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授与した学位	博士
専攻分野の名称	エー学
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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
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学位論文の題目	A Study of Active Access-Point Configuration Algorithm for Dual IEEE 802.11n and 11ac Interfaces in Wireless Local-Area Network System (無線 LAN システムにおける複式の IEEE 802.11n・11ac インターフェースのための動作アクセスポイント構成アルゴリズムの研究)
論文審査委員	教授 舩曵 信生 教授 田野 哲 教授 野上 保之
学位論文内容の要旨	

In this thesis, the study of the active AP configuration algorithm for the IEEE 802.11n/ac wireless local-area network (WLAN) with dual network interfaces of access points (APs) is presented.

First, I survey the background technologies of IEEE 802.11 wireless network technologies related to this study, including the IEEE 802.11 WLAN, the IEEE 802.11n and 11ac protocols, and the Linux tools for wireless networking. Second, I review our previous studies related to this thesis, including the elastic WLAN system, the throughput estimation model, the parameter optimization tool, and the active AP configuration algorithm for single network interfaces of APs. Third, I present the experimental observations for interface selection for the dual interface. Fourth, I propose the active AP configuration algorithm for dual interfaces at the same AP in WLAN. This algorithm selects the associated AP and the network interface to each host, using the throughput estimation models for 11ac and 11n. Moreover, the throughput reduction factor is incorporated into the throughput estimation model to improve the estimation accuracy when multiple hosts are associated with the same AP. The algorithm can greatly enhance the network performance while reducing the number of active APs in the network for smaller power consumptions and less interferences. The effectiveness of the proposed algorithm is confirmed through simulations using the WIMNET simulator. Finally, I implement the proposal on the elastic WLAN system testbed using Raspberry Pi and Linux PCs. At first, I evaluated the proposal when APs are operating under non-channel bonding (non-CB). Due to the wide channel width, the channel bonding (CB) channels can provide higher throughputs, where two adjacent channels are combined into one channel. Therefore, secondly, I evaluated the proposal when the APs are operating under CB. The experimental results confirmed the effectiveness of the proposed algorithm.

This thesis is organized as follows: Chapter 1 introduces the background, motivation, and the contributions of the study in this thesis. Chapter 2 reviews IEEE 802.11 wireless network technologies related to this thesis, including features of the IEEE 802.11n and 11ac protocols as well as software tools for the Linux operating system. Chapter 3 reviews our previous related studies. Chapter 4 describes the experimental observations for interface selection for the dual interface at the AP. Chapter 5 presents the proposal of active AP configuration algorithm for dual interface. Chapter 6 presents the implementation of the active AP configuration algorithm for dual interfaces on the testbed system. Chapter 7 describes the evaluations of the proposals. Chapter 8 reviews relevant works in literature. Finally, Chapter 9 concludes this thesis with some future works.

論文審査結果の要旨

This thesis presented the study of the active AP configuration algorithm for the IEEE 802.11n/ac wireless local-area network (WLAN) with dual network interfaces of access points (APs).

First, he surveyed the background technologies of IEEE 802.11 wireless network technologies related to this study, including the IEEE 802.11 WLAN, the IEEE 802.11n and 11ac protocols, and the Linux tools for wireless networking. Second, he reviewed our previous studies related to this thesis, including the elastic WLAN system, the throughput estimation model, the parameter optimization tool, and the active AP configuration algorithm for single network interfaces of APs. Third, he presented the experimental observations for interface selection for the dual interface. Fourth, he proposed the active AP configuration algorithm for dual interfaces at the same AP in WLAN. It selects the associated AP and the network interface to each host, using the throughput estimation model. The algorithm can greatly enhance the network performance while reducing the number of active APs in the network for smaller power consumptions and less interferences. The effectiveness of the proposal on the elastic WLAN system testbed using Raspberry Pi and Linux PCs. The experimental results confirmed the effectiveness of the proposed algorithm.

The applicant has published two journal papers and three domestic conference papers to present the contributions.

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