

# Context-Phonebook - Extending Mobile Phone Applications with Context

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**Abstract.** Today people use mobile phones to make calls and to receive calls anytime and anywhere. This gives the user a lot of freedom but also introduces that the phone can interrupt the user always and everywhere. In our work we implemented a phonebook that contains additionally to the phone number also context information, such as details on the users connection status, availability preferences, or location. Providing this information the potential caller can take the situation on the other end into account before setting up the call. Based on the prototypical implementation we conducted study. Here users stated that the situation and the environment is important to them when using a mobile phone. It also indicated a great interest of users in having context information visualized in the phonebook. When making the decision whether or not to call this additional information is significant. In the study we also find evidence that people are willing to give some information away to make these services available.

*Keywords: mobile communication, mobile telephony applications, mobile HCI, telephony services, phonebook application, wireless application protocol (WAP)*

## 1. Introduction

It is estimated that there are more than 600 million mobile phone users around the world – and the number is increasing. The success of mobile phones seems easy to explain: being available anytime and anywhere. If a businessman moves from one place to another he is available for his company at no extra effort. If the son will be late at home he can inform his parents. If you have trouble with your car you can call the breakdown service. Mobile phones are used for communication but also for coordination between people. Informal meetings between people (e.g. going to a pub) are often not planned anymore in advance – they are arranged on time by

mobile communication. Altogether there are a lot of opportunities using mobile phones.

But there are also some emerging problems. Being reachable always and everywhere is solved by technology – but being reachable does not necessarily mean being available to all potential callers!

Sharing information about the real world context of users is a solution to this problem [5]. But until now the user interfaces of mobile phones are still very much based on legacy. In particular UIs and standard applications are not context dependent and therefore the caller has very little chance to know when making a call in what situation the called party will be interrupted. In this

paper we analyze three ideas for the realization of context sharing and the integration of context into standard phone applications. In particular we explore how context information can be build into the phonebook application.

In the following section we introduce the prototypical implementation of three different phonebooks that supply further information to the potential caller about the potential communication partner. In the later section we report on a user study, where we interviewed people about the prototypes.

## 2. Prototypical Implementation

We have implemented different context-phonebooks. In particular we concentrated on these issues:

- Providing the potential caller with information about the connection state of the party to call
- Sharing and visualizing information about the availability of the user
- Providing an abstract representation of the location of the party to call

The basic idea behind the context-phonebook is that the phone book is an application in the network, rather than a local application in the phone. For the prototypical implementation the phone book was build as a WAP-application that runs on a server in the network. So each time the phonebook was used a WAP-application was invoked, that generated the phonebook pages with current data.

To make the phonebook working, e.g. when clicking on a name the connection should be set up, we used the WTAI (Wireless Telephone Application Interface). This is standardized in WAP but not fully implemented on all phones. For our

experiments we used a Siemens S35i where the functionality was available.

### 2.1. Connection State

When calling someone there are several possibilities what can happen. In short we discriminate four cases:

1. The phone of the party called rings and that the person is taking the call or the person is not taking the call
2. The phone rings and the call is taken by the answering machine
3. The phone does not ring and the caller gets the information that the called party is not reachable
4. The called line is busy

In the first case the phone call works as usually anticipated. In the second case it could be helpful to know that the call will be taken by an answering machine before the call is made. The user could then to decide not to call at all or if she is still calling she would not be surprised by being connected to a answering machine. For case 3 and 4 calling does not really make sense, because there will be no success.

Current mobile phones offer this information still very much the same way as phones did this many years ago – by calling the number and than getting the information after making the connection. With modern telephone networks this information is available in the network and using advanced phone UIs the information can be provided visually to the caller before the connection is made.

In Figure 1 a photo of a mobile phone with the phonebook application open is depicted. This version of the phone book incorporates the connection state into the interface. In the example *John has switched the phone off* and if we would call him we would get the message that the called party is not available.

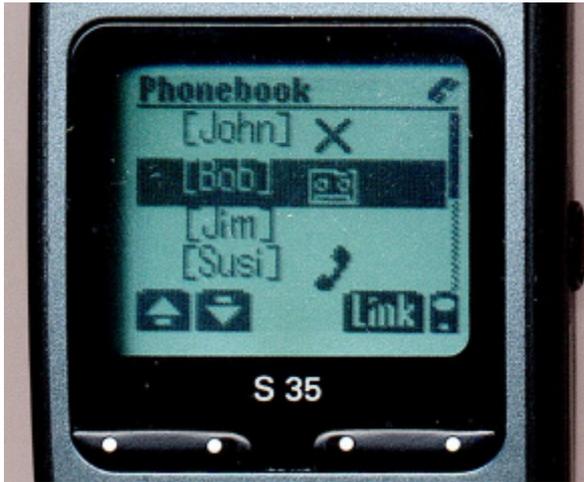


Figure 1: Icons show the connection state of the person.

