MULTIPATH ROUTING IN MOBILE AD HOC NETWORK USING EEBMRP ALGORITHM

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Abstract – Mobile Ad hoc network (MANET) is a infrastructure less in wireless networks. In Cluster based MANETs are considered one of the expedient method of routing in ad hoc. Existence of Cluster Head (CH) in a grouping of nodes for data forwarding get better the presentation of routing overhead and power consumption. However, due to the movement of organizing node and frequent modify in cluster members, reformation is needed and increases cluster formation overhead. The stability of the cluster highly reliant of constancy of the CH and hence during CH selection particular care should be taken, so that the CH survives for longer time. In this paper first set up the nodes and cluster head for randomly distributed. In MANET all the data collected by the mobile nodes are ahead to a sink node. Therefore the position of the sink node has a huge impact on the energy utilization and the lifetime of MANET. That is analysis the node is either sink node or primary node and choose the best path, then broadcast data to that specified path. Further choose the efficient route on the basis of least total transmission energy of the route. In this paper proposed a new algorithm EEBMRP (Energy Efficient Based Multipath Routing Protocol) is better performance compare to existing clustering algorithm WCA (Weighted Cluster Algorithm) and HCH (Hidden Cluster Head) and also improving packet delivery ratio, reducing end to end delay and minimum number of dead nodes.

Keywords : MANET, EEBMRP, Hidden Cluster Head(HCH), Weighted Cluster Algorithm(WCA), throughput, packet delivery ratio, total energy.

I. INTRODUCTION

In this paper multipath routing algorithm in ad hoc network used to transferring the packet efficiently from source to destination. First we create the dynamic nodes, and send to hello message sender node to destination node through the primary or alternative path. Routing algorithms in MANET for decide the specific choice of route and each route has only prior information of networks attached directly to it[1][2]. Routing protocol distributes this information first among immediate neighbors, and then throughout the wireless network. If the ad hoc networks are directly connected to the router already knows how to get in to the network. Otherwise the router must find out how to obtain to the remote network with either fixed or dynamic routing which administrator manually enter the routes in the routing table or non-static routing which happens automatically using routing protocols. Hence, to conserve the power consumption, route relaying load, battery life, and reduction in the frequency of sending control messages, optimization of the size of control headers, an efficient route reconfiguration should be considered when developing a routing protocol. The network's topology changes rapidly and unpredictably, due to the limited transmission range of wireless network nodes, multiple network hops may be needed for one node to exchange data with another across the network. In Figure.1 depicts the clustering in MANET.

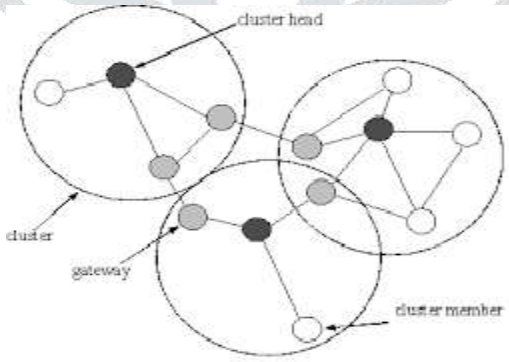

Figure 1 : Clustering in MANET

Clustering in mobile ad hoc networks has become a most crucial research issue in modern research years, cause clustering can improve the system performance of MANET. Clustering has evolved as an important research topic in mobile ad hoc network as it improves the system performance of large MANET. Clustering is one of the approaches for regulation of the routing process that divides the network into smaller groups is known as clusters. Each and every cluster has a Cluster Head (CH) as coordinator within the small structure that divided the network into number of interconnected substructures is non-static and unstable nature of the nodes makes it difficult for the cluster formation and constrained resources restrict the determination of cluster heads for everyone cluster. In this paper data can be send source to destination using energy efficient multipath routing algorithm[3] [4]. That is data send to be choose best path without loss. To compare the existing cluster algorithm for Weighted Cluster Algorithm, Hidden Cluster Head performance is low level metrics are simulated. The proposed algorithm better performance than existing one and also improving the packet delivery ratio, reducing end to end delay time, routing overhead and minimum number of dead nodes. Our aim of this paper data send to best path using energy efficient and hybrid algorithm without loss packet[5].

