International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Impact Factor (2012): 3.358

A Comparative Study of TCP over MANET with Variable Speed

Nishi[1], Kirti[2]

[1, 2]Department of Electronics and Communication Engineering, Meri College of Engineering & Technology
Sampla, Bhadurgarh, Haryana, India

Sachin Kumar

Guide, Department of Electronics and Communication Engineering, Meri College of Engineering & Technology
Sampla, Bhadurgarh, Haryana, India

Abstract: ***Mobile Ad hoc networks are wireless network that use multi-hop routing instead of static networks infrastructure to provide network connectivity. The network topology in MANETs usually changes with time. Transmission Control Protocol (TCP) is a connection oriented protocol for reliable end-to-end data delivery over IP networks. Wireless Mobile Ad-hoc networks offer challenges to TCP congestion control mechanism because mobile Ad-hoc networks encounter several types of losses or delays that are not related to congestion such as high BER, delays due to reordering of packets. Several approaches have been proposed to deal with this issue that can be categorized to either end system based or network assisted. This paper presents a comprehensive TCP performance evaluation study to understand the nature of the TCP performance in different scenarios in mobile Ad-hoc network.***

Keywords: Autonomous, Dynamic, Infrastructure, Nodes , Optimized Link State Routing Protocol ,Temporally Ordered Routing Algorithm, Throughput, Topology.

1. Introduction

A mobile ad hoc network (MANET) is a self-determining ad hoc wireless networking system consisting of independent nodes that move dynamically changing network connectivity. The network can be formed anywhere, at any time, as long as two or more nodes are associated and communicate with one another either directly when they are in radio range of each other or via intermediate mobile nodes because of suppleness that a MANET offers[1,2]. A wireless network is a growing new technology that will allow users to access services and information electronically, irrespective of their geographic position. Wireless networks can be classified in two types: - infrastructured network and infrastructure less (ad hoc) networks. Infrastructured network consists of a network with fixed and wired gateways. In ad hoc network each node acts both as a host (which is capable of sending and receiving) and a router which forwards the data intended for some other node. Mobility is becoming increasingly important for users of computing systems. Technology has made possible smaller, less expensive and more powerful wireless communicating devices and computers. As a result users gain suppleness and the ability to exchange information and maintain connectivity while roaming through a large area. The necessary mobile computing support is being provided in some areas by installing base stations and access points. Recent advancements such as Bluetooth introduced a fresh type of wireless systems which is frequently known as mobile ad-hoc networks. Mobile ad-hoc networks or "short live" networks control in the nonexistence of permanent infrastructure. Mobile ad hoc network offers quick and horizontal network deployment in conditions where it is not possible otherwise. TCP [3] is a connection-oriented transport layer protocol that provides reliable,in-order delivery of data to the TCP receiver.

2. Mobile AD-HOC Network

A mobile ad hoc network (MANET), sometimes called a wireless ad hoc network or a mobile mesh network is a wireless network, comprised of mobile computing devices (nodes) that use wireless transmission for communication, without the aid of any established infrastructure or centralized administration such as a base station in cellular network or an access point in wireless local area network.

Figure 1: Mobile Ad Hoc Networks

The nodes are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably.

2.1 Characteristics of MANET

- **Wireless Medium-** In an ad hoc environment, nodes communicate wirelessly and share the same media.
- **Autonomous and Infrastructure Less-** MANET does not depend on any established infrastructure or centralized

administration. Each node operates in distributed peer-to-peer mode, acts as an independent router and generates independent data.

- **Dynamic Network Topology-** In mobile ad hoc networks, because nodes can move arbitrarily, the network topology can change frequently.
- **Limited Availability of Resources-** Because batteries carried by each mobile node have limited power supply, processing power is limited, which in turn limits services and applications that can be supported by each node.

2.2 Advantages of MANET

1. Provide access to information and services regardless of geographic position.
2. These networks can be set up at any place and time

2.3 Disadvantages of MANET

1. Limited resources and physical security
2. Lack of authorization facilities.
3. Volatile network topology makes it hard to detect malicious nodes.
4. Security protocols for wired networks cannot work for ad hoc networks.

2.4 MANET Protocols

MANET Protocols are following:

1) OLSR
The Optimized Link State Routing Protocol is a Proactive link state protocol .OLSR employs three mechanism for routing (1)Hello message for neighbor sensing message (II)Control packet using multi-point rely(MPR).(III)Path selection using shortest path first algorithm.[7].

