

# TE-E - Telecommunications and Wireless Communications



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## **Short Description**

This manual covers the fundamentals of telecommunications and is suitable for anyone looking for a complete understanding of the essentials of the terms, jargon and technologies used. This manual is designed for those who require a basic but fundamental grounding in telecommunications and is of special benefit for those who want to apply the technology quickly.

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## **First Chapter**

# Introduction to Telecommunications

## 1 Introduction to Telecommunications

### Learning objectives

After studying this chapter you will:

- Understand the basic principles of Telecommunications
- Be familiar with some of the better-known Telecommunication standards bodies

### 1.1 Telecommunications

The word *telecommunication* is derived from the Greek 'tele', meaning 'at a distance'. 'Communications' refers to the science and practice of transmitting information.

A more relevant definition is given in the Dictionary of Communications Technology, which defines it as 'a term encompassing the transmission or reception of signals, images, sounds, or information by wire, radio, optic, or infrared media'.

Telecommunications play a vital role in international commerce, and in industrialized nations it is an accepted necessity. The telecommunications networks in all countries are interlinked to form a global telecommunications network for carrying information of all kinds. The Public Switched Telephone Network (PSTN) was originally developed solely for carrying voice communications, but today carries an ever-increasing amount of data communications traffic.

The Internet uses the PSTN circuits to carry some of its data and the phenomenal growth of the Internet has stimulated the growth of data circuit usage in the PSTN. In some countries, Internet traffic accounts for more than half the total PSTN traffic.

Cellular radio services are having an enormous impact on the growth of telecommunications networks. In industrialized countries they are used increasingly for mobile business communications. However, in developing countries, they enable many customers in the main population centers to obtain affordable telecommunications services.

With cellular services the telecommunications provider does not have to invest

in the very high costs of a fixed subscriber distribution plant for individual customers and can serve thousands of customers from one transmitter site. Service can be supplied almost immediately.

## **1.2 Principles of telecommunication services**

Telecommunications services follow the following principles:

- The telecommunications networks are used to provide services to the users
- A service requires the execution of a series of programs by the originating and destination entities
- The services are decomposed into different layers by the initiating entity, where each layer undertakes a specified portion of the overall service. This makes the services more manageable and allows interoperability between vendors. Most modern systems adhere to the 7-layer OSI reference model
- The telecommunications services include information transfer, signaling, and billing
- Information is transferred over the network in the form of bits. These bits have different forms depending on the type of the transmission media; electrical signals on copper cables, pulses of light in fiber optic cables and electromagnetic waves traveling through space
- Signals can be corrupted during transmission, due to interference
- Protocols incorporate error correction and detection mechanisms to overcome errors

## **1.3 Telecommunication standards**

Telecommunications standards are essential in allowing the global PSTN to function. It is clear that when a telephone call or data message originates in one country and terminates in another, both sender and recipient need to understand each other's messages. This is achieved by using standardized message formats. This enables a message to be successfully passed through a number of countries, as necessary, along the way.

Standardization is provided by two international organizations; the International Telecommunication Union (ITU), and the International Organization for Standardization (ISO). These are supplemented by many national standardization agencies.

The ITU produce recommendations that serve as world-wide standards, although they are not legally binding. Prior to January 1993 the ITU's telecommunication recommendations were promulgated by the CCITT, the International Consultative Committee for Telephone and Telegraph, which has now been reorganized into the Telecommunication Standardization sector of the ITU. Their recommendations are denoted ITU-T. In similar fashion the International Consultative Committee for Radio (CCIR) handled the standardization of radio communications. This has now become the ITU Radio communication Sector and produces ITU-R recommendations.

The ISO has issued many important data communications standards. One of the most important is the Open Systems Interconnection Reference Model, which we will discuss later. Many national standards organizations are affiliated to ISO, including the American National Standards Institute (ANSI).

Some of the other important telecommunication standards organizations are:

- Electronics Industries Association (EIA)
- Telecommunication Industry Association (TIA)
- European Telecommunication Standardization Institute (ETSI)
- Institute of Electrical and Electronic Engineers (IEEE)
- International Electro-technical Commission (IEC)

Telecommunications standards are also developed by groups of manufacturers that formulate standards. These often become ad hoc industry standards and may subsequently be incorporated in the recommendations of the International standards organizations. Some examples of these groups are the Frame Relay Forum, the ADSL Forum and the ATM Forum.