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# MOBILE COMMUNITIES: EXTENDING ONLINE COMMUNITIES INTO THE REAL WORLD

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## Abstract

*Communities offer a context for people to meet, communicate and collaborate. Tools to support communities usually provide a communication and coordination medium and functionalities to find communication partners. Thereby, they strengthen existing communities or enable completely new (virtual) communities. In this paper we briefly present some ideas towards the extension of community support to mobile environments from the ongoing project COSMOS.<sup>1</sup> The objectives of COSMOS are the development of new technologies and concepts for this support. We discuss ideas for mobile community support services and lay out a plan for future work.*

## Introduction

Human beings are social creatures with an inherent desire for communication and interaction with others. The term „community“ describes groups of people that identify themselves with a common idea (often reflected in common interests) and that have the means to communicate with each other, which they use to collaborate around the common idea.

Communities offer a context for people to meet and communicate and thereby support awareness of people and communication and coordination among each other. Community support systems help communities to form or function by providing a physical and/or virtual space where people can communicate and where they can find other people.

A functioning community depends on the active participation of a significant percentage of its members. Hence, the availability and modality of access to the community support infrastructure can be considered a major issue, because only a broad participation in the community activities can sustain the functioning of the community. However, experience so far demonstrates that the common user base of community support systems is mainly composed of computer literate individuals, accessing the network with an already existing PC at home or at the workplace. In fact, from the technology point of view community support systems are often based on large bulletin boards and the main user interface is usually PC-based (proprietary application), a Web browser.

Electronic community support has been, till now, determined by boundaries of stationary computers and desktop based user interfaces. Ubiquitous computing, i.e. new user interfaces and the disappearing computer, and mobile computing are addressing these boundaries and offer possibilities for enlarging the reach of community support systems. In addition to enlarging the reach, mobile interfaces open completely new fields for community support – new functionalities and new scenarios can be contrived.

The new possibilities (new functionalities, new user groups, new situations where community support systems can be accessed) require the development of new service types and of new technological solutions, but also ask for new business models and organizational concepts. In the project COSMOS we have assembled an interdisciplinary group of researchers who try to address these issues from different angles. In the infrastructure group we have chosen to develop a generic set of community support

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<sup>1</sup>The project COSMOS (Community Online Services and Mobile Solutions) is funded by the German Federal Ministry of Education and Research (BMBF FKZ 01HW0107 - 01HW0110); see <http://www.cosmos-community.org/> for more information.

services that are adapted to mobile use. The result should be an easily configurable modular server and mobile device architecture that provides a generic communication and coordination medium for mobile communities. The work builds on ongoing work on modular community support systems (Koch 2002, Koch & Lacher 2000, Koch & Wörndl 2001).

In this work-in-progress paper we lay out our work on identifying generic mobile community support services. In the next section, we first review current work on the abstraction of community support and on tools to support communities. The third section builds on this work and motivates generic community support services that could profit from mobile access. The final section gives a brief overview of the different requirements related to implementing these services and how we will address them in the COSMOS project.

## Communities and Community Support

The main activities in communities are finding other people and communication and coordination in order to collaborate or help each other. Therefore, community support usually can be seen as “communication and matchmaking support”. In this context, the term communication is understood in a very broad sense. Communication can be classified as direct (Email, SMS, Chat, etc.) or indirect (publishing information for potential prospects, retrieving previously published information from the community information space etc.), synchronous or asynchronous, automatically triggered or manually triggered, and according to many more aspects.

In summary, the following basic support concepts can be derived:

- Providing a medium or channel for direct communication and for indirect exchange of information objects or comments on objects within the common scope (the information space) of the community. The information channel can be enhanced with features that use information about the community member to do (semi-)automatic filtering and personalization.
- Providing awareness of other members and helping to discover relationships (e.g. by visualizing them). This can help to find possible cooperation partners for direct interaction (*matchmaking, expert finding*).

Using networked computers for supporting communities can be tracked back to the beginnings of the Internet (Hafner and Lyon 1996). Current solutions mainly consist of bulletin board like systems, which are often integrated in different information offerings, and of different awareness and direct communication tools (see e.g. Ishida 1998a, Ishida 1998b, Michalski 1997).

