



NETWORK LAYER

Network Layer

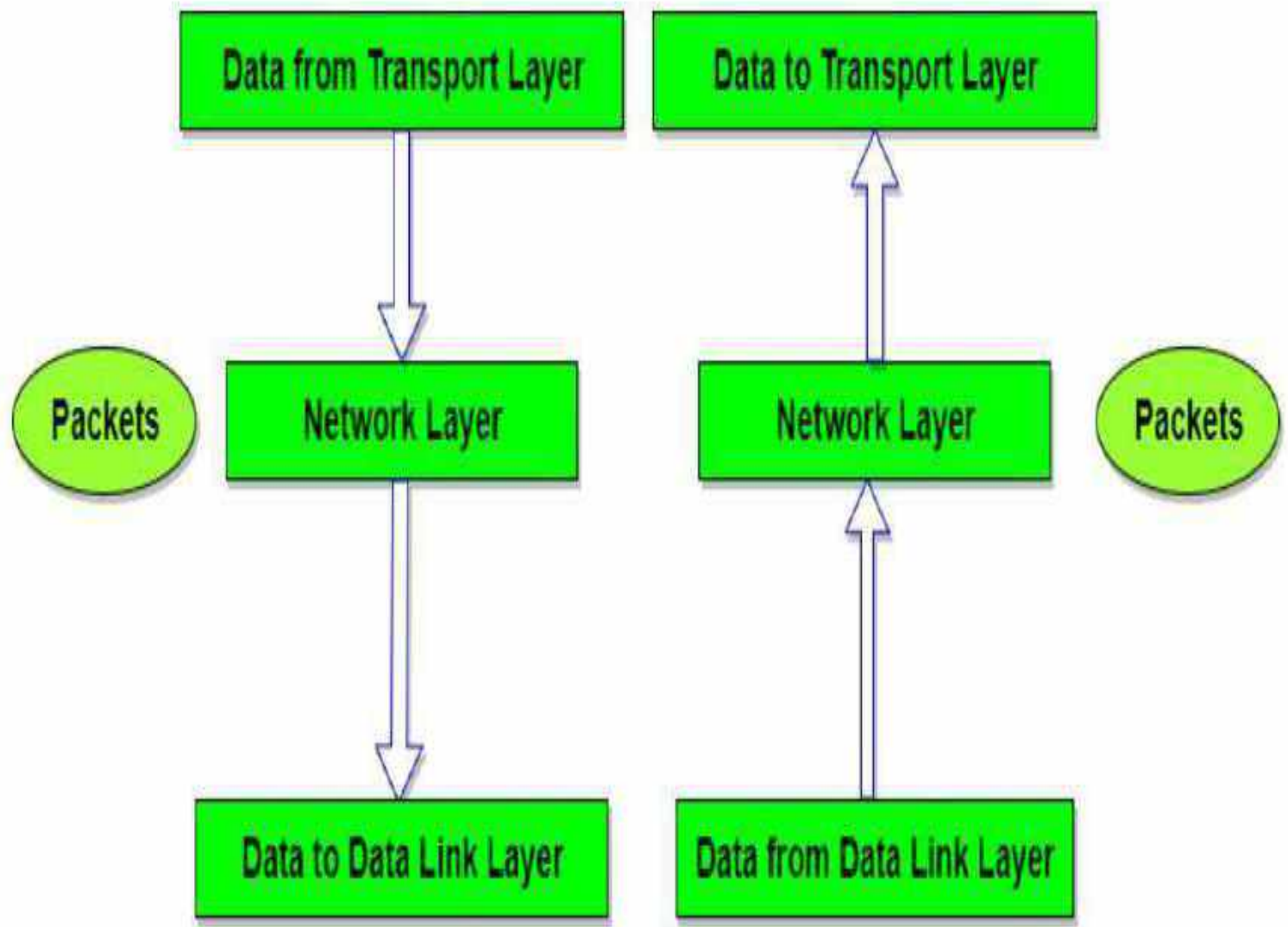
- The Network Layer is the **third layer** of the OSI model.
- It handles the **service requests from the transport layer** and further **forwards the service request to the data link layer**.
- The network layer translates the **logical addresses into physical addresses**
- It determines the **route from the source to the destination** and also manages the traffic problems such as switching, routing and controls the congestion of data packets.
- The main **role of the network layer is to move the packets from sending host to the receiving host**.

