Wired and Wireless Communication

Wired communication refers to the transfer of data over wired communication technology (communication cables). Wired connection is also known as wired connection. Examples include telephone networks, cable television or Internet access, and fiber optic communications.
Wireless communication is the transfer of information between two or more points without the use of an electrical .conductor, optical fiber, or any other continuous directed means of transmission

Module One: Wired and Wireless Communication

Telecommunications refers to the means of transferring information between different parties.
Here's an explanation of each:

1. Wired communications:
• It relies on wired means of transmission to transmit signals and data.
• Signals are transmitted via wires or cables, examples of which include landlines (fixed telephones), and Internet lines via optical fibers or copper wires.

2. Wireless communications:
• It relies on electromagnetic signals or radio waves to transmit data without the need for wired connections.
• Includes mobile phones, Wi-Fi networks, Bluetooth technology, and mobile networks (such as 4G and 5G).
• Provides flexibility and mobility but may be affected by interference and is less secure compared to wired communications.
Both play an important role in our daily life, as wired communications are widely used for fixed communication, while wireless communications allow mobility and communication in places where it is difficult to use wired communications.

Module Two: History of Telecommunications

Telecommunications refers to the means of transferring information between different parties. Here's an explanation of each:

1- Wired communications:

• The Middle Ages: Mechanical means of communication such as bells and pipes were used to transmit messages over short distances.

• The nineteenth century: witnessed the emergence of the telegraph and landline telephones, where wires were used to transmit electrical signals.

• The twentieth century: witnessed tremendous development in communications engineering with the expansion of the use of fixed telephones and telegraph services.

• Century and the beginning of the twenty-first century: With technological progress, Internet networks appeared via optical fibers and cable communication technologies to improve the speed and quality of communications.

2- Wireless communications:
• The end of the nineteenth century and the beginning of the twentieth century: Wireless communication technologies were discovered with the development of radio technologies and the use of electromagnetic waves.

• The decade of one thousand nine hundred and forty and one thousand nine hundred and fifty (1940 and 1950): witnessed development in radio technology and the emergence of mobile phones.

•The decade of one thousand nine hundred and eighty and one thousand nine hundred and ninety 1980 and 1990: The first generation technologies for mobile phones appeared, and the use of Bluetooth technology began.

• The 2000s and beyond: We witnessed the development of third generation (3G), fourth generation (4G) and fifth generation (5G) technologies for mobile phones, which increased the speed of wireless communications and opened a new horizon for advanced applications.

Wireless and wired technologies are constantly evolving, enhancing communications capabilities, and opening the way for new innovations in the world of communications.

Benefits of Wired and Wireless Communications

Each type of communication - wired and wireless - has distinct benefits that allow it to be used in different contexts. Here are some benefits of each:

- Benefits of wired communications:

- High security: Wired communication has a higher level of security, as it is difficult to infiltrate or spy on signals over wires compared to wireless signals.
- Connection quality: A wired connection allows data to be transferred in high quality and at faster speeds, which makes it ideal for applications that require a stable connection and high quality, such as video and audio.
- No effect from electromagnetic interference: Wired communication is not affected by electromagnetic interference that may affect wireless communications.
- Suitable for short distance: Wired communication is effective in environments that do not require a lot of movement and when devices are constantly connected to each other.

- Benefits of wireless communications:

- Mobility and flexibility: Wireless communications provide the freedom to move and communicate anywhere without the need for cables.
- Ease of installation and operation: The wireless connection does not require extension or installation of wires, which makes it easier to install and operate.
- Long-distance communication: Wireless communication allows data to be transferred over long distances without the need for complex infrastructure.
- Saving time and cost: Time and cost can be saved in some cases as devices can be installed quickly without the need for complex wiring settings.
- Integration with modern technology: Wireless connectivity allows better integration with modern technologies such as the Internet of Things (IoT) and artificial intelligence applications.

Benefits can vary depending on needs and the context in which communications are used. In many cases, hybrid solutions are used where wired and wireless communications are combined to investigate the benefits of both.

Module Three: The Future of Communications in The World

The future of communications is moving towards the development of more advanced and integrated technologies to meet the increasing communication requirements of the modern world. Some expected trends for the future of communications include:

- 5G technology and beyond:
The continued development of fifth generation (5G) networks and taking advantage of their potential to provide very high data transfer speeds. Accordingly, next generation (6G) technologies may emerge with greater improvements in speed, delay, and connectivity over long distances.

- The spread of the Internet of Things (IoT):
The increasing prevalence of connected devices and Internet of Things technology, which requires effective communications networks to transfer large amounts of data in an efficient manner.

- Increased use of artificial intelligence:
Wider integration of artificial intelligence technologies into communications solutions, which contributes to improving network performance and improving user experience.

- Expanding applications of augmented reality and virtual reality:
Communications technologies are evolving to better support augmented reality and virtual reality applications, opening a new horizon for enhanced user experiences.

- Improving communications security:
Developing protection technologies to enhance communications security and protect against cyber threats.

