Chapter V

Policy-Based Access Control for Context-Aware Services over the Wireless Internet

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Abstract

The spreading wireless accessibility to the Internet stimulates the provisioning of mobile commercial services to a wide set of heterogeneous and limited client terminals. This requires novel programming methodologies to support and simplify the development of innovative service classes. In these novel services, results and offered quality levels should depend on both client location and locally available resources (context). In addition, it is crucial to manage the frequent modifications of resource availability due to wireless client movements during service provisioning. Within this perspective, the chapter motivates the need for novel access control solutions to flexibly control the resource access of mobile clients depending on the currently applicable context. In particular, it discusses and exemplifies how innovative middleware for access control...
should support the determination of the client context on the basis of high-level declarative directives (profiles and policies) and distributed online monitoring.

Introduction

Recent advances in wireless networking and the growing number of wireless-enabled portable devices create new promising commercial opportunities. In-Stat/MDR estimates that more than 465 million mobile device units will be built and shipped in 2004, with an annual increase of more than 7%, and a similar rise expectation for the next years (Reeds, 2003). A primary commercial challenge is to exploit this enlarging market to ubiquitously provide mobile users with both traditional Internet services and innovative location-dependent mobile commerce applications.

Service providers and wireless network operators have to face new and challenging technical issues toward the seamless integration of wireless clients with the traditional fixed Internet. This scenario, called wireless Internet in the following, already starts to exhibit research and commercial solutions to support network connectivity (Bos, 2001; Perkins, 1999). However, provisioning commercially mature mobile services over the global and open wireless Internet requires addressing complex and different issues, such as configuration management, service content adaptation, access control, accounting, dynamic un/installation of infrastructure/service components, and interoperability. The research in several of these areas is still at its beginning; it starts to recognize the need for novel and flexible middleware solutions (Bellavista, 2002a).

In particular, the wireless Internet calls for novel methodologies to support and simplify the development of innovative service classes where results and offered quality levels depend on the context; that is, the logical set of resources that a client can access due to provisioning environment properties, such as current client location, security permissions, access device capabilities, user preferences and trust level, runtime resource state, and mutual relationships with currently local users/terminals/resources (Bellavista, 2003a). Some simple forms of context determination, such as the ones associated with traditional security permissions, are not new for distributed systems. The novelty here is that the frequent mobility of wireless Internet clients makes it crucial to manage the recurrent context variations, and the consequent service reconfiguration at provision time. In fact, the context depends on both quite static aspects, for example, the local authorization rules and the client device characteristics, and very dynamic aspects, for example, the client location and the provision-time state of involved resources.

In other words, the wide heterogeneity, the changing network topology/connectivity and the resource shortage/discontinuities typical of the wireless Internet stress the relevance of context awareness and of developing context-adaptive services. However, the complexity of designing, implementing, and deploying context-aware mobile services potentially limits the rapid emergence of this new service market. Therefore, there is a growing request for highly flexible and innovative middleware to facilitate the development and runtime support of context-aware wireless Internet services. In particular, in
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