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A Comparison of Routing Protocols of MANETs based on Packets Received at destination nodes in scenario

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Abstract

Performance comparison has been carried out of different Routing Protocols of Mobile Ad Hoc Networks i.e. AODV, DSR, STAR, and ZRP based on number of data packets send and received by each routing protocol. Using Qualnet 7.3.1 simulator networks, a set of 10 nodes was placed in the scenario where each node may be move randomly without any restrictions. 1500x1500sq.m dimension areas were set up to travel the nodes to make communication. Simulation time was fixed 500 second; Omnidirectional is used as Antenna Model. MAC Layer is used 802.11. Node number 1 of DSR protocol received maximum number of data where the node number 1 of remaining routing protocols i.e. DSR, and STAR, ZRP has received less. Node number 3 of AODV, DSR, and STAR has failed to receive a single data packet where the ZRP successes to receive the data packets that is possible because ZRP is a hybrid routing protocol which has both types of features. QualNet 7.3.1 Analyzer is a graphical tool for statistics analyzing. Using this platform, graph has been generated for exchange data packets between source nodes to destination nodes.

Keywords: AODV, DSR, STAR, ZRP, Qualnet

I. INTRODUCTION

MANETs mainly focus on the new development in wireless communication. MANETs are going to become important in present scenario because of their applications in definite critical areas like disaster management, military, rescue operation etc. In addition to these, MANETs have several smart features more than conventional networks[1].

Ad Hoc wireless networks look forward to that there is not required any infrastructure for routing packets to reach at destination node. Ad hoc Network facilitates the challenges to bring network in our own mobile unit, lacking the centralized policy or control of a traditional network[2]. MANET has provided environment to access unlimited information and computing, reduce all the hurdles of distance, time, and location for many applications. In the future, there may be changes at large scale in the wireless technologies which very much influence design and implementation of MANETs in Mobile Governance. Communication environment needs a little bit cost infrastructure which required to provide high quality communication and constant connectivity. Mobile Ad-hoc Networks (MANETs) is self-created, self-organized and self administered[3]. This paper compares the performance of AODV, DSR, STAR and ZRP routing protocols with by using Qualnet 7.3.1 simulator networks.

1.1 Routing Protocols

The existing routing protocols in MANETs can be classified into three categories as shown in figure 1.

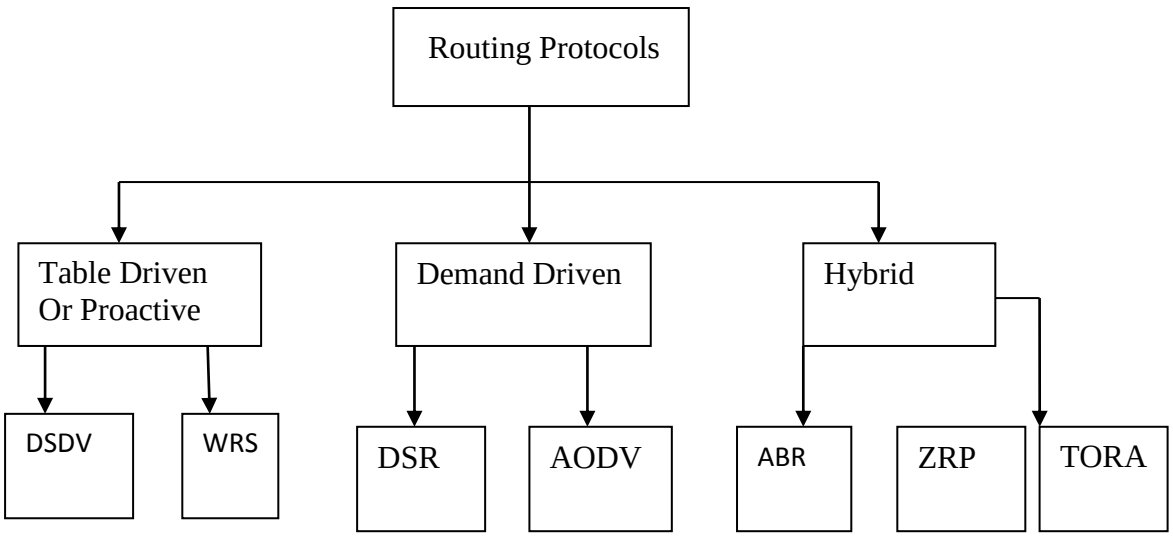

Figure 1: Classification of Routing Protocols

1.1.1 Table Driven Routing Protocols (Proactive)

In this nature of routing protocols, the path is decided in advance between nodes. There should be continuously maintaining the latest route between nodes in the network. However, for extremely active network topology, the proactive schemes emphasize on to manage important amount of resources to keep routing information up-to-date and consistent[4]. Finding overheads are large in such schemes as one has to discover all the nodes. Thus, if a route has already got by node before traffic arrives, transmission will take place without delay. Some proactive routing protocols are like DSDV, WRP, GSR and CGSR[5].

