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Congestion Control Approach for TCP by Differentiating NCL and PR upon the ERT in Wireless Mesh Networks.

Ms. Neha Patil, Prof. Gajendra Singh Chandel

Department of Computer Science & Engineering
Sri Satya Sai Institute of Science and Technology, Opp. Oilfed Plant,Bhopal-Indore Road, Pachama
Dist.- Sehore M.P-466002

***Abstract-* The main concern of wireless network is communication. Basically communication is influenced by traffic overloading. Communication congestion is one of the major issues of networks. Congestion degrades the performance of Transmission Control Protocol (TCP). TCP regulates the amount of data traffic injected by nodes into communication networks, preventing persistent network overload. In the network it is typically realized by Transmission Control Protocol (TCP), which backs off transmission of end systems upon detecting packet loss, with the assistance of active queue management algorithms, which probabilistically drop packets at the intermediate routers based on the buffer occupancy. To control congestion and improve the performance of TCP, several methods are devised and some more needed. In this paper a scheme is advised to control the congestion of TCP by differentiating Non-congestion loss and packet reordering upon the expirations of retransmission timeouts.**

Keywords- Wireless Mesh Network, Congestion Control, TCP, Packet Reordering

I. INTRODCUTION

WMN is a potential network infrastructure for cheap, fast wireless access to the Internet [1]. WMNs is dynamically self-organized and automatically configured, along with the nodes in the network without extra efforts establishing and maintaining mesh connectivity among themselves. One of the main characteristicsn of WMNs is multi-hop transmission and the number of wireless hops between the sender and receiver is variable. End-to-end performance can be very poor due to variable links, because of interference and various disturbing factors in environment. This is especially true for wireless mesh networks where packets traverse several consecutive links [2]. The main design challenge is to schedule links and route packets in order to efficiently use network resources while guaranteeing fairness among users. Wireless mesh networks typically provide several paths from a source to a destination, and using paths efficiently, makes aggregation of the available resources. To improve both capacity and reliability in such networks each node can be equipped with multiple radio interfaces using a set of orthogonal channels. This channel diversity improves the performance of a single-path, while at the same time increases the possibility to create multiple interference-free paths between the sender and the receiver

II. TRANSMISSION CONTROL PROTOCOL

Transmission Control Protocol is the most popular connection oriented transport layer protocol used in the current internet and its congestion control algorithms are very essential for the stability of the internet. TCP has severe performance problems when operated over WMNs [3]. The principal problem of TCP lies in the congestion control mechanism. With TCP congestion control mechanism, multiple TCP connections can share network and link resources simultaneously. The quality of TCP connections degrades rapidly with the number of wireless hops in WMNs due to its inability to distinguish non-congestion losses from congestion losses. Several loss differentiation algorithms [4] are proposed to improve the performance of TCP over wireless networks. However, these algorithms have no mechanism to detect and differentiate non-congestion losses from packet reordering. TCPs inability to distinguish non-congestion loss from packet reordering may causes unnecessary retransmissions, results in slow down of the progress of cwnd and decreases the efficiency of the receiving TCP. As an output, it is an important consideration of TCP to guide the TCP sender for triggering the congestion control algorithms properly by distinguishing non-congestion losses from packet reordering in addition to network congestion when the sender receives three dupacks.

TCP Congestion Control and Fairness- One of the goals of TCP is to detect and avoid network congestion. Another goal is to guarantee fairness among flows. TCP achieves both these goals by reacting to packet losses. Each packet loss is treated as a congestion loss, and the congestion window is halved. Faster flows see more congestion losses, which guarantee a certain form of fairness

Packet Reordering- Packet reordering is a rather common event that poses negative effects on applications and protocols that require in-order data delivery. For TCP, the reordering of both data and acknowledgments affects performance [5]. Previous research has shown the possibility to mitigate reordering effects in a reactive and/or proactive manner

III. RELATED WORK

To improve the performance of TCP and congestion control, numbers of techniques are advised by authors. Some of them describes in this section.

TCP NJ-Plus [3] method is capable of detecting non-congestion losses from packet reordering and reacts accordingly. The key idea behind TCP NJ-Plus is, to set a dynamic delay threshold value by gathering information from the current status of the network when the sender receives three dupacks. TCP NJ-Plus has three mechanisms. a) Detection of non-congestion losses and packet reordering from network congestion. b) Detection of non-congestion losses from packet reordering and c)Congestion control mechanism of TCP NJ-Plus sender at the time of receiving three dupacks and timeout expiration.

