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A Survey of New Methodologies to Overcome Congestion in the Network

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ABSTRACT: Today's the data usage is more and the data sending is also more from one network/system to other. As the traffic overload occurs in computer network which is called as congestion. To avoid this different protocol are came into existence. A clear explanation of these protocols how they avoid the congestion occurs in the network its cons and pros and applications of various congestions protocols for different networks. The congestion control in the network traces the evolution of different congestion protocols and a good motivation for the design of new methologies to overcome the present congestion problems in the network.

I. INTRODUCTION

When the network is overloaded with the data then the congestion occurs. To avoid the congestion many congestion control mechanism are introduced. Various Techniques are implemented for the control of congestion control in the network at different stages like nodes, routes, etc., the main issue to raise the congestion at networks is packet switching network. As too many packets delivery to the subnet then the congestion occurs which can degrades the performance of the network. The congestion may occur in any network when the load of the network is greater than the network capacity. Typical effects of the include queuing, delay, packet loss or the blocking of new connection.
Classification of the Congestion control algorithms:

There are many ways to categorize the congestion control algorithms, how these algorithms can control the congestion in the network , it follows some rule to categorize the congestion

a) In what way and what amount of feedback receiving from the network
b) Incrementing the deplorability on the current internet
c) The performance of the network by controlling of congestion aims to improve high
d) Fairness Citra

II. CONGESTION AVOIDANCE PROTOCOLS

a. TCP-Tahoe

It uses the additive increase and multiplicative decrease for the congestion avoidance. Here initially TCP-Tahoe saves the half of the current window as a threshold value. It then set CWND to one and starts as slow start until it reaches the threshold value, it increments linearly until it encounters the packet loss. As the increase in the window slowly as it approaches the bandwidth capacity. The main drawback is that to detect a packet loss it takes a complete timeout interval and it sends cumulative ACK in place of immediate ACk`s Therefore it follows the "GO BACK N APPROACH"

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b. TCP-RENO

It overcome the disadvantage of TCP-TAHOE like it add some intelligence and the packet loss can be detected at the earlier stages It suggest an algorithm that "FAST RE TRSNSMIT" in which 3way handshake process can be used for communication and sync with source and destination. The drawback of the RENO is when the packet loss are many then its performance is almost same as the TAHOE under the condition of high packet loss

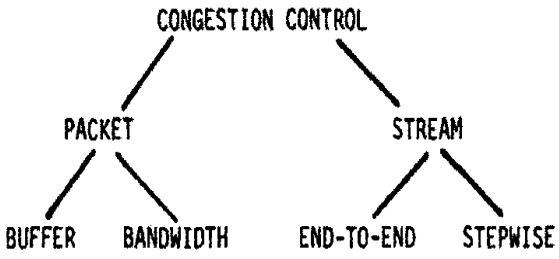

Fig. 4. Congestion control methods in S-F networks.

NEW-RENO

To overcome the disadvantage of Reno New Reno was introduced. The multiple packet loss can be detected. It is much more efficient than the TCP-RENO in the event of multiple packet losses. The working mechanism is same as the TECP-RENO

c. TCP-SACK

It is an extension of the NEW RENO. It works on the problem of TCP-RENO and TCP New Reno, is used for the detection of the multiple packet loss and retransmission of more than one packet loss per RTT. The main drawback of the SACK is that currently selective acknowledgments are not provides by the receiver

d. TCP-VEGAS

It is modification of the TCP-RENO. It is on the face that proactive measure to encounter congestion is more efficient than the reactive measure. It solves the problem of duplication of ACK`s to detect a packet loss. It also suggest a modified slow start algorithm. It detect the congestion before the packet loss occur it is main advantage. The major changes induced by VEGAS are

i. Re-transmission Mechanism
ii. Congestion Avoidance
iii. Modified Slow start

III. CONGESTION CONTROL PROTOCOLS

a. RED

RED is an certain improvement of the Traditional drop-tail queues. The main principle on which this RED works is Queue management which is used to detect incipient congestion early and to check the congestion notification to the end –host. The main advantage of the RED is it reduces their transmission rates before the queue in the network overflow and the