II. LITERATURE REVIEW

Based on the literature review one can understand the cluster based routing protocol for the route stability in mobile ad hoc networks. Route length based analyzed link stability for path constrained to improved route stability non-static in MANET from Amine Abid, M., and Abdelfettah Belghith. Topology control of multihop wireless networks using transmit power adjustment were studied from Ramanathan, R et al. Comparison of various cluster based self stabilizing algorithms in message passing model were analysed and discussed from Ba, M. and Flauzac, O. et al [6]. Multi-Hop Cellular: A New Architecture for Wireless Communications analysed from Y. D. Lin and Y. C. Hsu, Cluster density based distributed cluster algorithm for mobile ad hoc networks were discussed from Christian Bettstetter. Various weighted based clustering algorithm for mobile ad hoc networks were analyzed from Chatterjee, M. et al. A performance analysis of novel networks improving stability and low maintenance based clustering in MANET were discussed from Conceic, L. et al, [7] [8]. Route stability aware based multi metric clustering for mobile ad hoc networks in group mobility were discussed and analyzed from Hui Cheng, et al. A clustering service based route discovery protocol for mobile ad hoc networks were analyzed from Karunakaran, S. and Thangaraj, P. Non-static clustering algorithm based in mobile ad hoc networks for modifying weighted based clustering algorithm with dynamic movement predictions were discussed from Muthuramalingam, S. et al. Performance analysis of new strategies and extension based weighted cluster algorithm for mobile ad hoc networks were discussed from Mohamed Aissa, et al. [9] [10].An Overview of Routing Protocols in Mobile Ad-Hoc Network studied from Dhenakaran S.S et al. Performance analysis of node quality based weighted clustering algorithm for mobile ad hoc networks were discussed from Mohamed Aissa, and AbdelfettahBelghith. Distributed based weighted cluster routing protocol for MANET were studied from Naveen Chauhan et al. [11] [12]. Stable and flexible based weighted clustering algorithm for mobile ad hoc networks were studied from PandiSelvam, P. et al. Performance analysis of various routing protocol for mobile ad hoc networks were studied from Prabu, K. et al. Performance analysis of energy efficient based routing protocol for MANET through edge node selection using energy saver path routing algorithm were analyzed and discussed from Prabu, K. et al. Performance Comparison of BEMRP, MMZRP, MCEDAR, ODMRP, DCMP and FGMP to achieve Group Communication in Manet analyzed from Rajeswari M, et al. Novel weighted cluster based routing algorithm for mobile ad hoc network were discussed from Sunil Pathak, et al. [13]. Multi Path QoS Routing for Traffic Splitting in MANET from Niranjan ch, et al [14] [15]. Performance Analysis of Route Stability in MANET using Hidden Cluster Head (HCH) Algorithm were studied from Rajasekar,S et al [16] [17]. Performance analysis of clustering schemes in MANET discussed from Prabu,K et al.

III. PROPOSED WORK

Proactive approaches gather routing information for destination nodes in a periodic fashion are appropriate for incessant traffic, but need excessive energy. Mobile nodes have low-end CPUs with limited memory. Energy efficient cluster based routing protocols customary routing using these low-end processor mobile nodes consumes reduced time for effectiveness. A MANET is expected to remain operational for longer periods of time, where nodes might get added or nodes may face failures due to battery exhaustion or malfunctions. This may make the network non-operational or they might malfunction. These dynamic variations have to be accommodated by a resilient routing protocol for long-term availability of essential network services. This implies the need for self-organizing and self-managing routing protocols in autonomic systems. EEBMRP has the capability to re-organize on its own based on the number of nodes deployed in a MANET. Routing protocols that prioritize routes on energy metric (e.g., the residual energy of the nodes on the route) are classified as energy aware. Energy aware routing sustains a network for a longer time, which may be a challenging task in MANETs as they acquire information in very short time periods). EEBMRP routing protocol minimizes transmissions during route discoveries and final deliveries. It identifies shortest routes and cluster assignments for distributing and forwarding data packets in multiple paths, helping in an even depletion of node energy and finally increasing network lifetimes. Thus, EEBMRP is an energy aware routing protocol. In Figure.2 depicts methodology diagram for EEBMRP.

