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A Novel Algorithm for Enhanced Routing Protocols in MANETS

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ABSTRACT

Ad hoc wireless network is a collection of mobile nodes (or routes). It is dynamically existence without use of existence network infrastructure or centralized administration. Ad hoc wireless network can also regarded as more decentralized wireless network. Ad hoc network is a form of wireless communication networks are the simplest. AODV is packet routing protocol designed for use in mobile ad hoc networks, intended for networks that may contain thousands of nodes, source and destination, next hop are addressed using IP addressing each node maintains a routing table that contains information about reaching destination node. The packet size in AODV is uniform unlike DSR unlike DSDV; there is no need for system-wide broadcasts due to local changes. AODV supports multicasting and unicasting with in a uniform framework. In this work we are developed Enhanced AODV with comparing AODV, DSDV, ZRP and brought best results those are Routing overhead, Average End to End Delay, Route Packet loss.

Keywords:—*Routing overhead, End to End Delay, Route Packet loss, Enhanced AODV, AODV, DSDV, ZRP, NS 2.3*

I. INTRODUCTION

An Ad hoc network is a collection of mobile nodes, which forms a temporary network without the aid of centralized administration or standard support devices regularly available as conventional networks. These nodes generally have a limited transmission range and, so, each node seeks the assistance of its neighbouring nodes in forwarding packets and hence the nodes in an Ad hoc network [1][2] can act as both routers and hosts. Thus a node may forward packets between other nodes as well as run user applications. By nature these types of networks are suitable for situations where either no fixed infrastructure exists or deploying network is not possible. Ad hoc mobile networks have found many applications in various fields like military, emergency, conferencing and sensor networks. Each of these application areas has their specific requirements for routing protocols.

Since the network nodes are mobile, an Ad hoc network will typically have a dynamic topology, which will have profound effects on network characteristics. Network nodes will often be battery powered, which limits the capacity of CPU, memory, and bandwidth. This will require network functions that are resource effective. Furthermore, the wireless (radio) media will also affect the behaviour of the network due to fluctuating link bandwidths resulting from relatively high error rates. These unique desirable features pose several new challenges in the design of wireless Ad hoc networking protocols [10]. Network functions such as routing, address allocation, authentication and authorization must be designed to cope with a dynamic and volatile network topology. In order to establish routes between nodes, which are farther than a single hop, specially configured routing protocols are engaged.

The unique feature of these protocols is their ability to trace routes in spite of a dynamic topology. In the simplest scenarios, nodes may be able to communicate directly with each other, for example, when they are within wireless transmission range of each other. However, Ad hoc networks must also support communication between nodes that are only indirectly connected

II. Related Work

V. K. Patle, Sanjay Kumar (2016) worked on Evaluation of Mobility Model with MANET Routing Protocols. Here performance of protocols measure individually over various type of Non-realistic Mobility Models. The observable percentage of parameters in non-realistic mobility models are quiet acceptable by DSR in terms of throughput. The results generated by AODV [3] routing protocol is mostly similar to DSR[5] but it suffer from End to End Delay[3]. Performance of TORA is declined sharply as compared to others. The Average End-to-End delay is observed very low by DSDV [5] compared to other protocol results which are still is acceptable. On the basis of throughput and E2E, DSR perform better than others. This work is also extends with other simulator tools of other networks like NS3, OPNET etc. The other progress of regular and continuing approach of future work can be Quality of Services (QoS) issues.

M. NAGARATNA et al (2009) worked on Team Multicasting Routing Protocol In MANETs. We have proposed a HTMRP to support QoS-aware multicast in large-scale MANETs[2][3]. The proposed model is derived from n-dimensional hypercube, which have many desirable properties, such as high fault tolerance, small diameter, regularity, and symmetry This paper thoroughly analyses the problems of scalability in large scale multicast routing with more nodes and large number of multicast sessions. Based on that, HTMRP is proposed and implemented. From the experimental results, it is proved that HTMRP outperforms the existing multicast routing protocols in terms of delivery ratio and control overhead. HTMRP also implements a combination of both team multicast and hypercube structure to provide high scalability and reliability.