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packets are dropped. To detect the congestion RED maintain the average queue length. The main drawback is that they rely on queue length

b. BLUE

Blue used to recover the packet loss and the link utilization history to manage congestion. It performs more efficient than the RED both in terms of packet loss rates and buffer size requirements in the Network. It is a new active queue management algorithm

c. AVQ

The AVQ algorithm maintains a virtual queue whose virtual capacity is less than the actual capacity of the ink. When a packet arrives in the real queue, then the virtual queue is also updated to reflect the arrival. The main feature of the AVQ is that the absence of the feedback relay on the system which maximize the sum of utilities of all the users in the network

d. GRiDA

It is the algorithm which is used for the reduction of the power consumption in the backbone networks. It can switch on the selectively links in the ISP. IP based network is used to reduce the energy consumption on the system. It can neither require a centralized controller node, nor the knowledge of current traffic matrix. It saves the energy up to 50% when compared with other techniques

e. PID

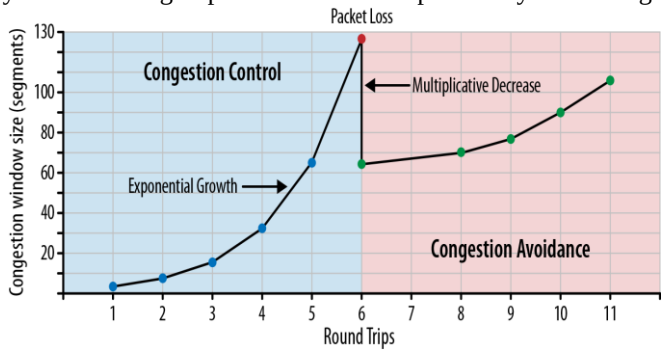
It is used to design with linear gain schulding and normalized values that works very well under different network load conditions. The controller is tuned to worst cases and works properly in wide range of situations. It is determined by only one parameter. The robust PID congestion controller is by three or more. The Robust PID controller perform better than the PID and RED, on keeping the router queue size at the target value

IV. HIGH BDP NETWORK

The High BDP(bandwidth delay product) in the network says that how the delay will be there in any increase or decrease in the bandwidth. There are different algorithms or techniques to explain there. They are as follows

a. HSTCP

High Speed TCP is an enhanced version of the TCP that reacts better when using the large congestion window on high bandwidth, high latency networks. High Speed TCP focuses specifically on a change to the TCP response function.



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b. STCP

The Accuarcy is proportion to the total number of predictions that were correct. The STCP is Slow TCP.

c. FAST TCP

In FAST-TCP a link model is used which captures the queue dynamics when congestion windows of TCP sources change. By using this model FAST TCP is always linearly stable with a single bottleneck link. FAST-TCP extends the existing stability results on homogeneous FAST flows to cases with heterogeneous delays.

d. HTCP

It is protocol which is used for the deployment in high speed and long range networks. In it window groth function is based on the real time and this type of protocol is deployed in conventional networks. So H-TCP acts like a CONVENTIONAL TCP-variant

e. BIC & CUBIC

It is a protocol which is used to solve the RTT unfairness problem, the Binary Increase Congestion Control. It supports TCP friendliness and bandwidth scalability. The two window size control policies are used they are Additive Increase and binary search increase. And the extension of the BIC is CUBIC which is used to enhance the scalability of TCP in long distance networks.

f. XCP

The XCP is a protocol which is used to the multi-level network feedback mechanism for the control of congestion. It is Stable and efficient high bandwidth delay product paths, while being more scalable to deploy than mechanism that require per flow state in routers

g. VCP

The extension of XCP is the VCP(Variable Structure Congestion Control Protocol). It is a window based protocol and is designed to regulate the CWND with different congestion control policies according to the level of congestion in the network.

h. DPCP & MPCP

It is an extension of the VCP, which utilizes two ECN bits of a pair of packets in order to use the ECN bit a distributed way. The Load factor is determined to refer the LSB and the MSB. The extension of DPCP is MPCP where the multiple packets can be distributed in the network. By using only two ECN bits MPCP is able to relay a more precise congestion feedback. In MPCP each packet carries two of 2n in its ECN bits

V. SATELLITE NETWORKS

a. P-XCP

Explicit Control Protocol (XCP) is a promising transport layer protocol for satellite IP networks. But XCP has some challenges while operating in satellite network. These challenges are low throughput under high link error rate conditions, and output link underutilization in the presence of rate-limited connections. To address the these problems PXCP protocol is used.

