

### **EXPERIMENT NO - 1**

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#### **Title: Networking Devices**

**Aim:** To Study different networking devices such as Repeater, Hub, Bridge, Switch, Router, etc.

**Objective:** To Identify the different types of network devices and their functions within a network.

#### **Theory:**

- 1) Explain OSI model with diagram.
- 2) What is computer network and its advantages.
- 3) List of networking devices
- 4) Answer in one line what is protocol, topology, transmission mode, IP address, MAC address.
- 5) Explain following devices in short with diagram. Mention in which layer of OSI it works, advantages, disadvantages and its functions.
  - 5.1 NIC
  - 5.2 Modem
  - 5.3 Repeater
  - 5.4 Hub
  - 5.5 Bridge
  - 5.6 Switch
  - 5.7 Router
  - 5.8 Gateway

**Conclusion:** Students comprehended the importance of networking devices necessary to build a network.

#### **References:**

**Tutorialspoint:** Tutorialspoint. (n.d.). Retrieved from <https://www.tutorialspoint.com/>

**GeeksforGeeks:** GeeksforGeeks. (n.d.). Retrieved from <https://www.geeksforgeeks.org/>

**IEEE:** IEEE. (n.d.). Retrieved from <https://www.ieee.org/>

### 1. Explain OSI model with diagram.

The Open Systems Interconnection (OSI) model is a conceptual framework that divides network communication into seven distinct layers. This layered approach simplifies the complex process of network communication by breaking it down into smaller, more manageable tasks. Each layer has specific functions and interacts with the layers above and below it.

#### The Seven layers of OSI Model

##### 1. Physical Layer

- Function: Deals with the physical transmission of data bits over the network medium (e.g., cables, wireless signals).
- Responsibilities: Defines the electrical, mechanical, and procedural interfaces for activating, maintaining, and deactivating physical connections.

##### 2. Data Link Layer

- Function: Responsible for reliable data transfer between two directly connected nodes.
- Responsibilities: Handles error detection and correction, media access control (MAC), and framing data into data link frames.

##### 3. Network Layer

- Function: Responsible for logical addressing and routing of data packets across the network.
- Responsibilities: Defines the logical addresses (IP addresses) of devices on the network and determines the best path for data packets to reach their destination.

##### 4. Transport Layer

- Function: Provides reliable end-to-end communication between applications.
- Responsibilities: Ensures that data is delivered correctly, in order, and without errors. Handles flow control and congestion control.

##### 5. Session Layer

- Function: Manages the establishment, maintenance, and termination of connections between applications.
- Responsibilities: Controls the dialogue between applications, allowing for synchronization and check-pointing.

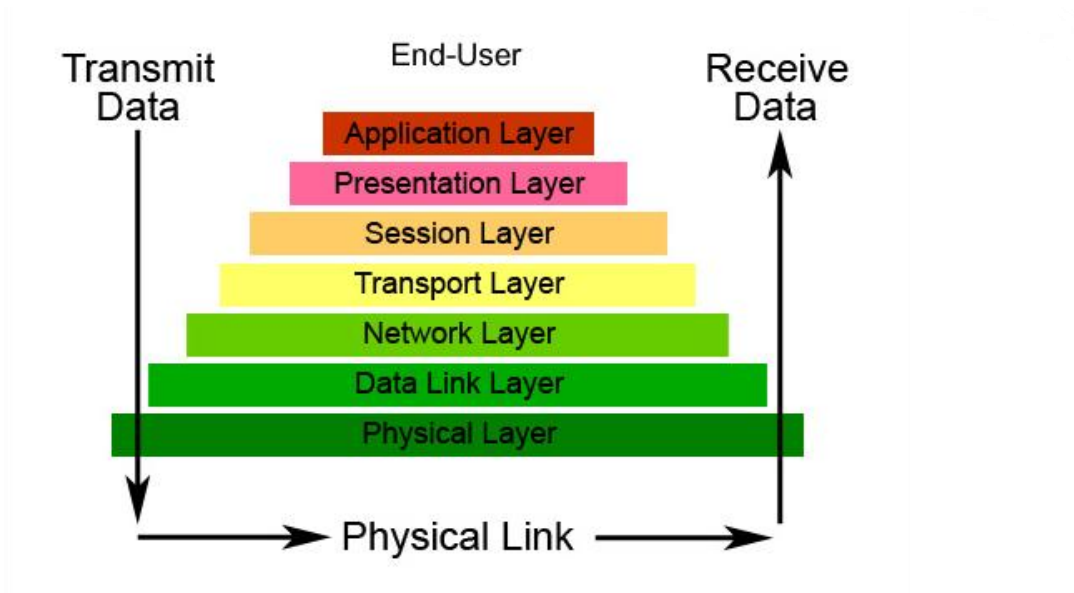
#### 6. Presentation Layer

- Function: Responsible for data formatting and encryption/decryption.
- Responsibilities: Translates data into a format that can be understood by the application layer and ensures data security.

#### 7. Application Layer

- Function: Provides services to user applications
- Responsibilities: Enables users to access network resources, such as file servers, email servers, and web servers.

#### Diagram of the OSI Model



## 2. What is computer network and its advantages

A computer network is an interconnected system of multiple commuting devices that can communicate and share resources. These devices are linked together through various media like cables, wireless signals, or satellite links.

