Performance of DSR Routing Protocol for RPGM Mobility model in Manets

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***Abstract*- Manets stands for mobile adhoc network with no centralized administration and infrastructure less network. Mobility is an important issue and mobility model plays major role in performance of routing protocol in manets. Most researchers use random waypoint mobility model to measure performance. For battlefield communication mobile nodes tend to move in groups. For group mobility here we use RPGM mobility model to measure performance of routing protocol. Performance is measured in terms of packet delivery ratio, end to end delay and routing overhead using ns-2 simulator.**

***Index Terms*- Manets, DSR, RPGM, NS2.**

1. INTRODUCTION

Mobile adhoc networks (Manets) do not have any fixed infrastructure or any centralized administration. They set up temporary network for instant communication. MANETs bear great application potential in these scenarios, including disaster and emergency relief, mobile conferencing, battle field communication, and so on. Routing is an important issue in manets and routing protocol is used to discover routes between nodes. On-demand routings outperform table-driven routings under various cases. So we selected on-demand routings, DSR for performance analysis because they have been widely studied and adopted by MANET researchers. Mobility models also affect the performance of ad hoc routing protocols and can be divided into entity mobility and group mobility models. Random Waypoint (RWay) [7] is the most widely used entity mobility model in MANET research. In recent years, people noticed that in real-life MANET for example in battle field communication, mobile nodes tend to move in groups. The rest of the paper is organized as follows: The DSR routing protocol Description is summarized in section II. The entity and group mobility model are explained in Section III. The simulation models and performance metrics are described in Section IV.

II. DSR ROUTING PROTOCOL

DSR[1-3][4][9-10] uses source routing rather than hop-by-hop routing with each packet to be routed carrying in its header the complete, ordered list of nodes through which the packet must pass. So, intermediate nodes do not need to maintain up-to-date routing information. DSR routing protocol can be divided into two mechanisms Route Setup Phase and Route Maintenance Phase. When a source node s wishing to send data packets to destination node d, source node s first checks its Route Cache (RC). If there is no valid route to destination node d found from its RC, the source node S broadcasts a route request (RREQ) packet that is flooded through the network in a controlled manner and is answered by a route reply (RREP) packet from either the destination node or another node that knows a route to the destination. Upon receiving the RREP message, source node s can send data packets using the "hop-by-hop" route stored in it.

Route Maintenance Phase takes the responsibility of detecting broken links and making route recovery. When a mobile node notices that it cannot send packets to the next node in route, a route error (RERR) message will be generated and sent back to the source node along the first part of the route. If a certain node holding the RERR message can find an alternative route from its route cache to substitute the failed link, local link repairing will be made. Otherwise, after the RERR message arrives at source node, a new Route Setup Phase will be initiated.

III. MOBILITY MODELS

A. Random Waypoint Mobility Model (RWay)[7]

Random Waypoint Mobility Model is the most widely used entity mobility model in MANET research. In RWay, each mobile node randomly chooses a destination inside the simulation area and speed uniformly distributed between [MinSpeed, MaxSpeed]. Then the mobile node travels toward the destination with the selected speed. Upon arriving, the mobile node pauses for a certain period of time and then, starts the selection process again.

B.Reference Point Group Mobility Model (RPGM)[8]

In RPGM, each group has a group leader, whose movement defines the entire group's movement, including speed, direction, etc. Group leaders' movement trajectories can be predefined or based on RWay. A number of reference points are placed around the group leader. The distance and direction between the reference points and their corresponding group leader are fixed during whole simulation. Each group member will be assigned one of the reference points and moves around its corresponding reference point. When a new position for one group leader is generated, new positions for reference points are also defined accordingly. Each group member also chooses a new position randomly around its reference point. Then, all mobile nodes in this group will move to their new positions in a same time period with constant speed.

IV. SIMULATION MODELS AND PERFORMANCE METRICS

A. Simulation Models

The NS-2 simulator, version 2.35, with wireless extension [6] is used for simulating the performance of DSR routing protocol. NS-2 can simulate the physical, MAC and data link layer of a multihop wireless network. The distributed coordination function (DCF) of IEEE 802.11 for wireless LANs is utilized as the MAC layer [6]. Lucent's WaveLAN is used as the radio model, which is a shared-media radio with a nominal bit rate of 2Mbps and a nominal transmission range of 250 m. With the use of a NS-2 simulator, we can correctly model the effects of contention for the media and the distance between mobile nodes in determining whether a transmitted packet will be successfully received.

