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Performance Evaluation of Reactive Routing Protocols in Manet Networks Using GPRS Based Data Traffic Applications

Rupanita Das[*1], Shanaz Aman[2], Smruti Ranjan Nayak[3]

[*1,2] Assistant Professor, [3]Teaching Assistant Electronics and Communication Engineering , Centurion University of Technology and Management, Jatni, Bhubaneswar, Orissa, India

rupanitadas@gmail.com

Abstract

As it is well known to all that the network topology is the arrangement of various elements like links and nodes etc .So topology is nothing but the structure of network .If the nodes changes their location over time ,they have to update their location estimates frequently in order to avoid inaccuracies resulting from using outdated location estimates. So the change of these nodes results frequently and unpredictable changes of network topology, like regular route changes, network partitions and possibly packet losses, making routing a challenging task in MANET network. This network stands for Mobile Ad Hoc Network is a type of network that can change the locations and configure itself on the fly because MANETS are mobiles they use wireless connections to connect a various networks The mostly used routing protocols in such networks are proactive, reactive and hybrid, topologies. This paper evaluates the performance of AODV- and DSR-reactive routing protocols in MANET network using GPRS quality data traffic by calculating matrices such as packet delivery fraction, end-to-end delay.

Keywords: Glomosim , AODV, DSR, GPRS, Packet delivery fraction, End-to-end delay

Introduction

A mobile ad hoc network (MANET) is a self-configuring infrastructure less network of mobile devices connected by wireless. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route traffic. Such networks may operate by themselves or may be connected to the larger Internet. [1]. Nodes in these networks utilize the same random access wireless channel, cooperating in an intimate manner to engaging themselves in multi-hop forwarding. The node in the network acts as hosts and routers also that route data to/from other nodes in network [2]. Within a cell, a base station can reach all mobile nodes without routing via broadcast in common wireless networks. In the case of ad hoc networks, each node must be able to forward data for other nodes. This creates additional problems along with the problems of dynamic topology which is unpredictable connectivity changes [3]. Many routing schemes have been presented to provide adequate performance of ad-hoc networks. Reactive routing determines routes on an as-needed basis: when a node has a packet to transmit, it queries the net-work for a route. An **ad hoc routing protocol** is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile ad hoc network .In ad hoc networks, nodes are not familiar with the topology of their networks they find it typically, a new node announces its presence listens for announcements broadcast by its neighbours. Each node learns themselves about others nearby and how to reach them,. When a transmission occurs from source to destination, it invokes the route discovery procedure. The route remains valid till destination is achieved or until the route is no longer needed. AODV(Ad-hoc On-demand Distance Vector Routing) and DSR(Dynamic Source Routing) belong to reactive routing protocols [4,5]. In this paper, MANET ad-hoc networks with reactive ad-hoc routing protocols are studied and evaluated using Glomosim then performance comparison has been performed between various reactive ad hoc protocols.

Dynamic Source Routing DSR [7] [8] is an On Demand routing protocol. DSR is source based routing and is a very simple and efficient routing protocol. DSR is designed for use in multihop wireless

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Ad hoc networks of mobile nodes. The DSR protocol works into two main mechanisms called Route Discovery and Route Maintenance. Route Discovery is the mechanism in which a source node tending to send a packet to a destination obtains a source route to destination. It is initiated only when a source node wants to send packet to a destination and doesn't already know the route to it. And, then it maintains that route in the cache of the nodes. Route Maintenance is the mechanism in which source node is able to detect the link failures to the destination. It then repairs the route or finds an alternate route. It is used only when source is sending packets to a destination.

Adhoc on demand distant vector protocol AODV [7] [9] is a reactive distant vector protocol. It mixes the property of DSR and DSDV. Routes discovered on demand are maintained as long as they are required. AODV routing table maintains routing information of any route that has been used recently within a time interval. The operation of AODV is loop free by use of sequence numbers which indicate the freshness of the route. When links break, AODV causes the affected set of nodes to be notified to invalidate the route. Route Request (RREQs), Route Replies (RREPs), and Route Errors (RRERs) are three message types defined by AODV for its working.

Simulation Setup

Using Glomosim we have designed MANET network having 50 nodes with vector mobility within simulation area of 1500Mx300M. Also, the high quality GPRS data traffic is used during simulation of 15m.Mobility model used is random waypoint model. The performance of the MANET network is evaluated by implementing reactive ad hoc routing protocol schemes such as ADOV and DSR in different scenarios at data rate of 2 Mbps.\

Result and Discussion

For the performance analysis we have used GloMoSim as the network simulator [2], where in the simulation is done above mentioned routing protocol. The mobility model we have chosen is Random Way Point model [3, 4, 7]. The other parameters that we have chosen for the network in the simulator are as listed in the table 1.

