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Network security issues and effective protection against network attacks

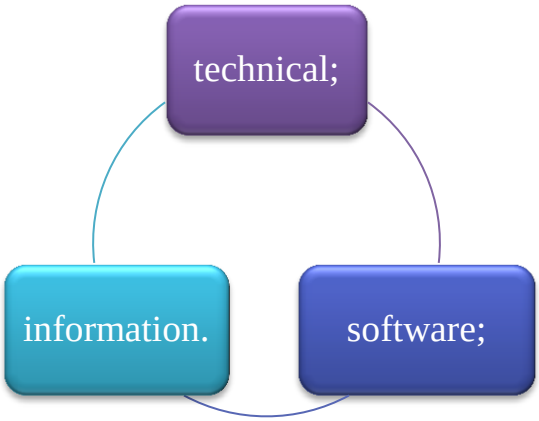
Zaripova D.A.
Zaripova Dilnoza Anvarovna – senior teacher, Faculty of Vocational Education in the field of ICT, Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, Tashkent
zaripovada85@gmail.com
Makhmudov Abdukhalil Abdurakhmon ugli
Student, Faculty of Vocational Education in the field of ICT, Tashkent University of Information Technologies named after Muhammad al-Khwarizmi, Tashkent
maxmudovabduhalil@gmail.com

Annotation:

The article gives a general overview of the network, the role of the global network today, a brief overview of the various attacks on the network. It also discusses the problems that can arise as a result of various attacks on the network and ways to overcome them. In addition, the article describes effective ways to ensure network security

Key words: eavesdropping, transmitting information, Denial of service, Port scanning, IPSec, VPN, IDS, Firewall technology, protocol.

The Internet is a complex system of self-formation and self-management, consisting of three main components:



❖ The maintenance of the Internet consists of various types of computers, communication channels (telephone, satellite, fiber-optic and other types of network channels) and a set of network hardware.

❖ Internet network software (software) programs that allow different computers and network devices connected to the network to work on a single standard (in a single language).

❖ Internet information support consists of a set of information available on the Internet in the form of various electronic documents, graphics, audio recordings, video images, websites, etc.

Naturally, as the global network spreads around the world, its security problems and the need to find effective ways to protect the network against attacks.

The use of computer and information technologies, telecommunications, data transmission networks, Internet services, which are included in the priorities of our country's

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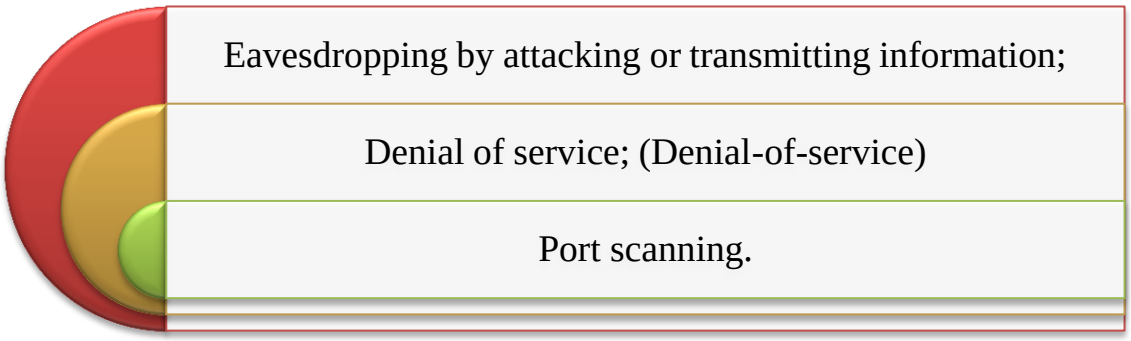
policy, is developing and modernizing. The widespread introduction of modern information technologies in all spheres of our society in our daily lives will ensure the achievement of our future goals. The use of the Internet in any industry increases productivity.

Quick data sharing using a network can save time. In particular, the formation of e-government in our country and the organization of strengthening the interaction between government and the population on its basis will be carried out using the network. Effective use of the network ensures the formation of a democratic information society. In such a society, the speed of information exchange will increase, and there will be faster results in the collection, storage, processing and use of information.

