International Journal of Advanced Research in

Computer Networking,Wireless and Mobile Communications

Volume: 1 Issue: 2 08-Mar-2013,ISSN_NO: 2320-7248

Comparative Analysis of Performance of Ad-Hoc Wireless Routing Protocols Based On Topology Using Qualnet

K Munivara Prasad V Jyothsna and M Ganesh Karthik Assistant Professor (SL), Department of CSE,Sree Vidyanikethan Engg College, Tirupati.AP,INDIA, Assistant Professor, Department of IT, Sree Vidyanikethan Engg College, Tirupati.AP,INDIA
Department of CSE, Sree Vidyanikethan Engg College, Tirupati.AP,INDIA.

Abstract:

Ad-hoc Network is an infrastructure less wireless network. Ad-hoc networks do not have a constant topology due to mobility of the nodes. The nodes keep a track of this dynamic topology by announcing its presence through broadcasting and listens to the presence of other nodes. Each node maintains the table of information regarding the topology. There many protocols such as AODV, DSR, FSR. These protocols maintain the topology information in different ways. This paper focuses on analyzing the performance of the protocols based on some quality of service parameters such as Packets lost, end to end packet delivery delay, and jitter and packet delivery ratio. This paper concentrates on mobility of nodes as major constraint. This analysis is performed using the Qualnet network simulator, which is similar to NS2.
Keywords: Ad-hoc Network, Topology, AODV, DSR, FSR

1. Introduction

Ad-hoc Routing protocols are broadly classified into 4 categories[5] based on 1. Routing information update mechanism, 2. Use of temporal information for routing, 3. Routing topology and 4. Utilization of specific resources. This paper mainly deals with the protocols based on routing topology such as AODV, DSR, and FSR. Depending upon number of nodes used in the network, it can further be divided into 2 types such as flat topology and hierarchical topology. The flat topology can be used in case of less number of nodes. And the hierarchical topology

can be used in case of large number of nodes. This paper compares both the flat and hierarchical topology. AODV, DSR belongs to flat topology and the FSR deals with the hierarchical topology.

2. Related Work

Dynamic Source Routing Protocol (DSR) DSR is a „beacon-less" on demand routing protocol that does not require periodic hello packet to inform its presence to its neighbors [5]. It uses the flooding mechanism to establish the route between the source and destination. The intermediate nodes maintain the route cache information to reduce the control overhead [5]. The main advantage of this approach is that, the route is established only when it is needed. So no periodic update is required. The major disadvantage is that route cache information does not help to heal the broken links. As the mobility increases the performance degrades. [1][2][3] 2.2 Ad-Hoc on-Demand Distance Vector Routing Protocol (DSDV) AODV is an On Demand routing protocol in which the routes are established only when required and uses the flooding mechanism to find new routes as in

DSR but the difference is that, the source node and the intermediate nodes stores the next hop information and it makes use of the destination numbers to find out the most recent paths. The major disadvantage is that if the source sequence numbers are very old, then it can lead to inconsistent routes. Periodic beaconing increases the control overhead. [1][3][5]

2.3 Fisheye State routing Protocol (FSR) FSR maintains the accurate information about the nodes which is in the local topology and less accurate information about the nodes which are far away. As the distance increases the accuracy decreases. Each node has the topology information but does not flood to all the nodes in the network but only with its neighbors. Shortest paths are computed as and when required. Updating the topology information takes place periodically because the wireless networks are more unstable. This is best suited for the large number of nodes in a network[1][3][5]. 3. Proposed Work With the clear understanding of the functionality of the routing protocols, the plan for the analyzing the performance of AODV, DSR and FSR is discussed further. In order to check whether the protocols works well even in the absence of mobility of nodes without the performance degradation. we have designed a scenario with 20 nodes placed in a random manner with no mobility. We try to send 100 items from a source and destination. Since we have taken mobility of nodes as the major issue in designing the protocols, we have to analyze the performance of the protocols with mobility. In DSR, AODV and FSR, the intermediate nodes store the information about their neighbors and it chooses the nearest shortest path to establish the route between the source and destination. Applying mobility for the nodes which are very far from source and destination is considered unnecessary in this paper. So mobility is done manually for the same scenario with same 20 nodes, which are near to the source and destination nodes and to the next intermediate nodes alone.

