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Design and Analysis of Enhanced Routing Protocols in MANET

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ABSTRACT

A mobile Ad hoc [6] network is collection of wireless mobile nodes that dynamically from a network connection temporarily without any support of starting infrastructure. There are mainly three types of routing protocols in ad hoc networks which are proactive, reactive and hybrid. AODV takes long time to build rout table. It is possible that a valid rout may have expired and the determination of reasonable expiry time is difficult. Problem in DSDV and ZRP, these are having heavy routing overhead due to maintaining rout table in the cluster. In order to reduce these problems we are establishing compromised node effect algorithm and implemented in NS2. By simulating AODV, DSDV and ZRP, this paper presented Enhanced AODV to overcome these problems. Simulation is carried out to check the performance of protocol as in terms of packet delivery ratio, energy consumption and throughput.

Keywords:—*AODV, DSDV, Hybrid Routing, Enhanced AODV, ZRP protocols.*

I. INTRODUCTION

The mobile ad hoc network is dynamic and temporary network. This network is composed of set of mobile nodes which are capable of searching and orientating dynamically and resuming automatically. They can fulfill the routing, transmitting the packets, and the discovery of service without fixed communication establishment. A MANET [I] much more vulnerable to attacks as composed to wild network due to node having limited energy. Even If the channel is reliable, the communication may still be unreliable due to broadcasting nature of MANETs. There is no central management point, which make it difficult to ensure that all node participating in the network or begin. Mobility of nodes play a very important role in the network, which makes routine more challenging as the topology keeps changing regularly. Application of MANETs [4] in battlefield, medical field, military applications, LANs and wireless sensor networks (WSN) [11] etc. In MANET every node having mobility and it causes route loss and topology changes. Protocol's can be divided into the following basic categories: proactive routine protocol [13][12] (OLSR, DSDV etc..), reactive routine protocol(AODV etc..) and Hybrid protocol (ZRP etc..)[8]. Disadvantage of proactive routine protocols are bigger overhead, needs more power to operate and need more operational experience to debug. Disadvantage of reactive routine protocols is potential collisions between route requests propagated by neighboring node. Disadvantage of hybrid routing protocol [7] is additional traffic produced by the creation and maintaining of the zone-level topology.

II. Related Work

P. Manickam (2011)[7] worked on performance comparison of routine protocols in mobile ad hoc networks. we have done comprehensive simulation results of average end to end delay, throughput and packet delivery ratio over the routine protocol DSDV [2], TSR and AODV [3] by varying network size, simulation time DSDV is a proactive routine protocol and suitable for limited no of nodes with low mobility due to the storage of routing information in nth routing table at each node. Comparing DSR with DODV and AODV protocol, byte overhead in each pack will increase when topology changes. Since DSR protocol uses source routing and rout cache. Hence DSR is preferable for moderate traffic with moderate mobility.

N. K. Patel, Sanja Kumar (2016)[8] worked on evolution of mobility model with MANET routing protocols. In this paper performance of protocols measure individually over various types of non realistic mobility models the observable percentage of parameters in non realistic mobility models are quite acceptable by DSR in terms of throughput. The results generated by AODV protocol are mostly similar to DSR but it suffers from end to end delay. Performance of TORA is declined sharply as compared to others the average end to end delay is observed very low by DSDV compared to other protocols results which are still is acceptable on the basis of throughput and End to End delay, DSR perform better than others in future this study can be done to compare protocol performance in mobility models and performance of some other routing protocol of WNS, this work also extends with other simulator tools of other networks like OPNET and MATLAB etc. the other progress of regular and continuing approach of future work can be quality of services (QOS) issues.

Mohammed Amna (2001) worked on impact of mobility and delay throughput performance in multi services mobile ad hoc networks. Mobile Ad hoc Network is collection of mobile nodes in communication without using infrastructure we have presented the behavior of AODV[5][9] routine protocol with multimedia traffic (VBR and CBR), by using various mobility nodes as random way point, random direction and Mogen steady state. With AODV model in association with CBR Traffic, the first one the optimal delay is achieved respectively by random way point in small density and Mogen steady states is heavy density. In the second one the optimal throughput is achieved by random way point other most important point in this paper is behavior of AODV with the three mobility described previously depends on the traffic used (CBR or VBR) [3].This behavior is influenced precisely in case of low density of nodes..Topology based protocols are better that proactive topology based routing topology.

