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Performance Analysis of AODV and AOMDV and Compare to the MAODV Routing Protocol for MANET Scenario

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Abstract:- Mobile Ad Hoc Networks (MANET) is an important and assert research area. The routing protocol should detect and maintain a exceptional route between source and destination nodes in these dynamic networks. Many routing protocols have been proposed for mobile ad hoc networks, and none can be studied as the best under all conditions. This work consist a systematic comparative evaluation of a multipath routing protocol and on demand routing protocol for MANETS. The protocol, called Ad hoc on demand Multipath Distance Vector (AOMDV), and AD-hoc on demand distance vector (AODV) This work containing evaluates the static network on a range of MANETS with between 50, 100, 150 and 200 nodes. The network comparison metrics are Packet Delivery ratio and Residual Energy.

Keywords:- MANET, Routing Protocol, AODV, AOMDV and MAODV

I. INTRODUCTION

A mobile ad hoc network (MANET) is a collection of wireless mobile nodes that dynamically establishes the network in the absence of fixed infrastructure. The main distinctive feature of MANET is, each node must be able to act as a router to find out the optimal path to forward a packet. MANET protocols provide an emerging technology for civilian and military applications. *A **mobile ad-hoc network*** (**MANET**) is a self-configuring infrastructure less network of mobile devices connected by wireless. *ad hoc* is Latin and means "**for this purpose**". Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. The primary challenge in building a MANET is equipping each device to continuously maintain the information required to properly route the traffic. Such networks may operate by themselves or may be connected to the larger Internet. MANETs are a kind of wireless ad hoc networks that usually has a routable networking environment on top of Link Layer in ad hoc network [3]. The growths of laptops and 802.11/Wi-Fi wireless networking have made MANETs a popular research topic since the mid 1990s. Many academic papers evaluate protocols and their abilities, assuming varying degrees of mobility within a bounded space, usually with all nodes within a few hops of each other [1]. Different protocols are then evaluated based on measure such as the packet drop rate, the overhead introduced by the routing protocol, end-to-end packet delays, network throughput etc.

MANET Network Model The MANET is a collection of nodes, which have the possibility to connect on a wireless medium and form an arbitrary and dynamic network with wireless links [1]. In infrastructure network computers nodes are connected via a inter connection network such as Bus, LAN etc. This means that links between the nodes can change with time, new nodes can join the network, and other nodes can leave it. A MANET is expected to be of larger size than the radio range of the wireless antennas, because of this fact it could be necessary to route the traffic through a multi-hop path to give two nodes the ability to communicate. There are neither fixed routers nor fixed locations for the routers as in cellular networks which is also known as infrastructure networks.

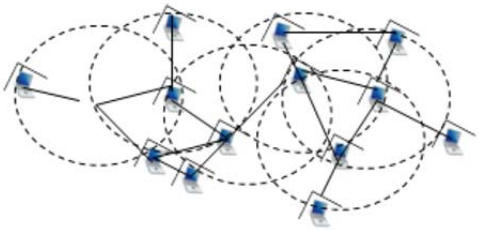


Fig-1 (Wireless Network Structures-I (Infrastructure Networks))

A MANET is a collection of various nodes which are connected via wireless network such as wireless Mesh Network. Cellular networks consist of a wired backbone, which connects the base-stations [1]. The mobile nodes can only communicate over a one-hop wireless link to the base-station; multi-hop wireless links are not possible. By contrast, a MANET has no permanent infrastructure at all. All mobile nodes act as mobile routers. A MANET is highly dynamic because links, quality of the links and participants are often changing. Furthermore, asymmetric links are also possible. New routing protocols are needed to satisfy the specific requirements of mobile Ad hoc networks. There exists a large family of ad hoc routing protocols.