Methodology diagram for EEMRP

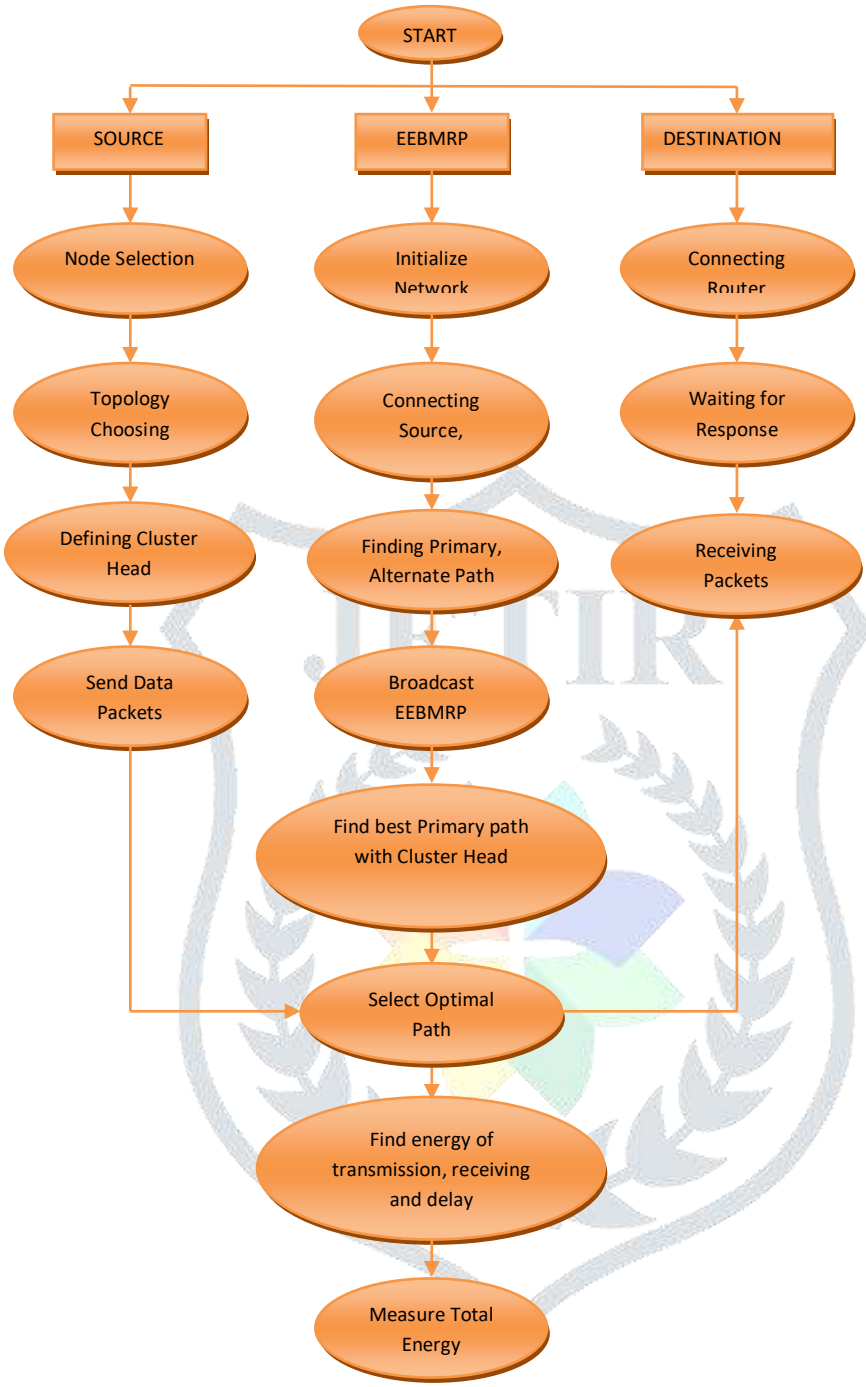

Figure. 2 : Methodology diagram for EEBMRP

In many MANET applications, nodes participating may be countless and a routing protocol has to cope with several challenges like countering radio interferences, encountering long paths and handling unpredictable failures. It should also be able to display a scalable performance in spite of these hurdles. EEBMRP is scalable, since it initially assesses a network and updates itself on re-configurations. A MANET transmission may have redundant information as it is accessible to all nodes in the range. Aggregation of information at the nodes reduces this redundancy, where EEBMRP effectively supports the setup of data aggregation in routing paths. EEBMRP is also very reactive as paths are searched and setup only when required. In proactive EEBMRP, all known destinations are known ahead as the information on them is kept up to date. The proposed EEBMRP algorithm is aimed at lesser energy consumption and longer network time. In Figure.3 depicts EEBMRP in Action.

