### **1 Definition of a network and its main characteristics.**

A computer network is a system that connects multiple independent computers for the purpose of exchanging information and resources. Integrating computers and other devices allows users to communicate more easily. A computer network consists of two or more computer systems linked together. These systems can use both physical cables, such as fiber optics, and wireless connections to transmit data and exchange information. It is important to note that networks come in different types, such as Local Area Networks (LANs), Wide Area Networks (WANs), and free nets, each with different functions and architectures.

### **2 Classification of networks based on size and scope.**

1. Personal Area Network (PAN):

Description: The most basic type of network, PAN is restricted to a single person. It focuses on communication between computer devices within an individual’s workspace. Range: Typically spans 1 to 100 meters from person to device. Examples: USB connections, communication between a computer, phone, tablet, printer, or PDA.

2. Local Area Network (LAN):

Description: LANs are commonly used networks. They connect computers within a limited area, such as a home, school, office, or library. Range: Covers up to 2 kilometers. Examples: Home networks, school labs, office LANs.

3. Metropolitan Area Network (MAN):

Description: MANs connect computers over a geographical distance within a city, town, or metropolitan area. Range: Spans 5 to 50 kilometers. Examples: Networking in towns, cities, large areas within multiple buildings.

4. Wide Area Network (WAN):

Definition: A WAN is essentially a network of networks. It allows communication, data sharing, and more between devices across vast distances. The Internet itself is considered a WAN, as it spans the globe and connects countless networks. Geographic Scope: WANs cover extensive regions, countries, or even the entire world. Purpose: They connect LANs, campus networks, and other types of networks together. Transmission Distance: WANs can transmit data over tens, hundreds, or even thousands of miles or kilometers. Connectivity: WANs enable users and computers in one location to communicate with those in distant locations.

### **3 Communication channels and their main types.**

A communication channel is the medium used to transport information from one network device to another. Data transmitted over a communication channel usually takes the form of an electromagnetic signal - waves of light, electricity or sound. These waves can travel through the air or through cables, so channels are divided into two general classifications: wired and wireless. Wired channels transport data through wires and cables including twisted pair wires used for telephone land lines, coaxial cables for cable television networks and fibre-optic cables used for high-capacity trunk lines that provide main routes for telephone, cable and Internet communications. Wireless channels transport data from one device to another without the use of cables or wires.

### **4 Network topology, network architecture.**

Network topology refers to the arrangement of elements within a communication network. These elements include links and nodes, which can represent various types of telecommunication networks, such as command and control radio networks, industrial fieldbusses, and computer networks. There are 5 types of topology: point-to-point, star, full mesh, partial mush, bus.

In a client-server network, a computer acts as a server and stores and distributes information to the other nodes or clients. In a peer- to-peer network, all the computers have the same capabilities - that is, share files and peripherals without requiring a separate server computer.

### **5 Network protocols.**

This is the language or set of rules, that computers use to communicate with each other. Networks use different protocols. For instance, the Internet uses TCP/IP. Protocols set standards for encoding and decoding data, guiding data to its destination, and reducing the effects of interference. Networks use more than one protocol, and the collection of protocols for a network is referred to as a protocol stack. Most popular protocols: TCP(Transmission Control Protocol), UDP(User Datagram Protocol), FTP(File Transfer Protocol), SMTP(Simple Mail Transfer Protocol), IRC(Internet Relay Chat), IP(Internet Protocol), HTTP(Hypertext Transfet Protocol), POP(Post Office Protocol), VoIP(Voice over Internet Protocol), Bit Torrent.

### **6 Cloud computing.**

Cloud computing is possible because of a technology called virtualisation.

