

## UNIT 5

### Data Transmission Networks II

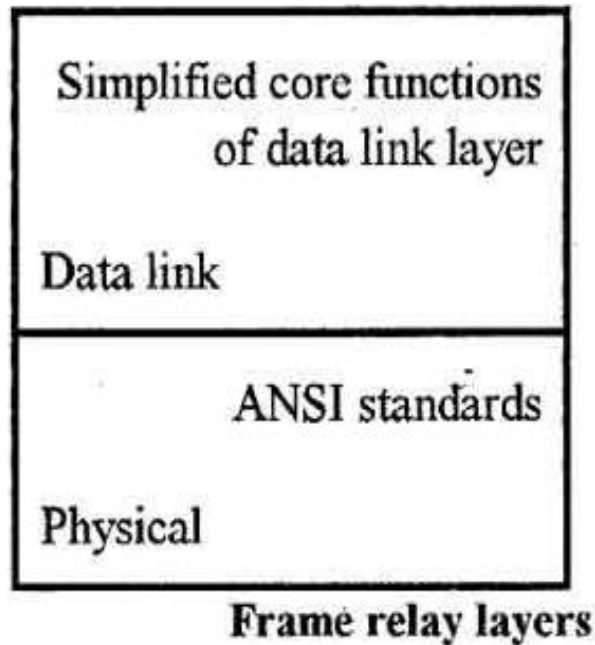
- **Frame Relay**
  - **Congestion Control**
  - **Cell Relay**
  - **ATM Structure**
- .....

### Frame Relay

- **Frame Relay** (*frame relay*) is a **packet switching technology** that fragmented into transmission units called frames and sent in high-speed bursts through a digital network.
- Establishes an exclusive connection during the transmission period called virtual connection.
- It uses a technology called fast packet in which error checking does not occur in any intermediate node of the transmission but done at the ends
- Frame relay is a virtual circuit wide area network, which was designed in early 1990s
- Frame relay also is meant for more efficient transmission scheme than the X.25 protocol.
- Frame Relay is used mostly to route Local Area Network protocols such as IPX or TCP/IP.
- The biggest difference between Frame Relay and X.25 is that X.25 guarantees data integrity and network managed flow control at the cost of some network delays. Frame Relay switches packets end-to-end much faster, but there is no guarantee of data integrity at all.

#### **Frame relay layers**

- Frame relay has only two layers i.e. physical layer and data link layer.

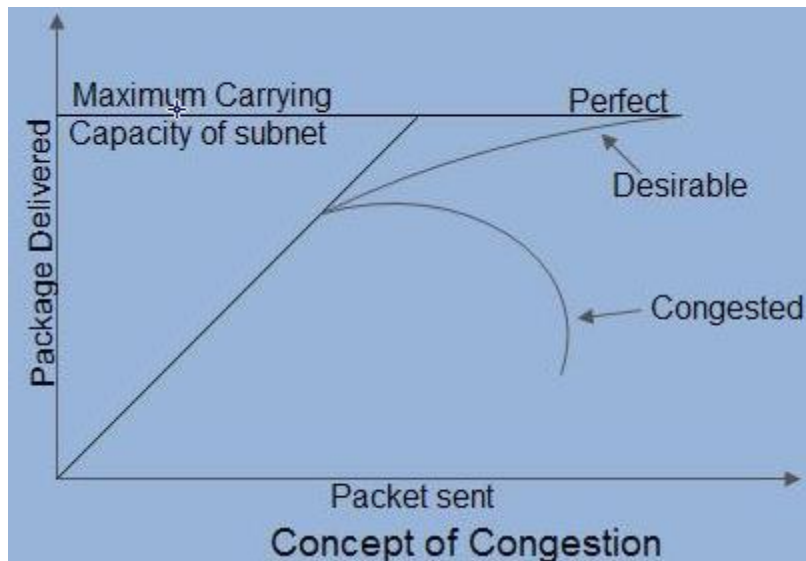


**Frame relay architecture:**

- Frame relay can provide two types of virtual circuits.
1. Permanent Virtual Circuits (PVC).
  2. Switched Virtual Circuits (SVC).
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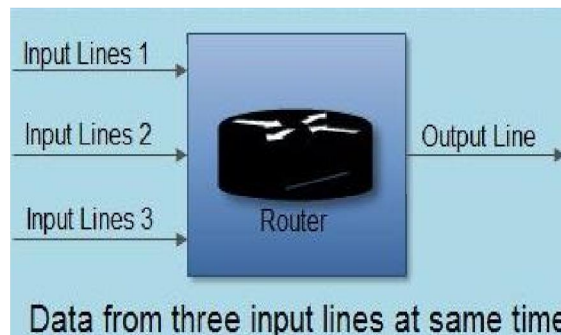
## **Congestion Control**

