

# Computer Network

## Lecture-6

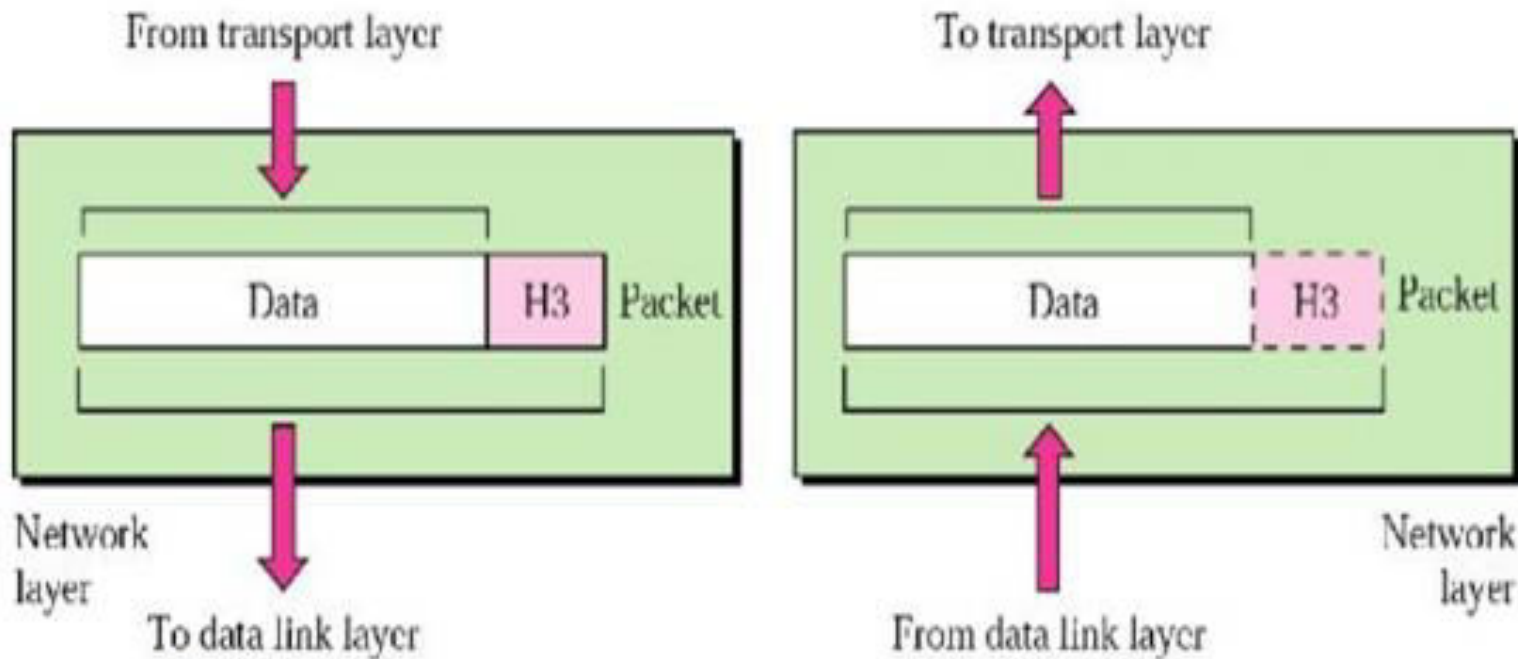
Dharmendra Kumar (Associate Professor)  
Department of Computer Science and Engineering  
United College of Engineering and Research,  
Prayagraj

# Functions of Network Layer

- The network layer is responsible for the source-to-destination delivery of a packet, possibly across multiple networks (links). Whereas the data link layer oversees the delivery of the packet between two systems on the same network (links), the network layer ensures that each packet gets from its point of origin to its final destination.
- If two systems are connected to the same link, there is usually no need for a network layer. However, if the two systems are attached to different networks (links) with connecting devices between the networks (links), there is often a need for the network layer to accomplish source-to-destination delivery.

