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RESEARCH ARTICLE

Ns-2 Simulation for Performance Comparison of Link State and Distance Vector Protocol using Tracegraph

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Abstract: A group of mobile hosts which are connected by wireless means is called as ad-hoc network. Ad-hoc means network is created when it is required. As these mobile hosts are not static so these form a temporary network. Links in these networks keep on changing very frequently. So these networks do not have any base station or fixed infrastructure. No specific router is involved in ad-hoc routers. So each node has to act as router for itself. Because of wireless medium communication range of every host is limited. Because of this limited range a host cannot communicate to every other host in the network. For communication it has to include its neighbor nodes in order to make links. A number of protocols are provided to find routes from one node to any destination. In this paper we briefly introduce two table driven protocols and then analyze their performance in different network densities. Metrics used are packet size vs average throughput of generating packets, packet size vs average simulation end to end delay and packet sent time vs end to end delay . For visualization ns-2 tool is used. By using these factors graphs are drawn with tracegraph utility.

Keywords: Dsdv, Olsr, link state, distance vector, throughput, delay.

Introduction

In past communication was very difficult with wireless networks. Communication was only possible with wired networks but as technology is improving day by day it has become very easy to communicate by using wireless networks. These networks are highly dynamic in nature as links keeps on changing. So network is created only when need to communication arises. That's why these networks are called as ad-hoc networks. It is not possible for every node to have a direct link with all other moving hosts in the network. So some protocols are designed to provide routes. These protocols are divided as on-demand and table driven types. On demand protocols are also called as reactive protocols because these provide routes only when request comes for communication. Table driven protocols are also called as proactive protocols because these protocols always have routes available. Whenever there is some change in network topology tables stored at each node gets updates by flooding like methods and stale entries are removed. In this paper we study and analyze the results of two proactive protocols. It is Difficult to store and maintain entries at each node. So proactive protocols are not good for large networks as overhead created by flooding messages in these protocols is very large. All proactive protocols used for mobile ad-hoc networks use in built algorithms to create routes between nodes.

Dsdv

The protocol used to solve the major problem which is loop free path associated with distance vector protocol of wired network is Destination Sequenced Distance Vector Protocol(DSDV).It is a proactive or table driven protocol and it is based on Bellman-Ford algorithm. It was introduced by C. Perkins and P. Bhagwat in 1994.Each mobile host maintains a routing table where each entry contains destinations IP address, next hop IP address, number of hops to reach the destination, sequence number assigned by the destination node and settling time. Sequence number

is the number which is used to remove stale entries from the routing table. If there is valid link available to destination then sequence number is generated by destination node which is owner node. Owner node always uses even number. If there is a link break in the route a non owner node can also update sequence number for that route which is an odd number. Each mobile host advertises its own routing table entries with its neighbors nodes in update packet forms. To reduce traffic route update packet is of two types. Full dump packets are used to send complete routing table entries .Full dump packets are used in case of fastly changing network. Incremental update packets are used to send only those entries from the routing table that has a metric change since the last update and it must fit in a packet. It is used when the network is relatively stable to avoid traffic. Each route update packet in addition to the routing table information also contains a unique sequence number assigned by the transmitter. There are two ways to select a route.

- 1) The route labeled with the highest sequence number is used.
- 2) If two routes have the same sequence numbers then the route with the best metric cost is used.

Based on the past history, the nodes estimate the settling time of routes. The stations delay the transmission of a update packets by settling time so as to eliminate those updates that would occur for a very small time. Each row of the update packets contains Destination IP Address, Destination Sequence Number, Hop Count.

Olsr

Optimized link state routing (OLSR) protocol is a proactive protocol. It is an optimization of link state protocol used in wired network. As it is a table driven protocol it always has routes available. It used two types to messages hello messages and Topology control (TC) messages. Multipoint relay concept is used to reduce the traffic due to retransmission of flooding messages. In pure link state protocol links with all the neighbor nodes are declared. But in case of Olsr to reduce the size of control packet only links with multipoint relay selector are declared in hello messages. To minimize the control traffic it uses the concept of selected nodes called as Multi point relay (MPR) nodes. MPR’s set is selected in such a way that set of one hop neighbor set of MPR’s consist of all two hop neighbor nodes of multipoint relay selector. Only nodes selected as MPR can retransmit the broadcast messages. The nodes which are not in the MPR’s set can only receive and process broadcast messages but cannot retransmit them. Each node maintains a list of MPR selector. Every packet coming from MPR selector is assumed to be retransmitted. This list keeps on changing every time nodes move. This change is reflected by the selector nodes in their hello messages. Each node in the MPR’s set generates TC messages.TC messages consists of originator’s address, addresses of MPR’s set that node and MPR selector nodes. If a node is not selected as MPR by any MPR selector than it can not generate TC messages. Olsr is best suited for large and dense network as multipoint relay concept is best suited in this context. More dense a network is more optimization is achieved. MPR’s set should as small as possible. Higher optimality is achieved in case of small MPR set. Every route in Olsr from source to destination is a sequence of hops which are multipoint relays. MPRs are one hop neighbors with bi-directional links available. MPRs act as intermediate nodes in every path. So to maintain routes in the routing table available each node has to periodically broadcast information about its one hop bi-directional neighbors. Each node creates and updates routes after receiving this information. Selection of bi-directional nodes as intermediate nodes solves the problem related with acknowledgment of data packets along uni-directional links. With the help of hello messages each nodes can select its MPRs set because hello messages contain information about neighbors which are upto two hops. After receiving hello messages nodes can construct the list of its Multipoint relay selector nodes. In the neighbor table, Each node records the information about its one hop neighbors with their link status which can be uni-direction,bi-directional,MPR and two hop neighbors. The validity of entries of neighbor table depends upon the holding time. It also contains a sequence number which is incremented every time the MPR set of the local node is updated.

