Chapter 26
Evolution of QoS Control in Next Generation Mobile Networks

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ABSTRACT

Next Generation Mobile Networks (NGMNs) constitute the evolution of mobile network architectures towards a common IP based network. One of the main research topics in wireless networks architectures is QoS control and provisioning. Different approaches to this issue have been described. The introduction of the NGMNs is a major trend in telecommunications, but the heterogeneity of wireless accesses increases the challenges and complicates the design of QoS control and provisioning. This chapter provides an overview of the standard architectures for QoS control in Wireless networks (e.g. UMTS, WiFi, WiMAX, CDMA2000), as well as, the issues on this all-IP environment. It provides the state-of-the-art and the latest trends for converging networks to a common architecture. It also describes the challenges that appear in the design and deployment of QoS architectures for heterogeneous accesses and the available solutions. The Evolved Core from 3GPP is analyzed and described as a suitable and promising solution addressing these challenges.

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INTRODUCTION

In the last few years both the Internet and telecommunication world are passing through an evolutionary phase: they are merging. Each is a successful paradigm by itself. The Internet is based on the Internet Protocol (IP) and provides many of the most of today's used services like World Wide Web, email, instant messaging, file sharing, etc., with Best Effort (BE) transport and no Quality of Services (QoS). There are no guaranties that the resources, like bandwidth, will be delivered for a particular session. Mobile networks offer voice services with great mobility (cellular networks). Making calls and offering other telecommunication services using the Internet or using Internet services in cellular networks are a trend today. This global trend increases the demand for integrated services, which at their turn increase the complexity of the networks, challenging the current network architectures and QoS control systems.

The main motivation of this book chapter is to describe first how QoS control mechanisms function on some of the most used wireless technologies including cellular technologies, and then describe the challenges that arise while converging distinct networks (very heterogeneous by technology), as well as on how end-to-end QoS should be approached. Finally it is presented a well suited architecture for coping with these issues and offering a platform for managing and controlling heterogeneous networks and services.

QOS CONTROL IN WIRELESS NETWORKS 3G (THIRD GENERATION)

ITU-T QoS Specifications

In order to support end-to-end QoS solutions in the converging world of Internet and Telecommunications, Next Generation Networks (NGN) have to offer a common set of IP packet transfer performance parameters and QoS objectives (Song, 2007). With this objective in mind the Telecommunication Standardization Sector (ITU-T) that coordinates standards for telecommunications on behalf of the International Telecommunication Union (ITU), started in 2002 to prepare international standards (recommendations) to help with 3G definition.

ITU-T has produced recommendations for defining standard performance parameters for packet transfer in IP-based networks, network-interface-to-network-interface (NI–NI) objectives, different QoS classes and many other standards for performance objectives and QoS parameters.

ITU-T specified the Resource and Admission Control Function (RACF) in order to provide the required NGN independence between service and transport stratum. The RACF is the element that determines resources availability in the transport layer and appropriately controls the network element. It defines different QoS control scenarios for the User Equipment (UE) with different QoS signaling capabilities, which are:

- The UE cannot signal QoS (No signaling capability)
- The UE has QoS SIP signaling capability
- The UE can reserve resources directly in the transport layer (e.g., RSVP)

QoS control in the RACF is done in pull or in push mode, which are described in the Policy and Charging Control (PCC) architecture section. Finally, the RACF is also responsible for defining Network Address and Port Translation (NAPT) control function.

QoS in UMTS

The Universal Mobile Telecommunications System (UMTS) started to be specified in Release 99 of The Third Generation Partnership Project (3GPP) standards and defines mechanisms for QoS