International Journal of Emerging Technology in Computer Science & Electronics (IJETCSE)
ISSN: 0976-1353 Volume 21 Issue 1– APRIL 2016. (SPECIAL ISSUE)

Performance Analysis of various Routing protocol in Mobile Ad-hoc Network (MANET) with increasing the speed of node (ms) during simulation

T.Sivaraman [#1] and Dr. E. Karthikeyan [*2]

[#] *Research scholar, Manonmaniam Sundaranar University,TamilNadu, India*

[*] *Department of Computer Science, Government Arts College, Udumalpet, Tamilnadu, INDIA*

***Abstract*— In this paper we compared the AOMDV protocol which is implemented from AODV and Energy consumed routing protocol (EE-BWA-AOMDV) by using increase the speed of mobile node under the random way point mobility model. The AOMDV protocol is using the loop free and node based routing metrics. The various dynamic or reactive routing protocols are providing multiple disjoint paths from single source node to destination node. Among these multiple routes it will select the link based node disjoint route for transfer the data from source to destination node.**

We proposed energy consumed routing protocol (NEE-BWA-AOMDV) which is used to reduce the delay time, routing overhead packets and battery life of a node. It provide better performance during simulation of packet delivery ratio and throughput. The NEE-BWA-AOMDV routing protocol shows better performance compared to the AOMDV and MMRE-AOMDV routing protocol. If the primary route will break up then the alternative path that is back up route will be selected to transfer the data from source to destination node.

***Index Terms*— Mobile ad-hoc networks, source routing ,hop-hop routing, link based routing, packet delivery ratio and residual energy.**

I. INTRODUCTION

A mobile ad-hoc network(MANET)[1] is a collection of wireless devices such as mobile phone, laptop, smart phone ,cables communicate with each other by using wireless links forming a physical network infrastructure. The quality of service (QoS) mechanism is used to find the quality route of any Ad-hoc routing protocol. The routing protocol provides the multiple routes from source to destination. Among these multiple routes it will select the best route to transfer the data from singe source node to single destination node. If the primary route is failure then the alternative path will be selected to send the data packets from source node to destination node. The MANET[2] has multiple routes in the dynamic topology. When the route discovery process happens the source node generates the RREQ(Route Request packet) and broad cast the packet overall the network. The energy efficient routing protocol is slightly modify the AOMDV routing algorithm The AOMDV is a node disjoint dynamic multipath routing protocol. The merits of MANETs are i) reduce the energy ii) the wireless devices are create a dynamic topology iii) maintaining the multiple route and select the best route iv)maintaining the residual bandwidth in each link of the network. So that the messages may be delivered in a timely manner. The wireless devices forming a MANETs are mobile phones, laptop, smart phone, tablet etc.

II. RELATED WORK:

A. Wireless Network Routing Metrics

The Routing protocols provide one or more network paths over which packets can be routed to the destination. The routing metrics are [20] the qualitative measures to select best routes among the multiple routes under certain aspects of the routing process of a protocol. The routing metrics are described as node based routing metrics and link based bandwidth aware metrics. These are used to select best routes among multiple routes based on available information of participating nodes such as energy, hop count, bandwidth etc.

B. Path Metrics

1) Path length or Hop count

The path length or hop count [9] is widely used in routing metric for ad-hoc networks. The shortest path will be selected to transfer the data from source to destination node. The routing mechanism based on path weight equals to the total number of links through the path. It is very simple to evaluate the route based on the path length.

Re-active multipath routing protocols based on routing strategy [5] are (i) *source routing* (ii) *hop-by-hop routing*.

In **Source routing** [5, 9], the data packets header has the information of a route from one node to another.. When the RREQ packets received by the intermediate node then it sent its own address to the packet and forwards it. The destination useless the recorded route in reverse order to send a route reply to the requesting node. the source node has the complete route to the destination. The node disjoint loop free paths are identified.

In **hop-by-hop** [5] routing the RREQ packets has only the single destination address and the next intermediate node address are kept. the intermediate nodes are store the routing information in a routing table then forward the RREQ packets to the destination node or next hop. Since every node in a path can update its route according to topology model. The better route will be selected among the multiple routes. The new

route requires few route recalculations during data transmission. The demerits of reactive routing method are that each mobile hops must have the information for alive route.