Result

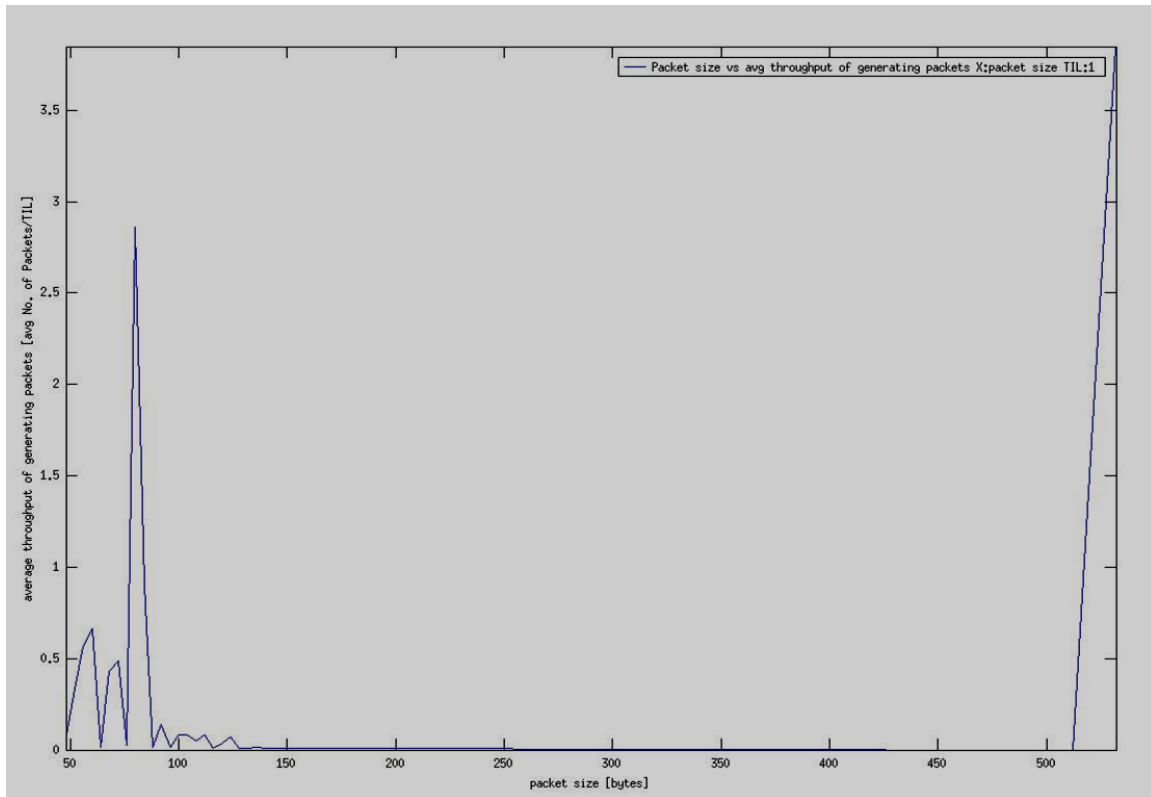
Table1: parameters used

Metricies	Packet size vs throughput Packet size vs end to end delay Packet sent time vs average simulation
Number of nodes	10,20,30
Protocols used	Olsr,Dsdv
Type of connection	Tcp
Maximum packet size	1200 bytes
Maximum topology area	600*600
Maximum simulation time	150
Mobility model used	Random way point model
Maximum queue length	50 Packets
Simulator	Ns-2.35