However, protection against problems such as unauthorized access to the network, use and alteration of information, loss of information has become a topical issue. Businesses, organizations, and government agencies that connect to the network must pay close attention to network security before connecting to the network to share information. Network security is achieved through the use of a variety of tools and methods, measures, and actions to ensure that information transmitted, stored, and processed is provided in a reliable and systematic manner. Network security tools need to be able to quickly identify and respond to threats. There are many types of network security threats, but they fall into several categories:



Eavesdropping by attacking or transmitting information

In the process of transmitting information, information can be listened to, altered and blocked without the user's knowledge, through the use of telephone lines, instant messaging via the Internet, video conferencing and faxing with a hearing and change attack. This attack can be carried out through several network analysis protocols. With the help of attack software, CODEC (convert video or audio analog signal to digital signal and vice versa) easily converts digital audio to high quality but large volume audio files (WAV). Usually the process of performing this attack is not noticeable to the user at all. The system performs the specified operations without excessive stress and noise. There is no doubt about the theft of information. Only those who are aware of this threat in advance and want the information sent to maintain its value will be able to exchange information through a secure network as a result of special network security measures. There are several technologies that can be effective against hearing and altering information being transmitted over a network:

IPSec (Internet protocol security) protocol. Ipsec (Internet protocol security) allows secure exchange of information over the network using these security protocols and encryption algorithms. This special standard ensures that software and data, as well as hardware, are compatible with computers on the network. The Ipsec protocol ensures the confidentiality of the information transmitted over the network, that is, only the sender and receiver can

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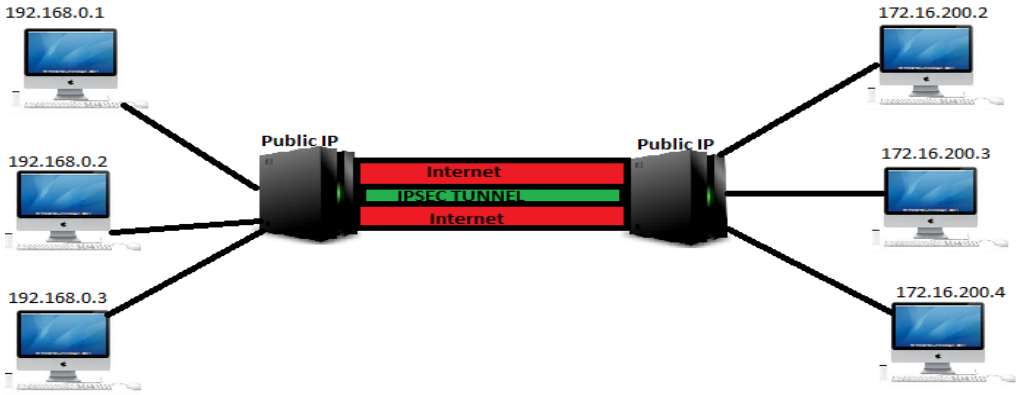
understand it, the purity of the information and the authentication of packets. The use of modern information technology has become a necessary tool for the development of any organization, and the Ipsec protocol provides effective protection for:

- connecting the head office and branches to the global network;
- remote control of the enterprise via the Internet;
- protecting the network connected to sponsors;
- in improving the security of e-commerce.



VPN (Virtual Private Network) virtual private network. VPN (Virtual Private Network) is defined as a virtual private network. This technology is based on the formation of an internal network within another network to share all information between users, aimed at providing reliable protection. The Internet is used as the network base for a VPN.

The advantage of VPN technology. By connecting local area networks to a common VPN network, a low-cost, high-security tunnel can be built. To create such a network, you need to install a special VPN gateway on one computer in each part of the network to exchange information between branches. The information exchange in each department is simple. If you need to send data to another part of the VPN network, then all data will be sent to the gateway. The gateway, in turn, processes the data, encrypts it using a reliable algorithm, and sends it over the Internet to another branch's gateway. At the designated point, the data is decrypted and transmitted to the final computer in a simple manner. All this is done in a way that is completely imperceptible to the user and is no different from working on a local network. Using the eavesdropping attack, the information you hear will be confusing.

In addition, a VPN is a great way to connect a separate computer to an organization's local area network. Let's say you're on a business trip with your laptop and you need to connect to your network or get some information from there. With a special program, you can connect to a VPN gateway and act like any other employee in the office. It is not only convenient but also inexpensive.

e-ISSN : 2620 3502
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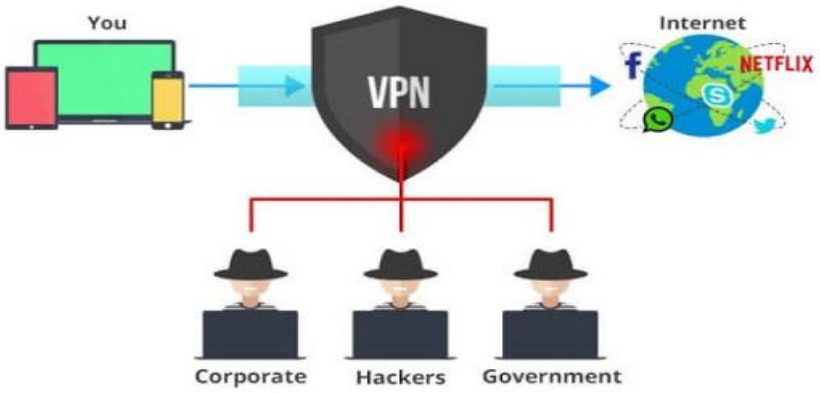


