Chapter 10

Group-Oriented Service Provisioning in Next-Generation Network

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Abstract. The chapter deals with group-oriented service provisioning in next-generation network (NGN). It consists of three parts: the first bringing forth user profile creation and semantic comparison; the second explaining user profile clustering and semantic classification; and the third describing social network creation and analysis. The multi-agent system A-STORM (Agent-based Service and Telecom Operations Management) is presented and elaborated as part of the proof-of-concept prototype which demonstrates provisioning of group-oriented services within NGN. As a group-oriented service, the RESPIRIS (Recommendation-based Superdistribution of Digital Goods within Implicit Social Networks) service is implemented and provisioned by using prototype’s agents. The proposed provisioning scenario is set forth, as well as provisioning process analysis presented.

Keywords: Intelligent Software Agents, Group-oriented Services, Semantic Clustering, Ontology-based User Profiles.

1 Introduction

The future of telecommunication industry is directed towards creating systems aware of user preferences, device capabilities, and communication context, and simultaneously enabling dynamic user group formation defined by similar characteristics (e.g., user preferences, user device and/or user context). Consequently, telecommunication operators (telcos) have recognized the importance of dynamic formation of user groups according to similar characteristics. The topic of this chapter is how using Semantic Web and software agent technologies can enable dynamic social networking in the environment of next-generation network (NGN).

The evolved NGN should aim at taking changing user demands into account and at creating spontaneous, adaptive services that can be delivered anytime, anywhere, to any device that its user prefers. Therefore, the realization of the full potential of convergence will make it necessary for operators to deploy dynamic, cooperative and business-aware consistent knowledge layer in the network architecture in order to enable ubiquitous personalized services. Providing such context-aware services
transparently to the user is not only challenging from a network point of view, but also imposes rigorous requirements on the service provisioning.

Semantic Web technologies are rather novel but very amenable grounding for user clustering, while software agents have proven to be very suitable for user profile management and telecommunication processes enhancements. The idea of semantic reasoning has resulted in a number of languages. Among these are Resource Data Framework (RDF), RDF Schema (RDFS) and the Web Ontology Language (OWL). Information retrieval from RDF and OWL ontologies is performed by using various query languages. These languages are often loosely based on the Structured Query Language (SQL) syntax, but are performed on different data model; instead of relational database, the data being queried is represented as a graph consisting of subject-verb-object (SVO) triples. Such languages are RDF Data Query Language (RDQL) and Sesame RDF Query Language (SeRQL).

This chapter is organized as follows. In Section 2, we define group-oriented services. Section 3 describes NGN, and Section 4 presents how to create an ontology-based profile of telecommunication service user. Section 5 brings forth user profile clustering, and Section 6 elaborates semantic classification of user profiles. In Section 7 a multi-agent system enabling service provisioning in NGN is presented, as well as a proof-of-concept implementation done in Java. Section 7 proposes ideas for future research work and concludes the chapter.

2 Group-Oriented Services

Simultaneous development of mobile devices and telcos’ infrastructure resulted in increasing complexity of mobile services [25]. The future of mobile communications is evolving from linear services (i.e., traditional services where the user cannot influence the predefined service provisioning procedure) towards new non-linear services (i.e., interactive services where the user participates in the service provisioning procedure, tailoring the service to his/her preferences, device and/or context) [4]. The non-linear services were available only for fixed network users until recently. In this chapter we study a special type of non-linear services: group-oriented services for mobile users:

- we define group-oriented service as a service in whose provisioning there cannot participate just one user, but a set of users with certain similarities (e.g., similar preferences, devices and/or context);
- we define mobile users as users possessing mobile devices (e.g., mobile phone or PDA).

The main idea behind the group-oriented services is to group mobile users into clusters taking into account users’ interests, their mobile devices’ characteristics and context in which they find themselves while requesting a service. To achieve this it is necessary to introduce a rather new approach in the service provisioning process: building implicit social networks of mobile users. Unlike explicit social networks (e.g., Facebook\(^1\), MySpace\(^2\) or LinkedIn\(^3\)), implicit networks are built autonomously based

\(^1\) http://www.facebook.com
\(^2\) http://www.myspace.com
\(^3\) http://www.linkedin.com