2.1 Proposed Work:

Simulation environment is created for transmitting data from one place to another with 1000*1000 dimensions. Maximum nodes are taken 100, Number of nodes have being given as input assuming nodes are moving. Process of data transmission, first identify the source and destination nodes and find the intermediate nodes between source and destination. Check whether they are in the same cluster or not, this can be founded by different path finding algorithms. If it is not in same cluster, from the source via intermediate nodes it sends route request (RREQ) to neighboring cluster node. This paper presents, Enhanced AODV protocol is to calculate the parameter metrics are packet delivery ratio, energy consumption and throughput.

III. Methodology

In this protocol we have chosen AODV as best protocol and Enhanced in such a way that each node should maintain routing table and update periodically which contains list of neighbors. It

can reach in one hop distance also it manages timer for each node which is directly proportional to neighbor node. This proposed protocol finds the compromising node in the cluster. Method of finding compromising node as follows, source node sending a RREQ to all neighboring nodes. Source has to wait for RREP from all neighboring nodes, if none of the neighboring node was destination node, all neighboring nodes sent RREQ to the further neighboring node. If it is compromise node does not send RREQ to another node. Source is send RREQ to same node, it continuous five iterations. Now source decided that node was compromised node.

3.1 Steps for finding compromise node:

At source node (i) sends RREQ to neighboring nodes(i+1,i+2,……i+n),

Neighboring nodes receive RREQ,

All neighboring nodes sent RREP to source node,

Update record of all neighboring node addresses,

If (destination address (i)=(j) any neighboring node address)

{

Path establish between source to destination

Else

All neighboring nodes send RREQ further nodes

}

If((i+1)node not send RREQ to further node)

{

Source(i) sends RREQ to (i+1)node for 5 iteration,

Else

(i+1) node is compromise node

}

END

3.2 Path establishing diagram:

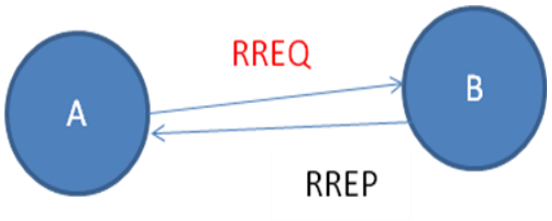

Figure 1. Path establishing

RREQ - Route Request

RREP – Route Reply

Node A – Sender

Node B – Receiver

3.3 Definition of compromising node:

If the Node is Compromised Node it cannot participate in a data transmission but it act as node it would send routing table to all neighboring nodes. In every cluster finding compromising node is very difficult the above proposal is one of the techniques to find compromising node. By this node we will get problems like.

1. It increases transmission time from sender to receiver
2. It gives false information to neighboring nodes in the form of route table.
3. By checking every Node more number of times causes Energy loss at neighboring node and creates complexity in Network.

4. Some time data transmission is not possible due to more number of compromising nodes in the cluster.

From this Algorithm complexity of network is reducing by finding compromising node earlier that is 0.3 micro seconds. So with our technique we are increasing throughput, increasing packet delivery ratio and reducing Energy consumption.

IV. Simulation Setup

The simulations were performed using Network Simulator 2 (NS-2.33). The source destination pairs are spread randomly over the network. We have summarized the model parameters that have been used for our experiments.

Table.1 Simulation setup

Parameter	Value
Network area (size)m^3	100x100
Wireless nodes	20
Node speed (m/s)	[0,10]and[10'25]
MAC layer protocol	PHY IEEE 802.11g
Channel setting	Auto assigned
Buffer size	25600=32k
Transmission power (watt)	0.005
MANET routing protocol	AODV, EMAODV, DSDV, ZRP
Simulation time(ms)	80
Addressing mode	Ipv6
Simulation	NS2.33

4.1 Parameter metrics:

The protocols are evaluated for packet delivery ratio, throughput, and Energy consumption.

4.1.1Energy consumption:

The power received at the node multiply by time is called power consumption.