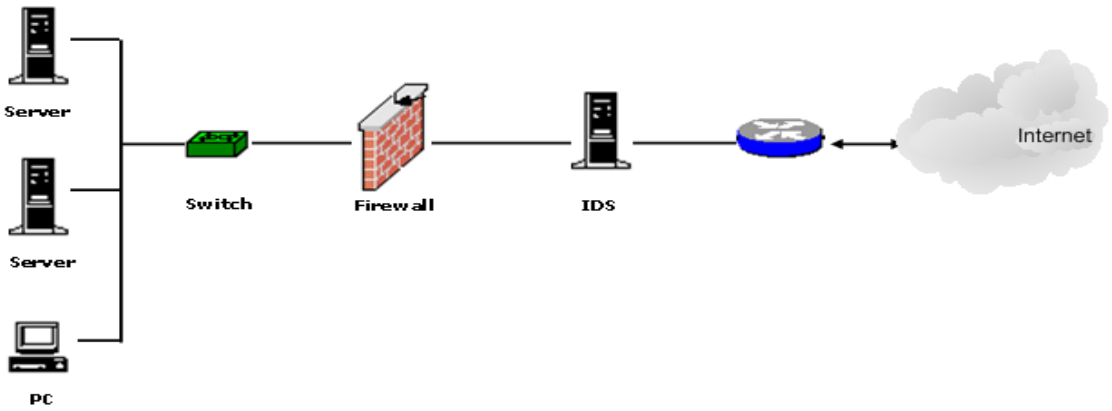
The principle of operation of a VPN. In addition to new hardware and software, setting up a VPN requires two main components: a data protocol and security tools.

Using an unauthorized access detection system (IDS) identifies the method or means by which an attempt is made to compromise a system or network security policy. Unauthorized access detection systems have a history of almost a quarter of a century. The first models and prototypes of unauthorized access detection systems used the analysis of computer system audit data. This system is divided into two main classes. It is divided into the Network Intrusion Detection System and the Host Intrusion Detection System.

IDS (Intrusion Detection System) is an intrusion detection system.

- a sensor system that collects and analyzes the security situation of protected systems;
- an analytical part system for detecting suspicious actions and attacks based on sensor data;
- a warehouse that collects analysis results and initial data;

A control console that allows you to configure the IDS system, monitor the status of the IDS and the protected system, and monitor conflicts detected by the analysis partition systems.



This system is divided into two main classes. It is divided into the Network Intrusion Detection System and the Host Intrusion Detection System. The principle of operation of the system of unauthorized access to the network (NIDS) is as follows:

1. Checks the traffic that has access to the network;
2. Restricts harmful and unauthorized packages.

Denial of service; (Denial-of-service)

DOS (Denial-of-service) This type of network attack is called a denial-of-service attack. The attacker tries to prevent legal users from using the system or service. Often, these attacks are carried out by overflowing infrastructure resources with service access requests. Such

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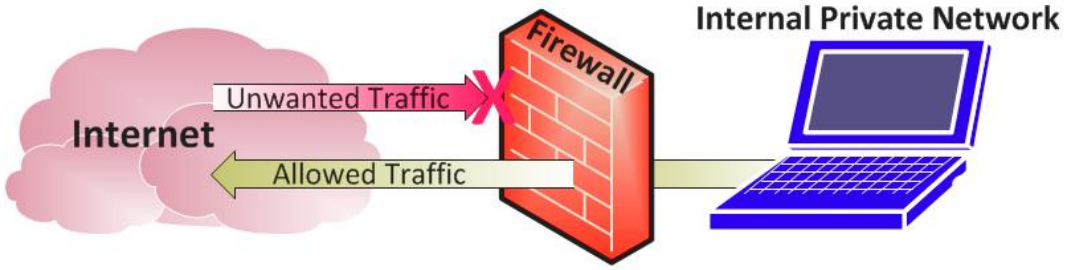
p-ISSN : 2615 3785

attacks can target the entire network, as well as the individual host. Prior to an attack, the object is thoroughly examined, that is, the vulnerabilities or deficiencies of the protection against network attacks, what operating system is installed, and when the object is at its peak. Based on the results of the following detection and verification, a special program is written. In the next step, the created program is sent to the servers of the highest position. Servers send to registered users in their database. The user who receives the application installs the application knowingly or unknowingly that it was sent by a trusted server. This can happen to thousands or even millions of computers. The program activates on all computers at the specified time and continuously sends requests to the server of the object to be attacked. The server is busy answering incessant requests and is unable to perform its main function. The server fails to serve.

