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Analysis of Single Path AODV Vs Multipath AOMDV in MANET

Manish Y. Barange, Amol K. Sapkal, Suryakant Bhonge,

M.Tech Scholar, Dept. of ENTC, RTMNU, Maharashtra, India

Assistant Professor, Dept. of ENTC, RTMNU, Maharashtra, India

Assistant Professor, Dept. of ENTC, SGBAU, Maharashtra, India

ABSTRACT: In a mobile ad hoc network (MANET) there is a collection of wireless devices which moving in seemingly adventitious directions and communicating with one another without establishing the real infrastructure. Communicating nodes in a Mobile Ad hoc Network normally seek the help of other intermediate nodes to establish communication channels. Thus, the communication may be via many intermediate nodes from source to destination. Multi-path routing is better one than the single path routing in mobile ad hoc networks, this is because many path routing allows the lay foundation of many path between a single source and single destination node. But in multipath routing, there is a problem of overhead management and transportation performance. So the aim of this work is to design such a wireless system which uses reactive multipath routing protocol who gives better data transportation performance than baseline protocols. Also it improves throughput and packet delivery ratio with reduction in overhead and end to end delay. The proposed approach contains implementation of better routing protocol which provide proper route updates, set require parameters at proper value, generate wireless network which has low error rate and fast packet generation. We used ns-2 to simulate. Simulation results will show better data transportation performance than baseline protocols. Also it will show improvements in throughput and packet delivery ratio with reduction in overhead and end to end delay.

KEYWORDS: Mobile Ad-Hoc Network,Routing Protocols, Multipath Extensions, DSR, AODV, AOMDV.

I.INTRODUCTION

Amobile ad hoc network (MANET) is a wireless communication network, where the nodes that are not within the direct transmission range of each other they require some other nodes to forward the data. It can be operate without establishing the infrastructure and support mobile users which are in a network, and it falls under the general scope of multi hop wireless networking. This type of networking paradigm originated from the needs in battlefield communications, emergency operations, search and rescue, disaster relief and in many other operations. Now a day, it has been more used for civilian applications such as community networks. The most of the great deals of research and results have been published since its early days in the 1980s. The newly research challenges in this area include high packet delivery ration with low overhead, end-to-end data transfer, low error rate, link access control, security, and providing support for real-time multimedia streaming.

The network layer has received a much more of attention in the research field in MANETs. As a result, abundant number of routing protocols in this network with different objectives and for various specific needs have been proposed. In fact, the two most important operations at the network layer, those are data forwarding and routing are distinct concepts. Data forwarding relates to how packets are taken from one link and put it on another link. Whereas routing firstly determines which path should a data packet follow from the source node to the destinationnode. After that it essentially provides the former with control input. As the amount of effort in routing ad hoc networks, data forwarding, follows the same paradigm as that in Internet Protocol (IP) forwarding in the Internet. IP forwarding was mainly designed for multi hop wired networks, in which one packet transmission can be only received by nodes attached with the same cable. However, in wireless networks, packet is transmitted over a medium. Generally, interference during the packet reception intended for the receiving node had been considered completely negative.Thus having the goal of the research in wireless networking in order to make wirelesslinks as good as wired links.

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IN other words, we can say that Mobile Ad Hoc Networks (MANET) A mobile, ad hoc network is a self define system of mobile hosts which are connected by wireless links. There is no fixed infrastructure such as base station. If there is condition that the two hosts are not within radio range, then in that case all message communication between them must pass through one or more intermediate hosts which double as routers. The hosts are free to move around randomly, thus hanging the network topology dynamically. Thus routing protocols must be adaptive and able to maintain routes without changing the network connectivity. Commercial applications are likely where there is a need for ubiquitous communication services without the presence or use of a fixed infrastructure.

II. RELATED WORK

In this paper, a lightweight proactive source routing (PSR) protocol is proposed [1]. As PSR is able to maintain more network topology information than distance vector (DV) routing to facilitate source routing, also with that it has much smaller overhead than the traditional DV-based protocols [e.g., destination-sequenced DV (DSDV)], link state (LS)-based routing [e.g., optimized link state routing (OLSR)], and reactive source routing [e.g., dynamic source routing (DSR)].With the tests using computer simulation in Network Simulator 2 (ns-2) shows that the overhead in PSR is only a fraction of the overhead than that of the baseline protocols, and also a PSR achieves similar or better data transportation performance than these baseline protocols.