III. 3. DEMERITS OF MANET.

The following are the major issues [5, 6] of MANET.

A. *Unpredictable link properties:*

The wireless media is very unpredictable.

B. *Limited Battery life:*

Mobile devices generally depend on finite battery sources.

C. *Affect by Electro Magnetic Interference(EMI):*

Due to varying environmental conditions such as high level of Electro Magnetic Interference (EMI) or inclement weather, the quality of the wireless link may be unpredictable.

IV. OVERVIEW OF ROUTING PROTOCOLS

In this section we give a description of AOMDV, BWA-AOMDV,EE-BWA-AOMDV routing protocols. are also discussed along with the Energy Model.

A. *Ad-hoc on-Demand Multipath Distance Vector Routing Protocol (AOMDV)*

AOMDV [7] is an extension of AODV protocol to find the multipath in route discovery process In AOMDV, RREQ (Route Request) propagates from source to destination to find multiple routes. The AOMDV routing protocol is find out the node disjoint multiple routes from source to destination node. when the source wants send the data packets to the destination node, then its generate the Route Request packet (RREQ) and floods the RREQ packets to next intermediate node. When the destination received the RREQ packets then it will sent the Route Reply(RREP) packets to the source node in reverse order.

The RREP provide node disjoint and link disjoint path. In AOMDV each and every node has routing table. The routing table consists of next hop address and advertises hop count value of a particular path. When the intermediate node received the RREQ packets then it check the sequence number of just received packet is less than the previous packet sequence number. if the condition is true means the minimum hop count value is stored in routing table.

In AODV whenever the routes are break up then new routes will be discovered. But in AOMDV the multiple loop free paths are establish during simulation process. when the primary route is break up then the backup route is used to transfer the data to the destination. in AOMDV the new routes are find out whenever all the routes are break up during the simulation.

B. *OVERVIEW OF NEE-BWA-AOMDV*

1) *Route Discovery process*

An energy efficient Bandwidth aware AOMDV protocol is extended by modifying of AOMDV. When an intermediate node receives RREQ if the sequence number of just received packet is greater than this node, it kept energy with the min_re_energy of RREQ of this node if it is less than min_re_energy of RREQ of this node lowest minimum energy from all the nodes in this path.

When an intermediate node receives RREQ if the sequence number of just received packet is equal to this node and the mi_re_energy of j is greater than E_{TH} it updates its energy as a minimum energy in the variable of the min_re_energy. If the min_re_energy greater than or equal to E_{TM} and advertised hop count of i is less than H_{TS} then it updates its residual energy with the min_re_energy of this node based on algorithm. The setup of reverse routes at the destination node EE-BWA-AOMDV routing protocol is just like in AOMDV routing protocol. In the source node the value of min-re-bandwidth should be assigned as maximum value such as node's initial bandwidth.

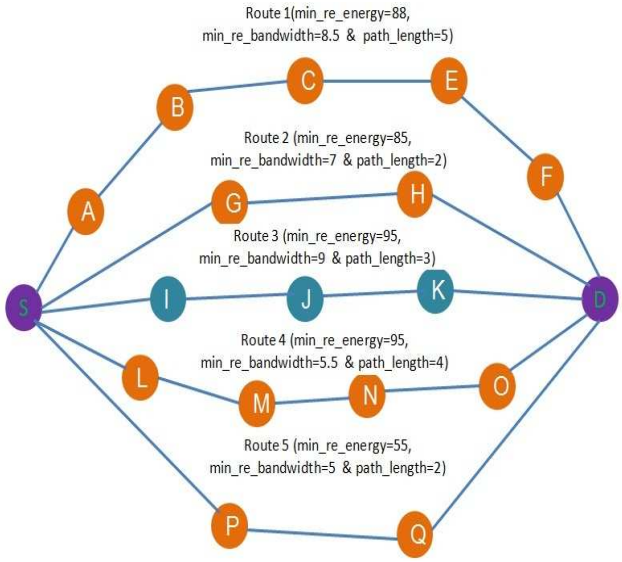

Figure .1 Route selection process of EE-BWA-AOMDV

For example, in figure 1 the node S generate the routing packets and sent towards the destination node D through intermediate nodes. The source node S has five multiple routes to destination D the routes are S-A-B-C-E-F-D, S-G-H-D, S-I-J-K-D , S-L-M-N-O-D, and S-P-Q-D between them. The minimum hop count with shortest route 3 will be selected for data transmission based on **Algorithm.**

