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Performance Analysis of Congestion Control Variants of TCP with Different Reactive Routing Protocols in Manet

[1] Divya, [2] Khatheeja Rukshana, [3] Mrs. Shifana Begum, [4] Mr. Akhilraj V Gadagkar

[1][2]U.G. Student, [3][4]Assistant Professor

[1][2][3][4] Department of CSE, Srinivas School of Engineering, Mukka, Mangalore, India

[1]divyaamin666@gmail.com, [3]shifanabgm@gmail.com

***Abstract* - A widely used TCP protocol is originally developed for wired networks. It has many variants to detect and control congestion in the network. However, Congestion control in all TCP variants does not show similar performance in MANET as in wired network because of the fault detection of congestion. In this paper, we do a performance comparison between TCP variants NEW RENO, SACK and Vegas in AODV and DSR reactive (On-Demand) routing protocols. Network traffic between nodes is provided by using File Transfer Protocol (FTP) application. Multiple scenarios are created and the average values of each performance parameter are used to evaluate the performance. Based on different performance metrics such as jitter, throughput, packet loss, signal received with error and bytes received, are taken in consideration to analyse the performance.**

Index Terms—Congestion Control, NEW RANO, TCP sack, TCP vegas, MANET, AODV, DSR

1. INTRODUCTION

The technology of Mobile Ad hoc Network (MANET) is widely used these days, and it's considered as a hot topic in network filed. Each node in MANET works as router and client. Nodes communicate with each other through wireless links like radio or microwave with no fixed infrastructure to control communication between them.

Nodes in MANET are moving randomly and send packets to each other instead of depending on the router in coordinating the flow of packets in the network. In single-hop, nodes are connected directly while in multi-hop the connection is sequential with the help of an intermediate node using ad-hoc routing protocols. Ad-hoc routing protocols are used to determine routes packets should travel through. Every node senses the broadcasting from its neighbours to establish the connection.

Figure 1. Example of MANET

TCP variants for congestion control have proved its performance in wired network unlike in MANET. Because there are many reasons for packet loss in MANET in addition to network congestion, like the effect of fading, interference from other devices, noise, multipath propagation and link failure in addition to network congestion. This causes a fault detection of congestion at the nodes. These false determinations of packet loss drive TCP to call congestion control algorithm which decreased the Throughput of the network.

In this paper, the performance of MANET is studied under a combination of TCP variants and different on-demand routing protocols. Three variants of TCP have been studied: TCP New Reno, TCP Sack, and TCP Vegas, along with two on-demand routing protocols AODV and DSR.

2. LITERATURE SURVEY

In network field, Congestion control in MANET has been studied widely as an interesting research topic. In this paper comparison between different TCP Variants in MANET network has been done. Some of these comparisons are summarized in this section. Poonam, Tomar and Prashanth Panse[1] performed a comparison between the performance parameters of MANET network under TCP variants (TCP Tahoe, TCP Lite, and TCP

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Reno) using DSR routing protocol. There are various TCP variants and each one belongs to a different criteria. In the paper they discusses about the congestion problem in Adhoc networks and compared the performance of three TCP variants that all work on different techniques. Their paper also compares other TCP variants specifically TCP Tahoe, Reno and Lite based on different parameters such as number of nodes received with error, packet loss, byte received, and throughput and pause time Some of TCP Protocols showed a high performance under some conditions. The conclusion of this comparison shows that none of the TCP variants can overcome the congestion of the network, each protocol can perform better under specific conditions. TCP Vegas and TCP SACK under AODV routing protocol are not within the scope of this paper. Yuvaraju B N and Niranjan N Chiplunkar [2] Proposed a paper in which they had done a comparison between the performance of six TCP variants such as TCP TAHO, TCP RENO, TCP New Reno, TCP SACK, TCP FACK and TCP Vegas in MANET with AODV routing protocol under different scenarios and different environmental parameters using the NS2 simulator. The results show that TCP Vegas performed better than the other TCP variants in data transmission. However, no information provided about the performance of these variants with DSR routing protocol. NehaArora compared the behavior of four TCP congestion variants TCP Tahoe, TCP Reno, TCP New Reno, and TCP Sack under three routing protocols AODV, TORA, and OSLR in MANET using OPNET simulator, the results showed that the behavior of TCP variants is better under AODV routing protocol. TCP Vegas and DSR protocol are not included in this study.