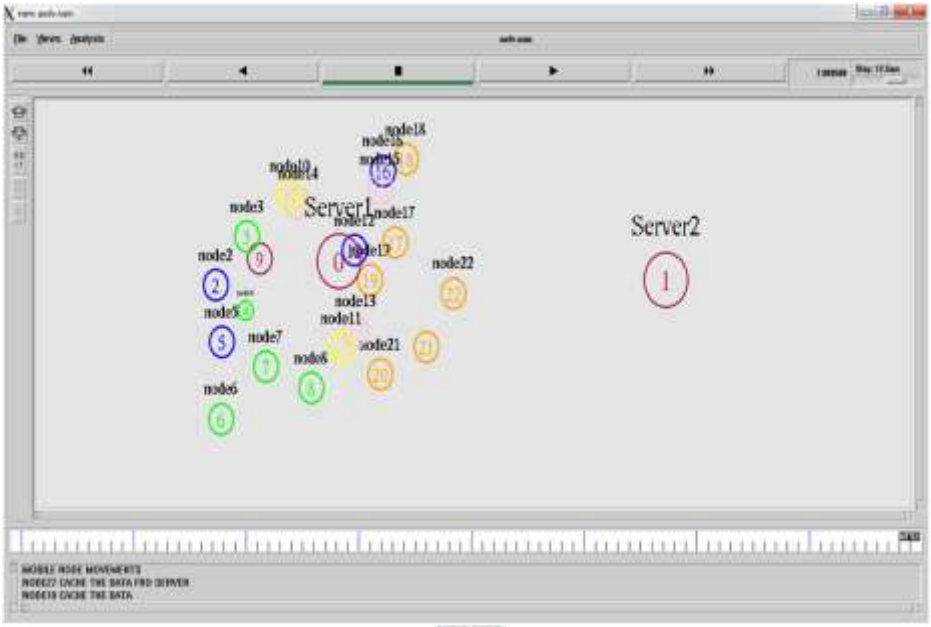

Figure 3: EEBMRP in Action.

Pseudo Code for Energy Efficient Based Multipath Routing Protocol (EEBMRP)

repeat
if (node == sinknode)
{FindPrimaryPath();
FindAlternatePath();}
else if (node == Primary) {
FindPrimaryPath();
FindAlternatePath();}
else if (node == Alternate) {
FindPrimaryPath();
until (node = Source)}
procedure FindPrimaryPath()
if (node == Primary) {
Broadcast PRIMARY;
Search for the best node;
node ← Primary;}
if (node == Alternate) {
Broadcast ALTERNATE;
Search for the best node and prefer Primary;
if (node = Primary){
node ← Alternate;
}}
end procedure
procedure FindAlternatePath()
if node == primary {
Search for the next best path node accept Primary;
if ((node = Primary)&&(node = Alternate)) {
node ← Alternate;
}}
if (node == Alternate) {
Exit();}
end procedure.

