Motivation

Among other features, ambient intelligence aims at offering access to users' data, anytime, anywhere, in a transparent manner. However, realizing such a vision necessitates several improvements in the way information servers and users terminals interact. In particular, users terminals should not tightly rely on an information server, which can be temporarily unavailable in a mobile situation. They should rather exploit all the information servers available in a given context through loose coupling with both stationary and mobile nodes.
Originally, systems introduced for mobile data management were mainly oriented towards infrastructure-based wireless networks. Hence, the independence of mobile nodes has prevailed in the design of these systems due to the focus on handling temporary disconnection. In these systems, data copies on a given mobile node are updated locally and are subsequently loosely synchronized with copies on either other mobile nodes or stationary servers hrough propagation of updates, which is also referred to as optimistic replication. Copy synchronization is then handled through the provision of protocols for the management of conflict detection and resolution. Achieving fully automatic conflict resolution depends on the specific protocols that are provided but also on the frequency of update propagation. As a result, a mobile user may freely access the data that are locally available on his/her machine but he/she has no guarantee about when and how local updates will be seen by users sharing the data and even whether they will be accounted for in the case of conflicts that cannot be solved. In addition, update propagation comes at a high cost in terms of the number of exchanged messages, when data are concurrently updated by users. Then, proposed solutions were poorly suited for dealing with collaborative sharing among mobile nodes that happen to be connected through the WLAN, as it is for instance the case in group meeting.

Research

In general, advances in WLANs and in service discovery protocols called for revising the handling of data sharing on mobile nodes. Specifically, nodes that are in the communication range of each other dynamically form a LAN system, which may be seen as a temporary wired LAN system. However, the resulting LAN system has the following intrinsic requirements that must be dealt with: resource saving and in particular energy saving for (unplugged) mobile nodes, adaptation according to the network's dynamics, and security.

Our research work aimed at offering a distributed file system that supports collaborative caching among ad hoc groups of trusted terminals in the local communication range of each other. Collaborative caching within ad hoc groups prevents from disseminating data over untrusted machines and hence from access by unauthorized users subsequently to later key forgery. This also allows for distributing data over (possibly mobile) nodes in a way that both accounts for fair resource usage and enables data replication on mobile nodes that may thus later access the data when isolated. We have investigated the following issues in the design of the AdHocFS file system: Management of dynamic ad hoc groups, Coherency management, Security management, Enhancing data availability on mobile nodes.

Contributors

- Malika Boulkenafed
- Valérie Issarny
- David Mentre
- Animesh Pathak

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Follow-up

- Data sharing and replication in pervasive networks

Publications

Titre Gestion de l'accès aux données dans les réseaux sans fil en mode ad hoc AuteursBoulkenafed Malika DétailThèse. Université Pierre et Marie Curie - Paris VI (24/10/2003) Accès au texte intégral

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