

# A Mobile Agent Approach for IDS in Mobile Ad Hoc Network

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## Abstract:

Mobile Ad Hoc Networks are a group of wireless computers, forming a communication network, that have no predetermined structure. It's highly vulnerable to attacks due to the open medium dynamically changing network topology, co-operative algorithm, lack of centralized. The fact that security is a critical problem. This work describes the proposal for an Intrusion Detection System architecture that uses multi-agent system. It's an effective choice for many research and application areas due to several reasons, including improvements in latency, reducing network load and threat assessment. To respect the main primitives of a multi-agent system, we used the MadKit platform for implementation.

## Keywords

*MANET, Multi-Agent System, IDS, MadKit, mobile agent.*

## 1. Introduction

Security in Mobile Ad-Hoc Network (MANET) is the most important concern for the basic functionality of network. Availability of network services, confidentiality and integrity of the data can be achieved by assuring that security issues have been met. MANET often suffer from security attacks because of its features like open medium, changing its topology dynamically, lack of central monitoring and management, cooperative algorithms and no clear defense mechanism.[1] Because the Mobile Ad Hoc Network has characteristics of wireless connected signal channel, autonomous mobile node, network topology in

dynamic change and weak security authentication mechanism, in addition, it is easier to suffer various security threats and attacks form passive eaves dropping to active impersonation, message playback, message falsification, and denial of service, etc. [2] Therefore, the Intrusion Detection System (IDS) comes into the second firewall of network security solution. Intrusion detection is one of the key techniques behind protecting a network against intruders. An intrusion detection system tries to detect and alert on attempted intrusions into a system or network, where an intrusion is considered to be any unauthorized or unwanted activity on that system or network. An IDS is a defense system that detects hostile activities in a network and then tries to possibly prevent such activities that may compromise system security. The low detecting speed and high false positive rate of traditional intrusion detection system, the Intelligent and mobile characteristics of the agent are principals reasons to propose a new architecture of intrusion detection system based on mobile agent.

## 2. Related work

This section explores the work of researchers in the fields of mobile agent for intrusion detection system and highlighted the areas of potential scope for research : DIDMA performs decentralized data analysis using mobile agents that makes it more scalable. DIDMA uses platform independent components in contrary to platform specific security managers of CSM. The Autonomous Agents for Intrusion Detection (AAFID) project [3] makes use of multiple layers of agents organized in a hierarchical structure with

each layer performing a set of intrusion detection tasks. A proposed efficient anomaly intrusion detection system in Ad-hoc by mobile agents[4] which uses the data mining algorithm to detect the attacks exploited by the intruders. Mobile agent based intrusion detection system for MANET [5] proposed by yinan Li which uses the clustering and joint detection technique to identify the intruders. Literature review [6,7,8,9] brought up the fact that although many attempts have been made to provide security in MASs (Mobile Agent Systems) communication and establishing trust among the agents, many rigid technologies developed to support security; but as the wheel of the technology spins every time, so the area always needs further refined researches in every approach we take.

### 3. Survey of Mobile Agent and IDS

#### 3.1 Mobile Agent

Mobile Agents are the programs that move between computers or nodes of network, autonomously trying to fulfill some specific goals given by users. Agents are different from other applications in that they are goal-oriented: they represent users and act on their behalf to achieve some set goals in an autonomous manner – i.e. they control themselves, as in the decision where and when they will move to the next computer or node. Mobile Agents do provide a viable means of performing network security assessment and analysis efficiently and effectively. Mobile agent neither brings new method to detect for IDS nor increases detection speed for some kind of attracting. Nevertheless, it improves the design, construct, and execute of IDS obviously. Mobile agents offer several potential advantages that may overcome limitations that exist in static, centralized components :

##### **Reducing Network Load:**

Instead of sending huge amount of data to the data processing unit, it might be simpler to move the processing algorithm (i.e. agent) to the data.

##### **Overcoming Network Latency:**

When agents operate directly on the host where an action has to be initiated, they can respond faster than the tree based systems that have to

communicate with a central coordinator located elsewhere on the network.

##### **Autonomous Execution :**

When portions of the tree based systems get destroyed or separated, it is important for the other components to remain functional. Independent mobile agents can still act and do useful work when their creating platform is unreachable which increases the fault-tolerance of the overall system.

##### **Heterogeneous Environment:**

The agent platform allows agents to travel in a heterogeneous environment and inserts an OS independent layer.

##### **Dynamic Adoption:**

The mobility of the agents can be used to reconfigure the system at run-time by having special agents move to a location where an attack currently takes place to collect additional data.

##### **Scalability :**

when distributed mobile agents replace a central processing unit, the computational load is divided between different machines and the network load is reduced. This enhances scalability and additionally supports fault-resistant behavior [10].

