Subscription Policy Control Framework for IMS-Based Networks

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ABSTRACT

The Policy and Charging Control (PCC) architecture was firstly introduced in the 3GPP’s Release 7. However, the PCC has its problems. The main problems include the incapability of performing policy control with consideration of subscriber profiles and missing specification on how to organize and express the policy information. In addition, no policy control at application session establishment stage also contributes to its imperfectness. In this paper, the authors propose a subscription-based policy control framework that implements a subscription-centered approach for policy control and to enable flexible policy definitions based on the subscriber’s profile at the application level. The framework also provides functionalities of organizing the subscription data, identifying the policy, regulating the policy control process, interpreting, managing and enforcing the corresponding policies. The main objective is to qualify the subscribers and thus, enhance the network customization through defining flexible policies based on policy control requirements for different subscribers. [Article copies are available for purchase from InfoSci-on-Demand.com]

Keywords: 3rd Generation Partnership Project (3GPP); Diameter Protocol; Extensible Markup Language (XML); IP Multimedia Subsystem (IMS); Policy and Charging Control (PCC); Session Initiation Protocol (SIP)

INTRODUCTION

IP Multimedia Subsystem (IMS) (TS 22.228, 2007) is defined by 3rd Generation Partnership Project (3GPP) (Agrawal, 2008) as the All-IP based core network solution capable of providing real-time multimedia services. It is an access-independent and packet-based IP connectivity and service control architecture that enables various types of multimedia services for end-users using common Internet-based protocols (Camarillo & Garcia-Martin, 2006). It can also be viewed as the soft-platform combining the Internet protocols, multimedia applications and services (Mayer, Khartabil, Niemi & Poikselka, 2006). Figure 1 illustrates the conceptual composition of the IMS.
As a comprehensive core network solution plus its All-IP structure, it is not only regarded as the ideal core network of the Next Generation Networks (NGN), but is also seen as an important method for the implementation of Fixed-Mobile Convergence (FMC), Unified Communications (UC), Converged Networks (CN) as well as the key to achieve the universal control layer.

In contrast to traditional network architectures, IMS offers the network architecture through the use of standards, enable network elements like general purpose servers. With the 3GPP specifications, IMS enables many network functionalities to be reused and shared across multiple access networks, allowing for rapid service creation and delivery. To this end, IMS takes a layered network infrastructure which allows carriers to rapidly develop, deploy, and deliver a large number of new services, which in many cases will have been developed by a 3rd party content and service provider.

Among the IMS network entities, there are several key functional components defined in the 3GPP IMS as shown in Figure 2 (TS 23.002, 2007). The most important one is the Call Session Control Function (CSCF) (TS 23.228, 2007), which is the pivotal element to control the call session and is divided into three different entities: Serving CSCF (S-CSCF), Interrogating CSCF (I-CSCF) and Proxy CSCF (P-CSCF). The Home Subscriber Server (HSS) is the central data centre which stores subscriber's profile information and system provisioning data. The others include User Equipment (UE) and Application Server (AS).

Before illustrating the policy control within the IMS, we first present the concept of policy control. Policy control has been defined as a mechanism to control a network’s resources through a device-independent approach (Yavatkar, Pendarakis & Guerin, 2000). It is achieved by using so called policies to express how a user may make use of the network resources. A policy is described as the combination of rules and services where rules define the criteria for resource access and usage. In policy control architecture (Bohm, 2003), a policy controller
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