4.1.2 Throughput:

The throughput is defined as the total amount of data a receiver receives from the sender divided by the time it takes for the receiver to get the last packet. The throughput is measured in bits per second (bit/s or bps). Throughput is the ratio of the total amount of data that reaches a receiver from a sender to the time it takes or the receiver to get the last packet.

4.1.3 Packet delivery ratio

Packet delivery ratio is defined as the ratio of data packets received by the destinations to those generated by the sources. Performance of the DSDV is reducing regularly while the PDR is increasing in the case of DSR and AODV. AODV [14][15] is better among the above protocol.

In figure 2, 3, 4 units for X-axis is 1 unit= 4 milliseconds

4.2 The graph for PDR versus Time:

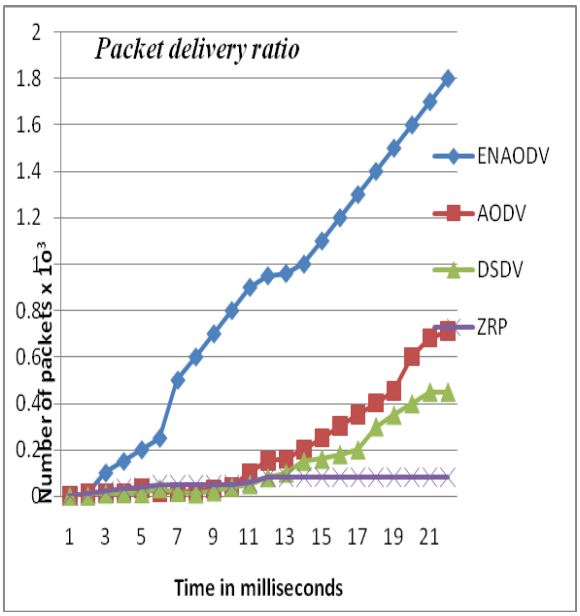

Figure 2. Packet Delivery Ratio

4.3 Experiment result packet delivery ratio with respective time:

Table 2. Values of packet delivery ratio

EMAODV	AODV	DSDV	ZRP
0	0	0	0
0.01	0.01	0.001	0.01
0.1	0.011	0.01	0.02
0.15	0.012	0.011	0.03
0.2	0.033	0.012	0.04
0.25	0.014	0.033	0.05
0.5	0.017	0.017	0.05
0.6	0.02	0.01	0.05
0.7	0.03	0.02	0.05
0.8	0.04	0.04	0.05
0.9	0.1	0.05	0.06
0.95	0.15	0.08	0.08
0.96	0.16	0.1	0.08
1	0.2	0.15	0.08
1.1	0.25	0.16	0.08
1.2	0.3	0.18	0.08
1.3	0.35	0.2	0.08
1.4	0.4	0.3	0.08
1.5	0.45	0.35	0.08
1.6	0.6	0.4	0.08
1.7	0.68	0.45	0.08
1.8	0.71	0.45	0.08

4.4 Experiment result of energy consumption:

Table 3. Values of energy consumption

ENAODV	AODV	DSDV	ZRP
0	0	0	0
1	1	1	2
2	1	2	4
3	1	2	8
4	1	3	10
5	1	10	20
7	1	20	25
7.1	5	30	30
7.5	6	35	35
7.7	10	40	40
7.9	20	45	50
8	40	60	60
8.1	60	65	70
8.2	80	70	80
8.5	90	75	90
9	100	80	100
9.5	110	90	120
10	115	100	130
10.5	120	120	140
10.5	125	125	145
10.5	125	125	150

4.5 Experiment result of Throughput versus Time:

Table 3. Values of Throughput versus Time

ENAODV	AODV	DSDV	ZRP
0	0	0	0
0.2	0.2	0.01	0.01
0.4	0.3	0.02	0.02
0.3	0.5	0.03	0.03
0.58	0.55	0.04	0.04
1	1	0.05	0.05
1.5	1.2	0.06	0.06
1.6	1.4	0.07	0.07
1.8	1.5	0.08	0.08
2.2	2	0.1	0.09
2.6	2.5	0.2	0.1
2.8	2.5	0.3	0.2
2.9	2.5	0.4	0.3
3	2.5	0.5	0.4
3.1	2.5	0.6	0.4
3.2	1.5	0.7	0.4
3.3	2	0.8	0.4
3.4	1.5	0.9	0.4
3.5	2	1	0.4
3.6	1.5	1.01	0.4
3.8	2	1.02	0.4
4	1	1.03	0.4
4.2	1.5	1.04	0.4
4.4	1	1.05	0.4
4.6	1.5	1.06	0.4
4.8	1	1.07	0.4
5	1.5	1.1	0.4
5.5	1	1.2	0.4
6	1.5	1.3	0.4
6.5	1	1.5	0.4

