility of the 5G [15] including car, machine to machine access, telemedicine, household medicine, no matter of bandwidth because it provides the bandwidth 24/7 to people. And we will use the biohazard sensor which is used to carry the bit to bit data each and every day. This is happening because of the rapid increase in the technology and daily growing of the traffic data. The other most important technology is Li-fi (light Fidelity), which is used to connect the things and data with the help of a light signal. It is faster than Wi-Fi and provides the speed of 224 gigabits per second. It uses the ultraviolet and infrared waves to transfer data and they carry more information than radio frequency waves and it is 10,000 times larger than the radio frequency. Engineers are still working to increase the working capacity of the wireless technology more and more enhanced with better security and high speed.

## 6. CONCLUSION

The wireless network is better than wired network. 80% of the world using the wireless network now a day. Its future is brighter than wired network according to research. Wireless gives the freedom of movement and sharing of files becomes easier, no matter of slower speed. But there have been made some changes in the wireless network properties related to the speed, cost, and security. It gives the flexibility as data is transfer from one medium to another through radio waves. But in the wired network, there is a concept of cables, which sometimes mess the working place and become dangerous also. Cables can be easily damaged. There is a single connection and no multiple connections can be made or accessible on a single cable network. It is time-consuming and costly as compared to the wireless network. The wireless network is opposite to the wired network and its protocol is much beneficial than that of a wired network. Wired technology does not provide the generations of the internet to the users. It is limited and gives the connection through the wire to wire that's why wireless is commonly use nowadays and further going on we will see the brighter and brighter future of Wi-Fi technology.

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