Chapter 34
Technologies to Improve the Quality of Handovers: Ontologies, Contexts and Mobility Management

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ABSTRACT

Modern life makes people internet-dependents. They want to move connected and care for always getting the best options for connectivity, hoping between providers. Freedom for choosing providers and the business options which these exchanges can offer are the motivations for this chapter. After pointing out some characteristics which make the basics of the current handover technologies, we describe an information infrastructure, based on context and ontologies which can be used to foster an intelligent, efficient and profitable scenario for managing handovers in the Next Generation Networks. Some experiments are described and the potential of using these technologies are evaluated.

INTRODUCTION

Future computing will be based on the idea that users are highly mobile, their devices ubiquitously instrumented to sense the surroundings and continuously interacting with local and remote environments. Sensors will look for signs of locally emanated events, objects, people and services of interest to the user. Users will also use communicating channels to interact with remote environments, looking for information on events, objects, people and services elsewhere. The mobile user, whether inside a car or public transportation

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or even inside a public place or at home, will be inserted into rich-in-information contexts.

This paper deals with the possibilities that can be exploited by the users, service providers (access or content providers), or third parties, to build services with aggregated value through a good strategy using context information for handovers decision. The proposal of structuring the relevant information into an ontology, besides creating the common agreed terminology which will facilitate the integration of services, provides semantic relations between information which could enable the search reformulation and extent, the combination and proper correlation of capabilities for the services being offered.

A TAXONOMY FOR HANDOVER MANAGEMENT

Various terms and classifications for the handover process are found in the literature, these classifications vary with the perspective and approach in which mobility aspects of the handover process are analyzed. The distinctions can be made in accordance with the scope, coverage range, performance characteristics, state transitions, types of mobility, and handover control modes.

The most common classification outlooks are: layer, system, technology, decision, performance, procedure and connection. Some classification and types of handover perspectives are briefly presented in Table 1, which was created based on RFC 3753.

The process of access point changing is called hard handover when the connection to the access point to which the mobile device is connected is broken before the new connection is established. However, the process called soft handover occurs when the connection is broken after the new connection is established. Another important operational factor is the entity that is able to decide on the handover's performance. The options are essentially the network-based handover, where the decision is made by the network to which the mobile device is connected; and the second option is the client-based handover, where the client/device is the entity that has the decision-making power.

In addition to the classifications in REF _Ref244439661 \h * MERGEFORMAT Table 1, there is also an outlook of why users perform handovers – REF _Ref244439812 \h * MERGEFORMAT Figure 1.

An imperative handover occurs only for technical reasons, that is, the access point change is made by a technical analysis. This analysis can be based on parameters such as signal strength, coverage, QoS offered by another network, among others. The term "imperative" is because the analysis shows that if the change is not made, there is a significant deterioration in the performance or loss of connection. The handover is classified into two types: reactive and proactive. The "reactive" responds to changes made by the device interfaces, such as availability and unavailability of the network access. This type is subdivided into "anticipated" and "unanticipated" (Patanapongpibul, Mapp, & Hopper, 2006). The "anticipated" type is a soft handover which knows the access points´ situation and/or base candidates for a new connection. In the "unanticipated" case, the device loses or is about to lose the connection to the network in use and has no coverage information on the candidate networks in the position it is, that is, there is no access point option for a new connection. Therefore, the "unanticipated" type is an example of hard handover.

The "proactive" is the counterpart of the "reactive". The proactive type uses soft handover techniques to choose new access points. In Figure 1, the "proactive" type is subdivided into "knowledge-based" and "mathematical model-based". The first one uses knowledge based on information provided by other users and/or by candidate networks, for example, the topology of the networks in an area. The second "mathematical model-based" type uses mathematical