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Performance Analysis of Traffic Load and Mobility on AODV, DSR and DSDV Routing Protocols in MANET

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Abstract: Mobile Adhoc network is an infrastructure less multi hop wireless network, were there is no any centralized access. MANET is a self-configuring and self-organizing collection of mobile nodes. As nodes have given mobility, it is very complex task to manage the routing. As in MANETS, every node can work as the host as well as the router such that can receive and send the packet. As in MANET the network topology is dynamic and frequently changes, so routing protocols should be designed to meet the requirement of the MANET. There are various protocols available for the routing compare the working of AODV DSR and DSDV for different mobility. Also in future we can compare AODV with other routing protocols.

Keywords: MANET, NS-2, AODV, DSR, DSDV, throughput, packets dropped, End-to-end delay

I. INTRODUCTION

Basically there are two types of networks: Infrastructure based and Infrastructure less networks. Mobile Ad-hoc networks (MANETs) are infrastructure less networks as there is no existing infrastructure available. Currently Ad hoc networks are enjoying extraordinary research interest, and are expected to provide opportunities for utilization of network applications in new scenario in which today's internet-based communication paradigms are no longer applicable. Ad-hoc networks are formed in a situation where no infrastructure is available and having no central administration. For MANET no predetermined subnet structure is known. Ad hoc networks are considered to be composed of mobile wireless devices, so the interconnection pathways between the devices can change rapidly. As in MANET each device is free to move independently, links between the devices may change frequently. Routing is the process of forwarding the packets from source to the destination with efficient performance

II. ROUTING PROTOCOLS

Mainly there are three types of routing protocols:

1) Proactive (Table-Driven)

2) Reactive (On-Demand)

3) Hybrid

Proactive routing protocols find paths for all source-destination pairs in advance and stores in the routing tables. Each node periodically exchanges the routing information by broadcasting. The protocols are also known as table-Driven routing protocol. Destination-Sequenced Distance-Vector Routing (DSDV) is a proactive routing protocol.

Reactive routing protocols discover a path when a packet needs to be transmitted and no known path exists between source and destination. So the protocol is known as on-demand routing protocol. In case of routing failure occurs the protocol discovers an alternate path. Dynamic Source Routing (DSR) and Ad-hoc On-demand Distance Vector (AODV) routing protocol are the most popular routing protocols.

Hybrid routing protocols are the combination of proactive and reactive routing protocols. Hybrid routing protocol use the proactive as well as reactive routing protocols for route finding.

a) Ad-hoc On-Demand Distance-Vector

Ad-hoc On-demand Distance Vector (AODV) routing protocol is the most popular reactive unicast routing protocol, essentially combination of DSDV and DSR. AODV uses mechanism of route maintenance from DSDV and route discovery from DSR.

AODV was designed to meet the following goals:

- » Minimal control overhead
- » Minimal processing overhead.
- » Multi-hop path routing capability.
- » Dynamic topology maintenance.
- » Loop prevention.

Route Requests (RREQs), Route Replies (RREPs), Route Errors (RERRs) and Route Reply Acknowledgements (RREP-ACK) are message types defined by AODV. AODV allows mobile nodes to react to link breakages and changes in network topology in a timely manner. When links break, AODV causes the affected set of nodes to be notified so that they are able to invalidate the routes using the lost link.

b) Dynamic Source Routing (DSR)

It is a reactive routing protocol which is source-initiated rather than hop-by-hop and is based on the theory of source-based routing rather than table-based. Every node in the network maintains a route cache to store the complete and ordered list of nodes through which the packet must pass to reach to the destination. Since the hop sequence is known to the source, any loop in routing can be excluded, and the routing decision is determined when sending out data packets. Thus data packets are appended with the same complete hop sequence in the packet header; intermediate nodes just forward the packet to the next hop along the hop sequence. A node that desires to send a packet to other node first checks its entry in the route cache. If the route is available then it uses that path to transmit the packet and node also attaches its source address on the packet.

Once a link breakage occurs at an intermediate node, the node sends a Route Error message back to the source node. Any route containing that broken link is also removed by the source. If the source still needs to send data packets to that destination, a new route discovery process is initiated; otherwise, there is no need to discover a new route.

Several optimization options proposed by DSR are

1) Salvaging used for repairing a disconnected route locally;
2) Promiscuous listening used for finding smaller hop-count route; and
3) Piggy backing the bad link on its next Route Request, which can assist to remove the broken link in the caches of other nodes, and keep other nodes away from generating Route Replies.

c) Destination-Sequenced Distance-Vector Routing (DSDV)

Destination-Sequenced Distance-Vector Routing (DSDV) [6] is a distance vector routing protocol based on classical Bellman-Ford routing algorithm. It was developed by C. Perkins and P.Bhagwat in 1994. Each node in DSDV maintains next hop table, which it exchanges with its neighbor. Periodic full-table broadcast and event-driven incremental updating are two types of next-hop table exchange. It eliminates route looping, increases convergence speed, and reduces control message overhead, by having a monotonically increasing even sequence number for each node, which increments whenever a new routing-update message is sent out, thus letting other nodes know about which routing information is fresher. Routing table also contains the hop count to the destination, next hop to the destination and currently known largest sequence number of the destination in addition to the destination node address. Packets are routed using the information available in the routing table. The relative frequency of the full-table broadcast and incremental updating is determined by node mobility. The source node appends a sequence number to each data packet sent during a next-hop table broadcast or incremental updating. This sequence number is propagated by all nodes receiving the corresponding distance-vector updates, and is stored in the next-hop table entry of these nodes.