- Congestion is an important issue that can arise in packet switched network.
- Congestion is a situation in Communication Networks in which too many packets are present in a part of the subnet, performance degrades
- Congestion in a network may occur when the load on the network (*i.e.* the number of packets sent to the network) is greater than the capacity of the network (*i.e.* the number of packets a network can handle.).
- Network congestion occurs in case of traffic overloading.
- In other words when too much traffic is offered, congestion sets in and performance degrades sharply



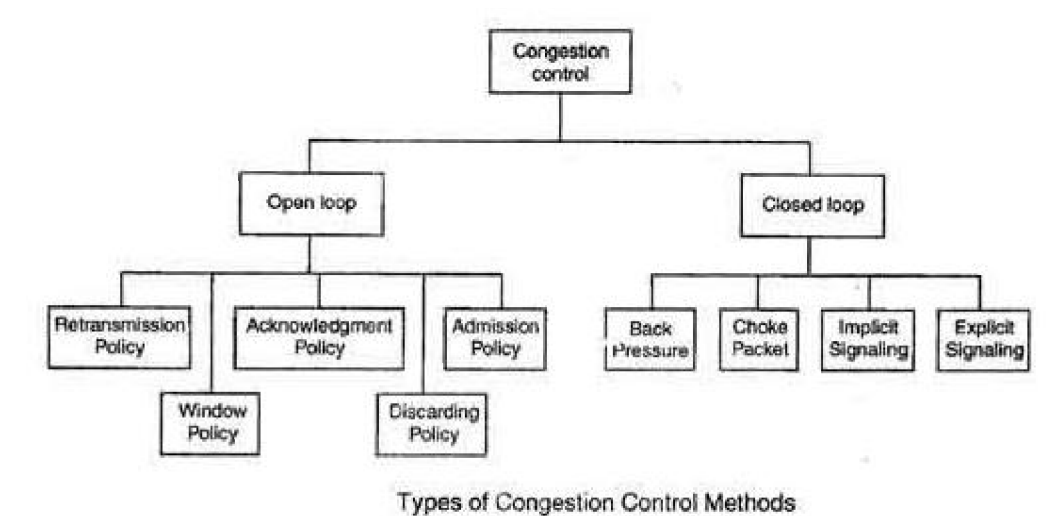
### Causing of Congestion:

- The various causes of congestion in a subnet are:
  - The input traffic rate exceeds the capacity of the output lines.



- The routers are too slow to perform bookkeeping tasks (queuing buffers, updating tables, etc.).
- The routers' buffer is too limited.