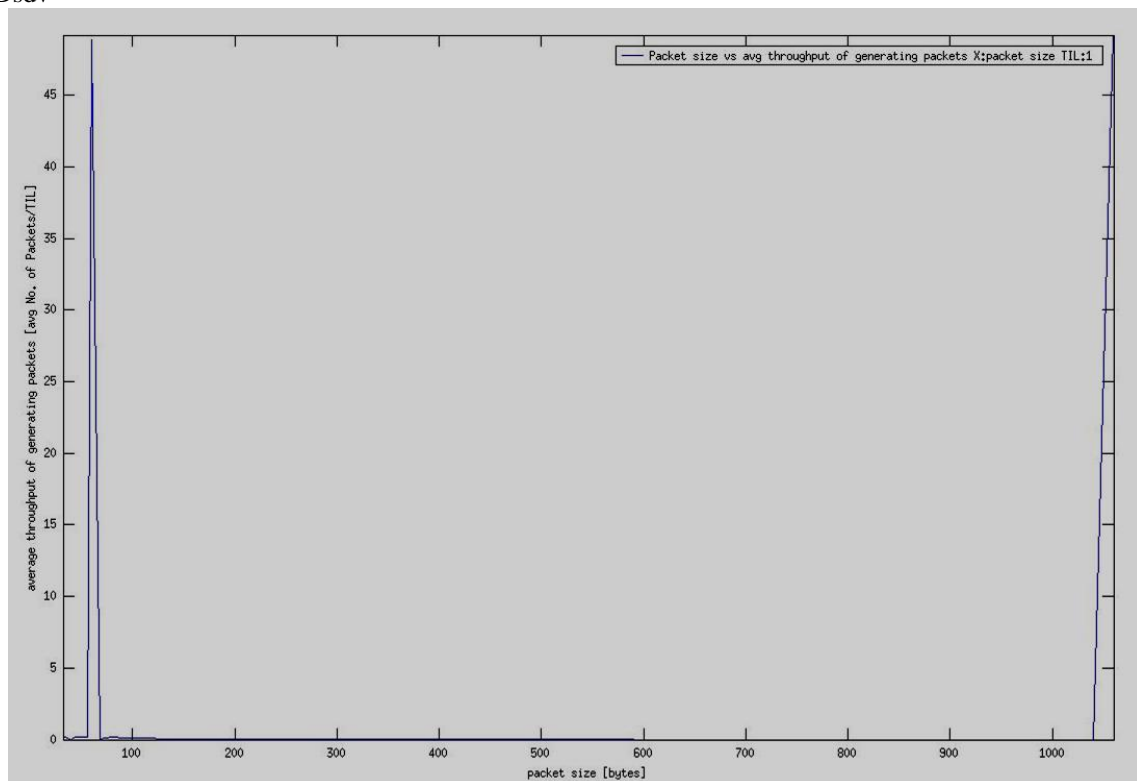
Type i) Graphs for 10 nodes

A) Graphs for packet size vs average throughput of generating packets

For Olsr

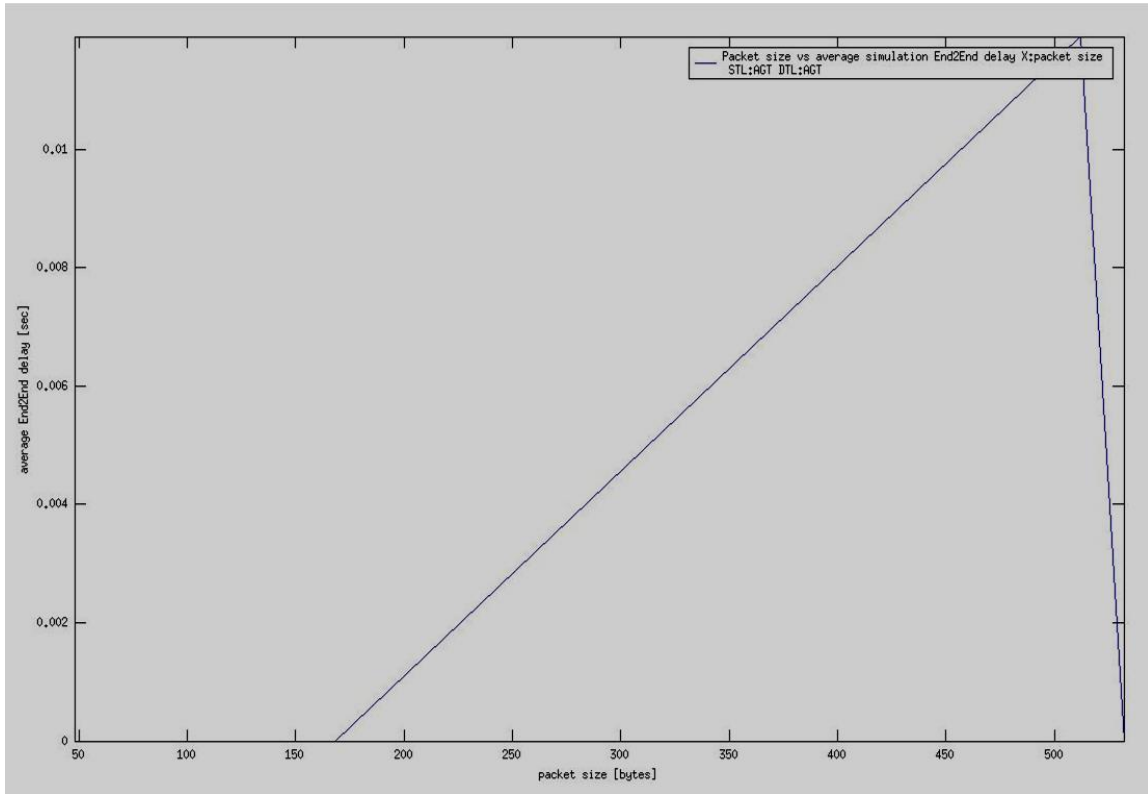


For Dsdv

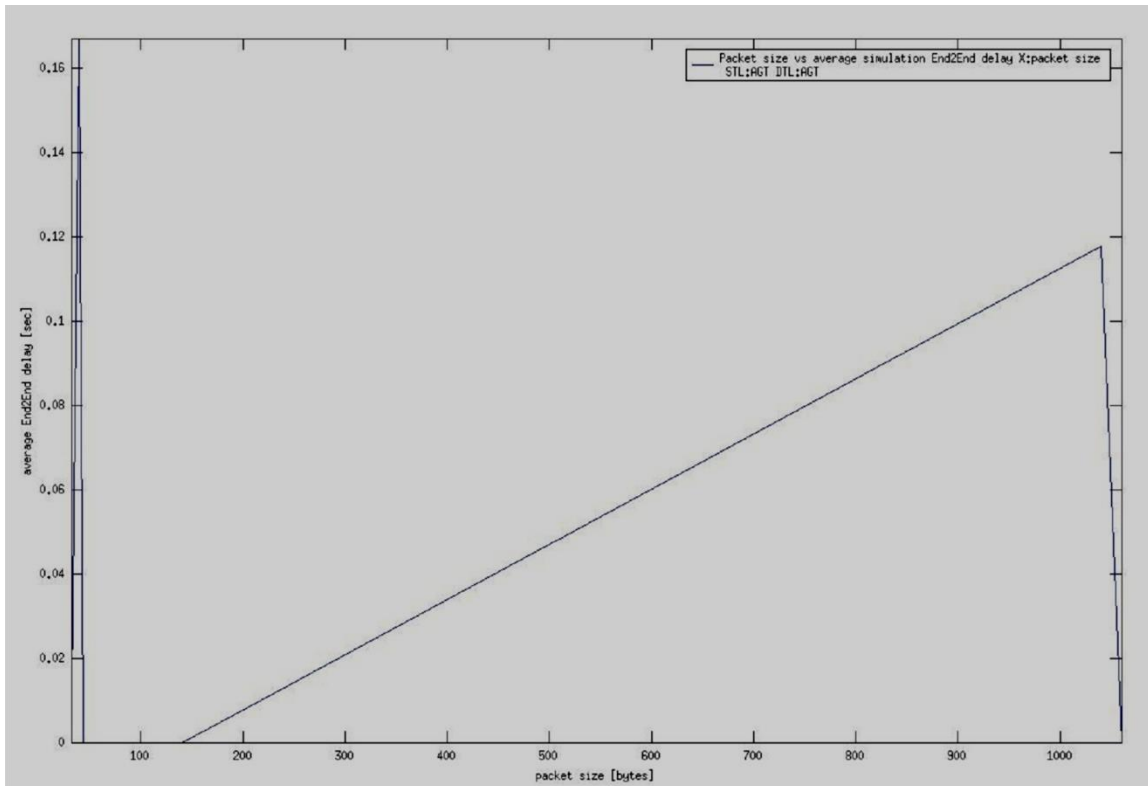


In case of 10 nodes we observe that as the packet size is increasing, throughput of dsdv is much higher than olsr.