EEBMRP Algorithm

Input: Set of n mobile nodes randomly distributed.
Output: One primary and multiple alternate paths from source to sink, finding the energy of the destination node
Step 1: repeat
Step 2: if (node == sinknode) or (node == Primary) then FindPrimaryPath(); FindAlternatePath();
else if (node == Alternate) then FindPrimaryPath(); end if
Step 3: until (node = Source)
Step 4: procedure FindPrimaryPath()
if (node == Primary) then Broadcast PRIMARY; Search for the best node; node ← Primary; end if
if (node == Alternate) then Broadcast ALTERNATE; Search for the best node and prefer Primary;
if (node = Primary) then node ← Alternate;
end if end if end procedure
Step 5: procedure FindAlternatePath()
if node == primary then Search for the next best path node accept Primary;
if ((node = Primary)&&(node = Alternate)) then node ← Alternate; end if end if
if (node == Alternate) then
Step 6: Exit();
Step 7: Generate all the possible routes.
Step 8: Calculate the TEnode for each node of each route using.
Step 9: Check the below condition for each route till no route is available to transmit the packet. if (RBE < = TEnode) Make the node into sleep mode. else Select all the routes which have active nodes end
Step 10: Calculate the total transmission energy for all the selected routes using.

In Energy Efficient Based Multipath Routing Protocol (EEBMRP) algorithm using efficiently transfer the data from sender node to receiver node through the best route in mobile ad hoc network. First we set up the mobile nodes, cluster head for randomly distributed. Then analysis the node is either the sink node or primary node. In MANET all the data collected by the mobile nodes are forwarded to a sink node. Therefore, the placement of the sink node has a great impact on the energy consumption and lifetime of MANET. If the node is primary path, analysis the path and choose the best path (that is minimum delay and minimum traffic history) then broadcast data to that specified path. If the node is an alternate path, specify the best primary path and broadcasting the data. Generate all the possible routes then find the Transmission Energy (TE), Receiving Energy (RE), Delay Energy (DE) and node for each node of each route .

$$\text{Transmission Energy (TE)} = \frac{\text{Total energy taken for transmission} + \text{Delay of transmission}}{\text{Overall Energy}}$$

$$\text{Receiving Energy (RE)} = \frac{\text{Total energy taken for receiving} + \text{Delay of receiving}}{\text{Overall Energy}}$$

$$\text{Delay Energy (DE)} = \frac{\text{Transmission Delay} + \text{Receiving Delay}}{\text{Overall Energy}}$$

$$\text{Overall Energy} = TE + RE - DE$$

In the above equation using calculate the total transmission energy for all the selected routes. Next choose the energy efficient route on the basis of minimum total energy of the route. Then calculate the Residual Battery Energy (RBE) for each node of the selected route. Finally analysis Transmission Energy, Receiving energy and Delay energy based on this measure the Total energy. In this proposed EEBMRP algorithm is better performance than existing algorithm and also efficiently transmit the packet using minimum delay and low traffic network in the mobile ad hoc network.

Result : The proposed EEBMRP (Energy Efficient Based Multipath Routing Protocol) algorithm using NS2 Simulation packet send to multipath that is select the best path through the primary path or alternative path with low traffic network in mobile ad hoc network.

IV. SIMULATIONS RESULTS AND ANALYSIS

Performance of the proposed scheme is evaluated using Network Simulator version 2 (NS2). Some of the basic assumptions made for the simulations are the mobile ad hoc networks works in a secure environment and thus not prone to any sort of attack, each of the mobile nodes has a maximum battery power that a mobile node in a MANET could offer since it has to be used in the military battlefield which may require a high backup to sustain for a longer duration of each and every node has enough memory to store a copy of the token being circulated. Since any node can become a primary or alternate cluster head has to recover the token and circulate it under situations of token loss. With the assumption of the following parameters in Table 1 chosen for the simulation environment.