III. Comparison Of AODV, DSR and DSDV

For the comparison the simulation tool used is NS-2[8] which is highly preferred by research community.

TABLE 1: SIMULATION PARAMETERS

1	Number of nodes	50
2	Area	500*500m2
3	Traffic Source	CBR
4	Pause Time (sec)	0, 20, 10, 30 ,40, 100
5	Packet Size	512 Bytes
6	Max. Number of connections	10,20,30,40
7	Mobility model used	Random way point
8	Simulation Time 200sec.	Simulation Time 200sec.

The performance metrics that are taken into consideration for the comparison are:

1) Throughput

2) Packets Dropped

IV. Simulation Results: Effect of Mobility

The number of nodes is taken as 50 and the maximum number of connection as 20. For the analysis of the effect of mobility, pause time was varied from 0 seconds (high mobility) to 100 seconds (low mobility). Graphs shown in Fig (1-2) show the effect of Mobility for AODV, DSR and DSDV protocols with respect to various performance metrics.

Pause Time Vs Throughput

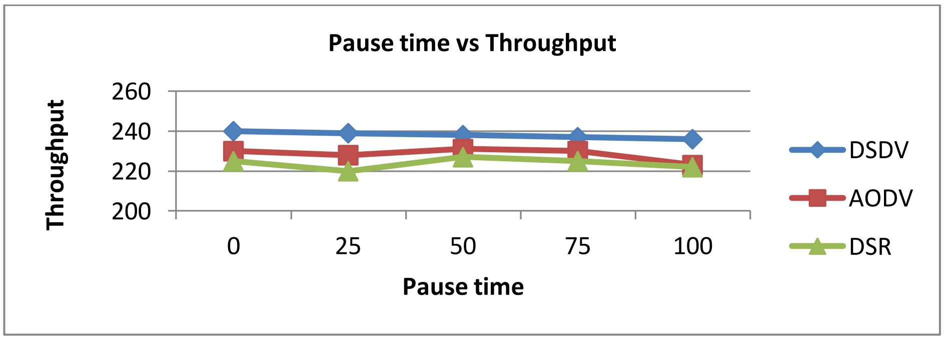

Fig1.Pause Time Vs Throughput

Throughput of DSR is poor at lower pause times (high mobility), therefore performance of DSR protocol decreases as mobility increases compared to on demand protocols DSDV and AODV. DSDV and AODV perform better at high mobility.

Pause Time Vs Packets Dropped

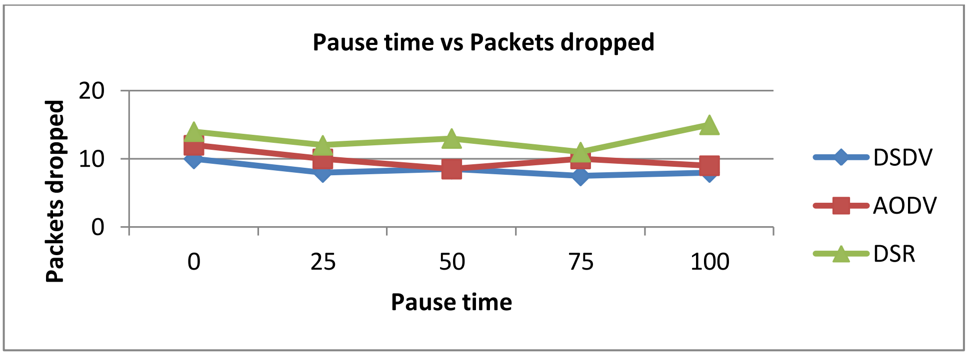

Fig2. Pause Time Vs Packets Dropped

DSR performs poorly as it is dropping more number of packets at high mobility.

Simulation Results: The effect of Traffic

The network was simulated for high mobility scenario keeping the pause time 0 seconds. The number of connections was varied as 10, 20, 30 and 40 connections to study the effect of traffic load on the network. Graphs in Fig (15-18) show the effect Traffic Load for DSDV, AODV and DSR protocols with respect to various performance metrics.