Pankaj Rohal et al (2013) worked on Study and Analysis of Throughput, Delay and Packet Delivery Ratio in MANET for Topology Based Routing Protocols (AODV, DSR and DSDV). In this paper we find out the performance of three topology based routing protocols (both reactive and proactive) like DSDV, AODV and DSR by increasing numbers of nodes. Here, we find out the performance on the basis of throughput, delay and packet delivery ratio. By comparing these protocols on the basis of various performance metrics we have reached to a conclusion that reactive topology based protocols are better than proactive topology based routing protocols.

Surender Singh, BS Dhaliwal, Rahul Malhotrat al(2016) Performance Analysis of Hybrid Routing Protocol in Mobile Adhoc Networks. : An ad hoc network is a wireless and infrastructure less network. Various routing protocols have been discussed so far to improve the routing performance and reliability. A detail study shows that performance of on demand Routing protocols AODV and DSR are better than table driven protocols. AODV and DSR still suffer some short coming problems due to longer set up time in case of link failure and scalability problem due to more routing overhead. In this work Hybrid protocol by combining DSR and AODV is implemented to overcome these problems. Simulation is carried out to check the performance of protocol in terms of packet delivery ratio, Packet miss ratio, throughput, end to end delay, routing overhead and energy consumption under the stressed conditions of node mobility and node density.

III. METHODOLOGY

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 neighbouring cluster node. This paper presents, Enhanced AODV[14] protocol is to calculate the parameter metrics are Routing overhead, End to End Delay, Route Packet loss.

IV. PROPOSED WORK

A new protocol has been proposed title Enhanced AODV protocol (ENAODV). In this protocol a malicious node at a random location. The simulation has been performed using TCL script. The simulation results have been obtained with help of three metrics as Routing overhead, Average End-to-End delay and packet loss. The results of ENAODV compare with AODV, DSDV and ZRP are respected in the form of graph. This node communicates with existing routing nodes, results in the hacker attack. The algorithm flow chart given in figure 2.

Existing protocols are suffering with large routing overheads due to unnecessary transmission between intermediate nodes to reach source to destination, average end to end delay and pocket loss due to heavy traffic at receiving nodes these problems are solved by enhanced AODV routing protocols, proper TCL scripts and early finding compromising node and malicious node.

3.1.1 Malicious node

when node a node breaches any of the security principle and is there any attack such node exhibit one or more of the following behaviour, packet drop, battery drained, buffer over flow, bandwidth consumption, delay, stale packets, link break, fake routing, stealing information, session capturing, and others.

3.1.2 Normal Behaviour

When any operation is performed in ad hoc network (for example – all the packets from source node 'S' to destination node 'D' is delivered) while maintaining the security principle [confidentiality (C), Integrity(I), Availability(Av), Authenticity(Au) and Non-Repudiation (NR)], then it is called the normal behaviour of a node."

Security Principles C, Av, I, Au, NR maintained from S and D]
Cryptography -Security through TTP

TTP – Trusted third party

IDS – Instruction detection system

TCL Script – Tool Command Language Script

In this work we are proposed TCL Script for finding malicious node and proposed Enhanced AODV Routing protocols.

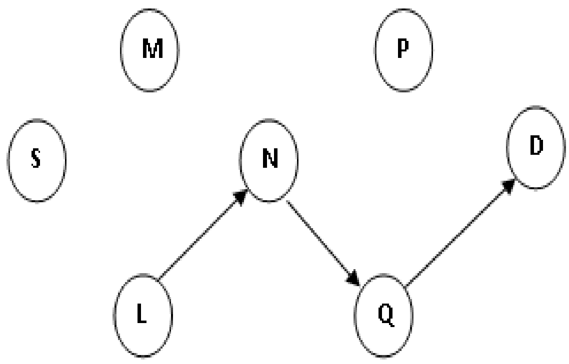

Figure 1 : *Route Establishment between S to D*

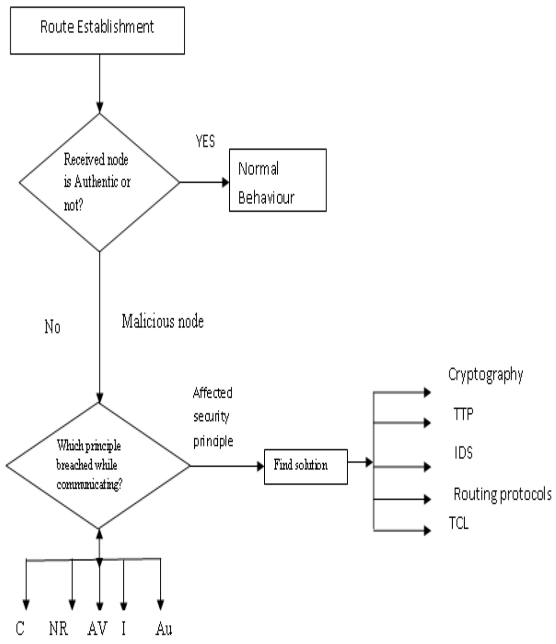

Figure 2 : The Algorithm Flow Chart of Node Communicates with Existing Routing Nodes, Results in the Hacker Attack

