

# Constructing Software Autonomous Agents to Computer Network Management

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## Abstract

*There are three important concepts in the computer network management area: managers, agents and managed objects. "...A manager can obtain up-to-date information on the managed objects to control them. In order to do this, it transmits management operations to the agents. An agent executes the management operations on the managed objects. It still can transmit to the manager notifications emitted by the managed objects...". These concepts were initially presented in the CMIP (Common Management Information Protocol), of OSI's Reference Model, and SMNP (Simple Network Management Protocol), of the Internet's protocols. However, these managers and agents don't possess any autonomy that is to say they don't participate in the decision-making process. A well-known specialist as the computer network administrator usually accomplishes the decision-making.*

*It is possible to find in the literature several works about the intelligent agents' approach in computer network environments. Some papers concern the assistance in information search in the Internet, and others are applied to the network management. However, it is noticed that none of the researched works deals with static or dynamic characteristics of the approached problem. The most uses production rules or feedforward neural networks when looking solutions for dynamic problems*

*This work presents a methodology to develop autonomous agents for network management. There are two kinds of agents to develop: static or dynamic agents. The first one can be implemented, using heuristics obtained from an expert or the network administrator, through production rules or feedforward neural networks. Using the network examples we can construct dynamic agents. The recurrent neural network may be*

*trained to solve a problem using some examples. Moreover, the behavior of the management must be considered, the network management may be reactive or proactive.*

*The Fault Management may be reactive in the case of impossible forecasting faults, as is the case of the action of the atmosphere (on cables and network interface boards), or when selecting the quality of pieces and equipment. These behaviors can have static or dynamic characteristics. The Performance Management should be proactive to avoid a low performance or the degradation of the service supplied to the users. The Configuration Management is usually reactive and possesses dynamic characteristics; it involves the growth of the number of equipment and users what alters the Network State. The Account Management is static and it doesn't demand a dynamic solution. Finally, Security Management can be either reactive or proactive and usually, it possesses dynamic characteristics. Starting from this analysis it is possible to define if the problem demands static or dynamic autonomous agents.*

*Another question in the agents' development tells respect the neural network complexity. Recently, Barreto (1996) proved that is more appropriate to use recurrent neural networks than feedforward ones to solve dynamic problems. The application of a static approach in the solution of dynamic problems cause two inconveniences, the first because it doesn't allow covering all the different states of a dynamic system. And the second because to cover all the states it would be necessary a great neural network, perhaps impossible of converging to a solution.*