As we can see it already in the phone book we probably will not call him. *Bob is not available on the phone but he has his answering machine on. Jim has his phone on and we could call him. Susi is speaking on the phone so if we would call her we would get a busy tone.* Using this phonebook a lot of information is available to the user before making the call. This can prevent to make unsuccessful calls and also let the caller beforehand know what he or she can expect (e.g. knowing there will be an answering machine on the other side). In the prototypical implementation of this version the availability of the information was simulated due to a lack of access to the functions in the telephone network.

## 2.2. Availability

In this approach we implemented an interface where people can make their availability context visible for a potential caller. What does availability mean? Users can select how welcome calls are for them in the current situation. They can set their availability status to green, yellow, or red to communicate how welcome incoming calls are to them.

- Setting to green (🟢) means  
*I am happy to get a call*

- Yellow (🟡) means  
*I am busy, but if it is important you can still call me*
- Red (🔴) means  
*I really don't want to get any phone calls now – but in the case of an emergency I am reachable.*

This system is based on the idea that the user is giving away minimal information to the potential caller. Similar systems are also used on desktop PC, e.g. ICQ [1]. In return the potential caller has the responsibility – as in a face-to-face communication – to respect the context of the one he or she wants to call. An investigation of the implications of social awareness is reported in [3]. An ongoing project that investigates the sharing of context based on audio can be found at [2]. Based on the knowledge of the other side and the callers need for the call he or she can decide whether or not to set up the call.

In a first step on the simulation environment we used colored icons, but for real implementation we went for a symbolic traffic light, that also works on a monochrome screen, as shown in figure 2. When a potential user is now scrolling through the phone book the information on the availability of the one to call is immediately visible. The decision whether to call or not will be influenced on how welcome are calls for the other one. The phonebook page is generated on request at the server and so the information is always up to date. Caching on the phone has to be prevented.

In the example, given in Figure 2, we can see:

- *John has switched his phone to red. He does not want to receive calls. It is probably better to have a really good reason when calling him!*
- *Bob and Marc have set their phones to yellow. So they are busy and want to receive only important calls.*

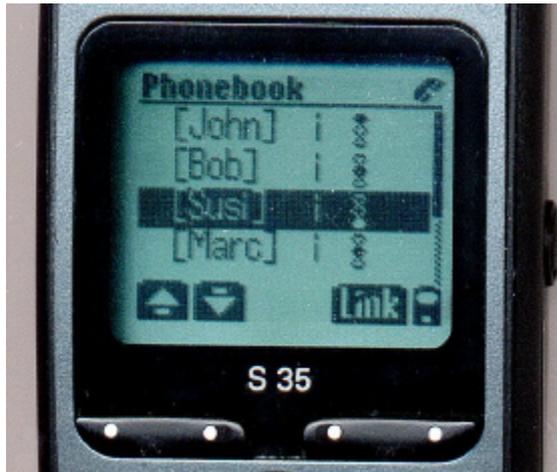


Figure 2: Icons show the availability of people in the phonebook

- Susi has her phone set to green. She is happy to receive phone calls.

This simple metaphor of a traffic light – and therefore the knowledge of the caller about how welcome calls are - changes the responsibility when making a phone call. When someone calls somebody, who's phone is switched to red, the caller has to explain why he calls anyway.

The *i* after the name in Figure 2, tells the user of the phone that there is more information about the person available in the phonebook, e.g. a photo, contact details, or details on the availability. The information that is in the phonebook is held in a database on a server.

### 2.3. Location, Activity

Some time ago people had a phone number in their office, a phone number at home, and some had a mobile phone or car phone number. Using these numbers the caller could imagine where and to some extent in what situation the called party will be reached. Now with many people having this reduced to a single phone with only one number this information is not available any longer.

In this experiment we used icons to visualize the generalized location or activity in the

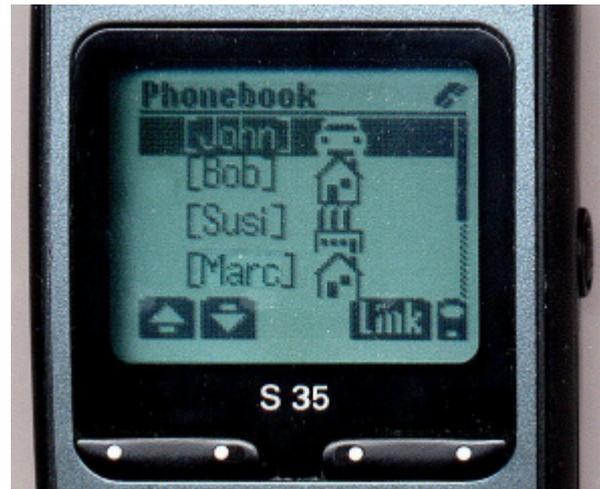


Figure 3: Icons show generalized location information about the people

phonebook to the potential caller, see Figure 3. We discriminate the following cases

