Nipun Gupta al. International Journal of Recent Research Aspects ISSN: 2349-7688, Special Issue: Engineering Research Aspects Feb 2015, pp. 84-87

Comparison of performance of various Protocols of ad-hoc network

Nipun Gupta[1], Dr. Kamal Kumar Sharma[2], Sharad Chauhan[3]
[1]Student, M. Tech, ESSEAR, Ambala
[2]Professor, Dept. of ECE, E-Max group of Institutions, Ambala
[3]Assistant Professor, Dept. of CSE, E-Max group of Institutions, Ambala

Abstract-The Mobile ad-hoc network had become a major component of the future network development due to their ease of deployment, self configure ability, flexibility and independence on any existing network infrastructure. Mobile ad-hoc network have attributes such as wireless connection, continuously changing topology, distributed operation and eas of deployment. Routing protocol election in Manet is a great challenge, because of its frequent topology changes and routing overhead. In Manet Simulation plays an important role in determining a network characteristic and measuring performance. For this reason, constructing simulation model closer to the real circumstances is very significant.

Keywords— **LEACH, WSN, DBS, EESR, ESDC, BS**

I. INTRODUCTION

In view of the increasing demand for wireless information and data services, providing faster and reliable mobile access is becoming an important concern. Nowadays, not only mobile phones, but also laptops and PDAs are used by people in their professional and private lives. These devices are used separately for the most part that is their applications do not interact. Sometimes, however, a group of mobile devices form a spontaneous, temporary network as they approach each other. This allows e.g. participants at a meeting to share documents, presentations and other useful information. This kind of spontaneous, temporary network referred to as mobile ad hoc networks (MANETs) sometimes just called ad hoc networks or multi-hop wireless networks, and are expected to play an important role in our daily lives in near future.

AODV: Adhoc On–demand Distance Vector Reactive Protocol: [12, 27]

AODV is a distance vector routing algorithm which discovers route whenever it is needed via a route discovery process. It adopts a routing algorithm based on one entry per destination i.e., it records the address of the node which forwards the route request message. AODV possesses a significant feature that once the algorithm computes and establishes the route between source and destination, it does not require any overhead information with the data packets during routing. Moreover the route discovery process is initiated only when there is a free/available route to the destination. Route maintenance is also carried out to remove stale/unused routes. The algorithm has the ability to provide services to unicast, multicast and broadcast communication. AODV routing algorithm has two phases i.e. Route Discovery and Route Maintenance [27]. The AODV routing protocol is a reactive routing protocol; therefore, routes are determined only when needed.

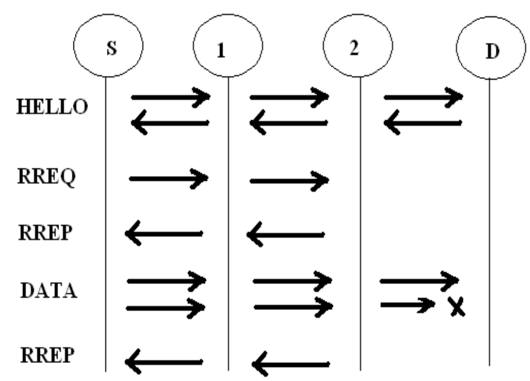


Fig. of AODV messages

This fig. shows various messages exchanges in the AODV protocol. The lists of these messages are:-

- HELLO
- RREQ
- RREP
- DATA
- RERR

Hello messages may be used to detect and monitor links to neighbors. If Hello messages are used, each active node periodically broadcasts a Hello message that all its neighbors receive. Because nodes periodically send Hello messages, if a node fails to receive several Hello messages from a neighbor, a link break is detected. [27] When a source has data to transmit to an unknown destination, it broadcasts a Route Request (RREQ) for that destination. At each intermediate node, when a RREQ is received a route to the source is created. If the receiving node has not received this RREQ before, is not the destination and does not have a current route to the destination, it rebroadcasts the RREQ. If the receiving node is the destination or has a current route to the destination, it generates a Route Reply (RREP). The RREP is unicast in a hop by hop fashion to the source. As the RREP propagates, each intermediate node creates a route to the destination. When the source receives the RREP, it records the route to the destination and can begin sending data. If multiple RREPs are received by the source, the route with the shortest hop count is chosen. As data owns from the source to the destination, each node along the route updates the timers associated with the routes to the source and destination, maintaining the routes in the routing table. If a route is not used for some period of time, a node cannot be sure whether the route is still valid; consequently, the node removes the route from its routing table. If data owns and a link break is detected, a Route Error (RERR) is sent to the source of the data in a hop by hop fashion. As the RERR propagates towards the source, each intermediate node invalidates routes to any unreachable destinations. When the source of the data receives the RERR, it invalidates the route and reinitiates route discovery if necessary.

