# Study Guide: Introduction to Computer Networks

## Introduction to Computer Networks

- Computer networks are a group of linked devices that exchange information and resources.

- Networks, particularly the internet, are essential in various aspects of modern life.

- Networks enable effective communication across geographic boundaries and can vary in size from local area networks to wide area networks.

## Understanding LAN and its Components

- Local Area Networks (LANs) are networks that consist of linked devices within a confined geographical area, allowing for efficient transmission of data at fast speeds.

- LANs can have different topologies, such as star, ring, and bus configurations, each with its own benefits and disadvantages.

- Essential components of LANs include switches, routers, Ethernet connections, and Network Interface Cards (NICs), which facilitate the routing and delivery of data packets within the network.

- Firewall and intrusion detection systems are used to ensure network security.

## IP: Addressing and Functionality

- Internet Protocol (IP) is essential for network communications, allowing devices to recognize and interact with each other in a global digital environment.

- IP addresses serve as unique identifiers for devices connected to the internet, similar to residential addresses.

- There are two main versions of IP:

- IPv4, which has a 32-bit address space.

- IPv6, which has a 128-bit address space to accommodate a larger number of devices.

## Transport Layer

- The Transport Layer is the fourth layer in the OSI paradigm and ensures seamless communication within a networked setting.

- TCP and UDP are two widely acknowledged protocols operating at the transport layer:

- TCP (Transmission Control Protocol): Prioritizes data integrity.

- UDP (User Datagram Protocol): Prioritizes quickness.

- Port numbers are crucial in the transport layer as they ensure incoming data is sent to the relevant process or application on a device.

## Socket Programming

- Sockets are terminations of communication channels in networks, crucial for networked application development.

- TCP and UDP are two primary categories of sockets:

- TCP: Provides reliable data delivery.

- UDP: Offers faster transmission without guaranteed delivery.

- Socket programming is used in various applications like internet surfing, email communication, and video streaming, but security and error handling are important considerations.

## Important Terminologies

- Computer Networks: A network is a collection of networked computers and gadgets that collaborate to share data and resources.

- Local Area Network (LAN): A local area network (LAN) is a kind of network that is limited in scope to a smaller geographic region, such as an office or home environment.

- Internet Protocol (IP): The process through which data packets are sent and received across networks.

- Transport Layer: The layer in the network paradigm that is accountable for facilitating the transmission of data between two devices inside a network.

- Socket Programming: One approach for facilitating communication between devices on a network is by using a mechanism known as sockets, which provide endpoints for data exchange.

- IP Addressing: The process by which devices inside a network are assigned distinct identifiers for the purpose of facilitating data transmission.

## Summary

- Module 1 covers computer networks and their significance in the digital landscape.

- It explores Local Area Networks (LANs) and their role in enabling local communication.

- The module also discusses Internet Protocol (IP), Transport Layer, and socket programming in networked communication.