Table 1 : Simulation Parameters

Parameters	Value
Simulation	NS-2
MAC Protocol	IEEE 802.11
Protocol Name	EEBMRP, WCA, HCH
Mobility Model	Random Waypoint
No. of Nodes	20 – 100
Transmission Range	250 meters
Size of Network	500m * 500m
Pause Time	25s
Hello Interval	5.0s
Simulation Duration	500 times

The following performance metrics to evaluate through Networks Simulation (NS2):

Packet Delivery Ratio: The packet transfer relationship is computed by separating the number of packets received by the destination by the number of packets initiated by the application layer of the source. Specify the packet failure rate, which limits the highest performance of the network. The better the transfer relationship, the more complete and correct the routing protocol.

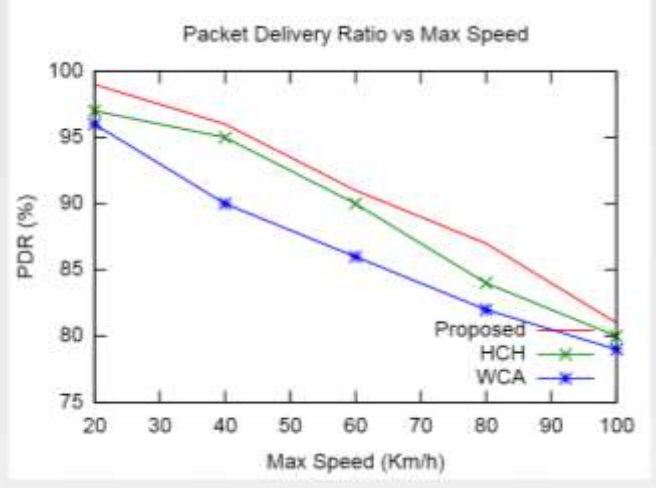

Figure 4 : PDR(%) Vs. Max speed(km/h)

In Figure.4 the proposed algorithm presents better performance compared to existing algorithms and also increased packet delivery ratio with maximum speed is increased.

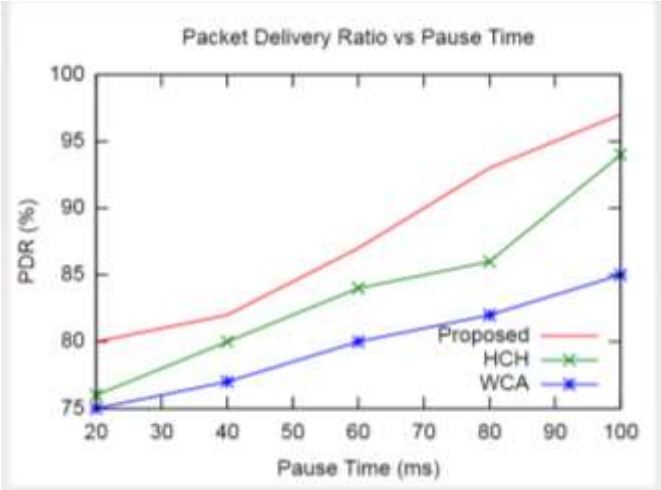

Figure 5 : PDR(%) Vs. Pause Time(ms)

In Figure.5 the proposed algorithm presents better performance compared to existing algorithms and also increased packet delivery ratio with pause time is increased.

