Lightweight Selective Availability in Instant Messaging

Mirko Fetter, Julian Seifert,
Tom Gross
Faculty of Media
Bauhaus-University Weimar
Bauhausstr. 11, 99423 Weimar
<firstname.lastname>(at)medien.
uni-weimar.de

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Abstract
Selective availability in instant messaging can improve connectiveness while at the same time keeping disruption low. In this paper we report on an experience sampling study of selective availability in instant messaging to inform the design of lightweight mechanisms with little user effort.

Author Keywords
Computer-Supported Cooperative Work; Computer-Mediated Communication; Instant Messaging.

ACM Classification Keywords
H.5.2 [Information Interfaces and Presentation]: User Interfaces — Graphical User Interfaces, User-Centred Design; H.5.3 [Information Interfaces and Presentation]: Group and Organisation Interfaces — Computer-Supported Cooperative Work.

General Terms
Human Factors.

Introduction
The acceptance and adoption of computer-mediated communication technologies such as instant messaging (IM) in various contexts such as family, friends, work entails more availability of users. This availability

comes at the cost of increased disruption. Online states in IM (e.g., *Available, Do Not Disturb*) communicate the users' availability and can reduce disruption.

The basic assumption of most IM systems is that users only have one availability state for all contacts. In this paper we argue for *selective availability:* the opportunity to have distinct sets of contacts with specific availability. For instance, at work users could be available for interruption by colleagues, but not available to their private friends. Patil and Kobsa [12] found in their study that users in fact are selectively available. They give an example where subjects reported to use different IM accounts for personal and work-related contacts for specific availability. Also Davis and Gutwin [3] argue for 'a richer range of differentiation' for information disclosure in IM systems.

Managing this selective availability entails additional effort for users. In our PRIMIFaces IM infrastructure [6] users can create groups of contacts and assign specific availability states. They reported considerable effort in keeping their online states up-to-date. *Lightweight* mechanisms capture users' current needs for selective availability and adjust selective availability accordingly.

There has been great research on availability for interruption while keeping user effort low through detecting users' needs based on sensors and probabilistic models [5, 9].

In this paper we report on a four-week experience sampling study, in which we collected context data with sensors and with user labels about their respective selective availability. The study *aims to inform* the design of lightweight selective availability.

Study

We did a long-term exploratory study to get impressions of the users' selective availability management and its effort in order to inform lightweight mechanisms for it.

We recruited four subjects (male, between 25 and 33 years) with long-term experience with IM and particularly Skype. From a pre-questionnaire we found that three of them used IM several times a day and one 3-4 days a week. They had 4 to 15 years experience with IM use and used 2 to 6 different IM accounts with in mean 61 contacts over all accounts (SD=23.4). With 11.2 of those contacts they communicated in the last three months (SD=2.5).

The study was done in form of a four weeks long experience sampling including a short questionnaire upfront and a short semi-structured interview afterwards. Derived from social psychology the Experience Sampling Method (ESM), [2] captures an individual's reaction to experiences in the moment they occur. In HCI—and most prominently in ubiquitous computing—ESM was adapted in different ways: for in-situ evaluation in the design phase [10], for Context-Aware Experience Sampling (CAES) by leveraging ubiquitous computing technologies [1], and finally for getting labels for the hidden states of computer users in order to build predictive models with means of machine learning by combining the sampled data with data from sensor logs [8].

For the ESM we used the PRIMIFaces IM infrastructure with a PRIMISensorDaemon and a PRIMISensorSuite installed on the subjects' laptop computers, all running Mac OS X. The PRIMISensorDaemon builds a basic infrastructure that, inter alia, allows loading of sensors via a plugin mechanism, the configuration of these sensors in respect to sample rate, quantisation level, etc., and the persistent collection of sensor data in the form of a daemon process. The PRIMISensorSuite comprises a variety of 30 sensors for monitoring software (e.g., application in user-focus, calendar entries, unread email count) and hardware (e.g., connected devices, voice activity detection, battery status, wireless networks) states and events. The software is mainly implemented in Java with most of the sensors making calls to native functions, scripts or applications in order to get the necessary information from the operating system.

