Comparative study of different Parameters of MANET Routing Protocol for different Buffer Size

YASHI RAJVANSHI
Department of ECE, Vidya College of Engineering, Meerut
India, U.P.-250002

SEEMA RAHUL
Department of ECE, Radha Govind Group of Institutions, Meerut
seema_3485@yahoo.com

SANJAY KUMAR MAURYA
Department of ECE, GCRG Group of Institutions, Lucknow
sanjay.skm97@gmail.com

SANDIP VIJAY
Head, Department of ECE/AEI, Dehradun Institute of Technology, Dehradun
vijaysandip@gmail.com

Abstract

In this Paper I have taken the different buffer (packet) size for different Routing Protocols and study the different performance matrices where we will get the optimize result and where we will get the worst result i.e. where we get the maximum packets and where packet reception at receiver is minimum..In this paper we have taken the one Protocol from each category of Routing Protocols.

Keywords: MANET, DSR, Bellman-Ford, ZRP Protocol, Qualnet 5.02

1. Introduction

This work is based on MANET which represents the Mobile Adhoc Network. Adhoc means something which is implemented on a temporary basis or we can say which works dynamically on the basis of requirement, so in wireless communication an ad hoc network is a collection of wireless mobile nodes dynamically forming a temporary network without the use of any existing network infrastructure or centralized administration. MANETs are useful in rescue operations at the time of natural disasters, in military operations. These are situations when network is not required for longer period. MANET can be used then. For e.g. in a business meeting, devices of members need be networked for few hours. MANETs accounted with a number of challenges for designing a suitable routing protocol due to their natural characteristics. Guaranteeing delivery and the capability to handle dynamic connectivity are the most important issues for routing protocols in MANETs. The integration of MANETs into Internet increases the Networking flexibility and coverage of existing infrastructure networks.
Ad hoc networking allows portable devices to establish communication independent of a central infrastructure. However, the fact that there is no central Infrastructure and that the devices can move randomly gives rise to various kind of problems, such as routing and security [1]. A mobile ad hoc network is formed by mobile hosts. Some of these mobile hosts are willing to forward packets for neighbors. Examples include vehicle-to-vehicle and ship-to-ship networks that communicate with each other by relying on peer-to-peer routings. In order to ensure effective operation as the total number of nodes in the MANET becomes very large, the overhead of the employed routing algorithms should be low and independent of the total number of nodes in MANET [2].
There are mainly three types of routing protocols i.e. Reactive, Proactive and Hybrid these protocols are having different criteria for designing and classifying routing protocols for wireless ad hoc network.

2. Problem Description:

The aim and objective of this work is to study MANET Routing Protocols and to find out the stage at which buffer size we get the maximum output and at which stage we get the minimum output. So to do this we have taken

different parameters such as Throughput, End-to-End Delivery of the Packets, Delay etc. This all study and Simulation Environment has been provided by one of the Wireless Sensing Network Software QUALNET 5.02.

3. Wireless Sensor Networks and Routing Protocols in Ad Hoc Networks

Routing is the act of moving information from a source to a destination in an internetwork. During this process, at least one intermediate node within the internetwork is encountered

3.1. Proactive routing protocols
It is also known as Table driven protocols since they maintain the routing information even before it is needed. In proactive routing protocols each and every node maintained a routing table in the network and update this periodic table through periodic exchange of control massage between nodes because every node should have instant information about any topology change in the networks. In proactive routing protocol route to every destination already present so there is no initial delay to start sending data. In table-driven or proactive protocols, the nodes maintain an active list of routes to every other node in the network in a routing table. The tables are periodically updated by broadcasting information to other nodes in the network. Thus, they are an extension to the wired network routing protocols such as the Routing Internet Protocol (RIP).   Many proactive routing protocols have been proposed, for e.g. Destination Sequence Distance Vector (DSDV), Optimized Linked State Routing (OLSR), and **Bellman-Ford** and so on.

3.1.1 Bellman-Ford Overview
The algorithm known as Bellman-Ford was originally developed by Bellman and by Ford and Fulkerson. It is typically described in pseudo code. [4]
Bellman-Ford is used for single source shortest path along with Djikstra Algorithm. It is a Dynamic Programming based algorithm and it work for negative weight edges. Also distributed variant of the Bellman–Ford algorithm is used in distance-vector routing protocols. The Bellman-Ford distance-vector routing algorithm is used by routers on internetworks to exchange routing information about the current status of the network and how to route packets to their destinations. The algorithm basically merges routing information provided by different routers into lookup tables. It is well defined and used on a number of popular networks. It also provides reasonable performance on small-to medium sized networks, but on larger networks the algorithm is slow at calculating updates to the network topology. In some cases, looping occurs, in which a packet goes through the same node more than once. In general, most DVR (distance-vector routing) algorithms are not suitable for larger networks that have thousands of nodes, or if the network configuration changes often. In the latter case, the routing algorithm must be able to dynamically update the routing tables quickly to accommodate changes [5]. It is used as an algorithm by distance vector routing protocols such as RIP, BGP. Routers that use this algorithm will maintain the distance tables, which tell the distances and shortest path to sending packets to each node in the network [6]. This protocol and algorithm currently use in the IPv4 Internet.