V. 5. SIMULATION RESULT:

A. *5.1 Simulation Environment*

The performance analysis of Energy consumed Bandwidth aware AOMDV (EE-BWA-AOMDV) and AOMDV routing protocols are evaluated by using NS 2.34 [10,11] illustrate the simulation model and simulation parameters respectively.

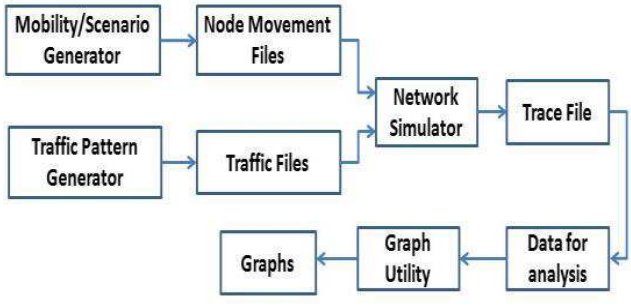

Figure 2. Simulation model

The simulation experiment is carried out by using LINUX. Table shows the simulation parameters .The simulations are run for with the maximum speed of 5,10,15,20 and 25m/s.The maximum speed of node is 25m/s.

TABLE:1 SIMULATION PARAMETERS

Parameters	Values
Simulator	NS 2.34
Traffic Type	CBR
Number of Nodes	100
Simulation time	100 seconds
Pause Time	50,100,150,200,250,300
Network load	4 packets/sec
Packet size	512 byte
Mobility Model	Random way point model
Radio propagation Model	Two Ray Ground
Dimension	1000m*1000m
Speed	5,10,15,20,25
Channel Type	Wireless Channel
Initial Energy	100 Joules

B. Quality of Service (QoS) Using speed (in ms).

The quality of service (QoS)[13,15] is used to provide the quality of route at any mobile ad-hoc routing protocol. we compare the proposed energy consumed routing protocol by using increase the speed of 5,10,15,20,25 (in ms) during simulation. By using the quality metrics[16], we find out the following metrics such as throughput, packet delivery ratio, and total energy consumed.

1) packet delivery fraction:

The packet delivery ratio is (PDR) is find out that divide the number of data packets successfully received to the destination node by number of packets broadcast by the source node.

2) Throughput:

The total amount of bytes received by the destination node per unit time.

3) Normalized routing overhead:

How many routing packets are generated and sent the towards the destination node divided by the number of data packets received by the destination node.

IV) Average Delay (in ms): The average delay time will be calculated during the data transmission in interface queue.

4) Remaining Energy in route (joules):

The summation of remaining energy is calculated of each path is subtract the residual energy from the initial energy of a node in a particular route during the simulation.

C. Performance Metrics using in varying speed (m/s)

TABLE 2 PACKET DELIVERY RATIO (%) OF AOMDV, MMRE-AOMDV , NEE-AOMDV,BWA-AOMDV AND EE-BWA-AOMDV

Max. Speed (in m/s)	AOMDV	MMRE-AOMDV	NEE-AOMDV	BWA-AOMDV	EE-BWA-AOMDV
5	45.59	45.53	47.10	49.17	92.24
10	41.48	38.85	41.51	43.74	83.00
15	37.86	38.13	39.17	41.18	75.07
20	29.12	31.03	33.84	35.94	71.40
25	32.36	26.97	30.37	32.47	57.23

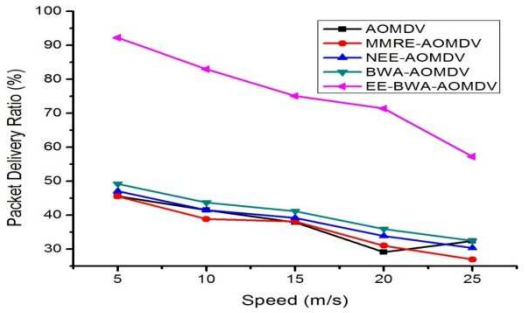

Figure:3 : Packet delivery Ratio(%) vs using varying speed(in ms) in various routing protocol.

