Multi-management Schemes for MAF Platforms

Rui Pedro Lopes¹ and José Luis Oliveira²

¹Polytechnic Institute of Bragança, ESTiG, 5300 Bragança, Portugal
²University of Aveiro, DET, 3810 Aveiro, Portugal

Abstract. Due to the crescent complexity of networks and systems, network management solutions are being pushed towards more distributed and cooperative models. Several specifications promoted by the IETF DISMAN charter already allow strong distribution of management tasks. Unfortunately, they are not adequate to achieve cooperative models. According to recent research, mobile agents provide a good platform to back cooperative models but several lacks are still identified – interoperability between different platforms and SNMP integration. Based on Mobile Agent Facility specification from the OMG, we propose a MIB to better integrate mobile agent models into SNMP frameworks and a GUI tool to monitor and control mobile agents platforms.

1 Introduction

There are several different ways to look at the term mobile agents. Usually it is used to name a mobile code paradigm where processes are allowed to migrate autonomously to another host and resume execution seamlessly. However, in the distributed artificial intelligence field, the term mobile agent refers to an intelligent agent with an additional property: mobility. As such, it encompasses a lot more than simply mobile code. In the context of this paper, and according to several positions about this field [1][2], we use the term mobile agents as the former although allowing a mobile agent to become, at some point, intelligent. We also consider that code mobility in the context of mobile agents also implies state mobility. If the platform does not allow strong mobility – transparent migration of state and code – the programmer can always explicitly preserve the agent state (weak mobility) [3].

Mobile agents require a runtime platform (agent system) that provides them with the resources they need to operate. The agents’ platform is typically constructed within a single organization in a closed way, and it usually supports agents that are strictly developed for that specific platform. The absence of standards for an agent system API limits or even eliminates the possibility for interoperability between different vendors’ products. This also means that the monitoring and management operations over any kind of agent element are performed with proprietary tools through proprietary methods.
The Mobile Agent Facility (MAF) specification is the first attempt to standardize agent system actions, thus aiming to achieve interoperability between different manufacturers’ agent systems [4]. MAF is a collection of definitions and interfaces designed as simple and generic as possible to allow future development in mobile agent systems. MAF uses OMG’s IDL to declare two interfaces, which are the base to all the operations on the agent system and on the region: the MAFAgentSystem and the MAFFinder. MAF interfaces specify a common access method to mobile agent platforms. So, any MAF platform can be managed by following the same procedures with the same tools.

Concepts such as agent, place, agent system and region are the base of MAF nomenclature. A place is a logical entity where agents operate. Places can provide differentiated environments for agents depending, for instance, on agent goal, on organizational policies or on access control. The agent system (or agency for some) is the environment for several places, typically corresponding to a host. The region is more or less an organizational classifier that allows mimicking, in this environment, the domain concept of the IP-based LANs.

On the other hand, the SNMP is, so far, the framework of choice from a large number of equipment (hardware, software and technical knowledge), so any near upcoming management architecture have to deal with SNMP standards. Thus, it is natural the coexistence of mobile agent and SNMP.

Why should mobile agents be managed by SNMP? First of all, SNMP is specifically designed for management operations. Moreover, there are available several SNMP based powerful applications and quite a number of installed systems rely on them. This way it is possible to integrate both the mobile agent technology and the SNMP management architecture thus getting the advantages of both [1][5].

Management systems in general and SNMP in particular define a tool, usually called network management station, which provides the user with views of the network current and past state. With this tool, the user may be acquainted of the eventual problems and the current running condition.

The continuous introduction of technological waves in modern networks forces these applications to cope with different models, access methods or security mechanisms. We recently proposed the use of URI (Uniform Resource Identifier) schemes [6] to identify the service tools to use in a common context interface, just like in Internet browsers. The resource is specified in the address field by the URI and, according to its grammar, it calls the appropriate tool for processing and presentation [7]. This approach allows using the same tool for managing different network elements as well as using different access mechanisms. The work presented in this paper follows some previous work related to the management of mobile agents and agent systems through MAF interfaces and SNMP. This work started by defining a specific MIB to convert between SNMP commands and MAF interfaces calls [8].

This paper is structured as follows: section II describes the MAF-MIB structure and its main functionality; section III describes some usage scenarios for the SNMP-MAF association; section IV reveals the URI based mobile agent management station; the paper ends with some conclusions.