Seamless Lawful Interception Architectures for Wireless Networks

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Abstract

Lawful Interception (LI) refers to a lawfully authorized process of looking into private communication under a court-issued warrant. Many countries have been drafting and enacting laws authorizing the LI procedures on packet-switched IP networks as well as traditional circuit-switched ones. As the IP mobility becomes more ubiquitous, propelled by wireless networks, it becomes an issue in the LI domain to keep track of a migrating target. However, the current LI architectures give little consideration to a seamless LI triggering, which accommodates IP mobility and vertical handover. This paper proposes three types of lawful interception architectures for heterogeneous wireless networks.

Keywords: lawful interception, IP multimedia subsystem, 3G networks, IEEE 802.16e Networks

1. Introduction

The execution of a LI is allowed only when a competent authority authorizes such an activity [1]. The European Telecommunications Standard Institute (ETSI) has set forth most of the existing standards in Europe, while the Communication Assistance for Law Enforcement (CALEA) is making progress in the U.S.A. Since wireless broadband networks for a portable Internet service such as IEEE 802.16e and 3G cellular networks-based services are growing popular in Korea, existing lawful interception technologies, which are focused on wired networks, have serious limitations for interception suspicious packet contents. Due to the handoff problem of wireless broadband networks, lawful interception cannot be completed, since a mobile unit can move to other lawful interception areas [2], [3]. In this paper, three types of architectures for lawful interception are proposed; LI architecture for the 802.16e networks, Heterogeneous Networks, and IP Multimedia Subsystem (IMS) in 3G, proposed seamless LI triggering architecture and the specific functions of the LI agents and the server. The LI agents are composed of authority delegator, mobility detection function, interception function and delivery function, which are basic components to guarantee seamless LI.

2. Proposed Lawful Interception Architectures

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2.1 Seamless LI Architecture for IEEE 802.16e Networks

On the IEEE 802.16e networks, it is easy for a target user to migrate out of the jurisdiction of the current LI agent. Such change of location poses a set of difficult problems to law enforcement agencies and LI agencies. Particularly in the context of the 802.16e networks, lawful interception is faced with the following challenges:

- Service networks and access thereto may belong to different service providers.
- When a user changes her IP addresses frequently, it becomes difficult to keep track of the original identity.

Thus, a need arises for a new automatic LI architecture in order to support seamless LI services, and we proposed a new one [3].

2.2 Seamless LI Triggering for the Heterogeneous Wireless Networks

To overcome the LI-related problems on the heterogeneous wireless access networks, we propose a seamless LI triggering architecture as shown in Fig. 1.

![Diagram of Seamless LI Architecture for Heterogeneous Networks](image)

Fig. 1. Components of Seamless LI Architecture for Heterogeneous Networks

The proposed architecture caused few packet losses at the LI agent and the server, and performed interception without much loss, and received partial information from LI agents. In case of the conventional architecture, the longer it takes to re-issue a warrant, the fewer packets are intercepted. On the other hand, our proposed seamless architecture shows constantly high performance in terms of the total number of intercepted packets [4].

2.3 Seamless LI Triggering for IP Multimedia Subsystems (IMSs) in 3G Cellular Networks

When considering the current smart phone trends (e.g. Apple’s iPhone and Samsung’s Omnia) in a wireless communication market such as South Korea, the foregoing scheme seems more promising. On 3G networks, it is easy for a target user to migrate out of the jurisdiction of the current LI agent via a roaming service. Such changes of location pose a set of difficult problems for law enforcement and LI agencies [3], [4]. Particularly in the context of 3G networks, lawful interception is faced with the following challenges:

- IMS service provider and network access provider may belong to different CSPs.
- Security measures and encryption make it hard to conduct lawful interception.

Mobility in 3G IMS can be divided into user mobility and session mobility. Both user mobility and session mobility support MIPv4 and MIPv6. We are currently working on topics such as how to intercept IMS-based traffics on heterogeneous wireless networks and how to relegate LI authority on them.

References