The figure 3 indicates that the Packet delivery Ratio (%) of energy consumed routing protocol compared to the AOMDV. The EE-BWA-AOMDV protocol given the better packet delivery ratio compare to AOMDV and MMRE-AOMDV.

TABLE: 3 TOTAL ENERGY CONSUMED(IN JOULES) OF AOMDV,MMRE-AOMDV AND EE-BWA-AOMDV

Max. Speed (m/s)	AOMDV	MMRE-AOMDV	NEE-AOMDV	BWA-AOMDV	EE-BWA-AOMDV
5	420.54	365.0	378.28	376.28	359.34
10	473.08	435.2	374.84	372.84	356.06
15	364.59	345.3	335.3	333.3	318.30
20	400.12	376.9	367.68	365.68	349.22
25	734.78	726.1	700.34	698.34	666.91

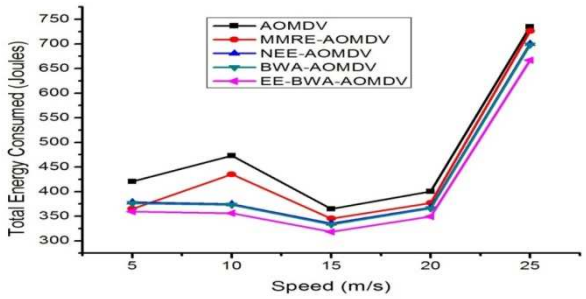

Figure : 4 Total Energy Consumed(in joules) of AOMDV and EE-BWA-AOMDV

The graph represent total energy consumption of EE-BWA-AOMDV protocol is very less compare to AOMDV and MMRE-AOMDV.

TABLE: 4 THROUGHPUT OF AOMDV,MMRE-AOMDV AND EE--BWA-AOMDV

Speed (m/s)	AOMDV	MMRE-AOMDV	NEE-AOMDV	BWA-AOMDV	EE-BWA-AOMDV
5	47.581	44.34	47.12	52.12	57.33
10	44.914	41.49	43.74	48.74	53.61
15	55.3	53.90	58.25	63.25	69.57
20	39.398	40.062	44.068	49.068	53.9748
25	42.413	35.741	39.549	44.549	49.0039

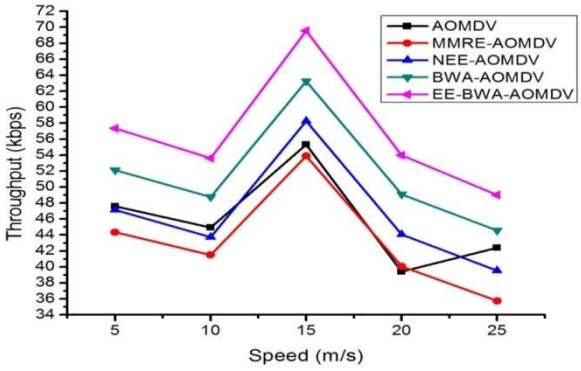

Figure 5: Throughput of AOMDV,MMRE-AOMDV and EE-BWA-AOMDV

The EE-BWA-AOMDV gives the better throughput compare to MMRE-AOMDV and AOMDV protocols as shown in the figure 5.

