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RESEARCH ARTICLE

CONGESTION CONTROL USING ENHANCE AODV (EAODV) ROUTING MECHANISM IN MANET

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Abstract - Mobile ad-hoc network is defined as the network in which nodes are communicated with each other without any fixed network. Here nodes are itself act as the router. In Manet nodes are in movable format that means they change network topologies time to time as they change their position. In Manet congestion is main issue. When many number of nodes transmitted packets across the network then network increases congestion which may leads to packets losses. In the existing work there is no phenomenon to handle the congestion effectively. The proposed system modifies the existing AODV algorithm by using congestion control phenomena. In this system the node waits for acknowledgement for the threshold period of time. If the acknowledgement not received with in threshold period then the node broadcast again to select alternate path. This paper discusses the congestion control using EAODV. Here we analyze the performance of proposed system which is better than existing system by using various performance parameters on different number of nodes namely packet delivery ratio, end to end delay, packet loss ratio.

Keywords: MANET, CONGESTION CONTROL, AODV, EAODV

I. INTRODUCTION

Wireless networks provide connection flexibility between users. We can extended established the network in any places without the buses of wired connection. Wireless networks are classified into two categories namely Infrastructure network and AD-HOC network. In infrastructure network nodes connect with the network through access point. But ad-hoc network do not have a coordination point. In ad-hoc network there is no any fixed infrastructure. Sending and receiving of packets are more complicated than infrastructure network [1].

Mobile ad-hoc network is a type of ad-hoc network. Mobile Ad hoc Networking (MANET) is a collection of mobile nodes that are connected over various wireless links. In Manet there is no any existence fixed infrastructure. In Manet nodes are freely moves in the network and change topologies time to time. In this network nodes are not only behave as the host but also act as a router [2]. In Manet nodes are communicate with each other directly via wireless link if they are in radio range. If they are not in range then they depend upon other neighboring nodes which act as a router to transmit the packets [3]. Routing is a problem in Manet due to limited resources and moving nature of nodes. To use these limited resources efficiently, we required efficient routing strategies which should also be adaptable to changing condition of the network like, size of the network, traffic density and network partitioning [4]. Here we discussed mainly challenges and routing protocols of MANET. These are explained as:

- ***CHALLENGES OF MANET***

There are some other challenges and complexities which are discussed below:

1. In MANET, scalability is required as it is mainly developed for communications in military establishments. The network grows, as the number of users increases many folds, each mobile device must be capable to handle the intensification of network to accomplish the task.

2. MANET is an infrastructure less network. Here each device can communicate with every other device, hence it becomes difficult to manage and detect the faults. The use of this topology results in frequent network partitions, route changes, and possibly packet losses [5].

3. Each node in the network is self-determining. Each node has its own equipment with different transmission/receiving capabilities of other nodes, which results in asymmetric links between nodes in transmission. Routers are not used between devices in MANET [6].

- ***ROUTING PROTOCOLS OF MANET***

Routing protocol in Manet are classified in to three categories:

1. PROACTIVE ROUTING PROTOCOLS

In these protocols, each node maintains a constant route to all other network nodes. They are also called table –driven routing protocols as each node has to maintain one or more table for storing routing information and any changes in network topology need to be reflected by propagating updates throughout the network in order to maintain a consistent network view. Example of such schemes is the conventional routing protocol is Destination sequenced distance vector (DSDV) [7].

2. REACTIVE ROUTING PROTOCOLS

Reactive routing is also called as on-demand routing protocol since they do not maintain routing information or routing activity at the network nodes if there is no communication. If a node wants to send a ***packet*** to another node then this protocol searches for the route in an on-demand manner and establishes the connection in order to transmit and receive the packet. The route discovery occurs by flooding the route request packets throughout the network. Examples of reactive routing protocols are the Ad-hoc On-demand Distance Vector routing (AODV) [8] and Dynamic Source Routing (DSR).

3. HYBRID ROUTING PROTOCOLS

These protocols are made from the combine strategies of both proactive and reactive protocols. Example of hybrid routing protocols is Zone Routing Protocol ZRP.

In section II, Congestion in MANET is explained. In section III, working of AODV is explained. In section IV, proposed work is explained. Results are explained in the section V. At last conclusion is in section VI.

II. CONGESTION IN MANET

As we know mobile ad-hoc networks suitable for establishing connection between users without any fixed infrastructure. But due to moving behavior of nodes and limited resources many problems are come which require high work. Some of these problems are security, topology control, quality services, routing, congestion control etc. Out of these problems congestion control is most important challenging issue in ad-hoc network [9].

