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Telecommunication Technologies

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Abstract

Early telecommunication technologies included visual signals, such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs. Other examples of pre-modern telecommunications include audio messages such as coded drumbeats, lung-blown horns, and loud whistles. Electrical and electromagnetic telecommunication technologies include telegraph, telephone, and teleprinter, networks, radio, microwave transmission fiberoptics, communications satellites and the Internet

The world's effective capacity to exchange information through two-way telecommunication networks grew from 281 petabytes of (optimally compressed) information in 1986, to 471 petabytes in 1993, to 2.2 (optimally compressed) exabytes in 2000, and to 65 (optimally compressed) exabytes in 2007. This is the informational equivalent of two newspaper pages per person per day in 1986, and six entire newspapers per person per day by 2007. Given this growth, telecommunications play an increasingly important role in the world economy and the global telecommunications industry was about a $4.7 trillion sector in 2012. The service revenue of the global telecommunications industry was estimated to be $1.5 trillion in 2010, corresponding to 2.4% of the world's gross domestic product (GDP).

Keywords: History; Primary Units of telecommunication system; Basic Elements; Ancient systems of telecommunication and Future of telecommunication.

1. Introduction

Telecommunication is communication at a distance by technological means, particularly through electrical signals or electromagnetic waves.

Early telecommunication technologies included visual signals, such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs. Other examples of pre-modern telecommunications include audio messages such as coded drumbeats, lung-blown horns, and loud whistles. Electrical and electromagnetic telecommunication technologies include telegraph, telephone, and teleprinter, networks, radio, microwave transmission, fiber optics, communications satellites and the Internet.

2. History

The history of telecommunication began with the use of smoke signals and drums in Africa, the Americas and parts of Asia. In the 1790s, the first fixed semaphore systems emerged in Europe; However semaphore as a communication system suffered from the need for skilled operators and expensive towers often at intervals of only ten to thirty kilometres (six to nineteen miles). As a result, the last commercial line was abandoned in 1880.However it was not until the 1830s that electrical telecommunication systems started to appear. Electrical and electromagnetic telecommunication technologies include telegraph, telephone, and teleprinter, networks, radio, microwave transmission fibre optics communications satellites and the Internet. A revolution in wireless telecommunications began in the 1900s with pioneering developments in radio communications by Nikola Tesla and Guglielmo Marconi.

3. Primary units

A basic telecommunication system consists of three primary units that are always present in some form:

- A transmitter that takes information and converts it to a signal.
- A transmission medium, also called the "physical channel" that carries the signal.
- A receiver that takes the signal from the channel and converts it back into usable information.
    - Telecommunication over fixed lines is called point-to-point communication because it is between one transmitter and one receiver. Telecommunication through radio broadcasts is called broadcast communication because it is between one powerful transmitter and numerous low-power but sensitive radio receivers.[36]
    - Telecommunications in which multiple transmitters and multiple receivers have been designed to cooperate and to share the same physical channel are called multiplex systems. The sharing of physical channels using

multiplexing often gives very large reductions in costs. Multiplexed systems are laid out in telecommunication networks, and the multiplexed signals are switched at nodes through to the correct destination terminal receiver.

4. Basic Elements of Telecommunications Systems

Telecommunications pervade our daily lives. Many people wake up to their radio alarms, open the TV to get traffic and weather updates, and perhaps telephone their car pool buddies just to make sure they won't miss the ride. At the office, they boot their computers to check if they have emails or some other business documents delivered. All these are forms of telecommunications, and it is obviously something that no modern society can do away with.

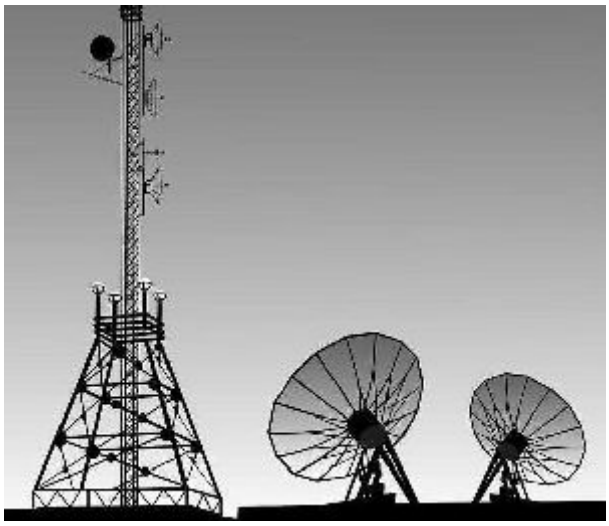

Fig. 1: elements of telecommunication system.

