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# Hierarchical Inter/Intra Cluster Based Enhanced Efficient Power Saving Adaptive Routing Protocol (e-EPSAR) for MANETs : Feasibility and Analysis

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**Abstract:** Communication process in mobile ad hoc network is based on multihopping system for routing to create a path between source and destination. If we found a solid and sound path for routing the packets that would be more reliable, adaptable and efficient for the various network scenarios too by following the next hop method and that also should be the farthest node within the cluster, then we could get superior work by the networks. This paper provides stress on same fact by means of simulating the protocol e-EPSAR over ADOV (reactive) existing protocol. In addition this research paper also shows the few simulations of e-EPSAR over multiple network (i.e. expands in the form of number of nodes) and evaluate the performance and feasibility of e-EPSAR by taking into account the various parameters of network such as Packet Sent, Packet Received, Ratio of Packet Delivery and End-to-End Average Delay. The simulations have been performed using Network Simulator 2 version 2.35. The performance obtained is better than available EPSAR.

**Keywords:** Multi-hopping; Reliable Node Selection; FRENSA; e-EPSAR; Cluster Based Routing

## I. INTRODUCTION

Mobile ad hoc networks are such type of networks that works under dynamic routing with mulihopping mechanism and have no centralized control to govern the network under which the network has to communicate. Apparently it's crucial to work with such kind of network because of the absence of base stations/routers. In MANETs nodes itself have capability to act as base station/router and every node may function as a router and forward packets through routing paths. Co-operation among nodes during path discovery and packet relaying is of primary concern and should be supported for correct functioning of the network. In order to work with MANETs we have some predefined routing strategies through which we can pursue our communication i.e. active routing (on demand), proactive routing (table driven). Rest of these there is one more routing strategy known as preemptive routing (works on the bases of signal strength and age of path) all these strategies have their own pros and cons. All these protocols have some wonderful features if we intermix all these features particularly offer additional stress on signal strength that acts as threshold and we could lead towards a routing path that is extremely efficient in terms of power utilization [1], [2], [3], [5]

## II. PREVIOUS WORK

Along with the existing routing strategies, if we could improve the path election/selection process on the bases of he parameters and constraints that are directly related to the given network definitely we would have a sound, efficient and adaptable network. To work with such kind of scenarios for path selection researchers have already proposed an algorithm/protocol that works on same phenomenon. i.e. EPSAR (Efficient Power Saving Adaptive Routing) and an enhanced form of this algorithm is proposed e-EPSAR (enhanced-Efficient Power Saving Adaptive Routing) protocol. In this dissertation we are dealing with the design, simulation, analysis of e-EPSAR and check their feasibility whether this protocol is suitable and reliable for mobile ad-hoc networks. We have done amendments in EPSAR to make e-EPSAR i.e. highly efficient and reliable as well for mobile ad-hoc networks. For packet forwarding the proposed algorithm checks weather source node's id and destination node's id are in same cluster or not if both are found in same cluster then it select the next node with respect to its distance from sender node, reliability and power backup, which reduces the overall communication head, if not found in same cluster then source node's cluster head broadcast beacon massages to all other cluster heads along with destination id. After finding the cluster in which destination id lies, communication will start through cluster heads.[9], [11],[14], [17]

e-EPSAR is implemented over AODV i.e. reactive routing by considering the feature of preemptive routing that follows signal strength. Simulations have done under the different scenarios by taking different number of

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nodes for each routing strategies along with e-EPSAR characteristics and also evaluate the performance e-EPSAR under these. The actual mechanism of e-EPSAR is shown in figure 1. [12], [13]