We believe that electronic support for several types of communities, especially local communities (built around a locality, meetings in physical space) can only be successful if the access to the support infrastructure is broadly extended into the real places through new user interface metaphors mixed with classical community support media, and not only offered through home or work PCs. It should be possible to use community support platforms “anytime” and “anyplace” – one should no longer need to go to special (work-)places to interact with other community members .

Some projects have already started to tackle this objective. For example the project Campiello (Agostini et al. 2000, Grasso et al. 2000) was targeted towards the development of a community support system for the tourist domain. The main problem addressed was the fact that even while information systems are available anytime and anyplace they are not smoothly integrated into all interaction and tasks – some tourists would like to interact with the information system when walking around in a museum – and are not available to anyone – especially computer amateurs are quite reluctant when it comes to interacting with a community support application via desktop based Web user interfaces.<sup>2</sup>

In Campiello we investigated the idea of using “the cheapest mobile device available”, namely paper forms, and worked on better interfacing of paper forms with electronic information systems. People could write their comments on paper cards and also get recommendations in paper form (Koch et al. 1999) – this can be seen as an intermediate step to fully connected mobile devices.

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<sup>2</sup>The same has been discovered in the lifestyle area – for example with movie communities, where people like to interact when in town and looking for a movie to go to or sitting in a bar after having seen a movie.

## Context-sensitive and Location-based (Mobile) Community Support Services

The first mobile services that can be used for community support are already deployed. The most popular service is the Short-Message-Service (SMS). This service enables users to send short messages from their mobile device to other users mobile devices. In addition to SMS several prototypic matchmaking or location-based information services are currently introduced (e.g. FriendFinder from Swiss Telecom). However, these services do not make extensive use of mobile context information or are technology-focused solutions not designed with the idea of community (support) in mind.

Much of the work in research on mobile services has dealt with technology issues such as limited battery life, portability and location discovery. User-centered research of mobile support emerged in the work support area and is just now extending into general collaboration support (see Churchill and Wakeford 2001, Grinter and Eldridge 2001, Luff and Heath 1998, Perry et al. 2001).

There is a need to explore the possible space of mobile community services in a more general manner. In the COSMOS project we have therefore started with some scenarios for mobile community support and then have derived basic categories for mobile community support services (based on the generic community support services motivated in Section 2).

Here one example for a usage scenario from the lifestyle support domain:

*After a laborious college week, 20-year old student Susan is having dinner with her best friend Petra in the pub "Future". Via her mobile device, Susan is continuously connected to her mobile online community "Munich Community (Muccom)". Through Muccom she informs a group of ten friends (her "buddy" network) that she is currently staying at the "Future" pub and that she intends to go to a club at 11 p.m.. At 10 p.m. Susan's friends Stefan and Holger enter the pub. They have received the information (via Muccom) that Susan and Petra are there and that they intend to go to a club afterwards. Through the news service they receive the information that the club "In-Dance" will be giving a party tonight with the motto "Space-Night". The party is said to be very hip, at least according to the club, which posted the information in Muccom. Holger and Susan check whether somebody from their buddy-network is already at the club. Holger finds out that his friend Sven is there and contacts him. Sven dissuades him from coming, because the club is rather empty and drinks cost twice as much as usual. But Sven has found out through his "buddy network" that the club "Alternative" has spontaneously arranged a Samba party after the arrival of a group of Hispanic tourists. Holger contacts the other community members and tells them about the situation. They decide to visit the "Alternative" ...*

In addition to the anytime, anyplace features (access from everywhere and at anytime, being accessible anywhere and at anytime) the extension of support for communities into the real world via the integration of mobile end-devices makes a broad spectrum of context data available for communication services. The most important contextual information is the information of someones whereabouts (the current location). Other contextual data include the interaction in which the user is currently involved, the temperature outside, the velocity and direction of movement etc. In general we can understand the context of a (mobile) user as all data that is measurable by sensors and that can be reasonably represented in a computer in order to improve the quality of services.

Previous systems used contextual data in location based information services. For community support we are thinking of *location and context based communication services*. In the following we will discuss possible service categories according to the basic community support categories presented in Section 2.

### **Services for Matchmaking and Awareness**

Matchmaking is the process of bringing together people that have common attributes (flirting service, expert-finder etc.). This can be done proactively by pointing to a person that might be interesting to contact (and displaying an explanation why) or non-proactively by simply providing awareness of who is around (a topic, a place) and visualizing interesting (public) features of these persons. Providing awareness can also be offered for people one already knows. Such awareness services provide information and notifications about people one has put on special (buddy) lists (Schlichter et al 1998). Having this information available can help to arrange spontaneous communication.

