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Clustered Mobile Ad Hoc Networks Using Hierarchical Routing Algorithm

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Abstract*— To improve the Routing the Enhanced Routing protocol mechanism is used in Mobile ad hoc networks. The EHRP provides efficient and reliable routing paths. EHRP is compatible which reduces routing overhead and route discovery delay of the mobile ad hoc networks. The shortest hierarchical path is calculated based on the cluster head of different Clusters using the Cluster Table addressing scheme which is the Proposed Addressing mechanism in EHRP. The Hierarchical routing system consists of several distributed Routing systems where each of it is responsible for one network. This hierarchical network uses the Dynamic Routing Methodology .Thus the advantage of EHRP is to find the shortest hierarchical path by using hierarchical addressing scheme

***Keywords*— EHRP- Enhanced Routing protocol mechanism**

I. Introduction

Mobile ad hoc networks (MANETs) are comprised of mobile nodes that perform multiple hop forwarding over wireless links. The mobility of network nodes combined with the transient nature of wireless links results in a rapidly changing network topology. The dynamic nature of the network environment makes the task of routing in MANETs far more difficult than in wired networks. Further,it is commonly assumed for MANETs that the wireless links tend to be relatively low capacity fixed-sized links (i.e., no hierarchy in the physical topology of the network). This means that neither traffic aggregation nor summation of routing information can be achieved through hierarchically proportioned physical links. Thus, not only is maintaining and acquiring routing information in MANETs difficult to achieve but so is achieving this in a manner that scales well with increasing network size.

This paper addresses the scalability, with respect to increasing node count, of *hierarchical routing* in MANETs.The performance metric under consideration is the Average Routing time and the Average routing information required by hierarchical routing. This assessment considers only the overhead due to the maintenance of routing tables and hierarchical clustering.

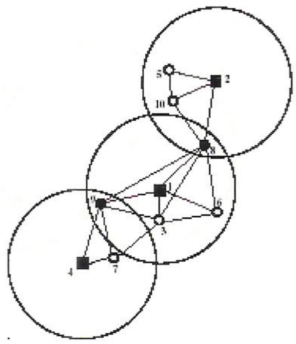


Table 1.1 (a) Number of Nodes Vs Amount of Routing Information for AODV protocol

Number of Nodes	Average amount of Routing Information
0	0
20	120
40	100
60	1000
80	1300

The overhead due to location (or address) management is considered elsewhere. The objective here is to make the comparison between the AODV Routing protocol and the Zone Routing Protocol .The parameters are evaluated based on the value metrics and the concurrency between the set of the values involved .The Hierarchical Adressing Scheme is mainly used for the numbering between the Clusters.Single Forwarder concept is used. The overhead is mainly due to the Cluster head formation and hence enabling the multihopping fron one Network to another Network .The most efficient protocol used is the Zone Routing Protocol for the comparison of the Average Routing time and Average Routing Information.

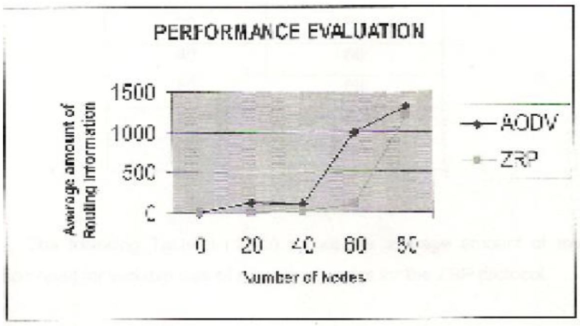
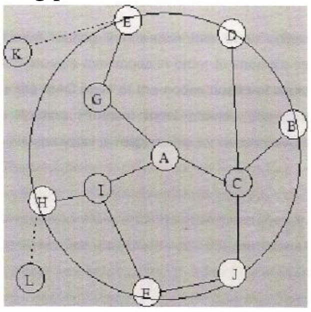


Figure 1.' Performance comparisons between the AODV and the ZRP protocols.

II. ZONE ROUTING PROTOCOL

A mobile ad hoc network is antonomous system of mobile routers autonomous connected by wireless links the union of which form an graph .there are no mobility restrictions on these routers and they can organize in the network topology. The routing scheme adopted is the zone routing protocol.



Zone Routing Protocol

The efficiency of the algorithm is compared with the efficiency of the Adhoc on demand distance vector Routing Protocol .The parameters considered are the Average Routing Time and the Average Information Unit.The Algorithm has been mainly used for the Networks with the Clustered Approach.The Forwarders are used with the conection of the two Clusters.