- at home (🏠)
- at work (🏢)
- or on the way (🚗)

In Figure 3 you can see that *Bob and Marc are at home*, while *John is on the way*, and *Susi is still at work*. In most cases this information is available in the network, based on location, e.g. VIAG Genion home-zone, Ericsson MPS (Mobile Positioning System). We did not have access to the location information in the network so we simulated to have this information by letting people provide their location. It would also be possible to extent the information to activity. This can be realized using sensors on the phone, as described in [4].

## 3. Questionnaire and Study

We conducted a study and interviews to get an overview on the attitude of possible users towards new services, user interfaces and applications. Beyond UI issues we also asked people what they would like to have on their mobile phones and what cost (e.g. giving away information, reduced privacy, or money) they would accept.

In a questionnaire we first asked people about their normal behavior when using mobile phones. These were questions about locations and situations where they make and receive calls (in the street, on the train, etc.), about locations and situations where they switch off the phone and about situations where they see dangers when using a mobile phone.

The next section of questions concerned new services itself. We asked people what they think about an online phonebook with information about the availability of called people, information about the location of called people and information about the connection state of the called user, as described in the last section.

In further sections we asked people about more advanced applications using context and also about sensor or network based context-awareness for mobile phones. We will not go into detail on these parts. The full questionnaire is available on the WWW, see <http://www.teco.edu/~tanjev/study/>.

The target group was open. People were clustered according to the age. Furthermore we asked people if they have an IT-related education because we suspected a different attitude towards applications on a mobile phone in this user group. The following results are based on 23 people who have been interviewed and complete the questionnaire.

There are some places and situations where people don't want to receive calls, e.g. in restaurants, in cinemas and in meetings. In general it can be stated that people make a difference on the situation when and how they use their mobile phone.

Exchanging minimal context information on availability of the receiving end was at the center of the next question. The scenario was given where potential receivers of a call can set their phone to a mode where the callers get signaled how welcome their calls are. The

metaphor of a traffic light was used, as explained earlier. So 82,6% of the people asked found sharing of context information useful or very useful. Only 13,0% of the people found it less useful. 91,3% of the people are willing to give away some information to make it possible to provide context to the caller. Also it is interesting to see that 34,8% of the people would make this a reason for choosing their provider and phone model. And still 56,5% of the people would be influenced to some extent when choosing a provider or a phone model on this functionality.

Considering location information the result is slightly different: 52,2% of the asked people find location information useful or very useful and 26,1% of the people find it less useful or useless. People feel here a greater threat for their privacy. If it is possible to get some location information of people, it is possible to track people and to get information about their daily behavior. This strongly indicates the use of a generalized representation of location, as shown in the last section.

## 4. Experience, Discussion

We explored how context information can be added to the phonebook using the advantages of a network-based application.

The study gave strong evidence that situation matters to people when using their phone. The overall feedback on the prototype was that sharing information about the situation of the potential communication partner is very useful for both sides. Especially looking at the availability we can see that results indicate that users are willing to give away some information if this could prevent other people from calling in situations when calls are not welcome without switching off the phone. Compared to the possibility to provide detailed information as described in [5] users

opted in the study for the simple traffic light metaphor.

Considering generalized location, the information is available in the network, but a group of the users is concerned about giving away this information. Still a majority of people liked this information (e.g. home, work, on the way) but they some would prefer to set this information manually rather than automated from their real location. This issue has to be further investigated.

Some of the above scenarios make sense only if a majority of people has it, e.g. availability. Whereas other information, e.g. about the connection state or location is also useful if only few people use it.

In our experiments we used WAP – knowing that it is not an optimal solution – but currently still the best way to do rapid prototypes of mobile phone user interfaces. When we build the phonebook based on WAP we also found it quite interesting to add further information – such as the whole address of people - and even images of people turned out to be a useful option. The integration of WAP and WTAI is one approach to build new applications for mobile phones [6]. Our work was not focused on making WAP more usable; we rather explored new ways to make phone applications more usable. Ultimately we see that the suggested interfaces should be integrated into the standard applications on phones.

## 5. Conclusion

In our work we investigated how context information could enhance applications on a mobile phone. Based on three prototypical implementations we explored how additional context information could be included in a phonebook.

A study strongly indicated that it is useful to have information about the connection state, the availability or location of the potential communication partner available before making a call. From our experience with the prototypical implementations and from our interviews we can see a benefit for the caller as well as the potential receiver of a call. It is quite interesting that a great majority of people is willing to give some information away to get these new services.

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