Chapter 8

Recent Trends in Channel Assignment Techniques in Wireless Mesh Networks

D. Jasmine David
Karunya Institute of Technology and Sciences, India

Jegathesan V.
Karunya Institute of Technology and Sciences, India

T. Jemima Jebaseeli
Karunya Institute of Technology and Sciences, India

Anand Babu Ambrose
Independent Researcher, India

Justin David D.
James College of Engineering and Technology, India

ABSTRACT

Wireless mesh networks have numerous advantages in terms of connectivity as well as reliability. Traditionally, the nodes in wireless mesh networks are equipped with a single radio, but the limitations are lower throughput and limited use of the available wireless channel. To overcome this, the recent advances in wireless mesh networks are based on a multi-channel multi-radio approach. Channel assignment is a technique that selects the best channel for a node or to the entire network just to increase the network capacity. To maximize the throughput and the capacity of the network, multiple channels with multiple radios were introduced in these networks. In this work, algorithms are developed to improve throughput, minimize delay, reduce average energy consumption, and increase the residual energy for multi-radio multi-channel wireless mesh networks.

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INTRODUCTION

Wireless Mesh Network (WMN) is a fundamental network procedure of the wireless networks. The wireless mesh network is transpired as a capable concept to gather challenges in the subsequent generation networks provided with flexible, adaptive, and self-configurable architecture with low cost. WMN are multi-hop networks and it attracted lots of interest recently. Three different types of architecture in WMN are given by Akyildiz et al. (2005). They are infrastructure or backbone WMN, client WMN, hybrid WMN. WMN enables rapid, flexible and robust network configuration and coverage, without the expensive cabling infrastructure. The characteristics of WMN are self-organizing, self-healing, and self-configuring for high reliability. The capability of WMN can be influenced by issues like the architecture of the network, topology, flow pattern, node concentration, number of channels per node, communication power intensity and mobility of a node. Factors such as inadequacy of protocol, interference from external sources sharing spectrum, and the insufficiency of Electro-Magnetic (EM) spectrum reduces the capacity of single radio WMN. The elements in WMN are mesh client, mesh router or Access Point (AP) to forward the traffic in network, and gateways connected to the Internet. Generally, Mesh routers are assumed as immobile and they are endowed with one or more than one wireless interface. Clients can be either mobile or immobile. They are linked to the network via routers.

WMN is a modern technology that provides better quality service to users. In wireless internet, most of the nodes are either static or fewer mobility nodes. The nodes automatically create ad hoc networks and maintain their connectivity due their self-organized nature. Due to this reliability is improved and the coverage area is increased and the equipment cost is reduced. Divyansh Puri et al. (2019) introduced the machine learning techniques for WSNs at a very low cost to increase the life span of Wireless Sensor Networks. The competency of the network owing to interference from neighbouring nodes in the network can be affected by this configuration. The challenging approach to improve the capacity of WMN is furnishing all nodes with several radios so that the spectrum can be utilized efficiently and actual available bandwidth in the network can be improved. WMN has grown with time to manage with the user anxieties such as data rate, scalability, reachability, and mobility of the user.

Interference is the main factor that directly impacts the network capacity. A protocol called Priority based Interference Aware Channel Assignment with Bandwidth Reservation is proposed to minimize interference. Though interference is minimized in this algorithm, the performance is degraded due to congestion. To improve the performance of the network Distributed Optimal Congestion Control and Channel Assignment algorithm is proposed. To improve the performance, Traffic Aware Channel Assignment with Node Stability is proposed. To provide secure communication Efficient Key Establishment Protocol is devised. This algorithm automatically removes the misbehaving node in the network and the information is notified to the neighbour nodes. From the comparative study of the performance of the proposed algorithms, it is proven that the performance of traffic aware channel assignment algorithms with node stability is good when compared with the other two modules. Therefore, from all the performance metrics investigated, TACA-NS is identified as the most attractive scheme for channel assignment in wireless mesh networks among the three proposed schemes.

The content of the paper is organized as follows: section 2 is about the literature survey, section 3 is about the design issues in channel assignment, section 4 is about the comparison of channel assignment methods, section 5 is about the priority based interference aware channel assignment with bandwidth reservation, section 6 is about the congestion aware channel assignment, section 7 is about the traffic
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