

NETWORK TECHNOLOGIES AND COMPUTER COMMUNICATIONS

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Abstract; Currently, computer networks are developing rapidly. It is difficult to imagine any organization or institution without computer networks. The Internet, a global international computer network that emerged at the end of the 20th century, is proof of this. This network is becoming one of the electronic forms of information that many people receive daily from newspapers, journals, and books. Therefore, using and studying the structure of computer networks and obtaining information from them is of great importance.

Keywords; Technology, network, computer, Internet – international, information, supply, electronic.

Content of the Subject The objective of teaching this subject is to educate students on how to overcome network-related problems they may encounter in their professional field, and to provide them with sufficient knowledge to become specialists as future subject teachers.

The task of the subject is to provide students with information about computer networks, to show the role of information technologies in every person's life and in the development of society, to reveal the possibilities of regional, local, and global computer networks, to form concepts on when and for what purposes to use data in computer networks, and to provide knowledge on how to generate data to be placed on the global network.

Network technologies are technologies that enable communication in network mode (English: network technologies, Russian: сетевые технологии).

Network technologies are a set of standards that define the minimum level of software-hardware composition for organizing and coordinating computer networks. As a rule, network technologies define and specify network topology, as well as the protocol at the channel level.

Network technologies are a unified set of rules for transmitting and delivering data in the form of software, hardware, and protocols. Data exchange is carried out with network adapters, as well as through various connectors and cables.

Network technologies form the basis of information and communication technologies, and their application in various fields provides the following opportunities:

- Mutual use of a single printer, copier, and other devices by several computers on the network;
- Conducting business and other collaborations over wide areas via VPN (Virtual Private Networks);

- Shared use of information from one computer as a backup storage and management of several computers in a client-server model;
- Using telephone services with IP telephony, i.e., voice traffic (speech) transmission between two subscribers, or with VoIP (Voice over IP - reconstruction of analog signals from packets and discrete signals received on the network, or vice versa) technologies;
- Conducting e-commerce online in an e-commerce model;
- Shared use of electronic journals and newspapers;
- IPTV (IPTelevision - internet television) technologies;
- Wiki, e-mail, and internet social networks;
- Broadband network services and its many possibilities.

The term **broadband network** refers to continuous and high-speed internet connectivity. However, this is not just about data transfer speed, but also a special way of using the World Wide Web.

A broadband network client can transmit and receive large amounts of data, including color images, audio and video clips, animation, television content, and more, at any time. A broadband network provides the most modern services to the client, regardless of where they are connected. The client will have more opportunities in multimedia and business information provision, including file sharing, telephone, and banking services, and more.

Broadband networks enable the opening of new sectors and the development of existing ones. They open up new opportunities for economic growth and investment, and job creation. They facilitate the development of remote settlements, create favorable conditions for commerce for local authorities, provide highly qualified medical services, enable remote work, high-speed data access, and participation in public administration.

One of the broadband network technologies is **FTTx technology**. FTTx - the name is derived from the initial letters of the English words Fiber to the x, meaning "optical fiber to point x". Fiber to the Home/Building means "optics to every home". This term is used for all computer networks where an optical cable is used up to a certain distance (point x) from the communication node. The FTTx system opens up great opportunities for new services to broadband subscribers.

According to experience in using computer networks, delaying users' access to the Internet, which is considered the global computer network, can completely negatively affect various aspects of any country's life, including:

- Lack of timely and necessary modern information about the latest scientific and technical achievements in the world leads to lagging in the development of science and high-tech industries, which in turn can negatively affect the development of all sectors of the economy;
- Low level of information communication can negatively affect the country's trade and foreign economic relations;
- The absence of reliable information about the country's cultural, historical, national, literary, artistic, and other riches on the global computer network (Internet) can lead to "cultural isolation" from the outside world;

- A country may lose a valuable source of state budget revenue - the sale of information intellectual products and service industries. In the context of computer (computing) networks, the following possibilities are envisaged:
- Access to data in distributed databases;
- Expansion of the list of tasks to be solved for information production;
- Increasing the reliability of the information system by duplicating EHM operations;
- Creation of new types of service;
- Decrease in the cost of information processing.

Main Requirements for Modern Computer Networks

The main requirement for modern computer networks stems from their primary purpose: to provide users with simple, convenient, and reliable access to distributed network resources. Other requirements such as productivity, reliability, expandability, transparency (openness), and others are linked to the quality of fulfilling this primary requirement.

In general, quality use of network services implies two requirements for the network: **productivity** and **reliability**. There are two approaches to quality use of computer network services:

In the first approach, the computer network guarantees a specific type of service to the user. For example, a packet sent by User A to User B should not be delayed by more than 150 ms, or the average data throughput of the communication channel serving Users A and B should not be less than 5 Mbit/second, and so on. Guaranteeing networks include: Frame Relay, ATM, and others.

In the second approach, services are provided in a computer network based on user priority. This type of service is called "best effort." The network strives to provide good service according to its capabilities, but does not guarantee quality service.

Network expandability refers to the ability to connect new users, additional computers, applications, services, and devices to the network. **Network scalability** refers to the network's performance not decreasing after expansion.

Network transparency ("openness"). According to the motto of Sun Microsystems specialists: "The network is the computer." This motto indicates the network's transparency and "openness." Not informing users about certain shortcomings that appear in the network is also considered transparency.

Ability to support various types of network traffic. Problems with computer and multimedia traffic.

Network management refers to centralized control of the main elements of the network, analysis of its effectiveness, and planning of network development.

Network adaptability. If a computer network has various hardware, software, and technological provisions, it is called a heterogeneous network. If a heterogeneous network operates without any problems, it is called an integrated network.

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