Basics Telecommunication System Covers Working Principles and Emerging Problems

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Article Info	Abstract
	This article discusses the basics of the telecommunications system covering developments, working principles and emerging problems in telecommunications. The telecommunications system is all elements of both telecommunications infrastructure, equipment, facilities and infrastructure, as well as telecommunications operators, so that long-distance communication can be carried out. During the journey the information will pass through various media with different characteristics. So that it allows the occurrence of high delays and large packet loss, all of which will reduce the quality of the information received. The quality of the transmission medium determines the quality of the information received. Because as long as it is in the media, it is certain that the information will experience damping which will reduce the quality of the information. In order to communicate properly, the channel provided is not only physical media but also logical lines (frequency channels), considering that these frequency channels are expensive and limited.

Introduction

Basically, telecommunication in the world is growing every day. Because it is seen from the importance of telecommunications today. Without communication, the world will be dark with the information that already exists. Besides that, telecommunication is also a forum for interaction between cities, between regions, between islands, between provinces and even between countries. According to Freeman (2004) the definition of the word telecommunications can be seen as follows from Greek: (1) Tele: Far (2) Communication: Delivery of information or relationships between one place to another. (3) Telecommunication: Delivery of information or relationships between one place and another that is far away. Based on this understanding, what if there is a communication relationship but is close, can it be called telecommunications. Also if there is long distance communication like a person shouting it is called telecommunications? Telecommunication: Delivery of information or a relationship between one place and another by using special equipment, in other words, electronic equipment. Example: Telephone, TV etc. It can be seen here that the relationship does not have to be far away (even though there is the word TELE) as close as possible. It doesn't have to be any special equipment (electricity). Examples: smoke, flags, drums, etc.

In addition, it must also be distinguished between telecommunications and communication even though the two are interconnected. (1) Communication: The process of exchanging information. Information can be in the form of voice, image, data, etc. (2) Communication constraints: (a) Language, the communication process will not run properly if the giver and recipient of the information do not use the same language. This obstacle can be overcome by

learning a language that is understood by both parties, or using a translator. (b) Distance (c) Close: talk directly (d) Somewhat Far: sends signals that can be seen / heard directly, for example: smoke, trumpets, light, etc. (d) Away: by sending letters, or via electronic media. The difference can also be seen from the science that studies it.
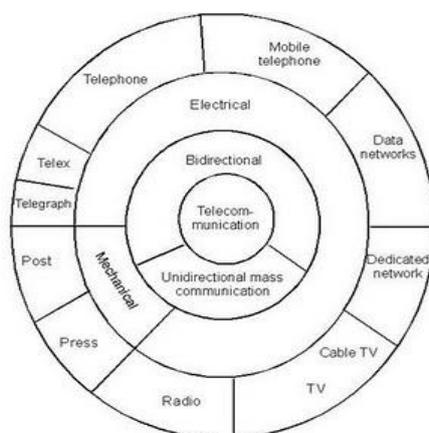
Telecommunication Chart

Figure 1. Telecommunication Chart

Telecommunication Development

The development of telecommunications has existed in the era of BC starting from the simple following the development of telecommunications from the beginning it was created until now (Letichevsky et.al, 2005).

The Commencement of Telecommunications

Stated by Seelig & Erickson (2007) in the beginning, telecommunication was done using very simple media. Drums are used by indigenous peoples of Africa, New Guinea and South America. In China, people use "Tamtam", a large, round metal plate that hangs freely so that when it is hit it creates a loud sound that can be heard over long distances.
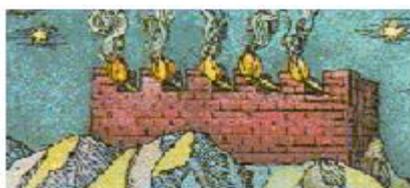

Figure 2. Telecommunications in the early days

In the 5th century BC, the ancient Greek and Roman empires used fire to communicate from mountain to mountain or tower to tower. Telecommunications is carried out by special soldiers by understanding the code in the form of the number of flames. This telecommunication is used during war and is only effective at night.