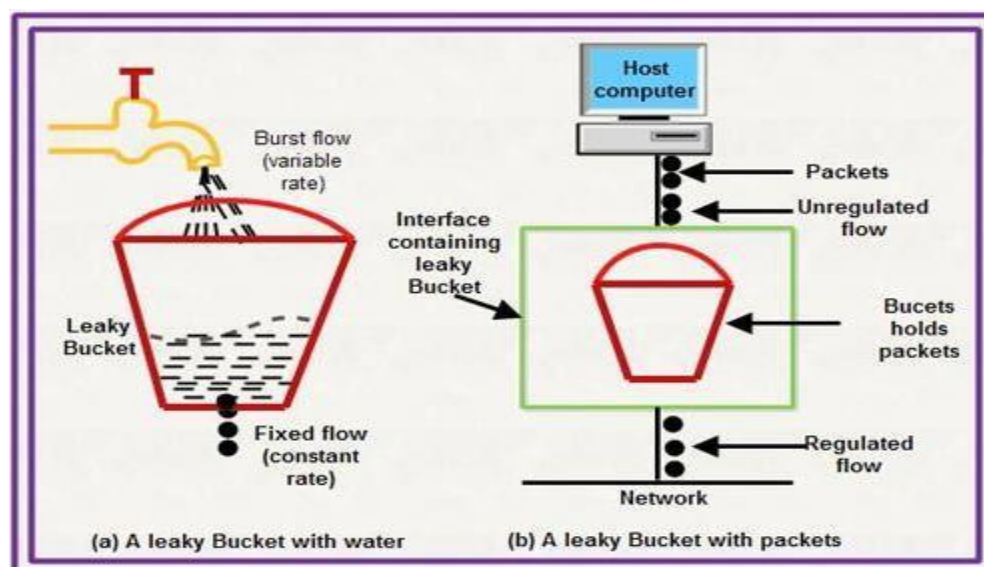
## Types of congestion control methods



## Congestion control algorithms

### Leaky Bucket Algorithm

- It is a traffic shaping mechanism that controls the amount and the rate of the traffic sent to the network.
- A leaky bucket algorithm shapes bursty traffic into fixed rate traffic by averaging the data rate.
- Imagine a bucket with a small hole at the bottom.
- The rate at which the water is poured into the bucket is not fixed and can vary but it leaks from the bucket at a constant rate. Thus (as long as water is present in bucket), the rate at which the water leaks does not depend on the rate at which the water is input to the bucket.

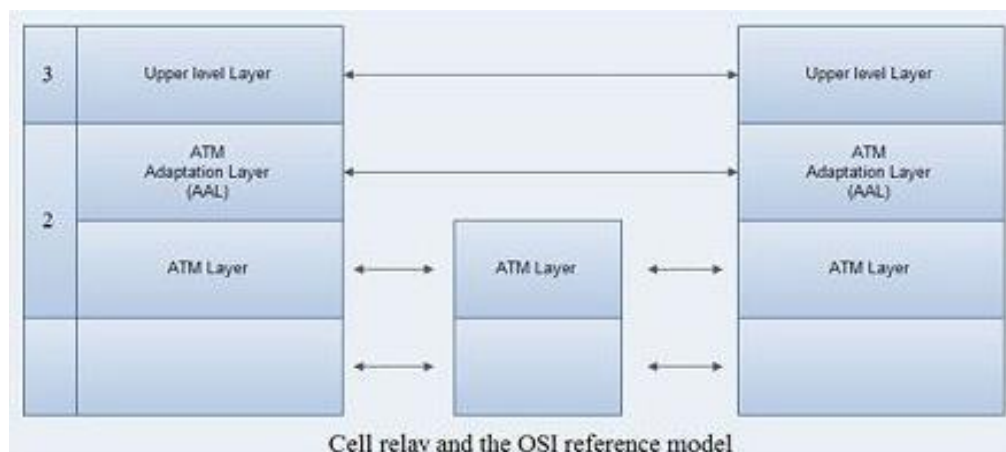


# Cell Relay

- **Cell relay** is data transmission service that uses transmission technology referred to as Asynchronous Transfer Mode (ATM).
- As the name suggests, the data transmission unit is a fixed length of data known as a cell.
- High-speed transmission compared to other services like frame relay is possible with the cell relay method.
- The cell relay is considered by most to be the transport service of the future
- Advantages
  - High speed transmission
  - Multiplexing transmission
- Disadvantages
  - Congestion
  - High cost