3.2 Parameter Metrics:

The protocols are evaluated for Routing overhead, Average End-to-End delay, and Packet lost.

3.2.1. Routing Overhead:

It is the number of packets generated by routing protocol during the simulation. Where overhead is the control packet number generated by node. It's length of packet is depends on number of nodes in corresponding route between source to destination. It could be decreases the protocol performance.

3.2.2 Average End To End Delay

The average time it takes a data packet to reach the destination. This includes all possible delays caused by buffering during route discovery latency, queuing at the interface queue. This metric is calculated by subtracting time at which first packet was transmitted by source from time at which first data packet arrived to destination. A small line of code is used in simulation file to generate the ZRP.

3.2.3. Packet lost:

As shown in Figure 3 packet loss due to interface queue overflow increases with the increased data rate because queues of forwarding node overflow due to high data rate. Moreover reduce packet loss by using TCL script.

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

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	1000x1000
Wireless nodes	20
Node speed (m/ s)	[0,10], [10'25], [25,50], [50,100]
MAC layer pro-tocol	PHY IEEE 802.11g
Channel setting	Auto assigned
Buffer size	25600=32k
Transmission power (watt)	0.005
Manet routing protocol	ENAODV,AODV,DSD V,ZRP
Simulation time (ms)	80
Addressing mode	Ipv6
Simulation	NS2.33

4.1 Experiment Result Routing Overhead

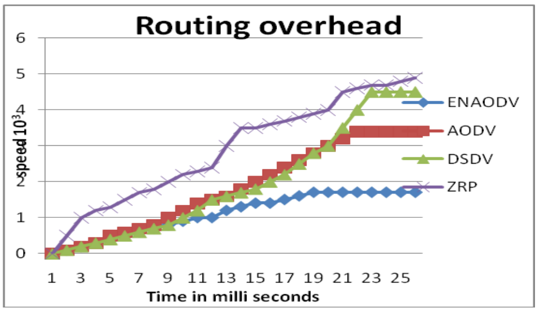

Figure.3: Routing Over Head

Table.2: Values of Routing over head vs Time

ENAODV	AODV	DSDV	ZRP
0	0	0	0
0.1	0.1	0.1	0.5
0.2	0.2	0.2	1
0.3	0.3	0.3	1.2
0.4	0.5	0.4	1.3
0.5	0.6	0.5	1.5
0.6	0.7	0.6	1.7
0.7	0.8	0.7	1.8
0.8	1	0.8	2
0.9	1.2	1	2.2
1	1.4	1.2	2.3
1	1.5	1.5	2.4
1.2	1.6	1.6	3
1.3	1.8	1.7	3.5
1.4	2	1.8	3.5
1.4	2.2	2	3.6
1.5	2.4	2.2	3.7
1.6	2.6	2.5	3.8
1.7	2.8	2.8	3.9
1.7	3	3	4
1.7	3.2	3.5	4.5
1.7	3.4	4	4.6
1.7	3.4	4.5	4.7
1.7	3.4	4.5	4.8
1.7	3.4	4.5	4.9

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
3	2.5	0.5	0.4
3.1	2.5	0.6	0.4
3.2	1.5	0.7	0.4
3.4	1.5	0.9	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

