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A Location based Scheme for Improving the Performance of AOMDV Routing Protocol

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Abstract—It is needless to say that reducing of control overheads is extremely important for efficient reactive routing protocols. New route discovery is needed only when the primary paths is fail. In Multipath protocol AOMDV if the link failures in the primary path, through which major data transmission takes place, cause the source to switch to an alternate path instead of initiating another route discovery process. A new route discovery process becomes necessary only when all pre-computed paths break. This reduces both route discovery latency and routing overheads. Using location awareness through location based DREAM (Distance Routing Effect Algorithm for Mobility) protocol the nodes in network are aware about the location information of nodes. In this paper we proposed protocol to minimize the flooding of the control packets in the direction of the destination node. Moreover we have also used shortest as well as alternate paths for transmission of the data packets to improve the performance of the routing protocol. The performance of AOMDV with DREAM protocol tends to increase with some issues like node density (at higher node densities), a greater number of alternate paths are available it means these issues are degrades the routing performance. This approach results in reducing end-to-end delay since packets do not need to be buffered at the source when an alternate path is available and if the location information is available then the proposed AOMDV with DREAM routing provides the better results as compare to normal AOMDV.

Index Terms— AOMDV, DREAM, Routing, Mobility, delay, Loacation, multipath

1 INTRODUCTION

A Mobile Ad-hoc NETwork (MANET) is a collection of wireless mobile hosts forming a temporary network without the aid of any stand-alone infrastructure or centralized administration [1]. Mobile Ad-hoc networks are self-organizing and self-configuring multihop wireless networks where, the structure of the network changes dynamically. This is mainly due to the mobility of the nodes. Nodes in these networks utilize the same random access wireless channel, cooperating in a friendly manner to engaging themselves in multihop forwarding. The node in the network not only acts as hosts but also as routers that route data to/from other nodes in network. Each device in a MANET is free to move independently in any direction, and will therefore change its links to other devices frequently. Each must forward traffic unrelated to its own use, and therefore be a router. Routing in ad-networks has been a challenging task ever since the wireless networks came into existence. The major reason for this is the constant change in network topology because of high degree of node mobility. A number of protocols have been developed for accomplish this task.

Routing [2] is the process of selecting paths in a network along which to send network traffic. In packet switching networks, routing directs packet forwarding, the transit of logically addressed packets from their source toward their ultimate destination through intermediate nodes.

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An ad hoc routing protocol is a convention, or standard, that controls how nodes decide which way to route packets between computing devices in a mobile ad-hoc network. Several routing protocols [2, 3] have been proposed for Mobile Ad hoc networks. In such protocols, nodes build and maintain routes as they are needed. Also, frequent route breaks cause the intermediate nodes to drop packets because no alternate path to the destination is available. This reduces the overall throughput and the packet delivery ratio. Moreover, in high mobility scenarios, the average end-to-end delay can be significantly high due to frequent route discoveries. Multipath protocols [4] try to improve these problems by computing and caching multiple paths obtained during a single route discovery process. The link failures in the primary path, through which data transmission is actually taking place, cause the source to switch to an alternate path instead of initiating another route discovery. A new route discovery occurs only when all pre-computed paths break.

2 DREAM PROTOCOL

The location information refers to the geographic coordinates that can be obtained from and by the use of the location based routing. The location based protocol specifically considered here is the Distance Routing Effect Algorithm for Mobility or DREAM [5]. The DREAM protocol can be considered proactive in the sense that a mechanism is defined for the dissemination and updating of location information. When the sender node S needs to send a message to the destination node *D*, it uses the location information for *D* to obtain *D*'s direction, and transmits the message to all its one hop neighbors in the direction of *D*. The subsequent nodes repeat the same procedure until the destination node is reached. This effectively results in using a reactive approach, as individual nodes in the path determine the next hop in an on-demand.

