Manet Protocol Property Survey and Behaviour Analysis of DSDV and AODV Routing Protocol

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***Abstract*: MANET is an infrastructure-less, multi-hop, self-configured and self-organized wireless network. Nodes are mobile in MANET. These mobile nodes give rise to dynamic change in topology. Each node is act like a router, so information of any change in the network is carried out or forwarded from one node to another. In our work we conducted survey of protocol properties of DSDV and AODV routing protocols. The tools which we used to do the performance analysis are TRACE GRAPH, X-GRAPH and NS2 as a simulator. We also analyse the network performance of the two protocols by comparing the various trace graphs and X-graphs, which results from TR files through NS2 simulator. The various performances metric which are considered are- throughput, end-to-end delay, packet loss percentage and jitter with varying network nodes.**

Keywords- MANET, DSDV, AODV, throughput, end-to-end delay and packet loss percentage.

1. INTRODUCTION

In Mobile communication there are two types of wireless networks are possible. First one is Infra-structure less network and second is infra-structured network. Cellular wireless network is an example of infrastructure dependent networks and Infrastructure-less network is an ad- hoc network. A MANET can be a standalone network or it can be connected to external networks (Internet)[1]. In mobile ad-hoc network, nodes are mobile which give rise to dynamic change in topology. Mobile device communicate in peer-to-peer fashion or we can say it follow multi-hop communication pattern. MANET is self-configured, self-organized because each and every node has the ability to forward traffic on behalf of other. Each node will communicate with its neighbors reporting any changes in the system. The application area of MANET is in disaster recovery where the entire infrastructure network is destroyed and resorting Dynamic topology

a) Dynamic change in topology
b) Constraint in Bandwidth
c) Constraint in energy
d) Limited security during operation

2. CLASSIFICATION OF ROUTING PROTOCOL

Routing is the process of path generation, path selection in a network along with data forwarding and path maintenance. Routing is bounded by traffic requirements and network capacity also. The two type of routing protocol are pro-active and reactive routing protocol. In proactive routing algorithms, each node maintains a routing table containing the next hop information for every other node in the network, and hence a route between the source node and the destination node is always available making the approach proactive[2][3]. In reactive routing, there is no concept of table formation but a path discovery process determines the path to the destination only when the node has a packet to forward that is it reacts to a request to send data to a host. The routing protocol in MANET are classified under three categories-

a) Table driven or pro-active
b) Source on demand driven or reactive
c) Hybrid

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Here we consider the DSDV (table driven or pro-active) and AODV (source on-demand driven or reactive) routing protocol.

3. ROUTING PROTOCOL UNDER CONSIDERATION

3.1 Wireless Ad-hoc Network: A Wireless Ad-hoc network is a decentralized, self configure, self organized infrastructure-less wireless network. It is a standalone network or can be connected to external networks (internet). Wireless Ad-hoc network consists of mobile nodes and that is why we need to configure or organize the network with any change in node position. In simple words we can say any change in node position give rise to dynamic change in topology[4]. Ad-hoc network is infrastructure-less network because it does not rely on routers in wired network or access points. Each node will communicate with its neighbors reporting any changes in the system. Flooding is used in the network for forwarding the data from source to destination node. In Ad-hoc network all devices are free to associate with any other ad-hoc network device in link range. developed in Nokia Research Center, University of California, Santa Barbara and University of Cincinnati by C.Perkins, E. Belding-Royer and S. Das.

3.1.1 AODV: Ad-hoc On Demand Distance Vector (AODV) routing protocol is a reactive protocol for mobile Ad-hoc network (MANET). It is jointly one-to-another multi-hop mobile wireless networks so that the information packets are transmitted in a store-and-forward manner. When a source node desires a route to a destination for which it does not already have a route, it broadcasts a route request (RREQ) packet across the network and RREQ carries Source ID, Destination ID, Source Sequence Number, Destination Sequence Number and a Broadcast ID[6]. When an intermediate node receives a RREQ, it sends a route reply (RREP) if it is either the destination or if it has a route to the destination with corresponding sequence number greater than or equal to that contained in the RREQ and the intermediate node also stores the previous node information in order to forward the data packet to this next node towards the destination as shown figure1.

