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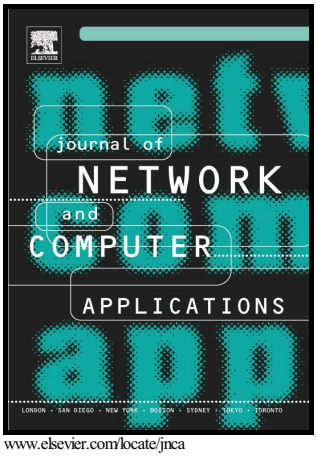

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Abstract

Network stability is a key performance metric in supporting real time communication over wireless networks. Because of high bandwidth demand and dynamic traffic variation, several paths in Wireless Mesh Networks (WMNs) are expected to be unstable. High levels of network instability can lead to interferences, packet losses and high delays.

In this paper, we address the stability problem of WMNs. Instability in these networks is caused mainly by link quality fluctuations and frequent route flapping. First, we present the key factors that may cause network instability. Then, we propose a new technique, called Node Stability-based Routing (NSR), using the entropy function to define a node stability and a probability function to select an appropriate gateway. Simulation results show that NSR can significantly improve the overall network performance compared to techniques using interference and channel switching (MIC), Expected Transmission count (ETX) or load at gateways as a routing metric, Reinforcement learning-based best path to best gateway (RLBDR), and nearest gateway (i.e., shortest path to gateway).

Keywords

Multi-channel, Routing, Wireless Mesh Networks, Network Stability

1. INTRODUCTION

In the last several years, wireless communication has emerged as promising technology for next-generation networks. Among those networks, Wireless Mesh Networks (WMNs) [1] have become quite popular allowing communication to the Internet, anytime and anywhere. WMNs have the potential to eliminate cables and thus dramatically reduce installation and maintenance costs.

A WMN can be seen as a multi-hop Mobile Ad-hoc Network (MANET) with extended connectivity; the key difference is that WMNs are characterized by a relatively static architecture and low mobility. WMNs combine wired and wireless networks with wireless Mesh Routers (MRs) as backbone and mobile stations as users. The role of MRs is to relay information from one MR to another via multi-hop communications. Usually, MRs send traffic to a gateway (GW) that connects nodes to the Internet. In the case of a WMN with a single gateway, the gateway selection problem becomes simple;