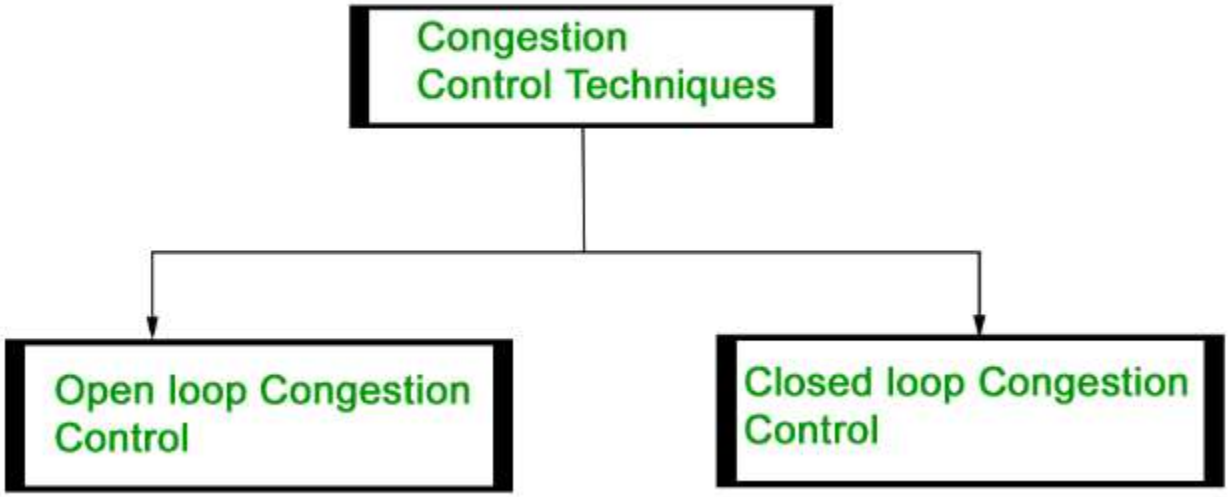
Congestion Control Techniques

TCP Congestion control

Congestion control

- Congestion control refers to the techniques used to control or prevent congestion



Open Loop Congestion Control

- Open loop congestion control policies are applied to prevent congestion before it happens
- The congestion control is handled either by the source or the destination

Policies adopted by open loop congestion control

- Retransmission Policy
- Window Policy
- Discarding Policy
- Acknowledgment Policy
- Admission Policy

Open Loop Congestion Control

Retransmission Policy

- Retransmission of lost segment may increase the congestion in the network
- To prevent congestion, retransmission timers must be designed to prevent congestion and also able to optimize efficiency
- **Window Policy**
- The type of window at the sender's side may also affect the congestion
- Selective repeat window performs better than Go-back-n window

Open Loop Congestion Control

Discarding Policy

- A good discarding policy adopted by the routers is that the routers may prevent congestion and also be able to maintain the quality of a message

Acknowledgment Policy

- The receiver should send acknowledgement for N packets rather than sending acknowledgement for a single packet
- The receiver should send an acknowledgment only if it has to send a packet or a timer expires

Open Loop Congestion Control

Admission Policy

- In admission policy a mechanism should be used to prevent congestion
- If there is a chance of a congestion or there is a congestion in the network, router should deny establishing a virtual network connection to prevent further congestion

Closed Loop Congestion Control

- Closed loop congestion control techniques are used to treat or alleviate congestion after it happens

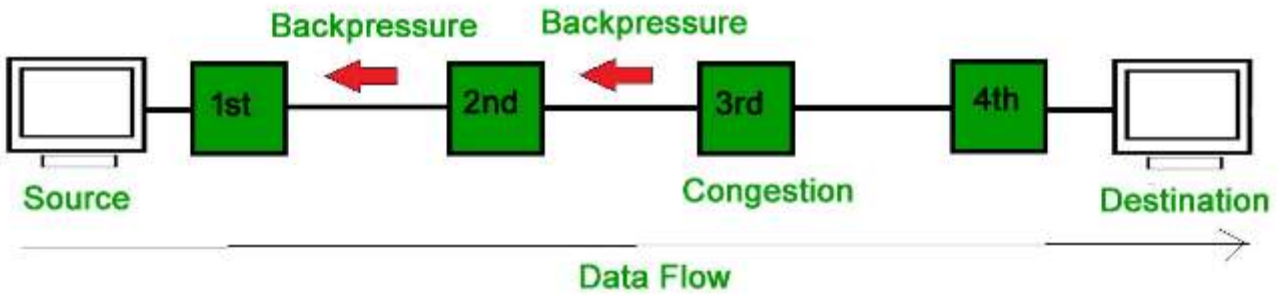
Techniques used for closed loop congestion control

- Backpressure
- Choke Packet Technique
- Implicit Signaling
- Explicit Signaling

Closed Loop Congestion Control

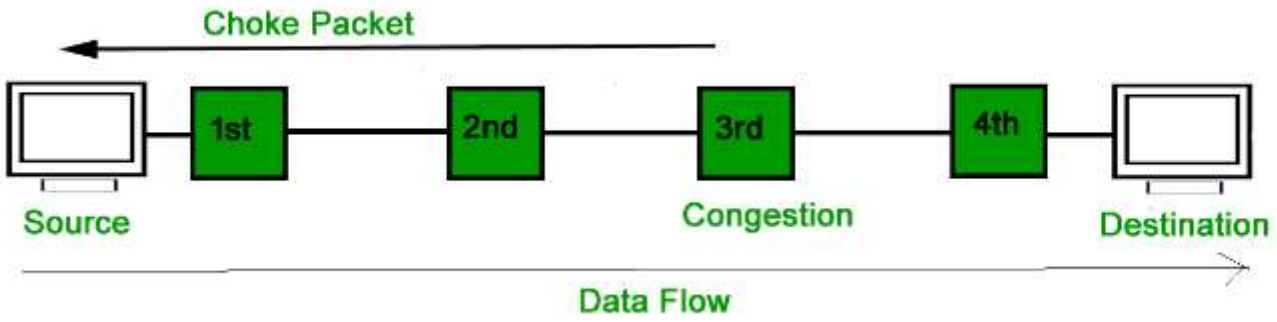
BackPressure

- Backpressure is a technique in which a congested node stops receiving packets from upstream node



Closed Loop Congestion Control

- Choke Packet Technique
- A choke packet is a packet sent by a node to the source to inform it of congestion



Closed Loop Congestion Control

Implicit Signaling

- In implicit signaling, there is no communication between the congested nodes and the source
- The source guesses that there is congestion in a network

Explicit Signaling

- In explicit signaling, if a node experiences congestion it can explicitly sends a packet to the source or destination to inform about congestion
- Forward Signaling
  - In forward signaling, a signal is sent in the direction of the congestion
  - The destination is warned about congestion
- Backward Signaling
  - In backward signaling, a signal is sent in the opposite direction of the congestion
  - The source is warned about congestion and it needs to slow down

TCP Congestion control and Avoidance

- TCP congestion control is a method used by the TCP protocol to manage data flow over a network and prevent congestion
- TCP uses a congestion window and congestion policy that avoids congestion
- Previously, we assumed that TCP receiver could decide the sender's window size
- In addition to the receiver, the network is a second entity that determines the size of the sender's window

TCP Congestion control and Avoidance

TCP's effective window is given as

Sender_max_Window = MIN(CongestionWindow, AdvertisedWindow)

Advertised window is window size advertised by receiver

Thank You