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ENHANCED NETWORK PERFORMANCE BY USING AODV BASED MULTIPATH ROUTING IN MOBILE AD HOC NETWORK

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Abstract: **MANET is an infrastructure less communication system. So have to face high challenges dynamically changing of topologies, low transmission power and asymmetric links. Due to link instability, node mobility and frequently changing topologies routing becomes one of the core issues in MANETs. A suitable and effective routing mechanism helps to extend the successful deployment of mobile ad-hoc networks. Most effort has recently been reported to improve reliability and performance of ad hoc network. So the multipath routing protocol has been implemented to achieve higher throughput and reliability than the current single path routing algorithm. Multipath extension of ad hoc on-demand distance vector protocol can provide reliable and adaptable routes for communication. Many researchers are still working on the developments of MANET routing protocols. Simulation results show better performance in terms of Packet Delivery Ratio and Normalized routing Load in comparison to AODV routing protocol. The simulation work is verified using network simulator version 2.**

Keywords: **AODV, Multipath AODV, MANET, NS-2.**

I. INTRODUCTION

The internet engineering task force created a mobile ad-hoc network Ad-hoc is a Latin word, which means "for this or for this only". Mobile Ad hoc network is a group of wireless mobile nodes and connected by wireless links. It is a network of independent nodes, which are mobile, connected through the wireless medium and highly dynamic by nature, and exemplified by the absence of physical infrastructure. Each mobile node dynamically changes the network topology without relying on any wired backbone network or fixed base station [1-3].

The main purpose of an ad hoc network routing protocol is to enable the transport of data packets from one point to another. This work author examines the potential on the transport services which arise from the realization of nodes. The prerequisite of a routing service is a distributed mechanism for the discovery and maintenance of routes; network integrity and availability are required to ensure the correct operation of an ad hoc network. This work also provides a qualitative analysis of reactive protocols scope. Multipath routing can increase end-to-end throughput and provide load balancing in MANETs by the use of multiple paths. The concept of multipath routing motivated to design a multipath routing for mobile ad hoc networks. To avoid the overhead of additional route discovery attempts, minimize the routing overhead by the use of secondary paths and to reduce the route error transmission during route break recovery.

The objective of designing a multipath routing protocol is to provide enhanced robustness to node or link failures. If one could provide multiple paths from a source to a destination, one could envision that the transmission of redundant information on various paths would help the receiver reconstruct the transmitted information even if a few of the paths were to fail. Single-path or link stability need to repair routes each time the route is broken, therefore these type of issues

solve by using multipath, So we implemented a multipath routing algorithm based on the AODV protocol in our work. In addition, multipath routing has the advantages of balancing load, minimizing end to end delay, increasing fault-tolerance, reducing the frequency of route inquiries and achieving a lower overall routing overhead. The main goal in the design of the algorithm is to receive the maximum packet for routing and find out efficient metrics. Furthermore, in this thesis the performance of AODV in terms of packet delivery fraction and NRL is analyzed by varying the mobility and node density parameters through simulation results using NS-2 simulator.

The rest of this paper is organized as follows; section 2 and 3 discussed the AODV and Multipath AODV routing. In section 4,5and 6 we have present the details of Related Work, performance matrices, simulation parameter and simulation model. And after that section 8 present the results analysis by using graphical form. Finally, section 9 provides our conclusions and then last section is References.

II. AD-HOC ON-DEMAND DISTANCE VECTOR

In November 2001 the MANET Working Group for routing of the IEFT community has published the first version of the AODV Routing Protocol. AODV belongs to the class of Distance Vector Routing Protocols. In a DV every node knows its neighbors and the costs to reach them. A node maintains its own routing table, storing all nodes in the network, the distance and the next hop to them. If a node is not reachable the distance to it is set to infinity. Every node sends its neighbors periodically its whole routing table. So they can check if there is a useful route to another node using this neighbor as next hop. When a link breaks a Count to Infinity could happen. AODV is an 'on demand routing protocol' with small delay. That means that routes are only established when needed.

Ad-hoc On Demand Distance Vector Routing Protocol is one of the reactive protocol in which source node initiates data packet to destination node only when requires the route discovery is occur. There are no periodical exchanges of routing information [16].The Protocol consist of two phases:

Route Discovery: The route discovery process is initiated when a source needs a route to a destination and it does not have a route in its routing table. To initiate route discovery, the source floods the network with a RREQ packet specifying the destination for which the route is requested. When a node receives an RREQ packet, it checks to see whether it is the destination or whether it has a route to the destination. If either case is true, the node generates an RREP packet, which is sent back to the source along the reverse path. Each node along the reverse path sets up a forward pointer to the node it received the RREP from. This sets up a forward path from the source to the destination. If the node is not the destination and does not have a route to the destination, it rebroadcasts the RREQ packet. At intermediate nodes duplicate RREQ packets are discarded. When the source node receives the first RREP, it can begin sending data to the destination.

