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Towards Throughput Optimization of Wireless Mesh Networks in Disaster Areas

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***Abstract*—Wireless mesh networks (WMNs) have received increasing attention in recent years, due to their attractive advantages, like easy network deployment, stable topology, robustness, and reliable coverage. In disaster area, they allow us to quickly recover network access services even if the existing network have been seriously destroyed by terrible disaster. However, one of the most important challenge in disaster recovery is to optimize the throughput to ensure high network performance. In this paper, our research is towards the problem of throughput optimization in wireless mesh networks. We take into account the gateway selection and channel assignment that can efficiently relieve potential congestion, alleviate the interference of close-by transmissions, and maximize the throughput in wireless mesh networks.**

I. Introduction

Wireless mesh networks (WMNs) are a quickly emerging technology for last mile broadband Internet access in recent years [1]. They are very suitable for disaster recovery. For example, recent events like the 3-11 earthquake in Japan, which destroyed a great number of wireless base stations, unfortunately demonstrated that the remaining functional parts of the network were unable to provide adequate services. WMNs can first respond communications after the disaster occurs. Throughput is one of the most important criteria to evaluate the network performance. Our research is focusing on the problem of optimizing the throughput of the wireless mesh network.

II. Infrastructure

Fig. 1 shows an example of WMN infrastructure deployed by considering an actual disaster area. Here, we divided the network into three hierarchies. A base station is located at the center of the wireless mesh network as the top hierarchy that can assign the wireless mesh routers as the gateways, and establish a connection with each of them by point-to-point with 25 GHz. The middle hierarchy comprises of wireless mesh routers, which make up the backbone network with 802.11a 5 GHz. The bottom hierarchy consists of mesh clients that are deployed at the edge to communicate with the mesh routers by 802.11b with 2.4 GHz.

III. Research Objective

In our research, we would like to achieve the objective of throughput optimization to guarantee the network performance in disaster areas. To solve this problem, efficient gateway selection and channel assignment are essential for throughput optimization in wireless mesh networks [2]. We mathematically analyze how to select the optimal node as the gateway with taking into account the range of candidates and formulating the throughput for each candidate gateways. We also try to propose a channel assignment scheme to optimize the network throughput with avoiding potential congestion on the mesh routers to the gateways and alleviating the interference of close-by transmissions.

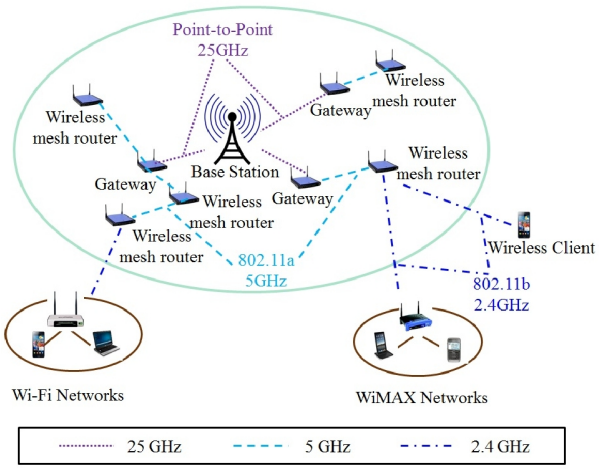

Fig. 1. An example of a wireless mesh network infrastructure.

IV. Conclusion

Our goal is to solve the issue of throughput optimization for wireless mesh networks in disaster areas. We aim to achieve network throughput maximization by proposing a novel gateway selection algorithm and channel assignment method with efficiently relieving the congestion and interference.

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