4.6 The graph of Energy Consumption versus Time:

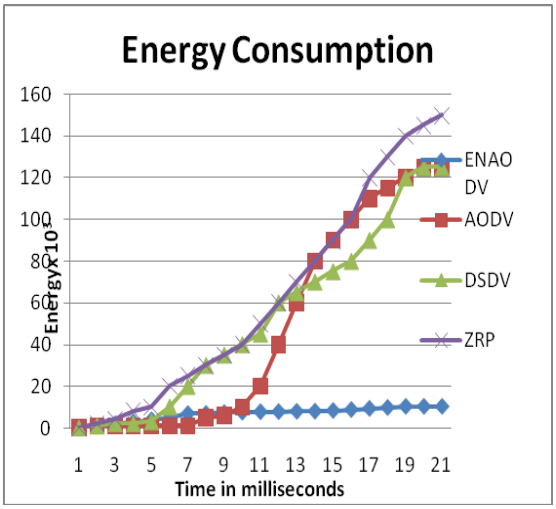

Figure 3. Energy Consumption versus Time

4.7 The graph of Throughput verses Time:

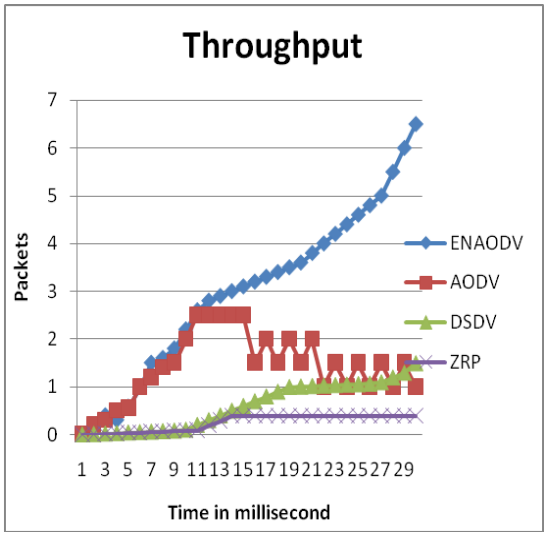

Figure 4. Throughput verses Time

4.8 Packet delivery ratio:

$$\textit{Packet delivery ratio} = \frac{\textit{Data packet received at destination}}{\textit{Data packet sent by source}}$$

In Figure 2 blue graph indicates the Enhanced AODV. By applying compromising node algorithm. The ENAODV Packet delivery ratio is more compare to AODV, DSDV, ZRP It was evaluated by more number of readings and plotted graph.

4.9 Energy Consumption:

Energy Consumption = Power received at node Time

In Figure.3 Battery life time is depends on energy consumption of the nodes.ZRP having more energy consumption compare to DSDV, AODV, ENAODV. E NAODV having less energy consumption as blue line shown in figure 3.

4.10 Throughput:

$$Throughput = \frac{number\ of\ bytes\ received}{simulation\ time}$$

Throughput increases gradually with respective time, for ENAODV remaining are some reducing some are fluctuating.

In Figure 4 RED Graph shows AODV, it is throughput increases until certain time after that it fluctuating this will take more power and energy.

A violet graph shows the throughput for ZRP, it was very low due to large Routing overhead.

CONCLUSION

A new design and analysis of enhanced routing protocols in MANET are described. Performance of Enhanced AODV, DSDV and ZRP protocol is evaluated with help performance parameters like throughput, packet delivery ratio, Energy Consumption. Comparison of both the protocols is done using the same parameters. The proposed algorithm shows superior performance as compared to conventional algorithms. Future improvement in AODV protocol can be done by improving other parameters like Bandwidth, End to End Delay etc.

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