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Performance Analysis of AODV and OLSR Using OPNET

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***Abstract* - A mobile ad-hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless links. Each device in a MANET is free to move randomly in any direction and will therefore change its links to other devices rapidly and unpredictably. Mobile devices can communicate with each other without the use of a predefined infrastructure or centralized administration. In this paper routing protocols AODV and OLSR for mobile ad hoc network are compared on the basis of delay, network load and throughput. This comparative study shows that OLSR out performs the rest of three protocols in terms of network load and throughput.**

Keywords: **MANET, AODV, OLSR, OPNET, Routing**

I. Introduction

A mobile ad-hoc network (MANET) is a self-configuring network of mobile routers (and associated hosts) connected by wireless links - the union of which form an arbitrary topology. The routers are free to move randomly and organize themselves arbitrarily; thus, the network's wireless topology may change rapidly and unpredictably. A collection of wireless mobile nodes can dynamically establish the network in the absence of fixed infrastructure [1]. Because of these characteristics, routing is a critical issue and an efficient routing protocol needs to be chosen to make the MANET reliable [2]. The most popular routing protocols in MANET are AODV (reactive) and OLSR (proactive). Reactive protocols find the routes when they are needed. On-demand protocols find a route on demand by flooding the network with route request packets. Proactive protocols are table driven protocols and find routes before they need it. In this paper, four MANET routing protocols AODV and OLSR are evaluated on the basis of three parameters: delay, network load, and throughput. The organization of the paper is as follows. We explain routing protocols in section II, related works are discussed in section III, section IV explains the simulation and performance metrics, section V explains the results of simulations and finally section VI concludes the paper.

II. Routing Protocols In Manets

Two routing protocols are considered in this paper namely: AODV and OLSR. Below is a brief description of each protocol:

A. Ad-hoc On-demand Distance Vector Routing Protocol(AODV): AODV [3] is reactive protocol, when a source wants to initiate transmission with another node as destination in the network, AODV use control messages to find a route to the destination node in the network. AODV will provide topology information (like route) for the node. In AODV protocol if one Node wants to send messages to another node. It will generate a Route Request message (RREQ) and forwarded to the neighbours, and those node forward the control message to their neighbour's nodes. Whenever the route to destination node is located or an intermediate node have route to destination. They generate route reply message (RREP) and send to source node. When the route is established between nodes then they communicate with each other.

B. Optimized Link State Routing Protocol (OLSR): OLSR is a table driven protocol. It usually stores and updates its routes so when a route is needed, it present the route immediately without any initial delay. In OLSR, some candidate nodes called multipoint relays (MPRs) are selected and responsible to forward broadcast packets during the flooding process. This technique reduces the overhead of packet transmission compared to flooding mechanism [2]. OLSR performs hop-by-hop routing, where each node uses its most recent routing information to route packets. MPR's is made in a way that it covers all nodes that are two hops away (i.e. neighbours of the neighbours). A node senses and selects its MPR's with control messages called HELLO messages. Hello messages are used to ensure a bidirectional link with the neighbour. HELLO messages are sent at a certain interval. Nodes broadcast "TC" or Topology control messages to determine it's MPRs [2].