VI. CONCLUSION:

In this paper ,we proposed The NEE-BWA-AOMDV routing protocol is proposed by using three metrics such as path Length or Hop count, consumed energy and minimum available. The performance of EE-BWA-AOMDV routing protocol was compared with AOMDV, MMRE-AOMDV, NEE-AOMDV and BWA-AOMDV routing protocols using NS 2.34 with increasing speed 5,10,15,20,25(in ms).When there is a hike in network flows, the EE-BWA-AOMDV routing protocol reduced 24% of routing overhead,61% of packet loss ratio,71% of normalized routing overhead and 14% of energy consumption than the AOMDV routing protocol. When there is hike in number of nodes, the EE-BWA-AOMDV reduces 21% of routing overhead, 20% of packet loss ratio and 16% of normalized routing overhead. From our simulation result, we show that the EE-BWA-AOMDV routing protocol given better performance than AOMDV, MMRE-AOMDV, and NEE-AOMDV routing protocols.

REFERENCES

[1] Elizabeth M. Royer, C-K Toh, A Review of Current Routing Protocols for Ad-Hoc Mobile Wireless Networks, IEEE Personal Communications, pp.46-55, , April 1999.

[2] Abolhasan, Tadeusz Wysocki, and Eryk Dutkiewicz , A review of routing protocols for mobile ad hoc networks, Ad Hoc Networks, pp.1-22, June 2004.

[3] S. Corson and J. Macker, Mobile Ad hoc Networking (MANET): Routing Protocol Performance Issues and Evaluation Considerations, IETFWGCharter, ,January 1999.

[4] S.Mueller, R. Tsang, D. Ghosal, Multipath routhing in mobile ad hoc networks: Issues and challenges. In performance Tools and Applications to Networked Systems, LNCS, Springer-Verlag, Vol.2965, pp. 209-234, 2004

[5] Marina, M. K. and Das, S. R., "On-demand Multipath Distance Vector Routing for Ad Hoc Networks," Proc. of 9th IEEE Int. Conf. On Network Protocols, pp.14-23 (2001).

[6] Y. Liu, L. Guo, H. Ma, T. Jiang, Energy efficient on demand multipath routing protocol for multi-hop ad hoc networks, ISSSTA-08, IEEE 10th International Symposium on Spread spectrum and applications. Bologna, Italy, pp. 592-597, August 25-27 2008.

[7] Y. L. Jin, H. J. Miao, Q. Ge, C. Zhou, Expected Transmission Energy Route Metric for Wireless Mesh Sensor Network, International Journal of Digital Multimedia Broadcasting, Hindawi Publishing Corporation, pp. 1-7, 2011.

[8] S. Guha, S. Khuller, Approximation algorithms for connected dominating sets, in: Proc. IEEE INFOCOM, pp. 179-193, 1996.

[9] W. Ye, J. Heidemann, D. Estrin, An energy-efficient mac protocol for wireless sensor networks, in: IEEE INFOCOM, 2002.

[10] Darji, Pinesh.A. et.al., (2012) "An Improvement in AOMDV with Randomization", International Journal of Computer Technology & Applications, vol.3, no.3, pp 968-972.

[11] S. Lee, M. Gerla, Split multipath routing with maximally disjoint paths in ad hoc networks, Proceedings of the IEEE ICC, pp. 3201-3205, June 2001.

[12] B. Chen, K. Jamieson, H. Balakrishnan and R. Morris, SPAN: An energy-efficient coordination algorithm for topology maintenance in ad hoc wireless networks. ACM Wireless Networks Journal 8(5), pp. 481–494, 2002.

[13] Medhi, D. (2002) "Quality of Service (QoS) Routing Computation with Path Caching: A Framework and Network Performance", IEEE Communications Magazine, vol. 40, no. 12, pp 106–113.

[14] S. Das, C.Perkins, E. Royer, Ad Hoc On Demand Distance Vector (AODV) Routing, IEFT RFC3561, July 2003.

[15] Chen, L. and Heinzelman, W. B. (2005) "QoS-Aware Routing Based on Bandwidth Estimation for Mobile Ad Hoc Networks", IEEE Journal On Selected Areas In Communications, vol. 23, no. 3, pp 561-572.

[16] Geng , R. and Li, Z. (2006) "QoS-Aware Routing Based on Local Information for Mobile Ad Hoc Networks", S. Madria et al. (Eds.): ICDCIT, LNCS 4317 © Springer-Verlag Berlin Heidelberg, pp 159 – 167.