Purpose of the Physical Layer

4.1.1

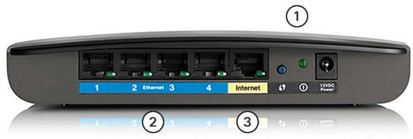
The Physical Connection

Whether connecting to a local printer in the home or a website in another country, before any network communications can occur, a physical connection to a local network must be established. A physical connection can be a wired connection using a cable or a wireless connection using radio waves.

The type of physical connection used depends upon the setup of the network. For example, in many corporate offices, employees have desktop or laptop computers that are physically connected, via cable, to a shared switch. This type of setup is a wired network. Data is transmitted through a physical cable.

In addition to wired connections, many businesses also offer wireless connections for laptops, tablets, and smartphones. With wireless devices, data is transmitted using radio waves. Wireless connectivity is common as individuals and businesses alike discover its advantages. Devices on a wireless network must be connected to a wireless access point (AP) or wireless router like the one shown in the figure.

Wireless Router



These are the components of an access point:

1. The wireless antennas (These are embedded inside the router version shown in the figure above.)
2. Several Ethernet switchports
3. An internet port

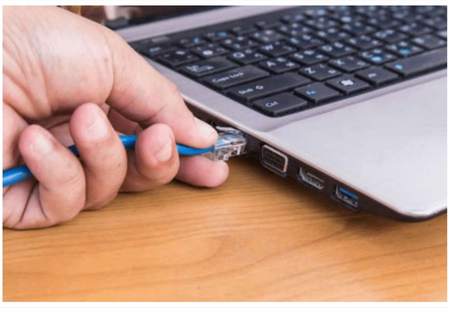
Similar to a corporate office, most homes offer both wired and wireless connectivity to the network. The figures show a home router and a laptop connecting to the local area network (LAN).

Wired Connection to Wireless Router

Network Interface Cards

Network interface cards (NICs) connect a device to the network. Ethernet NICs are used for a wired connection, as shown in the figure, whereas wireless local area network (WLAN) NICs are used for wireless. An end-user device may include one or both types of NICs. A network printer, for example, may only have an Ethernet NIC, and therefore, must connect to the network using an Ethernet cable. Other devices, such as tablets and smartphones, might only contain a WLAN NIC and must use a wireless connection.

Wired Connection Using an Ethernet NIC



Not all physical connections are equal, in terms of the performance level, when connecting to a network.

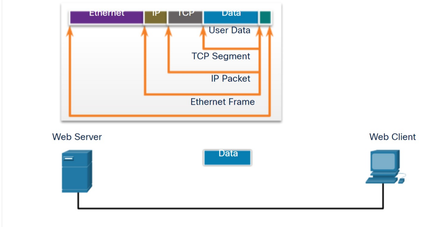
4.1.2

The Physical Layer

The OSI physical layer provides the means to transport the bits that make up a data link layer frame across the network media. This layer accepts a complete frame from the data link layer and encodes it as a series of signals that are transmitted to the local media. The encoded bits that comprise a frame are received by either an end device or an intermediate device.

Click Play in the figure to see an example of the encapsulation process. The last part of this process shows the bits being sent over the physical medium. The physical layer encodes the frames and creates the electrical, optical, or radio wave signals that represent the bits in each frame. These signals are then sent over the media, one at a time.

The destination node physical layer retrieves these individual signals from the media, restores them to their bit representations, and passes the bits up to the data link layer as a complete frame.



4.1.3

Check Your Understanding - Purpose of the Physical Layer

Check your understanding of the physical layer by choosing the correct answer to the following questions.

1. True or false? The physical layer is only concerned with wired network connections.
   - True
   - False
2. True or false? When a frame is encoded by the physical layer, all bits are sent over the media at the same time.
   - True
   - False
3. The physical layer of the receiving device passes bits up to which higher level layer?
   - Application
   - Presentation
   - Network
   - Data link
4. What PDU is received by the physical layer for encoding and transmission?
   - Frame
   - Segment
   - Packet

Check
Show Me
Reset