Suneel Kumar Duvvuri& Dr. S. Rama Krishna [4] performed a comparison between the performance of six TCP variants TCP TAHO, TCP RENO, TCP New Reno, TCP SACK, TCP Vegas and TCP FACK in MANET with AODV routing protocol the results are similar to the results of comparision done by Yuvaraju B N and Niranjan N Chiplunkar[2]. However, no information is provided about the performance of these variants with DSR routing protocol.

M.Jehan& Dr. G.Radhamani [5] had compared the behavior of three TCP congestion variants TCP Binary Increase Congestion Control (TCP BIC), SCALABLE TCP and TCP Vegas under DSR and DSDV in MANET using NS2 simulator. The results showed that SCALABLE TCP showed the highest Throughput and TCP Vegas showed a better round-trip delay in DSDV. the performance under AODV protocol is not included. IffatSyad, Sehrish Abrejo & Asma Ansari, [6] compared the performance of TCP Vegas and TCP New Reno in both DSDV and DSR routing protocols in MANET using NS2 simulator. The results showed that the performance of TCP variants in proactive DSDV routing protocol has a higher Throughput thanreactive DSR routing protocol, but with a higher packet drop rate and delay. AODV routing protocol was not used in this study. HrituparnaPaul ,Anish Kumar Saha , Partha Pratim Deb &Partha Sarathi , compared TCP variants (TCP RENO, TCP New RENO, and TCP TAHOE) in MANET when different routing protocols are used (AODV, TORA, and DSR) in two scenarios using OPNET simulator. The first scenario uses three nodes and the second one uses five nodes. The throughput of each TCP variant in these scenarios is analyzed. The results show that AODV performed a higher throughput than DSR and TORA while increasing the number of nodes. TCP Vegas and TCP SACK are not used in this study.

3. TCP VARIANTS

3.1 NEW RENO

New RENO is a slight modification over TCP-RENO. It is able to detect multiple packet losses and thus is much more efficient that RENO in the event of multiple packet losses. Like RENO, New-RENO also enters into fast-retransmit when it receives multiple duplicate packets, however it differs from RENO in that it doesn‘t exit fast-recovery until all the data which was out standing at the time it entered fast recovery is acknowledged. The fast-recovery phase proceeds as in Reno, however when a fresh ACK is received then there are two cases:

- If it ACK‘s all the segments which were outstanding when we entered fast recovery then it exits fast recovery and sets CWD to threshold value and continues congestion avoidance like Tahoe.

- If the ACK is a partial ACK then it deduces that the next segment in line was lost and it re-transmits that segment and sets the number of duplicate ACKS received to zero. It exits Fast recovery when all the data in the window is acknowledged.

3.2 TCP SACK

TCP with Selective Acknowledgments' is an extension of TCP RENO and it works around the problems face by TCP RENO and TCP New-RENO, namely detection of multiple lost packets, and re-transmission of more than one lost packet per RTT. SACK retains the slow-start and fast retransmits parts of RENO. It also has the coarse grained timeout of Tahoe to fall back on, in case a packet loss is not detected by the modified algorithm. SACK TCP requires that segments not be acknowledged cumulatively but should be acknowledged selectively. If there are no such segments outstanding then it sends a new packet. Thus more than one lost segment can be sent in one RTT.

3.3 TCP VEGAS

VEGAS is a TCP implementation which is a modification of RENO. It builds on the fact that proactive measure to encounter congestion is much more efficient than reactive ones. It tried to get around the problem of coarse grain timeouts by suggesting an algorithm which checks for timeouts at a very efficient schedule. Also it overcomes the problem of requiring enough duplicate acknowledgements to detect a packet loss, and it also suggests a modified slow start algorithm which prevents it from congesting the network. The three major changes induced by Vegas are:

New Re-Transmission Mechanism:
Vegas extend on the re-transmission mechanism of RENO. It keeps track of when each segment was sent and it also calculates an estimate of the RTT by keeping track of how long it takes for the acknowledgment to get back.

Congestion avoidance:
TCP Vegas is different from all the other implementation in its behavior during congestion avoidance. It does not use the loss of segment to signal that there is congestion. It determines congestion by a decrease in sending rate as compared to the expected rate.

