SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECT301- COMMUNICATION NETWORKS

III YEAR/ V SEMESTER

UNIT 2 –DATA-LINK LAYER & NETWORK LAYER

TOPIC – CONGESTION CONTROL ALGORITHMS

DATA TRAFFIC

The main focus of congestion control and quality of service is data traffic. In congestion control we try to avoid traffic congestion. In quality of service, we try to create an appropriate environment for the traffic. So, before talking about congestion control and quality of service, we discuss the data traffic itself.

CONGESTION

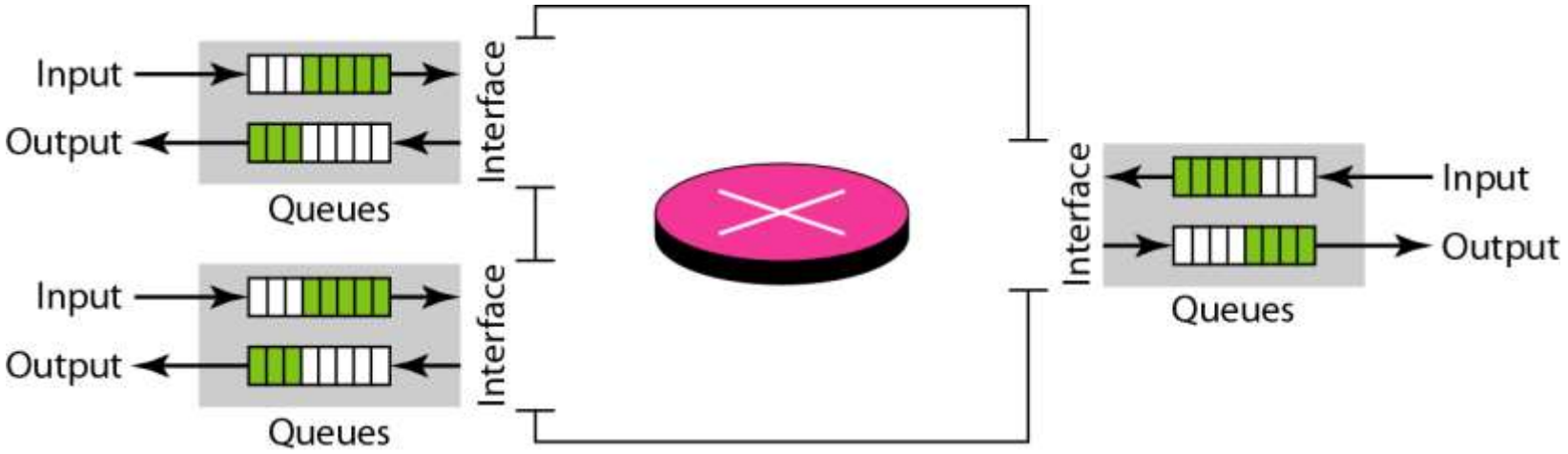
Congestion in a network may occur if the load on the network—the number of packets sent to the network—is greater than the capacity of the network—the number of packets a network can handle. Congestion control refers to the mechanisms and techniques to control the congestion and keep the load below the capacity.

• When a packet arrives at the incoming interface, it undergoes three steps before departing

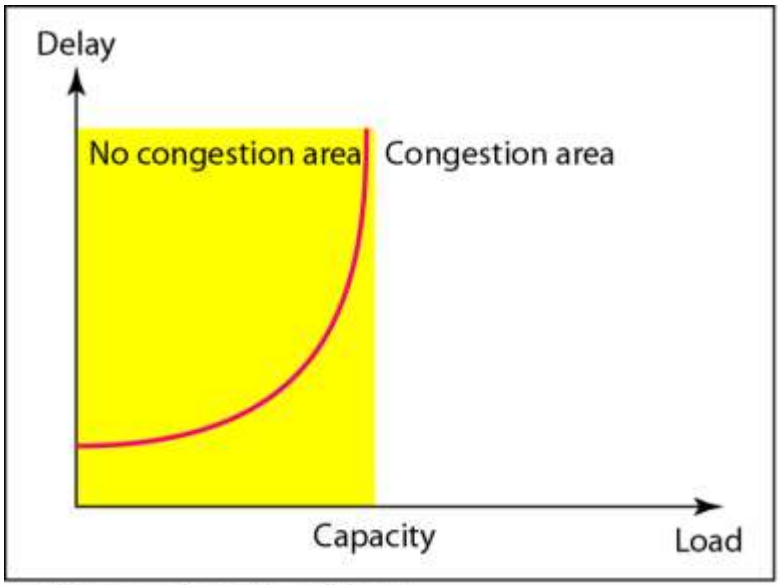
1. The packet is put at the end of the input queue while waiting to be checked.
2. The processing module of the router removes the packet from the input queue once it reaches the front of the queue and uses its routing table and the destination address to find the route.
3. The packet is put in the appropriate output queue and waits its turn to be sent.