Max. Number of Connections Vs Throughput

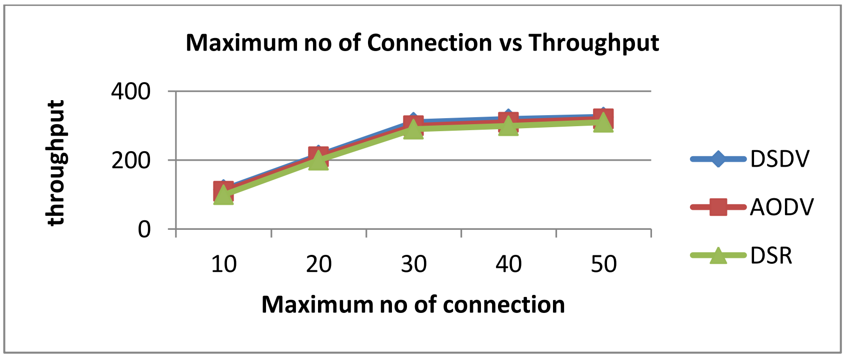

Fig3. Maximum Number of Connections Vs Throughput

As the traffic load increases both on demand protocols work better compared to DSR.

Max. Number of Connections Vs Packets Dropped

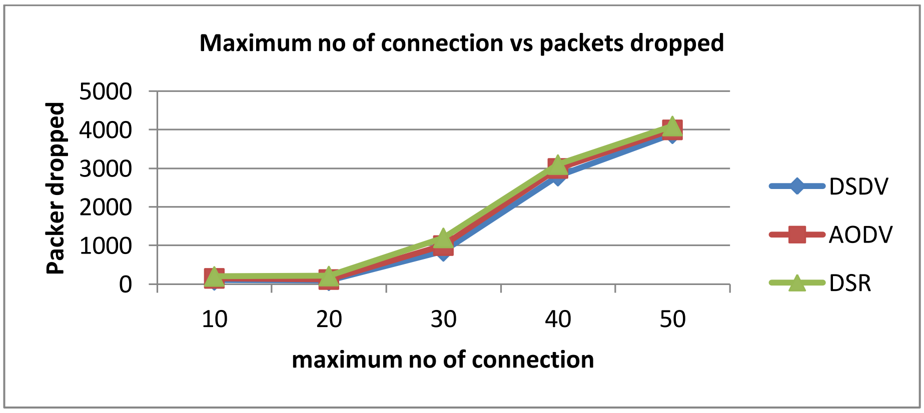

Fig4. Maximum Number of Connections Vs Packets Dropped

As the traffic load increases packets dropped will also increase. The reason is bandwidth requirement increases as load increases. Each packet that the MAC layer is unable to deliver is dropped in DSR since there are no alternate routes. DSDV and AODV drops less packets compared to DSR.

V. Conclusion And Future Work

The analysis of adhoc routing protocols indicate that DSDV is more preferable for a network with low mobility and less number of nodes. The performance of DSR which uses source routings is preferable for the normal network of general nature with moderate traffic and moderate mobility. Investigation also suggests that AODV performs better for the robust scenario where high mobility, nodes are dense, the amount of traffic is more, area is large, and network pattern sustains for longer period. In future AODV can be compared with other routing protocols like TORA and ZRP for various traffic loads and different mobility.

References

1. Perkins, C. E. and Royer, E. M.; "Ad-hoc On-Demand Distance Vector Routing", Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications (WMCSA.99), New Orleans, LA, USA, February 1999, pages 90-100.
2. "Evolution and future directions of the ad hoc on-demand distance-vector routing protocol", Elizabeth M. Belding-Royer, Charles E. Perkins, 2003 Elsevier B.V, doi:10.1016/S1570-8705(03)00016-7.
3. Mobile Ad Hoc Networking Working Group – AODV, http://www.ietf.org/rfc/rfc3561.txt.
4. D. B. Johnson, D. A. Maltz and Y.C. Hu, "The Dynamic Source Routing Protocol for Mobile Ad Hoc Networks (DSR)", IETF Draft, http://www.ietf.org, April 2003.
5. Maltz, D. A.; Broch, J.; Jetcheva, J. and Johnson, D. B.; .The Effects of On-Demand Behavior in Routing Protocols for Multihop Wireless Ad Hoc Networks., IEEE Journal on Selected Areas in Communications Special Issue on Mobile and Wireless Networks, August 1999, Vol. 17, No. 8, pages 1439-1453.
6. Perkins, C. E. and Bhagwat, P.; "Highly Dynamic Destination-Sequenced Distance-Vector Routing (DSDV) for Mobile Computers", Proceedings of the ACM SIGCOMM.94 Conference on Communications Architectures, Protocols and Applications, London, UK, August 1994, pages 234-244.
7. "Wireless Ad Hoc Networks" Zygmunt J. Haas, Jing Deng, Ben Liang, Panagiotis Papadimitratos, and S. Sajama Cornell University School of Electrical and Computer Engineering.
8. Tutorial for Simulation-based Performance Analysis of MANET Routing Protocols in ns-2By Karthik sadasivam ISSN