Congestion is a condition in which number of packets across the network is greater than the capacity of the network. Congestion in the network leads packets losses, long delays, and high overhead. In Manet only congestion is not a reason to packet loss, while other factors are also cause of packet loss and these factors are link failure, mobility, interferences etc. But congestion is a top most reason of packet loss. Because if we do not control congestion then network is collapse. Hence we assume that other factors leads packet loss is rare and congestion is most probable reason of packet loss [10].

In this paper we used ENHANCE AODV (EAODV) protocol to control network congestion.

III. WORKING OF AODV

Ad hoc On-Demand Distance Vector (AODV) routing is a routing protocol for mobile ad hoc networks and other wireless ad-hoc networks. It is jointly developed in Nokia Research Centre of University of California, Santa Barbara and University of Cincinnati by C. Perkins and S. Das. It is an on-demand and distance-vector routing protocol, meaning that a route is established by AODV from a destination only on demand [13].

AODV is capable of both unicast and multicast routing [11]. It keeps these routes as long as they are desirable by the sources. AODV defines three types of control messages namely RREQ, RREP, RRER.

RREQ- A route request message is transmitted by a node requiring a route to a node. As an optimization AODV uses an expanding ring technique when flooding these messages. Every RREQ carries a time to live (TTL) value that states for how many hops this message should be forwarded. This value is set to a predefined value at the first transmission and increased at retransmissions. Retransmissions occur if no replies are received. Data packets waiting to be transmitted (i.e. the packets that initiated the RREQ) [14].

RREP- A route reply message is unicasted back to the originator of a RREQ if the receiver is either the node using the requested address, or it has a valid route to the requested address. The reason one can unicast the message back, is that every route forwarding a RREQ caches a route back to the originator.

RERR- Nodes monitor the link status of next hops in active routes. When a link breakage in an active route is detected, a RERR message is used to notify other nodes of the loss of the link. In order to enable this reporting mechanism, each node keeps a ―precursor list", containing the IP address for each its neighbours that are likely to use it as a next hop towards each destination.

AODV has two main components and these are following as:

I. Route Discovery

RREQ is the message for route discovery, RREP message is routed back whenever the route is discovered by the destination or any intermediate node in the path [15].

II. Route Maintenance

In case of the link failure RERR message is used by the node which faces link failure to the next node. RERR message send back to the source node then source node starts route discovery again [49].AODV uses sequence number to control looping. In route discovery process AODV uses different flags and fields in RREQ message. These fields include source and destination node addresses, source and destination sequence numbers, a broad cost ID and other validation flags. RREQ ID with source address uniquely identifies a route request and is used to prevent repetition of same message [49]. Each node can get to know its neighborhood by using local broadcasts, so-called HELLO messages. Nodes neighbors are all the nodes that it can directly communicate with. AODV is a reactive protocol it uses HELLO messages to inform the neighbors that the link is still alive.

Here we mainly discuss characteristics, advantages and disadvantages of aodv.

1. Characteristics of AODV

- Unicast, Broadcast, and Multicast communication.
- On-demand route establishment with small delay.
- Multicast trees connecting group members maintained for lifetime of multicast group.
- Link breakages in active routes efficiently repaired.
- All routes are loop-free through use of sequence numbers.
- Use of Sequence numbers to track accuracy of information.
- Only keeps track of next hop for a route instead of the entire route.
- Use of periodic HELLO messages to track neighbors [12].

2. AVANTAGES OF AODV

- In AODV route is established on demand.
- Less delay for connection setup [12].
- Do not cause unnecessary overhead in the network.

3. DISADVANTAGES OF AODV

- Multiple Route Reply packets in response to a single Route Request packet can lead to heavy control overhead.
- Periodic beaconing leads to unnecessary bandwidth consumption [12].

IV. PROPOSED WORK (EAODV)

In the existing work there is no phenomenon to handle the congestion effectively. The proposed system modifies or enhances the existing AODV algorithm by using congestion control phenomena. In our system the node transmit packets and waits for acknowledgement for the threshold period of time. If the acknowledgement not received with in threshold period then the node broadcast again to select alternate path. Due to this threshold period of time our proposed system detects and control congestion very fast than existing system. Because in existing system there is no threshold period of time that's why nodes wait for acknowledgement to the unnecessary time ,hence existing system detects congestion late than proposed system , that's why existing system do not control the congestion very effectively than our system. This shows more packet loss in existing system than our system. So, our system does work more effectively to control the congestion at high traffic than existing system. The process can be understood by following algorithm:

Step 1. Select source and destination node.