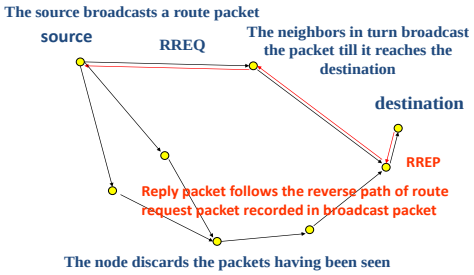

Figure:1 Route formation in AODV routing protocol

Whenever there is a link break in the routing path, the RERR message will be broadcasted by the link break identifying node to the neighbor nodes to update or delete the routes through that node. If the source node moves, it reinitiates the route discovery. If intermediate node moves, its upstream node sends a RREP to the source. The source restarts the route discovery. The initiator or source node broadcasts a *route request* (RREQ) with an additional field that indicates the required security level of the route.

3.1.3 DSDV: Destination Sequenced Distance Vector Algorithm (DSDV) protocol is the pro-active routing protocol for ad hoc wireless networks. It is based on the distributed Bellman-Ford algorithm where each node maintains a table that contains the shortest distance and the first node is at shortest path to every other node in the network. Each Node Maintains Tables for:

- Next Hop on Path
- Distance (in hops) to destination.
- Sequence Number(keep current route)

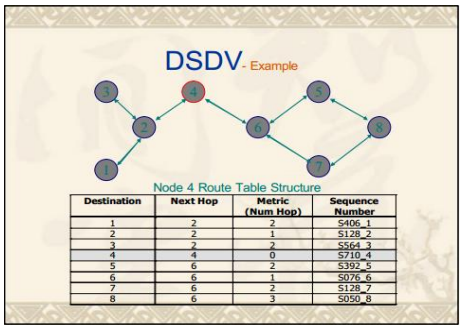

Figure 2: DSDV Route Table Example

It's a table driven routing protocol. Here, each node and every node maintains consistent and up-to-date routing information by means of periodic exchange of routing updates information even if there is no change in topology[6]. Also, the nodes broadcast routing updates to their immediate neighbours

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whenever there is a minor change in network topology of the network. Here, each node maintains the routing table as shown in figure- 2 that comprises: < Destination IP address, next node IP address, cost metric, sequence number, install time >
Destination IP address includes the IP address of all the Destination IP address includes the IP address of all the known destinations in the network. The next node IP address is the IP address of the immediate neighbour of the source node. Cost metric demonstrates the number of hops from source to destination node. Problems of distance vector are-

a) Topology changes are slowly propagated
- Count-to-infinity problem

b) Moving nodes create confusion
- they carry connectivity data which are wrong at new place

c) Table exchange eats bandwidth

d) DSDV requires a regular update of its routing tables, which uses up battery power and a small amount of bandwidth even when the network is idle.

e) Whenever the topology of the network changes, a new sequence number is necessary before the network re-converges or re-organized thus, DSDV is not suitable for highly dynamic networks.

4. SIMULATION ENVIRONMENT

In our work we take 50 nodes. The simulation is done using NS-2, to analyse the performance of network under node mobility scenario.

4.1 Metrics used for Analysis

The following metrics were used for the comparison of the protocols:

- Packets received Vs Packets lost
- Throughput of received packets: This represents the number of packets received within a given time Interval.
- Lost packets rate: This represents the number of packets lost within a given Time Interval.
- End to End delays: It represents the delay encountered between the sending and receiving of the packets.
- Jitter: It represents any unwanted variation in one or more signals generated during the packet transfer.

4.2 Simulation Parameters:

Table 1: Simulation Parameters Under Consideration

Parameters	Values
Simulators	NS-2.35
Mobility Model	Random Way Point
Antenna Type	Omni
Area of map	750*750
PHY/MAC	IEEE 802.11p
Routing Protocol	DSDV and AODV
Network Traffic	TCP
Simulation Time	200sec

5. PROTOCOL PROPERY SURVEY

S No.	**PROTOCOL PROPERTY**	**DSDV**	**AODV**
1.	Table Driven/Source Routing	Table Driven	Source Routing
2.	Route discovery	Periodic	On-demand
3.	Network Overhead	high	Medium
4.	Network suitable for	Less no. Of nodes	Highly Dynamic
5.	Reactive/pro-active	Pro-active	Reactive
6.	Multi-hop wireless support	Yes	Yes

6 COMPARISON RESULTS –

6.1 Lost Packet Rate (LPR)-

1. (a) X graph for received packets and lost packets comparison for 50 node AODV protocol based network –

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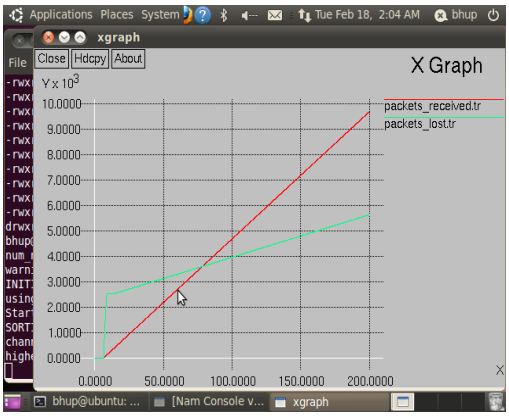

Figure 6.1(a) X Graph for packets received Vs packets lost (AODV)

1.(b) X graph for received packets and lost packets comparison for 50 node DSDV protocol based network.

