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A Novel Detection Intrusion Approach for Ubiquitous and Pervasive Environments

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Abstract

Ubiquitous system returns to making pervasive computing in everyday life, the objects of our environments become intelligent and communicate without anyone being aware of their communication processes. Ubiquitous computing adds the concept of mobility to the notion of omnipresence; therefore, it makes reference to moving intelligent objects (from mobile computing) that can communicate with other ubiquitous objects in our daily lives. These advantages expose the network to malicious and unauthorized activities. The security of these networks, targeted by attackers, is an important issue. For this, Intrusion Detection Systems (IDSs) have been widely discussed for solving networks intrusions problems. Several solutions have been adopted to overcome these kinds of intrusion. These IDS solutions are insufficient and/or incomplete because they are based on centralized devices, and did not consider the heterogeneity and mobility nature of these devices, which is the case for ubiquitous environments. We developed a new IDS approach to support security problems in ubiquitous network. The approach proposed is based on nodes authentication abilities for preventing inside and outside ubiquitous network intrusion.

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1. Introduction

Ubiquitous computing is applicable to all areas and has the capacity to deal with context sensitivity, invisibility and mobility. One of the characteristics of ubiquitous computing systems is their availability at all times, which makes them easily vulnerable to attacks¹.

Security is one of the most important challenges for ubiquitous computing. Security in ubiquitous environments is very harsh due to the use of wireless communications and low power consumption devices (equipment)¹.

Individuals and organizations express the need to protect their property and/or system against thefts or protect their privacy (confidentiality) against intrusions (attacks)². An intrusion is an abuse by hackers in order to obtain information, services or other forms of profits. Attacks against information systems may come from outside or inside sources. For technical and economic reasons, it is not possible to find and fix all these defects (abuses/ attacks). Many tools and resources are available today for intrusion detection problems either for hardware (firewalls) or software such as audits systems^{2,3}. However, these solutions are limited because they are based on monitoring intrusions or attacks. As against, a new technique based on monitoring intruders or attackers themselves is developed to better protect and manage the system supported by IDS mechanisms⁴.

Intrusion Detection System (IDS) provide the ability to quickly implement new security policies to detect and respond as soon as possible to attacks occurring in the network. They may be based on logs or registration systems audits, which are managed by a system controller or an administrator^{5,6}.

To deal with ubiquitous computing vulnerabilities, security and privacy safeguards in ubiquitous computing environments, we propose a new IDS for such environments.

In this article, we propose an Intrusion Detection System that overcomes network intrusions problems in ubiquitous computing. Our goal is to explore the possibilities to detect intrusions (attacks) occurring in cloud computing.

The rest of the paper is organized as follows: Section 2 outlines some background on ubiquitous system and intrusion detection system, and presents related work on intrusion detection in ubiquitous environments. In section 3, we expose open research problems in the subject. Section 4 details our proposal. Section 5 we show some experimental results and evaluate our solution. A conclusion and perspectives are presented in section 6.

2. Background and related work

2.1. Ubiquitous computing

Ubiquitous computing is a set of technologies (hardware and/or software) present in the (our) daily lives and activities¹.

In the Ubiquitous computing era, the user is taken into account by its physical context in order to have mobile access to data and processing tools, offer conditions for best service. In ubiquitous computing environment, the user may have several devices. These devices need to communicate and interact with their environments in order to be able to cooperate and to access remote information. The users then can easily, quickly and effortlessly exchange data, regardless of their geographies position. This ubiquity of information access has a strong impact on society, change work habits, and privacy.

2.2. Intrusion Detection System

The security mechanisms such as Intrusion Detection Systems (IDS), can be implemented in order to detect any attempted of security violation. Intrusions Detection Systems is a surveillance, monitoring, detection and correction, tool and even in some cases a preventive tool⁷.

Intrusion is any set of actions to compromise the confidentiality, data integrity and availability of services or resources. Intrusion detection is the ability for a computer system to automatically detect, based on events relating to security, a security breaches³.

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