• If the rate of packet arrival is higher than the packet processing rate, the input queues become longer and longer.
• If the packet departure rate is less than the packet processing rate, the output queues become longer and longer.

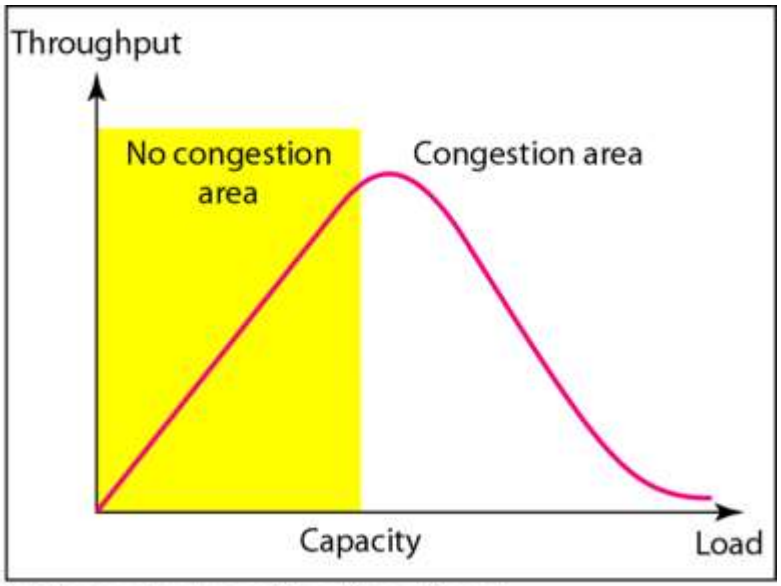
Queues in a router



Packet delay and throughput as functions of load



a. Delay as a function of load

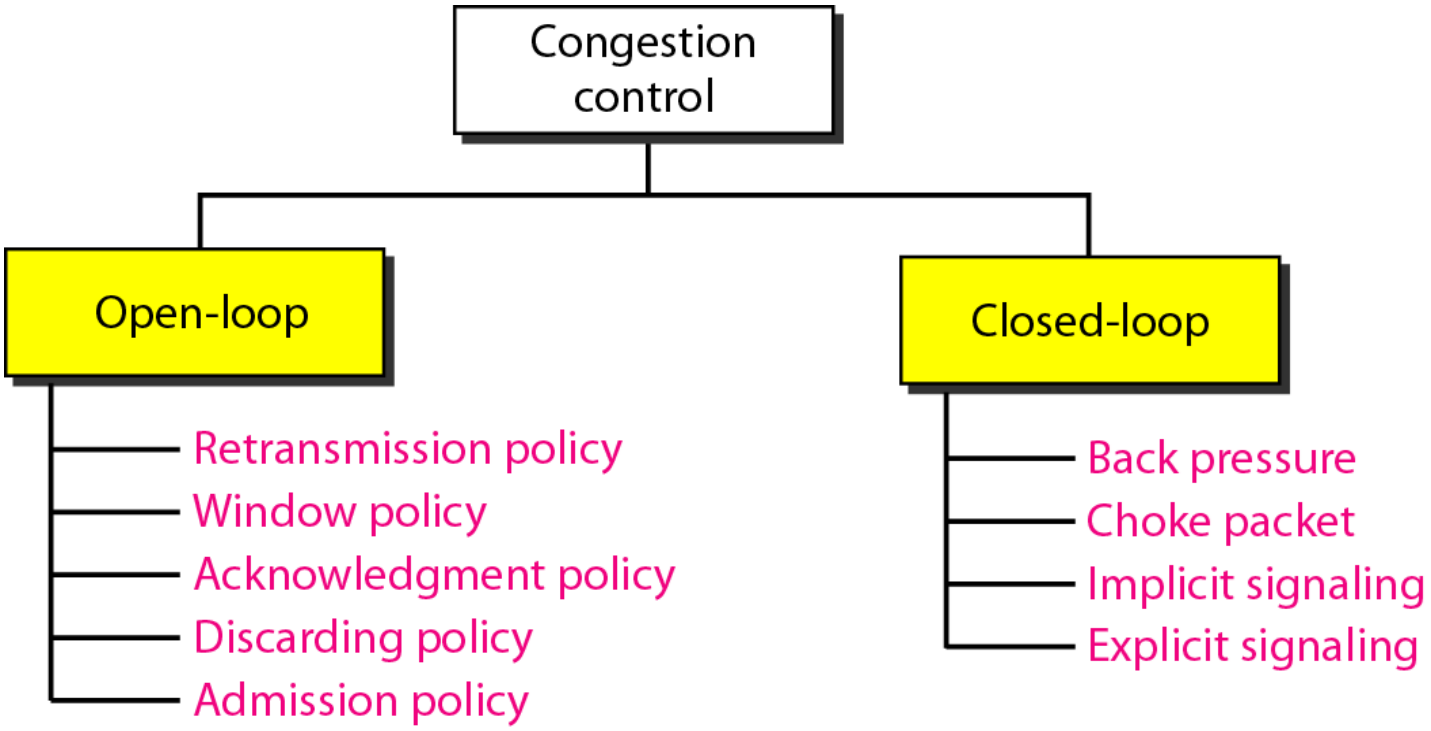


b. Throughput as a function of load

CONGESTION CONTROL

Congestion control refers to techniques and mechanisms that can either prevent congestion, before it happens, or remove congestion, after it has happened. In general, we can divide congestion control mechanisms into two broad categories: open-loop congestion control (prevention) and closed-loop congestion control (removal).

Congestion control categories