Authors [6] proposed TCP enhancement approach named as Explicit Congestion Notification (ECN) which works in number of steps to check second and third ACK send right away or not if not then start timer.

TCPVeno [7] differentiates the random losses from congestion losses by adopting the mechanism of TCP Vegas to estimate the size of the backlogged packets (N) in the buffer of the bottleneck link. When a packet is lost, Veno compare the measured value of N with β (backlog threshold). If $N < \beta$, TCP Veno assumes the loss to be random rather than congestive, otherwise TCP Veno assumes the loss to be congestive. TCP Congestion Control Enhancement for Random Loss (CERL) distinguishes random losses from congestion losses based on a dynamic threshold value.

TCP CERL [8] is a sender side alteration of TCP Reno. TCP CERL and TCP Veno are almost similar in concept but TCP CERL utilizes the Round Trip Time (RTT) measurements made throughout the duration of the connection to estimate the queue length (l) of the link, and then approximately calculates the status of congestion. If $l < N$ (dynamic threshold value) when a packet loss is detected via three dupacks, TCP CERL will seems to the loss to be randomized rather than congestive. Otherwise, TCP CERL will assume the loss is caused by congestion. TCP NewJersey is devised as the extension of TCP Jersey as a router assisted solution for differentiating random loss from congestion loss and react accordingly [9]. TCP NewJersey is the best existing scheme for improving the performance of TCP in terms of throughput [10]. It has two key components in its policy, time-stamp based available bandwidth estimation (TABE) and congestion warning scheme. To calculate the availablity of bandwidth, TCP NewJersey follows the same idea of TCP Westwood's rate estimator to observe the rate of acknowledged by acknowledgments, but with a different implementation. When the sender receives three dupacks, TCP NewJersey checks whether the received acknowledgment (ack) has congestion warning mark or not. If it has yes, TCP NewJersey believes that the loss is caused by network congestion and proceeds as TCP NewReno after estimating the available bandwidth for adjusting the size of cwnd, whereas, if the ack has marked no, TCP NewJersey believes the loss is caused by non-congestion and retransmits the dropped packet without reducing cwnd. In addition to random loss differentiation algorithm, some other algorithms developed for differentiating packet reordering from congestion losses. Among that TCP DCR [11] proposed for detecting the out-of-order events in wireless networks. TCP-DCR (Delayed Congestion Response) is a sender-side response approach that defers a congestion response for a period of time to prevent the unnecessary reduction of the size of cwnd caused by non-congestion events. To maintain ack- clocking, TCP-DCR sends one new data segment upon the receipt of each dupacks. All these schemes have no mechanism to differentiate random loss from packet reordering. In WMNs, the packet losses due to transmission errors are more frequent and this unnecessary reduction of cwnd degrades the performance of TCP.

IV. PROBLEM IDENTIFACTION

A lot of works have done which are tried to rectify the weakness of earlier approach and improve the TCP performance. Recently TCP NJ-Plus [3] approach solve the problem of existing schemes have no mechanism to differentiate non-congestion losses from packet reordering is capable of distinguishing non-congestion losses from packet reordering by gathering information from the current status of the network at the time of receiving three duplicate acknowledgments and react accordingly. The key idea behind TCP NJ-Plus is, to set a dynamic delay threshold value by gathering information from the current status of the network when the sender receives three dupacks. TCP NJ-Plus has three mechanisms.

A) Detection of non-congestion losses and packet reordering- TCP NJ-Plus improves the congestion warning mechanism for detecting network congestion as it is one of the best existing solution for loss differentiation. Congestion Warning (CW) is a configuration of routers for giving alerts from the routers to end stations by marking all packets when the average queue length exceeds a threshold value.

B) Detection of non-congestion losses from packet reordering- The sender receives three dupacks without a CW mark (CW= 0), it assumes that these dupacks are the sign of non-congestion loss or packet reordering. In this situation, the sender of TCP NJ-Plus sets a dynamic delay threshold value for detecting non-congestion loss from packet reordering.

C) Congestion control mechanism of TCP NJ-Plus sender at the time of receiving three dupacks and timeout expiration - It describe the congestion control algorithms of TCP NJ-Plus and how the TCP sender reacts upon the arrival of three dupacks. We used the Slow Start (SS) and Congestion Avoidance (CA) algorithms of original TCP NewJersey and improved the fast retransmission and recovery algorithms. At the beginning of the TCP connections, sender enters into the SS phase, in which the cwnd increases by one maximum segment size (mss) for every receiving acknowledgment and grows the cwnd exponentially.

