

Review on Performance Improvement of TCP with TCP New Reno & Improved Westwood

Er.Karuna Mittal¹, Er.Jasvir Singh²

¹*Research Scholar (Department of Computer Science & Engineering)
Punjabi University ,Patiala, Punjab, India*

²*Assistant Professor (Department of Computer Science & Engineering)
Punjabi University ,Patiala, Punjab, India*

Abstract- There is degradation in TCP throughput in MANETs because of node mobility, unreliable medium, interference, an unreliable medium and route failure. TCP suffers through this because it cannot distinguish between segment loss either because of route failure or due to congestion. Sometimes, TCP falsify wireless error as if it is congestion. MANETs has another issue of routing. A major issue in TCP suffers because it is unable to distinguish packet loss due to route failures and due to congestion and another major issue in TCP that is the hidden node problem due to hidden node collision of packets with each other at a particular node. In this paper we are going to present the different reviews on TCP Reno, TCP New Reno, TCP Westwood and Improved Westwood. We will purpose to improve the efficiency of Data transmission with combination of TCP Improved Westwood and TCP New Reno. We will involve IAODV Protocol to resolve the hidden node problem. Along with this we will analyze the performance of our work with previous approach in terms of packet delivery and Throughput.

Keywords- MANET, TCP New Reno, AODV, IAODV, Westwood, Congestion, TCP, Congestion Control Mechanism, RTT.

I. INTRODUCTION

A mobile ad hoc network (MANETs) [1] is an autonomous, infrastructure-less, self-healing and self configuring of mobile nodes connected by radio or wireless links. Each node in a MANET can move randomly at random speeds in different directions. In Manet no need for central device or controlling device who controls all the traffic at the nodes and broadcast the information because in which each node act as router or controlling device or central device who maintains the traffic themselves. The main threat in designing a mobile ad-hoc network (MANET) is that in which each node is preparing to maintain the info continuously required to properly route the traffic to other node. Such mobile networks may be operate or connected to the Internet. TCP [2] provides reliability, end-to-end congestion control, flow control byte stream transport mechanism and congestion control mechanism. Compared to wired networks, there are different types of characteristics in wireless environments, which makes TCP congestion control mechanism is not directly suitable for wireless networks and many improved TCP congestion control mechanisms [3] have been presented.

TCP is executed at the end terminals of the network and does not retain real time information about the network such as route details, congestion over a link, failure of a link, available bandwidth, per hop latency, per hop saturation level, etc. The only indicator of network status to

TCP protocol is packet travelling time as well as success and failure of packet delivery. In this paper, we use packet and segment interchangeably.

Data between two communication ends is transmitted via different routes and there may be congestion at one route and not on others. So, selection of the next under loaded node at end-to-end terminals can perform better if some information about the congested links is available periodically. Apart from congestion, if a routing link breaks, a new route is required to forward message towards the destination. This increases overhead and consumes some time and ultimately becomes a reason of DACK (Duplicate Acknowledgement) too at TCP. This can also be eliminated if we control TCP congestion window according to the network congestion status.

TCP suffers from packet drop problem. TCP misinterprets packet losses due to various reasons [4] including misinterpretation of route failures as congestion, and unnecessary retransmission due to small RTO (Retransmission Timeout). When retransmitted packet is lost, timer at TCP expires and ultimately performance degrades. Node mobility is also a cause for packet drop that results in increase in RTT (Round Trip Time). So, an adequate approach is required to solve these issues with the goal of improving overall network performance.

Previous research that Many TCP variants are available with different approaches. We will purpose to improve the efficiency of Data transmission with combination of TCP Improved Westwood and TCP New Reno. We will involve IAODV Protocol to resolve the hidden node problem. Along with this we will analyze the performance of our work with previous approach in terms of packet delivery and Throughput.

II. RELATED WORK

A. TCP, TCP Reno and TCP New Reno

Y.Ravikumar et.al. [6] Considers that TCP provides reliable data transfer between two nodes in the form of continuous stream of data. It uses sequence number to ensure the correct delivery of data at destination. To provide flow control and congestion control functionality, TCP works in various phases. These include congestion avoidance, slow-start, fast recovery and fast retransmission [8]. It is discussed earlier how MANET's performance degrades due to its own and TCP behavior [9, 12, and 13].

