SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

19CSB302- COMPUTER NETWORKS

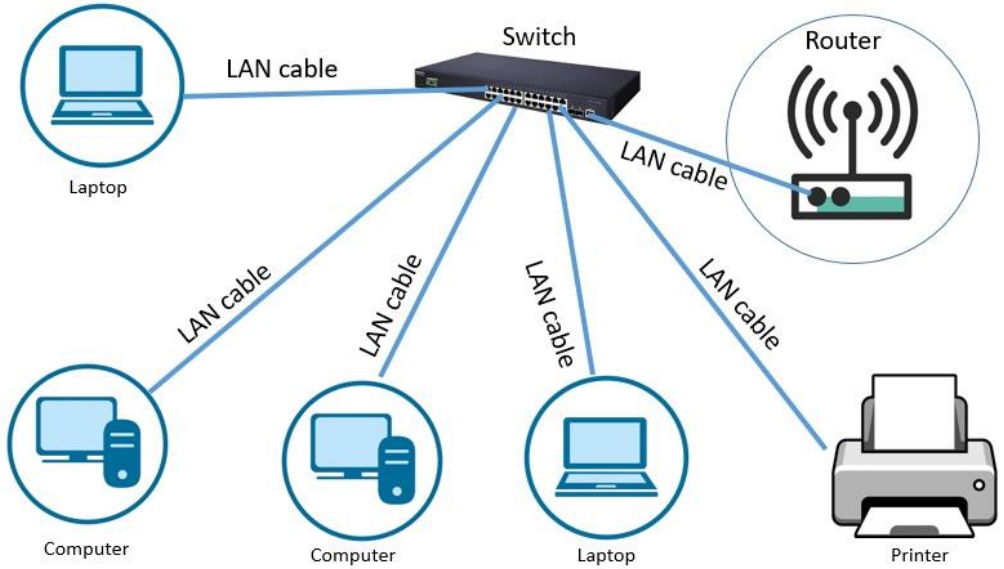
UNIT-1 FUNDAMENTALS AND PHYSICAL LAYER

Types of Network

- Local Area Network(LAN)
- Wide Area Network(WAN)
- Metropolitan Area Network(MAN)

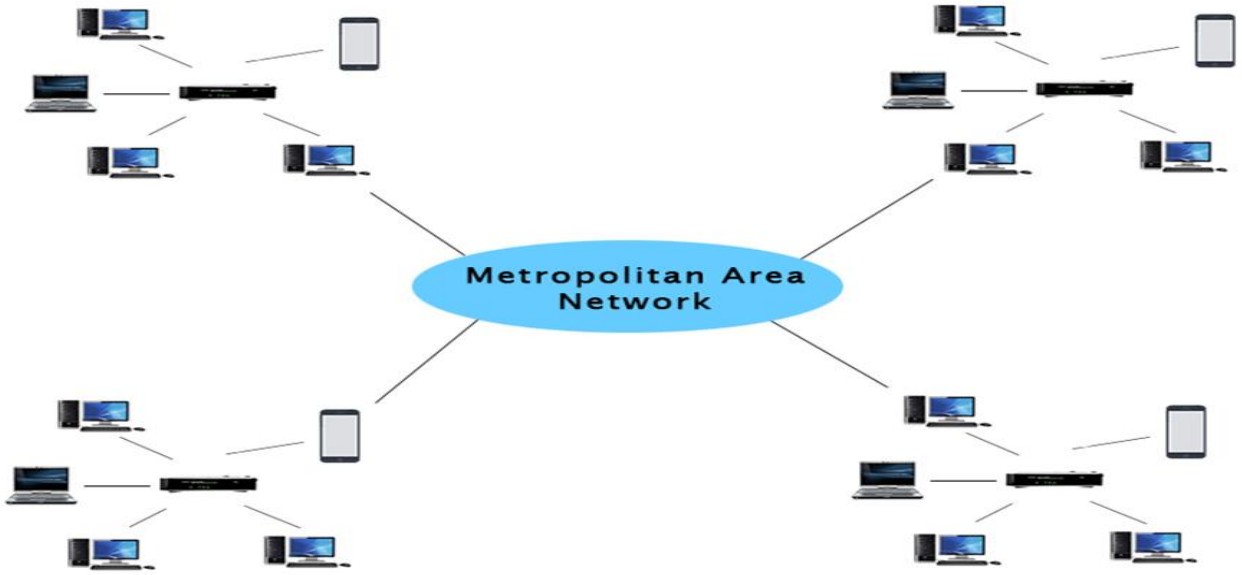
Local Area Network(LAN)