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VI. TCP-FRIENDLY

i. Single Rate

a. RAP

The Rate Adaption Protocol is a simple AIMID Scheme. In this each data packet is ACK by the receiver

b. LDA+

The Loss Delay based adaption Algorithm relies on the Real time Transport control protocol Feedback. It is designed for the Unicast communication

c. TFRC

The TCP-Friendly Rate Control Protocol is designed for the unicast and the muntlicast communications. The main importance of TFRC is that has a relatively stable sending rate while providing sufficient responsive to competing the traffic

d. TEAR

TCP Emulation at receives is a hybrid protocol because it combines aspects of window-based and rate based congestion control. In this case sender adjusts the sending rate. TEAR protocol does not directly use the congestion window (cwnd) but calculates the TCP sending rate

e. **MTCP**

To achieve TCP friendliness, Multicast TCP (MTCP) is a reliable multicast protocol that uses window-based congestion control. In MTCP a logical tree structure is used where the root of the tree is the sender of the data. A parent in the

logical tree structure stores a received packet until receipt is acknowledged by all of its children. Upon receiving a packet, a child transmits an ACK to its parent using unicast. The main problem of MTCP is its complexity

VII.MULTI RATE

a. RLC

Receiver Driven Layered Congestion Control (RLC) protocol is used to dimension the layers so that the bandwidth consumption increases exponentially at each and every layer.

b. FLID-DL

To address some of the problems of RLC, Fair Layered Increase/Decrease with Dynamic Layering (FLID-DL).This protocol uses a digital fountain at the source. It introduces the concept of dynamic layering. The FLID-DL protocol extends the work of RLC.

c. LTS

The Layered Transmission Scheme (LTS) is used for the transmission of video. LTS is easy to implement but it suffer from a multitude of drawbacks.

d. MLDA

The Multicast Loss-Delay Based Adaption Algorithm (MLDA) is a congestion control protocol that uses layered multicast. It uses the combination of two protocols that are LDA+ and RTCP reports for the signaling between the

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sender and the receivers. The problem of MLDA is the added complexity of the application that has to distribute the data onto the dynamic layers.

e. Rainbow

Rainbow is a window-based congestion control scheme which is used for the reliable transfer of bulk data. In this case the data is encoded using a digital fountain. The main idea behind Rainbow is that receivers individually request the transmission of each data packet

VIII. WIRED NETWORKS

a. **Enhanced RED**

In this approach ERQD algorithm is used for congestion avoidance in wired networks. The main idea behind this algorithm is to optimize the value of the average size of the queue used for congestion avoidance and to consequently reduce the total loss of packets at the queue and also reduces the Queue delay. It reduces the number of packet losses at the gateway and also reduces the queue delay.

IX. WIRELESS NETWORK

a. DCCP

It provides the efficient congestion control Mechanism for the Heterogonous and homogenous networks by using the CCID framework. It evaluates the congestion control mechanism which discriminates congestion and wireless losses

b. ECN2

It is an extension of ECN mechanism to respond the packet losse in the wireless environment because some protocol may or may not work in the wirless communication

c. WTCP

It is a reliable transport protocol that address rate control and reliability over commercial WWAN networks. It uses for the END-to End Communications and performs rate controls the receiver and uses the packet delays as the primary metric for the rate control

d. TCP_Westwood

TCP Westwood (TCPW) is a sender-side modification of the TCP congestion window algorithm. TCPW improves upon the performance of TCP Reno in wired as well as wireless networks

e. AIRMAIL

Asymmetric Reliable Mobile Access in Link layer is a link layer protocol for the indoor and outdoor wireless networks. It is asymmetric to reduce the processing load at the mobile

X. CONCLUSION

This paper it clearly evaluates the various congestion protocols which are used in the network. It is a survey of congestion control protocols how they are used and what are the cons and pros of the each protocol. So by this can be say that designing an efficient congestion control protocol which solves all problems of congestion is very difficult because many

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parameter are proposed to consider. So by considering all the cons and pros of various protocols a new protocol can be designed.

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