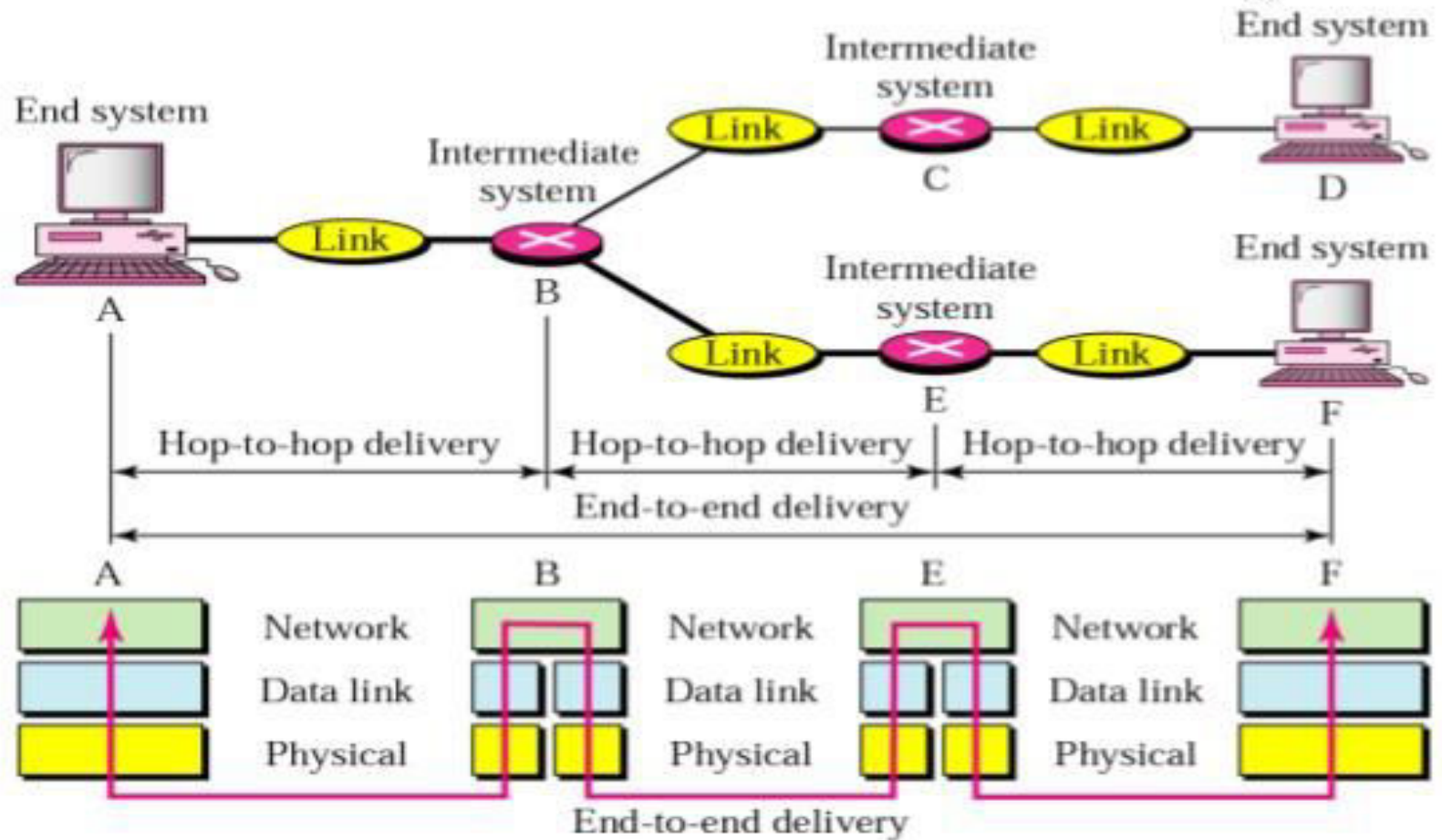
# Functions of Network Layer

**Note:** The network layer is responsible for the delivery of individual packets from the source host to the destination host.



# Functions of Network Layer

## Source to destination delivery



# Functions of Network Layer

Other responsibilities of the network layer include the following:

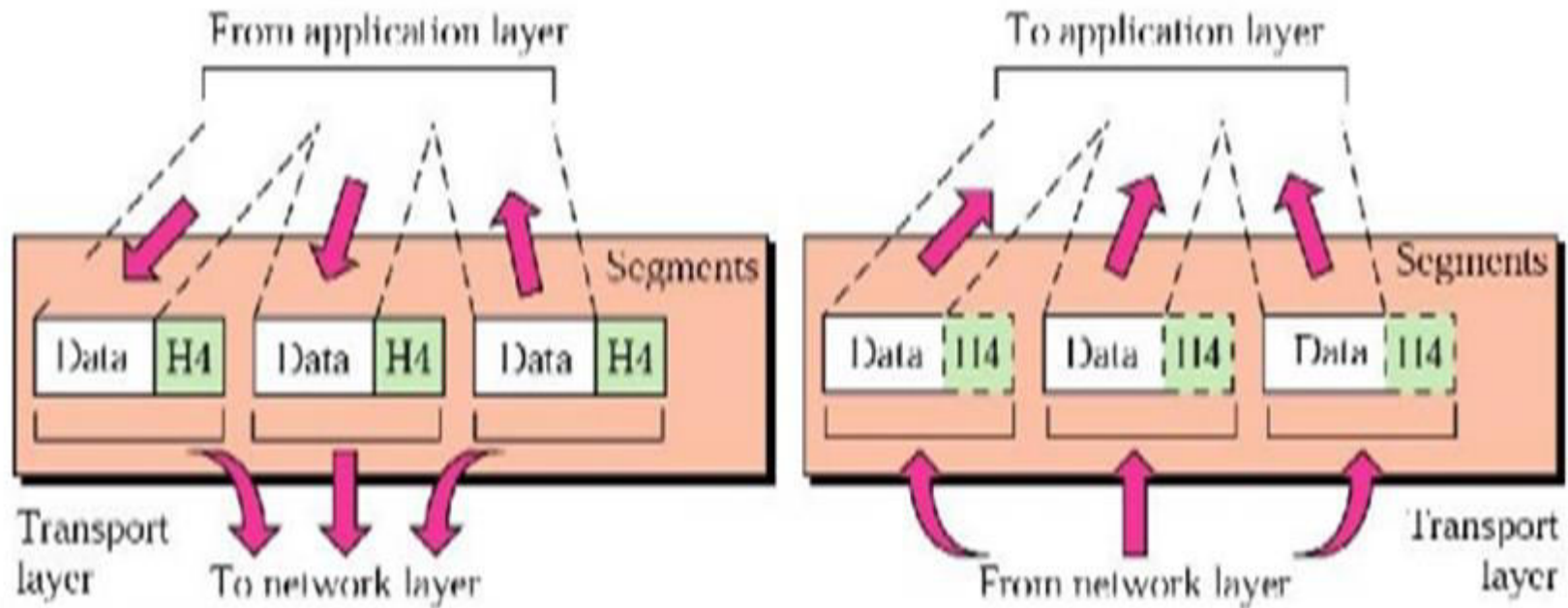
- **Logical addressing.** The physical addressing implemented by the data link layer handles the addressing problem locally. If a packet passes the network boundary, we need another addressing system to help distinguish the source and destination systems. The network layer adds a header to the packet coming from the upper layer that, among other things, includes the logical addresses of the sender and receiver.
- **Routing.** When independent networks or links are connected to create internetworks (network of networks) or a large network, the connecting devices (called routers or switches) route or switch the packets to their final destination.

# Functions of Transport Layer

- The transport layer is responsible for process-to-process delivery of the entire message.
- A process is an application program running on a host.
- Whereas the network layer oversees source-to-destination delivery of individual packets, it does not recognize any relationship between those packets. It treats each one independently, as though each piece belonged to a separate message, whether or not it does.
- The transport layer, on the other hand, ensures that the whole message arrives intact and in order, overseeing both error control and flow control at the source-to-destination level.

# Functions of Transport Layer

Following figure shows the relationship of the transport layer to the network and session layers.



Note: The transport layer is responsible for the delivery of a message from one process to another.

# Functions of Transport Layer

Other responsibilities of the transport layer include the following:

**a. Service-point addressing:** Source-to-destination delivery means delivery not only from one computer to the next but also from a specific process (running program) on one computer to a specific process (running program) on the other. The transport layer header must therefore include a type of address called a service-point address (or port address).

**b. Segmentation and reassembly:** A message is divided into transmittable segments, with each segment containing a sequence number. These numbers enable the transport layer to reassemble the message correctly upon arriving at the destination and to identify and replace packets that were lost in transmission.



# Functions of Transport Layer

**c. Connection control:** The transport layer can be either connectionless or connection oriented. A connectionless transport layer treats each segment as an independent packet and delivers it to the transport layer at the destination machine. A connection oriented transport layer makes a connection with the transport layer at the destination machine first before delivering the packets. After all the data are transferred, the connection is terminated.

**d. Flow control:** Like the data link layer, the transport layer is responsible for flow control. However, flow control at this layer is performed end to end rather than across a single link.