2) DSDV
The Destination Sequence Distance Vector (DSDV) is a proactive routing protocol. This protocol adds a new attribute, sequence number, to each route table entry at each node. Routing table maintained at each node and with this table; node transmits the packets to other nodes in the network.

3) AODV
The Ad Hoc On-demand Distance Vector Routing (AODV) protocol is a reactive unicast routing protocol for mobile ad hoc networks. As a reactive routing protocol, AODV only needs to maintain the routing information about the active paths.

4) TORA
The Temporally-Ordered Routing Algorithm is a highly adaptive scalable and efficient distributed routing algorithm which works on the principle of link reversal [6]. This protocols based on three function (1)Route Creation for creating the route source to destination.(2) Route maintenance maintain the session during the packet transfer(3)Route Eraser use for ending the session of data sending and ensure that the occupied route is free.

3. Transmission Control Protocol

TCP [3] is a connection-oriented transport layer protocol that provides reliable, in-order delivery of data to the TCP receiver.

3.1 Features of TCP

a) **Sequencing-** A sequence number is attached to each transmitted segment. At the receiver side no segment is delivered until all lower segments have been delivered.
b) **Buffering-** Buffering is used to balance the flow, if any buffer is full incoming packets will be drop, they will be not acknowledged and sender will send them again. To avoid overflowing the buffer, TCP sets a windows size field in each packet that it transmits.
c) **Flow Control-** The sender takes care not to overwhelm the receiver. The problem is what is the correct time to wait for ACKs. It is too low, packets are retransmitted unnecessarily, and if it is too high the connection can be idle while the host waits to timeout.
d) **Checksum-** Each segment carries a checksum. If the received segment does not match the checksum, it is dropped.
e) **Network Adaptation-** Buffering and flow control make TCP learn dynamically the delay characteristics of a network and adjust its operation to maximize throughput without overloading the network.

3.2 Types of TCP Protocols

- **TCP Tahoe-** Tahoe refers to the TCP congestion control algorithm. TCP Tahoe [4] is based on a principle of 'conservation of packets', i.e. if the connection is running at the available bandwidth capacity then a packet is not injected into the network unless a packet is taken out as well. When congestion encounters it decrease over sending rate and reduced congestion window to one.
- **TCP Reno-** TCP Reno is the most widely adopted Internet TCP protocol. It employs [5] four transmission phases: slow start, congestion avoidance, fast retransmit, and fast recovery.
- **TCP New Reno:** New Reno [4] is a slight modification over TCP-Reno. It is able to detect multiple packet losses and thus is much more efficient than Reno in the event of multiple packet losses.
- **TCP Sack:** Sack algorithm allows a TCP receiver to acknowledge out-of-order segments selectively rather than cumulatively by acknowledging [5] the last correctly in order received segment.
- **TCP Fack-** This protocol measure the total number of bytes of data outstanding in the network. When congestion is detected the window should be halved according to the multiplicative decrease of the correct CWND.

4. Methodology

In this paper results are obtained by using the network simulator -2.The output results of TCP & AD-HOC protocols are compared .In this paper we describe the simulation of various protocols.

4.1 Simulation

Throughput vs. Speed

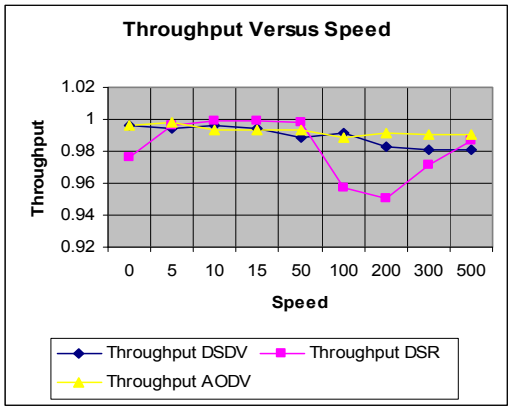

Figure2: Throughput for each protocol versus speed

Throughput vs. TCP Protocol Types

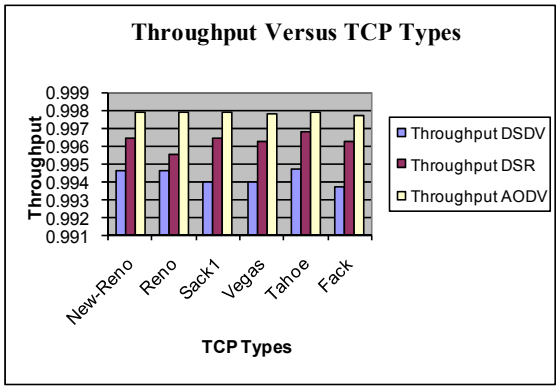

Figure 3: Throughput for each of the DSDV, DSR, AODV protocols versus the TCP protocol type

