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Performance Comparison of Routing Protocols for wrecked ship scenario under Random Waypoint Mobility Model for MANET

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Abstract

Mobile ad-hoc networks (MANET) are used widely in the areas of disaster management, war, emergency situations etc. It is a network which can be easily and quickly deployed. Due to this property many researchers use this network as it is a fast and reliable network too. This network works on different protocols which can be reactive, proactive or hybrid. Hybrid protocol contains the quality of both reactive as well as proactive protocol. MANET also contains different mobility models such as Random Walk, Manhattan grid, Random Waypoint (RWP), Reference Point Group Mobility (RPGM), etc. The comparison of three different routing protocols i.e. DYMO, LAR and LANMAR with Random Waypoint mobility model is done in this paper. The performance of the considered routing protocols has been compared in the considered scenario. To simulate the considered scenario Qualnet 6.1 simulator is used.

Keywords: MANET, AODV, DYMO, LAR, LANMAR.

I. INTRODUCTION

MANET is an autonomous collection of mobile nodes. It's key importance is that it is infrastructure less and self-configuring network. It prepares each device to continuously maintain the information required to route traffic in a proper manner. These nodes may operate by themselves or may be connected in different topologies.

Wireless networks are playing a major role in the area of communication. As they are easy to install these wireless networks are used in different fields. It is a peer-to-peer, self-forming and self-healing network. MANET consists of different topologies, algorithms and applications on which these nodes work. This paper presents the performance analysis of different routing protocols for MANET in a random waypoint mobility mode by varying the pause time.

II. ROUTING PROTOCOL

It can be classified into three different types, Proactive routing protocol, Reactive routing protocol and Hybrid routing protocol.

Proactive routing protocols- In Proactive routing protocol or table driven routing protocol each node has table containing information telling which route to follow and telling how to reach every other node and with the help of the algorithm it is updated. It choses shortest path to reach its next destination and periodic updates are needed to keep themgoing. Average end-to-end delay or the time taken by data to reach the destination from the source to destination is constant for a given Ad hoc network.

Reactive routing protocols- Reactive routing protocol is also known as on-demand routing protocol. It uses two different operations to route discovery and route maintenance operation. In this routing information is obtained on- demand. Route maintenance is mainly the process of responding to change in topology that take place after a route has initially been created. Unlike proactive protocol in this average end-to-end delay varies for a given ad hoc network. The delivery packet data is much more efficient in this protocol. Performances of reactive protocols are comparatively faster than the proactive protocols. They are much more adaptive and work much better in different topographies.

Hybrid routing protocols- This type of protocol combines the properties of both proactive as well as reactive routing. The routing is initially established with some proactively prospected routes and then serves the demand from additionally activated nodes through reactive flooding. These are the new generation of protocols. Most of these are zone based, which means that the network is partitioned or seen as a number of zones by each node.

1. Dynamic Manet On-Demand (DYMO)

DYMO is reactive protocol. It is a fast, simple, easier to implement and designed with future enhancement in mind. It discovers unicast routes among DYMO routers within the network in an on-demand fashion. Route discovery and route management are the basic operations of the DYMO protocol.

2. LANMAR routing protocol

LANMAR protocol is basically known as Landmark Adhoc routing protocol which combines the features of FSR and LANMAR routing. It assumes that the large scale ad hoc network is grouped into logical subnets in which the members have a commonality of interests and are likely to move as a group. In this protocol each node periodically exchanges topology information with its immediate neighbours.

3. LAR1

The Location Aided Routing Protocol uses location information to reduce routing overhead of the ad-hoc network. This protocol uses the GPS (Global Positioning System) technique to get this location information. With the help of GPS mobile hosts knows there physical location. In this route request and route reply packets similar to DSR and AODV are being proposed.

4. AODV

Ad hoc On-Demand Distance Vector (AODV) routing is a routing protocol for mobile ad hoc networks (MANET) with large number of mobile nodes. The algorithm used in these protocols creates routes between nodes only when the routes are requested by the source nodes, giving the network the flexibility to allow nodes to enter and leave the network at will. Routes remain active only as long as data packets are travelling along the paths from the source to the destination. It supports both uncast as well as multicast.

