Chapter 6
Service Provision Evolution in Self-Managed Future Internet Environments

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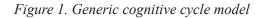*University of Athens, Greece*

ABSTRACT

Future Internet is based on the concepts of autonomicity and cognition, where each network element is able to monitor its surrounding environment, evaluate the situation, and decide the action that should be applied. In such context, the traditional service provisioning approaches necessitate a paradigm shift so as to incorporate the Cognitive Cycle. Towards this end, in this chapter, we introduce a Cognitive Service Provision framework suitable for Future Internet Networks. The proposed approach supports cognition by modeling a service as an aggregation of software components bundled together through a graph. Consequently, each service is composed by various components and is tailored to the operational context of the requestor. In order to prove the viability and applicability of the proposed approach we also introduce the enhancement of the IP Multimedia Subsystem through our Cognitive Service Provision framework. Finally, based on our work, we discuss future research directions and the link between service and network management.

FUTURE INTERNET NETWORKS

Future network systems design principles are based on high autonomy of network elements

in order to allow distributed management, fast decisions, and continuous local optimization. The Cognitive Cycle model, as it is depicted in Figure 1, is envisaged to be in the heart of Future Internet Elements and it leads to their autonomy (Kousaridas et al., 2010), (Ganek, 2003). A Future

Figure 1. Generic cognitive cycle model

Internet Element could be a network element (e.g., base station, mobile device), a network manager, or any software element that lies at the service layer.

The three distinct phases of the Generic Cognitive Cycle Model are the following:

- Monitoring process involves gathering of information about the environment and the internal state of a Future Internet Element. Moreover, the Monitoring process receives, internally or externally, feedback about the effectiveness of an execution that took place, after the last decision.
- Decision Making process includes the problem solving techniques for reconfiguration and adaptation, utilizing the developed knowledge model and situation awareness. The Decision Making supports the optimal configuration of each element, considering its hypostasis and the organization level that it belongs. Decision making mechanism identifies alternatives for

adaptation or optimization and chooses the best one, based on situation assessment, understanding of the surrounding context, and the preferences of the element. After decision making, the execution process undertakes to apply the decision that will change the behavior of the element.

- Execution process involves (self-) reconfiguration, software-component replacement or re-organization and optimization actions.

The scope of this book chapter is to discuss the challenges and describe the path for the evolution of the Future Internet services synthesis, delivery and adaptation, by exploiting the cognitive cycle paradigm. The cognitive cycle is placed at each network element that provides, consumes, or forwards one or more end-user services, and thus affects their performance and consequently users' experience. Even the software that undertakes to deliver (i.e. service provider) or consume (i.e.

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