TCP NJ-plus approach improves the TCP performance by distinguished No-congestion control and packet reordering. This approach is restricted to differentiate non-congestion loss and packet reordering upon the expiration of retransmission timeouts. Need to work on restrictions of TCP NJ-plus technique.

V. PROPOSED SOLUTION

To sort-out the restriction of existing approach, one more approach is proposed which differentiate non-congestion loss and packet reordering upon the expiration retransmission timeouts. The motives of approach to maximize performance of TCP and to monitoring the congestion of TCP traffic during the communication. Approach works in different phases.

1. Create network environment considering certain number of nodes. Also configure routing and mac protocol to simulate environment.
2. Generate TCP traffic to consider specific source and destination.
3. To extract whole packets which are dropped during the transmission
4. Find and separate dropped packets due to congestion and retransmission ordering from the record of whole dropped packets.
5. After this, find packet loss rate basis on the packet expiration transmission timeouts.
6. Finally filters actual packet loss by differentiating all of this and try to reduce them and improve performance of TCP.

VI. EXPECETD OUTCOMES

After simulation and analysis the results of proposed approach following outcome will be expected.

1. To able to differentiate non-congestion loss and packet reordering
2. To control the congestion of TCP traffic
3. To enhance TCP Performance
4. To resolve limitations of existing approach

VII. CONCLUSION

TCP performance of wireless mesh network effected by traffic congestion and retransmission parameters. Congestion occurred during the transmission by dropping ack packets and mis-utilization of bandwidth. Congestion control is major challenge for network communications. To controlling congestion and improve TCP performance, several approached are devised to differentiate non-congestion loss from congestion loss and packet reordering. Proposed approach will also try to resolve congestion problem of TCP traffic. It offers to monitoring and differentiating non-congestion loss based on the expiration of retransmission timeouts of packets. Additionally, approach enhances the performance of TCP and control the congestion.

REFERENCES

[1] Sumit, Apoorva, Ki-Young, Konstantinos and Ramesh, “Understanding Congestion Control in Multi-hop Wireless Mesh Networks”, Proc. of MobiCom’08, Californis,USA,Sept 2008.

[2] Božidar Radunovi´, Christos Gkantsidis, Dinan Gunawardena, Peter Key, “Horizon: Balancing TCP over Multiple Paths in Wireless Mesh Network”, MobiCom’08, September 14–19, 2008, San Francisco, California, USA

[3] Prasanthi. S, Sang-Hwa Chung, Won-Suk Kim, “An Enhanced TCP Scheme for Distinguishing Non-Congestion Losses from Packet Reordering over Wireless Mesh Networks”, 2011, IEEE International Conference on High Performance Computing and Communications.

[4] Fu, C. P., and Liew, S. C. TCP Veno: TCP enhancement for transmission over wireless access networks. IEEE Journal on Selected Areas in Communications, 21(2), 216–228, 2003.

[5] J. C. R. Bennett, C. Partridge, and N. Shectman, “Packet reordering is not pathological network behavior,” IEEE/ACM Transactions on Networking, vol. 7, no. 6, December 1999.

[6] Dhaval B. Patel, Sagar J. Dholariya, Prof.Naren V. Tada, “ ECN BASED TCP ENHACEMENT WITHIN WIRELESS MESH NETWORK”, JOURNAL OF INFORMATION, KNOWLEDGE AND RESEARCH IN COMPUTER ENGINEERING, ISSN: 0975 – 6760, NOV 12 TO OCT 13 ,VOLUME – 02, ISSUE – 02, Page 394

[7] Fu, C. P., and Liew, S. C. TCP Veno: TCP enhancement for transmission over wireless access networks. IEEE Journal on Selected Areas in Communications, 21(2), 216– 228, 2003.

[8] Hosam, “TCP CERL: Congestion control enhancement over wireless networks”, Journal of Wireless networks, 2008.

[9] Xu, Tian and Ansari, “Improving TCP performance in Integrated wireless communication networks”, Computer Networks, 2005.

[10] Jaehyung Lee, Jungre, Minu, Jahwan and Hyunseung, “NJ+: An Efficient Congestion Control Mechanisms for Wireless Networks”, KSII Transactions on Internet and Information Systems, Dec 2008.

[11] S. Bhandarkar and A. L. N. Reddy. TCP-DCR: Making TCP Robust toNon-Congestion Events. Lecture Notes in Computer Science, Vol. 3042,pp. 712-724, May 2004.