3.2. Reactive protocols
It is also known as On demand routing protocol. In reactive routing protocol routes are developed when it needed so update of routing table in reactive routing protocol is not required so frequently and there is no need of maintain routes for all nodes in the networks. In reactive routing protocol for new destination every node required a route so they have to wait until new root is discovered. Reactive routing protocols take a lazy approach to routing. They do not maintain or constantly update their route tables with the latest route topology. This type of routing creates routes only when desired by the source node. The source node initiates a process called route discovery when it requires a route to the destination. This process is completed when a route is found or when all the possible routes are examined. The process of route maintenance is carried out to maintain the established routes until either the destination becomes unavailable or when the route is no longer required. Several reactive protocols have been proposed such as **Dynamic Source Routing Protocol (DSR)**, Ad hoc On-demand Distance Vector (AODV), Temporary Ordered Routing Algorithm (TORA), and so on.

3.2.1 DSR Overview
The Dynamic Source Routing Protocol (DSR) is an efficient routing protocol designed specifically for use in multihop wireless adhoc networks of mobile nodes. DSR allows the network to be completely self-organizing and self-configuring, without the need for any existing network hauling. Dynamic Source Routing is a imprudent

routing protocol that uses source routing to send packets. DSR uses source routing which means that the source must know the complete hop sequence to the destination [7]. In DSR the source determines the complete sequence of hops that each packet should traverse. This requires that the sequence of hops is included in each packet's header. A negative consequence of this is the routing overhead every packet has to carry [8].

3.3. Hybrid routing protocols

This type of protocol is combination of table-driven (Proactive) and on demand (Reactive) routing protocol i.e. it contains features of proactive as well as reactive protocol. It inherits the advantages of proactive and reactive routing protocols. Initially hybrid routing protocol developed the routing through proactive routes and then reactive flooding satisfy the demand of additional activated nodes Several hybrids routing protocols have been proposed such as **Zone Routing Protocol (ZRP)**, Zone-based Hierarchical Link State (ZHLS) and so on, but the most popular protocol is ZRP [3].

3.3.1 ZRP Overview

The Zone Routing Protocol (ZRP) was introduced in 1997 by Haas and Pearlman. It is either a proactive or reactive protocol. It is a hybrid routing protocol. It combines the advantages from proactive and reactive routing. It takes the advantage of pro-active discovery within a node's local neighborhood (Intrazone Routing Protocol (IARP)), and using a reactive protocol for communication between these neighborhoods (Interzone Routing Protocol (IERP)). The Broadcast Resolution Protocol (BRP)[9] is responsible for the forwarding of a route request.

ZRP divides its network in different zones. That's the nodes local neighborhood. Each node may be within multiple overlapping zones, and each zone may be of a different size. The size of a zone is not determined by geographical measurement. It is given by a radius of length, where the number of hops is the perimeter of the zone. Each node has its own zone.

5. Simulation Parameters

I have used the following metrics for evaluating the performance of MANET Routing Protocols:

5.1 Throughput

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 i.e., information whether or not data packets correctly delivered to the destinations.

5.2 Average End to End delay

The average end-to-end delay of data packets is the interval between the data packet generation time and the time when the last bit arrives at the destination [6].

5.3 Packet Delivery Sent

It is the ratio of the number of data packets received by the CBR sink at the final destinations to the number of data packets originated by the "application layer" at the CBR sources.

6. Simulation Setup

To analyze the performance of MANET Routing Protocol we have Simulate the different Buffer (packet) size on **Qualnet 5.02** software.

The main purpose of this simulation is to observe where we will get the Optimum information and where we will get the minimum information.

Table 1: Simulation Parameters Values

S.No.	Parameters	Values
1	Simulator	Qualnet 5.02
2	No. of Nodes	100
3	Traffic Type	CBR
4	Terrain Area	1500 m. x 1500 m.
5	MAC Type	IEEE 802.11b
6	Antenna Type	Omni- Direction
7	Protocol	Bellmann-Ford
8	Channel Type	Wireless channel
9	Radio Propagation Model	Two-Ray Ground Model
10	Mobility Model	Random Way Point

7. Results and Discussion

With the use of Qualnet 5.02 we have studied the different parameters for Bellman-Ford Protocol and their results are as follows:

7.1 Throughput (bits/sec)

At the Transmitter side there was a throughput of 4274 bit/sec and we observed that the at 800 buffer size of DSR Protocol we get the maximum throughput i.e. **4341** and at 10000 buffer size of Bellman-Ford we will get the minimum throughput i.e. **283**.
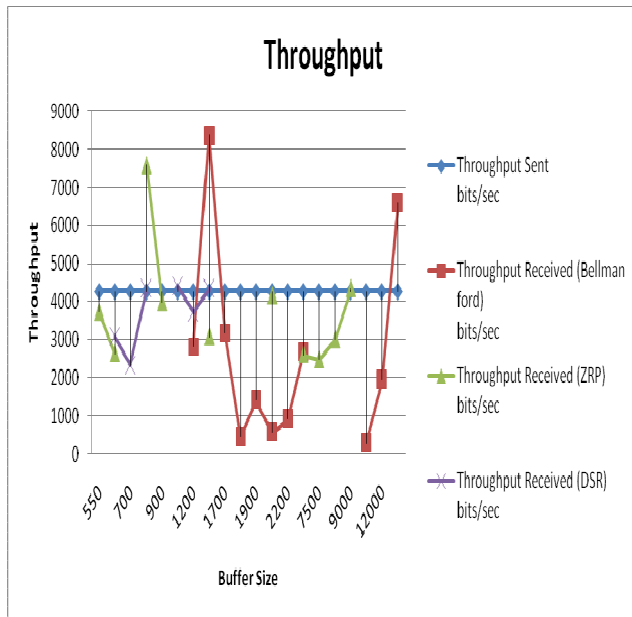

Fig 1 Comparative Graph for Total Throughput for All Three Protocols

7.2 Average End to End Delay (sec)

In this it is observed that minimum delay is at 1200 buffer size i.e**. 0.033 sec** of Bellman-Ford Protocol and maximum delay is of ZRP at 550 buffer size i.e. **0.262 sec**
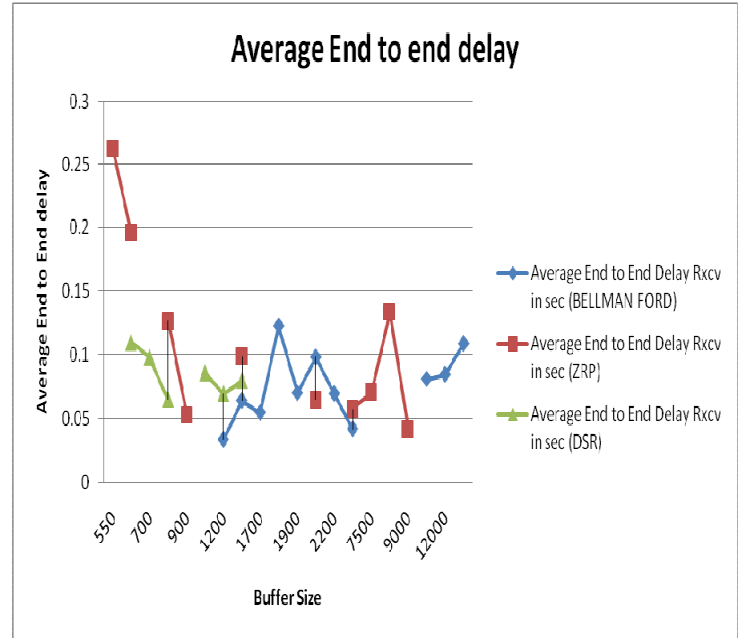

Fig 2 Comparative Graph for Average End to End Delay for All Three Protocols

7.3 Packet Delivery Sent/Ratio

Initially we have sent 24 packets of data and we observe that at the buffer size of 800 & 1000 of DSR we get the exact number of packets i.e. 24 packets and at the buffer size of 800 of ZRP we get more than the packet which we sent i.e. **41**
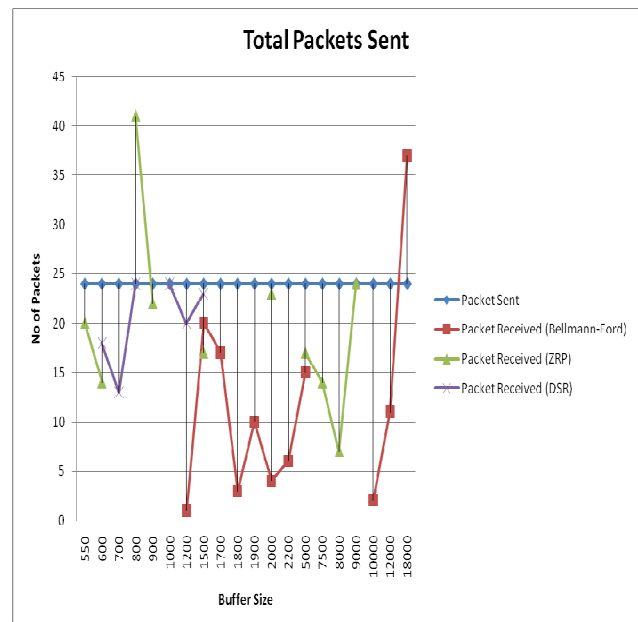
Fig 3 Comparative Graph for Total Packet Sent/Received for All Three Protocols

8. Conclusion

In this paper we have taken the one Protocol from each type and find out the optimize result for each individual performance characteristics. Here we have taken the Scenarios of different buffer size to get the Optimize result. We believe that our work could be more intuitive for researchers for protocol selection and their suitability of application in real time.

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