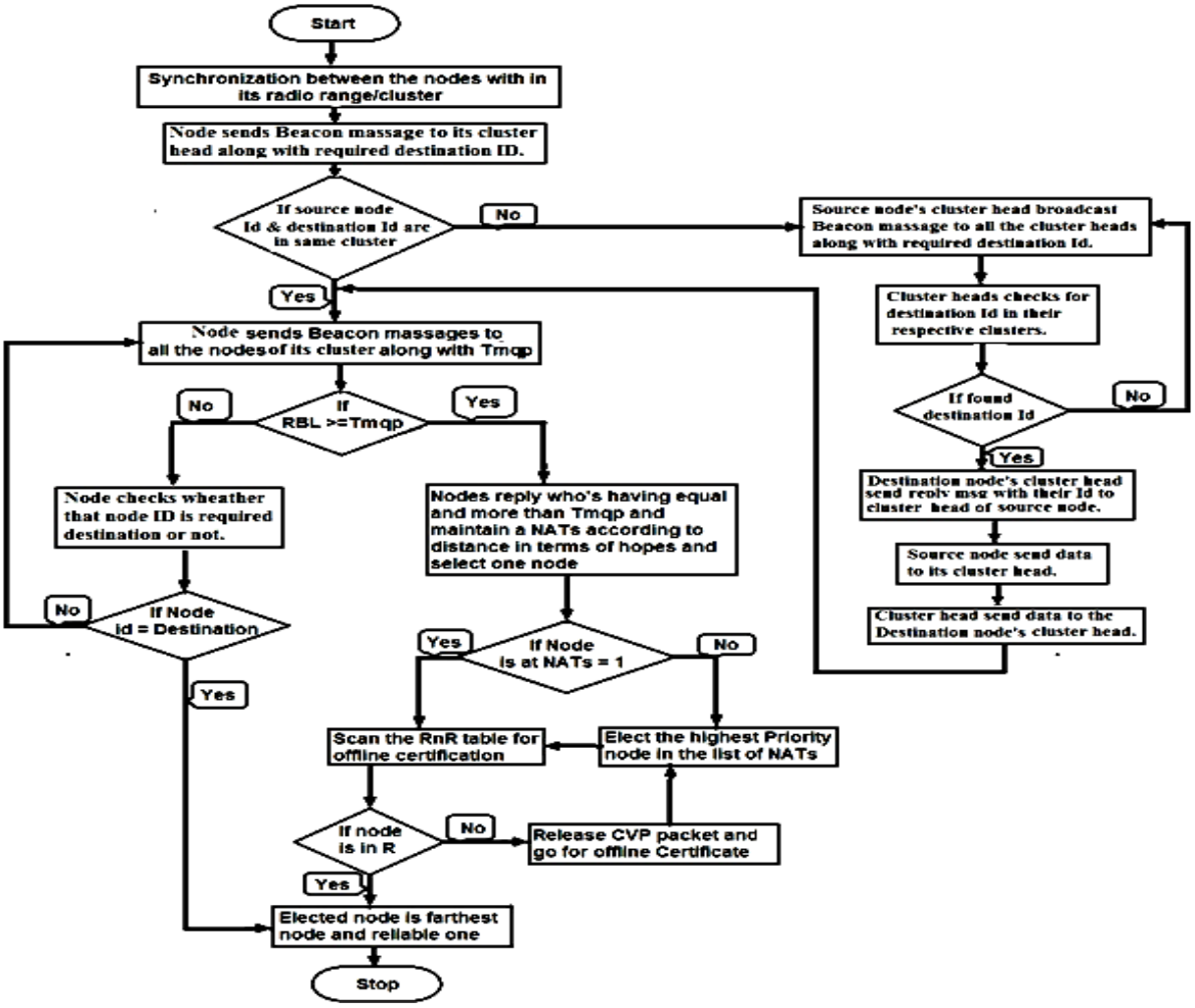


Figure. 1: Working of e-EPSAR [12]

## III. SIMULATION

Figure 2 shows the simulation of e-EPSAR with AODV for 10 numbers of nodes using NS-2 version 2.35, How formation of clusters can be done between these nodes; how iterations can be done in between clusters and out of clusters for e-EPSAR; how data packets can be sent thorough the nodes ; and reply can be done only by the nodes those fulfil the said threshold value for that network.