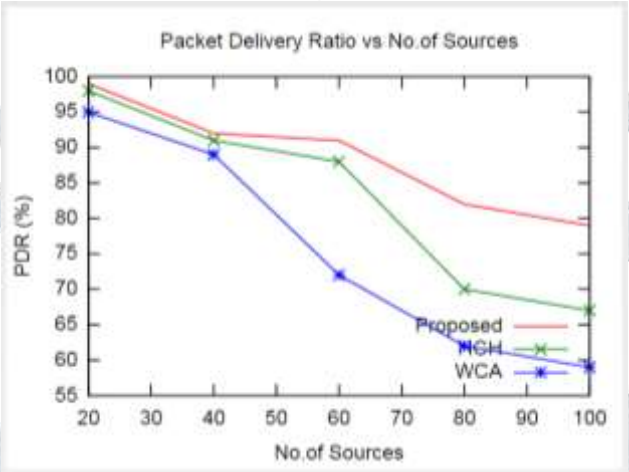

Figure 6: PDR(%) Vs. No. of sources

In Figure.6 the proposed algorithm presents better performance compared to existing algorithms and also increased packet delivery ratio with number of sources is increased.

End to End Delay : Delay is number of bytes or bits per seconds at time interval.

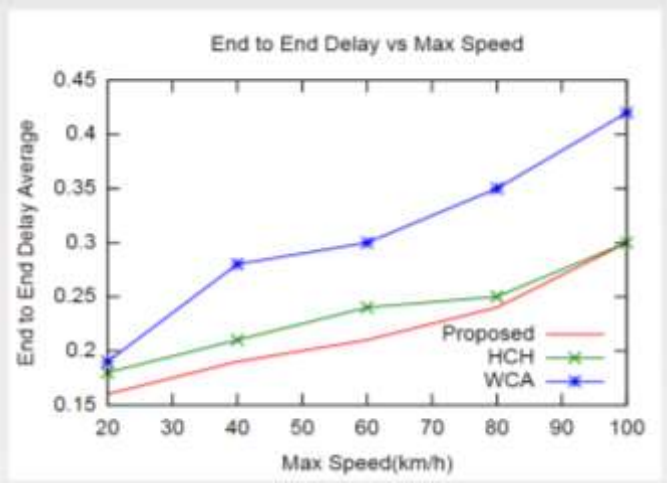

Figure 7 : End to End Delay Average Vs. Max Speed (km/h)

In Figure.7 the proposed algorithm provides better performance compare to existing algorithm and also reduced end-to-end delay with maximum speed is increased.

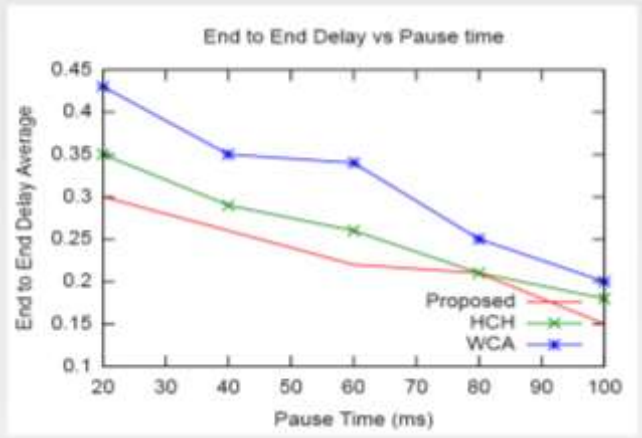

Figure 8 : End to End Delay Average Vs. Pause Time (ms)

In Figure.8 the proposed algorithm provides better performance compare to existing algorithm and also reduced end-to-end delay with pause time is increased.

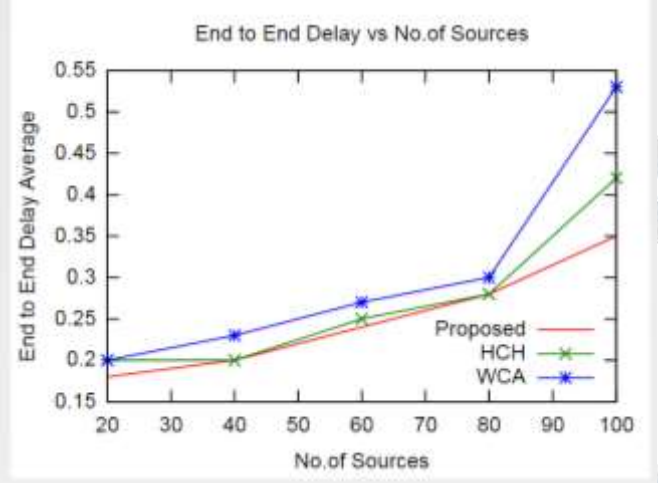

Figure 9 : End to End Delay Average Vs. No. of Sources

In Figure.9 the proposed algorithm provides better performance compare to existing algorithm and also reduced end-to-end delay with number of sources is increased.