B) Graphs for packet size vs average simulation end to end delay
For olsr

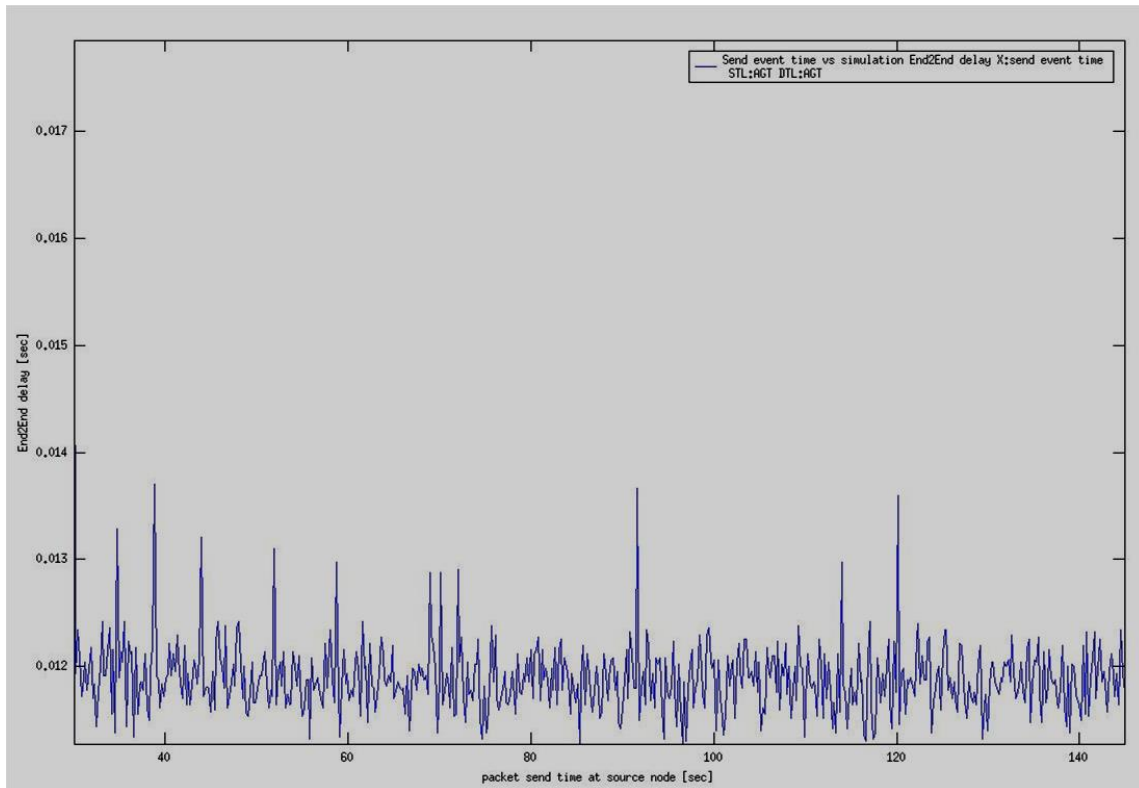


For Dsdv

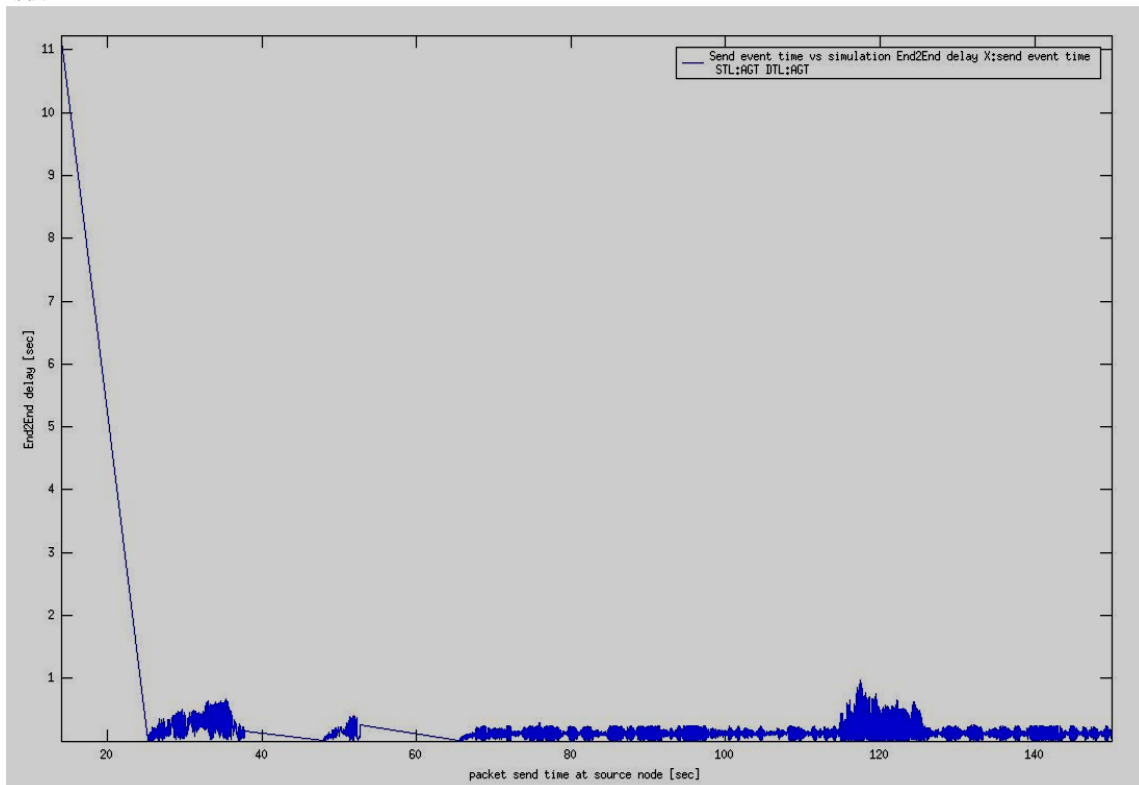


In case of 10 nodes we observe that as the packet size is increasing end to end delay of dsdv is slightly higher than olsr.