III. MOBILITY MODEL

Mobility models represent the movement of mobile user, and how their location, velocity and acceleration change over time. Such models are frequently used for simulation purposes when new communication or navigation techniques are investigated.

Random Waypoint

Nodes in the simulation set up move according to a model that is well known as the "random waypoint" model. In this mobility model the destination, speed and direction are all chosen randomly and independently of other nodes.The movement scenario files w used for each simulation are characterized by a pause time. Nodes moves in 1500m x 1500m space and selects a random destination.

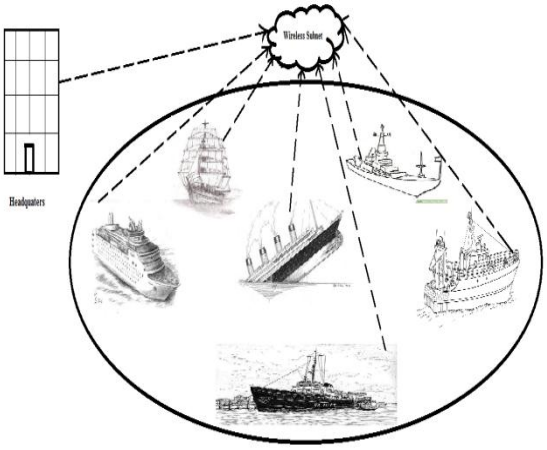

Fig.1. Scenario of wrecked ship

IV. SIMULATION SETUP

A. Simulator

To simulate the protocol Qualnet 6.1 is chosen. Qualnet supports the random waypoint mobility model along with user defined trajectories.

B. Simulation Mode

The description of the scenario is as follows:-

i. The considered scenario has been focused towards a reliable communication between the ships in a wide area disaster network.

ii. Most of the time signals sent from a sinking ship to the other neighbouring ships will not be processed properly due to the long distance. As well as, the various environmental hazards may also disrupt the signals.

iii. We have focused on a reliable communication which will take place between a satellite (wireless subnet) tracking the position of all the ships (nodes) and will send the info to the main headquarters (server).

iv. The headquarters will be updated regularly about the position of the ships in the considered wide area network.

v. According to this scenario we are comparing the performance of routing protocols between the satellite (wireless subnet) and ships (nodes) in a wide area MANET. We have considered the mobility model for the ships (nodes) to be Random Waypoint.

vi. The comparison has been done between the protocols on the basis of different pause time in the considered mobility model.

The parameters for frame work scenario are given in Table 1.

Table 1: Parameter For Framework Scenario

Parameters for the frame work scenario	
Packet size	512 Bytes
Packet rate	4 packets/sec
Data traffic	CBR
Dimensions	1500 x 1500
No. of nodes	50
Min. speed	0 m/s
Max. speed	10 m/s
No. of groups	2
Mobility model	Random Waypoint
Radio transmission range	180 m
Varying pause time	5, 10, 15
Simulation time	1000s

C. Performance Metrics

i. **Average end-to-end delay:** It can be defined as a measure of average time taken to transmit each packet of data from source node to destination node.

ii. **Throughput:** It is the number of packets successfully transmitted to their final destination per unit time.

iii. **Average jitter:**It is the variation of the inter-arrival times between the two successive packets received.

V. RESULT AND DISCUSSION

Here we evaluate three parameters namely end-to-end delay, throughput and jitter and for performance evaluation of the routing protocols.

i. Average end-to-end delay

As can be observed from Fig 2, Average end-to-end delay is less in DYMO. In LAR1 it has increased where as LANMAR is showing the highest average end-to-end delay which is increasing with network size.