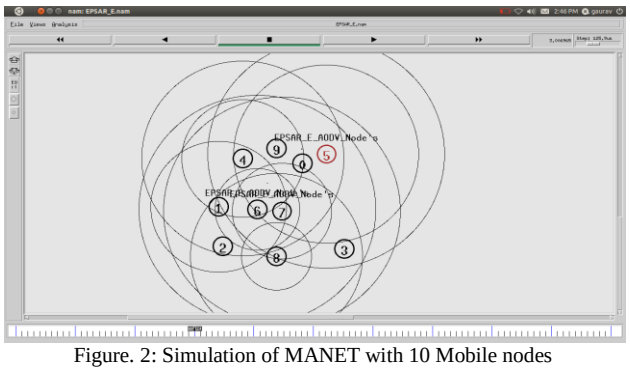

Figure. 2: Simulation of MANET with 10 Mobile nodes

Figure 3 shows the simulation of e-EPSAR with AODV for 20 numbers of nodes in which the different network parameters (Packet Sent, End-to-End Average Delay and Ratio of Packet Delivery) vary according to network.

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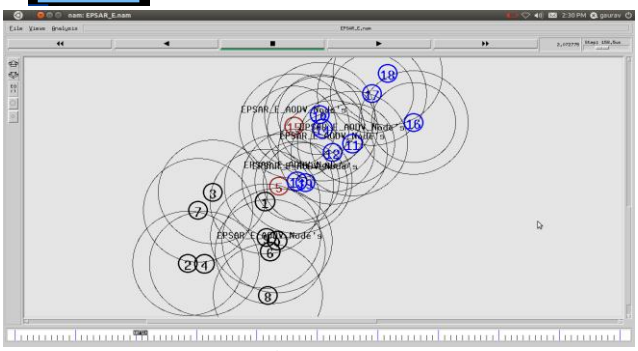

Figure. 3: Simulation of MANET with 20 Mobile nodes

Figure 4 shows the simulation of e-EPSAR with AODV for 30 numbers of nodes and have analyzed how effective is the protocol and what is performance in related to above.

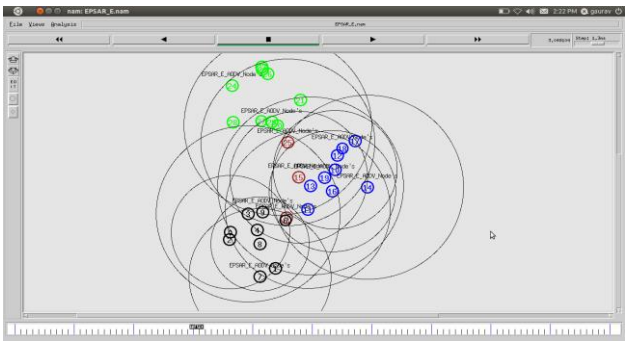

Figure. 4: Simulation of MANET with 30 Mobile nodes

Figure 5 shows the simulation of e-EPSAR with AODV for 40 numbers of nodes, it offers the higher results because as the network grows the performance of e-EPSAR improve step by step.

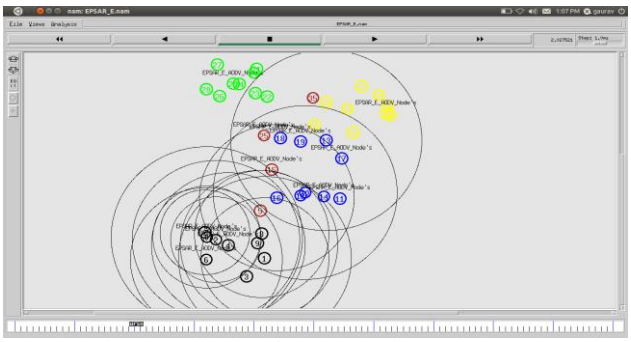

Figure. 5: Simulation of MANET with 40 Mobile nodes

Figure 6 shows the simulation of e-EPSAR with AODV for 50 numbers of nodes, it gives the best results because as the network grows the performance of e-EPSAR increases gradually.