V.Jacobsan [14] Considers that the RENO TCP implementation retained the enhancement but the fast retransmit congestion control algorithm is modified to include fast recovery congestion control algorithm. It is improvement in TCP Tahoe. When sender sends the packets to the receiver at another end but sometimes during the transmission packet loss due to buffer overflow or bandwidth problem in a congested link. When that problem occurs the sender either receives the three duplicate acknowledgements or retransmission timeout expires then the sender avoids the congestion problem with activating the fast recovery algorithm and makes the congestion window size to half. The TCP RENO is best for detecting the single packet loss but the performance of TCP RENO suffers when the multiple packet loss occurs. For multiple packet loss the size of congestion window to half again and again [15, 16]

We elaborate our discussion about TCP New Reno. Similar to other TCPs, TCP New Reno also works in Different phases except with a modified fast recovery phase. Fast recovery is enabled by both timeouts and reception of 3 DACK. Its algorithm tries to improve TCP performance when burst of packets are lost [9].

A.S.Ghaleb et.al. [7] Considers that TCP New Reno, a new data ACK (acknowledgement) is not enough to take TCP out of fast recovery to congestion avoidance. It is the development of TCP Reno who's only detects single packet loss. In TCP New Reno have not to reduces the size of congestion window again and again that we reduces the congestion window for single packet loss in TCP Reno and does not exit from the fast recovery phase as long as all the packets are acknowledged. Therefore, it takes one Round Trip Time to detect each packet loss. In other words, it assumes that the packet that immediately follows the half acknowledgement received at fast recovery is lost, and transmits the packet again. Sometimes this is not true and results in low performance. In TCP, the packet loss either due to congestion or node movement results in increase in Round Trip Time that further increases the timeout and changes its cwnd (congestion window).

S.Qamar et.al. [10] Considers that TCP New Reno is unfair in throughput and inefficient in terms of link capacity. It does not focus on the state of the network and halves its congestion window in fast recovery when packet loss is detected. Another issue is if there is no packet loss but packets are just reordered by three duplicate ACKs, it mistakenly enters into fast recovery and halves its congestion window. Several researchers present their approaches to enhance the TCP performance and work with different TCP variants, but each has some flows.

H.Torkey et.al. [11] Presents their approach to modify TCP New Reno but in absence of any routing protocol. Apart from this, their work is limited to single topology.

B. TCP WESTWOOD

TCP Westwood [17] is yet another improvement in the TCP Reno family line. The Fast Recovery algorithm from TCP New Reno has been modified. To help gain faster recovery bandwidth estimation (BWE) algorithm also has been added [18]. This BWE function is what makes TCP

Westwood standout. Influenced by TCP Vegas, BWE uses the RTT and the amount of data that has been sent during this interval to calculate an estimate of the currently successful transfer rate. The bandwidth estimate is then used when a loss is detected, setting cwnd and sssthresh at values near the estimation. The main purpose behind this is to improve the throughput in wireless links, where loss is more often caused by link failure than by congestion. There is also the general benefit that starting CA at higher values will lower the recovery time on most networks, thus lowering the transfer times.

C. HIDDEN NODE PROBLEM

Hidden nodes are elementary problem that can potentially affect any wireless network where nodes cannot hear each other whereas they have short distance and does not know about when other node sends the data to access point. In this situation, not visible nodes cannot receive any control packets, so packets are sent to the visible node regardless of any other nodes sending packets, due to this problem the collision occurs and many packet losses [19, 20]. There are three conditions where a node can be a hidden node or not visible nodes. In the first condition, which has the worst throughput, all nodes are not visible. In the second condition, all nodes are visible and dealing with each other for resources like Access Points (AP), so the network has the best throughput. The last condition, called combination of where not visible nodes and challenging nodes appear together [21].

