Chapter V
Advanced Middleware Architectural Aspects for Personalised Leading–Edge Services

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ABSTRACT

This chapter introduces context-driven personalisation of service provision based on a middleware architectural approach. It describes the emerging environment on service provision, outlining the increasing requirements for personalisation as well as the state-of-the-art approaches in personalisation. A novel information space is presented to introduce the middleware architectures for personalisation in service provision. Technology enablers for context and knowledge management as well as service adaptation are also introduced, and an architectural model for the personalisation functionality is presented. The study also touches upon advanced concepts based on autonomic computing and communications to introduce future research directions.

INTRODUCTION

In the context of future mobile communications users will be able to access an abundance of services that will be typically developed by many co-operating entities. Moreover, the diversity of service access contexts, which is inevitable in the era of pervasive, "anywhere" computing, and the co-existence of different technologies caused by the evolutionary character of the transition to

next generation systems, will lead to the heterogeneity of the networks and systems that support end-user application provision. This creates the requirement for applications to be optimally delivered and executed over a large diversity of infrastructures and configurations, as well as for dynamic adaptability of services to changing conditions and contexts.

The current mobile communications paradigm was not built to support this evolution. The requirements deriving from the service and access methods diversity and heterogeneity are new to the traditionally vertically integrated and closed telecommunications environment thus disallowing an open service access, which would lead to a larger variety of choice and better quality of service for the user. Traditional architectures have, therefore, not taken under consideration the multiple capabilities that unfold in favour of the end-user. Considering that it would not be feasible to develop separate versions for different execution contexts, applications should be to a large extent agnostic of the environment they run on. Intelligent mechanisms should exist for identifying the context and the particular high-level requirements of an application and mapping them to appropriate reconfiguration operations on the underlying hardware and software infrastructure. To this end, context management, knowledge building and the respective decision making process are key factors for the service personalisation and system adaptation in future mobile communications. A need for middleware platforms, that will abstract this management load and complexity and enable an end-user seamless service experience, emerges.

In order to address these requirements this chapter is organised as follows: The first section ("Personalisation aspects and evolution from state of the art") includes state-of-the-art and beyond on personalisation aspects. More specifically, the first subsection provides information about the notion of personalisation in the 3G world as well as basic concepts that compose the current

approach in personalisation. It also introduces the terms of user context, user profile, profile management and context awareness. The next subsection ("Personalisation aspects—State of The Art") presents in more details specific personalisation aspects: profile and context awareness, information representation and information repositories. The following subsection outlines the corresponding progress beyond-state-of-the-art: a novel information space for personalisation and the ontological representation of contextual information in the vision of reconfigurable and autonomic systems.

The next section discusses solutions for personalised service provision through middleware architectures. More specifically, several object-oriented architectures together with relevant standardisation activities are presented in the first subsection. In the same sense, a number of personalisation aspects are discussed in the following subsection focusing on functional issues ("Functional Issues for Personalisation"); profile, context and knowledge management mechanisms, as well as service adaptation issues are therein included. Furthermore, the next subsection presents an integrated middleware framework for personalised service provision support.

The section that follows initiates a discussion about advanced concepts in personalised service provision such as situation awareness, autonomic features in service management (service provision, service adaptation etc) as well as the corresponding evolution of middleware solutions. More specifically, it comprises two subsections which present characteristic features on autonomic computing and communications as well as a discussion on personalised service provision and adaptation in the context of autonomic communications.

Finally, this chapter concludes on the innovative approaches and differentiations of current approaches in service personalisation aspects. Points to future research directions have been added to further guide the interested user.

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