Table 1 Parameters used for simulation

Parameters	**Value/Specification**
Terrain Area	1500Mx300M
Number of Nodes	50
Node Mobility model	Random Waypoint
Number of sources	10 ,20
Maximum Speed	20 M/S
Pause time	0 S to 900 S
Simulation Time	15 M
Transmission Range	250 M
Mac Protocol	802.11
Routing Protocol	AODV,DSR
Packet size	512 bytes
Data rate	2 Mbps
Type of Data traffic	CBR (Constant Bit Rate)

Pause time in MANET corresponds to the period of time for which a node halts at a intermediate node before moving to destination point[10].
The plots given in this paper indicates different values of performance metrics as mentioned in the last section with a variation in pause time from 0 to 900s corresponding to the network of 50 nodes with 10 and 20 sources differently.

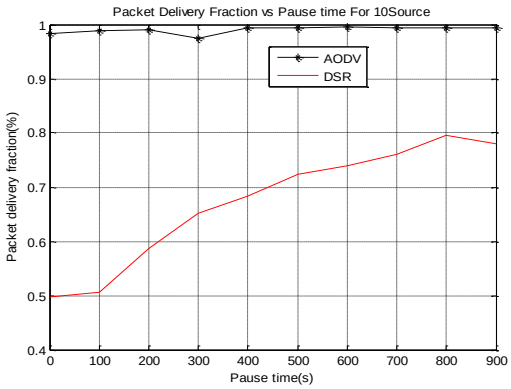

Fig.1(a) Packet delivery fraction vs pause time for a MANET of 50 nodes with 10 sources

Fig. 1(a) indicates the plot between packet delivery fraction and pause time for 10 sources. From the figure it can be observed that in AODV with low network load (i.e. 10 sources) and high mobility scenario(i.e. zero pause time) the packet delivery fraction is better than DSR.

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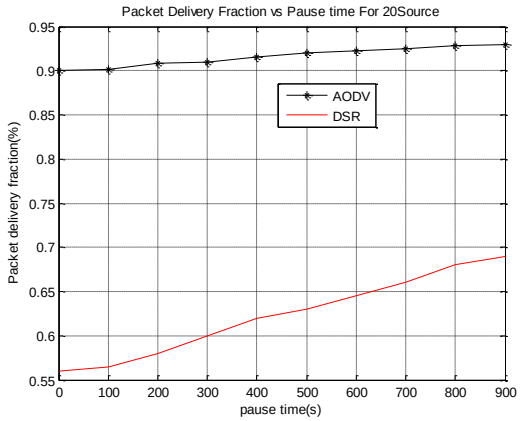

Fig.1(b) Packet delivery fraction vs pause time for a MANET of 50 nodes with 20 sources

With increase in network load (i.e for 20 sources) the routing load also increases significantly which leads to non availability of routes from source to the destination. It can also be observed that with increase in pause time the packet delivery fraction for AODV decreases. This is because, with increase in pause time, the network congestion increases, which leads to decrease in packet delivery.

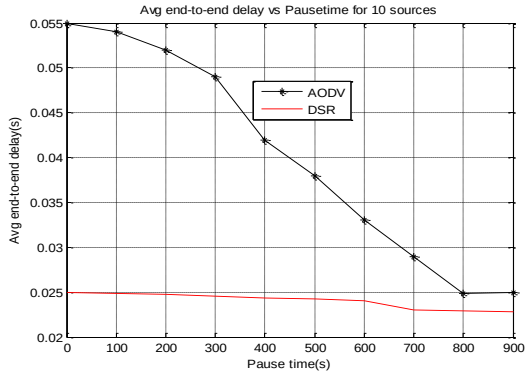

Fig.2(a) Average end-to-end delay vs pause time for a MANET of 50 nodes with 10 sources

Fig. 2(a) indicates the plot between average end-to-end delay and pause time for 10 sources. From the figure it can be observed that in DSR with low network load (i.e. 10 sources) and high mobility scenario(i.e. zero pause time) the average end-to-end delay is better than AODV.

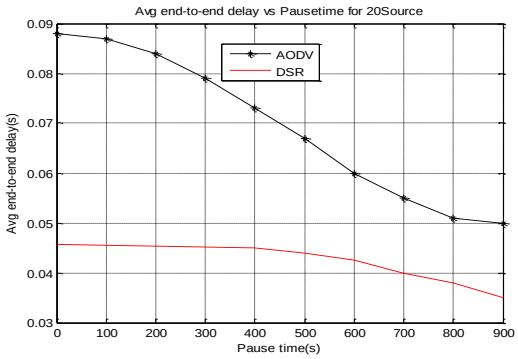

Fig.2(b)) Average end-to-end delay vs pause time for a MANET of 50 nodes with 20 sources

With increase in network load (i.e. for 20 sources) the routing load also increases significantly which leads to non availability of routes from source to the destination so average end to end delay increases

Conclusion

The simulation model of MANET network is developed using Glomosim simulator and analyzed for different reactive adhoc routing protocols with different mobile nodes transmitting GPRS data traffic. It is concluded that though the DSR has lower end-to-end delay compare to AODV but still AODV is best suited for MANET network in dense population of nodes in GPRS data traffics because AODV has higher packet delivery fraction than DSR.

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