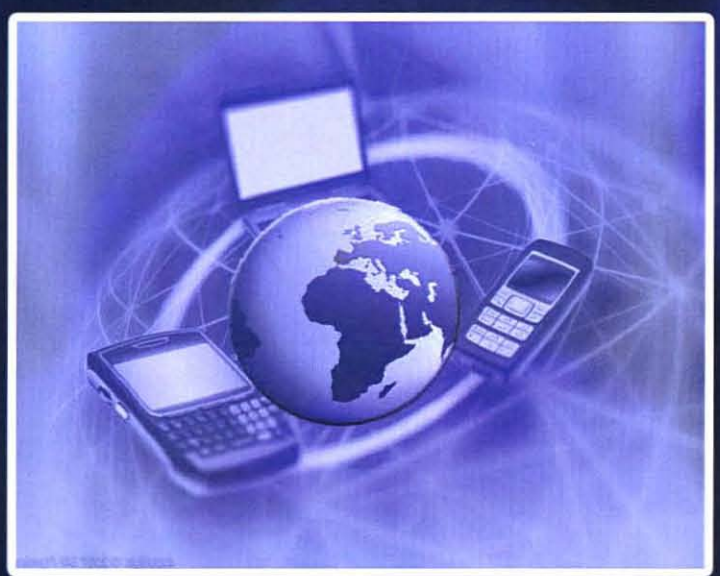
Research Issues in Wireless

Communications and Networking

Farhat Anwar
Wajdi Al-Khateeb



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CHAPTER 5

ENHANCED MULTICAST ROUTING PROTOCOL FOR WIRELESS MESH NETWORKS (WMN)

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5.1 INTRODUCTION

The Wireless mesh networks (WMNs) are dynamically self-organizing, self-configuring and self-healing, with the nodes in the network automatically establishing an ad hoc network and preserving the mesh connectivity [1]. These types of networks are permanent or semi-permanent networks. WMNs are comprised of two types of nodes: mesh routers and mesh clients. Along with the routing capability for gateway/bridge functions as in a conventional wireless router, a mesh router contains additional routing information to support mesh networking. Generally, mesh routers have minimal mobility and form the mesh backbone for mesh clients. On the other hand, mesh clients also have necessary functions for networking, and thus, can work as a router. However, gateway/bridge functionalities do not exist in these nodes. Therefore, these nodes can not be used to connect to the Internet or other networks.

In this research an enhancement of MAODV routing protocol is proposed for multicasting in wireless mesh networks. MAODV routing protocol is preferred after a comparative study between three prominent multicast routing protocols over wireless mesh environments, they are: On Demand Multicast Routing Protocol (ODMRP), MAODV and Multicast Open Shortest Path First (MOSPF). From the investigation, it is discovered that proactive (e.g. MOSPF) multicast routing protocols are not suitable for WMNs, because of their huge routing overheads. Among the other two reactive routing protocols, mesh based (ODMRP) shows better result than tree based (MAODV) routing protocol. Because of the scalability problem of ODMRP and considering other implementation issues, MAODV routing protocol is selected to be enhanced on wireless mesh environments. For achieving the goal, MAODV is enhanced using two phases. Initially, it is enhanced using an improved link repair technique. Tree-based multicast routing protocols like MAODV maintains only one path from member to the group leader. Therefore, it is extremely important to repair broken links quickly and efficiently. In this research, we proposed an improved link repair technique for MAODV routing protocol. We investigate and identify that the shortest path from the group leader to the nodes downstream to the node which initiates link breakage is not ensured after link repair in original MAODV. The proposed technique ensures optimum path from all the nodes to the group leader. Secondly, MAODV is further enhanced by integrating multiple performance metrics. Since WMNs is a permanent or semi-permanent network, a reliable path form source to destination is one of the key issues for WMNs. The proposed technique helps to find a reliable path with loop free routing and avoids highly loaded and lossy links from member nodes to group leader of the multicast group. Simulation results demonstrate that proposed enhanced MAODV protocol outperforms traditional MAODV protocol over wireless mesh environments.

5.2 PROPOSED ENHANCEMENT

This section illustrates only the link repair technique of MAODV. A link breakage is determined by the nodes in the same way as described in [2]. Branches of the multicast tree become invalid if a broken link results in an infinite metric being associated with the next hop