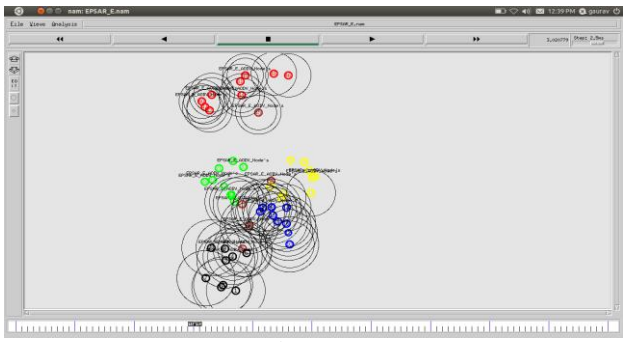

Figure. 6: Simulation of MANET with 50 Mobile nodes

## IV. IMPORTANT OBSERVATIONS

After having all these simulations it is analyzed as the numbers of nodes grow in the network, e-EPSAR gives better results. Evaluation of e-EPSAR for AODV can be done by taking some parameters like data packets sent; data packet received; data packet lost; delivery ratio and end to end delay. By examine all it is analyzed that the proposed protocol is suitable for large network. Figure 7 and 8 represents the performance of e-EPSAR among all the scenarios of AODV.

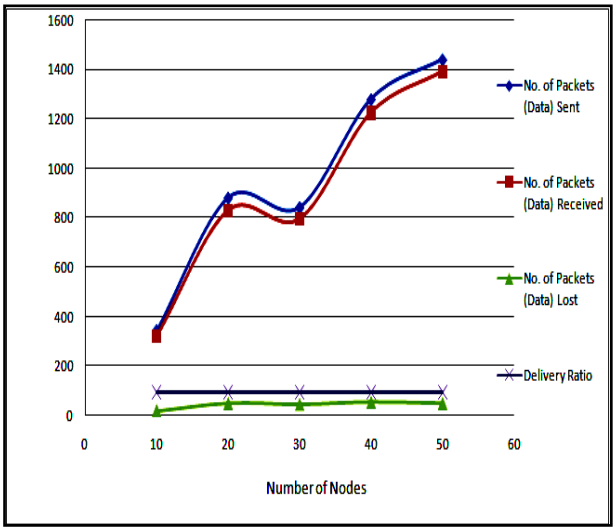


Figure. 7: Results in terms of Delivery Ratio

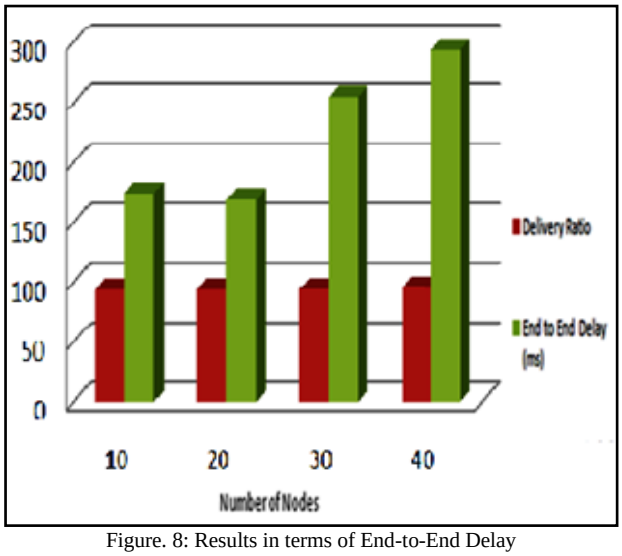


Figure. 8: Results in terms of End-to-End Delay

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## V. CONCLUSION

This paper presents the research work carried out for simulating protocols for MANETs. After merge the reliable features of proactive, reactive and pre-emptive routing related to path selection over e-EPSAR, it is concluded that e-EPSAR is a unique approach towards the selection of reliable and efficient node within as well as outside the cluster and finally we have an adaptable and energy conserved path too. From the above simulations and results it is clear that e-EPSAR is more suitable and highly feasible as the network grows in size can change the network performance. It gives elegant results while dealing with on demand routing and have large network. The above graphs represents the evaluation of e-EPSAR on the bases of network parameters such as Packet Sent, Ratio of Packet Delivery, and End-to-End Average Delay.

## VI. FUTURE SCOPE

e-EPSAR is a unique approach to achieve fair routing but there is always some scope of improvement and enhancement. In the same way the scope of enhancement in e-EPSAR is to introduce balancing of loads on the bases of priority so that we would have an new approach towards efficient, and adaptable, prioritized routing.

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