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Improving the Routing Performance of Mobile Ad hoc Networks Using Domination Set

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Abstract

Mobile Ad hoc network is a self organized, self maintained network. Node movement is the important factor of increasing the control overhead in the network. The main objective of the paper is to reduce the control overhead by using the domination set based routing. The nodes which use to connect all the other nodes in the network are called dominating nodes, and the set of dominating nodes forms domination set. This paper proposes a new approach for finding the route and reducing the reroute establishment delay and increasing the packet delivery ratio. The efficiency of the method is demonstrated through simulation study.

1. Introduction

The evolution of mobile ad hoc networks (MANET) is growing in a rapid pace. Anytime anywhere networking came into picture because of the infrastructure less property of MANET. The nodes in the MANET are selfsufficient and each node is act as either router or source. There is no central controller in MANET[1] and the control is distributed among the nodes. Topology of the network is dynamic and the topology change is more frequent. Conventional routing algorithms are not suitable for MANET. There are many routing algorithms proposed for

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MANET timely. Mainly the routing algorithms are categorized into two ie, proactive and reactive[6]. Proactive algorithms are the extension of wired routing protocols. In this, all the nodes keep the routing information in the routing table, when the network is initialized. This information is periodically exchanged with its neighbors. Because of the periodic exchange, the routing overhead is very high in this case. In the reactive routing protocol on the other hand, the route is determined only when a node wants to send some data. In this case, there is some delay occurs for route establishment since the routing information is not readily available; many control packets are used for finding the route. The control packets also induce routing overhead in the network. As per study, it has been reported that the reactive algorithms are more efficient than proactive ones[8]. The main constraints in MANET include high mobility, low bandwidth and low energy. Due to the high mobility, frequent disconnections are more in MANET. In all reactive algorithms, when the route is broken then the route re-establishment process diminish the performance of the network by inducing more overhead.

This paper proposes a method to reduce the reroute establishment delay and routing overhead by using the dominating nodes in the network. Domination based routing came into existence[3,4] for a decade but no qualitative and quantitative analysis have been reported properly. In this work a scenario of Domination Based Routing is created and compared the performance against the existing algorithms. This clearly justifies that the proposed work is more efficient in terms of packet delivery ratio, control overhead and packet drop. In this method, initially all the dominating nodes in the networks are located. From this a domination set is created. A set is a dominating set, if all the nodes in the network are either in the set or the neighbors of the nodes in the set[2]. The route is established through the members in the domination set only. All nodes in the network can be reached through the dominating nodes. When the route fails, it is easy to find the new route by using the domination nodes. This ensures the re-route establishment without any delay and overhead, thereby enhancing the routing performance, even when the route breaks occurs.

The rest of the paper is organized as follows. Section 2 gives the brief idea about how the domination set is computed. Section 3 describes the proposed domination based routing. Simulation study and results are described in section 4 and the conclusion is given in section 5.

2. Computation of Domination Set

In graph theory, the domination set is the subset of the graph such that each node is either in the set or has a neighbor in the set. The determination of the domination set is distributed among the nodes. Every node in the network can be reached through the domination nodes.
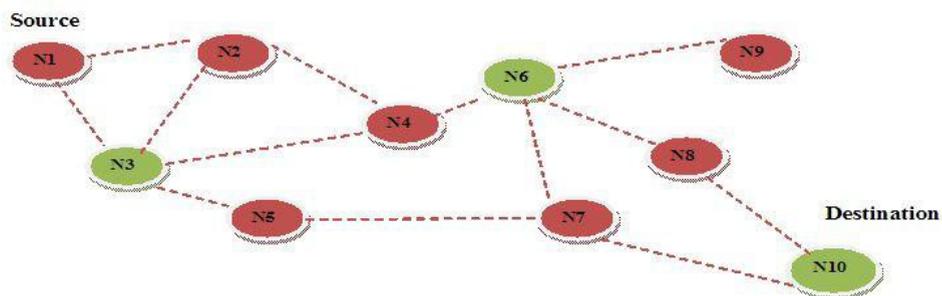

Fig.1. An example mobile ad hoc network