This paper discussed about the power consumption aspect of the MANET routing protocols [2]. Here the comparison between the performance of Dynamic Source Routing (DSR) and Ad hoc On-Demand Distance Vector (AODV) routing protocols with respect to average energy consumption and also with routing energy consumption are explained thoroughly. After that, an evaluation of how exactly the varying metrics in diverse scenarios affect the power consumption in these two protocols is discussed. A simulation model using Network Simulator 2 (NS2) with different mobility and traffic models are used to study their energy consumption. Lastly, an evaluation of these routing protocols based on energy consumption is presented.

This Paper proposed that,mobile ad-hoc network (MANET) as an energy constraint multi-hop network and with the nodes having routing capability with limited battery power[3]. In any network, establishing a correct and efficient route is an important design issue. Above that a more challenging goal is to provide an energy efficient multi-hop route between sources to destination. So, the routing protocols must establish an energy-efficient route between source-destination pair by considering the energy consumption and residual energy of the nodes. The trust based routing mechanism is one of the bestforms of a co-operation among nodes for establishing an energy-efficient route between source-destination pair. Firstly by introducing an energy consumption model to calculate the energy-factor of the nodes and after that propose a trust based protocol for energy-efficient routing. Here a trust module is adopted to track the value of routing matrices. A simulation result shows that the proposed protocol reduces delay, routing overhead, and increases the packet delivery ratio with the less energy consumption as compared to AODV and DSR.

This paper proposed an Energy Conscious routing protocol by modifying one Dynamic Source Routing (DSR) protocol which is not concerned about power consumption[4]. This Energy conscious DSR (ECDSR) uses the basic concept of traditional DSR and imposes it's two importance characteristics as Energy saving and Energy Survival in DSR, this will enhances the life time of the network and also increases the overall performance of the networks. Here the proposed protocol is validated through ns-2.34 and evaluated the performance of the networks taking the consideration of few energy metrics and found that the proposed method ECDSR outperforms DSR in the performance analysis.

This paper addresses energy conservation which is one of the important factor in Energy Constraint Mobile ad-hoc Networks (MANETs) and also tried to reduce routing overhead in order to efficient functioning of the network[5]. Here by comparing two different protocols with respect to energy conservation and routing overhead. The proposed work is in two modules named Node Energy Aware Methodology which consist conditional Min-Max Battery Cost Routing Algorithm (CMM-BCR) and Destination Estimation Module which consist Distance Routing Effect Algorithm for Mobility (DREAM). Both of these modules together are applied over Dynamic Source Routing protocol (DSR) which is On-Demand Routing protocol and over Destination Sequence Distance Vector Routing Protocol (DSDV) which is a Table driven routing protocol. Simulation shows that this energy scheme used with DSR provides better result than DSDV. As energy efficiency is of main factorin ad-hoc networks so main aim is to know which among these two protocols is good in energy conservation and increases network lifetime by reducing overhead. Here used NS-2 to simulate 50 nodes**.**

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This paper proposed the optimized routing protocol for multi-interface multi-channel wireless mesh networks (MIMC-WMNs)[6]. The MIMC-WMNs using original AODV (Ad hoc On-demand Distance Vector) routing protocol which is defined in IEEE 802.11s standard can cause the several problems sowill degraded the safety, efficiency, reliability of network.Therefore, to overcome this problem, OM-AODV (Optimized MIMC AODV) protocol is proposed which includes the multi-target PREQ mechanism, the predictive PREQ algorithm, and the PREQ sender assignment algorithm. In addition to that, several performance metrics of the proposed routing protocol will be analysed when it applied to the MIMC-WMNs. Also, the routing protocol will be evaluated by several experiments in outdoor test bed with real mesh routers which are implemented.

III.**PROTOCOL OVERVIEW**

A. Dynamic Source Routing (DSR):-

DSR is a specially proposed efficient routing protocol which is to be used in multi-hop mobile Ad hoc networks. It has two phases, one is Route Discovery and other one is Route Maintenance. These two phases help nodes to find out and maintain the perfect source routes to destinations. The Source Routing is a loop-free routing in which the intermediate nodes do not need any routing information and allows nodes to cache the routing information for the further use. In DSR, each node controls each packet for source route information and later forward it based on this routing information. When the routing information is not found in the packet, it will provide the source routing by knowing the route. When the destination is not known, in that case node caches the packet and finds the routing information to the destination by sending route queries to all nearby nodes. Lastly, it sends the Route acknowledgment back to the source.