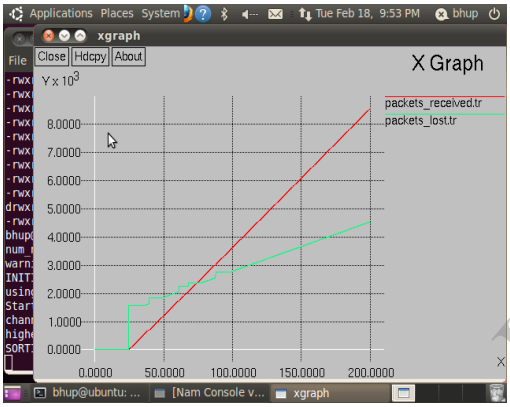

Figure 6.1(b) X Graph for packets received Vs packets lost (DSDV)

Here we see that the protocol with least packet drop is DSDV in comparison to AODV routing protocol.

6.2 Throughput of Sending and Receiving Packets (TSP & TRP)

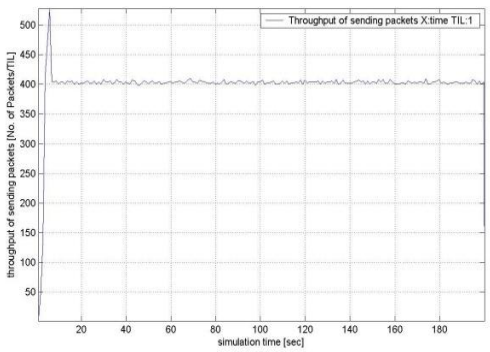

Figure 6.2(a)- throughput of sending packets (AODV)

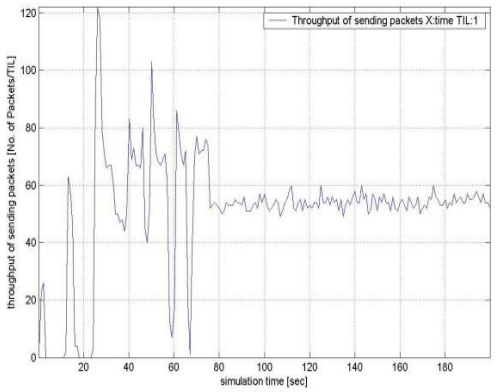

Figure 6.2(b)- throughput of sending packets (DSDV)

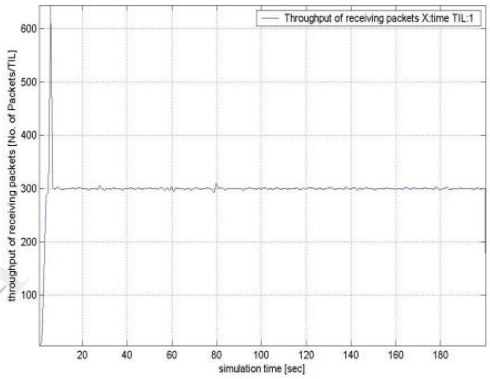

Figure 6.3(a)- throughput of receiving packets (AODV)

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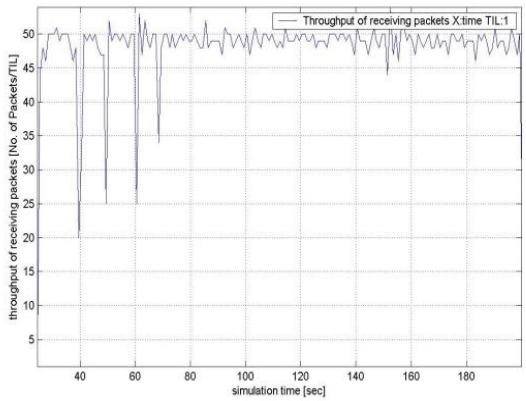

Figure 6.3 (b) – throughput of receiving packets (DSDV)

From the individual analysis of the protocols, we find that DSDV protocol shows the more consistency.