In the 2nd century AD the Romans used smoke as a medium of telecommunications. They build a telecommunication network consisting of hundreds of towers up to 4500 kilometers. Each tower can emit smoke that can be seen by other towers that are nearby. This telecommunication system was used to convey military messages in running the government over an increasingly large colony.
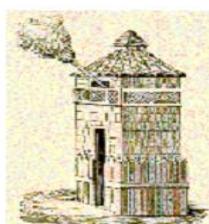

11

In the 4th century AD, Aeneas the Tactician proposed a telecommunications system using water called the hydro-optical telegraph. This telecommunication system utilizes the water level as codes in communicating. This system can send messages very quickly from one place to another.
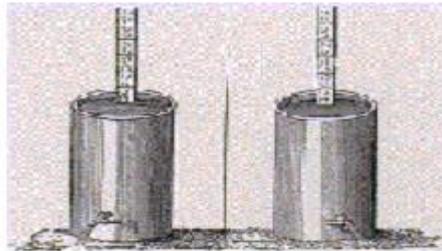

Figure 4. Telecommunications in the 4th century

During the French Revolution, Claude Chappe invented a telecommunications style called the mechanical-optical telegraph or often called the semaphore. The tool is in the form of a rod that can be moved using a rope so that it can form various symbols / letters which number up to 196 (uppercase, lowercase, punctuation and numbers). The device is installed on the roof of the building so that it can be seen from a distance. The telegraph network using the device was put into operation in 1794 when the army volunteered to defend France and the Austrian and other invaders. The network consists of 22 stations with a range of 240 kilometers. Sending messages that far only took 2 to 6 minutes.
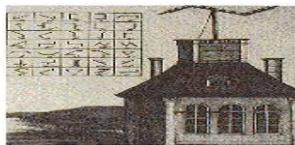

Figure 5. Telecommunications in the French revolution

The period of electric telecommunications

According to Hannula & Kari (2000) the period are (1) 1844: Morse patented the telegraph (2) 1876: Bell invented and patented the telephone (3) 1895: the wireless telegraph not the inventor of Radio (4) 1895: Inventor of Radio (5) 1907: triode vacuum tube (6) 1920: Commercial AM radio broadcast (7) 1939: First FM radio broadcast 'Alphine New Jersey by Edwin Armstron (8) 1954: The broadcast of color television begins (9) 1962: First satellite communication

New era telecommunication

Software: Internet with various applications has been widely used, such as e-commerce, e-learning, video conferencing, e-government, google and so on. telecommunication hardware. Telecommunications networks, both wired and wireless, already have very high speeds of up to Megabytes per second. In developed countries, accessing data from other continents has almost the same speed as accessing data from a hard disk. Thus, multimedia data (text, sound, image and video) can be sent via the internet. Some countries are already using the Voice over Internet Protocol (VoIP) technology enables voice communication over the internet network. This keeps costs down telecommunications is becoming cheaper. Computers that are very small and integrated with mobile phones is commonly used. There is convergence between voice-based telecommunications with other data: text, images, and videos. Bluetooth technology

allows a cellphone to communicate wirelessly in close proximity with several other devices such as computers, printers, scanners, and so on. Mobile based on 3G network (3rd generation) can be used for sending multimedia data (Huurdeman, 2003).

Telecommunications of the Future

Ray Kurzweil is one such expert trying to paint a picture of telecommunications of the future. In his book entitled "The age of Spiritual Machines: When Computers Exceed Human Intelligence", Kurzweil predicts that by 2009 a US $ 1000 PC would be able to do about one trillion calculations per second. Most of the interactions with computers have been through gestures and two-way natural language speech communication. The all-encompassing realistic environment (audio, visual, and physical) enables humans to virtually do things with other humans, despite physical limitations. Humans begin to have relationships with automatic personalities, such as friends and teachers.

Basic Telecommunication System

Defined by Balogh (2005) telecommunication system is all elements / elements of both telecommunication infrastructure, telecommunication equipment, telecommunication facilities and infrastructure, as well as telecommunication operator, so that long-distance communication can be carried out. The following is the meaning of several terms in the telecommunications sector in concerning Telecommunications: (1) Telecommunication Equipment is a group of telecommunication tools which enables telecommunication. (2) Telecommunication facilities and infrastructure are everything that enables and supports the functioning of telecommunications. (3) Telecommunications operators are individuals, cooperatives, Regional Owned Enterprises, State Owned Enterprises, private enterprises, government agencies, and state defense and security agencies. (4) Telecommunications services are telecommunications services to fulfill telecommunications needs using telecommunications networks. (5) Customers are individuals, legal entities, government agencies that use telecommunications networks and or telecommunications services based on contracts. (6) Users are individuals, legal entities, government agencies that use telecommunications networks and or telecommunications services that are not based on a contract. (7) Interconnection is the connection between telecommunications networks of different telecommunications network operators.