Characteristics of AODV [27]

- Unicast, Broadcast, and Multicast communication.
- On-demand route establishment with small delay.
- Multicast trees connecting group members maintained for lifetime of multicast group.
- Link breakages in active routes efficiently repaired.
- All routes are loop-free through use of sequence numbers.
- Use of Sequence numbers to track accuracy of information.
- Only keeps track of next hop for a route instead of the entire route.
- Use of periodic HELLO messages to track neighbors.

1. Setting the parameters of Group Mobility Model

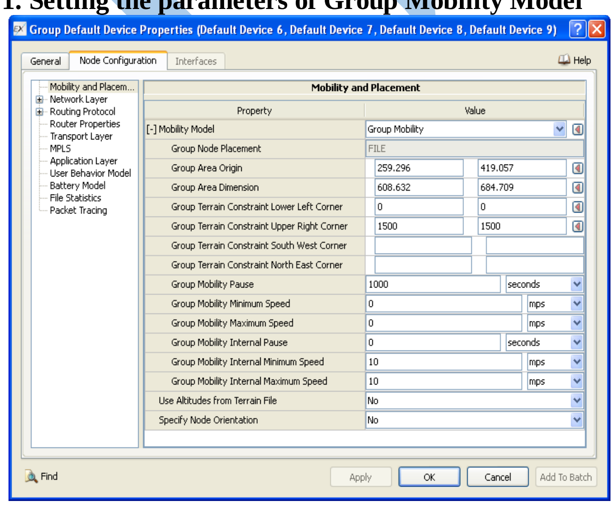


Figure of Setting Group Mobility Parameters

In dynamic topology, Group Mobility Model is used with maximum speed of 20m/s and minimum is 10m/s, external minimum speed is 20m/s and external maximum speed is 60m/s, external pause time is 0s seconds and internal pause time is 5s. In the dynamic scenarios, nodes are randomly chosen to be the sender and the receiver. In this scenario

has been taken 4 CBR links, and has made 4 groups in 20 nodes, each group keeps 5 nodes, Group 1st 1 through 5, 2nd 6 through

10, 3rd 11 through 15, and 4th 16 through 20. Group area origin is 1109.91 - 1040.81m.

Group area dimension is 389.389 – 289.66m. Packet sizes are 512 bytes. This scenario shows the performance of the protocols.

II. PERFORMANCE EVALUATION

2.1 Packet Delivery Ratio (PDR)-Packet delivery ratio is calculated by dividing the total number of data packets received at all the nodes, by the total number of data packets sent out by the CBR sources. Packet delivery ratio forms an important Metric for performance evaluation of an ad hoc routing protocol because, given similar scenarios, the number of data packets successfully delivered at the destination depends mainly on path availability, which in turn depends on how effective the underlying routing algorithm is in a mobile scenario[13]. This number represents the effectiveness and the throughput of a protocol in delivering data to the intended receivers within the network. Number of successfully delivered legitimate packets as a ratio of number of generated legitimate packets.

$$PDR = \frac{\text{Total no. of Packets Received}}{\text{Total no. of Packets sent}}$$

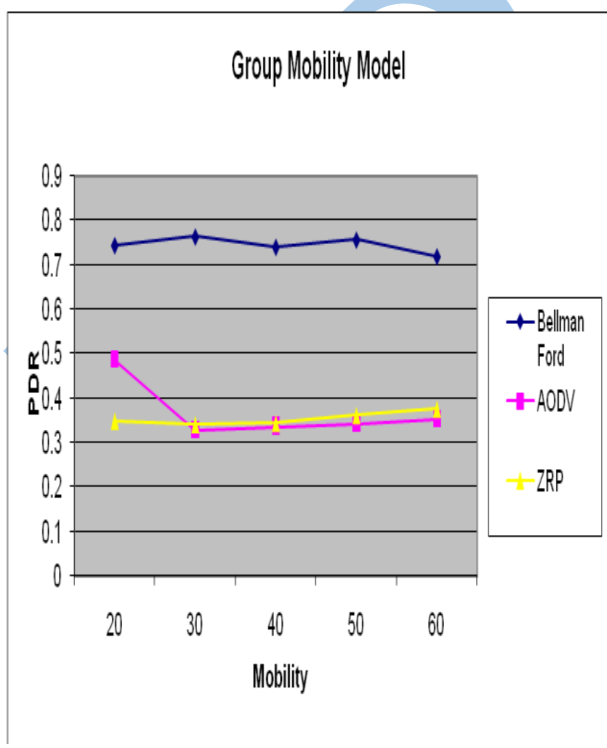
2.2 Average end-to-end delay: Average end to end delay is the time a data packet takes in traversing from the time it is sent by the source node till the point it is received at the destination node [14].This metric is a measure of how efficient the underlying routing algorithm is, because primarily the delay depends upon optimality of path chosen, the delay experienced at the interface queues and delay caused by the retransmissions at the physical layer due to collisions. Routing overhead is a major factor affecting the interface queuing delay as well as the retransmissions. Because the higher the routing overhead the delay experienced at the queues will be longer as well as the number of collision would be high. This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue, retransmission delays at the MAC, and propagation and transfer times.