- A LAN is a computer network that connects computers through a common communication path, contained within a limited area, such as school, university campus, office building



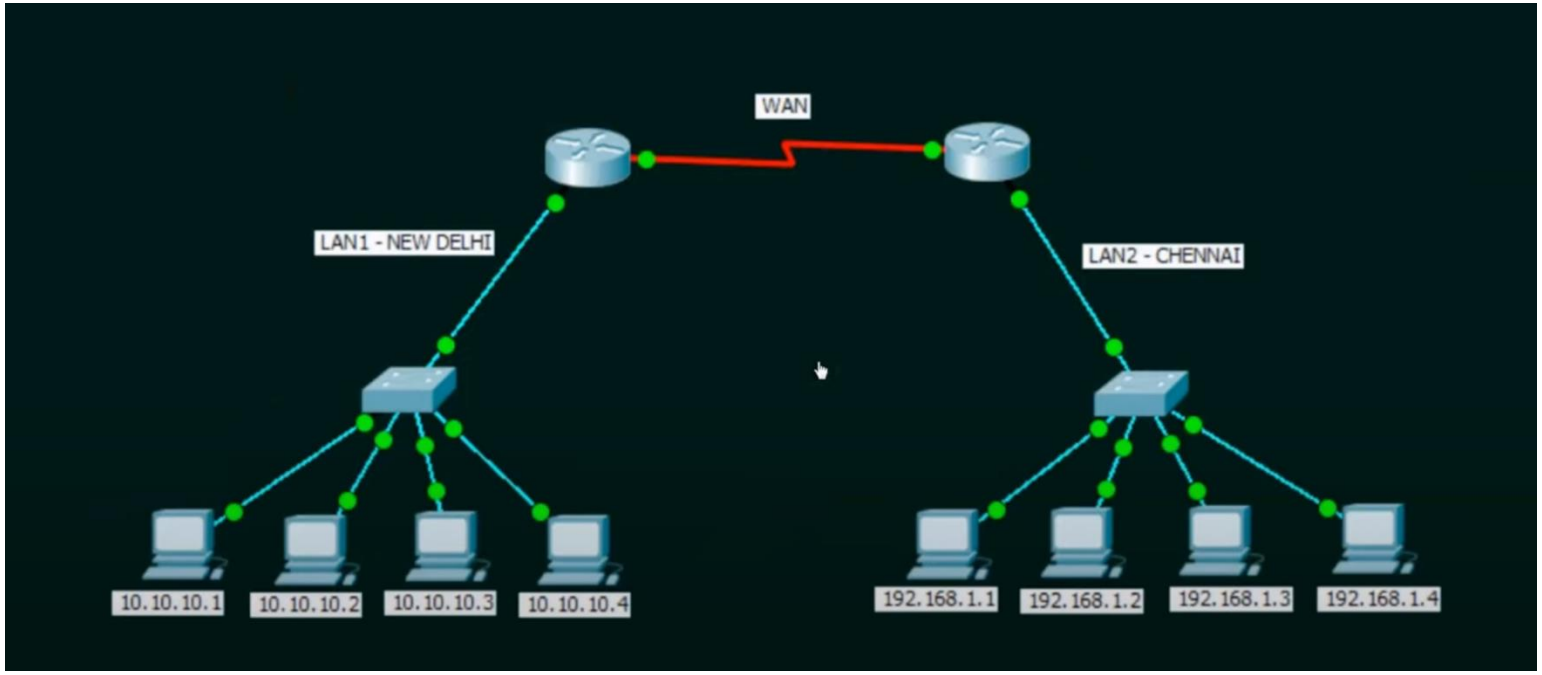
Metropolitan Area Network(MAN)

- This is the type of computer network that connects computers over a geographical distance through a shared communication path over a city, town, or metropolitan area.



Wide Area Network (WAN)

- WAN is a type of computer network that connects computers over a large geographical distance such as states or countries



Protocols and Standards

The protocol mainly defines what is communicated, how it is communicated, and when it is communicated.

Syntax
This term mainly refers to the structure or format of the data which simply means the order in which data is presented.

Semantics
This term mainly refers to the meaning of each section of bits.