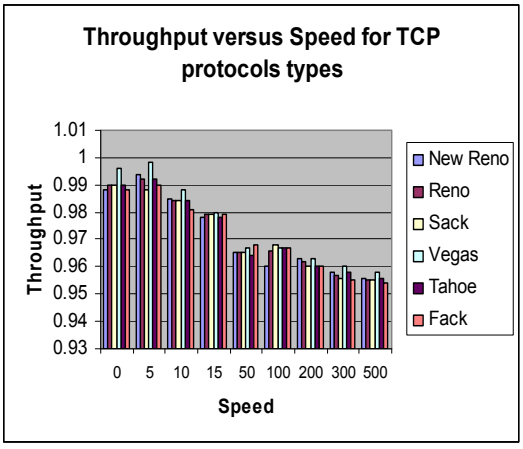

Figure 4: Throughput for each TCP protocol types versus speed

5. Conclusion

In this paper, we discussed main issues of TCP performance over mobile ad hoc networks. We have used Network Simulator [NS-2] as a tool for evaluating mobile ad hoc networks and various TCP variants used in such networks. We compared different TCP protocols for AODV, DSR, DSDV routing protocol for the MANET with varying speed. From simulation results it is concluded that Throughput of various routing protocols decrease with increase in the speed of nodes Increase in the density of nodes yields to an increase in the Average end-to-end Delay. Throughput performance of all TCP Variants is better for AODV routing protocol as compared to DSR & DSDV. However it is currently impossible to quantitatively compare and contrast most ad hoc routing protocols.

Reference

[1] Jun-Zhao Sun *"Mobile Ad Hoc Networking: An Essential Technology for Pervasive Computing"*, Proc. International Conferences on Info-tech & Info-net, Beijing, China, C:316 - 321,2001

[2] Imrich Chlamtac, Marco Conti, Jennifer J.-N. Liu, *"Mobile Ad Hoc Networking: Imperatives and Challenges"*, I. Chlamtac et al. / Ad Hoc Networks 1, 2003, Page 13–64I. S. Jacobs and C. P. Bean, "Fine particles, thin films and exchange anisotropy," in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.

[3] Jian Liu and Suresh Singh, *"ATCP: TCP for Mobile Ad Hoc Networks"*, IEEE Journal on Selected Areas in Communications, Vol. 19, No. 7, July 2001.

[4] Anshu Chaturvedi, D.N.Goswami, Sandeep K. Tiwari, *"An Enhanced TCP Corruption Control Mechanismfor Wireless Network"*, IJCST Vol. 3, Issue 1, Jan. - March 2012.

[5] Laxmi Subedi, Mohamadreza Najiminaini, and Ljiljana Trajkovic, *"Performance Evaluation of TCP Tahoe, Reno, Reno with SACK, and NewReno Using OPNET Modeler"*, in Simon Fraser University Vancouver, British Columbia, Canada, 2009.

[6] Dinesh Singh, Deepak Sethi,Pooja *"Comparative Analysis of Energy Efficient Routing Protocols in MANETS(Mobile Ad-hoc networks)"*International Journal of Computer Science and Technology(IJCST) Vol.2, Issue 3, September 2011

[7] C. Perkins and E.Royer *"Adhoc on-demand distance vector Routing"*.In Proceedings of Second IEEE Workshop on Mobile Computing Systems and Application(WMCSA'99).pages 234-244.1994.

Author Profile

Nishi received the B. Tech. degree in Electronics and Communication Engineering from Matu Ram Institute of Engineering and Management in 2012. Now she is pursuing M. Tech from Meri College of Engineering & Technology, Sampla (Haryana). She got 65th rank in all Haryana Talent ship Competition.

Kirti received the B. Tech. degree in Electronics and communication Engineering from Matu Ram Institute of Engineering and Management in 2012 . Now she is pursuing M. Tech from Meri College of Engineering & Technology, Sampla (Haryana).