B. Ad-hoc On-Demand Distance Vector Routing(AODV):-

AODV is also a one of the reactive routing protocol which discovers the routing path whenever needed with the help of route discoverymechanism. It uses traditional routing tables in that table there is a one entry per destination. AODV can relies on its routing table entries to propagate an RREP (Route Reply) back to the source without using source routing and also to route data packets to the destination. By using the sequence numbers AODV can maintainfreshness of routing information at each destination to determine and also to prevent routing loops. These sequence numbers are carried out by all routing packets. A timer-based state in each node is maintained by AODV, and these states are utilized for individual routing table entries, while the older unused entries are removed from the table. For each routing table entry predecessor node sets are maintained, which shows the neighbouring nodes sets which is to be using that entry to route packets. When the next-hop link breaks these nodes are notified with RERR (Route Error) packets. Again these packets are forwarded by each predecessor node to its predecessors, by erasing all routes effectively using the broken link. In AODV,routing error propagation can be visualized as a tree in which a node at the point of failure is a root and all sources using the failed link as the leaves. The advantages of AODV are, as information of only active routes are maintained so less memory space is required, which results in increasing the performance. This protocol is not scalable and also it does not perform wellin large networks and does not support asymmetric links.

C. Ad-hoc On-demand Multi path DistanceVector Routing(AOMDV**):-**

Ad-hoc On-demand Multi path Distance Vector Routing (AOMDV) protocol is also a reactive routing protocol and for computing multiple loop-free and link disjoint paths it is an extension to AODV. A list of the next-hops along with the corresponding hop counts is maintained by the routing entry for each destination. The same sequence number is carried by all the next hops. This can useful in keeping track of a route. A node maintains the advertised hop count, which is defined as the maximum hop count for all the paths for each destination, which is useful for sending route advertisements of the destination. A node defines an alternate path to the destination for each duplicate received route advertisement. By accepting alternative paths to destination loop freedom is assured for a node if it has a less hop count than the advertised hop count for thatdestination. For the same sequence number the advertised hop count does not change as the maximum hop count is used. The next-hop list and the advertised hop count are reinitialized when a route advertisement is received for a destination with the greater sequence number. Node-disjoint or link-disjoint routes can be finding out by using the AOMDV. In order to find out node-disjoint routes, each node does not instantly reject duplicate RREQs. Source defines a node-disjoint path with a different neighbour arriving by each RREQs. As nodes cannot be broadcast duplicate RREQs, so any two RREQs arriving at an intermediate node with a different neighbour of the source could not have traversed the same node. The destination replies to duplicate RREQs in order to get multiple link-disjoint routes, the destination only replies to RREQs arriving with unique neighbours. The RREPs follow the reverse paths after the first hop, which are node disjoint and thus link-disjoint. EachRREP takes a

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different reverse path to the source to ensure link disjointness, but the trajectories of each RREP may intersect at an intermediate node. The main advantage of AOMDV is that while still selecting disjoint pathsit allows intermediate nodes to reply to RREQs. During route discovery due to increased floodingAOMDV has more message overheads and the destination replies to the multiple RREQs whose results are in longer overhead since it is a multipath routing protocol

ENERGY AWARE ROUTING IN MOBILE ADHOC NETWORK

Wireless mobile devices are useful as they can be used anywhere. But with the limited battery power supply to use it.Therefore, power managementin wireless communication is one of the most challenging problems. To achieve this several energy aware routing protocols have been developed. The energy consumed per packet needed to deliver this packet to its destination can be done with minimum energy this is the aim of most of these routing protocols. Some of the routing algorithms associate a cost with routing through a node with low power reserve. To maximize the network lifetime is the aim of other routing protocols. By using single path to distribute data traffic through the network uses all previous protocols. The routing protocols, which are described previously, are simply based on the single path routing between a source and a destination. However, there may exist several paths between a source-destination pair, in awell-connected network. To give the source node choice at any given time of multiple paths to a particular destination by taking the advantage of the connectivity redundancy of the underlying network is the concept of multipath routing. The multiple paths may be used one after another, namely, traffic taking one path at a time, or they may be used multiple paths simultaneously.Multi-path routing consists of three components: route discovery, routeMaintenance, and traffic distribution among multiple paths.

Route Discovery:-

Route discovery finds out multiple routes between a source and destination nodes. Node disjoint (no common nodes), link disjoint (no common links), or non-disjoint routes may also be multipath routing protocols. Non-disjoint routes may have lower average resources than disjoint routes for the reason that non-disjoint routes share links and nodes. Disjoint routes also provides higher fault-tolerance.