We generate CBR traffic with the ''cbrgen'' tool and scenario for random waypoint mobility model (Rway) [7] with the "setdest" tool in NS2 [6]. Bonnmotion tool is used for generating the scenario for reference point group mobility model (RPGM). The largest group diameter is 100m. The default group-based scenario contains 5 groups (5 MNs for each group). The size for each data packet is 512 bytes and the packet generation rate is 4 data packets per second. Table I shows the default parametric values used in the simulations. In order to make our simulation results more reliable, a number of simulation runs (more than 5 runs for each point) have been made.

TABLE I. SIMULATION PARAMETERS

Parameters	Values
Simulation time	200 s
Number of mobile nodes	30
Simulation area	1000 m*200 m
Transmission range for mobile nodes	250 m
Pause time for mobile nodes	0.0s
Max. Speed for mobile nodes, V_{max}	15 m/s
Speed for mobile nodes	Uniformly distributed between 0 – V_{max}
Traffic pairs	10,15,20,25
Data Traffic Rate for each source	4 packets/second
Propagation Model	Two ray ground
Node Movement Model	Random waypoint, RPGM
MAC	IEEE 802.11

B. Performance Metrics

Following are the metrics which are measured.

1. Packet Delivery Ratio (PDR): it is the ratio of the number of (data) packets received to the number of (data) packets sent in the entire network. Being an end-to-end metric, it is calculated on the basis of the packets sent or received at the application layer.
2. Normalized routing overhead (NRL): It refers to the total number of non-data packets transmitted at the IP layer over the total data packets received during the simulation. Each

transmission of a non-data IP layer packet from one hop to another hop is counted as one packet.

3. Average end to end delay (EED): It is average packet transmission delay between the time the packet generated at the source and the time the packet arrived at the destination.

V. SIMULATION RESULTS

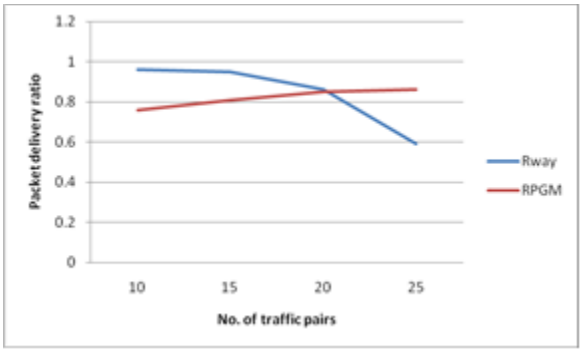

Fig.1. PDF for DSR

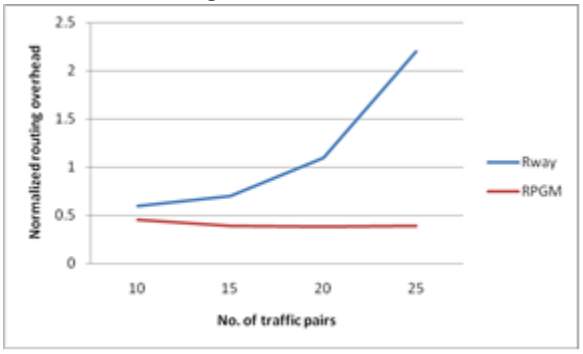

Fig.2. NRL for DSR

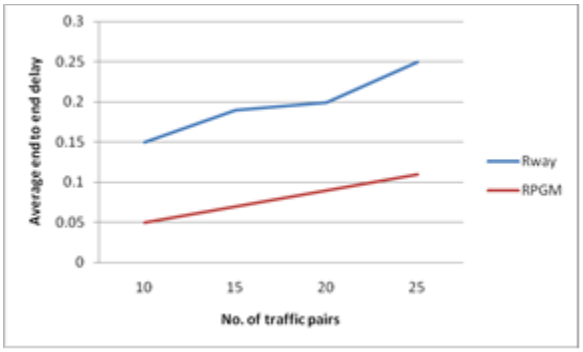

Fig.3. EED for DSR

VI. CONCLUSION

Here we have analyzed the performance of DSR routing protocol. For battlefield communication as the mobile nodes that is soldiers or tankers, they move in groups. So, we have analyzed performance for RPGM group mobility model. DSR routing protocol in group mobility perform worse than in entity mobility. In group mobility model, intra-group transmissions, in which the source and destination nodes are inside the same group, are quite reliable. Packet dropping generally comes from inter-group transmissions in which the source and destination nodes are from two different groups. Thus, there is no link connection between these two groups.

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