III. CLUSTER FORMATION

The formation of level-k clusters, $k\{1,2,\ldots,L\}$, involves the recursive application at each level of the node .Each level of the clusters one forwarder is elected to forward the Routing information.The communication with level-k neighbors is via node hops. That is, the length of paths connecting level-k nodes is β k times longer than paths connecting level-(k−1) nodes, on average. This would suggest that the communication overhead due to level-k cluster formation increases with k. However, the increase in path length between level-k nodes is offset by a decrease in the number of nodes at each successively higher level in the hierarchy. Specifically, the number of level-k nodes is less than the number of that cluster formation overhead is involved in Evaluation of level-1 cluster formation is omitted here as it follows the procedure of requiring two rounds of communication between neighbours and network-wide communication overhead. Level-2 cluster formation is now evaluated. First, it is recalled that it represents the average number of hops separating adjacent level-1 nodes. Therefore, each level-1 node must communicate 2 rounds of cluster formation messaging with on average neighboring level-1 nodes over level-0 paths consisting of, on average, of $D1$ hops. Since there are level-1 clusters in the network, the aggregate communication overhead due to level-2 cluster formation is considered. Here, the average number of level-0 hops separating level-2 nodes is on average larger than that separating level-1 nodes). Thus, the overhead due to a level-2 unicast communication session is greater than that incurred by a level-1 unicast session by a similar factor. However, the number of level-2 nodes is smaller than the number of level-1 nodes by a factor of some value. cluster formation is more than offset by the reduced number of level-2 nodes involved in the process versus the number of level-1 nodes involved in level-2 cluster formation. Applying this analysis to level-k cluster numbering scheme

IV. CLUSTER MAINTENANCE

The assessment of level-*k* cluster maintenance follows some logic similar to that given for level-*k* cluster formation. Hence, the analysis is performed with respect to a baseline link state change frequency *f*0 corresponding to the frequency of level-0 (i.e., node level) cluster link state change events. The maintenance of level-1 and higher level clusters is based on recursive application level-0 cluster link state changes. That is, although a level-0 cluster link state change will necessarily result in messaging between level-0 nodes in the vicinity of the change, it will impact level-1 nodes with some probability $p1 < 1$. Further, the level-0 link state change events also impact level-2 nodes with probability neighborhood of the endpoints for the updated level-(k−1) cluster link will be effected. This means that the effect of a level-(k−1) cluster link state change does not propagate A third concept of importance here is that as in cluster formation, the average hop distance level-*k* control messaging must traverse increases by a factor of k β over that required at level-(k−1). Thus, a critical issue to assess is whether *pk* becomes sufficiently small with increasing *k* to offset the combined effects of *lk* and increased path length between level-*k* nodes. Simulation results, reported some address whether *pk* offsets the effects of *lk* and k β . However, justification for this to be true is provided now as follows.Hence it represents mainly based on the frequency of Hopping between the set of the Networks. It is also called as Frequency Hopping.

V. CONCLUSION

This paper has argued that the number of packet transmissions per node required for a particular MANET hierarchical clustering scheme datagram header bits required for hierarchical addressing results in per node overhead of few bits per second. This is an important result because it implies that the sizing of network links need only be in order to accommodate the growth in control traffic incurred by hierarchical routing. Thus, given the clustering procedure under consideration here, hierarchical routing actually *scales very well* with respect to increasing node count. In contrast, for example, non-hierarchical links state routing incurs aggregate link state packet overhead that is involved. This means the sizing of network links must be in order to accommodate the growth in traffic due to flooding of link state packets. Although communication overhead per node for hierarchical clustering may be an intuitively sensible there is no previous work that justifies the multi-hop, mobile packet radio networks. Determining whether a similar bound holds for other clustering approaches represents a direction for future work.

The effect of different levels of hierarchical addressing is that the length of datagram headers must be equal to the average throughput available for each network node is represented by a factor of number of the nodes compared to what theoretically can be achieved via non-hierarchical routing. However, non-hierarchical link state routing incurs overhead that is involved per node. Thus, although hierarchical addressing may constrict network throughput, hierarchical routing is still clearly more scalable in comparison. For example, in the 2800 node simulation of means that the hierarchicl address consists of the concatenation of 5 node IDs. Assuming a 64-bit NIC number used as the node ID, means that a 5-level hierarchical address incurs 32 additional bytes of datagram header content that do not occur for a non-hierarchical address. An extra 32 *bytes* in each datagram header is likely to be substantially less than the value *packet transmissions per node* that occur at a frequency of *f*0 in order to propagate link state packet updates.Of course, the result derived here is not the complete picture in assessing the scalability of topology-based hierarchical routing. First, there are issues of location management (i.e., address management) .It is mainly based on the set of nodes available on the Network.

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Biography

R. Senthilkumar, currently working as an Assistant Professor at Panimalar Institute of Technology, has more than 9 years of teaching and research experience. He had graduated his Bachelor’s in Computer Science and Engineering from Anna University and his Master’s in Computer Science and Engineering from Dr.M.G.R Educational and Research Institute. He had served several positions as Lecturer, senior Lecturer, Assistant professor at various institutions. He had guided more than 30 under graduate students in research and is more interested in the area of Adhoc networks.