Route Request:-

Whenever the route is not found in the route cache of the source node, in that case the source node broadcasts a Route Request (RREQ) message to all its nearer nodes by attaching its own address, destination address and a unique identification number so that each node processes the RREQ only once. Each intermediate node appends its own address to the route record of the packet by keeping the broadcasting RREQ message until and unless it finds the destination node in its own route cache during the RREQ propagation. A route reply (RREP) message is generated by the destination node when the destination node receives the RREQ with the same destination address in the RREP packet or being generated by any other an intermediate node when the routing information about the destination is available in its own route cache. In the mean while the sequence of hops are kept updating in the RREQ packet. On the basis of minimum hop count, the destination node selects the best path and generates the RREP packet back to the source by placing the route record from route request packet into the route reply packet. When an intermediate node,generates the RREP message then it appends its cached route to the destination to the route record in the RREQ packet and then generates the RREP packet. Lastly, the source accumulates the route carried by the RREP that itreceives for future use.

Route Maintenance:-

It find outs and repairs the broken paths. MANET must have certain mechanism to maintain from source to destination due its dynamic in nature. At any other particular time if a single participating node comes out of the range of its neighbour node then it may lead to a network partition. A network partition increases the packet loss and also compels to begin few costly operations like route discovery, route maintenance, path repair and many more. The route maintenance can be done by generating route error message or through different acknowledgement. So in other words, we can say that route maintenance acts as a route repair phase once some trouble in occurs while sending the packets.

Benefits and Limitation:-

As the packet themselves contains the routing decision, the intermediate nodes do not need to maintain the up-to-date routing information. More ever, with the caching mechanism in of any initiated or overheard routing data also reduces thenumber of control message being sent which in turn reduces the overhead.

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Traffic Allocation:

The traffic allocation strategy is used to deal with how exactly the data is distributed amongst the paths.

IV.SIMULATION AND EVALUATION

According to Shannon, simulation is the process of creating a model of a real system and conducting experiments with this system model for the purpose of learning the behaviour of the system or evaluating various strategies for the operation of the system. With the different nature of computer networks, we thus actually deal with an energetic model of a real dynamic system.

Simulation tool:-

NS-2 is an open-source event-driven simulator designed especially for research in computer communication networks. Since its inception in 1989, NS-2 has always gainedtremendous interest from industry, Academia and various government and private organization. Having been investigation and enhancement for years to investigatenetwork model observe results generated by NS-2.

Performance Evaluation:-

Implementation of wireless ad-hoc networks in the real world is quite hard one. Hence, the preferred alternative is to use some simulation software which can show the real-life scenarios. Though it is difficult to reproduce all the real life factors such as humidity, wind and human behaviour in the scenarios generated, most of the characteristics can be programmed into the scenario.

Performance Evaluation Metrics

By comparing the performance of AODV and AOMDV according to the following performance metrics:

Packet delivery ratio: It can be defined as, the ratio of data packets delivered to the destinations to those generated by the constant bit rate.

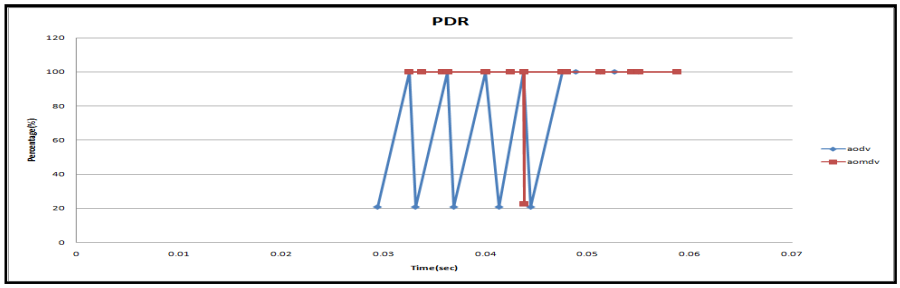

Fig.1. PDR- AODVVs AOMDV

The simulation result of Fig.1 shows that, AODV has slightly more PDR as compare to AOMDV, as it is a single path and loop free protocol. As the numbers of nodes are increases, then it will shows different simulation.

Average End-to-End delay of data packets: This includes all the possible delays caused by bufferingduring route discovery, queuing at the interface queue, retransmission delays at the MAC and propagation and transfer times.

