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A PATH FOR HORIZING YOUR INNOVATIVE WORK

VARIOUS FACTORS AFFECT ON SPEED OF NETWORK AN OVERVIEW

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Abstract: This paper briefly focus on various factor affect on the speed of networks. In day to day life user face problem that system goes slow down while working in networks. Various factors affect on speed of network such as transmission media. impairment such as attenuation means a loss of energy due to distortion, and noise, Elector magnetic interfere (EMI), Bandwidth the rate of data transfer in hertz & bps, Throughput which is actual measurement of how fast we can send data, Number of receivers, Latency i.e expected delays in long distance transmission, Congestion, Packet loss/ dropped, Quality of network interface card (NIC), impacts of Virus, Spyware or malware, Role of protocol stacks such as TCP/IP and UDP/IP, Poor performance processor, Speed of hard disk, Insufficient memory and old unstable operating system.

Keywords: EMI, UPS, Throughput, Latency, Congestion, NIC, Impairment, Protocol.

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INTRODUCTION

Networks are broadly classified according to their geographical area as Local Area Network (LAN) which is privately-owned networks covering a small geographic area, like a home, office, building or group of buildings, campus, Metropolitan Area Network (MAN) which covers a larger geographical area than is a LAN, ranging from several blocks of buildings to entire cities. MANs can also depend on communications channels of moderate-to-high data rates, Wide Area Networks (WAN) is computer network that covers a large geographical area, often a country or continent, & Internet which is a network of networks that consists of millions of private, public, academic, business, and government networks of local to global scope.

Table show classification of interconnected processors by scale.[1]

Inter processor distance	Processors located in same		Example
1 m	Square meter		PAN
10 m	Room		
100 m	Building		LAN
1 km	Campus		
10 km	City		MAN
100 km	Country		WAN
1000 km	Continent		
10,000 km	Planet		The Internet

2. Transmission Media

The transmission media that are used to convey information can be classified as guided or unguided. Guided media include twisted pair has been the workhorse for communications of all sorts. Coaxial cable has often been used for high-speed LAN and for high-capacity long-distance trunk applications. Optical fiber has taken over much of the market for high-speed LANs and for long-distance applications the tremendous capacity of optical fiber has made that medium more attractive than coaxial cable. Unguided media employ an antenna for transmitting through air, vacuum, or water. Unguided transmission techniques commonly include broadcast radio, terrestrial microwave, and satellite. Infrared transmission is used in some LAN applications. [2]

3. Impairment

The imperfection causes signal impairment. This means that the signal at the beginning of the medium is not the same as the signal at the end of the medium. What is sent is not what is received. Three causes of impairment are attenuation, distortion, and noise.

3.1 Attenuation: Attenuation means a loss of energy. When a signal, simple or composite, travels through a medium, it loses some of its energy in overcoming the resistance of the medium. That is why a wire carrying electric signals gets warm, if not hot, after a while. Some of the electrical energy in the signal is converted to heat. To compensate for this loss, amplifiers are used to amplify the signal.

3.2 Distortion: Distortion means that the signal changes its form or shape. Distortion can occur in a composite signal made of different frequencies. Each signal component has its own propagation speed through a medium and, therefore, its own delay in arriving at the final destination. Differences in delay may create a difference in phase if the delay is not exactly the same as the period duration. Therefore, the shape of the composite signal is not the same.

3.3 Noise: Noise is another cause of impairment. Several types of noise, such as thermal noise, induced noise, crosstalk, and impulse noise, may corrupt the signal. Thermal noise is the random motion of electrons in a wire which creates an extra signal not originally sent by the transmitter. Crosstalk is the effect of one wire on the other. Impulse noise is a spike that comes from power lines, lightning, and so on.[3]

Channels have limited transmission capacity (*bandwidth*) and take certain *delay* to reach the destination; Signals in the channel can be affected by, *Noise, Attenuation, & distortion.*

Interference may result in signal distortion for both guided and unguided media

In guided media, More receivers (multi-point) introduce more attenuation.[4]

4. Electromagnetic Interference (EMI) can be caused by natural causes such as electrical storms, or from man-made origins, including power lines, broadcast transmitters, cellular telephones and pencil sharpeners. Electromagnetic waves are guided along a solid medium. Twisted Pair, Coaxial cable, Fiber-Optic cable.