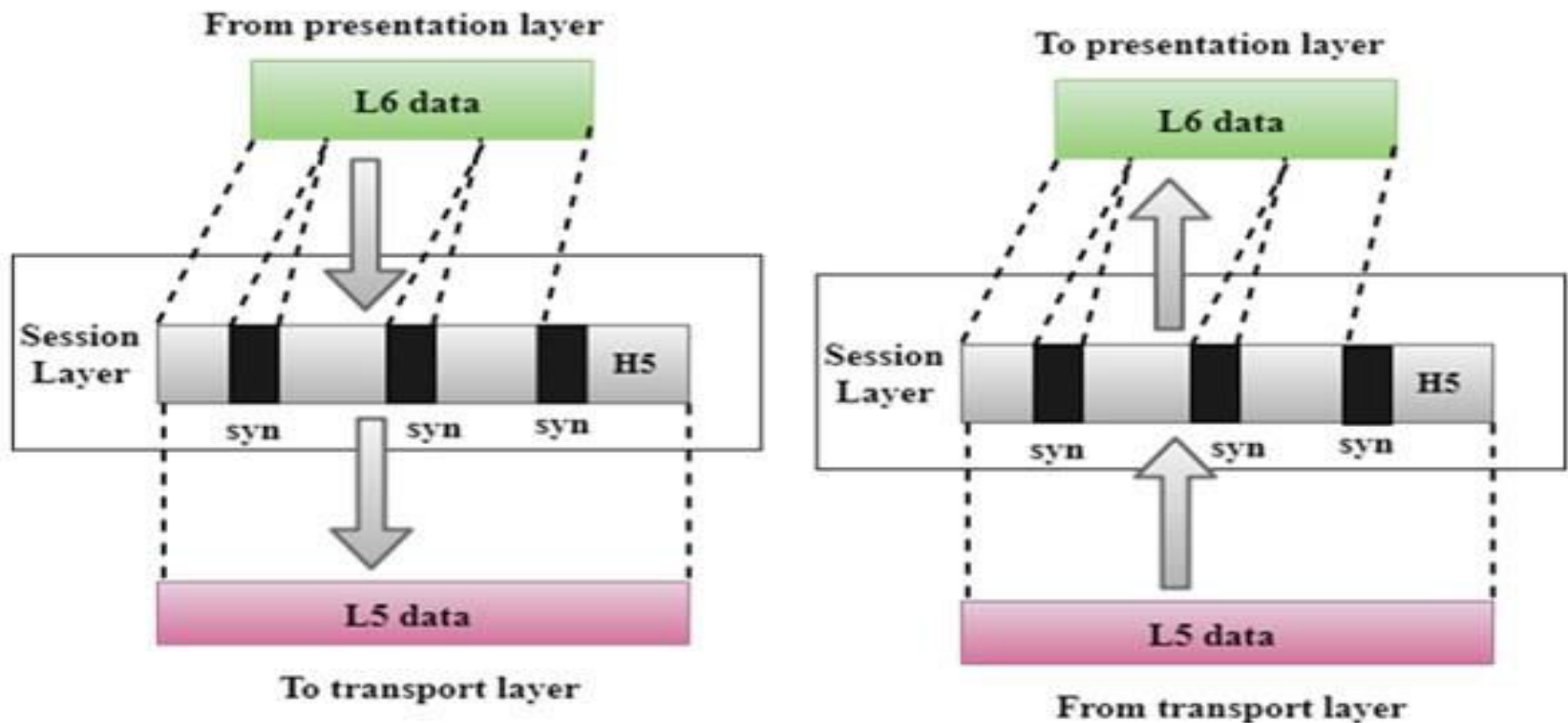
# Functions of Transport Layer

**e. Error control.** Like the data link layer, the transport layer is responsible for error control. However, error control at this layer is performed process-to-process rather than across a single link. The sending transport layer makes sure that the entire message arrives at the receiving transport layer without error (damage, loss, or duplication). Error correction is usually achieved through retransmission.

# Functions of Session Layer

The session layer is the network dialog controller. It establishes, maintains, and synchronizes the interaction among communicating systems.

**Note:** The session layer is responsible for dialog control and synchronization.



# Functions of Session Layer

Specific responsibilities of the session layer include the following:

- a. Dialog control.** The session layer allows two systems to enter into a dialog. It allows the communication between two processes to take place in either half duplex or full-duplex.
  
- b. Synchronization.** The session layer allows a process to add checkpoints, or synchronization points, to a stream of data. For example, if a system is sending a file of 2000 pages, it is advisable to insert checkpoints after every 100 pages to ensure that each 100-page unit is received and acknowledged independently. In this case, if a crash happens during the transmission of page 523, the only pages that need to be resent after system recovery are pages 501 to 523. Pages previous to 501 need not be resent.