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Routing Improvement in Wireless Mesh Networks

M. A. Shabad, S. S. Apte

***Abstract*—A wireless mesh network (WMN) has emerged as a wireless backbone for Internet access for next-generation wireless network. In Mesh Network several applications like audio/video conference, vehicular network encourage, require the support of multicast communication with quality-of-service (QoS) guarantee.**

In multihop Wireless Mesh Network there is frequent link failure caused by various reasons as channel interference, dynamic obstacles, demand of different bandwidths. Because of these link failures the throughput of wireless mesh network severely decreases which is expensive and manual management is required. In this paper we propose a system which will recover from failure links. Channel and radio diversities can be used to generate the new configuration.

***Index Terms*—Wireless Mesh Network, Self-Reconfiguration, multi-radio, network-planning.**

I. INTRODUCTION

Wireless mesh networks (WMNs) are being developed actively and deployed widely for a variety of applications, such as public safety, environment monitoring, and city-wide wireless Internet services [6]–[9]. In WMNs, nodes are comprised of mesh routers and mesh clients. Each node operates not only as a host but also as a router, forwarding packets on behalf of other nodes that may not be within direct wireless transmission range of their destinations. These features bring many advantages to WMNs such as low up-front cost, easy network maintenance, robustness, and reliable service coverage.

The architecture is shown in Fig. 3, where dash and solid lines indicate wireless and wired links, respectively. This type of WMNs includes mesh routers forming an infrastructure for clients that connect to them. The Mesh Network infrastructure/ backbone can be built using various types of radio technologies, in addition to the mostly used IEEE 802.11 technologies. With gateway functionality, mesh routers can be connected to the Internet. Conventional clients with Ethernet interface can be connected to mesh routers via Ethernet links. For conventional clients with the same radio technologies as mesh routers, they can directly communicate with mesh routers. If different radio technologies are used, clients must communicate with the base stations that have Ethernet connections to mesh routers. Infrastructure/Backbone WMNs are the most commonly used type. For example, community and neighborhood networks can be built using infrastructure meshing.

The mesh routers are placed on the roof of houses in a neighborhood, which serve as access points for users inside the homes and along the roads. Typically, two types of radios are used in the routers, i.e., for backbone communication and for user communication, respectively. The mesh backbone communication can be established using long-range communication techniques including directional antennas.

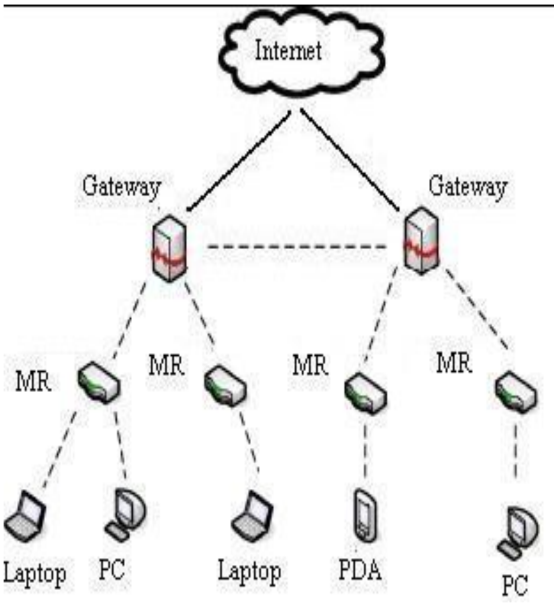

Figure1.System architecture

They have also been evolving in various forms (e.g., using multi-radio/channel systems [6] – [9]) to meet the increasing capacity demands by the above mentioned and other emerging applications. However, due to heterogeneous and fluctuating wireless link conditions [10] – [13], preserving the required performance of such WMNs is still a challenging problem. For example, some links of a WMN may experience significant channel interference from other co-existing wireless networks. Some parts of networks might not be able to meet increasing bandwidth demands from new mobile users and applications.

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***** Correspondence Author (s)
M.A.Shabad, Computer Science and Engineering department, Solapur University/ Walchand Institute of Technology / Solapur-413003, Maharashtra, India.
S.S.Apte, Computer Science and Engineering department, Solapur University/ Walchand Institute of Technology / Solapur-413003, Maharashtra, India.

Links in a certain area (e.g., a hospital or police station) might not be able to use some frequency channels because of spectrum etiquette or regulation [13].

II. LITERATURE REVIEW

Wireless networks experience many challenges that are not present with wired networks. Adverse environmental conditions add to the challenges that these networks face; challenges include the weather, temperature, humidity, and surrounding materials, such as materials known to cause interference (lead, steel, rebar, and concrete) [2, 3].

As explained by the Xu-Zhen [4] the issues of QoS multicast routing in wireless mesh networks. Xu-Zhen has represented TDMA-based timeslot allocation, and presents an effective heuristic algorithm for calculating bandwidth of a multicast tree.

