ICARIS 2012

Conference Programme

The 11th International Conference on

Artificial Immune Systems

San Domenico Palace Hotel
Taormina, Italy
August 28-31, 2012

Toward Self-Healing Architectures: A Lymphatic System Inspired Socially Attentative Multi-Agent System against Malware Propagation.

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In a world of ever-changing self-sustaining malicious infections and ever-changing, complex, highly-connected systems an effective and equally self-adaptive countermeasure is a vital tool. And like the components of the human immune system, these systems will need heterogeneous self-organisation, cooperative system management without a single-point-of-failure, collaborative decision making and trustworthy interactions to sustain homeostasis. We consider dynamic heterogeneous networks of computers and embedded systems (such as ore smelting machine control systems and their network attached systems, where malicious configuration changes could have disastrous effects) and propose a multi-agent system with a lymphatic system inspired organisational architecture. Nodal segregation, distributed state storage, collective awareness with multi-signal decision making for immunisation and apoptosis of infected and infectious nodes are invoked prior to deployment of repair mechanisms such as rebooting, initiating a virus removal procedure or reinstallation of damaged system components. We begin by addressing the problems of nodal segregation through periodic machine benchmarking, such as speed, usage and availability of devices (such as processor, memory, storage and network) and social sensing evaluation via remote request of known (run shared script) and novel tasks (run self-written script). We expect this to provide a basis for self-organisation upon which to build the self-healing architecture.

An Immune Multi-Agents System used in the Intrusion Detection System in distributed Network

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With the development growing of network technology and the information exchange, the computer networks became increasingly wide and opened. This evolution gave birth to new techniques allowing the accessibility of the networks and information systems with an aim of facilitating the transactions. Consequently, these techniques gave also birth to new forms of threats. In this article, we present the utility to use a system of intrusion detection through a presentation of these characteristics, followed by a brief history of the existing models. Using as inspiration the immune biological system, we propose a model of an artificial immune system, which is integrated in the behaviour of distributed agents on the network in order to ensure a good detection of intrusions. We also present the internal structure of the immune agents and their capacity to distinguish between self and not self. The agents are able to achieve simultaneous treatments, are able to auto-adapt to the evolution of the environment and have also the property of distributed coordination. In this approach, the immune agent model is installed on each host on the network and subnetwork, for an extensive monitoring and a simultaneous analysis of the frames.