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3 AOMDV Routing Protocol

The AOMDV (Ad hoc On demand Multi-path Distance Vector routing) [6] AOMDV extends AODV to provide multiple paths. In AOMDV each RREQ and respectively RREP defines an alternative path to the source or destination. Multiple paths are maintained in routing entries in each node. The routing entries contain a list of next-hops along with corresponding hop counts for each destination. To ensure loop-free paths AOMDV introduces the 'advertised hop count' value at node i for destination d. This value represents the maximum hop-count for destination d available at node i. Consequently, alternate paths at node i for destination d are accepted only with lower hopcount than the 'advertised hop count' value. Node-disjointness is achieved by suppressing duplicate RREQ at intermediate nodes. .Multipath on-demand protocols try to alleviate these problems by computing and caching multiple paths obtained during a single route discovery process. The performance of these protocols tends to increase with node density; at higher node densities, a greater number of alternate paths are available. In such protocols, link failures in the primary path, through which data transmission is actually taking place, cause the source to switch to an alternate path instead of initiating another route discovery. A new route discovery occurs only when all pre-computed paths break. This approach can result in reduced delay since packets do not need to be buffered at the source when an alternate path is available.

4 Literature Survey

The previous work that has been done in this field is explained in this section. Here the current research is observed to find the new routing scheme in location based routing.

This paper proposes [7] a Network Coding in Ad Hoc network multipath routing protocol. It is typically proposed in order to increase the reliability of data transmission, and by applying network coding, which allows packet encoding at a relay node. We will also implement the performance difference between multipath routing based on fresnel zone routing (FZR), and Energy aware Node Disjoint Multipath Routing (ENDMR) protocol in a factor of two of wide range of movement and communication models.

In this paper [8] an attempt is made to consolidate reported works that streamline geographical location attributes for routing in WSN. Usually, the routing schemes are formulated to address specific purposes and depending upon a particular application the elements of WSN, namely MCH, CH and motes may be stationary or mobile. It has been observed that geographical location based localization of nodes are more effective methods as it consumes less energy to convey requisite measures from many sensor nodes to a sink. When it comes to storing the measured or conveyed data, different storage policies are used and reported. In general, these storage policies can be classified into three types: local storage, external, and data centric storage.

The proposed protocol [9] is a variant of the single path AODV routing protocol. The proposed multipath routing protocol establishes node disjoint paths that have the lowest delays based on the interaction of many factors from different layers. Other delay aware MANETs routing protocols don't consider the projected contribution of the source node that is requesting a path into the total network load. The implication is that end to end delay obtained through the RREQ is not accurate any more. On the contrary of its predecessors, the proposed protocol takes into consideration the projected contribution of the source node into the computation of end to end delay. To obtain an accurate estimate of path delay, the proposed multipath routing protocol employs cross-layer communications across three layers; PHY, MAC and Routing layers to achieve link and channel-awareness and creates an update packet to keep the up to date status of the paths in terms of lowest delay. The performance of the proposed protocol investigated and compared against the single path AODV and multipath AOMDV protocols.

This work [10] proposed a node-disjoint location based multipath routing protocol (Location-BMP) for mobile ad hoc networks to reduce the number of broadcast multi-path route discoveries and the average hop count per path from the source to the destination. During route discovery process, the intermediate nodes include their location information along with the distance in the Route-Request (MP-RREQ) packet. The destination node selects a set of node disjoint paths from the MP-RREQ packet received and sends a Route-Reply (MP-RREP) packet on each of the node-disjoint paths.

This work [11] proposes a novel Geographic Location Aware Adaptive Routing (GLAAR) protocol to reduce the computation and communication requirement for selection of next node (hop) for packet forwarding. Proposed protocol fetches the node location information using GPS and follows the robust, adaptive and efficient routing algorithm to ensure communication occurs with minimum no's of hops and computations GLAAR is adaptable to the moving destination whether destination node moves towards/ or away from the source node as shown using different case scenarios, thus it imparts efficiency in terms of route discovery, bandwidth utilization and resource usage. Simulation results enhance the performance analysis of GLAAR in terms of throughput and jitter tolerance for the packet transmission over the network.

In this paper [12], we considered to a very important position based routing protocol, named Greedy. In one of it's kinds, named MFR, the source node or the intermediate packet forwarder node, sends packet to its closest neighbor to destination node. Using distance deciding metric in Greedy is not suitable for all conditions. If closest neighbor to destination has high speed (in comparison with source node or the intermediate packet forwarder node speed) or has very low remained battery power, then packet loss probability is increased. We can use other deciding metrics in addition to distance metric, to improve Greedy and increase its reliability. The metrics like power, velocity similarity. The proposed strategy uses combination of (tradeoff between) metrics distance-velocity similarity-power, to deciding about to which neighbor, the given packet should be forwarded. This strategy has lower lost packets average than Greedy, so it has more reliability.