	Frequency Range	Typical Attenuation	Typical Dealy	Repeater Spacing
Twisted Pair	0-3.5 kHz	0.2 dB/km @ 1 kHz	50 µs/km	2 km
Coaxial Cable	0 -500 MHz	7 dB/km @ 10 MHz	4 µs/km	1-9km

Optical Fiber	180-370 THz	02-05 dB/ km	5 μs/km	40 km

Above table indicates the characteristics typical for the common guided media for long-distance point-to-point applications.

For guided transmission media, the transmission capacity, in terms of either data rate or bandwidth, depends critically on the distance and on whether the medium is Point-to-point or multipoint.

5. Number Of Receivers: A guided medium can be used to construct a point-to point link or a shared link with multiple attachments. Each attachment introduces some attenuation and distortion on the line, limiting distance and/or data rate.

6. Bandwidth

Bandwidth measures network performance. It is the **theoretical maximum rate of data transfer** that a particular network or network device is capable of handling. However, Bandwidth can be used in two different measuring value: hertz & bits per second (bps) like Kbps, Mbps, and Gbps.

The table below features bandwidth specifications of some common Internet access technologies. Transmission Media Characteristics.

Media Type	Bandwidth	Performance: Typical Error Rate
Twisted-pair	1 MHz	Poor to fair (10^{-5})
Coaxial cable	1 GHz	Good (10^{-7} to 10^{-9})
Microwave	100 GHz	Good (10^{-9})
Satellite	100 GHz	Good (10^{-9})
Fiber	75 THz	Great (10^{-11} to 10^{-13})

Higher bandwidth gives higher data rate.

7. Throughput

The throughput is a measure of how fast we can actually send data through a network. Bandwidth in bits per second and throughput seem the same, they are different. The bandwidth is a potential measurement of a link; the throughput is an actual measurement of how fast we can send data. For example, we may have a link with a bandwidth of 1 Mbps, but the devices connected to the end of the link may handle only 200 kbps. This means that we cannot send more than 200 kbps through this link.

8. Latency

In WAN, the actual rate of data transfer, which is known as throughput, is usually a small fraction of advertised bandwidth.

For example, while the bandwidth between a host in LA and a host in Tokyo is 45 Mbps, the actual throughput might be only 5 Mbps. That's just a little over 10% of what you'd have expected in a world without latency and packet loss.

When packets are transmitted over a local area network (LAN), they appear to arrive instantaneously. In reality, however, they do not. Because packets travel at speeds that are dependent on the properties of the physical medium through which they pass and because they have to cover a certain distance, there is actually a very small amount of delay. This delay, which is measured as the time it takes for a packet to get from one point in the network to another, is more formally known as latency and is usually expressed in milliseconds (ms).

The longer the distance the packet has to travel from those two points, the greater latency. Latency is more evident in WANs that span very large distances.

More latency can be introduced when the packet passes through gateways or proxy servers because of the various processes it has to undergo there.

The greater the value of latency, the longer the delay. So, if you have a high latency network, you can expect significant delays.

9. Congestion

Congestion is a situation in communication network in which too many packets are present in a part of the subnet or contending for the same link so. The queue overflows, Packets get dropped, Network is congested. Imagine a highway designed to transmit 1000 cars per minute from one point to another. If there is congestion on the road, this may be reduced to 100 cars per minute. The bandwidth is 1000 cars per minute; the throughput is 100 cars per minute. Congestion happen due to packet arrival rate exceeds the outgoing link capacity, insufficient memory to store arriving packets, Bursty traffic, & slow processor.

10. Packet Loss

Even a single lost packet can be a big problem because some text and other portions may end up missing.

