Chapter 24
Protocol Interactions among User Agents, Application Servers, and Media Servers:
Standardization Efforts and Open Issues

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ABSTRACT

In this chapter, the authors focus on the complex interactions involving the various actors participating in a multimedia session over the Internet. More precisely, bearing in mind the current standard proposals coming from both the 3GPP and the IETF, they investigate some of the issues that have to be faced when separation of responsibilities comes to the fore. The scenario the authors analyze is one in which one or more user agents are put into communication with a media server through the mediation of an application server. In such scenario, the application server does play the role of a middlebox for all that concerns signaling, since it is responsible for the transparent negotiation of a session among the entities (the user agents on one side and the media server on the other) that will be exchanging media during the communication phase. In this chapter, the authors highlight that protocol interactions become really complex under the depicted circumstances. They provide a survey of the current standardization efforts related to media control, together with a discussion of open issues and potential solutions.

INTRODUCTION

Recently, advanced services have massively entered the Internet arena pushed by the revolutionary "global" approach envisaging the coexistence of a variegated portfolio of applications on top of an integrated IP-based network. Consequently, the Internet has become a place where an ever-increasing number of "dependent" or "correlated" transactions take place every day. This unexpected growth of complexity unavoidably unveils a number of less or more subtle issues that have to be faced when looking at the interactions among the various entities involved in the service deliv-

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ery chain. Standardization bodies like the IETF (Internet Engineering Task Force) and the 3GPP (3rd Generation Partnership Project) are actively contributing both to the definition of an integrated framework for advanced service creation and deployment and to the solution of the above mentioned issues. As to the 3GPP, the consortium is currently standardizing the *IP Multimedia Subsystem* (IMS) architecture (see Figure 1), whose aim is to provide a common service delivery mechanism capable to significantly reduce the development cycle associated with service creation across both wireline and wireless networks.

The main objective of IMS resides in trying to reduce both capital and operational expenditures (i.e., CAPEX and OPEX) for service providers, at the same time providing operational flexibility and simplicity. Since the beginning, the IMS has chosen SIP (Session Initiation Protocol) (Rosenberg, et al., 2002) as the main signaling protocol among most of its components (3GPP, 2007). The envisaged portfolio of IMS services includes advanced IP-based applications like Voice over IP (VoIP), online gaming, videoconferencing, and content sharing. All such services are to be provided on a single, integrated infrastructure, capable to offer seamless switching functionality between different services. It is worth noting that IMS is conceived as an access agnostic platform. This requirement clearly imposes a careful study of the core IMS components (such as Call/Session Control Function–CSCF, Home Subscriber Server–HSS, Media Resource Function–MRF, and Application Server–AS), which must be scalable and able to provide advanced features, like *five nine* reliability. A more-in-depth analysis of the IMS architecture is reported in Appendix A.

Similarly, the IETF is devoting a great effort to the definition of advanced frameworks for multimedia service delivery, starting from the effective utilization of the base functionality made available by the SIP protocol. SIP provides users with the capability to initiate, manage, and terminate communication sessions in an IP network. For a brief description of the SIP protocol and architecture, see Appendix B. The main working groups within the

Figure 1. The architecture of the 3GPP IP multimedia subsystem (IMS)