2.3 Throughput: Throughput is, bits per second delivered to destination, so that unicast network throughput is sum of bits delivered to all destinations over time. It is one of the dimensional parameters of the network which gives the fraction of the channel capacity used for useful transmission selects a destination at the beginning of the simulation, information whether or not data packets correctly delivered to the destinations.

Effect of Mobility: In the presence of high mobility, link failures can happen very frequently. Link failures trigger new route discoveries in AODV since it has at most one route per destination in its routing table. Thus, the frequency of route discoveries in AODV is directly proportional to the number of route breaks.

Table 1. Effect of Mobility on Packet Delivery ratio in Group Mobility

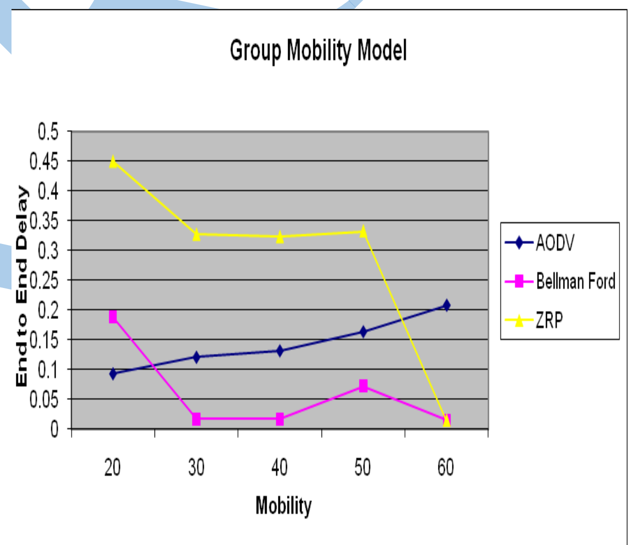
Mobility	Bellman Ford	AODV	ZRP
20	0.744426	0.487179	0.34782609
30	0.763657	0.327759	0.33946488
40	0.740524	0.336399	0.34253066
50	0.756689	0.341695	0.3606466
60	0.719342	0.352531	0.3755643



In Group Mobility Model, Bellman Perform Better in PDR in comparison of AODV And ZRP. Packet delivery fraction for AODV decreases as speed increases, since finding the route requires more and more routing traffic. Therefore less and less of the channel will be used for data transfer, thus decreasing the packet delivery, because AODV uses flooding for route discovery, which makes the packet delivery fraction decreases. When increase the mobility the ZRP also not perform better in PDR.

Table 2. Effect of Mobility on End to End Delay in Group Mobility Model

Mobility	AODV	Bellman Ford	ZRP
20	0.093092	0.188168	0.449427
30	0.120698	0.017077	0.32695
40	0.13151	0.016423	0.322935
50	0.163488	0.072437	0.332327
60	0.207804	0.015354	0.014283



III. CONCLUSION

A mobility pattern has a high relative speed, the nodes might move out of range more quickly. Thus an already existing link may remain stable for a relatively shorter duration. This may lead to more packets being dropped due to link breakage, resulting in lower throughput. Higher control overhead is needed to repair the more frequently broken link. We also note that the worst performance of all the protocols while using these models.

This comparison shows that the AODV protocol performed the best in Random Way Point Mobility model and this type of scenario with throughput, PDR and Average end to end delay. We found that effect of mobility shows that AODV is better under high mobility than the other protocols Bellman ford and ZRP.

REFERENCE

[1]. Thomas Heide Clausen, Philippe Jacquet and Laurent Viennot Inria Rocquencourt, Projet Hipercom," Comparative Study of Routing Protocols for Mobile Ad-hoc Networks".

[2]. P. Chenna Reddy, Dr. P. Chandrasekhar Reddy," Performance Analysis of Ad hoc network protocols".

[3]. Geetha Jayakumar and G. Gopinath , "Performance Comparison of Two On-demand Routing Protocols for Ad-hoc Networks based on Random Way Point Mobility Model", *American Journal of Applied Sciences* 5 (6): 659-664, 2008.

[4]. Neda Moghim and Faramarz Hendessi" Ad hoc Wireless Network Routing Protocols and Improved AODV".