C) Graphs for packet send time vs simulation end to end delay
For Olsr



For Dsdv

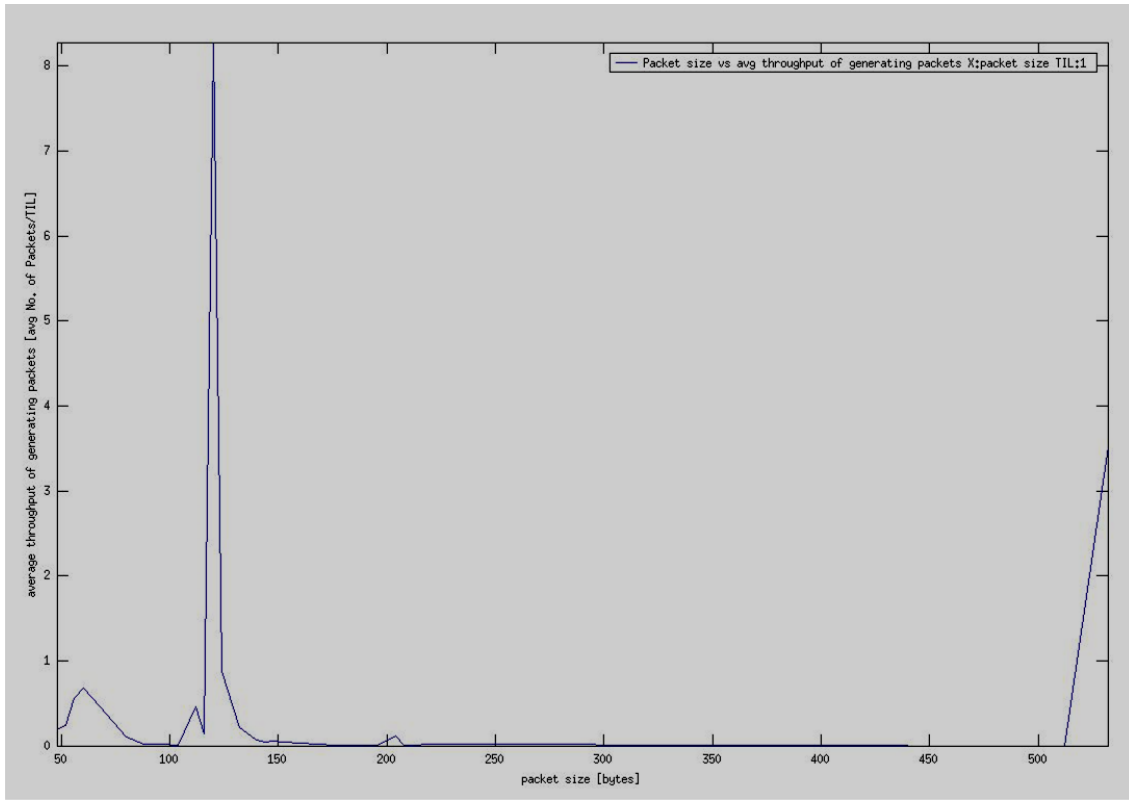


In case of 10 nodes we observe that as the packet sent time is increasing end to end delay of dsdv is much higher than olsr.