In the previous research of Kyu-Han Kim [5] the EAR (Efficient and Accurate link-quality monitor) has been used, the EAR maximizes the measurement accuracy, and its opportunistic use of the unicast application traffic present in the network minimizes the measurement overhead. EAR effectively recognize the existence of wireless link asymmetry by measuring the quality of each link in both directions of the link, thus improving the utilization of network capacity.

A. *Existing System*

First, resource-allocation algorithms can provide (theoretical) guidelines for initial network resource planning. However, even though their approach provides a comprehensive and optimal network configuration plan, they often require “global” configuration changes, which are undesirable in case of frequent local link failures. Next, a greedy channel-assignment algorithm can reduce the requirement of network changes by changing settings of only the faulty link(s). However, this greedy change might not be able to realize full improvements, which can only be achieved by considering configurations of neighboring mesh routers in addition to the faulty link(s). Third, fault-tolerant routing protocols, such as local re-routing or multi-path routing, can be adopted to use network-level path diversity for avoiding the faulty links. However, they rely on detour paths or redundant transmissions, which may require more network resources than link-level network reconfiguration.

B. *Disadvantages*

- Cannot avoid propagation of QoS failures to neighboring links
- Unsuitable for dynamic network reconfiguration

III. METHODOLOGY

A. *Algorithm*

I Autonomous Network Reconfiguration System planning algorithm [1]:

This algorithm describes the operation of Autonomous Network Reconfiguration System (ARS).

1) ARS in every mesh node monitors the quality of its outgoing wireless links at every time (e.g., 10 sec) and reports the results to a gateway via a management message.
2) Once it detects a link failure(s), ARS in the detector node(s) triggers the formation of a group among local mesh routers that use a faulty channel, and one of the group members is elected as a leader using the well-known bully algorithm, for coordinating the reconfiguration.
3) The leader node sends planning request message to a gateway. Then, the gateway synchronizes the planning requests if there are multiples requests—and generates a reconfiguration plan for the request.
4) Gateway sends a reconfiguration plan to the leader node and the group members.
5) All nodes in the group execute the corresponding configuration changes, if any, and resolve the group. We assume that during the formation and reconfiguration, all messages are reliably delivered via a routing protocol and per-hop retransmission timer.

B. *Proposed System*

To overcome the above limitations, we propose an Autonomous Network Reconfiguration System (ARS) that allows a multi-radio WMN to autonomously reconfigure its local network settings—channel, radio, and route assignment—for simulation to recover from link failures [11]. In its core, ARS is equipped with a reconfiguration planning algorithm that identifies local configuration changes for the recovery, while minimizing changes of healthy network settings. Briefly, ARS first searches for feasible local configuration changes available around a faulty area, based on current channel and radio associations. Then, by imposing current network settings as constraints, ARS identifies reconfiguration plans that require the minimum number of changes for the healthy network settings. It detects a long-term (lasting for weeks or months) failures, network-wide planning algorithms [11]–[13] can be used. Note that hardware failures (e.g., node crashes) or broadband-channel failures (e.g., jamming) are beyond the scope of this project.

C. *Advantages*

- Throughput improvement
- Public safety, environment monitoring and city-wide wireless Internet services [6]–[8].
- Avoid propagation of QoS failures to neighboring links (or ‘ripple effects’).

IV. CONCLUSION

In Wireless Mesh Networks there is always frequent link failure. Here in this paper we propose an Autonomous Network Reconfiguration System (ARS) that allows a multi-radio WMN to autonomously configure its local network settings and improve the network throughput.

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Muzaffar A. Rahim Shabad is the Post Graduation student perusing M.E in computer science and engineering from Walchand Institute of Technology Solapur. He received Bachelor of Engineering degree from College of Engineering Pandharpur affiliated to Kolhapur University in 2009. His research interests lie in the area of Wireless Mesh Networks, Mobile Ad-hoc Networks and network security and specifically focus on denial-of-service characterization, detection and defense.

Dr. Sulbha S. Apte. is the Professor and Head of Department in Computer Science and engineering at Walchand Institute of Technology, Solapur. She received her B.E degree from Pune University, Pune and M.E. from Shivaji University, Kolhapur. She received the Ph. D. degree from S.R.T.M. Nanded, Maharashtra, India. Book published: Digital Systems and Microprocessor Fundamentals published by Jaico Publishing House, Bombay in 1993. Her name included in World ‘Who’s who’ by Marquis, US, also her name included in ‘The Directory of Computer Professionals’ and she acquired a Session Chair at ICINT: International Conference on Information & Network Technology, Shanghai, China (23 June 2010). She is the Membership of Reputed Bodies:
Life Member - ISTE (No. LM2349), Fellow of Institute of Engineers (No. F-114920-9).

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