

Congestion Control Methods in Computer Networks

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Introduction

Congestion is condition in router in which Router discard packets when there are too many packets to handle. Congestion control includes all set of policies, methods and techniques to handle or prevent Congestion. There are two methods to handle congestion

A-Preventative Congestion Control (Open loop)

B-Detection and Removal Congestion Control (Closed loop)

Prevention is set of policies in those are applied to control congestion before it occurs. In this technique a policy is embedded in Source or Destination. It is assumed that congestion will never happen in Network after prevention.

Preventative Congestion Control (Open loop)

1. Packet Resending:

In this policy retransmission of packets is considered. If packet is lost or corrupted then packet is retransmitted as soon as Sender feels it. If there are so many retransmissions then there will be congestion. Congestion is prevented by implementing timers. Timers are also used to optimize throughput.

2. Windowing:

Windowing is a mechanism which can affect congestion. There are two mechanisms for implementing it. In GO back N multiple packets are repeated towards receiver in which some are already received at receiver end .Due to this Congestion may happen, therefore Selective repeat is better mechanism.

3. Packet Dropping:

it may be good discarding policy. It is better to discard a less sensitive packet instead of more sensitive packet Router can maintain quality of service. In case of video transmission router can discard less sensitive packet.

4. **Admission control-** A good admission control policy can minimize congestion. Router in a network can first check resource requirement by incoming packet. Router can deny for route for new node to prevent congestion.

5. Acknowledgment:

Acknowledge are sent to confirm receiving of packet. These acknowledge are also part of load in network. One acknowledgement for one packet may increase load in network. Other approaches are applied to handle Congestion. one acknowledgement for multiple packet or

acknowledgement with data can be sent to reduce load in network. Timer policy can be applied to send acknowledgement.

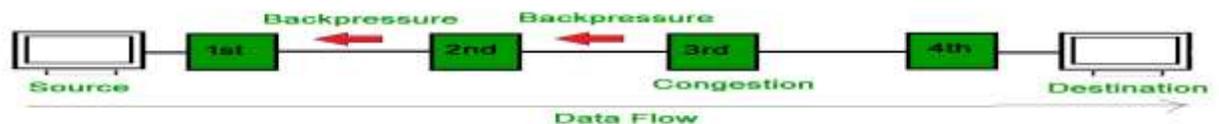
All above explained policies are implemented to prevent congestion before it occurs in the network.

Detection and Removal Congestion Control (Closed loop)

Once Congestion happens, detection and Removal Congestion Control technique is used to remove Congestion. There are several techniques those used. Some of methods are here.

1. Backpressure:

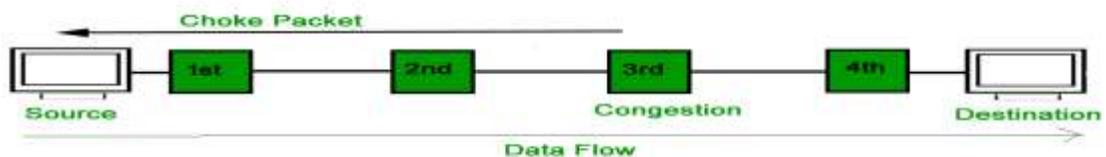
In this technique upstream node is stopped by congested node by not receiving data. When upstream node become congested it also rejects to above node. During this method pressure goes to source node. Backpressure works in opposite direction. Back pressure works well in virtual circuits where each node know address of above upstream node.



In above figure 3rd when node is congested ,it sends pressure to 2nd node and then 2nd node send pressure to first node. Finally source node realized to reduce its speed.

1. Choke Packet :

Choke packet technique can be implemented in to both virtual networks and datagram subnets. A special packet called choke packet is released to source by congested node with information about congestion .Every router checks its output line and resource utilization . when there is high utilization than threshold, Congested router sent choke packet to source with warning message to intermediate nodes .



2. **Implicit** No signal is transmitted between source node and congested node. When there is no acknowledgement for while source guesses that there is congestion in a network it must reduce traffic.

Explicit-If a node rely that congestion happens it send explicit signal to sender or receiver about congestion. In choke packet a separate packet is created but in Explicit signaling signal is included in data packet

- **Forward Signaling** . In this scheme a warning signal is sent to destination. Receiving node can adopt policy to reduce signal.
- **Reverse Signaling** : In this method a warning signal is sent to backward direction. The sending node is warned. Source can reduce traffic after receiving signal

Conclusion-Both techniques have advantages and disadvantages. Closed loop mehods are better than open loop

References:

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3-Computer Networks, 5th Edition Andrew S. Tanenbaum David J. Wetherall, University of Washington