#### 3.2 IDS

IDSs are hardware and software systems that monitor events occurred on computers and computer networks in order to analyze security problems. IDS and firewalls have become key components in ensuring the safety of network systems. Intrusions and invasions inside computer networks are called as “attacks” and these attacks threaten the security of networks by violating privacy, integrity and accessibility mechanisms. Attacks can be originated from users who login to the computer using Internet trying to gain administrator rights and other users who misuse the rights they have. IDSs automate monitoring and analyzing the attacks [11, 12, 13].

In general, the IDSs are composed of four components (sensors, analyzers, database and response units) and are responsible for activities such as monitoring the users and systems activities, auditing systems configuration, accessing data files, recognizing known attacks, identifying odd



MadKit is a scalable and modular multi-agent platform, written in the Java language. It allows the creation of SMA based on the relational model Agent, Group, Role. MadKit leverages the Object Oriented Programming: the madKit features are contained in the kernel MadKit. This core is a set of classes for the user to design a basic way of SMA simple, but also, through inheritance, to design and add new features that will be compatible with those provided base. One of the biggest advantages is that MadKit, because it defines a basic structure for the representation of an agent, of a group, of a message. It is relatively easy to communicate with agents designed by programmers different, even for different projects.

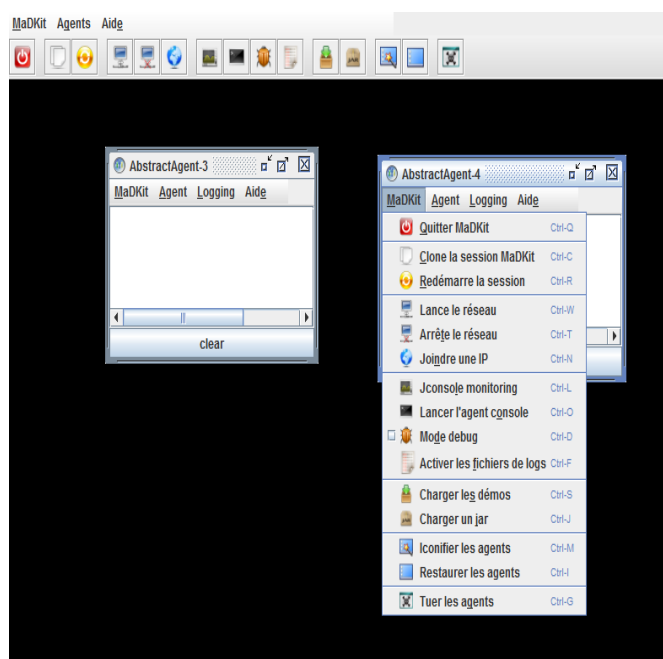


Fig2 :MadKit Console

The scenario for which our approach was tested is the game between two teams because it is considered a typical example of intrusion detection. We consider a game with two teams, on one side the intrusion detection system (IDS) and the other side the intruder. IDS seeks to flush out the attacks intruders protect the network. Furthermore, the intruder tries to reach its target and fulfill his plan. In intrusion detection, attack consists of several packages. The intruder reaches its target

when all the packets arrive at target. But, if the IDS arrives at intercepting a Many of these packages,

the attack is then flushed out. In reality the two adversaries adopt strategies at different levels and in different ways to achieve their goals.

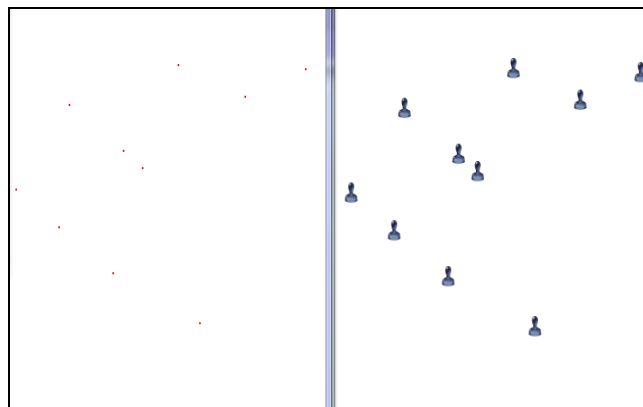


Figure3: Representation of mobile agents

## 6. Conclusion and future work

The proposed IDS exploits the benefits of employing mobile agents such as reduced ad hoc network bandwidth usage, increased scalability and flexibility, and ability to operate in heterogeneous environments. Here we are in position to say that mobile agents do provide a viable means of performing ad hoc network security analysis as well as some other complex tasks. As opportunities for future work, it could be identified: the deployment of a more complex detection, with mobile agents, using statistical anomalies detection identified by mobile agents and enabling the creation of attack signatures, the development of more complex detection ontology, with more parameters to characterize the attacks; the study of the impact of the use of the proposed architecture in ad hoc network traffic, and the implementation and testing of the architecture with a redundant and fault-tolerant main container.

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