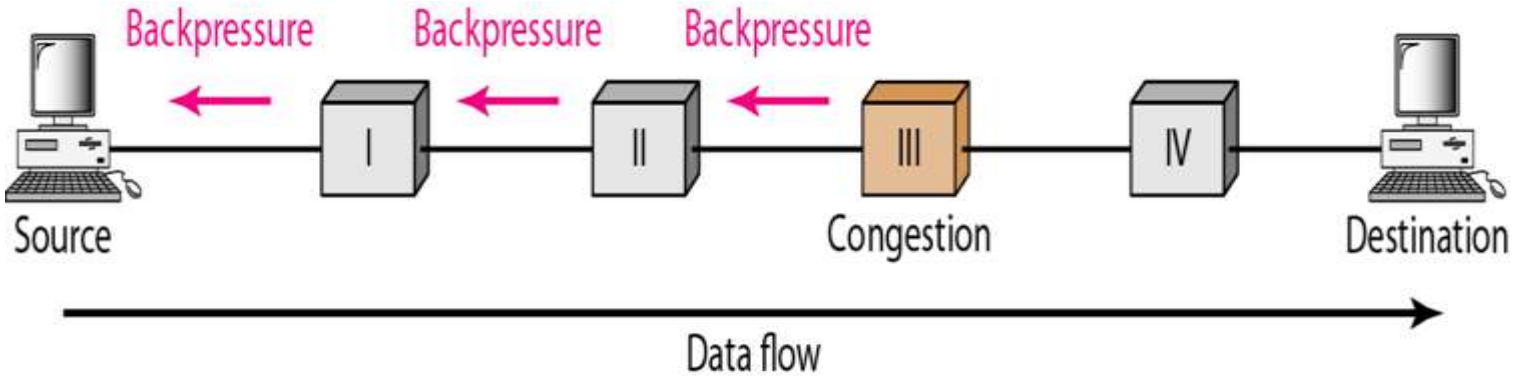
- In open-loop congestion control, policies are applied to prevent congestion before it happens.
- ***Retransmission Policy -*** a good retransmission policy can prevent congestion. The retransmission policy and the retransmission timers must be designed to optimize efficiency and at the same time prevent congestion.
- ***Window Policy-*** The Selective Repeat window is better than the Go-Back-N window for congestion control.
- ***Acknowledgment Policy-*** If the receiver does not acknowledge every packet it receives, it may slow down the sender and help prevent congestion.
- A receiver may send an acknowledgment only if it has a packet to be sent or a special timer expires.
- A receiver may decide to acknowledge only *N packets at a time.*
- *We need to know that* the acknowledgments are also part of the load in a network.

