International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue 5, ISSN No. 2455-2143, Pages 103-105
Published Online March – April 2016 in IJEAST (http://www.ijeast.com)

A SURVEY ON DIFFERENT CONGESTION CONTROL AND CONGESTION AVOIDANCE MECHANISMS

Ashwini G S
Department of CSE
GSSSIETW, Mysuru,
Karnataka, India

Sahana B R
Department of CSE
GSSSIETW, Mysuru,
Karnataka, India

Manjuprasad B
Department of CSE
GSSSIETW, Mysuru,
Karnataka, India

Abstract— **Congestion is an issue which can arise in packet switched network. Congestion in Communication Networks is a situation where too many packets are present in a part of any subnet which may lead to performance degradation. Congestion may occur in any network whenever the load on the network is greater than the capacity of the network, i.e., when too much traffic is offered, congestion sets in and sharply the performance degrades. Congestion Control is a mechanism which is concerned with efficiently using a network at high load. This paper surveys some of the congestion control and congestion avoidance mechanisms. Congestion Control minimizes the impact of congestion when it occurs and Congestion Avoidance avoids producing congestion. Analysis and comparison of different Congestion Avoidance and Congestion Control is done. This paper also discusses about TCP Congestion Control in Wired cum Wireless Networks.**

Keywords— **Congestion Control, Congestion Avoidance,**

I. INTRODUCTION

Due to severe delay the congestion is caused by an overload of datagram at one or more switching point. Network congestion occurs when a node or a link carrying the, that its quality of service deteriorates. Typical effects include packet loss, queuing delay or the blocking of new connections. Congestion may occur for several reasons. It affects two main parameters of the network performance, Throughput and Delay. Congestion control is a reactive algorithm that dynamically adjusts the rate at which data is sent to reduce the amount of network congestion and packet loss. When the likelihood of congestion is detected, the rate at which data is sent is reduced to avoid congestion and take action before packets are lost in the network [5]. The combination of congestion control and avoidance results in better end-to-end throughput. The scheme called the congestion control helps the network to recover from the state of congestion. Congestion avoidance allows a network to operate in which the region is of low delay and high throughput [1].

When congestion happens TCP's strategy is to control it. Whenever the load is imposed on any network the TCP will increase it in order to find the exact point where the congestion occurs and later it backs off from that point. An alternative that is appealing is, that it is not yet been widely adopted, prediction of when the congestion is to happen and also to reduce the rate of hosts sending data, just before packets start being discarded. Such a strategy is called as congestion avoidance, to distinguish it from congestion control [6].

We need to solve these Congestion problems either by avoiding it before happening or by controlling it. This paper describes the Additive Increase or Multiplicative Decrease, Slow Start, Fast Retransmit and Fast Recovery, TCP Reno, New Reno, TCP Vegas, Stack Congestion Control and Congestion Avoidance mechanisms.

II. LITERATURE SURVEY

A. Analysis of different Congestion Avoidance Algorithms

The congestion avoidance algorithm [2] of TCP is the primary basis for congestion control in the internet. The main goal of this paper is to analyze and also to compare different congestion control and congestion avoidance mechanisms. These mechanisms include Tahoe, Reno, New-Reno, TCP Vegas and SACK. Comparison of Tahoe and Reno is the main concept which has been included in this paper. Protection of packets when connection is running is the principle on which TCP Tahoe is mainly based. TCP Tahoe includes Slow Start and Fast Retransmission algorithms. Reno has two versions: New-Reno which is a modified version of TCP, and a TCP SACK.

TCP Reno has major improvements over TCP Tahoe, when compared with Tahoe, Reno deals with multiple packet loss within window of data. Also Reno introduces Fast Recovery

International Journal of Engineering Applied Sciences and Technology, 2016
Vol. 1, Issue 5, ISSN No. 2455-2143, Pages 103-105
Published Online March – April 2016 in IJEAST (http://www.ijeast.com)

mechanism which was activated after the Fast Retransmit. TCP New Reno fixes the problems of Reno by modifying Fast Recovery and Fast Retransmit. It is same as Reno with more intelligence during the Fast Recovery [7].

The other strategy called Selective Acknowledgements (SACK) corrects the behavior in the face of multiple dropped segments. Whenever there is a SACK option, the TCP sender can always have the information to make decisions about packets to be transmitted or not during the Fast Recovery mechanism. There were some flaws in TCP Reno, therefore TCP Vegas was introduced. It is an alternative implementation which interoperates with any other TCP valid implementation. Through various algorithms congestion can be avoided.
The author has also included congestion avoidance algorithms such as Additive Increase Multiplicative Decrease (AIMD), Slow Start, Fast Retransmission and Fast Recovery in this paper. These algorithms ensure that packets are not last. Additive Increase Multiplicative Decrease (AIMD) is a feedback control algorithm, packet conservation is ensured by this algorithm. And it is a necessary congestion for TCP Congestion Control to be stable. Slow Start is used to control congestion inside the network. It is also known as exponential growth phase. Another algorithm called as Fast Retransmission is used as an enhancement to TCP, where the time sender waiting before retransmitting a lost segment is reduced. Lastly the algorithm called Fast Recovery is an improvement algorithm that allows high throughput for large windows.