- Expanding the range of wireless communications:
Expanding wireless communications technologies & improving coverage of current & next generation networks.

- Using edge computing techniques:
Increased use of edge computing technologies to improve application performance and reduce data delay.

- Focus on network sustainability:
Integrating green technologies and renewable energy into the network structure to improve its sustainability and reduce its impact on the environment.

These are some of the potential trends for the future of communications, and other developments could emerge as technology advances and the needs of users and industries change.

Module Four: When Was Wireless Communication Invented?

In the context of talking about the difference between wired and wireless communications, it is worth mentioning that wireless communication was invented using radio waves and their technologies in the early twentieth century. The Italian scientist Guglielmo Marconi is one of the most important figures who contributed to the development of this technology. In the year one thousand eight hundred and ninety-five, 1895, Marconi succeeded in sending wireless signals over a short distance. In the year one thousand eight hundred and ninety-six, 1896, he demonstrated his success in establishing wireless communication over up to several kilometers.

In the context of talking about the difference between wired and wireless communications, it is worth mentioning that wireless communication was invented using radio waves and their technologies in the early twentieth century.

After that, wireless communications technology was constantly developed and improved. In the year one thousand nine hundred and one, 1901, Marconi carried out a famous experiment, where he succeeded in receiving a wireless signal across the Atlantic Ocean between the United States and England. This experiment proved that radio waves can be used to communicate over long distances.
The contributions of Marconi and others in this field contributed to the development of wireless communication and opened the door to the development of the communications and mobile phone technologies that we use today.

Who invented the wireless radio in the year one thousand eight hundred and ninety-six, 1896?
In a related context about the difference between wired and wireless communications, it is worth mentioning that the inventor of wireless technology in the year one thousand eight hundred and ninety-six, 1896, is the Italian scientist Guglielmo Marconi. Marconi led efforts to develop wireless communication by using radio waves to send signals over long distances, and he has been called the "Godfather of wireless communications." Marconi provided the first commercial guide to wireless communications and founded a company to develop the technology. His inventions represented the basis for building the foundations for the development of wireless communications and mobile phones in subsequent decades.

Advantages Of Wired and Wireless Networks

The question here is to compare wired and wireless networks in terms of speed. Here are the most prominent advantages and disadvantages of wired and wireless communication, which are as follows:

Advantages of wired networks:

- Connection stability: Wired networks are usually stable and reliable; Because it relies on wired connections to transmit data, which reduces the chances of interference and signal interference.
- High quality: Providing high communication quality due to the use of stable physical means and dedicated channels.
- Better security: It is more difficult to spy on data in wired networks than in wireless networks, as physical access to cables is required to do so.
- High speeds: Wired networks provide high transfer speeds that enable large amounts of data to be transferred quickly.

Advantages of wireless networks:

- Mobility and flexibility: Wireless networks allow devices to move and communicate easily without the need for fixed wired connections, and this is perhaps the most notable difference between wired and wireless communications.
- Easy installation: No need to extend cables and set up physical connections, making the installation process easier and faster.
- Providing communication in uninhabited areas by wire: Wireless networks enable the provision of communication in remote or temporary areas where it is difficult to set up a wired structure.
- Sharing resources between devices: Wireless networks allow shared devices to easily share resources and data without the need for cables.
- Technology development: Wireless technologies are witnessing continuous development, which enhances communication speeds and their ability to deal with more complex applications.
- Social engagement: Wireless networks contribute to enabling social communication and cooperative work between individuals and devices.

Module Five: Disadvantages Of Wired Network

Despite the advantages of wired networks, they also come with some drawbacks and challenges. Here are some common drawbacks of wired networks:

- Mobility restrictions: In wired networks, devices are connected by cables and wired connections, which restricts freedom of movement and movement between locations.
- Difficulty in installation and expansion: Wired networks require extended cabling and infrastructure connections, which makes installation and expansion more complex and expensive.
- Operation and maintenance costs: Wired networks require additional costs to install and maintain cables and physical devices, including repairing broken cables.
- Vulnerable to physical damage: Wired cables can be damaged because of environmental factors such as corrosion and mechanical damage, which leads to interruption of communication. This is perhaps the most important difference between wired and wireless communications.
- Distance and range limitations: The communication range in wired networks depends on the length of the cables used, which can limit the range of the network.
- Complexity of planning and design: Designing infrastructure and cable distribution requires specialized technical skills and careful planning, and this may increase the complexity of the process.
- Difficulty integrating with modern technologies: As technology develops, wired networks may be less able to integrate with new and innovative technologies.
- Difficulty in providing connectivity in some areas: In some places that are isolated areas or require extending cables over long distances, it may be difficult to establish an effective wired network.
- Vulnerable to electromagnetic interference: Wired cables may be vulnerable to electromagnetic interference from other sources, which may affect the quality of the connection, and this is something that is not found in wireless communication.