Route Maintenance: When a node detects a broken link while attempting to forward a packet to the next hop, it generates a RERR packet that is sent to all sources using the broken link. The RERR packet erases all routes using the link along the way. If a source receives a RERR packet and a route to the destination is still required, it initiates a new route discovery process. Routes are also deleted from the routing table if they are unused for a certain amount of time. It is performed by the source node and can be subdivided into: i) source node moves: source node initiates a new route discovery process, ii) destination or an intermediate node moves: a route error message (RERR) is sent to the source node. Intermediate nodes receiving a RERR update their routing table by setting the distance of the destination to infinity. If the source node receives a RERR it will initiate a new route discovery. To prevent global broadcast messages AODV introduces a local connectivity management. This is done by periodical exchanges of so called HELLO messages which are small RREP packets containing a node's address and additional information [2-5].

III. MULTIPATH AODV

In multipath routing is also known as alternate path routing. In alternate path routing, each source node and destination node have a set of paths (or multipath) which consist of a primary path and one or more alternate paths. Alternate path routing was proposed in order to decrease the link breaking probability and increase overall network utilization.

In alternate path routing or Multipath routing protocols generally are considered more reliable and robust than single-path routing protocols [18]. Furthermore, whenever a link failure is detected on a primary route, the source node can select the optimal route among the other available routes. This mechanism enhances route availability and consequently reduces control overhead. It also enhances data transmission rate, and increases the network throughput.

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IV. RELATED WORKS

In this work we covered Single path and multipath process in terms of routing protocol. Single path routing scheme used a data transfer by using single path, if will break the path therefore data loss occur. Because maximum routing protocol follow the single or uni path. To solve this problem we have used multipath in our work. Multiple path abstraction in routing protocols means that multiple routes could be detected due to routing discovery process and one route of them (the optimal) should be maintained in a source node routing table. In multipath routing protocols, multiple routes could be detected due to routing discovery process and all of these routes should be maintained in a source node routing table. All of these routes could be used for data transmission between source and destination nodes. Many multipath extensions of AODV have been developed to improve the performance of AODV protocol especially in high mobility scenarios where link failures increase.

In multipath AODV, RREQ propagation from the source towards the destination establishes multiple reverse paths both at intermediate nodes as well as the destination. Multiple RREPs traverse these reverse paths back to form multiple forward paths to the destination at the source and intermediate nodes. Multipath AODV also provides intermediate nodes with alternate paths as they are found to be useful in reducing route discovery frequency.

Modified routing Algorithm and saving data in Multipath AODV routing protocol consider the total path energy routing metric. By considering Multipath AODV routing algorithm is as follows–

1. When Source node has some data for transmission, it first checks that the route is available from source to destination or not. If route already exist in source routing table then start transmission on that route.

2. Else sends RREQ to initiate route discovery process for finding reliable path for communication.

V. PERFORMANCE METRICES

These parameter shows the performance of Routing Protocol is as follows:

Packet Delivery Ratio (Fraction) **-** It is the ratio between the number of received packets by the destination and the number of sent packets by the source.

$$Packet\ Delivery\ Fraction = \frac{Number\ of\ Packets\ Received}{Number\ of\ Packets\ Sent} x\ 100.$$

Normalized Routing Load- It can also be defined as the ratio of routed packets to data transmissions in a single simulation. It is the routing overload per unit data delivered successfully to the destination node

VI. SIMULATION PARAMETER

In this section mention table of parameters used in this work.

PARAMETERS	VALUE
Simulator	NS-2
Routing protocol	AODV, Multipath Based AODV
Number of Nodes	10,20,30,40,50
Area	1000mx1000m(Constant)
Packet size	512 byte
Simulation time	500s (Constant)
Pause time	1.0s(Constant)
Traffic type	CBR
Mac protocol	Mac/802.11
Maximum Speed	10m/s
Simulator	NS-2
Routing protocol	AODV, Multipath Based AODV

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VII. SIMULATION MODEL

We evaluated the effectiveness of Multipath AODV relative to AODV using NS-2 simulator. A simulated field is 1000m×1000m and simulations are performed for 500 seconds. The mobility model uses the random waypoint model in a rectangular field. Here, each packet starts its journey from a random location to a random destination with a chosen speed from 10 m/s. Once the destination is reached, another random destination is targeted after a variation of Nodes 10 to 50. The pause time, which affects the relative speeds of the mobiles, is varied. Identical mobility and traffic scenarios are used across protocols to gather fair results.