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TABLE 1
SIMULATION PARAMETERS

Number of Nodes	30
Dimension of simulated area	800×800
Routing Protocol	AOMDV
Simulation time (seconds)	100
Location based Protocol	DREAM
Transmission Range	250m
Traffic type	CBR 3pkts/s
Packet size (bytes)	512
Agent type	TCP, UDP
Number of traffic connections	20
Maximum Speed (m/s)	30
Nodes Mobility	Random way point

5 PROBLEM STATEMENT

Mobile Ad Hoc network are maintained dynamic topology with random mobility by that we can't identify the location of nodes. Multipath protocols have definitely sort the problem of single path by providing alternative route in between sender and receiver. It means, if the existing route is break than in that case the alternative route is available but it is not providing the location of mobile nodes. AOMDV has more message overheads during route discovery due to increased flooding and since it is a multipath routing protocol, the destination replies to the multiple RREQs those results are in longer overhead. The overhead enhancement are increases the delivery of routing packets in network by that the data delivery are affected and end to end delay in the is also increases.

6 PROPOSED APPROACH

If We design the algorithm for multipath routing protocol after that we follow next algorithm for destination location estimation, here very first we create mobile node and then set all parameter like routing protocol as AOMDV and each layer header then broadcast the routing packet, that time we check next hop information like multipath and connectivity of next neighbor node is found so we add this node into the routing table and send routing packet till the destination reach condition through above mechanism if destination found so destination node reply through routing acknowledgement packet to the source node, and after that sender node send's actual data packet to the destination. But certain time communicator and intermediate node move due to mobility nature and existing route break down so that case we apply DREAM module and minimize routing overhead of the network that also minimize delay as compare to other existing routing protocol.

Set node = N; // m number of mobile node
Set Sender = S1;// s € m s sender that belong into m node
Set receiver = R1;// r € m s receiver that belong into m node
Set protocol = AOMDV; // Routing protocol
Set RR = 250m // maximum radio range of node
Route_RREQ (S,R,rr) // broadcast route request packet
If (rr<= 250 && nexthop=="true")
{ next hop find ;
r-table = create route table;
Work until destination search;
If (more than one route S to R)
{ find (shortest path)
{Shortest path find
Send (R1,S1, route table, ack) // sends acknowledgement
}}
Else {Route not exist;
Not in route; }
Else {destination out of range or not find ;}

DREAM Algorithm

That module runs for destination location estimation if communication breaks down in certain time Receiver sends information of location to the source node. in that module we find the speed of the node, current distance between sender to destination and particular time and then send that information to the sender node time to time for location table generation if destination node update our location and communication path break so sender node retrieve information through location table of the destination node and initiate routing discovery process and send routing packet in calculated direction that minimize the routing overhead and also minimize west full energy utilization of each node on the network.

Speed of R1 = S_r // speed of receiver
Location Packet sending time = T_0//last time
Distance S1 to R1 = D_{RS} //current distance between receiver to source
Send (S_r, T_0, D_{R1S1}, S, R)
{ Sender receives location information from receiver;
Current Time = T_1
//Calculate new distance and direction of receiver;
Time gap = $T_1 - T_0$; // time gap in second
Radius = (S_r * Time Gap));
New Distance = (D_{R1S1} + (S_r * Time Gap));
// Direction of Receiver
}
Route request packet send only calculated direction

7 SIMULATION ENVIRONMENT

NS2 [14] is an open-source event-driven simulator designed specifically for research in computer communication networks. Since its inception in 1989, NS2 has continuously gained tremendous interest from industry, academia, and government. Having been under constant investigation and enhancement for years, NS2 now contains modules for numerous network components such as routing, transport layer protocol, application, etc. To investigate network performance, researchers can simply use an easy-to-use scripting language to configure a network, and observe results generated by NS2. NS-2 stands for Network Simulator version 2, ns-2.28, **2.31**. The simulation parameters are given in table 1 considered for simulation.