Timing
This term mainly refers to two characteristics: At what time the data should be sent and how fast data can be sent.

Standards

- Standards are mainly used to provide guidelines to manufacturers, vendors, government agencies, and also to other service providers (agreed upon rules)
  - **de facto** (which means "by fact"/ "by convention")
  - **de jure** (which means "by law" /"by regulation")

Standard Creation committees

- International Organization of Standardization(ISO)
- American National Standards Institute(ANSI)
- Electronic Industries Association(EIA)
- Institute of Electrical and Electronics Engineers(IEEE)

Layering and Protocols

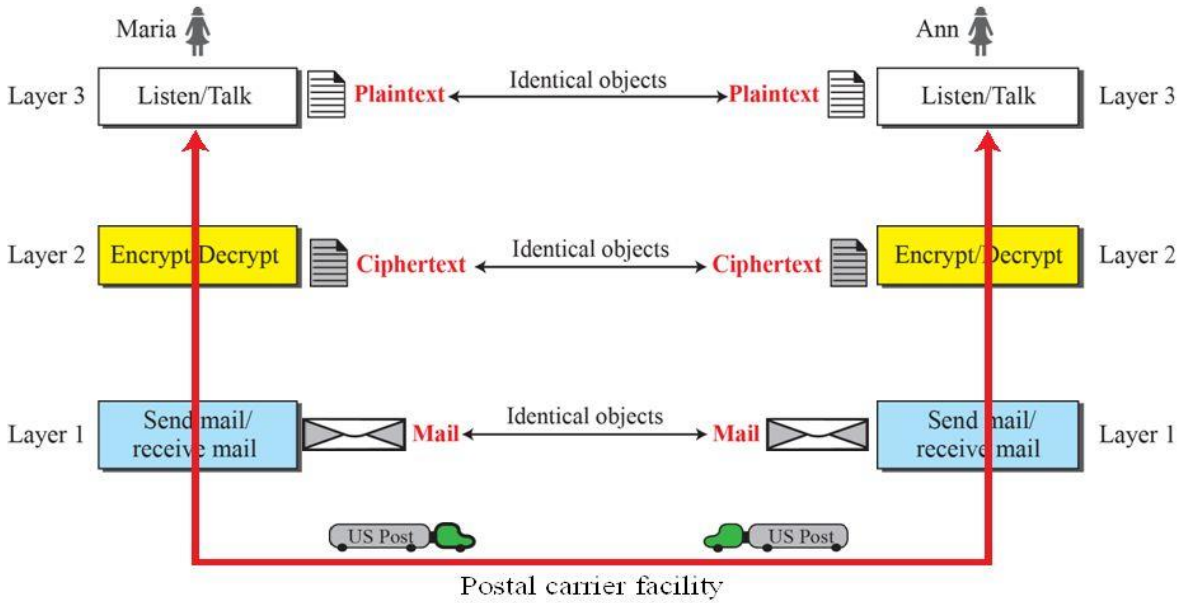
Protocol

- A protocol is a **set of rules** that govern how two or more devices communicate with each other.
- It defines the **format of the data** that is exchanged, as well as the **procedures** for sending and receiving data.
- Protocols are essential for ensuring that data is **exchanged reliably** and efficiently between devices on a network.

Layering

- Layering is a technique for **decomposing** a complex system into smaller, more manageable components.
- Layering is used to divide the task of communication into a series of well-defined layers.
- Each layer is responsible for a specific aspect of the communication process, such as error detection, routing, or data formatting.

Figure 2.2: A three-layer protocol



2.8

Principles of Protocol Layering

First Principle

If we want bidirectional communication, each layer should be able to perform two opposite tasks(encrypt/decrypt)

Second Principle

Two objects under each layer at both sides should be identical(object under layer2 should be cipher text)