The traffic in which each network is classified by Wang et al. [22] into downstream and upstream traffic. When the AP or sink (in the wireless sensor networks) sends a packet to the terminals, it is considered downstream traffic, while packets sent in a reverse direction are upstream traffic generated in the network. In downstream traffic there is no hidden node, because all nodes can hear the access point. But in upstream traffic, the network deals with hidden nodes because of their different transmission ranges

III. CONCEPT OF THEORY FOR RESEARCH

Wireless ad hoc networks, though famous for minimal configuration and quick deployment, still are more susceptible to mobility, node's capacity and power consumption level. Due to this, the major problem of congestion and TCP performance degradation occurs where there is high potential of packet loss and packet reordering. The problem of congestion is one of the most challenging tasks in wireless ad hoc networks to overcome with. Thus, an optimal checking on packet behavior, flow of data and performance is needed. The other major problem of TCP over mobile ad-hoc networks that is when Two nodes wants to send the packet to same node But the one node is out the transmission range of another node . So, that means one node is hidden from another node and vice versa and they do not know about which node send packet first. When both nodes are send packet to same node together then the collision occurs. Then for that the particular protocol is used to resolve that problem.

In the previous approach could not solve the problem of hidden node problem But this research will be an effort

to improve the congestion, reliability and packet delivery throughput by using the combination of two congestion control mechanism and will solve the hidden node problem with the improved AODV protocol with the concept of acknowledgement token.

IV. METHODOLOGY

TCP protocol is a reliable data transfer protocol over internet due to its capability many researchers are interested in deploying it's over MANET. But while deploying TCP creates many problems. The main issue of TCP is a packet loss due to congestion during transmission. We will solve the congestion problem with the increased throughput and packet delivery by using hybrid of TCP New Reno and TCP improved Westwood .First we will create a path with AODV protocol sending a packet from sender to receiver .we will use the look up table for deciding where we will use TCP improve Westwood and where we will use TCP new Reno.

We will use the Improved Westwood for long bandwidth and for short bandwidth we will use the TCP New Reno. From this approach the congestion will never occur and no packet loss within transmission and improved network performance from previous approach.

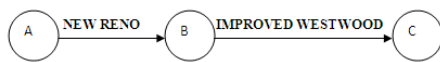


Fig1: Congestion Control Mechanism

We will also solve the hidden node problem this is also a main issue in the TCP when two nodes are not hear each other and data send at the same node simultaneously and the collision occurs .To alleviate the hidden node problem we will use the Improved AODV protocol and we will use the concept of acknowledgement token.

V. CONCLUSION AND FUTURE WORK

From the above study we have presented different congestion control mechanisms or transmission protocol which includes Reno, New Reno, and Westwood. We have also discussed their pros and cons. From its different reviews it is concluded that we are open for future research in improvement of TCP performance. In future we will present the hybrid of TCP new Reno and Westwood and also we will discuss and resolve the problem of hidden node.

REFERENCES

[1] Irish Chlamtac, Marco Conti, Jennifer J.N. Liu .Mobile ad hoc networking: imperatives and challenges, School of Engineering, University of Texas at Dallas, Dallas, TX, USA ,b Institution IIT, Consigliere Nazionale delle Recherche, Pisa, Italy ,c Department of Computer Science, University of Texas at Dallas, Dallas, TX, USA. Ad Hoc Networks 1 (2003)

[2] Ahmad al Hanbali, Eitan Altman, And Phillipe Nain, "Survey of Transmission Control Protocol over Ad-Hoc Networks," IEEE communication Survey Tutorials, vol. 7, Third Quarter 2005, no. 3.

[3] Jian Liu and Suresh Singh. "The TCP: TCP for mobile ad hoc networks," IEEE Journal on Selected Areas in Communications, vol. 19, no. 7, July 2001, pp. 1300-1315

[4] A. Ahuja, S. Agarwal, J. Singh, and R. Shorey, "Performance of TCP over different types of routing protocols in MANET," Proc. IEEE Vehicular Technology Conf. (VTC'00), vol. 3, Tokyo, Japan, 2000, pp.2315-2319.

[5] S. Y. Ameen, and L. A. Jbrahimi, "MANET Routing Protocols Performance Evaluation with TCP Tahoe, Reno and New-Reno,"412 International Journal of u- and e- Service, Science and Technology, vol. 4, no. 1, pp. 37-49, March 2011.

