Publish/subscribe architecture with transparent mobility support

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Abstract. In this work, we present the development of a publish/subscribe architecture that supports mobility and disconnection of event producers and consumers effectively and in a flexible manner, as well as firewall and NAT traversal, enabling the system to be used on the entire Internet, and not only within network domains. Unlike other work about distributed pub/sub systems e.g. [Mühl, Ulbrich et al. 2004], which interprets the mobility of a device as being the re-association with a new event server (or broker) within the pub/sub overlay network, in our work we consider the device mobility as a predicted or unpredicted change of its IP address. This second form of mobility happens when the event producer/consumer switches between network domains or enters a network protected by firewalls/ NATs, while possibly still being associated with the same event broker. Hence, our notion of mobility support is orthogonal to the common notion of mobility support in distributed pub/sub architectures, and our support can be directly incorporated into distributed pub/sub systems. Thus, the main contribution of our work is this approach to mobility on pub/sub systems with the combination of different concepts and technologies (e.g. application layer mobility management, reliable protocols and disconnection detection) to achieve this goal. A central issue is to find an effective and flexible solution for mobility management [Henderson and Works 2003; Eddy 2004]. We present the development of a SIP Mobility Support Layer, an implementation of a mobility management mechanism at the application layer using SIP (Session Initiation Protocol) [Rosenberg, Schulzrinne et al. 2002] based on the work presented by [Wedlund and Schulzrinne 1999]. This layer has been implemented as an API that can be used by any service or application that requires transparent mobility and connectivity management. For addressing the problem of temporary disconnections of event producers and consumers, we introduced a customizable disconnection detection and handling mechanism, using TCP and an implementation of Reliable UDP [Stevens and Narten 1990], and also subscriptions storage and notifications queuing mechanisms. The referred pub/sub system has been implemented in Java, and the client APIs were ported to the Android Operating System.

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Biographies

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Markus Endler obtained the Dr. rer. nat. in Computer Science from the Technical University of Berlin, and the Professor Livre-docente title from the University of São Paulo. From 1989 to 1993 he worked as a researcher at the GMD Research Institute Karlsruhe (Germany), and from 1994 to 2000 as an Assistant Professor at the Institute of Mathematics and Statistics of the University of São Paulo. In 2001 he joined the Department of Informatics of the Pontifícia Universidade Católica in Rio de Janeiro (PUC-Rio), where he is currently Associate Professor. His main research interests include Mobile, Ubiquitous and Cloud Computing. He has supervised 8 Doctoral and 17 Master theses, and has published 90+ scientific papers.

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