Virtualisation allows for the creation of a simulated, digital-only "virtual" computer that behaves as if it were a physical computer with its own hardware. The technical term for such a computer is virtual machine. When properly implemented, virtual machines on the same host machine are sandboxed from one another, so they do not interact with each other at all, and the files and applications from one virtual machine are not visible to the other virtual machines, even though they are on the same physical machine. Virtual machines also make more efficient use of the hardware hosting them. By running many virtual machines at once, one server can run many virtual "servers", and a data center becomes like a whole host of data centers, able to serve many organisations. Thus, cloud providers can offer the use of their servers to far more customers at once than they would be able to otherwise, and they can do so at a low cost. Even if individual servers go down, cloud servers in general should be always online and always available. Cloud vendors generally back up their services on multiple machines and across multiple regions.

### **7 The Internet and the Web.**

Internet — an international computer network that allows people to share information around the world.

Web — a system for finding information on the Internet, in which documents are connected to other documents.

### **8 Types of the Internet protocols.**

Most popular protocols: TCP(Transmission Control Protocol), UDP(User Datagram Protocol), FTP(File Transfer Protocol), SMTP(Simple Mail Transfer Protocol), IRC(Internet Relay Chat), IP(Internet Protocol), HTTP(Hypertext Transfet Protocol), POP(Post Office Protocol), VoIP(Voice over Internet Protocol), Bit Torrent.

**TCP** creates connections and exchanges packets of data. **IP** provides devices with unique addresses**. HTTP** exchanges information over the Web.

### **9 Technologies and components of the WWW.**

1. Web Pages: Building blocks with text, images, and links.
2. Web Browsers: Software for viewing web content.
3. URLs: Addresses for accessing resources.
4. Web Servers: Host and serve web pages.
5. HTTP: Protocol for communication.
6. Hyperlinks: Connect pages together.
7. A **website** is a collection of web pages accessible via a common domain name.
8. HTML (Hyper Text Markup Language) is the standard markup language for creating web pages.

### **10 Types of communication media: dial-up, DSL/ADSL, cable, 3G/4G.**

1. Dial-Up Connection:

* Traditional but slow.
* Uses a modem and telephone line.
* One device at a time.

1. DSL (Digital Subscriber Line):

* Always on, no dialing.
* Internet via telephone line.
* Speeds range from 128k to 8Mbps.

1. Cable:

* Extremely fast via cable TV lines.
* Speed varies for upload and download.
* Ranges from 512k to 20Mbps.

1. Wireless (3G/4G):

* No cables or phone lines.
* Mobile internet access.
* Speeds vary based on network coverage.

### **11 Definition and applications of the IoT.**

The Internet of Things is the concept of basically connecting any device featuring an on/off switch to the Internet (and/or to each other). IoT is a giant network of connected “things”.

IoT refers to a network of physical devices, vehicles, appliances, and other objects embedded with sensors, software, and network connectivity.

**Applications of IoT**: Manufacturing, Healthcare, Transportation, Agriculture, Smart Cities.

### **12 IoT ecosystem.**

The IoT is an ecosystem of connected physical objects thar are accessible through the Internet. An IoT ecosystem comprises interconnected components:

* + **Devices**: Sensors, actuators, and gateways.
  + **Networks**: Connectivity options like Wi-Fi, Bluetooth, or specialized protocols.
  + **Platforms**: Aggregating and processing data.
  + **Agents**: Users, applications, or automated processes.

### **13 Benefits that IoT brings.**

Benefits of IoT: Cost Savings, Data-Driven Decisions, Productivity, Remote Monitoring, Improved Customer Service, Fresh Business Opportunities.

### **14 Problems related to the IoT and their solutions.**

In the dynamic world of the Internet of Things (IoT), rising consumer expectations drive market growth. However, this surge presents integration challenges as diverse devices must communicate seamlessly. Security and privacy concerns loom large. Innovations in encryption and standardization efforts aim to address these issues. Collaboration among stakeholders is essential for safeguarding consumer interests and fostering sector growth.

### **15 Future of the IoT**

The future of the Internet of Things (IoT) promises significant expansion. By 2030, there will be exponential growth in the number of IoT devices, transforming various sectors. This growth presents opportunities for improved human-machine interaction and real-time data processing. Additionally, the rollout of 5G networks will revolutionize IoT applications by providing high speeds and extensive coverage.