This can happen due to a variety of reasons like signal degradation, faulty networking devices or drivers, and congestion. Naturally, if a packet is lost, the information that will be received on the other end would not be complete.

In some cases, that's not a big issue. For instance, a few lost packets won't have a critical impact when you're having a VoIP session, playing a real-time online multiplayer game, or viewing streaming media. Audio and video quality may suffer a little but that's all.

However, if you're sending a document, even just a single lost packet can be a big problem because some text and other portions may end up missing.

Packet loss is expressed in percent (%).

11. Network Interface Card

Network connection integrated on the motherboard can slow your transfer rate. A NIC has a separate processor to perform the network operations, whereas an integrated connection uses the CPU.

NICs can slow your transfer rate if you have duplex mismatches. A duplex mismatch occurs when a NIC, set to a specific speed and duplex, is connected to a NIC with different settings. This mismatch severely hinders your network bandwidth, reducing it to only a few millions of bits per second (Mb/s).

12. Virus, Spyware or Malware

One of the most dreaded nightmares for any computer owner is viruses, spyware or malware. A computer virus is an executable file or program that has the capacity to self-replicate as well as self modify within the system with its sole aim being disruption of the computer operation.

These viruses may multiply within the machine's network, memory or storage area. It would be important to acknowledge that everything concerning a computer virus is basically unauthorized. They gain entry into the machine rampantly and you definitely would not be willing to have the function of the computer obstructed. There are varying impacts of viruses on the computer system, with some being complex and others simple. The severity depends on the level of harm that the viruses harm the computer. The effects will also depend on the part of the computer targeted by the virus.

Viruses may also target the data stored in the hard drive, therefore resulting in its crashing. This would call for reformatting the hard drive. On the files, viruses delete, modify, or corrupt them, in which case you would not be in a position to access them.

A computer virus would consume some of the computer's memory, therefore significantly slowing down the computer

13. Role of Protocol

Although extremely high-speed interconnects are available today, the traditional protocol stacks such as TCP/IP and UDP/IP are not able to utilize the maximum network bandwidth due to inherent overheads in the protocol stacks. Such overheads are a big obstacle for high-performance computing applications to exploit high-speed interconnects in cluster environments. We show that UDP/IP can utilize more than 95% of the maximum network throughput

4. RESULTS AND CONCLUSION

Signal energy may loss due to attenuation, to compensate for this loss, amplifiers are used to amplify the signal. The shape of the composite signal is may not the same due to distortion. Noise may corrupt the signal. Electromagnetic interference EMI has several affects on a wired network. EMI accounts for more than 30 percent of data lost due to EMI interference from televisions, neighboring routers, wireless devices, and even printers.

To fixing this EMI problem is to keep at least 15 foot distance between the aforementioned devices and the wired network. Quality cables will lower the occurrence crosstalk. Too much bending can elongate parallel runs, create kinks, and compromise the integrity of the cable, leading to otherwise avoidable signal attenuation.

If distance is not proper made between each of these devices and a wired network, the network will continue to lose bandwidth potential and suffer from continued bottlenecks thus reducing the potential of the network.

You need a repeater when length cable exceeds than capacity, it boost the signal and avoid impairments**.**

To avoid congestion it is essential to use efficient congestion control technique.

Purchase best quality routers, modem, cables, switches & repeaters to avoid latency and packet loss.

To achieve higher data rate use higher bandwidth i.e. Use proper ISP which provide best bandwidth up to 20 mbps.

NIC has a significant effect on the entire network so, equipped with highest-performance card as possible ranges from 100 mbps to 1 gbps.

Use power filters and plugs your switches, bridges, hub, and repeaters into an uninterruptible power supply (UPS) to avoid noise ad ensure that they receive clean power.

Use proper legal anti-virus guard like Bitdefender total security, Norton internet security, Kaspersky PURE total security.

Lastly poor performance processor, Speed of hard disk, Insufficient memory and old unstable operating system also affect speed so that update system with high performance processor like i3, 2-4 GB RAM & latest operating system like windows 7 or 8.

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