Functions of Network Layer

- **Routing:** When a packet reaches the router's input link, the router will move the packets to the router's output link. For example, a packet from S1 to R1 must be forwarded to the next router on the path to S2.
- **Logical Addressing:** The data link layer implements the physical addressing and network layer implements the logical addressing. Logical addressing is also used to **distinguish between source and destination system**. The network layer adds a header to the packet which includes the logical addresses of both the sender and the receiver.

Functions of Network Layer

- **Internetworking:** This is the main role of the network layer that it provides the logical connection between different types of networks.
- **Fragmentation:** The fragmentation is a process of breaking the packets into the smallest individual data units that travel through different networks.



Features

- Main responsibility of Network layer is **to carry the data packets from the source to the destination without changing or using it.**
- **If the packets are too large for delivery, they are fragmented** i.e., broken down into smaller packets.
- It decides **the route to be taken by the packets to travel from the source to the destination among the multiple routes available in a network** (also called as routing).
- **The source and destination addresses are added to the data packets inside the network layer.**

Network Layer Services

- **Guaranteed delivery:** This layer provides the service which guarantees that the packet will arrive at its destination.
- **Guaranteed delivery with bounded delay:** This service guarantees that the packet will be delivered within a specified host-to-host delay bound.
- **In-Order packets:** This service ensures that the packet arrives at the destination in the order in which they are sent.

Network Layer Services

- **Guaranteed max jitter:** This service ensures that the amount of time taken **between two successive transmissions at the sender is equal to the time between their receipt at the destination.**
- **Security services:** The network layer provides security by using a session key between the source and destination host. The network layer in the source host encrypts the payloads of datagrams being sent to the destination host. The network layer in the destination host would then decrypt the payload. In such a way, the network layer maintains the data integrity and source authentication services.

Other services in Network Layer

- **Error Control:** Although it can be implemented in the network layer, but it is usually not preferred because the data packet in a network layer maybe fragmented at each router, **which makes error checking inefficient in the network layer.**
- **Congestion Control:** Congestion occurs when the number of **datagrams sent by source is beyond the capacity of network or routers.** This is another issue in the network layer protocol. If congestion continues, sometimes **a situation may arrive where the system collapses and no datagrams are delivered.** Although congestion control is indirectly implemented in network layer, but still there is a lack of congestion control in the network layer.

Other services in Network Layer

Flow Control:

- It regulates the amount of data a source can send without overloading the receiver.
- If the source produces a data at a very faster rate than the receiver can consume it, the receiver will be overloaded with data.
- To control the flow of data, the receiver should send a feedback to the sender to inform the latter that it is overloaded with data.
- There is a lack of flow control in the design of the network layer. It does not directly provide any flow control.
- The datagrams are sent by the sender when they are ready, without any attention to the readiness of the receiver.

Advantages of Network Layer services

- Packetization service in network layer provides an ease of transportation of the data packets.
- Packetization also eliminates single points of failure in data communication systems.
- Routers present in the network layer reduce network traffic by creating collision and broadcast domains.
- With the help of Forwarding, data packets are transferred from one place to another in the network.

Disadvantages of Network Layer services

- There is a **lack of flow control in the design of the network layer.**
- Congestion occurs sometimes due to the presence of too many datagrams in a network which are beyond the capacity of network or the routers. Due to this, **some routers may drop some of the datagrams and some important piece of information maybe lost.**
- Although indirectly error control is present in network layer, **but there is a lack of proper error control mechanisms as due to presence of fragmented data packets, error control becomes difficult to implement.**



THANK YOU