Goals of Networks

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Computer Network means an interconnection of autonomous (standalone) computers for information exchange. The connecting media could be a copper wire, optical fiber, microwave, or satellite.

Networking Elements – The computer network includes the following networking elements:

1. At least two computers
2. Transmission medium either wired or wireless
3. Protocols or rules that govern the communication
4. Network software such as Network Operating System

Network Criteria:

The criteria that have to be met by a computer network are:

1. Performance – It is measured in terms of transit time and response time.

- Transit time is the time for a message to travel from one device to another
- Response time is the elapsed time between an inquiry and a response.

Performance is dependent on the following factors:

- The number of users
- Type of transmission medium
- Capability of connected network
- Efficiency of software
- Bandwidth
- Network topology
- Network protocols
- Distance
- Network congestion
- Network hardware

2. Reliability – It is measured in terms of

- Frequency of failure
- Recovery from failures
- Robustness during catastrophe
- Quality of service (QoS)
- Reducing single points of failure

- Capacity planning
- Network architecture

3. Security – It means protecting data from unauthorized access.

4. Network topology- it is another crucial factor to consider when designing a computer network. It refers to the way in which computers, devices, and links are arranged in a network. Common topologies include bus, star, ring, mesh, and hybrid, each with its own advantages and disadvantages in terms of cost, scalability, reliability, and performance. The choice of topology depends on the specific needs and constraints of the network. Other important criteria that must be met by a computer network include performance, reliability, and security.

Goals of Computer Networks: The following are some important goals of computer networks:

1. **Resource Sharing** – Many organization has a substantial number of computers in operations, which are located apart. Ex. A group of office workers can share a common printer, fax, modem, scanner, etc.

2. **High Reliability** – If there are alternate sources of supply, all files could be replicated on two or more machines. If one of them is not available, due to hardware failure, the other copies could be used.

3. **Inter-process Communication** – Network users, located geographically apart, may converse in an interactive session through the network. In order to permit this, the network must provide almost error-free communications.

4. **Flexible access** – Files can be accessed from any computer in the network. The project can be begun on one computer and finished on another.
5. **Security**– Computer networks must be secure to protect against unauthorized access, data breaches, and other security threats. This

includes implementing measures such as firewalls, antivirus software, and encryption to ensure the confidentiality, integrity, and availability of data.

6. **Performance**– Computer networks must provide high performance and low latency to ensure that applications and services are responsive and available when needed. This requires optimizing network infrastructure, bandwidth utilization, and traffic management.
7. **Scalability-** Computer networks must be designed to scale up or down as needed to accommodate changes in the number of users, devices, and data traffic. This requires careful planning and management to ensure the network can meet current and future needs.

   Other goals include Distribution of processing functions, Centralized management, and allocation of network resources, Compatibility of dissimilar equipment and software, Good network performance, Scalability, Saving money, Access to remote information, Person to person communication, etc.

Advantages:

Resource sharing: Networks enable the sharing of resources such as printers, scanners, storage devices, and software applications, which can reduce costs and increase efficiency.

Communication and collaboration: Networks provide a platform for communication and collaboration among users, allowing for easy sharing of information and ideas.

Centralized management: Networks allow for centralized management of devices, users, and resources, making it easier to control and monitor the network.

Scalability: Networks can be scaled up or down to accommodate changes in the number of users, devices, or data volume.

Accessibility: Networks can provide remote access to resources, enabling users to work from anywhere and improving accessibility to information and resources.

Disadvantages:

Security vulnerabilities: Networks can be vulnerable to security threats such as hacking, viruses, and malware, which can compromise sensitive **data and disrupt network operations.**

Complexity: Networks can be complex to set up, configure, and maintain, requiring specialized knowledge and expertise.

Dependence on infrastructure: Networks depend on the underlying infrastructure such as cables, routers, switches, and servers, which can be prone to failures or downtime, disrupting network operations.

Cost: Networks can be expensive to set up and maintain, requiring investments in hardware, software, and personnel.

Performance limitations: Networks have performance limitations such as bandwidth constraints, latency, and congestion, which can affect the speed and reliability of network operations.

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