6.3 End-to-End Delay

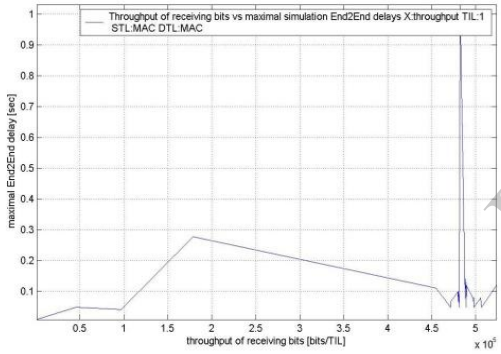

Figure 6.4 (a) : EED (DSDV)

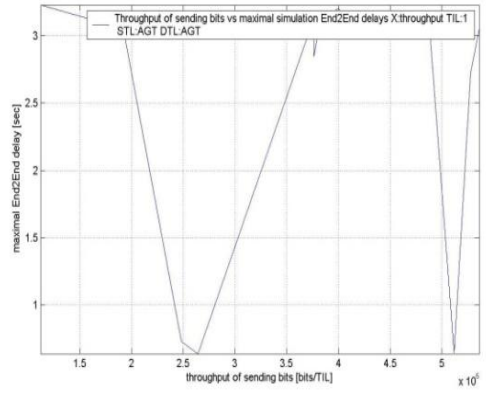

Figure 6.4 (b) : EED (AODV)

From the individual discussion of the end to end delays of the two protocols, we see that the protocol which introduces the minimum delay in the throughput is DSDV. AODV shows the maximum delay.

6.4 Jitter (JT)

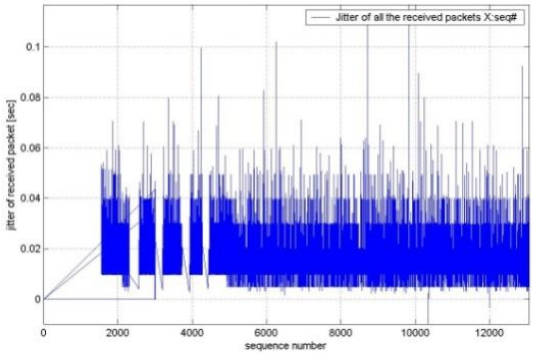

Figure 6.5 (a): DSDV jitter of received packets

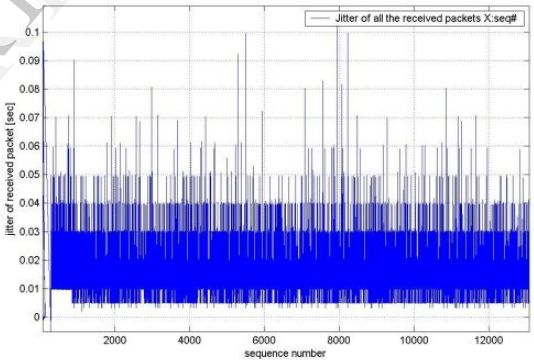

Figure 6.5 (b): AODV jitter of received packets

7. SIMULATION WINDOW

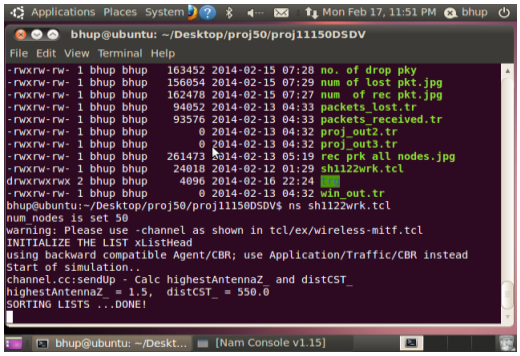

Figure 7: Simulatied .tcl file

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8. CONCLUSION

PROTOCOLS	TRP (HIGHER IS BETTER)	LPR (LOWER IS BETTER)	EED (LOWE-R IS BETTER)	JITTER
PARAME-TERS	Consisten-cy	packet lost	delay	jitter
AODV	Lack of consistenc-y	packet lost is high	Maximu-m delay introduce-ed	Initial -0.05 Avera ge-0.03
DSDV	Most consistent	packet lost is low	Minimu-m delay introduced	Initial-0.05 Avera ge-0.04

The above table give a comprehensive view of the performance of the two protocols i.e AODV and DSDV. From the above table we can conclude that DSDV performs better than AODV under TCP (CBR) taffic control pattern.

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