The features of mobile devices that can provide new services are 1) that it is possible to query from everywhere or to be notified of possible contacts at any place, and 2) that location and other context attributes can be taken into consideration for selecting

contacts. These features make it possible to use matchmaking and awareness for spontaneous activities and for immediately meeting face to face (if contacts were selected based on similar location).

Implementing matchmaking and awareness features in a community (platform) might also help in addressing the privacy issues that usually come up when using and presenting user profile information. A community can be a perfect place to control access to such attributes by capturing and defining relationship networks (e.g. in the form of buddy lists) that can be used to define access control.

### ***Services That Support Synchronous Communication***

Synchronous (speech) communication is currently the most important use of mobile devices. Synchronous communication can profit from being embedded into a community in different ways. First, community platforms can provide more powerful functions for reachability management. Users can specify rules and parameters in their profiles that enable other community members to look up the reachability status of someone they want to call before actually placing the call.

Knowledge of other user's profiles and contextual data (which can conceptually be regarded as part of the profile) can substantially increase the power of a reachability management component by e.g. automatically detecting a business meeting by deducing it from the fact that a certain number of coworkers are in a room together. By monitoring not only the motions and contexts of single persons but also the motions and contexts of groups of persons, a much broader basis for the application of machine learning algorithms for inductively learning reachability patterns will be given.

### ***Services That Support Asynchronous Communication***

Sending asynchronous messages (emails, SMS, etc.) is a very effective way of communicating and profits much of the community scenario and the mobile scenario as well. Sending messages to groups of people that are defined through combinations of attributes is one possible application. E.g. the groups can be defined as "the group of people with a current location near me" or "the group of people with a future location near xy" (tagging messages to places). In addition to pure messages community support services should allow to collect semi-structured community information (e.g. announcements of events) and comments on such information, and make new items available as messages.

Besides manually triggered asynchronous communication and information pull, automatically triggered communication (personalized and context-sensitive push services) are very useful too. E.g. the system can inform users of other community members around, or of information that is useful to groups of community members around.

## **Conclusions and Future Work**

In this paper we have given a brief introduction to mobile community support and have presented some ideas for generic mobile community support services. The main issues when constructing these services were to make the anytime, anyplace feature and the additional context information available for different communication and matchmaking services. Embedding this functionality in a community platform can help with different trust and privacy issues.

For our goal to derive a generic set of configurable components that form a generic communication and coordination medium for mobile communities we have up to now identified and further specified the following central components:

- *user management*: storage of static and dynamic user attributes and rules determining the access to the attributes; part of the user profile are buddy lists and item ratings.
- *message management*: direct communication based on buddy lists and on the rules in the user profiles.
- *item management*: management of persistent content objects and of comments and ratings on the content objects.
- *category/community management*: for categorizing items and interests

These core services will be made available through mobile devices and desktop/web interfaces. Desktop interfaces will be mainly used for configuring the system and for checking the location of friends. Mobile devices will offer the possibility to get location information, to participate in the communication (sending and receiving) and to access information objects while on the road. Positioning in community services has shown to be quite different from positioning in location based information services. In

community services positioning information is not only used for providing information for oneself but for informing other people. Here also a broad availability of positioning information from devices in different networks is needed (not all members of one peer group are using the same network).

In the project COSMOS we further developing these first ideas of generic communication and coordination services and of community based positioning. We are currently designing services and a support platform for two prototype communities in the domains lifestyle and healthcare. With these prototype communities we will test and further develop our ideas about useful services and continue our work on the basic challenges with mobile community support. Thereby, we will address both technical challenges like server platforms that support different kinds of devices, modules that do context adaptation, sensors for generating context information, and non technical ones like the thorough analysis of community needs with a sociological perspective and business models for the platforms. Results will be published on the project website at <http://www.cosmos-community.org/>.

In addition to our work on COSMOS we are also looking into implications of mobile community support for the workplace of the future. Here we think, that the introduction of mobile access technology and of community platforms might lead to a revolution similar to the one started by the introduction of networked personal computers. This area goes further than the one addressed in COSMOS – as telework and groupwork it will involve several disciplines from Economics, Business Administration, Informatics to Psychology and Sociology.

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