In proactive routing protocols, nodes exchange their information periodically in reaction to cause topological changes. The main advantage is to minimize the time delay in required route when there is initiating traffic to a required destination and quickly determines whether a destination is reachable or not. During the process significant network resources may be consume[6].

1.1.2 On-Demand Routing Protocols (Reactive)

In this kind of routing protocol, path between the nodes is initiated when the node wants to share their packets. Now this node initiates a route discovery process in advance from source to destination node. The process is ended when a route recognized by both nodes in the scenario. This type of transfer of data get recorded in a table with every path from the source or until the route is no longer desired[7]. All intermediate nodes play important role in maintaining the records of link of source and destination. When a request comes to destination from source node then route replies back to the source with the help of these intermediate nodes. As soon as the reply reaches to the source node, data traffic is sent to the destination[8].

1.1.3. Hybrid Protocols

Both proactive and reactive routing protocols combine to form Hybrid routing protocol. These protocols are considered to include the features of both types. The scenario is used in form of wide acceptability in terms of decreasing the route discovery overheads so that the advantages of both proactive and reactive routing protocols[9] may be achieved.

2. PROPOSED SYSTEM

AODV protocol is particularly used for MANETs. It provides a speedy acceptance to dynamic link condition, memory usage overhead, reduce link fault. AODV allows mobile nodes to get routes quickly for fresh destinations. There does not require for any nodes to maintain routes to destinations which is not in active communication. DSR routing protocol make routes based on on-demand by broadcast route request packets when a sender node want to send data to a destination. STAR is a table driven

protocol in which the nodes replace their own shortest path trees with their neighbors. STAR attempts to provide feasible paths to each destination. Zone Routing Protocol (ZRP) is a hybrid protocol that partitions the network into overlapping zones that runs independent protocols in the scenario of the zones. The proposed system compares AODV, DSR, STAR, and ZRP[10].

3. PERFORMANCE PARAMETER AND METRICS

Using Qualnet 7.3 simulator networks, the four protocols are compared. Following Steps involved in this are:

- Make the scenario in design mode of Qualnet Architecture.
- Setting various variables in network modeling of Qualnet Simulator.
- Run scenario in Visualize Mode of Qualnet Simulator.
- Collecting data of various parameters from Qualnet Analyzer

Qualnet is a simulator which performs behavior of network like a real network. A network simulation provide environment in which establish a network without invest any cost for developing the early stages of network. Design option of Qualnet 7.3.1 simulator networks provides simple platform to use interface for creating network scenarios and setting up various simulation parameters. That provides easy drag-and-drop functionality to build network topologies. Analyzer is a graphical tool of network simulation of Qualnet for analyzing statistics data generated. When a simulator is run from from Architect then a statistics (.stat) file is created. This file is containing the simulation results. The statistics basically file is a text file which can be opened in any text editor. Graph may be generating by data in statistics.

4. RESULT ANALYSIS

Qualnet 7.3 Networks Simulator has been used to simulate the various parameters given below in table 1. The simulated terrain area for a MANET is 1500 x 1500 and there are 10 mobile nodes dynamically moving around for 500 s of simulation time. All the 10 nodes travel without any restriction to make communication and transferred the data. There are four routing protocols AODV, DSR, STAR, ZRP when has been used to make comparison between them. STAR routing Protocol is a proactive where all the nodes in the path must maintain their own table. Tables of each node have the information about the neighbor node movement. AODV, DSR is a kind of reactive routing where each node has to maintain the information about only those participates in path between source and destination. ZRP routing protocol has been using mixture of both proactive and reactive routing features. MAC layer 802.11 has been used to transfer the data. Random waypoint model is used to move packets without any restriction in scenario. The model mobility is used to random waypoint model. The moving speed of each node is in between 10 and 20 m/s. Packets transmitted among

nodes are generated in constant bit rate (CBR). For each node, Antenna Model is used to omnidirectional and Antenna Height is1.5metres.

Table 1. Parameters used in Networks Simulation

Parameters	Value
Simulation Time	500 sec
Number of nodes	10
Simulation Repetition	**100**
Routing protocol	AODV,DSR, STAR, ZRP
MAC Layer	802.11
Number of Packets sent	200
Antenna Model	Omnidirectional
Antenna Height	1.5metres
Terrain Size	1500 x 1500
Mobility Model	Random waypoint
Data Traffic Type	CBR
Physical layer	802.11

In the given figure 2,3,4,5 showed the transmission of packets between the nodes in scenario for different protocols i.e. AODV, DSR, STAR and ZRP respectively. Each node has changed their location randomly.