III. Related Works

The performance comparison of various routing protocols over MANET namely-AODV, DSR, TORA, OLSR and GRP by varying the number of nodes with FTP and HTTP applications is done by Gagangeet singh aujla and Sandeep singh kang [4] on the basis of throughput, delay, load and data dropped performance metrics. They concluded that results for ftp give the clear picture about the OLSR protocol's best performance in all scenarios whereas the results for http application give the mixed picture. OLSR has highest throughput, least data dropped. TORA has high delay, load, data drop in all scenarios for ftp. DSR shows least throughput. GRP shows least delay. AODV gives highest throughput for http. The performance comparison of MANET routing protocols, namely AODV, DSR, TORA and OLSR is done by Ashish Shrestha and Firat Tekiner [5] which shows the overall performance of AODV and OLSR. However, AODV showed better efficiency to deal with high congestion and it proves better by successfully delivering packets over heavily trafficked network compared to OLSR and TORA. Performance comparison of three routing protocol -AODV, DSDV and TORA under different network size is done by N Vetrivelan, A V Reddy [6] shows that AODV performs well in terms of Average Delay, Packet Delivery Fraction and for Routing Load TORA performs well. In less stressful situation, the Packet Delivery Fraction, the TORA outperforms DSDV and AODV. Comparison of OLSR and TORA is done by Pankaj Palta and Sonia Goyal in [2] which shows that OLSR is better in those scenario where bandwidth is large as OLSR always updated their nodes so large bandwidth is used than TORA on same conditions. Performance comparison of OLSR, GRP and TORA using OPNET are compared on the basis of packets delay, load, media access and throughput by Harmanpreet Kaur and Jaswinder Singh [7]. Comparison of AODV, TORA and DSR is also done by N.Adam, M.Y Ismail and J. Abdullah [8] in terms of PDR, delay, throughput, dropped and routing load. AODV is best with minimum delay, packet delivery ratio and maximum throughput whereas TORA is worst. The simulation study for MANET network under five routing protocols AODV, DSR, OLSR, TORA and GRP were deployed using FTP traffic in [9].These protocols were tested with three QOS parameters. From their analysis, the OLSR outperforms others in both delay and throughput. Mr. L Raja, Capt. Dr. S Santhosh Baboo has done the comparative study of reactive routing protocol AODV, DSR, ABR and TORA [10].

IV SIMULATION PARAMETERS AND PERFORMANCE METRICS

In this paper, network simulator, Optimized Network Engineering Tools 14.5 has been used as a simulation environment. OPNET is a simulator built on top of discrete event system (DES) and it simulates the system behaviour by modelling each event in the system and processes it through user defined processes. OPNET is very powerful software to simulate heterogeneous network with various protocols. OPNET is a high level user interface that is built as of C and C ++ source code with huge library of OPNET function.

In this Paper, two scenarios are created where MANET networks are configured by using AODV and OLSR routing protocols. Two network scenarios are dedicated to AODV and OLSR routing protocols are compared and evaluated based on some quantitative metrics such as Network Load, Delay and Throughput.

1. Network load: It is the amount of traffic being carried by the network. It is the total data traffic (in bits/sec) received by the entire wlan from higher layers that is accepted and queued for transmission.

2. Delay: It is the time taken by a packet from the movement it is transmitted on the network by source node to reach the destination node.

3. Throughput: It is the number of packets received by all the destinations over the duration of simulation.

V. Results

A. Delay: Graph shows delay for 30 nodes. OLSR has the maximum delay. AODV delay decreases with increase in time.

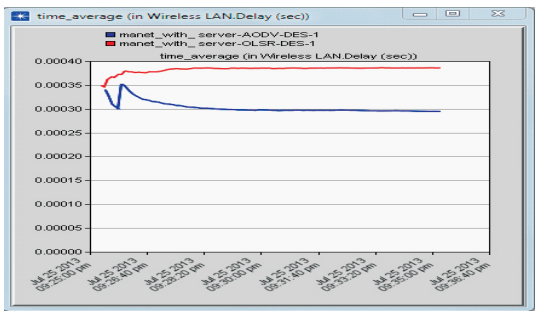

Fig. 1 Graph shows delay for 30 nodes

B Network load: Graph shows the network load for 30 nodes. OLSR has the maximum load form both the scenarios. This is because the mobile network causes changes in link state. These changes results in broadcasting of control messages i.e. Hello messages (for finding link status and hosts neighbour) and Topology Control (TC) to discover neighbourhood nodes. OLSR's table-driven approach increases overhead due to frequent updates and maintenance of network. While AODV shows lesser network load then OLSR.