7.1 Performance Metrics

RFC2501 [13] describe a number of quantitative metrics

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that can be used for evaluating the performance of MANET routing protocols. We have used the following metrics for evaluating the performance of two on-demand reactive routing protocols like AOMDV and proposed AOMDV with DREAM Protocol.

1. Packet Delivery Fraction (PDF)

It is the ratio of data packets delivered to the destination to those generated by the sources. It is calculated by dividing the number of packet received by destination through the number packet originated from source.

PDF = (Pr/Ps)*100

Where Pr is total Packet received & Ps is the total Packet sent.

2. Routing Overhead

It is the total number of control or routing (RTR) packets generated by routing protocol during the simulation. All packets sent or forwarded at network layer is consider routing overhead.

Overhead = Number of RTR packets

3. Normalized Routing Load

Number of routing packets "transmitted" per data packet "delivered" at destination. Each hop-wise transmission of a routing is counted as one transmission. It is the sum of all control packet sent by all node in network to discover and maintain route.

4. Average End-to-End Delay (second)

This includes all possible delay caused by buffering during route discovery latency, queuing at the interface queue, retransmission delay at the MAC, propagation and transfer time. It is defined as the time taken for a data packet to be transmitted across an MANET from source to destination.

D = (Tr –Ts)

Where Tr is receive Time and Ts is sent Time.

8 Simulation Results

The performances of both the protocols are measured here on the basis of performance matrices and the performance of Transport layer protocols like TCP and UDP. The performance of proposed AOMDV with DREAM is better as compare to normal AOMDV routing protocol.

8.1 Packet Delivery Fraction (PDF) Analysis

This graph represents the Packet Delivery Fraction Analysis in case of Simple AOMDV protocol and in case of AOMDV with DREAM. Here we clearly visualized that the performance of proposed protocol are better as compare to simple AOMDV protocol in MANET. Here the PDF in case of AOMDV protocol is about 100% at time about 8 sec. due to their multipath behavior but after that the performance are equal to 87% , up to end of simulation with little up and down. Now if we measure the performance of AOMDV with DREAM then in that case, from the beginning of simulation the performance of proposed protocol is nearly about 97%. It means that location based DREAM protocol enhanced the performance of AOMDV routing protocol.

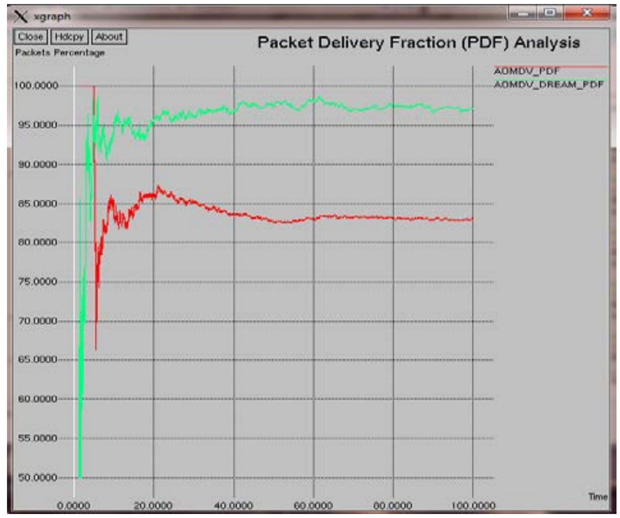

Fig.1. PDF Analysis in case of AOMDV and AOMDV with DREAM

8.2 Normal Routing Load (NRL) Analysis

This graph represents the Normal Routing Load (NRL) in case of AOMDV and AOMDV with DREAM. Here we recognize that in case of AOMDV more number of routing packets are delivered in network as compare to AOMDV with DREAM. Now in case of AOMDV every time node want to established connection means flooding routing packets in network but if the location of destination is known to sender then in that case less number of routing packets are deliver in network then definitely the routing load in case of proposed AOMDV with DREAM are less. Here in case of AOMDV routing protocol is about 4500 packets are deliver in network but in case of proposed protocol is only about 3000 packets are deliver in network it means that, the difference of routing packets is of about 1500, this overhead are reduces by using DREAM protocol and also the more number of packets are send in network with lower packet loss..