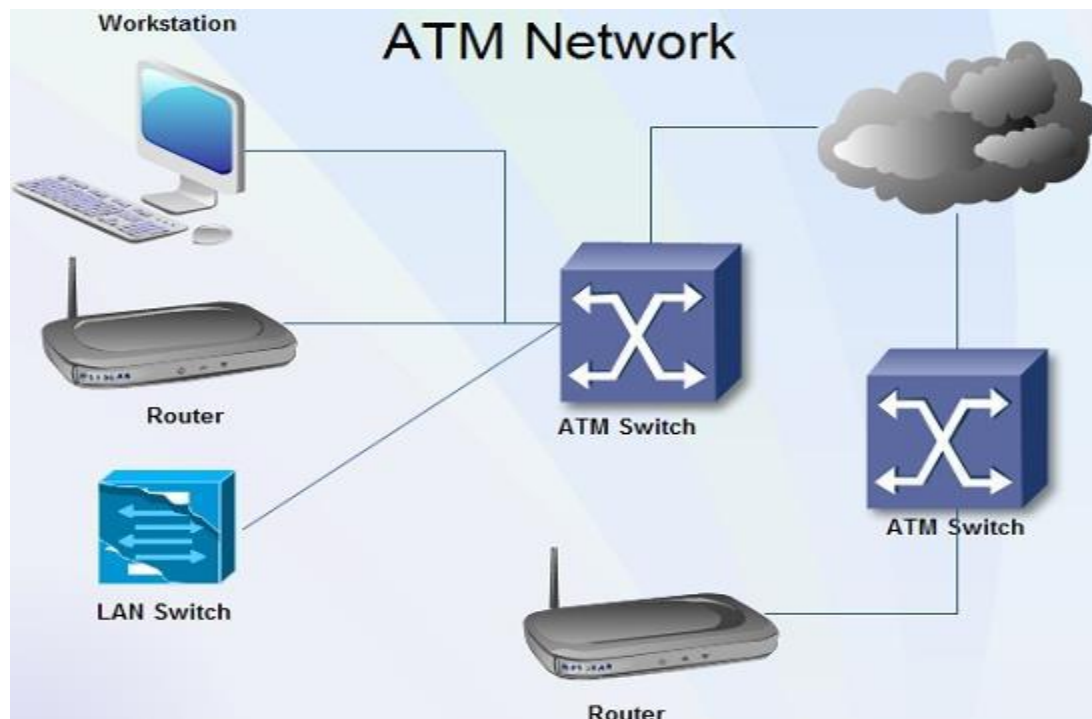
## **Cell Relay and the OSI Reference Model**

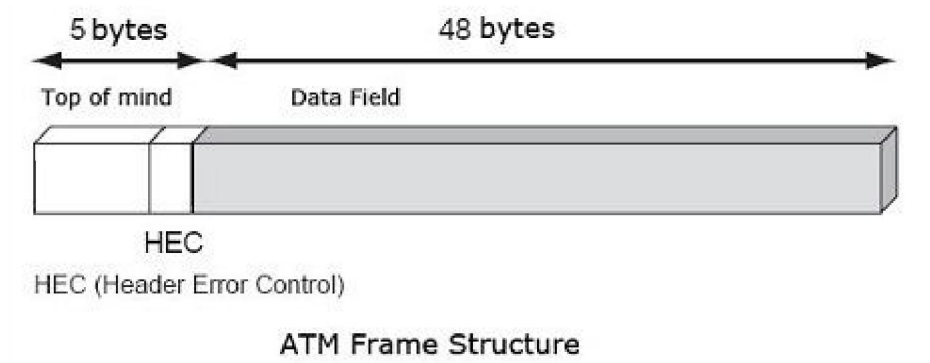
The cell relay **protocol** corresponds to first two layer of OSI reference model. The part that corresponds to second layer, that is, data link layer is referred as ATM layer. However, ATM layer does not have all functions of data link layer. Therefore, a protocol referred as the ATM Adaptation Layer (AAL) is prescribed above the data link layer. AAL is user defined and is not mandatory for cell relay usage.



## Asynchronous Transfer Mode (ATM)

- **Asynchronous Transfer Mode (ATM)** also called *cell relay* (transferring data in cells of a fixed size) that operates at the data link layer (Layer 2) of OSI Model over fiber or twisted-pair cable, a high-speed switched network technology based on ITU-T Broadband Integrated Services Digital Network (B-ISDN) standard, developed by the telecommunications industry to implement the next generation network.
- ATM was designed for use in WANs such as the public telephone system and corporate data networks, though it has also been applied to create super-fast LANs.
- ATM can carry all kinds of traffic: voice, video and data simultaneously at speeds up to 155 megabits per second.
- It Convert voice, video data to packets and passing large packet data through the same medium.
- ATM is differing from TCP/IP because it use fixed channel routing [protocol](#) routes between two end points.
- A real-time low-latency application such as VoIP and video takes precedence on an ATM network.





An ATM header can have User-Network Interface (UNI) and Network-Node Interface (NNI) two formats.

- **User-Network Interface (UNI)** used for communication between end systems.
- **Network-Node Interface (NNI)** used for communication between switches.

Two type of connections are supported by ATM (Asynchronous Transfer Mode)

**Point-to-point connections:** It connects either unidirectional or bi-directional two end-systems.

**Point-to-multipoint connections:** It connects one unidirectional ATM to number of destination ATM.

### **ATM features**

- It is connection oriented protocol
- It is full duplex
- It is point to point
- Dedicated bandwidth