[6] Y. Ravikumar, and S. K. Chittamuru, "A Case Study on MANET Routing Protocols Performance over TCP and HTTP," School of Engineering, Blekinge Institute of Technology, Master Thesis Electrical Engineering Thesis no: MSE-2010-6434, June 2010

[7] A. S. Ghaleb, Y. G. Doudane and S. M. Senouci, "Effect of Ad Hoc Routing Protocols on TCP Performance within MANETS," 3rd Annual IEEE Communications Society on Sensor and Ad Hoc Communications and Networks, pp. 866 - 873, 2006.

[8] M. Rani, H. Kumar, and G. Singh, "Optimal Routing Protocol for TCPNewReno in WirelessMobile Ad-hoc Networks," International Journal of Network and Mobile Technologies ISSN 2229-9114 Electronic Version, vol. 2, issue. 3, pp. 170-176, September 2011.

[9] A. Ahuja, S. Agarwal, J. Singh, and R. Shorey, "Performance of the TCP over different routing protocols in mobile ad-hoc networks," Proc. IEEE Vehicular Technology Conf. (VTC'00), vol. 3, Tokyo, Japan, 2000, pp.2315-2319.

[10] S. Qamar, and K. Manoj, "Impact of Random Loss on TCP Performance in Mobile Ad-hoc Networks (IEEE 802.11): A Simulation-Based Analysis," International Journal of Computer Science and Information Security, vol. 7, no. 1, pp. 228-233, 2010

[11] H. Torkey, G. Attiya, and L. Z. Morsi, "Modified Fast Recovery Algorithm for Performance Enhancement of TCP-NewReno,"International Journal of Computer Applications (0975 - 8887), vol.40, no. 12, pp. 30-35, February 2012

[12] A. Ahmed, M. H. Zaidi, and K. Sharif, "Enhancing TCP Performance in Mobile Ad hoc Networks," National Conference on Emerging Technologies, 2004.

[13] Z. Fu, X. Meng, and S. Lu, "How Bad TCP Can Perform In Mobile Ad Hoc Networks," Proceedings of the Seventh International Symposium on Computers and Communications, 2002, IEEE.

[14] V.jacobson "Modified TCP congestion avoidance algorithm". Technical report, 30 april 1990.

[15] M. Allman, V. Paxson, and W. Stevens.RFC 2581 - TCP Congestion Control. The Internet Society, 1999.

[16] L.Subedi, M. Najiminani and L. Trajkovic, "Performance Evaluation of TCP Tahoe, Reno, Reno with SACK and New Reno using OPNET modeler,2008.

[17] M. Gerla, M.Y. Sanadidi, RenWang, A. Zanella, C. Casetti, and S. Mascolo, "TCP Westwood: congestion window control using bandwidth estimation", In IEEE Global Telecommunications Conference, GLOBECOM '01, volume 3, pages 1698 – 1702, November 2001.

[18] Gerla, B.K.F. Ng, M.Y. Sanadidi, M. Valla, R. Wang, "TCP Westwood with adaptive bandwidth estimation to improve efficiency/friendliness tradeoffs", Computer Communications 27 (2003) pp. 41-58.

[19] Ming Luo, J. Hsu, Shaomin. Mo, R. Ghanadan, "Distributed MAC for collective hop adroit networks," in *Proceedings of IEEE Military Communications Conference*, pp. 107, Nov. 2008.

[20] Boroumand et al.: The study of Techniques to solve again the Hidden Node Problem in Wireless Networks **108**

[21] H. Khalife, N. Malouch, "Interaction between hidden node collisions and congestions in multihop wireless ad-hoc networks," in *Proc. of IEEE International Conference on Communications*, pp. 3947-3952, 2006. Article (CrossRefLink)

[22] Ozgur Ekici, Abbas Yongacoglu, "Fairness and throughput performance in infrastructure IEEE 802.11 networks with hidden-nodes," *Physical Communication*, vol. 1, no. 4, pp. 255-265, Dec 2008.Article .

[23] C. Wang, B. Li, K. Sohraby, M. Daneshmand, Y. Hu, "Upstream congestion control in radio sensor networks through cross-layer optimization," *IEEE Journal on Selected Areas in Communications*, vol. 25, no. 4, pp. 786-795, May 2007. Article (CrossRefLink)