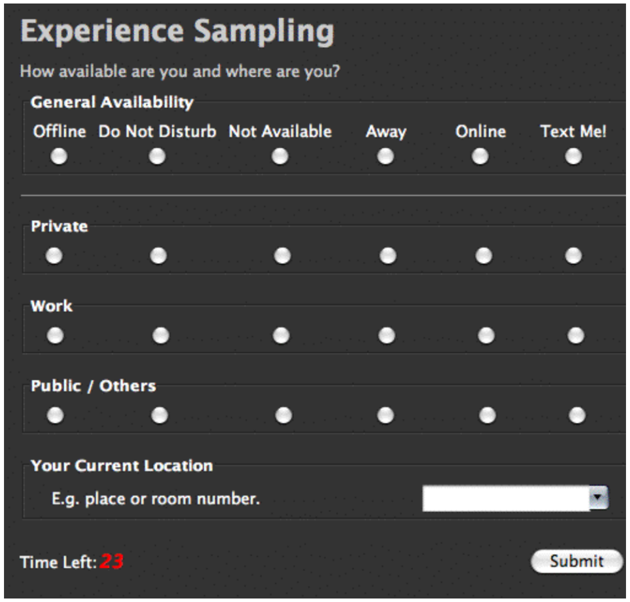


Figure 1. Popup window of the ESM sensor.

Although all sensors continuously collected data during the study, we focus on two of them for this analysis. The ESM Sensor randomly collected samples every 25 to 35 minutes starting with a first sample 2 minutes after the user logged into the computer or after the computer awakes from sleep mode. In order to collect the sample data, a popup window was presented to the user (cf. Figure 1). It appeared and remained in front of all open windows. A countdown timer gave users 30 seconds to start interaction with the window. If the window was clicked, the countdown was stopped and the users could take their time to fill out the form. By clicking the Submit Button the window was closed. If users did not react to the window (e.g., because they were away from their computer), the sampling was rescheduled to appear repeatedly in five minutes intervals until the users filled out and submitted the form and the sampling continued in the random interval. Additionally, a Skype sensor constantly collected data on the Skype use (e.g., online status was captured in one-minute intervals).

In a form users could state their current availability and location. Subjects were briefed that availability was defined as their current willingness to receive and respond to incoming IM messages from contacts. Also, we suggested the subjects that they use six Availability Levels (AL) that are ordinal with respect to the amount of time it takes until a communication request is answered. The six ALs (sorted by decreasing overall availability from 6 to 1, and with deliberate similarity to Skype) were:

- *Text Me!* (6): User has a desire for communication and is going to answer immediately.

- *Online* (5): User is ready for communication and is able and willing to answer within a short time.
- *Away* (4): User is loosely occupied by a task and answering will take time.
- *Not Available* (3): User is deeply engaged in an ongoing task and answering will either take considerable time or be refused.
- *Do Not Disturb* (2): User is online but will not answer.
- *Offline/Invisible* (1): User is offline and incoming communication requests will not be ignored.

In order to facilitate the management of selective availability, we introduced Availability Categories (AC). An AC is a set of contacts, for which a user is available in the same way (e.g., work colleagues might be in one AC with full availability while in office). In order to make the result comparable and keep overall effort limited we pre-defined three ACs, which resulted from our previous study: The AC *Private* refers all those contacts to which the subject has a personal close relationship. The AC *Work* corresponds to all contacts to which the subject has a work-related relationship. AC *Public/Other* contains all contacts that do not fit in the previous two such as old school mates, former project members. Due to the fact that users frequently have multiple connections with each other [7], users can have an individual contact in one or more ACs (e.g., a contact that is a colleague and friend).

Each time subjects were asked to state their availability in the experience sampling, they were asked to do this for their General Availability, as they would do in their current IM application. And they were asked to give a statement on their availability for the three ACs (cf. Figure 1).

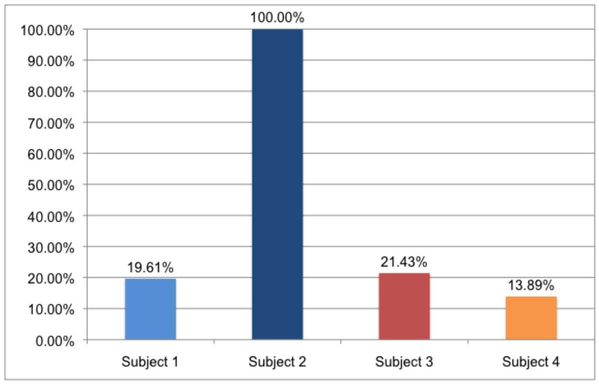
After the four week experience sampling the data was collected from the subjects' computers, analysed, and each subject was interviewed. The results are presented in the following.

Results of the Study

From the ESM we collected 1353 samples in total, which are 338.2 (SD=171.2) samples per person. Among the reported geographical locations were their office, home, colleagues' offices, meeting rooms, lecture rooms, and labs. The samples were taken at 4.8 (SD=2.2) locations. For all subjects in mean 76% of the samples were recorded at one dominant location (i.e., their office).

