An Efficient Clustering in MANETs with Minimum Communication and Reclustering Overhead

Mohd Yaseen Mir, Department of CSE and IT, Veer Surendra Sai University of Technology, Burla, India
Satyabrata Das, Department of CSE and IT, Veer Surendra Sai University of Technology, Burla, India

ABSTRACT

A flat structure in MANETs based on proactive or reactive routing schemes face scalability problems with increase in both mobility and network size. Clustering offers hierarchical organization of mobile nodes by forming disjoint groups (clusters). So clustering techniques solve the scalability issue in large MANETs but, requires extra message exchange among mobile nodes for maintenance of cluster structure. Due to mobility in MANETs stability of cluster structure is greatly affected as such it often leads to Ripple effect of reclustering. In this paper, the authors present clustering algorithm that eliminates the requirement of frozen period and minimizes reclustering of entire network by locally repairing cluster structure that gets affected due to moment of head node. They have reduced the number of messages exchanged in their proposed work by including different range of transmission for each node and overall stability of entire structure is enhanced.

KEYWORDS
Access Point, Clusterhead, Clustering, Clustermember, Clusters, Message Overhead, Mobile Ad Hoc Networks (MANETs), Scalability

1. INTRODUCTION

Mobile ad networks (MANETs) are infrastructure-less multi-hop wireless networks that allow mobile nodes to develop temporary network for instant need. MANETs, due to their quick and economically less demanding deployment bear many applications in several areas, including military applications, distributed computing, disaster management, mobile conferencing and so on. There are many issues and challenges faced by MANETs like medium access scheme, routing, quality of service provisioning, scalability and so on. Scalability is the ability of the routing protocol to perform efficiently when size grows drastically. However flat structure based on table driven or on-demand routing schemes does not perform well (P.Gupta, P.R. Kumar, 2000), (X.Y. Hong, K.X. Xu, M. Gerla, 2002). The reason behind this is growth of communication overhead of table-driven routing schemes with increase in number of mobile terminals in network (E.M. Belding-Royer, 2002). The flooding of route request in reactive routing protocols cause delays and communication overhead in face of mobility and growth of mobile nodes.

Clustering improves the scalability of MANETs in case of frequent topology changes due to node mobility. It divides the entire network into disjoint subset of clusters (Figure 1) and hence makes a large network to appear small and less dynamic. In any cluster, a clusterhead serves like a coordinator for its own cluster, performing various jobs like intra-cluster transmission arrangement,
data forwarding and so on. A clustergateway is a node which helps in inter-cluster links, so it can be used to forward information between clusters. A clustermember is ordinary node which directly communicates with its own clusterhead.

In this paper, we have proposed clustering technique for building stable non-overlapping clusters by eliminating the stationary assumption that is required for message exchange between nodes and reduced the messages required by a node for communication with its respective clusterhead. In order to mitigate the effect of reclustering overhead, we have divided clustering into two parts, Globalclustering and Localclustering. Localclustering will repair a cluster when certain events occur like moment of head nodes without disturbing the entire structure. The proposed scheme could be extended with inclusion of various characteristics for better stability.

The rest of the paper is organized as follows. In section 2 we have revived some existing protocols in clustering scheme. In section 3 we have explained our proposed work. In section 4 implementation details and in section 5 conclusions.

2. RELATED WORK

Clustering in general can be divided according to their objectives like Low maintenance cost, Mobility-aware clustering, Energy efficient, Combined-metrics based clustering and so on (J. Yu and P.Chong, 2005). The earliest clustering protocol Lowest-ID is based on ID of mobile node and any node having lowest ID compared with its neighbors is chosen as head node. Lowest-ID algorithm yields one hop clusters i.e two clusterheads are at two-hop count and clustermember is directly connected with its respective clusterhead.

ECS (Efficient Clustering Scheme) - ECS (Jane Yang Yu, Chon, 2006) eliminates the requirement of frozen period for cluster formation, and guarantees the performance in case of large and dense MANETs. Besides frozen period elimination, it reduces overlapping of clusters. ECS is based on random claim where any code can claim role of clusterhead and includes two new states for node, clusterguest and access point (AP). It divides clustering into two parts, cluster formation and cluster maintenance. The procedure is discussed as

- Initially all nodes have unspecified status.

Figure 1. A Typical Cluster Structure
Big Data Summarization Using Novel Clustering Algorithm and Semantic Feature Approach