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授与した学位	博　士
専攻分野の名称	工　学
学位授与番号	博甲第４２２１号
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学位授与の要件	自然科学研究科　産業創成工学専攻 （学位規則第５条第１項該当）
学位論文の題目	A Study of Access Point Allocation and Channel Assignment for Dependable Wireless Mesh Network （高信頼メッシュネットワークのためのアクセスポイント配置とチャネル割当に関する研究）
論文審査委員	教授　舩曳　信生　　教授　森川　良孝　　教授　秦　　正治

学位論文内容の要旨

In this thesis, first, we propose the algorithms for the access point (AP) allocation problem and the dynamic channel assignment problem for dependable wireless mesh networks. We start this thesis by giving an overview about the wireless Internet-access mesh networks and the adopted network model. Then, in Chapter 3, we formulate the AP allocation problem for the dependable WIMNET to endure link/AP failures, and present its two-stage heuristic algorithm composed of the initial AP allocation as the greedy stage, and the AP allocation optimization with the association host optimization as the improvement stage. Our algorithm finds the AP allocation where the connectivity between the GW and the hosts are maintained, even if one link/AP is failed. The effectiveness of this approach is verified through network simulations using the WIMNET simulator. In simulation results, the dependability is actually realized with a small number of additional APs and the network performance is not degraded for one link or one AP fault. After that, in Chapter 4, we formulate the route availability (RA) index to estimate the certainty of connections between hosts and the Internet gateway under some probabilities. The effectiveness of our proposal is verified through simulations in three network instances. In chapter 5, we formulate the dynamic channel assignment (DCA) problem and a DCA technique through modifications of our existing study for the fixed channel assignment (FCA) problem. We newly define a decision function for the channel reassignment. Our technique is divided into two stages, the initial stage and the dynamic stage. The significant performance improvement is observed by applying our DCA technique over two network instances. In Chapter 6, we survey secure multi-hop routing protocols to increase the availability and survivability of the wireless mesh network. This chapter covers relevant security goals for WIMNET and its secure routing. Then, secure routing objectives of WIMNET are summarized, and the possible attacks are illustrated. Finally, we conclude this thesis with some research proposals and open issues for our future studies.

論文審査結果の要旨

The applicant studied two important optimization problems to realize dependable wireless mesh networks, namely the dependable access point allocation problem and the dynamic channel assignment problem.

First, she formulated the dependable access point (AP) allocation problem to endure link/AP failure of the network, and presented its two-stage heuristic algorithm that is composed of the initial AP allocation (greedy stage) and the AP allocation optimization with the association host optimization (improvement stage). The algorithm finds the AP allocation where the connectivity between the Internet gateway and the hosts are maintained, even if one link/AP is failed. The simulation results show that the dependability is realized with a small number of additional APs and the network performance is not degraded even for one link or one AP fault.

Then, she introduced the route availability (RA) index to estimate the certainty of connections between hosts and the Internet gateway under some probabilities for the dependable AP allocation problem. The simulation results verify the validity of the proposed RA index.

Finally, for the dynamic channel assignment (DCA), she modified an existing fixed channel assignment (FCA) by introducing a newly decision function for the channel reassignment. The simulation results show that the significant performance improvement is observed by applying the DCA technique over two network instances.

From the overall evaluation of the thesis, the applicant has satisfied the qualification condition for the doctor degree in Engineering from Graduate School of Natural Science and Technology at Okayama University.