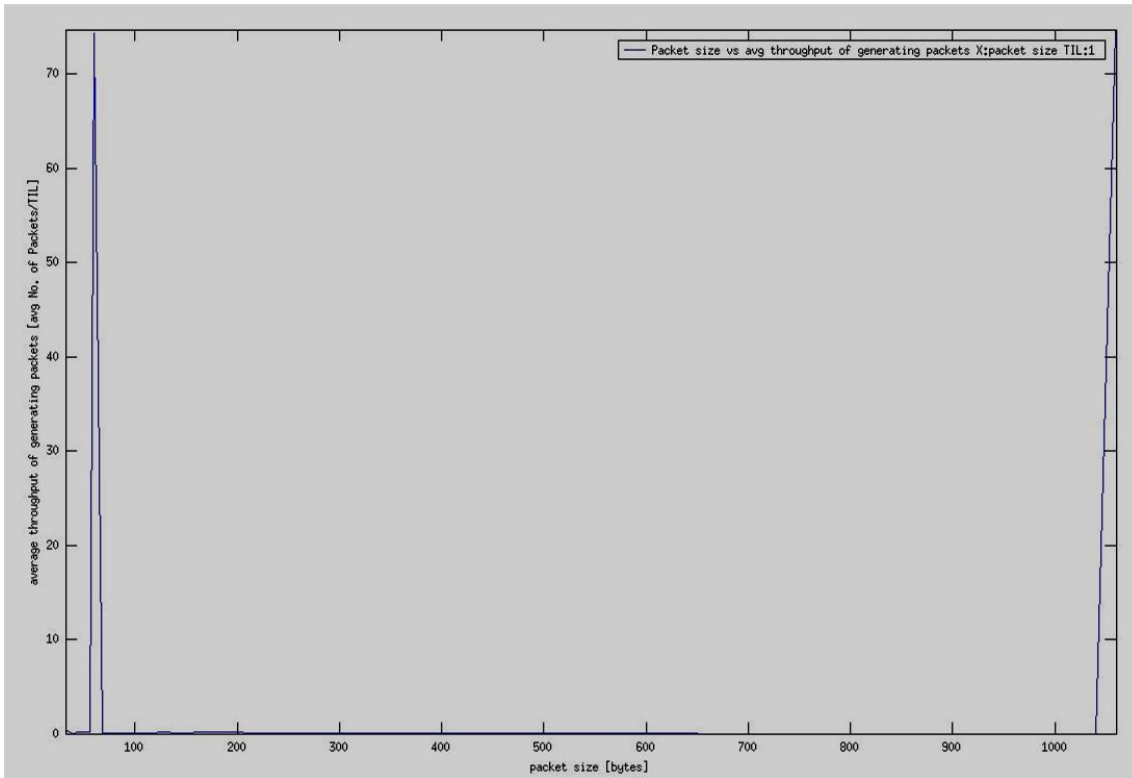
Type ii) For 20 nodes

A) Graphs for packet size vs average throughput of generating packets

For Olsr

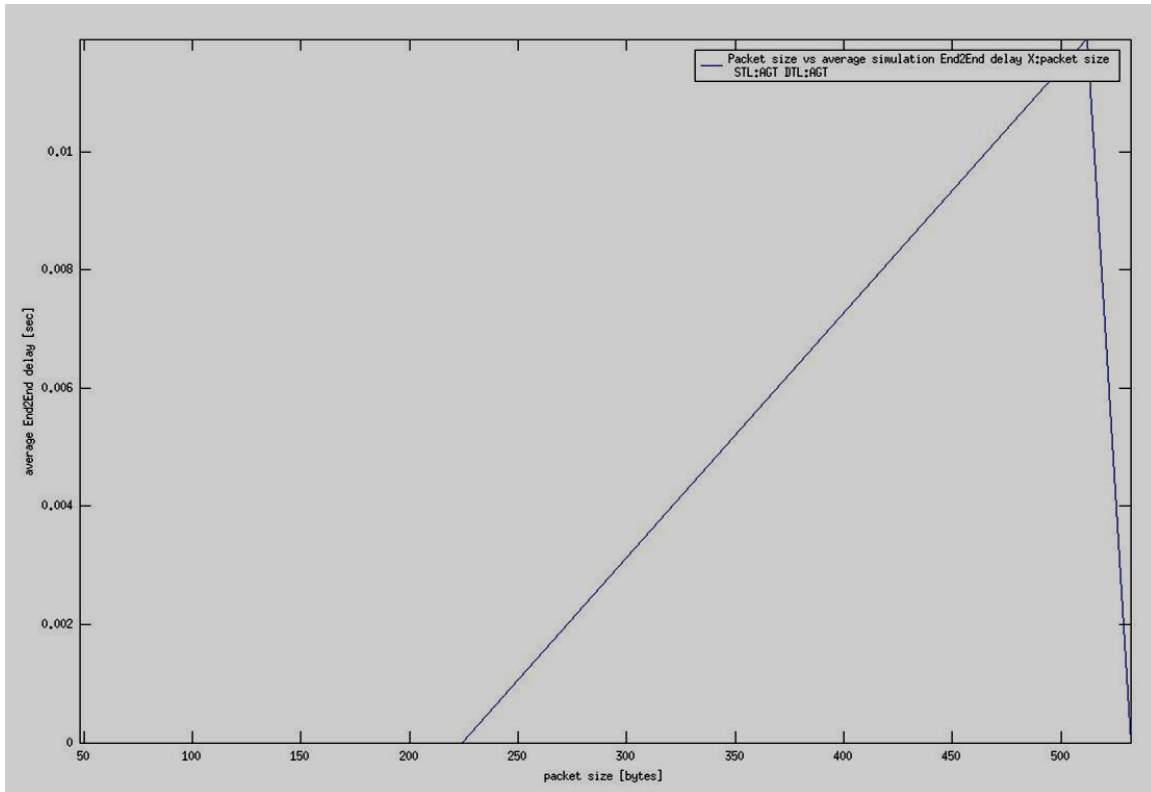


For Dsdv

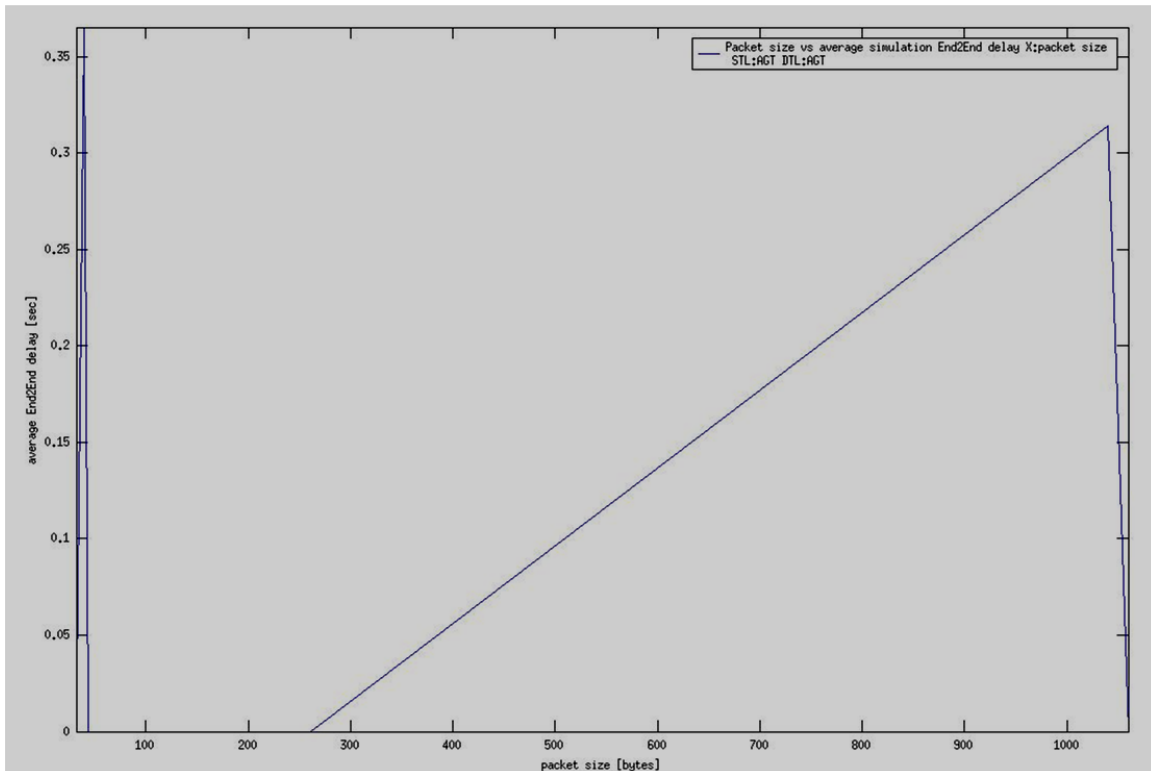


In case of 20 nodes as the packet size is increasing throughput of Olsr is higher than throughput of dsdv.