Number of Dead nodes : Number of nodes to be dead transfer the packet from source to destination.

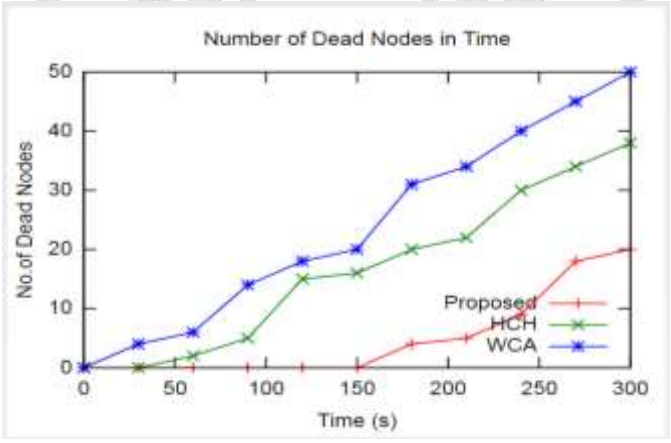

Figure 10 : No. of Dead Nodes Vs. Time(s)

In Figure.10 the proposed algorithm presents better performance compared to existing algorithms and also decreased dead nodes with time is increased.

Energy Consumption : In Figure.11 the proposed algorithm total energy consumption is reduced than compared to WCA(Weighted Cluster algorithm) and HCH(Hidden Cluster Head) algorithm. That is high transmission energy and receiving energy and low delay energy.

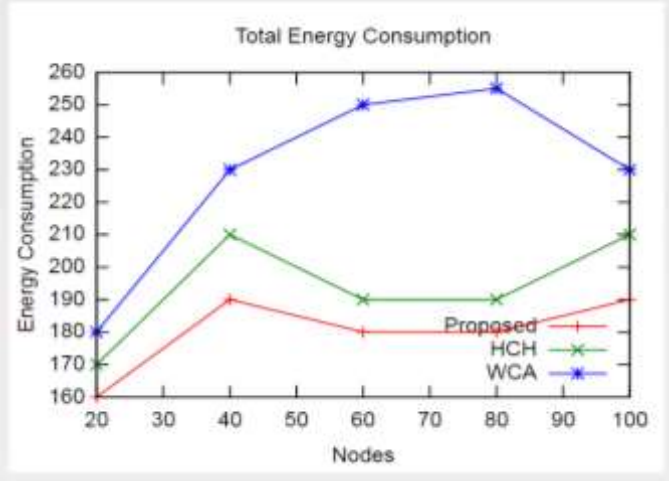

Figure 11 : Energy Consumption Vs. Nodes

V. CONCLUSION

In this paper proposed a new routing algorithm Energy Efficient Based Multipath Routing Protocol (EEBMRP) to transfer the data from source to destination efficiently and aimed at lesser energy consumption and longer network time. First set up the mobile nodes and cluster head for randomly distributed. In MANET all the data collected by the mobile nodes are forwarded to a sink node. Therefore the placement of the sink node has a great impact on the energy consumption and the lifetime of MANET. That is analysis the node is either sink node or primary node and choose the best path, then broadcast data to that specified path. Next select the energy efficient route on the basis of minimum total transmission energy of the route. This proposed EEBMRP algorithm is better performance compare to existing clustering algorithm WCA (Weighted Cluster Algorithm) and HCH (Hidden Cluster Head) and also improving packet delivery ratio, reducing end to end delay and minimum number of dead nodes.

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