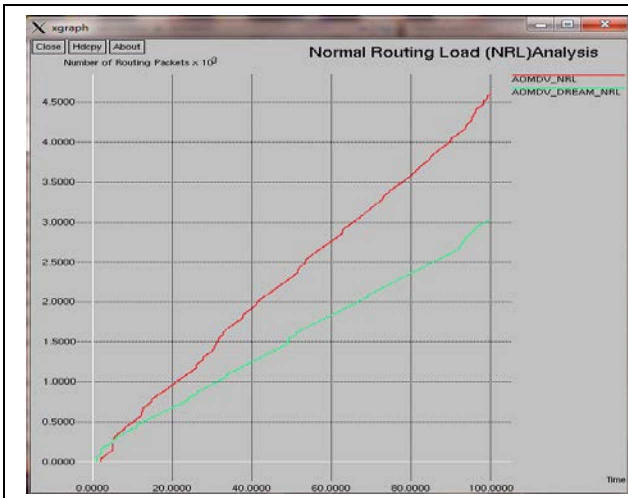

Fig.2. NRL Analysis in case of AOMDV and AOMDV with DREAM.

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8.3 Throughput Analysis

Throughput is also one of the important parameter to measure the network performance in case of AOMDV and AOMDV with DREAM. The throughput is measure on the basis of number of packets sends or receives in per unit of time in network. In this graph the throughput is measured on the basis of receiving in each time unit. The AOMDV protocols are provides the better routing techniques in network as compare to unipath protocol but the DREAM location based protocol are provides the better performance as compare to normal AOMDV. In case of AOMDV the numbers of packets are send in network in per unit of time is about 800 but in case of AOMDV with DREAM is about 930 packets are received in network in per unit of time in network. The location based DREAM protocol with AOMDV are proving the better receiving and improves the network performance.

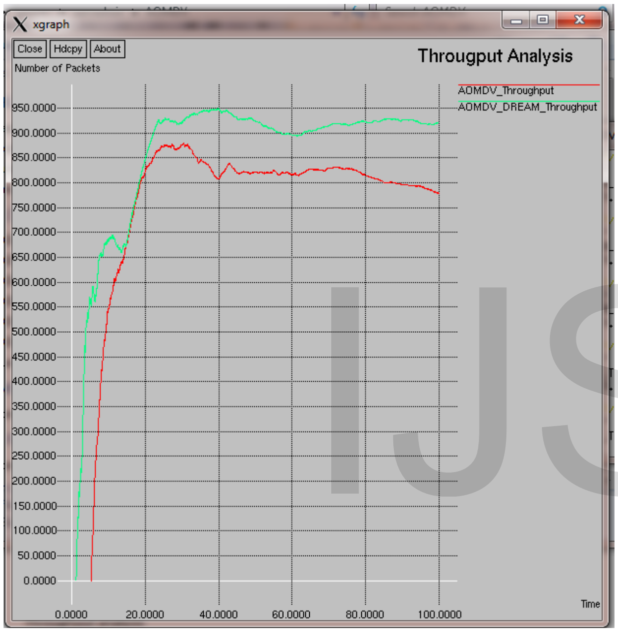

Fig.3. Throughput Analysis in case of AOMDV and AOMDV with

8.4 UDP Packet Loss Analysis

User Datagram Protocol (UDP) is the connection less unreliable protocol because of absence of acknowledgement mechanism. In UDP Protocol the sender sends data to receiver without any confirmation by that if the receiver is busy in any communication activity then the data is loss. In this graph we evaluate the performance of UDP packet loss in case of normal AOMDV and AOMDV with DREAM. In case of proposed routing scheme the packet loss is about only 40 packets but in case of normal multipath routing the packet loss is about more than 900 packets. The location based routing protocol are reduces the heavy UDP packet loss and improves network performance. In UDP performance if the network condition is favorable then in that case the performance of this protocol is also provides the better results but in network the possibility of uniform communication is almost negligible.

