Chapter 10
Auditory Feedback for
Network Intrusion Detection

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ABSTRACT

Network intrusion (the unauthorized access to a computer system perpetrated by persons or a piece of software) is a major concern of network administrators. Carrying out network intrusion detection (NID) manually is a tiring, complex and time-consuming task, often overloading the visual sensory channel. To overcome this, real-time auditory alarms and auditory information provide immediate feedback, helping to identify trends or patterns of the attacks in network logs and in real-time network accesses, allowing professionals make rapid decisions, thus representing an interesting alternative to conventional NID. The purpose of this chapter is to describe literature research on the benefits and challenges of Auditory Display (the use of non-speech sound to represent meaningful information at a computer interface) applied to wireless, wired, and mobile network intrusion detection. This chapter also highlights further work on Auditory Display and multimodal interfaces to support intrusion detection in wireless mesh networks.

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INTRODUCTION

The increasing threat of cybernetic attacks in wireless and traditional networks has become one of the major concerns of network equipment designers and administrators. An intrusion is defined as an unauthorized access to a computer system that violates some security policy. One of the main problems caused by intruders is that they consume or hijack resources (e.g., bandwidth, processing power, services) and compromise vulnerable systems. Network administrators cannot always assume that a network intrusion detection system (NIDS) can discern between malicious and non-malicious traffic. Even after an intrusion is discovered, considerable time is often spent deciding on what course of action to take, or whether or not it is necessary to disconnect or shut down services, which is not always a viable option. Carrying out the intrusion detection manually is a tiring, complex and time-consuming task, often overloading visual sensory channel. To overcome this, sound parameters have been used to represent information about network attacks. Real time auditory alarms provide immediate feedback, identify and register trends or patterns of the attacks in network logs, and help professionals make rapid decisions, thus representing an interesting alternative to conventional NIDS.

This chapter highlights usefulness of auditory feedback, in conjunction with other types of sensory information regarding intrusion detection in wireless networks, as well as technological advantages and challenges of its application, are also discussed in this chapter.

The remainder of the chapter describes further trends and work on Auditory Display and multimodal interfaces to support intrusion detection in wireless mesh networks.

Section 2 (Background) describes definitions on Auditory Display, sonification and other information regarding to the application of parameters of sound to human-computer interfaces.

Section 3 (Network Intrusion Detection Systems) outlines a general description on network intrusion detection systems and its placement in a network.

Section 4 (Wireless Networks and their Challenges on Network Intrusion Detection) refers to a list and a description of intrusion vulnerabilities of wireless networks.

Section 5 (Auditory Feedback applied to Computer Networks and NIDS) looks at a literature review on visual and auditory techniques applied to NIDS. This section also includes technical aspects on the design of Auditory Display for NIDS. In it, useful auditory feedback design guidelines are explained, as well as the challenges present in auditory feedback construction.

Section 6 (Future Trends) deals with the future trends on Auditory Display applications, for example in mesh networks. In addition, the use of multimodal information for NID carrying out visual, auditory information, and integrating other sensory channels, is a promising area of research that needs to be explored.

The objective of this chapter is to describe literature research on the benefits and challenges of Auditory Display (according to Kramer (1994), the use of non-speech sound to represent meaningful information at a computer interface) applied to wireless, wired, and mobile network intrusion detection.

BACKGROUND

Auditory Display can be defined as an area of computer science that studies how non-speech sounds are designed and applied to represent meaningful information in a computer interface (Kramer, 1994). Sounds can be very effective in Human-Computer Interaction (HCI) for discriminating data patterns, identifying trends in information, mapping complex data, complementing or supplementing other sensory channels, and representing alarms, among other applications,
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