B) Graphs for packet size vs average simulation end to end delay
For Olsr

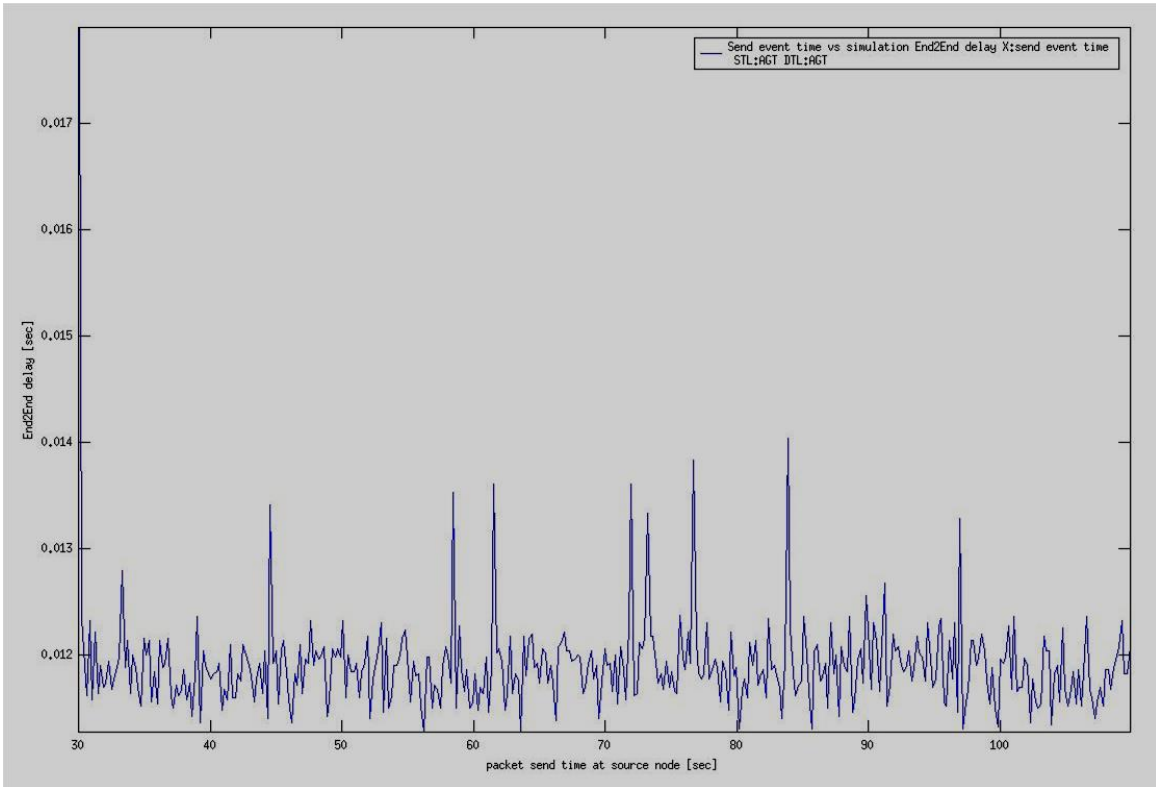


For Dsdv

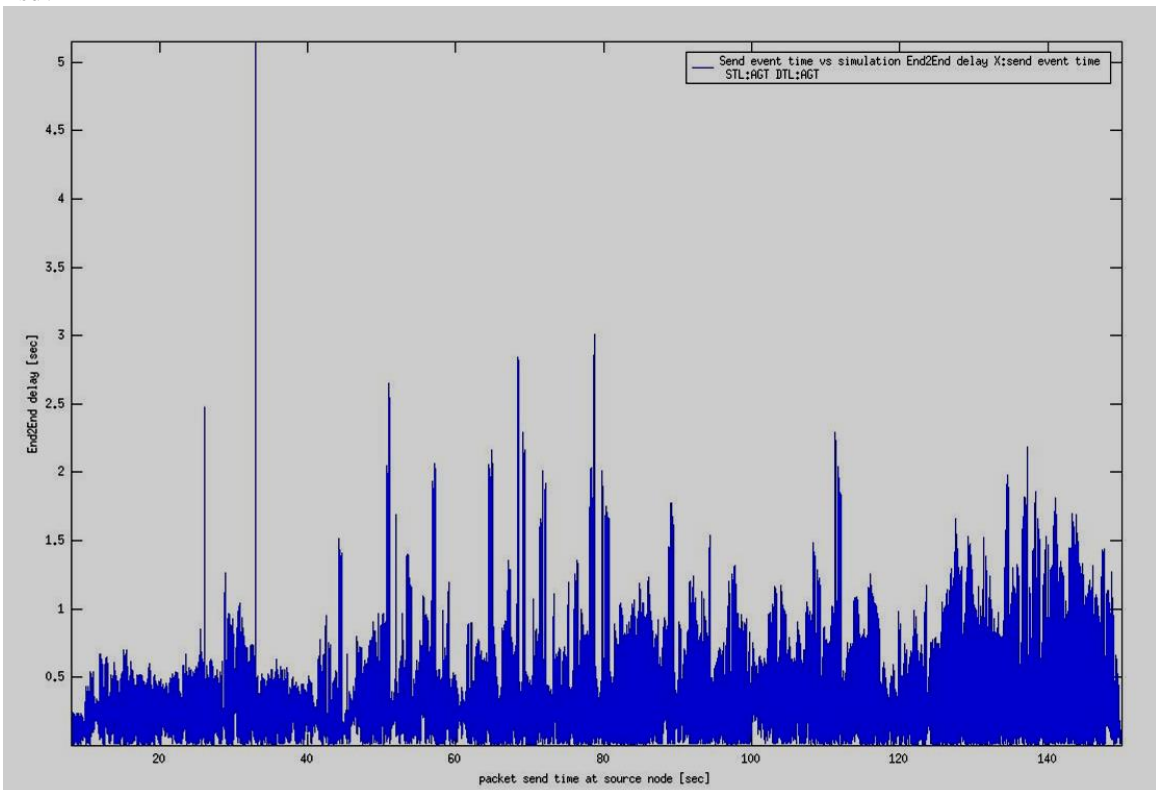


In case of 20 nodes as the packet size is increasing end to end delay of dsdv is higher than olsr.

C) Graphs for packet send time vs simulation end to end delay
For Olsr



For Dsdv



In case of 20 nodes we observe that as the packet sent time is increasing end to end delay of dsdv is much higher than olsr.