VIII. SIMULATION RESULTS ANALYSIS

In this simulation shows the differences in the protocol highlighted major differences with the protocol performance. These differences have been analyzed with variation of mobility parameters like as nodes. These section also covers the avoid path break problem using multi path based AODV scheme because this scheme to provide a muliple path for escape a path break or link stability. The find the overall results compare the performance with AODV and multipath based AODV with variations of No. of Nodes from 10 to 50. And the average results shown in below in graphical form

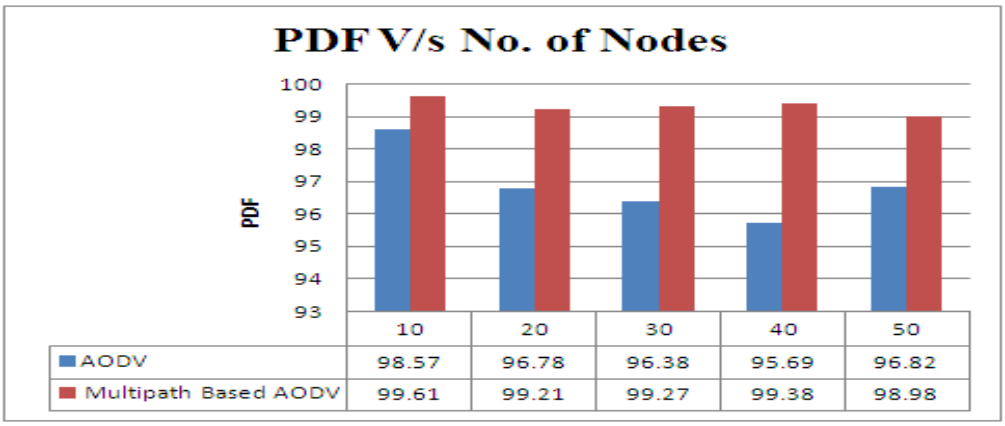

Figure 1: Packet Delivery Fraction with varying no. of nodes.

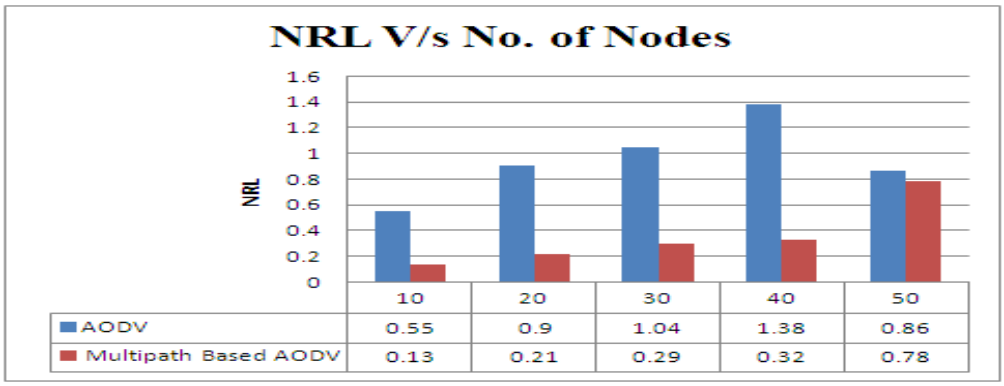

Figure 2: Normalized routing Load with varying no. of nodes.

Here 5.2 and 5.3 indicates the resulting graph, the simulation screen in which randomly placed from 10 to 50 mobile nodes packets sent and received properly we have demonstrated that and found the values of all scenarios. We now take a look at PDF and NRL calculated by our scripts. In this Simulation Covered the AODV (Single path or Uni path) and Mulipath Based AODV. The numbers of nodes do not vary significantly with changes in mobility. Consider the following data from a low traffic low mobility scenario. When we measure the number of RREQ packets that were received since they were flooded we get a better idea about the benefits of our approach and its scalability, the number of control packets received and they are less than AODV by a factor for the same scenario.

In Multipath AODV, we know that source node start transmission when we find the proper route from source to destination and ensure that routes is available so that packets can reach destination on time, this help in proper transmission of packets. From the above simulation outcome it is observed that the multipath based AODV routing

protocols improves the performance of real time traffic in case of efficient performance of in terms of PDF and NRL discussed above. The multipath based routing schemes have better results compare than existing AODV scheme. The average values of parameters give in above with Graph, Which shows that the maul path based scheme results are better.

IX. CONCLUSION

In multipath routing is able to improve the reliability of the wireless ad hoc works, as alternate paths are made available in the initial phase. However, the majorities of the existing multipath protocols still uses only one primary path for data transmission and consider other alternative paths as backups. In simulation part, in order to make a comparison, we have collected different simulation results which have already been done by others. We have designed same MANET scenarios in NS-2.31. In terms of Packet Delivery Friction and throughput have found efficient results compared with conventional single path routing protocols in our simulation work.

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