Chapter 12
Web Services for Quality of Service Based Charging

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ABSTRACT
Parlay X is a set of Web Service interfaces. These interfaces are designed to provide open access to telecommunication network functions in order to hide underlying network technology, and its control protocol complexity, from application developers. The Parlay X “intelligence” is concentrated in a node called Parlay X Gateway which converts interfaces methods in protocol messages and vice versa. An inherent constraint on any implementation requires the Parlay X Gateway to govern the interface to the underlying network i.e., to provide a single point of contact at which vertical signaling is received from the network. This chapter presents a study on alternatives for Parlay X Web Service deployment in Internet Protocol based multimedia networks (IMS). The focus is set on Parlay X Web Services for application-driven quality of service (QoS) management and charging control. It is presented as an analysis of the interfaces. Particularly the discussion is about their applicability to Policy and Charging Control architecture in IMS. Going further, the Web Service interfaces are mapped onto network protocols that they affect, namely Session Initiation Protocol (SIP) and Diameter. On that base an improvement is suggested concerning Parlay X interfaces for QoS management without violating the specified interface functionality. The usage of Web Services is exemplified with an application for charging control based on the provided QoS.

INTRODUCTION
The main motivation behind the definition of Internet Protocol Multimedia Subsystem (IMS) is to support provisioning of all kinds of multimedia services with session control for both mobile and fixed terminals. One of the main features of IMS is the secured open access to network functions through application programming interfaces (APIs) (Poikselka, et al., 2006). The service architecture
defined for open access to functions in IMS is Parlay / Open Service Access (OSA). The Parlay/OSAAPIs allow for <sup>3</sup>rd party applications access to network functions such as call control, data session control, mobility, user interaction, charging etc. The network functionality offered to applications is defined as service capability features supported by Service Capability Servers (SCS).

The Parlay/OSA APIs expose telecommunication functions in a neutral way for both the network technology and the programming language aspects (Hanrahan, 2008). Having common programmability paradigm for mobile, fixed, and managed packet networks, the APIs provide a medium level of abstraction of the network capabilities. The APIs are an abstraction from different specific protocol stacks, but the abstraction level of Parlay/OSA APIs is not oriented to what we call traditional group of web developers and this could affect usability. In order to make the accessibility of the network capabilities available to a much wider audience Parlay X provides a set of high level interfaces that are oriented towards the skills of the web developers.

The Parlay X is the name standing for a set of interfaces allowing access to Parlay/OSAAPIs via Web Services. In addition to being Web Services interfaces, the Parlay X interfaces are much simplified presentation of Parlay/OSA APIs (Chen, et. al., 2006). A typical Parlay X Web Services deployment model allows publication of Parlay X Web Services through a registry, making those Web Services available for discovery. The applications can use Web Services’ access methods to interact with the Parlay X Gateway, where the Web Service interfaces are implemented.

There exist different deployment scenarios for Parlay X Web Services (Grønbæk, 2006). One possible scenario addresses solutions where the Parlay X functionality is an add-on to the Parlay/OSA functionality. Thus, the Parlay X Gateway is connected to OSA SCS through a Parlay/OSA interface, forming a kind of interface wrapping. The lower-level mapping between Parlay/OSA APIs and network protocols is defined in 3GPP TR 29.998 standards. Another scenario for Parlay X deployment addresses hybrid solutions which combine Web Services interfaces and network protocols. The Parlay X Gateway attaches to the network through an interface defined by the corresponding network element. These interfaces (i.e. element defined interface) are not in the scope of Parlay/OSA standardization. No direct mapping is defined between Parlay X and network control protocols.

The chapter presents a study on the functions of Parlay X Gateway which communicates with IMS network elements. The focus is set at one hand on IMS functions for policy and charging control and at the other hand on Parlay X Web Services for application-driven QoS management and payment control. The later means that any deployment of Parlay X applications requires translation between Parlay X interfaces and network protocols. Therefore such a mapping of Parlay X APIs onto IMS protocols is examined. First in the chapter comes a brief presentation of the IMS Policy and Charging Control (PCC) architecture. The PCC architecture encompasses two main functions: flow based charging, including charging control and online credit control, and policy control e.g. gating control, QoS control, QoS signaling, etc. The functionalities of “Application-driven QoS” and “Payment” Web Services are analyzed and the IMS signaling flows in which results the invocation of Web service operations are discussed. An enhancement of the “Application-driven QoS” Web Service is suggested without violating the standardized functionality of the Web Service. An approach is described as combination of these Web Services in order to create a Parlay X Application for online payment that takes into account the QoS provided to the end user.
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