Step 2. Selected_node = source

Step 3. While(Selected node!= destination)

Step 4. Broadcast from Selected_node

Step 5. Select intermediate node by using AODV.
Step 6. Send acknowledgement from intermediate node to current node.

Step 7. If delay of Ack > threshold

{

Go to step 4.

}

Else

{

Update current node = Intermediate node.

}

Step 8. End while.

Here threshold is the average threshold time of the network. It varies from network to network. In our scenario value of threshold is the acknowledgement time of hello packets.

V. RESULTS

There are 40 nodes placed randomly in the simulation environment using. Due to random dynamic topology, the source and the destination are also selected randomly.

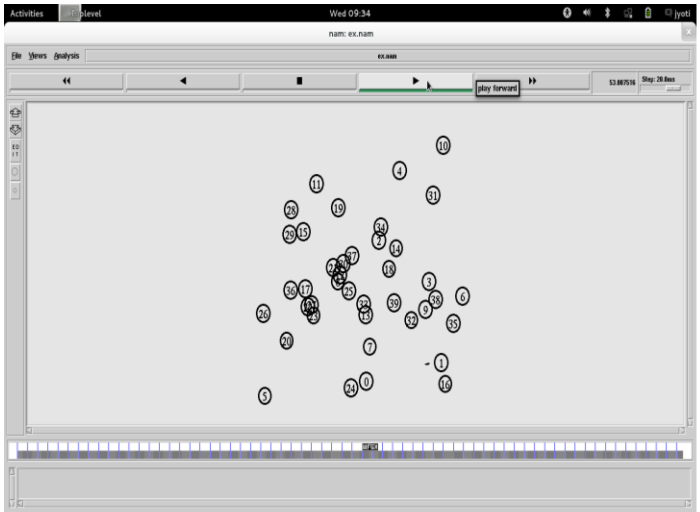

Fig 1 PACKETS TRANSMISSION

This fig shows the transmission of packets using selected path. This fig also shows the random network topologies.

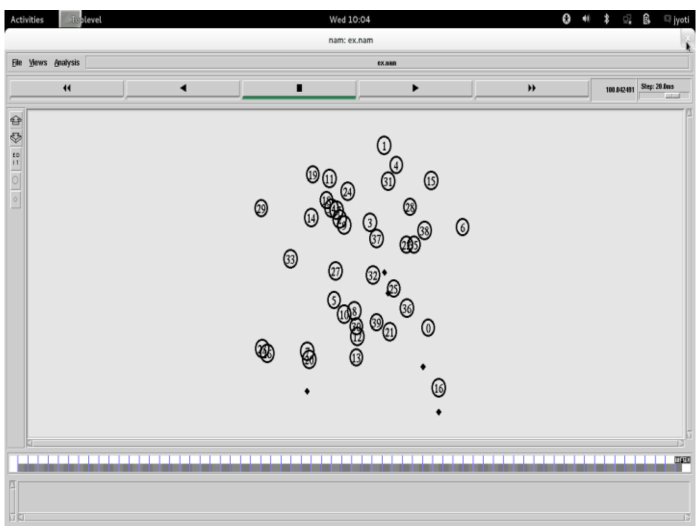

Fig 2 PACKET LOSS

This fig depicts after transmission of packets node wait for acknowledgement for the threshold period of time. If packets not received with in threshold time then loss of packets are start.