A basic telecommunication system consists of three elements:
A transmitter that takes information and converts it to a signal
A transmission medium that carries the signal; and,
A receiver that receives the signal and converts it back into usable information.

For example, in a radio broadcast the broadcast tower is the transmitter, free space is the transmission medium and the radio is the receiver. Often telecommunication systems are two-way with a single device acting as both a transmitter and receiver or transceiver. For example, a mobile phone is a transceiver.

Telecommunication over a telephone line is called point-to-point communication because it is between one transmitter and one receiver. Telecommunication through radio broadcasts is called broadcast communication because it is between one powerful transmitter and numerous receivers.

5. Ancient systems of telecommunication

5.1 Telegraph and telephone-

Early telegraphs used several wires connected to a number of indicator needles. The first commercial electrical telegraph was constructed in England by Sir Charles Wheatstone and Sir William Fothergill Cooke.

The electric telephone was invented in the 1870s, based on earlier work with harmonic (multi- signal) telegraphs. The first commercial telephone services were set up in 1878 and 1879 on both sides of the Atlantic in the cities of New Haven and London. The technology grew quickly from this point, with inter-city lines being built and telephone exchanges in every major city of the United States by the mid-1880s.

5.2 The Satellite:

A communications satellite or Comsat is an artificial satellite sent to space for the purpose of telecommunications. Modern communications satellites use a variety of orbits including geostationary orbits, Molniya orbits, elliptical orbits and low (polar and non-polar Earth orbits).

For fixed (point-to-point) services, communications satellites provide a microwave radio relay technology complementary to that of communication cables. They are also used for mobile applications such as communications to ships, vehicles, planes and hand-held terminals, and for TV and radio broadcasting.

5.3 Mobile cellular communication:

Initially, mobile communication was restricted to certain official users and the cellular concept was never even dreamt of being made commercially available However, with the development of newer and better technologies , there has been an astronomical growth in the cellular radio and the personal communication systems. Wireless services have since then been experiencing a 50% per year growth rate.

5.4 Microwave radio communication:

Microwaves are widely used for point-to-point communications because their small wavelength allows conveniently-sized antennas to direct them in narrow beams, which can be pointed directly at the receiving antenna. This allows nearby microwave equipment to use the same frequencies without interfering with each other, as lower frequency radio waves do. Microwave radio transmission is commonly used in point-to-point communication systems on the surface of the Earth, in satellite communications, and in deep space radio communications.

5.5 Video telephony:

This was first embodied in the device which came to be known as the video telephone, or videophone, and it evolved from intensive research and experimentation in several telecommunication fields, notably electrical telegraphy, telephony, radio, and television. With the rapid improvements and popularity of the Internet, it became widespread thru the use of videoconferencing and webcams, which frequently utilize

Internet telephony, and in business, where telepresence technology has helped reduce the need to travel.

6. Future of Communication

Tele-computing has several implications. The first is that it should be tailored to the person at work or at home. The goal is to serve employees and residential users. This means it is end-user-driven. Technology must not be cumbersome. It must be very easy to use. Further, it must be reliable. Once people count on these PC-based devices for all their information needs, the devices and supporting networks cannot ever fail.

Our PCs will become video telephones, using flat panel displays that can be hung on any wall. PCs will also become more portable and wearable. They must, however, have a more reliable operating environment than Windows 95/98/ME and even Windows NT/2000. We will have special-use systems aimed at a primary function or two. They will be small but have big displays and make loud sounds.

6.1 Telecommunications and Telephony:

All telephony will migrate to IP networks (for instance, the Internet). The voice telephone network as we know it is history. It is being transformed into a high-speed IP delivery system between distribution networks. Distribution networks will cover the last mile to the home or office using telephone wire, coaxial cable, radio frequency channels, or power wiring. Each of these will compete vigorously for the around $200 per month each household will spend on communications. New services will cater to consumer and business needs.

6.2 Residential Telecommunications:

Residential services will depend on high-speed Internet access. High-speed today is 100 Kbps to 900 Kbps. This will increase in the future to 1 Mbps to 10 Mbps for each household. This will be driven by the entertainment industry selling video over the Internet.

6.3 PC in the Kitchen:

They could be productively employed for tracking household inventories, counting calories, preparing grocery lists, purchasing essentials, presenting recipes, and entertaining the cook and bottle washers. So soon, PCs connected with special kitchen-oriented software will appear there. They will be of course be connected to the refrigerator so that when anything is removed or added, they update their food inventory list.

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