Modified Slow-start:
TCP Vegas differs from the other algorithms during its slow-start phase. The reason for this modification is that when a connection first starts it has no idea of the available bandwidth and it is possible that during exponential increase it over shoots the bandwidth by a big amount and thus induces congestion. To this end Vegas increases exponentially.

Table 1. Advantages and disadvantages of TCP variants

TCP	Advantages	Disadvantages
NEW RENO	-Performs better than TCP Reno over WLAN when multiple packets are lost from one window of data. -Modifications are only needed in the sender	-Cannot distinguish between Congestion -Loss and packet error
SACK	-The source have better information of the packets that have been successfully delivered compared to other TCP versions -Therefore it can avoid unnecessary delays and retransmission	-Requires modification to the acknowledgement procedure at both the sender and receivers sides
Vegas	-Good performance over WLAN when using snoop protocol	-Cannot distinguish between congestion loss and packet errors. -Poor performance over WLAN when multiple error burst occur without Snoop protocol

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4. MODULE DESCRIPTION

This paper presented a performance comparison between TCP variants with a different reactive routing protocol. The comparison is held by running a simulation scenario many times using NS2. Three performance metrics were used to compare the performance of TCP variants Throughput, Jitter, Packet drop, signal received with error and bytes received. We consider the different variants such as New RENO, TCP SACK, TCP VEGAS these TCP variants perform in a similar way in both DSR and AODV routing protocols. there is no much effect on the routing protocol on the TCP variants.

In the experiment, we compared the performance of TCP variants in DSR and AODV routing algorithms. Both AODV and DSR are on-demand routing protocol. This means that the route between source and destination is obtained when it is needed. When a source node needs to communicate with destination node in DSR protocol, the source node broadcast a Route Request Packet (RREQ). Each node receives RREQ rebroadcasts the RREQ unless it's the destination node or it has a route to the destination node. When an intermediate node which has a route to the destination or it is the destination itself receives an RREQ, it sends the RREP to the source node which contains a full path from source to destination in the header of the packet.

AODV routing protocol combines the advantages of both DSDV and DSR protocols. It uses the same mechanism of flooding to obtain a route to the destination node as used in DSR, and it uses also a sequence number and hop-by-hop routing similar to DSDV. The use of sequence number helps to avoid infinite loops and to determine the age of the route. AODV uses a routing table to determine a path from the source to the destination. DSR caches the route in the packet header but AODV stores the route in the nodes tables.

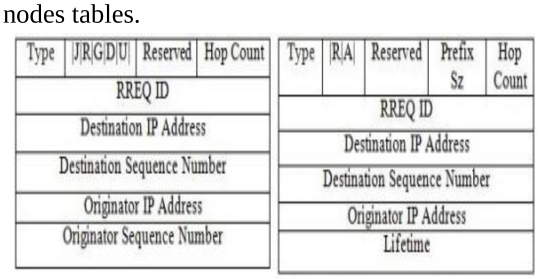


Figure 2. RREQ and RREP Packet Format in AODV

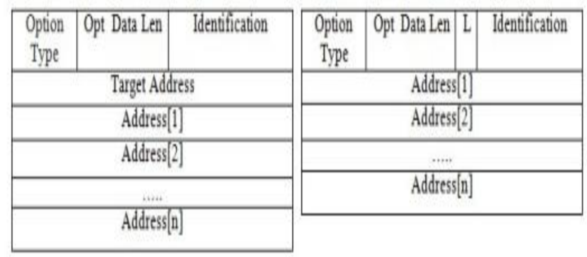


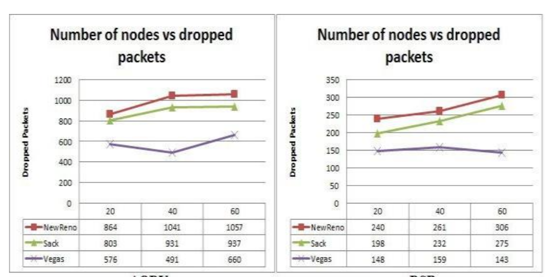
Figure 3. RREQ and RREP Packet Format in DSR

5. RESULTS

The simulation is executed many times and the number of nodes varies as 20, 40, and 60. AOD and DSR routing protocols are configured for each node with a maximum speed of 20 m/s and with 5s pause time. The mobility of the nodes is very low in all scenarios. For each design parameters, the simulation is executed many times and the average value of each performance parameter is used to evaluate the performance.

