Chapter VIII

The Adoption of Service-Oriented Architecture (SOA) in Managing Next Generation Networks (NGNs)

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ABSTRACT

Next Generation Networks (NGNs) will accommodate heterogeneous architectures that need to be managed in order to provide services with high QoS to the users. The complexity of NGNs will give new challenges to network operators and service providers. The aim of this chapter is to present the complexity and the problems in the NGN management plane and to introduce a new framework that will solve many problems that operators face today. This chapter is separated in two parts. The first part presents the management architecture for NGNs according to ITU-T M.3060 recommendation. The second part introduces the concept of the Service Oriented Architecture (SOA) for managing the Next Generation Networks.

INTRODUCTION

Over the last few years, many network operators have put into practise network upgrade plans to implement Next Generation Networks (NGNs). The desire for mobility and the rapid expansion of multimedia, digital traffic, and converged services are driving the need for networks that are packet-based, able to provide all kind of services that are available in any place, at any time, and on any device. NGNs are based on a new set of technologies that will transform the way that we communicate today, and will revolutionise the way that services will be delivered.
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in the future. In NGNs, applications and services, such as voice data and video, are separated from the underlying transport and will be organized into packets and delivered on an integrated IP network. The network architectures, services, and traffic pattern in NGNs will radically differ from existing circuit-switched and IP-based networks. Furthermore, the need for global roaming across different networks (mobile, wireless cellular networks, satellite or fixed-LAN) couple with the increasing number of users and terminals require the redesign of the existing architectures right from the infrastructure physical layer to the top business process layer.

One of the most challenging tasks for network operators and service providers is the management of NGNs. NGNs will accommodate different architectures and will provide services with different QoS to end users. The International Telecommunication Union (ITU) is the leading standardisation body in the telecommunication sector. ITU-T M.3060 recommendation (ITU-T M.3060, 2006) proposes the management requirements for managing NGNs to support business processes and the management requirements of network operators and service providers to plan, provision, install, maintain, operate and administer NGN resources and services.

The NGN Architecture

The ITU defines the term Next-Generation Network (NGN) in Recommendation Y.2001 (ITU-T Y.2001, 2004) as a packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It offers unrestricted access for users to different service providers. It supports generalized mobility, which will allow consistent and ubiquitous provision of services to users.

The NGN architecture, as it is recommended by the ITU, is divided into two independent functional strataums: the Service stratum and the Transport stratum as shown in Figure 1. By separating the Transport stratum from the Service stratum, the system provides flexibility in several aspects. One of the benefits is the installation independency. This means that the equipment used on stratum is independent of the equipment that is used on other stratum, allowing flexible deployment scenarios to meet the capacity requirements of each component. New services can be deployed to the service stratum (i.e. session-based services and non-session services) while the transport equipment remains unchanged. Another benefit of that separation is the migration independency. The transport elements can be upgraded or replaced with new technologies without changing service provisioning facilities. A common Transport stratum could be used by different retail sections of the same provider group. This modularity is a unique feature of the NGN architecture (Morita, 2007).

The NGN Service stratum provides functions that control and manage network services in order to enable end-users services and applications. The services can be voice, data or video applications. In more detail, these functions provide session-based services such as IP telephony, video chatting and videoconferencing and non session-based services such as video streaming and broadcasting. In addition, the Service stratum functions provide all the network functionality associated with existing Public Switched Telephone Network/Integrated Services Digital Network (PSTN/ISDN) services (Knightson, 2005). The Transport stratum provides functions that transfer data between peer entities and functions that control and manage transport resources in order to carry these data among terminating entities. The data could be user, control and/or management information data. In addition, the Transport stratum is responsible to provide end-to-end QoS, which is a desirable feature of the NGN. IP is recognized as the most promising transport technology for NGNs. Thus, the IP provides IP connectivity for end-user equipment outside a NGN, as well as controllers and enablers that reside on servers inside a NGN.

THE EVOLUTION OF THE MANAGEMENT PLANE

The layers of the NGN Framework are concerned with systems that provide communication between users or enhance applications such as transmission, switching, resource and service control, content hosting and distribution, and value-adding applications. These are control and user plane operations. The management plane encompasses all concerns with the operation of facilities and services, and business relationships with customers, partners and suppliers. It captures the behind-the-scenes operations that are required to enable service to be delivered.