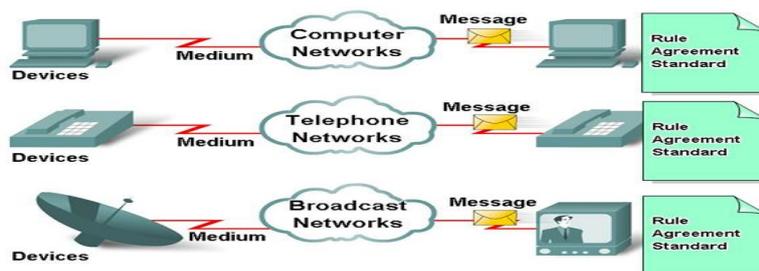## The basic components of building a Telecommunication System

Figure 6. Components of a Telecommunication System builder

In order to carry out telecommunications links, there are several components to build a telecommunications system, namely: (1) Information: is data sent / received such as voice, image, file, text. (2) Sender: converts the information into an electrical signal that is ready to be sent. (3) Media transmission: a tool that functions to send from sender to receiver. Because in a long distance, the sender's signal is modified again / modulated so that it can be sent long distances. (4) Receiver: receives an electrical signal and converts it into information that can be understood by humans as it is sent. (5) Rules / standards: what must be agreed upon in sending, transmitting, and receiving information.

13

Figure 7. Transition Media
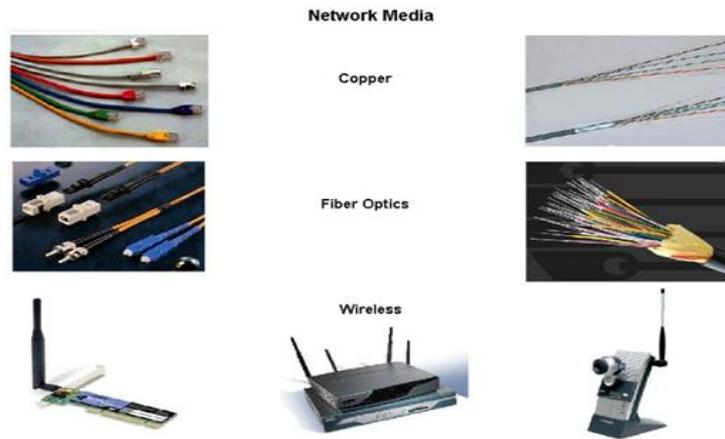
Telecommunication System Working Principles

In principle, a communication goes through the following stages:
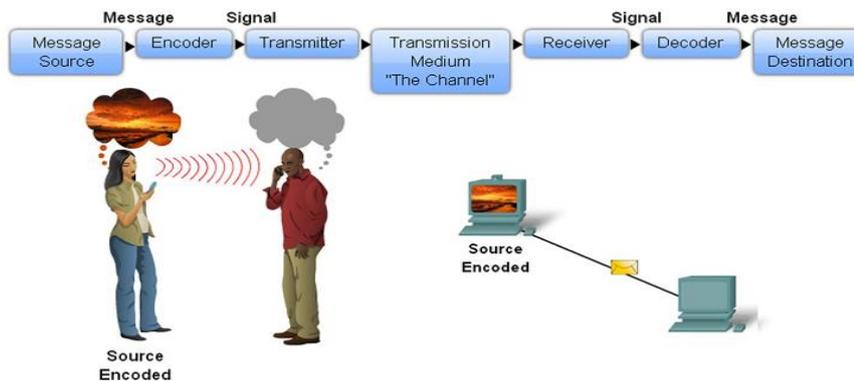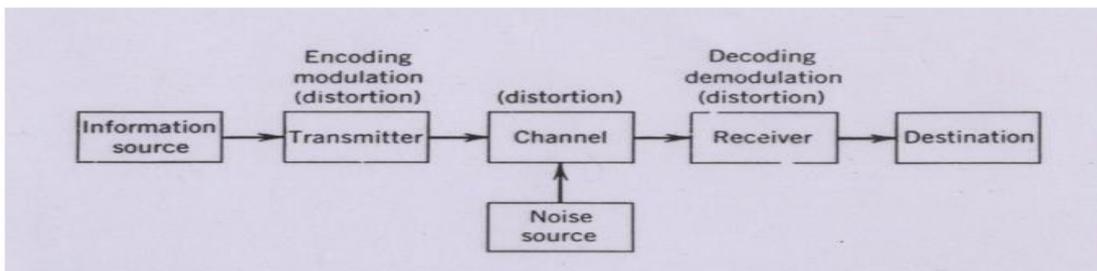