Benefits of Layering

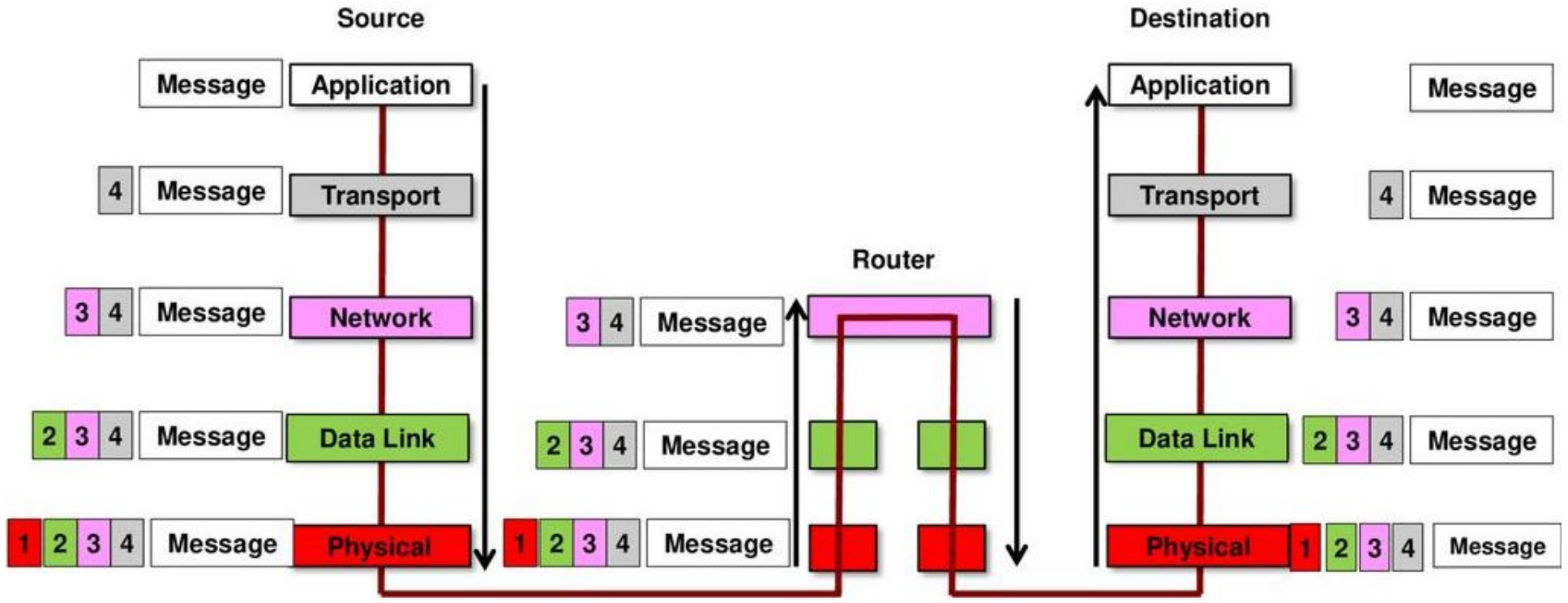
Modularity: Layering makes it easier to design, implement, and maintain complex networks. Each layer can be developed and tested independently of the other layers.

Abstraction: Layering provides a layer of abstraction between the application and the underlying network hardware. This makes it easier for applications to communicate with each other, regardless of the specific hardware that is used

Efficiency: Layering can help to improve the efficiency of network communication. By dividing the task of communication into smaller, more manageable components, layering can help to reduce the amount of overhead that is associated with each transmission.

Encapsulation

- Application layer Create and encapsulate the application **data** with any required application layer headers.
- Transport layer encapsulate the data supplied by the application layer inside a transport layer header. Based on host application a TCP or UDP header is typically used which results in **segments.**
- Network layer encapsulate the data delivered by the transport layer inside a network layer (IP) header. IP is a unique address on the network or each host. IP Address ensures where the packet has to be routed which results in **datagram/ packets**
- Data link layer encapsulate the data supplied by the network layer inside a data-link layer header and trailer. This layer uses both a header and a trailer. The header holds the MAC address of source/destination or router which results in **frames**
- The frame is then passed to the physical layer which converts them into **bits.**


Source
Destination
Router
Application
Transport
Network
Data Link
Physical
Message
4
3 4
2 3 4
1 2 3 4

Decapsulation

- Decapsulation is the inverse of encapsulation.
- Each layer decapsulates the packet received, removes the payload and delivers the payload to the next higher layer protocol until the message reaches the application layer.

Encapsulation vs Decapsulation

ENCAPSULATION	DECAPSULATION
1. It occurs at source host computer 2. Encapsulation is the process of wrapping the data 3. Process starts from the uppermost layer (Application Layer) to the lowest layer	1. It occurs at destination host computer 2. Decapsulation process is a process of opening packs 3. Process starts from the lowest layer (Physical Layer) to the uppermost layer