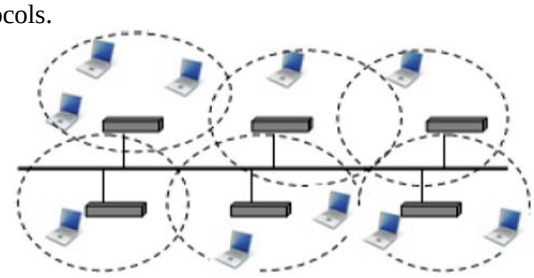


Fig-2 (Wireless Network Structures-II (Infrastructure less Networks)

II. MOBILE AD-HOC NETWORK (MANET) ROUTING PROTOCOLS

Nodes in ad hoc network also function as routers that discover and maintain routes to other nodes in the network. Thus, the primary goal of MANET is to establish a correct and efficient route between a pair of nodes and to ensure the correct and timely delivery of packets. A routing protocol is needed whenever a packet needs to be transmitted to a destination via number of nodes and numerous routing protocols have been proposed for such kind of ad hoc networks. These protocols find a route for packet delivery and deliver the packet to the correct destination [4].

MANET Routing Protocols:- Wireless protocol companies are analyzing with MANET. This includes all the IEEE protocols, Bluetooth, Integrated Resource Analyses (IRA) and Wi-Fi. There are also MANET analyzes using cellular and satellite technologies. Dedicated Short Range Communications (DSRC) is a protocol that has been specifically for use with MANET [13].

A. AD HOC On Demand Distance Vector (AODV)

A node running Ad-hoc on demand distance vector (AODV) initiates a route discovery process only when it has data packets to send and it does not know any route to the destination node that is route discovery AODV is on-demand [14].

During a route detection process, the source node broadcasts a route query packet to its neighbors. If any of the neighbors has a route to the destination it replies to the query with a route reply packet; otherwise, the neighbors rebroadcast the route inquiry packet. Finally some query packets reach the destination or nodes that know route to the destination. At that time, a reply packet is composed and transmitted tracing back the route traversed by the inquiry packet. To handle the case in which a route does not exist or the inquiry or reply packets are lost, the source node rebroadcasts the query packet if no reply is received by the source after a time-out [14].

A path maintenance process is used by AODV to monitor the operation of a route being used. If a source node receives the notification of broken link, it can re-initiate the route discovery processes to find a new route to the destination. If a destination or an intermediate node detects a broken link, it sends special messages to the affected source node [5].

AODV uses a routing table to specify distances to destinations. It uses string numbers maintained at each destination to determine the freshness of routing information and to prevent routing loops [2].

B. AD-HOC On Demand Multipath Distance Vector (AOMDV)

It is an extension to AODV and also provides two main services i.e. route discovery and maintenance. Unlike AODV, every RREP is being considered by the source node and thus multiple paths discovered in one route discovery. Being the hop-by-hop routing protocol, the intermediate node maintains multiple path entries in their respective routing table. As an optimization measure, by default the difference between primary and an alternate path is equal to 1 hop. The route entry table at each node also consist of a series of next hop forward with the analogous hop counts. Every node maintains an advertised hop count for the destination. Advertised hop count defined as the "Maximal hop count for entire paths". Route broadcasts of the destination are sent using this hop count. An alternate path to the destination is accepted by a node if the hop count is less than the advertised hop count for the destination.

C. Modified AD HOC On Demand Distance Vector (MAODV)

We propose a solution that is an enhancement of the basic AODV routing protocol, which will be able to control topologies. To reduce the probability of data losses it is proposed to wait and check the replies from all the neighboring nodes to find a safe and early route. According to this proposed solution the requesting node without sending the DATA packets to the reply node at once, it has to wait till other replies with next hop details from the other neighboring nodes. After receiving the first request it sets timer in the 'Timer Expired Table', for collecting the further requests from different nodes that having hop count equals to 2. It will store the 'sequence number', and the time at which the packet arrives, from those nodes to check which node is replying. The time for which every node will wait is proportional to its distance from the source. It calculates the 'timeout' value based on arriving time of the first route request. According to Topology Based AODV the requesting node transmit request to the node having hop count 2, then calculate the ratio of their total reply and time taken by all reply and generate threshold value between 0 to 10, for those the neighboring nodes who reply for the request will have threshold value greater than 5, the neighboring node that are reply for some of the request will have reply ratio less than those neighbor who are good to reply, and these neighbor have threshold value less than 5, based on these threshold values we find neighbors who have threshold value minimum and remove its entry from the routing table, and based on threshold values a safe route to the destination to reduce the probability of Black Hole Attack is generated. After the threshold value calculation, it first checks in Routing Table whether there is any entry for the node and its threshold value for hop node. If any entry to next hop node is present in the reply paths it assumes the paths are correct or the chance of malicious paths is limited.