Figure 8. Basic Working Principles of the Telecommunications System

Description of the working principle of the telecommunications system

The communication process begins with a message or information that must be sent from one individual / device to another. (a) Information is a message or information in the form of sound, signal or light which in a certain way can be received by the target, namely the receiving party which can be in the form of a living thing or a machine. Form of information : (1) text → telegraph (2) data → teletext (3) voice → telephone (4) picture → television (5) music → radio (6) picture & video → videophone. (b) The message / information is then converted into binary form or bits, which are then encoded into signals. This process occurs in the encoder device. (c) An encoder, or transducer, to convert information into signal forms suitable for transmission. (d) Example: telephone, computer, modem. (e) The signal is then sent / transmitted by the transmitter through the selected media or transmission system (channel), Transmitter (Tx) : The circuit that converts the information to be sent into a signal that is suitable for the media that will be passed. Example: (1) Microphone: sound vibration, electrical

14

signal. (2) Radio transmitter: electrical signals, electromagnetic waves (Bouvier & O'connell, 2002).

Type of signal transmitted

Analog signal - digital signal : (1) Analog signal: Change value (amplitude) of the signal takes place continuously. (2) Digital signal: Change in signal value (amplitude) takes place discrete. Signal authenticity: (1) Baseband signal - the modulated signal (2) Baseband signal: An information signal that still shows the original frequency spectrum.

Example: (1) Voice signal on landline telephone conversation (2) Digital signal on data transmission between computers (3) Signal Modulation: The original signal (baseband) is superimposed on a carrier signal that has a much higher frequency. The process, called modulation, is used to overcome the mismatch between the signal character and the media (channel) used. Example: AM signal (Amplitude Modulation)

Telecommunication Emerging Problems

In the telecommunications system there are several problems, namely: (1) The distance between sender and receiver (2) During the journey the information will pass through various media with different characteristics. So that it allows the occurrence of high delays and large packet loss, all of which will reduce the quality of the information received. (3) Different platforms, media, and the rules used in each sender, receiver and network. (4) Differences in platforms, media, and regulations in telecommunication systems often cause information not to be recognized by the recipient. For that it is necessary to make a telecommunications standardization. (5) The quality of the transmission media used. The quality of the transmission medium determines the quality of the information received. Because as long as it is in the media, it is certain that the information will experience damping which will reduce the quality of the information. For this reason, it is necessary to provide a transmission medium that has the smallest possible attenuation. (6) Limited paths provided. In order to communicate properly, the channel provided is not only physical media, but also logical lines (frequency channels), considering that these frequency channels are expensive and limited. (7) The number of communications raised simultaneously. The total information sent from generating a number of communications can be very large and exceeds the specified line capacity. For that we need traffic management and the selection of the right route so that the flow of information can be controlled (Altman, et.al, 2006).

Conclusion

Telecommunication is a medium of liaison between a person and another directly without having to meet face to face. The development of telecommunication is so fast and until now it is very sophisticated which we can use and enjoy today. Telecommunication makes communication distance will feel closer, information that we can feel quickly with the help of telecommunication equipment. .

In delivering the information, it has a telecommunication achievement system, which basically means that the delivery must have the main supporting components in it such as information, sender, delivery media, receiver and standard rules for receiving information, and there are also obstacles in sending the information to the recipient.

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