5.1 PACKET DROP

Packets drop usually when the sender fails to deliver some or all packets to the receiver or when the receiver buffer is full. In MANET there are more reasons for packets to drop, like fading, interference from other devices and noise, so it's impossible to determine the reason for packets dropped.



AODV DSR

Figure 4.Dropped packets of TCP variants in AODV and DSR

Figure 4 shows the number of dropped packets for all TCP variants used with both AODV and DSR routing protocols.

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5.2 THROUGHPUT

Throughput is the number of successfully transmitted data from source to destination per second. It depends on the number of packets sent and a number of Dropped packets through the network. Comparing Throughput of TCP variants in both DSR and AODV, TCP variants have highest Throughput values in DSR than in AODV. This is expected as the DSR outperform AODV at low mobility used in this scenario.

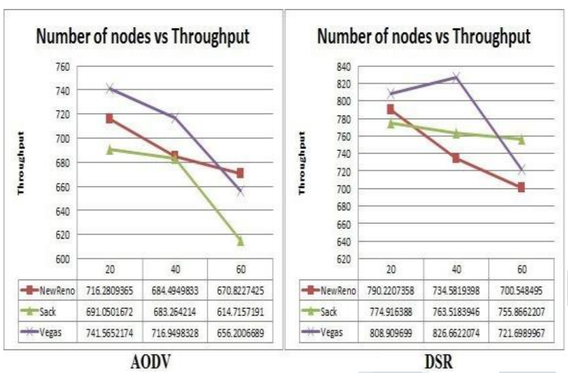

Figure 5.Throughput of TCP variants in AODV and DSR

Figure 5 shows the Throughput of TCP variants over AODV and DSR routing protocols. TCP-Vegas has the highest Throughput because of its mechanism for detecting a congestion

6. CONCLUSION

This paper presents a performance comparison between TCP variants with a different reactive routing protocol. To simulate above work, we use NS2 simulator in order to compare the performance of TCP variants. Five different performance metrics were used to compare the performance of TCP variants such as such as jitter, throughput, packet loss, signal received with error and bytes received, are taken in consideration to analyse the performance.TCP variants perform in a similar way in both DSR and AODV routing protocol. There is no much effect on the routing protocol on the TCP variants. TCP-Vegas outperform the other two variants in all parameters, packet drop, throughput, and jitter.

The results show that DSR has better performance compared with AODV, because DSR routing protocol mechanism outperforms AODV at low traffic, nodes and mobility. It generates less routing load and depends more on caching.

REFERENCES

[1] Tomar, Poonam, & Prashant Panse, (2011),"A Comprehensive Analysis and Comparison of TCP Tahoe, TCP Reno and TCP Lite." International Journal of Computer Science and Information Technologies (IJCSIT), Vol. 2, No 5, pp2467-2471.

[2] Yuvaraju B. N& Niranjan N Chiplunkar , (2010) “Scenario Based Performance Analysis of Variants of TCP using NS2-Simulator” International Journal of Advancements in Technology, Vol. 1, No 2, pp223-233.

[3] Neha Arora,(2013) “Comparative Analysis of Routing Protocols And TCP in MANETS”, International Journal of Emerging Trends in Engineering & Technology (IJETET) Vol. 02, No. 1, pp19-28.

[4] Suneel Kumar Duvvuri & Dr. S. Rama Krishna (2016) “Performance Evaluation of TCP alternatives in MANET using Reactive Routing Protocol”, International Journal of Modern Computer Science (IJMCS) ,Vol. 4, No.4, pp35-39.

[5] M.Jehan & Dr.G.Radhamani ,(2011) “Scalable TCP: Better Throughput in TCP Congestion Control Algorithms on MANETs”, International Journal of Advanced Computer Science and Applications (IJACSA), pp14-18.

[6] Iffat Syad, Sehrish Abrejo & Asma Ansari, (2013) “analysis of proactive and reactive MANET routing protocols under selected TCP variants”, International Journal of Ad hoc, Sensor & Ubiquitous Computing (IJASUC) Vol.4, No.4, pp17-26.

[7] Hrituparna Paul, AnishKumar Saha, Partha Pratim Deb & Partha Sarathi, (2012) “Comparative Analysis of Different TCP Variants in Mobile Ad-Hoc Network”, International Journal of Computer Applications Vol. 52, No.13, pp19-22.