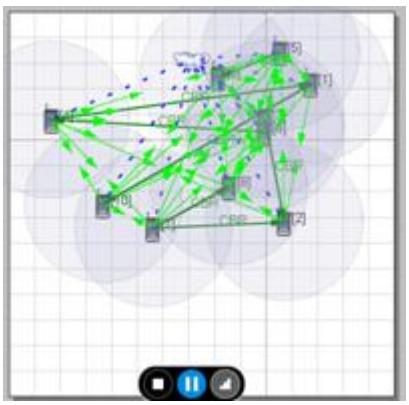

Figure 2. AODV Scenario

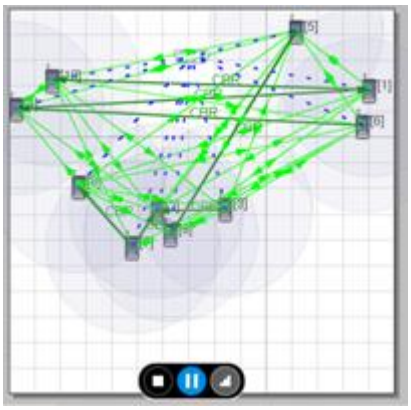

Figure 3. DSR Scenario

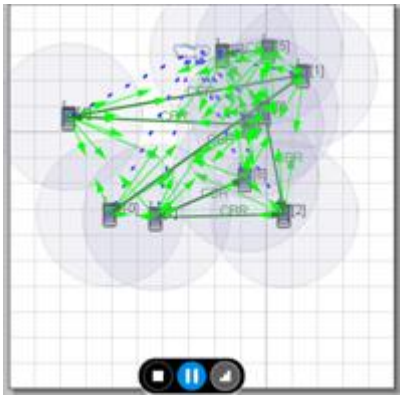

Figure 4. STAR Scenario

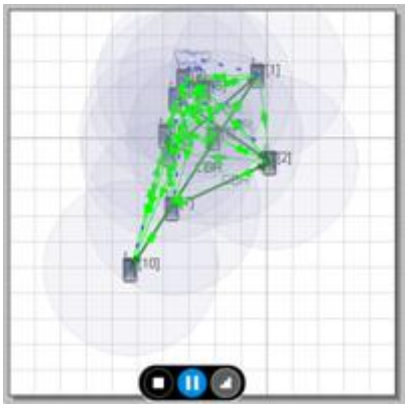

Figure 5. ZRP Scenario

Different no. of packets received by routing Protocols

Here evaluation of the performance of AODV, DSR, STAR and ZRP against No. of packets send from source nodes to destination nodes, where observed that each node has received different no. of packets. The variances between the packets received by routing protocols based on their distance and speed which is given in Table 2.

Table 2. No. of Packets Received by AODV, DSR and STAR, ZRP

No. of Nodes	AODV	DSR	STAR	ZRP
	No. of Packets Received			
1	0	2	13	51
2	10	14	39	197
3	3	10	0	139
4	3	4	18	59
5	24	0	78	0
6	0	10	0	131
7	24	0	3	1
8	24	4	42	72
9	0	2	22	49
10	0	4	13	57

In the figure 6, the graph is plotted based on sending data packets from each node. Figure showed that quantity of data packets send is equal through all the nodes i.e. AODV, DSR and STAR, ZRP. Node no. 2, 8,9,10 did not send any data packets to other nodes because at that point nodes may not be in reachable area. Node no. 7 has sent maximum number of data packets.

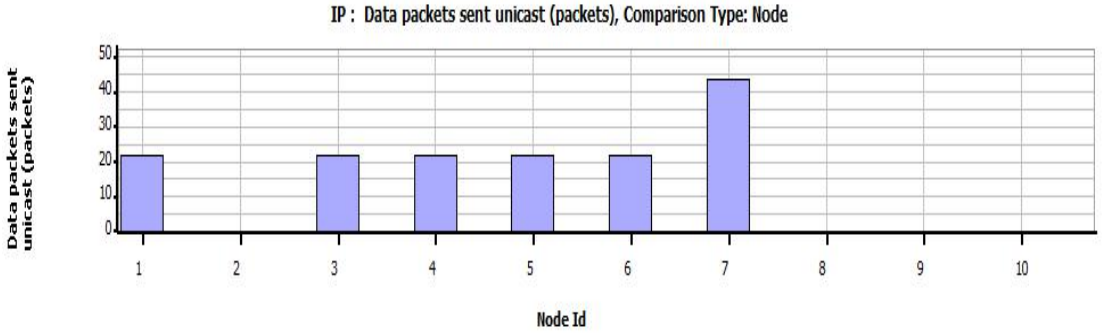

Figure 6. Data Packets sent in AODV, DSR, and STAR, ZRP Routing Protocols

In the figure 7, 8,9,10 the graph represents the received data packets in AODV, DSR and STAR, ZRP routing protocols respectively. Node number 1 of DSR protocol received maximum number of data where the other node number 1 of remaining routing protocols has received minimum i.e. DSR, and STAR, ZRP. Node number 3 of AODV, DSR, and STAR has failed to receive a single data packet where the ZRP succeeded to receive the data packets that is possible ZRP is a hybrid routing protocol which has both types of features.

