

# Chapter XL

## Telecommunications Network Planning and Operations Management in an Academic Environment: The Case Study of the Aristotle University of Thessaloniki

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### **ABSTRACT**

*Network planning and management in a large organization such as a university, is a complex task. A large university is an inherently demanding environment in terms of telecommunications services offered and technologies used. This chapter presents and discusses network management and planning issues in the Aristotle University of Thessaloniki, Greece. Examples of network management procedures are given. We present the data model for service provision. The network expansion and cost reduction case studies are discussed. A SWOT analysis about University's Telecommunications Center is given. Finally, we discuss the migration analysis for future upgrades that will fully enable the use of emerging technologies such as Voice over IP (VoIP).*

## INTRODUCTION

The Aristotle University of Thessaloniki (AUTH) is the largest university in Greece. It comprises nine Faculties organized into 39 Schools, as well as three independent Schools. Some educational and administrative facilities are located off campus for practical and operational reasons. The telecommunications network of AUTH consists of more than 40 digital Private Branch eXchanges (PBXs), which provide advanced telephony services to about 6500 users. Additionally, a distance learning service for all campus staff is available through adequately equipped classrooms. The Telecommunications Center is the administrative unit in AUTH that manages the network, provides the services and plans future upgrades.

The main objective of this chapter is to provide details about network management and network planning issues in such a large organization. We highlight some periodic operation management tasks. Service provision issues are also discussed. We present a new data model for telecommunications service provision based on existing Service Oriented Architecture (SOA) models, namely the Open Group SOA (OpenGroup, 2008) reference model and the Governance Enterprise Architecture (GEA) service object model (Goudos, Loutas, Peristeras, & Tarabanis, 2007; Peristeras & Tarabanis, 2004). Examples of use cases for telecommunications services are given. Most PBX vendors today have shifted their products from Time Division Multiplexing (TDM) based to Voice over IP (VoIP) based architectures. Consequently, we present the migration analysis to VoIP architectures (Douskalis, 2000; Schulzrinne & Rosenberg, 1999).

Network planning and management are common issues among researchers. A literature review about routing management issues in voice and data networks is given in (Medhi, 2007). Network management related issues include quality management (Okuno & Okuda, 2003) and governance modes for service development (Van

den Ende, 2003). Customer Relationship Management (CRM) using data mining techniques are presented in (Azevedo, Vellasco, & Passos, 2001) while a management approach of infrastructure telecommunications projects is given in (Mezher, Abdul-Malak, & Dayya, 1999).

The use of proprietary technologies over the past years has limited the telephone usage to being only a communication device. The integration of the voice infrastructure with web-based applications has enhanced the telephone's functionality and thus transformed it into an information tool. The rise of open client-server voice-web protocols, such as the Voice eXtensible Markup Language (VoiceXML), has enabled an Internet-like explosion in voice application development and delivery (Uppaluru, 2003). These new open business models that have emerged are among the factors that have to be taken into account for network planning. Network planning in public voice networks (Pravda & Vodrazka, 2007) and development of tools for new services (Atkins, 2004) are also issues found in the literature. The current trend in network operation is network convergence to reduce operational expenses and eliminate additional expenditures on multiple parallel core networks (McCormick, 2007). Companies are deploying Passive Optical Networks (PONs) to deliver broadband applications like video on demand and high-speed access to the Internet. VoIP service using Session Initiation Protocol (SIP) can also be delivered over PONs (Engbretson, 2007). Broadband networks deployment from service providers requires robust plans for providing various types, amounts, and locations of services at competitive prices (Bollapragada, Morawski, Pinzon, Richman, & Sackett, 2007). Due to their appeal to a broad base of customers, driven by economic incentives, improved productivity and creation of new services, VoIP networks may become an attractive value proposition to service providers. However, important issues like Legal Interception (LI) and emergency calls are not yet implemented by VoIP platforms. VoIP

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