Telecommunications Network Basics in Data Transfer

By entering user data into the signaling message, it is possible to quickly transfer data to a telecommunications network, while resources can be saved because it is not required to create a complete circuit or packet switching patch between the communication unit and the telecommunications network. User data may include application data for a program that is run by the unit of communication, for example, fluctuating data, measurement data, or their derivatives.

The past decades have shown a steady increase in the demand for data capacity of telecommunications networks, and telecommunications providers have adapted their networks to provide expanded services to meet the requirements of their customers. One example of these services relates to the field of machine-to-machine (M2M) communications, and M2M applications usually include hundreds or thousands of Communication units that rarely require access to a communications network.

An example includes electronic reading: electricity meters in the homes of a large customer base, where other examples include sensors and meters, which can be equipped with communication modules that allow status information to be reported to a data processing center over a telecommunications network For example, the data processing center may do so Example: Store data or provide a schedule for maintenance personnel to repair a machine, meter, and sensor.

M2M communication systems are usually characterized by the fact that most of the time the communication modules contain nothing or only a limited amount of data to report, however for some applications or in some situations such as alarm it is necessary to quickly send data from the communication module to the data processing center within seconds.

One of the goals is to provide a method and communications network that allows efficient and rapid communication of limited amounts of data in a machine-to-machine environment and includes a method for transmitting user data from a communications unit to a data processing center over a communications network, and the signaling message is received wirelessly from the communications unit in a network Communications. The signaling message contains user data that is later transferred to the data processing center.

Other aspects relate to a computer program, a communications network, and a node of that network configured to perform the steps of the method as specified in the safeguards, and includes a communication unit including a processor for processing user data, and an packaging unit configured to encapsulate user data in one or more signal messages Contact To the telecommunications network, and a transmitter to send signal messages containing user data for the telecommunications network.

Telecommunications Working Principal Network in Transmitting Data

In principle, it is possible to send a copy of the signaling message to the data processing center, and user data is retrieved from the signaling message in the telecommunications network, and then transferred to the data processing center. This is efficiently implemented in the backbone network of a telecommunications network, for example in a mobile switching center (MSC) or GPRS support node (SGSN), where signaling messages terminate at these nodes.

It is possible to provide a monitoring unit between the radio access network and the core network that is configured to sniff beacon messages to identify beacon messages that carry user data. The beacon message that carries user data is a network attachment request message, and the attached message contains an information element of the data user.

This information element may be a new information element or an existing information element that is not used in a particular situation. For example, if an information element (IMEI) is not required, this information element can be used for user data. An attached message is usually one of the first messages received from the unit. Communication in the telecommunications network, and thus it provides a suitable instance for receiving user data quickly.

For circuit-switched applications, the network attach request message may be a location update request message with an information element of the location update type indicating an IMSI attachment. For packet-switched applications, the network attach request message may be an attach request, with an information element Attachment type Indicates a GPRS request or a combined GPRS/IMSI attachment.

These specific instances of network attachment request messages typically occur when a communication device is running and allow for efficient implementation within the 3GPP TS 24.008 standard. Furthermore, the use of network attachment messages to transfer user data allows the use of communication modules that do not have a smart identity module (SIM), you may accept Network communications A request message to attach to the network, after which a connection can be established, and this allows more data to be sent to or from the communication unit.

“GPRS” stands for “General Packet Radio Service”.
“SIM” stands for “subscriber identity module”.
“IMSI” stands for “international mobile subscriber identity”.
“MSC” stands “Mobile Switching Center”.
“3GPP” stands for “3rd Generation Partnership Project”.

The Development of The Work of The Wired and Wireless Communications Network in Transmitting Data

Confirmation may be received that the User Data has been delivered to the Data Processing Centre, thus, for example, allowing the communication unit to return to sleep mode, refraining from attempting to send the same User Data again or deleting the User Data. Additional Data may also include additional information about the Data Processing Centre. Data processing.

If more data is not sent, the communication unit informs the communications network of its desire to disconnect it from the network. After it is disconnected, additional data can also be transferred from the communication unit in other attachment requests, and the attachment request message from the communication unit is rejected by the network, and thus excluded Possibility of creating A circuit switched circuit or packet switched connection

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The attachment rejection message may still contain a limited amount of information for the communication unit, for example confirmation that the user data has been delivered to the data processing center, which allows the communication unit to delete the user data or avoid the communication unit There are other attempts to transfer user data, and rejecting the attachment request is useful. To save energy in the communication unit and save resources in the communication network.

In the specific context of M2M telecommunications networks, it is not required to implement all the procedures generally required for commercial mobile communications, thus saving network resources, and the authentication procedures for the communications unit in the telecommunications network may be omitted, leaving it to the data processing center to identify one the connection is authenticated based on the application ID or Device ID.

The normal location update procedures and period may be omitted provided that the communications unit remains in a substantially fixed location within the area served by a particular MSC or SGSN, and at least part of the user data in the signaling message may be contained in encrypted form. User data needs to be sent to the telecommunications network as quickly as possible, thus allowing no time to establish a secure connection. It is advantageous to scramble or encrypt user data in the communication unit before entering it into the signaling message.