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Providing security vertical handoff in SARAH for heterogeneous networks

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ABSTRACT

Vertical handoff is one of the most important issues in the heterogeneous networks. While Lee et al. introduced a selective advance reservations and resource-aware handoff direction (SARAH) mechanism in order to provide a fast and efficient handoff with combination of layer 2 (L2) and layer 3 (L3) communications, there was a drawback that there was no consideration of handoff between heterogeneous network. In this paper, we improve the mechanism by providing security functions such as the neighbor-mapping server that binds IP address and MAC address with security support. At first, we discuss security issues in SARAH and proposed enhanced protocol. Finally, we show simple implementation results of our design in order to verify the practical aspects of our design.

1. Introduction

Wireless communication technologies are becoming common and deployed in various areas, and recent mobile phones enable multimedia-streaming services, such as music and movies. In such environment, seamless handoff is one of the important issues for such environments (Liao et al., 2010). However, there could be a dead spot that communication is unavailable due to the missing deployment of access point. For supporting seamless communication avoiding dead spot, using other network from different network service providers or different networks that have different network coverage and form a hierarchical overlay network. A vertical handoff is occurred when moving between these different communication systems. When a mobile node is receiving the movie from a home agent to a foreign agent, the mobile node wants the seamless connection during roaming. Thus many researches such as Huang and Cai (2005), Kim and Copeland (2003), Bernaschi et al. (2004), and Kang et al. (2005) focus on the vertical handoff for the seamless communication in the heterogeneous networks.

Lee et al. (2006) proposed a selective advance reservations based on host movement detection and resource-aware handoff (SARAH) that provides fast roaming service. They provide fast handoff from the combination of layer 2 (L2) and above layer communications. At first, the mobile node receives a L2 beacon message from a foreign agent (FA) and passes the message to the home agent (HA). L2 beacon message contains MAC address of FA. HA search the stored neighbor-mapping table (NMT) to find the IP address matching to the MAC address. After that HA builds pseudo-random path (PRP) to FA. SARAH could reduce the connection latency using both L2 and L3 communications.

However, SARAH has a drawback that it does not provide a vertical handoff in heterogeneous networks due to using NMT. Each base station (BS) needs to have the information of neighbor BS in their NMT using SARAH. When several distinct networks are deployed and provide the roaming services, it is hardly expected that the information of the entire neighbor BSs are stored in the NMT. Since the deployment of BSs fully up to the each service provider, it cannot be guaranteed that the information of new BS is stored to the NMT of neighbor BSs of other service providers.

Therefore, we propose the improved design of SARAH that provides the secure vertical handoff. We introduce a *neighbor-mapping server* that provides authentication of neighbor BSs.

The paper is organized as follows; Section 2 describes the brief of SARAH and discusses security issues on SARAH in the heterogeneous networks. Our security design is shown in Section 3. Section 5 shows the implementation result. Section 6 describes the further work and conclusion.

2. Deploying SARAH in heterogeneous network

2.1. Host movement detection in SARAH

In order to detect the neighbor base station, mobile node detects L2 beacon frames from multiple reachable BSs. SARAH assumes the underlying networks operate like IEEE 802.11.

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