In the interviews the subjects stated that they sampled during different activities. Among those were work-related activities like programming, text processing, participation in meetings, lectures; and private activities like watching a movie on the couch at home.

In order to explore subjects' selective availability management we counted the number of samples with divergent ALs over the ACs. We found two types of users: three of the subjects differed in 18.3% (SD=3.9) of the samples, one subject differed in 100% (cf. Figure 2A). Yet, also for the first type of subjects we could identify that at some of their locations the need for selective availability was high (cf. Figure 2B). These results were reflected by answers in the interviews. An interesting finding was that the first type of subjects estimated their selectivity higher than the measured 18.3%. One of them stated, 'in most situations I

A) 

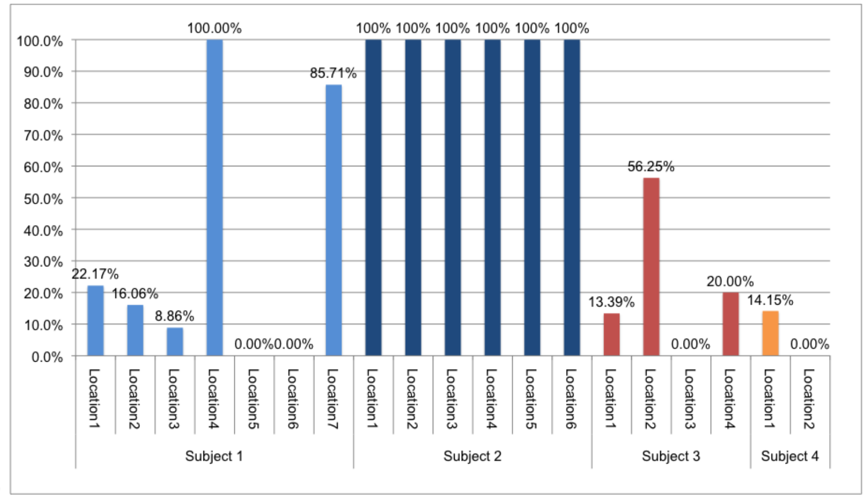
B) 

Figure 2. A) frequency of Selective Availability in percent per subject; B) frequency of Selective Availability in percent per subject per location.

treated work and private equally […] but for public I mostly chose at least one AL lower'. Furthermore, when we discussed the measured 18.3% with them, those subjects pointed out that in these situations using heterogeneous ALs for their ACs we important for them. One subject also noted, that he would make more use of selective availability, if he could set up his own ACs, what would allow him a finer grained selective availability. We also found that in almost all cases (in 97.6% (SD=2.6)) at least one AC was the same as the General Availability.

Further, we compared how often the General Availability status matched the status that was selected in Skype. This was true for only 41.5% (SD=16.8) of the samples over all subjects. Overall the Skype status was changed only at 6.9% (SD=3.8) of the total samples while General Availability with 31.6% (SD=11.4) of the samples changed more often. This was reflected in the interviews, where the subject stated that they rarely adapted their Skype status. One subject stated he hardly ever adapted the status, but sometimes in a meeting, when a message came in, he became aware of the inappropriate status, and changed it to Do Not Disturb. Yet, he added, that most times after the meeting he forgot to change the status back. Another subject responded that he became more aware of his online status during the study and started to adapt his Skype status more often.

Discussion and Conclusions

From the study results we can derive two insights. First, IM systems should provide selective availability. Our findings show that at least in some situations users have a strong desire for selective availability to different groups of contacts. Second, we conclude that the continuous manual adaptation of the availability states in today's IM systems is too tedious and often results in outdated online states.

There are related studies, also exploring users management of their availability for interruption. For instance, Hudson et al. [10] used a sampling approach in combination with qualitative interviews of the availability of 12 managers for one week. Other studies were done to inform system design for managing general availability. Fogarty et al. [4] did a shorter study on availability for interruption with four subjects who could verbally answer or hold up their finger to indicate their interruptibility for one location on a five-point scale from 'Highly Interruptible' to 'Highly Non-interruptible'. Horvitz et al. [8] used and experience sampling based approach to measure the cost of interruption where the subjects could state if they are busy or not. Finally, Lederer et al. [11] also suggested selectivity, applying for information disclosure, rather than availability.

The reported study helped us to get a better initial understanding of users needs and requirements for selective availability, its effort and the need for lightweight mechanisms. Further studies with a bigger sample size and pre-defined as well as user-defined ACs are needed.

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