III. IMPLEMENTATION AND RESULTS

In this paper implemented work i.e. Creation of MANET Scenario for NS-2 and then to analyze Different routing protocols with the use of various performance matrices Like Packet Delivery Ratio and Residual Energy.

Simulation Parameters:-

Simulation TOOL	Network Simulator-2.35
IEEE Scenario	802.11
Mobility Model	Two Ray Ground
No. Of Nodes	50, 100. 150, 200
Traffic Type	TCP
Antenna	Omni Directional Antenna
MAC Layer	IEEE 802.11
Routing Protocols	AODV, AOMDV, MAODV
Queue Limit	50 packets
Simulation Area(in meter)	2000*2000
Queue type	Droptail
Channel	Wireless Channel
Simulation Time	30 sec

Performance Matrices:-

This work have used MANET scenario with varying node density i.e. 50nodes, 100nodes, 150nodes and 200nodes under static scenario using three routing protocols. We have reached to the results with the help of various performance matrices for now we have used following performance matrices.

- Packet Delivery Ratio
- Residual Energy

Packet Delivery Ratio:- This is the fraction of the data packets generated by the TCP sources to those delivered to the destination. This evaluates the ability of the protocol to discover routes.

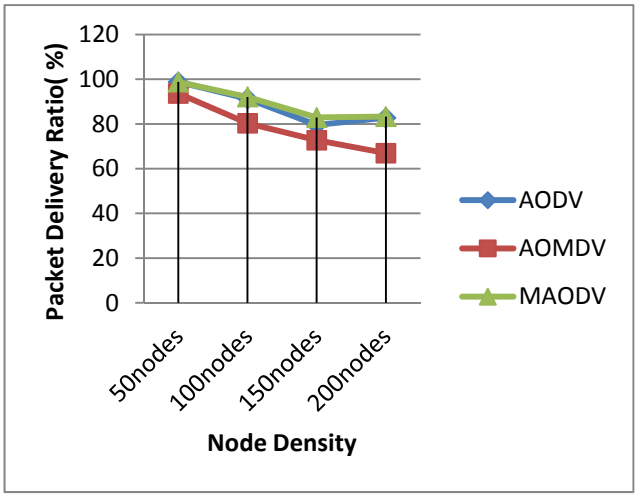
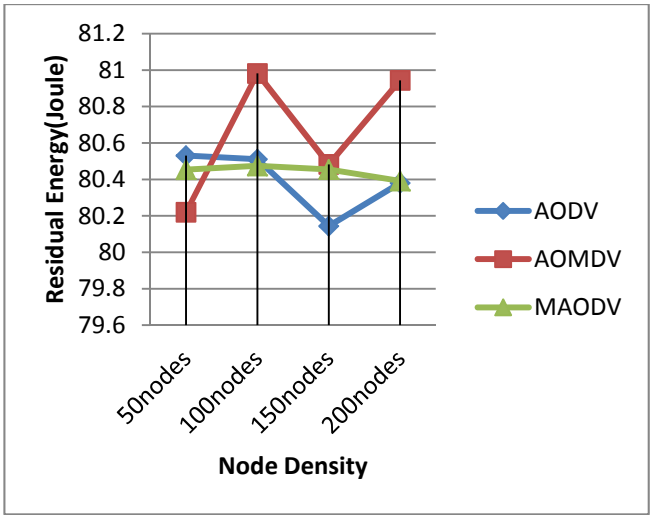


Fig-3 Packet Delivery Ratio in percent (%) for the various node densities

Residual Energy:- It is the total amount of energy Consumed by the Nodes during the completion of Communication or simulation for ex. If a node is having 100% energy initially and having 70% energy after the simulation than the energy consumption by that node is 30%.The unit of it will be in Joules.



Fig–4 Residual Energy in joule for the various node densities

IV. CONCLUSION

In this work we addressed the problem of identifying misbehaving of network that refuse to forward packets in wireless ad hoc network and give the mechanism to handle them. The impact of such nodes decreases network performance, lowering the network packet delivery ratio. To mitigate the problem of misbehaving packet dropping, this work proposed a feasible solution for it on the top of AODV protocol to avoid the misbehaving and our solution presents good performance in terms of packet ratio and moderate performance in terms of residual energy.

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