Assignment

Theme:

Basics and Types of Computer Networks

Course: Computer Networks

Module: Passive and Active Parts of Computer Networks

Student: Jovan Ljušić

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This document presents a step-by-step approach to solving a specific task, outlining the methodology, execution, and expected outcomes. By following the instructions, the reader will gain hands-on experience in applying technical concepts to practical situations, reinforcing both theoretical knowledge and problem-solving abilities.

The structured approach ensures that each step is clearly defined, making the process easy to follow and implement in professional environments.

"*You are employed in a company where the network infrastructure is based on 1 Gbps Ethernet technology. For a potential infrastructure modernization, the company management has assigned you the task of analyzing the current standards of 10 Gbps Ethernet technology and fiber-optic technology.*

The criteria for analysis should include reliability, quality, meeting the company's needs, cost, etc. For the comparative analysis, you may use a tabular (comparative) format. Your report should be concise, limited to two A4 pages. At the end of the report, it is mandatory to provide your opinion as the responsible IT expert in the company and your conclusion (what you would choose and why)."

Through this task, I will try to explain in detail and show the types of computer networks, including Ethernet 10 Gbps and fiber-optic technologies.

The materials that I will use during the creation of this task are the Tabular Representation of the Network and the textual content of the information.

10 Gigabit Ethernet

The new 10 Gigabit Ethernet standard includes seven physical media standards for LAN, MAN and WAN.

It is currently covered by the IEEE 802.3ae amendment and should be included in the next revision of the IEEE 802.3 standard.

Ethernet tip	***Speed***	***Cable Type***	***Duplex***	***Distance***
1 Gigabitni Ethernet				
1000Base-T	1 Gb/s	UTP kat. 5e	complete	100 m
1000Base-TX	1 Gb/s	UTP kat. 6	complete	100 m
1000Base-CX	1 Gb/s	Scots Gaelic	complete	25 m
1000Base-SX	1 Gb/s	Multimode Fiber	complete	550 m
1000Base-LX	1 Gb/s	Single-mode thread	complete	10 km

1000Base-ZX	1 Gb/s	Single-mode thread	complete	70-100 km
10 gigabit network				
10GBase-CX4	10 Gb/s	Scots Gaelic	complete	100 m
10GBase-T	10 Gb/s	UTP cat. 6a/7	complete	100 m
10GBase-LX4	10 Gb/s	Multimode Fiber	complete	300 m
10GBase-LX4	10 Gb/s	Single-mode thread	complete	10 km
10GBase-SR/W	10 Gb/s	Multimode Fiber	complete	300 m
10GBase-LR/W	10 Gb/s	Single-mode thread	complete	10 km
10GBase-ER/W	10 Gb/s	Single-mode thread	complete	40 km

What are the differences between Gigabit and 10 Gigabit Ethernet?

Ethernet Tip	***Speed***	***Coding Method***
1 Gigabitni Ethernet	1000 Mb/s	4D-PAM5 and 8B/10B encodings
10 gigabitni ethernet	10 Gb/s	64B66B coding scheme with 3% additional traffic.

10 Gigabit Ethernet is a standard or variant of Ethernet in computer networks, defined in 2002 by the IEEE 802.3ae-2002 standard for operation at information transfer rates of 10 Gb/s (10 times faster than gigabit ethernet).

10 Gigabit Ethernet only supports full-duplex modes on links that can connect switches. Distributors are not allowed in this system, as well as half-duplex mode and the CSMA/CD protocol.

The next difference is that it uses only optical fiber. All seven types of physical interfaces, or PHYs, are optical fibers.

In 10 GbE networks, multimode fibers are most commonly used for distances of less than 400 meters. There are several types of multimode fibers, identified by the designation "OM", described in the ISO/IEC 11801 standard, namely: OM1, OM2, OM3 and OM4.

What speeds can we expect on a 10 GbE network?

The data transfer rate can be close to the theoretical maximum of 1.25 gigabytes per second, but it can be significantly slower. An important parameter (at the L2 level) that determines how fast the speed will be achieved is the size of the Ethernet packet.

The speed is sometimes 500, sometimes 800 or 1100 MBps, but it is always much higher than in the previous 1 Gbps network, where it reached "only" 115 MBps – working with files of 10, 20 or 30 GB.

How to connect to 10 Gigabit Ethernet

In 10 Gigabit Ethernet, there are two types of fiber-optic cables: single-mode (SMF) and multimode (MMF).

How to connect to Gigabit Ethernet.

While talking about the affordability ratio of 10 gigabit ethernet, it can be said that it is significantly more expensive, but it guarantees safety during operation and errors are minimal.

Although the connection method is quite similar to 1Gigabit Ethernet, it can also be said that 10Giga Ethernet requires specialized equipment for the connection because as a result, it allows for a much faster source of data transfer.

However, it is essential to consider the long-term benefits and potential cost savings that may result from the superior performance and scalability of 10 Gigabit Ethernet.

What are the differences between 10 Gigabit Ethernet and fiber optics?

Copper/cable connection (10GBase-T)	Fiber Optic Train Connection (10GBase-CX4)
10GBASE-T is a standard technology that enables 10 Gigabit Ethernet operations over a twisted-pair balanced copper cable system, including unshielded and shielded Category 6A cables.	In addition to the copper mesh option, STP+ modules and matching fiber cables are required to connect 10GbE switches over 100m to achieve 10G Ethernet operation.
It is a technology that provides end-users with cost-effective media to achieve data transfer speeds of 10 Gbps.	An STP+ direct connect cable (DAC) is a fixed assembly that is purchased at a given length.
10GBASE-T offers relatively high flexibility in network design due to its 100-meter range capability.	The STP+ DAC provides high performance in 10Gb Ethernet networking applications by using an enhanced STP+ connector to send

	10Gbps data over a pair of transmitters and receivers over a thin twinax cable or fiber optic cable.
10GBASE-T copper equipment includes a 10G core Gigabit Ethernet switch, an access switch with 10G uplink, and 10G network cards for servers and storage devices.	It is a low-cost alternative to traditional fiber-optic and twisted-pair copper cables in data center deployments.
To build a 10GBASE-T copper network, there are generally two cable solutions: a 10Gb copper switch with a Cat6 cable or a 10GbE STP+ switch with a 10GBASE-T STP+	