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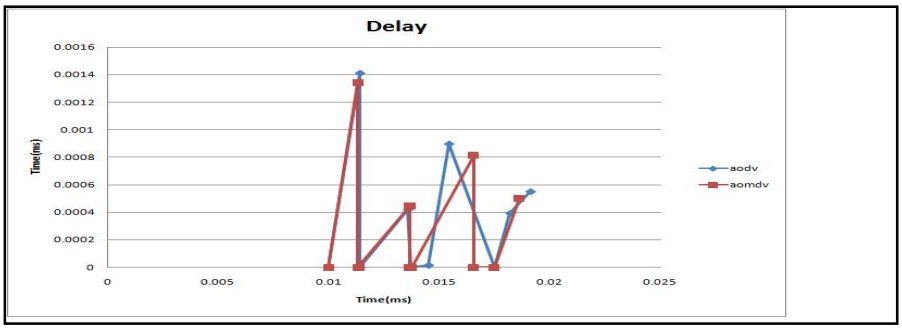

Fig.2.Delay-AODVVsAOMDV

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The simulation result of Fig.2 shows that, AOMDV has more end-to-end delay as it computes multiple loop-free and link-disjoint paths.

Routing Overhead: Simply it is the total number of routing packets transmitted during the simulation. For packets sent Overmultiple hops, each transmission of the packet (each hop) counts as one transmission.

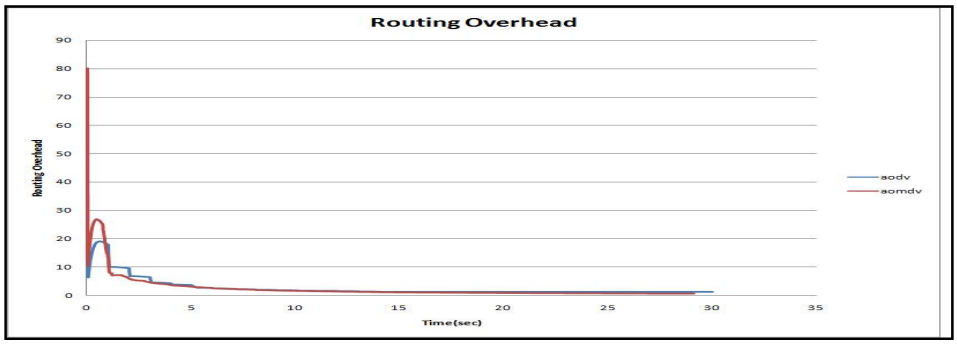

Fig.3.Routing Overhead- AODV Vs AOMDV

The simulation result of Fig.3 shows that, for this simulation AODV has slightly more routing overhead as compare to AOMDV.

Energy: During the simulation, each node starts its own journey from a start point to a random destination point. For this journey mobile nodes required an energy.

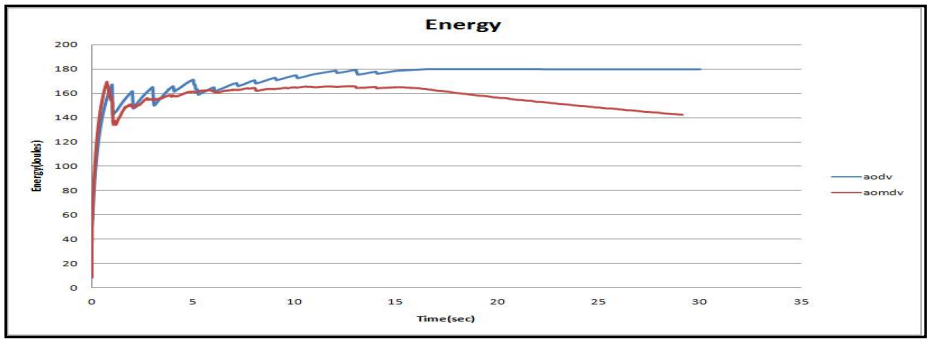

Fig.4. Energy- AODV Vs AOMDV

The simulation result of Fig.4 shows that, AOMDV requires less energy as compare to AODV.

Average Throughput: For the above simulations, we are getting the average throughput for both the routing protocols as, AODV =247.40 Bytes/sec andAOMDV= 366.15 Bytes/sec.

V.CONCLUSION AND FUTURE WORK

This paper analyzed the performance of single path AODV Vs multipath AOMDV using ns-2 simulator. Both the routing protocols were analyzed on the basis of average throughput, an energy, pdr, routing overhead, and end to end delay. For this analysis we were considered 30 mobile nodes, as we increase number of node, it will results in an increase in complexity. We can further increase the number of nodes and analyze the performance. Simulation results are shown by figures.

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AOMDV outperforms AODV due to its own ability to search for alternate routes when a current link breaks down. AOMDV incurs more routing overheads while flooding the network and packet delays due to its alternate route discovery mechanism, but it is much more efficient when it comes to packet delivery for the same reason. So, we can say that when network load tolerance is of no consequence, AOMDV is a better on-demand routing protocol than AODV since it provides better statistics for packet delivery and number of packets dropped.

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