The most effective ways to protect yourself from a service denial attack are:

- Firewall technology;
- IPsec protocol.

Firewall technology. The firewall is the first protection device of the inner and outer perimeters. The firewall manages incoming and outgoing data in information and communication technologies (ICTs) and provides ICT protection by filtering data, performing information verification based on established criteria and deciding whether packets to enter the system. The firewall sees all packets passing through the network and checks the packets in both directions (input, output) according to the established rules and decides whether to allow them or not.



The firewall also provides protection between two networks, that is, it protects the protected network from an open external network. The advantages of the protection tool listed below, especially the packet filtering function, are an effective means of protection against DOS attacks. Package filters control:

- physical interface, where the package comes from;
- the IP address of the source;
- the IP address of the recipient;
- source and receiving transport ports.

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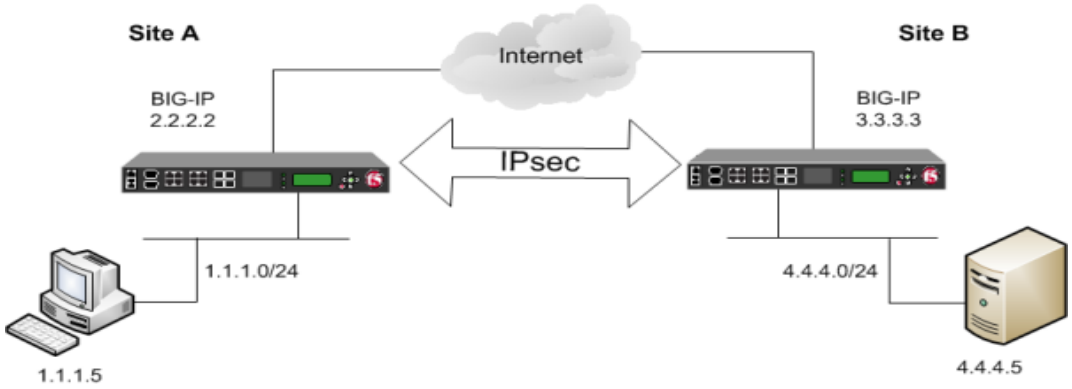

The firewall does not provide full protection against DOS attacks due to some shortcomings:

❖ Design errors or omissions - various technologies of firewalls do not cover all access points to the protected network;

❖ Implementation flaws - each firewall has errors as long as it is in the form of a complex set of software (hardware). In addition, there is no general test methodology that allows to determine the quality of software implementation and to ensure that all specified features are implemented on the firewall;

❖ Disadvantages of use - operation of firewalls, configuration based on security policy is very complicated, and in many cases there are cases of incorrect configuration of firewalls. These shortcomings can be addressed using the IPsec protocol. Summarizing the above, it is possible to provide adequate protection against DOS attacks through the proper use of firewalls and the IPsec protocol.

Port scanning

The attack type of port scan is more commonly used than computers that provide network services. We need to pay more attention to virtual ports to ensure network security. Because ports are a means of transporting data over a channel. The computer has 65,536 standard ports. Computer ports can be likened to a door or window in a house. The attack on the port checkpoints seems to indicate that the thieves knew whether the doors and windows were open or closed before entering the house. If a thief notices that the window is open, it will be easier to enter the house. The hacker uses the Ports Check attack to get information about whether a port is open or not being used during an attack.

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A message is sent at the same time to analyze all ports, resulting in real-time determining which port the user is using on the computer, which is the computer's thin point. It is possible to tell exactly which service the user is using by the known port number. For example, if the analysis reveals the following port numbers, it is possible to determine the name of the service used by these numbers

- Port # 21: FTP (File Transfer Protocol) file sharing protocol;
- Port # 35: Private printer server;
- Port # 80: HTTP traffic (Hypertext Transfer [Transport] Protocol) hypertext exchange protocol;
- Port # 110: POP3 (Post Office Protocol 3) E-mail port.

An effective protection solution against port control attack The effective use of firewall display technology gives the expected result. An attack can be prevented by introducing a special rule on the firewall to respond to requests to check all ports at the same time.

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