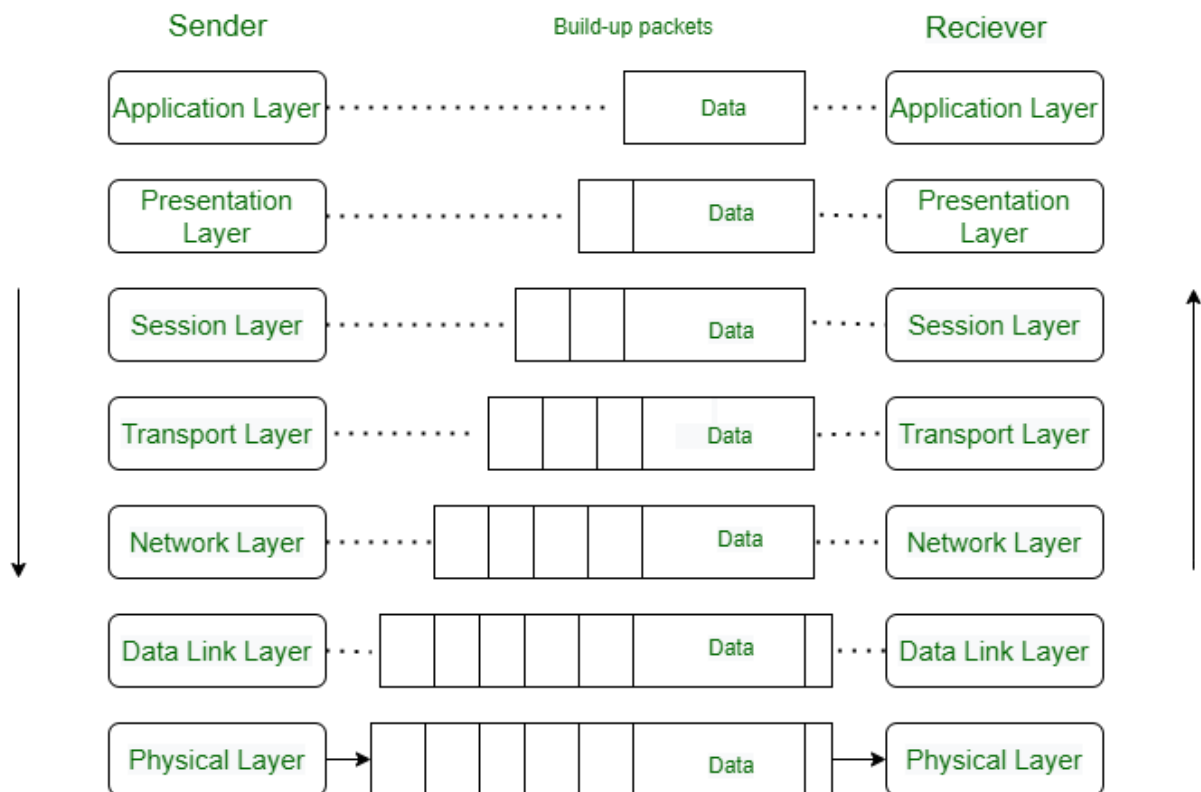


Physical Layer in OSI Model

The physical Layer is the bottom-most layer in the **Open System Interconnection (OSI) Model** which is a physical and electrical representation of the system. It consists of various network components such as power plugs, connectors, receivers, cable types, etc. The physical layer sends data bits from one device(s) (like a computer) to another device(s). The physical Layer defines the types of encoding (that is how the 0's and 1's are encoded in a signal). The physical Layer is responsible for the communication of the unstructured raw data streams over a physical medium.



Functions Performed by Physical Layer

The following are some important and basic functions that are performed by the Physical Layer of the [OSI Model](#) –

1. The physical layer maintains the data rate (how many bits a sender can send per second).
2. It performs the Synchronization of bits.
3. It helps in Transmission Medium decisions (direction of data transfer).
4. It helps in Physical Topology (Mesh, Star, Bus, Ring) decisions (Topology through which we can connect the devices with each other).
5. It helps in providing Physical Medium and Interface decisions.
6. It provides two types of configuration Point-to-Point configuration and Multi-Point configuration.
7. It provides an interface between devices (like PCs or computers) and transmission medium.

8. It has a protocol data unit in bits.
9. Hubs, [Ethernet](#), etc. device is used in this layer.
10. This layer comes under the category of Hardware Layers (since the hardware layer is responsible for all the physical connection establishment and processing too).
11. It provides an important aspect called Modulation, which is the process of converting the data into radio waves by adding the information to an electrical or optical nerve signal.
12. It also provides a Switching mechanism wherein data packets can be forwarded from one port (sender port) to the leading destination port.

Physical Topologies

Physical Topology or [Network Topology](#) is the Geographical Representation of Linking devices.

Following are the four types of physical topology-

1. **Mesh Topology:** In a mesh topology, each and every device should have a dedicated point-to-point connection with each and every other device in the network. Here there is more security of data because there is a dedicated point-to-point connection between two devices. Mesh Topology is difficult to install because it is more complex.
2. **Star Topology:** In [star topology](#), the device should have a dedicated point-to-point connection with a central controller or hub. Star Topology is easy to install and reconnect as compared to Mesh Topology. Star Topology doesn't have Fault Tolerance Technique.
3. **Bus Topology:** In a [bus topology](#), multiple devices are connected through a single cable that is known as backbone cable with the help of tap and drop lines. It is less costly as compared to Mesh Topology and Star Topology. Re-connection and Re-installation are difficult.
4. **Ring Topology:** In a [ring topology](#), each device is connected with repeaters in a circle-like ring that's why it is called Ring Topology. In Ring Topology, a device can send the data only when it has a token, without a token no device can send the data, and a token is placed by Monitor in Ring Topology.

Line Configuration

- **Point-to-Point configuration:** In Point-to-Point configuration, there is a line (link) that is fully dedicated to carrying the data between two devices.
- **Multi-Point configuration:** In a Multi-Point configuration, there is a line (link) through which multiple devices are connected.

Modes of Transmission Medium

1. **Simplex mode:** In this mode, out of two devices, only one device can transmit the data, and the other device can only receive the data. Example- Input from keyboards, monitors, TV broadcasting, Radio broadcasting, etc.
2. **Half Duplex mode:** In this mode, out of two devices, both devices can send and receive the data but only one at a time not simultaneously. Examples- Walkie-Talkie, Railway Track, etc.
3. **Full-Duplex mode:** In this mode, both devices can send and receive the data simultaneously. Examples- Telephone Systems, Chatting applications, etc.

Physical Layer Protocols Examples

Typically, a combination of hardware and software programming makes up the physical layer. It consists of several protocols that control data transmissions on a network. The following are some examples of Layer 1 protocols:

- Ethernet with 1000BASE-T.
- Ethernet with 1000BASE-SX.
- Ethernet at 100BaseT.
- Synchronous Digital Hierarchy/Optical Synchronization.
- Physical-layer variations in 802.11.
- Bluetooth.
- Networking for controllers.
- U.S. Serial Bus.

Conclusion

The Physical Layer forms the foundation layer of network communication. It's responsible for the physical transmission of raw data bits across the network medium, ensuring that data is successfully transmitted and received. By defining the electrical, mechanical, and procedural interfaces for devices, the Physical Layer establishes a reliable foundation for all higher-level communication within the OSI model.