B. Comparison of Congestion Control Mechanisms

Congestion Control is a mechanism or a technique [3] used to control congestion and keep the traffic below the capacity of the network. The paper represents the study of TCP Congestion Control principles and also their mechanisms. These include Slow Start, Congestion Avoidance, Fast Retransmission and Fast Recovery Algorithms. The Slow Start is a mechanism used by the sender for transmission rate control, otherwise called as sender based flow control, if return rate of acknowledgements is accomplished from the receiver.

A way to deal with lost packets is done by Congestion Avoidance [8]. Here it can signal the sender implicitly that a network congestion situation is about to occur when a retransmission timer expires or at the reception of duplicate acknowledgements. If timeout is an indication of congestion, then the congestion window is reset to one segment, where the sender is put automatically into Slow Start mode. And if duplicate ACK's is indicated by congestion, Fast Retransmission, Fast Recovery algorithms are invoked. The sender does not know if it is because of the loss of a TCP segment or simply because of a delayed segment and received out of order at the receiver when a duplicate ACK is received. Whenever three or more duplicate ACK's are received, the sender will not wait for any expiry of retransmission timer before retransmitting the segment. This process is called the Fast Retransmission Algorithm.

For larger windows, Fast Recovery is an improvement under moderate congestion, which allows high throughput. The usual implementation goes with Fast Recovery Algorithm. Also the paper describes about the performance characteristics of four representative TCP Schemes. TCP Tahoe, Vegas and New Reno under some network conditions of bottleneck link capacities for wired network.

C. TCP Congestion Control in Wired cum Wireless Networks

In networks data transfer using TCP is a complicated task. The approved mechanism that detects an optimum bandwidth for transmitting data segments over networks is the Congestion Control. Till date these are many researchers who are in direction of improving TCP performance in Computer Network. In various types of networks, TCP Congestion Control has its different variants. In wired networks, the TCP Congestion Control is successfully implemented, whereas it's not the case with wireless network because of non-functional and compatibility issues [4]. This paper proposes to build a system which will identify the network type and accordingly behave [9]. Algorithms are grouped into four categories in TCP Congestion Control namely, Slow Start, Fast Retransmission, Congestion Avoidance and Fast Recovery.

Slow Start mechanism is used for TCP implementation where in it controls the flow of data stream over networks from the sender's end. It is also known as sender band flow control. To initiate data transfer over a network, Slow Start is used. A network may reach a point where the packets may start dropping however. In this case Congestion Avoidance is used to slow down the data transfer. If sender receives three duplicate ACK's it does not wait for timer to expire and immediately retransmits the missed packet. This phenomenon is known as Fast Retransmit. Instead of going back to Slow Start phase, the sender resumes transmission with a larger window and gradually starts increasing as in the case of Congestion Avoidance. This result in increased throughput, also this phenomenon is referred to as Fast Retransmission. TCP implementation in wireless networks is cumbersome task due to some major reasons such as Bandwidth, Latency, Channel Losses and Mobility.

III. CONCLUSION

After the study of literatures, the possibility of congestion avoidance is identified over TCP. As well as, this paper describes the Additive Increase or Multiplicative Decrease, Slow Start, Fast Retransmit, and Fast Recovery Congestion Control mechanisms and also TCP Reno, New Reno, TCP

Vegas and STACK. We can conclude that TCP Vegas gives highest performance when compared to other mechanisms, as it changes its congestion window based on the situation of network traffic. In wireless network the whole scenario is different. In wireless networks there may be number of reasons like node failure, nod mobility, high BER, etc. So this describes that, can improve throughput of wired cum wireless systems. The phenomenon of congestion control is hoped to maintain the size of congestion window in between half of its size and congestion threshold value.

IV. REFERENCE

[1] ibm.com. 'TCP Congestion Control and voidance' 2015. [online]. Available:https://www.google.co.in Accessed: [09-12-2015].

[2] Bhargava, Neeraj, et al. "Analysis of Different Congestion Avoidance Algorithms." International J. Computer Networks Wireless Commun. [Accessed: 09-12-2015].

[3] Kumpavat, Digvijaysinh B., Paras S. Gosai, and Vyomal N. Pandya. "Comparison of TCP congestion control mechanisms Tahoe, Newreno and Vegas". [Accessed: 14-12-2015]

[4] Sharma, Neeraj, Manish Mann, and Ravinder Thakur. "TCP Congestion Control in cum Wireless Networks." International Journal of Computer Applications (0975 8887) Volume 88 (2014): 34-37. [Accessed: 14-12-2015].

[5] Barrera, Ivan D., Stephan Bohacek, and Gonzalo R. Arce. "Statistical detection of congestion in routers." Signal Processing, IEEE Transactions on 58.3 (2010): 957-968. [Accessed: 15-12-2015].

[6] c oursehero.com. 'Transport Protocols Congestion Avoidance' 2015. [online]. Available:https://www.coursehero.com/file/6770043/lect-16/ [Accessed: 14-12-2015].

[7] Abadin, AFM Zainul, et al. "Performance Analysis of TCP Tahoe, Reno, New Reno, Sack and Vegas using NS2." Global Journal of Computer Science and Technology 13.16 (2014). [Accessed :15-01-2016].

[8] Stevens, W. Richard. "TCP slow start, congestion avoidance, fast retransmit, and fast recovery algorithms." (1997). [Accessed: 15-01-2016].

[9] Ghosh, Anup K., Amitava Mukherjee, and Debashis Saha. "TCP throughput enhancement in wired-cum-wireless network." Computer Communications31.17 (2008): 41624166. [Accessed: 15-01-2016].