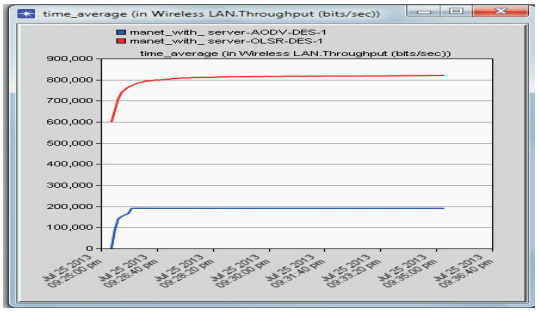

Fig.2 The network load for 30 nodes

C. Throughput: Graph shows the throughput for 30 nodes. OLSR has the maximum throughput in both the scenarios regardless of maximum load followed by TODV. AODV throughput decreases with increase in number of nodes because it keeps the information of one active node only.

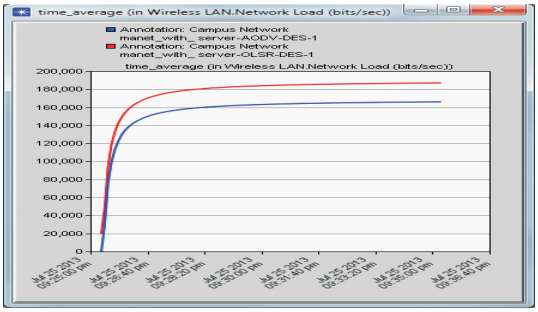

Fig.3 Throughput for 30 nodes

VI. Conclusion

In this paper performance of two MANET routing protocols was analyzed. OLSR performs best in terms of network load and throughput. AODV performs worst in terms of load and throughput. AODV's performance was better for delay out of three parameters. In summary, we can say that OLSR was best as compared to AODV in type of traffic taken into consideration for simulation because of its maximum throughput.

References

[1] C.Sivaram Murthy and B.S. Manoj, Adhoc Wireless Networks: Architectures, and Protocols, Pearson Education, 2004.

[2] Pankaj Palta and Sonia Goyal, "Comparison of OLSR and TORA routing protocols using OPNET Modeler", *International Journal of Engineering Research and Technology,* Vol. 1, No. 5, July 2012.

[3] C.Parkins, E.B.Royer and S.Das, A hoc On-Demand Distance Vector (AODV) Routing, July 2003, [Online]. Available: http://www.faqs.org/rfcs/rfc3561.html. [Accessed: April. 10, 2010]

[4] Gagangeet singh aujla and Sandeep singh kang, "Comparative analysis of AODV, DSR, GRP, OLSR and TORA by varying number of nodes with FTP and HTTP Applications over MANETs", *International Journal of Computer Applications,* Vol. 65, No. 2, March 2013.

[5] Ashish Shrestha and Firat Tekiner, "On MANET Routing Protocols for Mobility and Scalability," *International Conference on Parallel and Distributed Computing, Applications and Technologies,* pp. 451-456, November 2009.

[6] N. Vetrivelan and A. V. Reddy, "Performance Analysis of Three Routing Protocols for Varying MANET Size," *In Proceedings of the International Multi Conference of Engineers and Computer Scientists* (IMECS 2008), Vol. 2, 19-21 March 2008, Hong Kong.

[7] Harmanpreet Kaur and Jaswinder Singh, "Performance comparison of OLSR, GRP and TORA using OPNET", *International Journal of Advanced Research in Computer Science and Software Engineering,* Vol. 2, No.2, 10 October 2012.

[8] N. Adam, M.Y. Ismail et al., "Effect of Node density on Performances of Three MANET Routing Protocols," *In International Conference on Electronic Devices, Systems and Applications* (ICEDSA2010), pp. 321-325, October 2010.

[9] R. Al-Ani, "Simulation and performance analysis evaluation for variant MANET routing protocols", *International Journal of Advancements in Computing Technology,* Vol.3, No.1, February 2011.

[10] L. Raja and Capt. Dr. S. Santhosh Baboo, "Comparative study of reactive routing protocol AODV, DSR, ABR and TORA", *International Journal of Engineering and Computer Science,* Vol. 2, No. 3, March 2013, pp. 707-718.