4.2 Experiment result of Avg End to End Delay:

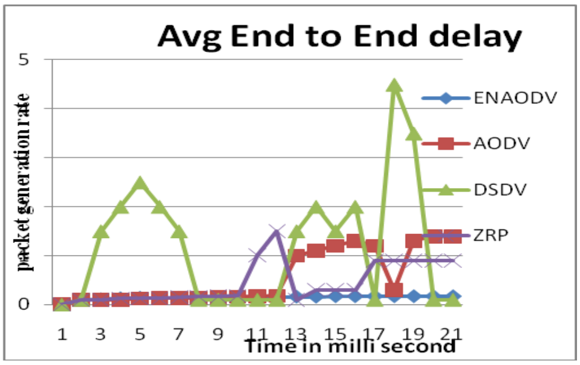

Figure 4; Graph of End to End Delay vs Time

4.3 Experiment result of packet lost vs Time:

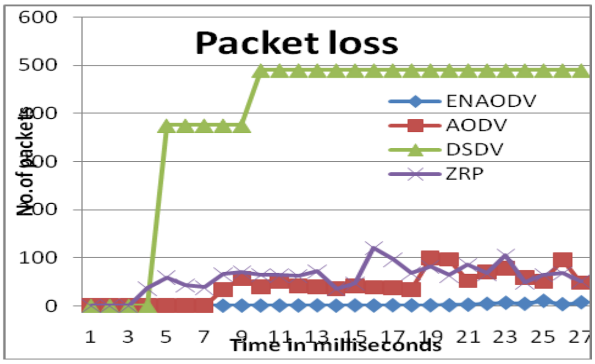

Figure.5; Graph of Packet Lost verses Time

Table.4: Values of Packet Lost versus Time

ENAODV	AODV	DSDV	ZRP
0	0	0	0
0	0	0	0
0	0	0	0
0	0	0	36
0.001	0	375	59
0.002	0	375	42
0.01	0	375	38
0.2	33	375	65
0.3	57	375	70
0.4	39	490	64
0.4	50	490	63
0.6	41	490	62
0.01	39	490	72
0.6	35	490	35
0.4	41	490	46
0.8	38	490	120
1	37	490	96
2	34	490	68
4	100	490	81
6	97	490	63
4	52	490	85
10	70	490	67
3	78	490	105
4	59	490	49
12	51	490	64
10	96	490	68

Routing Overhead:

Routing Overhead = Total no. of routing packets / Total No of delivered data packets.

The total number of routing packets transmitted during the simulation. For packets sent multiple hops, each transmission of packet (each hope) counts as one transmission.

In Figure 3 blue graph indicates the Enhanced AODV. By applying compromising node algorithm, the ENAODV Routing overhead is less compare to AODV, DSDV, ZRP, It was evaluated by more number of readings and plotted graph.

Also in figure 3 blue graph indicates routing overhead for ENAODV, it is small compare to AODV, DSDV, ZRP, this is achieved by finding the compromising node and malicious node earlier than other methods.

4.5 Average End-to-End delay:

Average End to End Delay: Average End to End delay is the average time taken by a data packet to reach from source node to destination node. It is ratio of total delay to the number of packets received.

$D_{E2E} = [D_{Propi} + D_{RDDi} + D_{rqueui} + D_{RTDi} + D_{Proci} + D_{Transi}] = (R_i - S_i)$

$$AVE2E = \frac{1}{N}\sum_{i=0}^{m}(RiSi)$$

- D_{RDD} : Route Discovery Delay
- D_{queue}: Queuing delay (Queuing delay is the time a job waits in a queue until it can be executed)
- D_{RTD} : Retransmission delays at the MAC layer
- D_{proc} : Processing delay
- D_{prop} : Propagation delay
- D_{trans} : Transmission
- N : The number of successfully received packets

R_i : Is time at which a packet with unique id *i is received*

S_i : Is time at which a packet with unique id *i is sent*

In figure 4 blue graph indicates average End-to -End delay. It is small for ENAODV campier to AODV, DSDV, ZRP this achieved by best routing protocols and TCL script of ENAODV.

4.6 Packet lost:

As shown in Figure 5 packet loss due to interface queue overflow increases with the increased data rate because queues of forwarding node overflow due to high data rate. Moreover reduce packet loss by using TCL script. Performance of the ENAODV packet loss is almost touches zero while the packet loss of AODV, DSDV, ZRP was increases. In Figure 5 blue Graph shows ENAODV, it is very low almost touches zero. DSDV having higher packet loss it causes information lost in the network

V. CONCLUSION

A novel algorithm for Enhanced routing protocols in MANET in described. Performance of Enhanced AODV, DSDV and ZRP protocol is evaluated with help performance parameters like Routing overhead, Average End-to-End delay, Packet lost. 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 and traffic congestion etc.

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