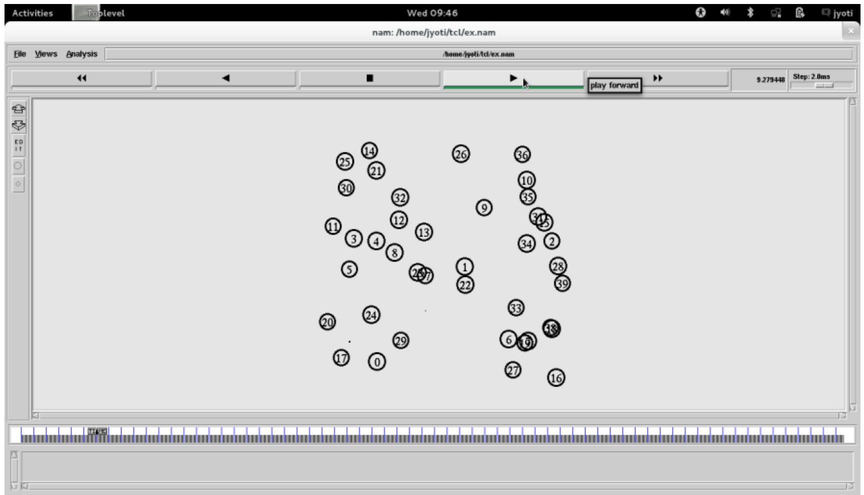

Fig 3 PACKETS TRANSMIT WITH ALTERNATE PATH

This fig depicts if packets not received with in threshold time then nodes select alternate path for transmit packets again. And hence, loss of packet decreases due to it detects congestion fast and packets transmit through new path every time when the congestion is come to start. So, in our system congestion is very less.

In this section we are showing results of our proposed system and existing system by using some different performance parameters.

Various parameters used for analysis are described below:

- Packet Loss Ratio (PLR): It is the ratio of difference between the total number of generated packets and total number of received packets divided by the total number of generated packets.

  Calculated as: PLR = (Generated packets- Received Packets)/ Generated packets

- Packet Delivery Ratio: Packet delivery Fraction (PDF): It is the ratio of the amount of data packets delivered to the destination and total number of data packets sent by source.

  Calculated as: PDF= (Received Packets / Packets Sent)*100

- Average End to End Delay: The interval time between sending by the source node and receiving by the destination node, which includes the processing time and queuing time.

$$\text{Calculated as EED} = \frac{\text{(Time packet received - Time packet sent)}}{\text{Total number of packets received}}$$

Table 1: Table showing performance analysis of existing system (AODV)

No. of nodes	Generated packets	Received packets	Packet delivery ratio	Packet loss ratio	Average end to end delay
10	24318	6619	27.2185	0.727815	21.2131
20	25239	8106	32.117	0.67883	15.4099
30	20797	7446	35.8032	0.641968	16.3814
40	19352	6462	33.3919	0.666081	16.8467

This table shows the performance analysis of existing AODV system on different number of nodes.

This table depicts that value of all performance parameters shows fluctuating behavior with the increases number of nodes.

Table 2: Table showing performance analysis of proposed system (EAODV)

No. of nodes	Generated packets	Received packets	Packet delivery ratio	Packet loss ratio	Average end to end delay
10	17477	5820	33.3009	0.666991	16.5604
20	23588	8915	37.7946	0.622054	14.4912
30	18681	9177	49.1248	0.508752	14.4734
40	18396	8918	48.4779	0.515221	13.7088

This table shows the performance analysis of Enhance AODV (EAODV) system on different number of nodes. This table depicts that value of all performance parameters shows fluctuating behavior with the increases number of nodes except average end- to- end delay. Value of average end to end delay is decreases with the number of nodes.

In this section we also show the comparison analysis between existing and proposed system through graphs using different parameters on different number of nodes. And these graphs shows results or performance of our proposed system are better than existing system.