The advantages of computer network are as follows:

1. Resource Sharing: Sharing hardware, software, and data.
2. Communication: Facilitating various forms of communication. (Email, video conferencing)
3. Scalability: Easily expanding the network to accommodate new devices and users.
4. Enhanced Security: Implementing centralized security measures for better protection.
5. Remote Access: Enabling users to access network resources from remote locations.
6. Cost Effectiveness: Reducing hardware and software while improving performance.

## 3. List of networking devices

The most used networking devices are as follows:

1. Hubs: Connect multiple devices, broadcasting to all.
2. Routers: Connect different networks and determine best data paths.
3. Modems: Connect devices to Internet.
4. Firewalls: Monitor and control network traffic, preventing unauthorized access.
5. NICs; Allow computer to connect to the network.
6. Repeaters: Boost weak wireless signals.
7. Bridges: Connect similar network segments.
8. WAPs: Enable wireless devices to connect to a wired network.

**4. Answer in one line what is protocol, topology, transmission mode, IP address, MAC address.**

- Protocol: A set of rules governing data exchange between devices.
- Topology: The arrangement of nodes and connections in a network (e.g., star, bus, ring).
- Transmission Mode: The direction of data flow (e.g., simplex, half duplex, full duplex).
- IP Address: A unique numerical identifier assigned to each device on a network.
- MAC Address: A unique physical address assigned to each network interface card.

**5. Explain following devices in short with diagram. Mention in which layer of OSI it works, advantages, disadvantages and its functions.**

**I. NIC**

Layer: Physical Layer

Function: Enables a computer to connect to a network.

Advantages: Allows for network connectivity, provides a physical interface for data transmission.

Disadvantages: Can be prone to physical damage, may have limited bandwidth depending on the type.



**II. Modem**

Layer: Physical Layer

Function: Convert digital data into analog signals for transmission over communication channels.

Advantages: Enables internet access over various communication lines.

Disadvantages: Can be slower than broadband connections, susceptible to noise interference.



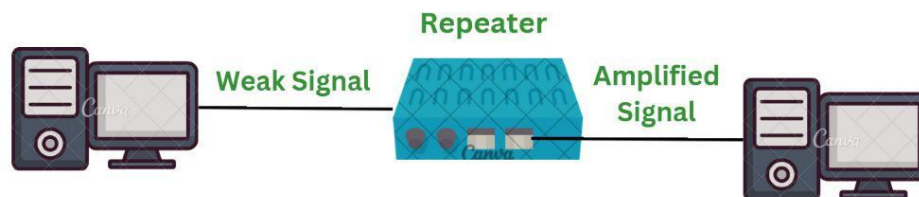
### III. Repeater

Layer: Physical Layer

Function: Receives a weak signal, amplifies it, and retransmits it to extend the range of a network.

Advantages: Increases signal strength over long distances.

Disadvantages: Can introduce signal distortion and latency.



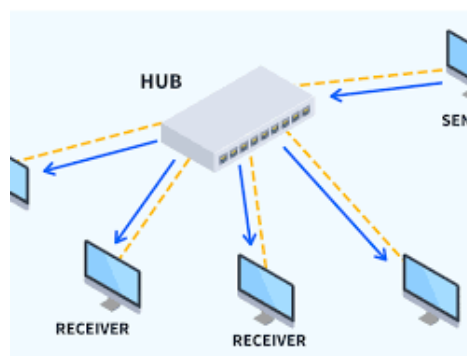
### IV. Hub

Layer: Physical Layer

Function: Connects multiple devices on a network, broadcasts data to all connected devices.

Advantages: Simple and inexpensive.

Disadvantages: Low performance, broadcasts data to all devices, security concerns.



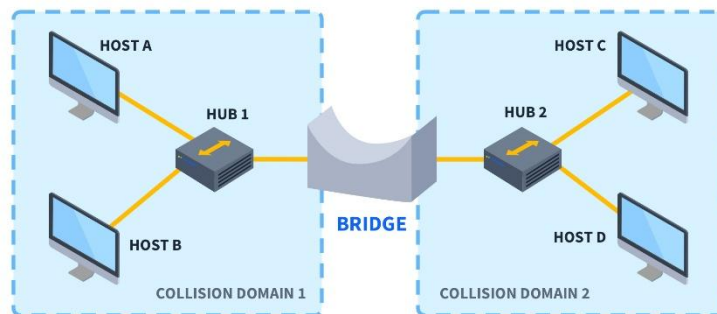
## V. Bridge

Layer: Data Link Layer

Function: Connects two similar network segments, filters traffic based on MAC addresses.

Advantages: Improves network performance by reducing traffic, enhances security.

Disadvantages: Can create bottlenecks if overloaded.



## VI. Switch

Layer: Data Link Layer

Function: Connects multiple devices on a network, forwards data only to the intended recipient.

Advantages: Improved performance compared to hubs, reduces network congestion, enhances security.

Disadvantages: More expensive than hubs.



## VII. Router

Layer: Network Layer

Function: Connects different networks, determines the best path for data to travel between networks.

Advantages: Enables communication between devices on different networks, provides network segmentation and security.

Disadvantages: Can be complex to configure.



### VIII. Gateway

Layer: All Layers

Function: Connects networks with different protocols, translates data between incompatible systems.

Advantages: Enables communication between networks with different protocols.

Disadvantages: Can introduce latency and performance overhead.