Summary

Type of protocols used are: Table driven and Table driven.

Simulation tool used: **ns-2**

Graphic tool used: **Tracegraph**

Metrics used are:

- a) Packet size vs throughput
- b) Packet size vs delay
- c) Sent time vs delay

Type of connection used: Tcp

Number of nodes used: 10, 20, 30.

Maximum packet size: 1200.

When packet size increases than 1200 both protocols failed to deliver packets because of network congestion. Simulation ends just one second after total simulation time.

Parameters used to fix in tcl file:nodes initial position, nodes final position ,number of nodes, connection between nodes and total simulation time.

Nodes decide their own path to move from source to destination.

The following result shows the graphs that were obtained using these metrics and comparison of two proactive protocols **dsdv** and **olsr**.

Conclusion

In this paper we conclude that a brief introduction of dsdv and olsr is given. Both these protocols are of proactive or table driven type. we conclude that overhead is much more in case of olsr as number of tables maintained at olsr is more than dsdv so number of broadcast messages by any node to maintain tables in case olsr is more than dsdv. Performance analysis is done here by using ns-2 simulation tool. Tracegraph is used to create graphs by using trace files of corresponding tcl files here. Three factors are used to to perform comparison analysis packet size vs average throughput of generating packets ,packet size vs average simulation end to end delay and packet sent time vs simulation end to end delay. Three cases of 10,20 and 30 nodes are used to increase network density. Different connections are created between nodes to analyze performance. Based on these factors following table is drawn.

Table 2: Performance analysis of olsr and dsdv

Metrics No.of nodes	Packet size vs Throughput			Packet size vs end to end delay			Packet sent time vs end to end delay		
	Olsr	<	Dsdv	Olsr	<	Dsdv	Olsr	<	Dsdv
10	Olsr	>	Dsdv	Olsr	<	Dsdv	Olsr	<	Dsdv
20	Olsr	>	Dsdv	Olsr	<	Dsdv	Olsr	<	Dsdv
30	Olsr	>	Dsdv	Olsr	<	Dsdv	Olsr	<	Dsdv

We conclude that as network density increases throughput of olsr seems to be better than dsdv. In every case end to end delay of dsdv is better than olsr because number of broadcast messages in case of dsdv is less than olsr. Also we notice that as network density goes on increasing delay of dsdv goes on increasing. So we can say dsdv proves to be a better protocol in cases where network density is low.

Future Work

Both of these dsdv and olsr protocols can be analyzed using using other tools like ns-3 and opnet etc. Xgraphs like other utilities can be used to create graphs. Other factors can be used for comparison of dsdv and olsr at each succession increment of number of nodes. Some mechanism must be there to reduce overhead problems in table driven protocols. As there is no method to reduce this so there is lots of scope related to this problem. Table driven protocols can be better in case of highly dynamic network as routes are always available here at the cost of overhead.

References

- [1] Sakil Ahmad Ansari & Prof.Saoud Sarwar,"An Analytical Approach for Security Measures Issues in MANET", International Journal of Advanced Research in Computer Science and Software Engineering ,Volume 4, Issue 2, February 2014, ISSN: 2277 128X
for Ad Hoc Networks
- [2] Kiranveer Kaur,Surinderjit Kaur & Vikramjit Singh," A Comprehensive Performance Analysis of Proactive and Reactive MANET Routing Protocols", International Journal of Advanced Research in Computer Science and Software Engineering, Volume 4, Issue 2, February 2014 ,ISSN: 2277 128X

- [3] Gurbinder Singh & Asst. Prof. Jaswinder Singh,” MANET: Issues and Behavior Analysis of Routing Protocols “,International Journal of Advanced Research in Computer Science and Software Engineering, Volume 2, Issue 4, April 2012, ISSN: 2277 128X
- [4] Ramandeep Kaur & Chandan Sharma,”Review paper on performance analysis of AODV, DSDV, OLSR on the basis of packet delivery”,IOSR Journal of Computer Engineering (IOSR-JCE) ,Volume 11, Issue 1 (May. - Jun. 2013), e-ISSN: 2278- 0661,p- ISSN: 2278-8727
- [5] Rutuja Rajan More & S. V. Sankpal,” Performance Evaluation of An Efficient DSDV Routing Protocol For Ad Hoc Networks “,ITSI Transactions on Electrical and Electronics Engineering (ITSI-TEEE), Volume -1, Issue -4, 2013, ,ISSN (PRINT) : 2320 – 8945
- [6] NehaSingla & Ruby Gupta,”A Review of Performance Evaluation of the Routing Protocols in MANETs”,International Journal of Innovative Research in Computer and Communication Engineering, Vol. 2, Issue 11, November 2014,ISSN(Online): 2320-9801 ISSN (Print): 2320-9798
- [7] Priyanka Goyal, Vinti Parmar & Rahul Rishi,” MANET: Vulnerabilities, Challenges, Attacks, Application”,IJCEM International Journal of Computational Engineering & Management, Vol. 11, January 2011 ,ISSN(Online): 2230-7893
- [8] Mina Vajed Khiavi, Shahram Jamali & Sajjad Jahanbakhsh Gudakahriz,” Performance Comparison of AODV, DSDV, DSR and TORA Routing Protocols in MANETs “,International Research Journal of Applied and Basic Sciences, Vol. 3(7) , 1429-1436, 2012,ISSN 2251-838X ©2012
- [9] Khushboo Tripathi, Tulika Agarwal & S. D.,” DixitPerformance of DSDV Protocol over Sensor Networks”,International Journal of Next-Generation Networks (IJNGN), Vol.2, No.2, June 2010,10.5121/ijngn.2010.2205 53
- [10] Alex Hinds, Michael Ngulube, Shaoying Zhu & Hussain Al-Aqrabi,”A Review of Routing Protocols for Mobile Ad-Hoc NETWORKS (MANET)”, International Journal of Information and Education Technology, Vol. 3, No. 1, February 2013 ,DOI: 10.7763/
- [11]Neelam Chauhan & Paramjeet Singh,”Simulation of DSDV Protocol”,Special Issue of IJCCT, Volume- 3, Issue-1, , ISSN (ONLINE) : 2231–0371, ISSN (PRINT) : 0975–7449