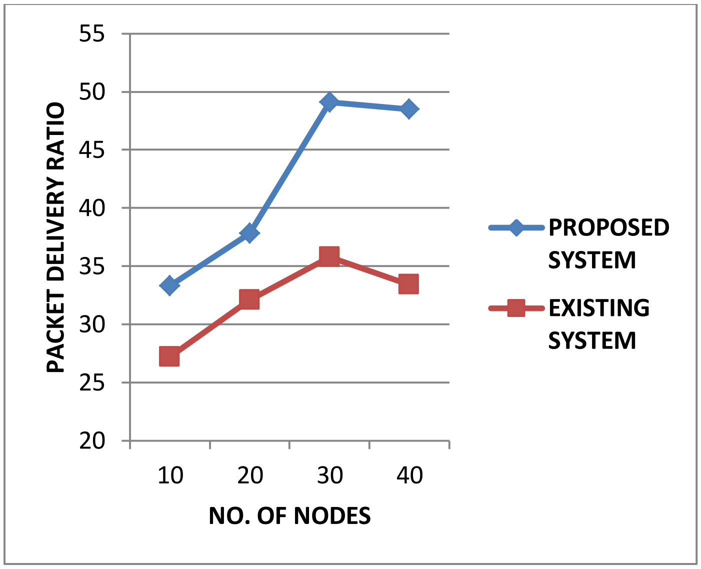

Figure 4 COMPARISON OF PACKETS DELIVERY RATIO IN PROPOSED SYSTEM AND EXISTING SYSTEM

Figure 4 depicts comparison of Packet delivery ratio. Packet delivery ratio is increases in our network because in this network nodes are wait for acknowledgement for threshold period of time if the Acknowledgement not received with in threshold period which shows congestion so to control congestion the node broadcast again to select alternate path. So it detects congestion fast and control congestion effectively. While in existing system there is no threshold period that's why wait for acknowledgement for unnecessary time. And after wait for unnecessary time nodes send packets again with the new path. So existing system detects and control congestion very late. This shows our system is more effective to control congestion than existing system.

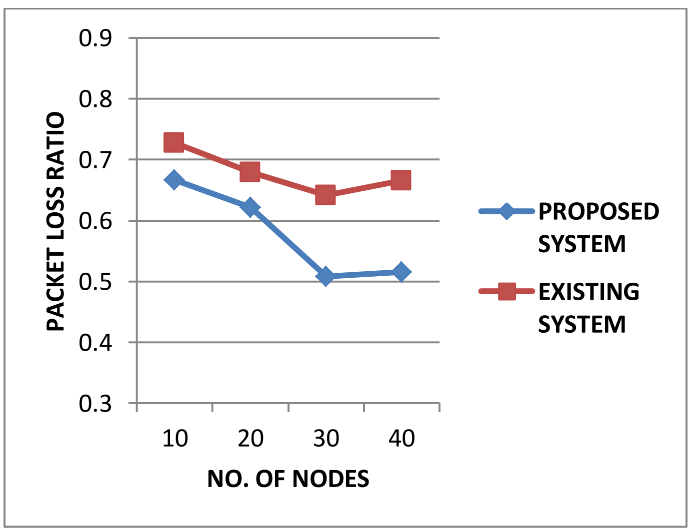

Figure 5 COMPARISON OF PACKETS LOSS RATIO IN PROPOSED SYSTEM AND EXISTING SYSTEM

Figure 5 depicts comparison of Packet loss ratio. Packet loss ratio is decreases in our network. Because in this network nodes are wait for acknowledgement for threshold period of time if the Acknowledgement not received with in threshold period which shows congestion so to control congestion the node broadcast again to select alternate path. So it detects congestion fast and control congestion effectively. While in existing system there is no threshold period that's why waits for acknowledgement for long time than proposed system. And after wait for long time nodes send packets again with the new path. So existing system detects and control congestion very late. This shows our system is more effective to control congestion than existing system.

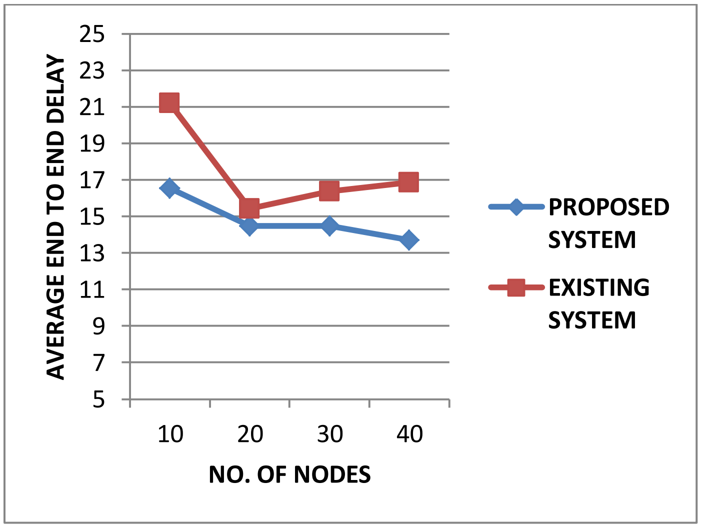

Figure 6 COMPARISON OF AVERAGE END TO END DELAY IN PROPOSED SYSTEM AND EXISTING SYSTEM

Figure 6 depicts comparison of average end to end delay. Average end to end delay is decreases in our network. Because in this network nodes are wait for acknowledgement for threshold period of time if the Acknowledgement not received with in threshold period which shows congestion so to control congestion the node broadcast again to select alternate path. So it detects congestion fast and control congestion effectively. While in existing system there is no threshold period that's why waits for acknowledgement for long time than proposed system. And after wait for long time nodes send packets again with the new path. So existing system detects and control congestion very late. This shows our system is more effective to control congestion than existing system.