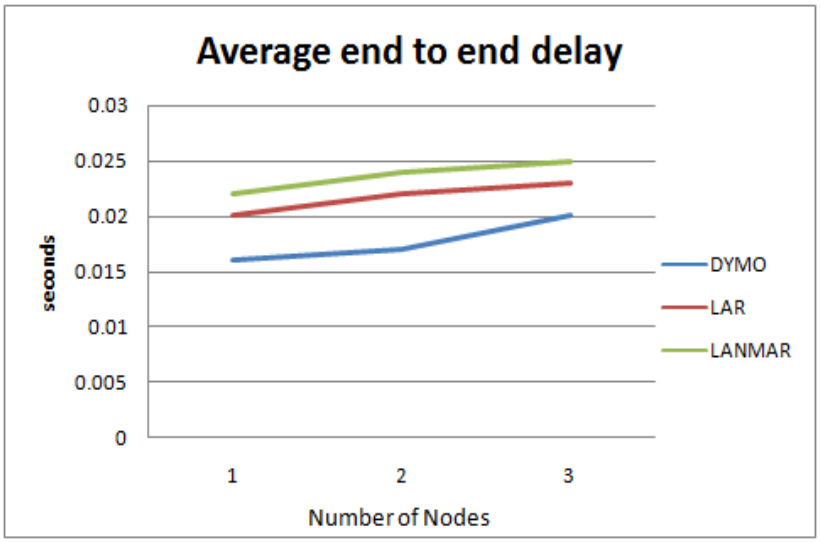

Figure 2:- Average End-to-End Delay

ii. Throughput

As can be observed from Fig 3, LANMAR has the poor performance, LAR1 is moderate while DYMO has the best performance of all three.

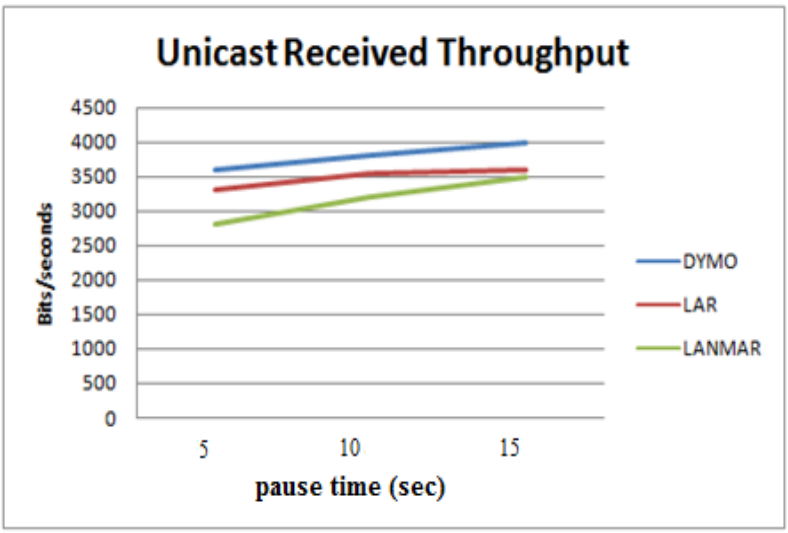

Figure 3:- Throughput

iii. Average Jitter

As can be observed from Fig 4, DYMO has the lowest average jitter compared to LAR1 and LANMAR.

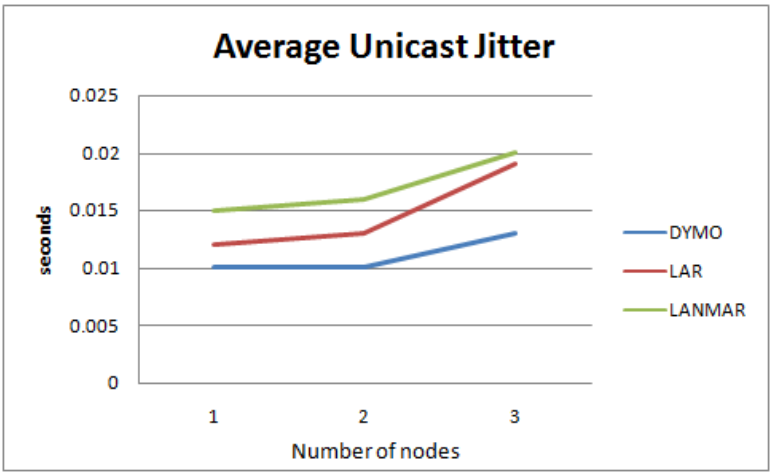

Figure 4:- Variation of Average Jitter

VI.CONCLUSION

We have simulated Random Waypoint for three MANET routing algorithms DYMO, LANMAR and LAR1. Comparison among these three protocols has been done on the basis on varying pause time. This simulation shows that MANET routing algorithms behaves significantly different under the mobility scenarios designed on the same platform. According to the simulation, it concluded that, the performance of DYMO routing protocol is much better than the other two considered protocols, and the performance of LAR1 and LANMAR was considerable but not up to the mark.

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