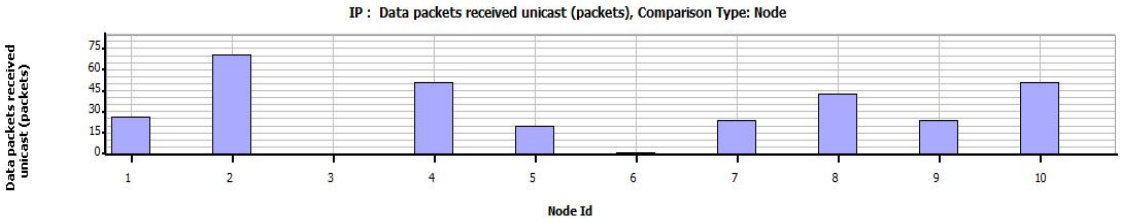

Figure 7. Data Packets Received in AODV Routing Protocols

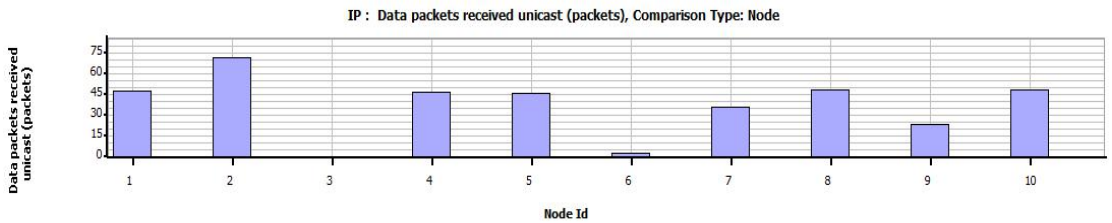

Figure 8. Data Packets Received in DSR Routing Protocols

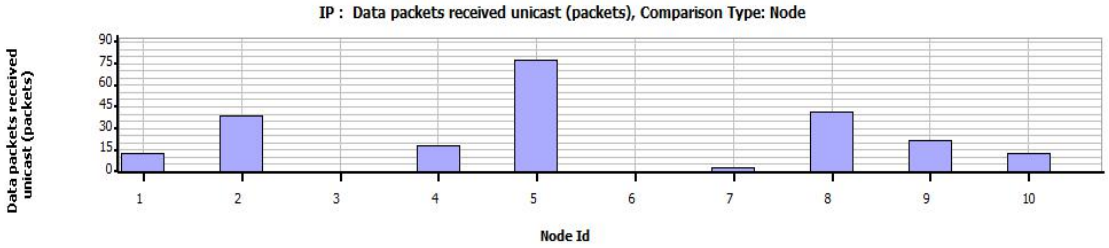

Figure 9. Data Packets Received in STAR Routing Protocols

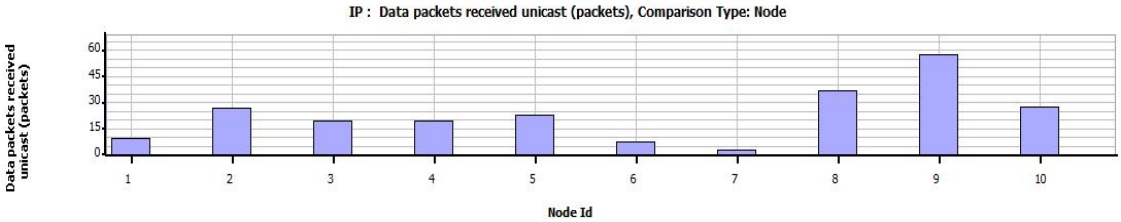

Figure 10. Data Packets Received in AODV Routing Protocols

3. CONCLUSION AND FUTURE WORK

In this paper, a comparison has been carried out between four routing protocols i.e. AODV, DSR, STAR and ZRP in MANETs. Four scenarios were prepared using Qualnet 7.3.1 for each protocol and applied different parameter on these protocols. There is a lot of scope of simulate of the different parameters on different dimension such as 500, 1000 etc. and compared with each other to find the more result. There are various protocols available in MANETs on which analysis may be possible.

4. ACKNOWLEDGEMENT

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