VI. CONCLUSION

In this paper we defined nodes in ad-hoc network communicate without any infrastructure. In AD Hoc network congestion control is a main issue. In Manet congestion is occur when transmission of packets is greater than capacity of the network. Due to congestion performance of the network has to be decreased. To control the congestion we use Enhance AODV (EAODV) protocol. In our system the node transmit packets and waits for acknowledgement for the threshold period of time. If the acknowledgement not received with in threshold period then the node broadcast again to select alternate path. Due to this threshold period of time our proposed system detects and control congestion very fast than existing system. The proposed algorithm (EAODV) is compare with existing network (AODV) on the basis of different parameters like PLR, PDR and Average end to end Delay. After analysis of result, we came to know that the PDR is increases, PLR is decreases and Average end to end delay is decreases in our network than the existing network. Because in existing system there is no threshold period that's why node waits for acknowledgement for long time than proposed system. And after wait for long time nodes send packets again with the new path. So existing system detects and control congestion very late because node waits for acknowledgement for long time. In existing system more packet loss than proposed system due to existing system detect congestion very late and due to congestion detect late it also control congestion late than our system. So, we can say that our system is more effective to control congestion than existing system.

REFERENCES

[1] Dr. S.S. DhenaKaran, A. Parvathavarthini "An Overview Of Routing Protocols In Manet" ; Vol. 3, Issue 2, February 2013.

[2] H. Pingale, A Rakshe, S.A.Jain, and S.R.Kokate, "A Study of congestion aware adaptive routing protocols in MANET", International Journal of Advanced Technology and Engineering Research (IJATER), May 2012, v. 2, Issue 2.

[3] S. Yin, and X. Lin, “MALB: MANET adaptive load balancing”, In Vehicular Technology Conf. IEEE, Beijing, China, vol. 4, pp. 2843-2847, 2004.

[4] M. Abolhasan, T. Wysocki, and E. Dutkiewicz, “A review of routing protocols for mobile ad hoc networks”, Ad hoc networks, vol. 2, Issue 1, pp. 1-22, 2004.

[5] Mohit Kumar, Rashmi Mishra, “An Overview of MANET: History, Challenges and Applications”; Indian Journal of Computer Science and Engineering (IJCSE), Vol. 3 No. 1 Feb Mar 2012.

[6]Jeoren Hoebeke, Ingrid Moerman, Bart Dhoedt and Piet Demester, “An Overview of Mobile ad hoc Netwroks: Applications & Challenges”.

[7]P. Kuosmanen, “Classification of Ad Hoc Routing Protocols”,
available at: http://www.netlab.tkk.fi/opetus/s38030/k02/Papers/12-Petteri.pdf.

[8] C. Perkins, E. Belding-Royer and S. Das, ―Ad-Hoc on-Demand Distance Vector (AODV) Routing‖, RFC3561, July 2003.

[9] Md. Mahbubul Alam, And Tanmoon Taz Shetu,”Congestion Control In MANET”; April 2011.

[10] C. Lochert, B. Scheuermann, and M. Mauve, “A survey on congestion control for mobile ad hoc networks”, Wireless Communications and Mobile Computing, vol. 7, Issue 5, pp. 655- 676, 2007.

[11] C.E. Perkins and E.M. Royer, ―Ad-hoc On-Demand Distance Vector Routing‖ , Proceedings of the 2nd IEEE Workshop on Mobile Computing Systems and Applications, New Orleans, LA, pp. 90-100, February 1999.

[12] Luke Klein-Bernd, ―A Quick Guide to AODV Routing‖ , National Institute of Standards and Technology, US.

[13] C.E Perkins, E.M. Royer, and S. Das, ―Ad hoc On-demand Distance Vector (AODV),‖ RFC 3561, July 2005.

[14] Abdul Hadi Abd Rahman and Zuriati Ahmad Zukarnain, ―Performance Comparison of AODV, DSDV and I-DSDV Routing Protocols in Mobile Ad Hoc Networks‖ , European Journal of Scientific Research, ISSN 1450-216X Vol.31 No.4, pp.566-576, 2009.

[15] Iftikhar Ahmad and Mata ur Rehman, “Efficient AODV routing based on traffic load and mobility of node in MANET” 2010 6th International Conference on Emerging Technologies (ICET).