Network Simulator	Qualnet
Version	5.2
Number of Nodes	20 wireless nodes
Simulation time	300s
Traffic	CBR (Constant Bit Rate)
Mobility Model	Manual
CBR Packet size	512 bytes
Number of CBR packets	100

5. Metrics used 5.1. Jitter Jitter in other words called Packet Delay Variation (PDV) is defined as the variation of delay over time in delivery of packets from one point to other point. If the variation is high then there is more chance of degradation of quality due to the retransmission of the lost packets which in turn may increase the control overhead.[6]

5.2. Throughput Throughput is defined as the average rate of delivery of packets without any error over a communication channel. The channel may be physical link or logical link.. Throughput is measured in bits/sec in Qualnet. But can also be taken as Number of data packets/sec.[4][6] 5.3. Average end to end Delay Average end to end delay indicates the delay in

time taken for the packets to pass from one layer to the other from source to destination.[4] 6. Topology A set of 20 nodes is added to a wireless network. CBR link is created between the source and destination. Simulation is done without mobility and the results are noted. Mobility is applied to the same set of nodes manually and then the simulation is done with mobility and the results are noted. The results are compared and analyzed to check the efficiency of the protocols using the above said metrics.

7. Results and Discussions The results computed from the simulation are tabulated below. The keywords used in the table and graph are abbreviated below. DSR - Dynamic Source Routing Protocol without mobility. DSR_M - Dynamic Source Routing Protocol with mobility. AODV- Ad hoc On-demand Distance Vector Routing without mobility. AODV_M - Ad hoc On-demand Distance Vector Routing with mobility. FSR – Fisheye State Routing without mobility. FSR_M- Fisheye State Routing with mobility.

Metrics	DSR	DSR_M	AODV	AODV_M	FSR	FSR_M
Throughput (bits/s)	4146	4023	4152	3903	658	250
Jitter (s)	0.0110391	0.00742367	0.00409173	0.02466928	0.00407477	0.00870957
Average end to end delay (s)	0.0246462	0.02611752	0.01787709	0.03346653	0.01941074	0.03467939
Number of packets sent (client)	100	100	100	100	100	100
Number of packets Received (server)	99	97	100	94	46	17

Table 2: Simulation results for the protocols

The throughput observed from the table 2 and fig-1 shows that, the routing protocols works well without mobility. When applied mobility, the performance degrades depending upon the mobility of the nodes. Performance degrades more with high mobility. The above chart shows that AODV protocol has the highest throughput when compared with DSR, which has a slight decrease in the throughput. FSR has a very worst throughput even in a static network.. This is due to periodic updating of topology information among the network leading to more control overhead. In other two protocols there is no periodic updation, which is an advantage and reduces the control overhead.

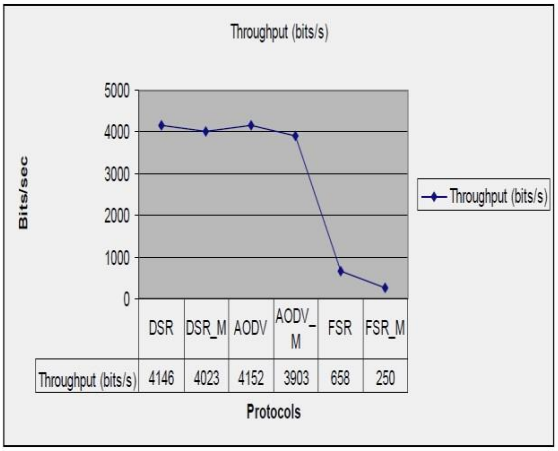

Fig-1 Chart for Throughput metric

In case of mobility applied to the same scenario, the throughput of AODV decreases more and performance is degraded, when compared with DSR. The throughput of FSR is far more worse with mobility