- ***Discarding Policy -*** A good discarding policy by the routers may prevent congestion and at the same time may not harm the integrity of the transmission.
- ***Admission Policy*** - An admission policy, which is a quality-of-service mechanism, can also prevent congestion in virtual-circuit networks.
- Switches in a flow first check the resource requirement of a flow before admitting it to the network.
- A router can deny establishing a virtual circuit connection if there is congestion in the network or if there is a possibility of future congestion.

Closed-Loop Congestion Control

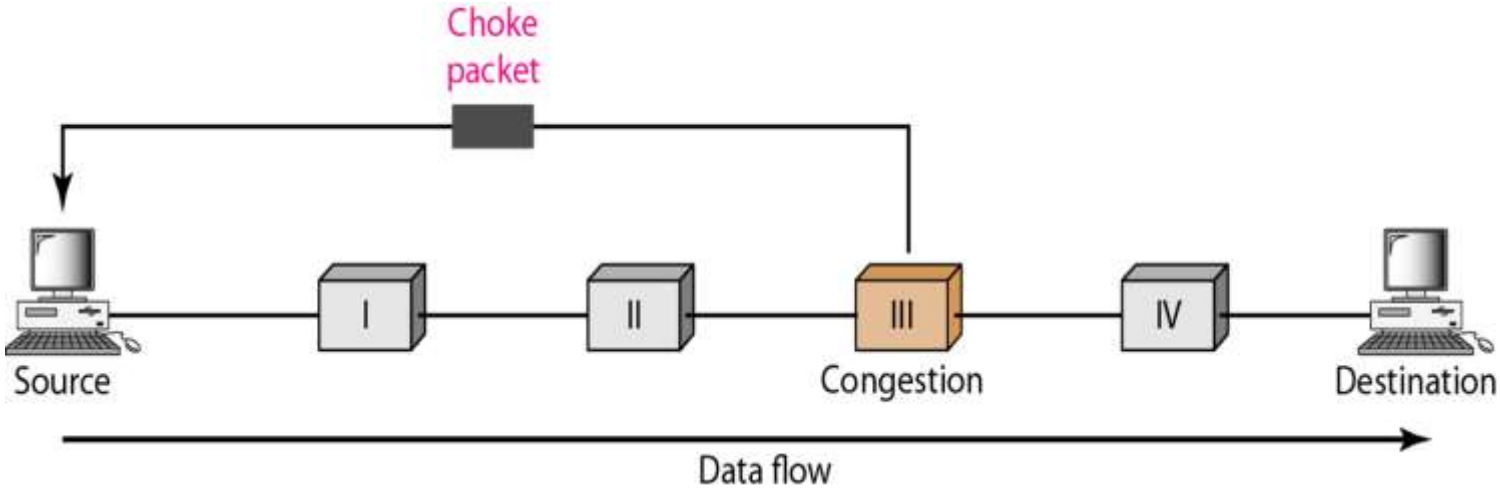
Closed-loop congestion control mechanisms try to alleviate congestion after it happens.

Backpressure method for alleviating congestion



The backpressure technique can be applied only to virtual circuit networks, in which each node knows the upstream node from which a flow of data is corning.

Choke packet



In the choke packet method, the warning is from the router, which has encountered congestion, to the source station directly.

Implicit Signaling

- In implicit signaling, there is no communication between the congested node or nodes and the source. The source guesses that there is a congestion somewhere in the network from other symptoms.
- when a source sends several packets and there is no acknowledgment for a while, one assumption is that the network is congested. The delay in receiving an acknowledgment is interpreted as congestion in the network; the source should slow down.

Explicit Signaling

- The node that experiences congestion can explicitly send a signal to the source or destination**.**
- In the choke packet method, a separate packet is used for this purpose; in the explicit signaling method, the signal is included in the packets that carry data

- Backward Signaling - A bit can be set in a packet moving in the direction opposite to the congestion.
- This bit can warn the source that there is congestion and that it needs to slow down to avoid the discarding of packets.
- Forward Signaling- A bit can be set in a packet moving in the direction of the congestion.
- This bit can warn the destination that there is congestion.
- The receiver in this case can use policies, such as slowing down the acknowledgments, to alleviate the congestion.

THANK YOU