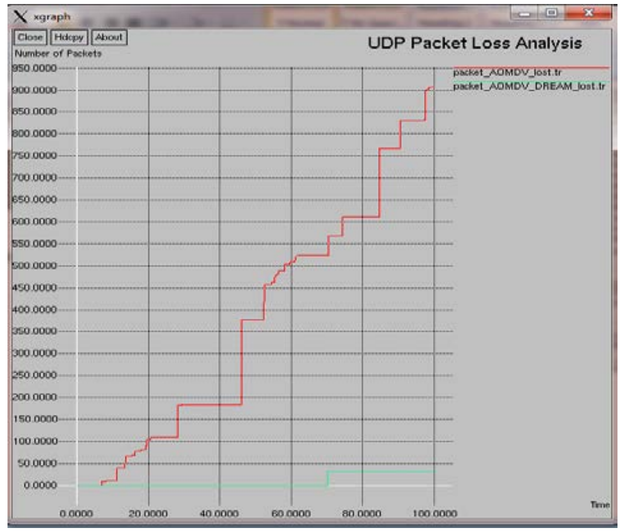

Fig.4. UDP Packet Loss Analysis in case of AOMDV and AOMDV with DREAM

8.5 TCP Packets Analysis

Transmission Control Protocol (TCP) is the connection oriented reliable protocol because of presence of acknowledgement (ACK) mechanism. the transmission of next TCP data or TCP congestion window is depend on the ACK of previous congestion window. It means if the data is loss in first transmission then in that case the next transmission are through from sender. In this graph the maximum size of TCP congestion window in case of proposed scheme is about 34 but in case of normal multipath routing the maximum size of TCP congestion window is about 14. The difference of 20 TCP packets is observed in case of previous and proposed scheme. It means that due to aware about the position of mobile nodes the routing performance of network is improved.

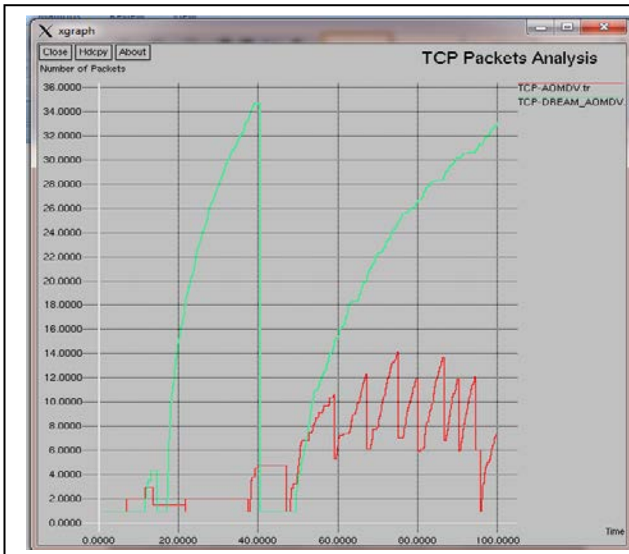

Fig.5. TCP Packet Loss Analysis in case of AOMDV and AOMDV with DREAM

8.6 Over all Performance Analysis

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The performances summery of both the protocol are mentioned in table 2. Each performance matrices are showing the better result in case of proposed scheme and improving the network performance.

TABLE 2
OVERALL SUMMERY

Parameters	AOMDV	DREAM with AOMDV
SEND	6844.00	6561.00
RECV	5686.00	6372.00
ROUTINGPKTS	4613.00	3036.00
PDF	83.08	97.12
NRL	0.81	0.48
Average e-e delay(ms)	242.02	193.95
No. of dropped data (packets)	1158	189

9 CONCLUSION

Each node itself in MANET acts as a router for forwarding and receiving packets to/from other nodes. Routing in ad-networks has been a challenging task ever since the wireless networks came into existence. The major reason for routing is the regular change in network topology, location because of high degree of node mobility. The multipath routing protocols like AOMDV are having a capability to providing the alternative path if the existing path are not able to send data packets to destination due to higher node mobility and heavy load. But in case of high mobility the DREAM protocol has identified the location of mobile nodes in network with respect to destination and each and every node has maintained their location table to reduce the overhead to because of frequently routing update. These researches have combined the two approaches and simulate the results of normal AOMDV and AOMDV with DREAM routing protocol. A. Proposed work is effective and better than normal AOMDV. The performance of network is measured on the base of performance metric. The location based protocol are improves the routing capability of AOMDV protocol. The performance parameter is showing the better result than normal AOMDV

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