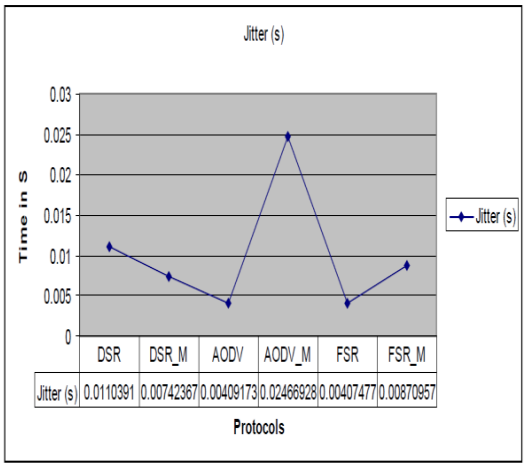

Fig-2 Chart for Average Jitter Metric

The table 2 and Fig-2 shows the simulation results for the metric average jitter in seconds. The average jitter is very less in case of FSR both with mobility and without mobility. This is due to periodic transfer of control and data packets. The jitter for AODV is less than that of DSR in case of static network. When mobility is applied to the same scenario, the results go in reverse order. Jitter for DSR is very less than AODV

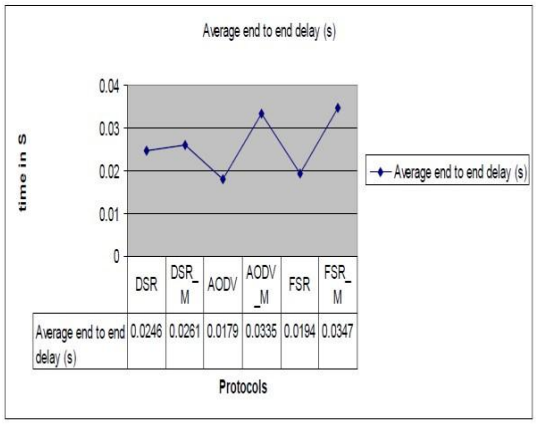

Fig-3: Chart for Average End to End delay.

The Table 2 and the Fig 3 shows the simulated results of the Average end to end delay metric. The delay is found more in case of DSR without mobility, whereas when mobility is applied the delay is more in case of AODV and FSR. 8. Conclusion From the above results and discussions, performance of AODV is good in all the three metrics. So AODV can be applied to the network where the nodes are motionless, or with very less mobility. FSR with or without mobility is worse in case of small networks. Performance of DSR is best in case of mobility when analyzed with the above metrics.

9. References

[1] Rachit Jain1, Laxmi Shrivastava, Study and Performance Comparison of AODV & DSR on the basis of Path Loss Propagation Models , International Journal of Advanced Science and Technology. Vol. 32, July, 2011

[2] David B. Johnson and David A. Maltz. Dynamic source routing in ad hoc wireless networks. Technical report, Carnegie Mellon University, 1996.

[3] Kapang Lego, Pranav Kumar Singh and Dipankar Sutradhar, Comparative Study of Adhoc Routing Protocol AODV, DSR and DSDV in Mobile Adhoc NETwork Indian Journal of Computer Science and Engineering Vol. 1 No. 4 364-371

[4] M.Uma And Dr.G.Padmavathi, A Comparative Study And Performance Evaluation Of Reactive Quality Of Service Routing Protocols In Mobile Adhoc Networks, Journal of Theoretical and Applied Information Technology

[5] C. Siva Ram Murthy and B. S. Manoj, Ad

Hoc Wireless Networks, Architectures and Protocols, Second Edition, Low price Edition,

Pearson Education, 2007

[6]Wikipediapages_
http://en.wikipedia.org/wiki/Jitter#Packet_jitter_
in_computer_networks [7] Tutorial for "Qualnet 5.0.2 User"s Guide

Volume: 1 Issue: 2 08-Mar-2013,ISSN_NO: 2320-7248