Look Ma', My Homepage is Mobile!

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Abstract

Much of the ongoing research in ubiquitous computing has concentrated on providing context information, e.g. location information, to the level of services and applications. Typically, mobile clients obtain location information from their environment which is used to provide "locally optimal" services. In contrast, it may be of interest to obtain information about the current context a mobile user or device is in, from a client somewhere the Web, i.e. to use the mobile device as an information service provider.

As an instance of such services we propose the metaphor of a "location-aware" Web homepage of mobile users providing information about, e.g. the current location a mobile user is at. Requesting this homepage can be as easy as typing a URL containing the mobile user's phone number such as `http//mhp.net/+49123456789` *in an off-the-shelf browser. The homepage is dynamically constructed as Web users access it and it can be configured in various ways controlled by the mobile user. We present the architecture and implementation and discuss issues around this "inverse" ubiquitous computing example.*

Keywords: *context information, location, ubiquitous computing, mobile computing, homepage, mobile phones*

1 Motivation

Currently, we are experiencing the tremendous success of SMS (Short Message Service) on mobile phones. The underlying technology can be characterized as a "limited version of email". Nearly the same applies to the WAP technology (Wireless Application Protocol), as displaying content is restricted and navigating the Internet burdensome. Nevertheless both are[1] successful. Why?

Possibly, one of the reasons for the success of SMS is the fact that the recipient of an SMS-message is reachable most of the time and can answer instantly. Nearly the same factors apply to the usage of WAP. The actual display resolution is less important than being "online" while being mobile, even in the bus or a café. Mobility, reachability, and ubiquitous access to data and information is important for the success of new emerging technologies in the field of mobile applications. Moreover, especially young people are beginning to define themselves over some representation in the virtual world of the Internet. Having a homepage is of great importance and presenting information about the own personality, e.g. interests or hobbies, is mandatory.

In the future, a problem might be that homepages are usually hosted somewhere by an Internet Service Provider (ISP) and referenced by an URL relative to the ISP and not relative to the person presenting him- or herself. This might be generating a feeling of "separation from the oneself" when providing or accessing homepages and might be experienced as somehow awkward and unsecure.

Given this, one can identify a *mismatch* between the highly personalized communication pattern of mobile telephony and -messaging and the identification with the own "virtual identity" on one hand, and more or less static content plus the non-personal addressing schema of homepages in the Internet on the other hand. In addition, usually a person has no information about *who* is accessing the homepage which might be very important for

[1] or said to become...

various social situations.[2]

This analysis leads to our thesis that a homepage in the Internet should be more personalized by means of representing information related to the activities a person currently is engaged in and the context of a user in the physical world. Moreover, mechanisms are desirable to personalize the access to user-related content in the Internet.

We present a system using a Web server running inside a mobile phone which brings the appealing ubiquitous features of SMS messaging to the world of Internet homepages: The homepage itself is getting mobile. The current view on Web-centric information access is focused on making Web applications mobile. Our approach inverses this view by making the *Web server* mobile which can be accessed by mobile or static clients, as well.

This Web server is used to enhance Web pages dynamically with context information collected by the mobile and brings the virtual presence of a user near to the physical presence. Applications of this approach might be a more personalized communication when calling a person on his or her mobile. The caller can estimate where the communication partner currently is by accessing his or her homepage which might be beneficial due to the additional information presented there. Just to give a short example: A potential caller can figure out that a person who is not in town cannot be met for a drink. Moreover, when calling this person, the caller does not have to ask where the other person is right now (which is part of the conversation often). On the other hand the system can be configured to ask the user of the cellular phone if access to personal information is permitted at all. This is a major enhancement as access can be permitted to one group of users, e.g. your family, and denied to others (e.g. your boss) on an personalized level.

2 The Mobile Homepage

The mobile home page system is built on top of an implementation of small Web server inside a Subscriber Identity Module (SIM) [1] of the Global System for Mobile Communication [2]. The SIM is a smartcard issued by mobile operators, which usually acts as security module in the GSM authentication protocol. This server called *WebSIM* [3, 4] is implemented as a Java applet in the SIM smartcard. Communication form the Internet is achieved by a so-called *proxy server* that (a) acts a gateway from the Internet to the GSM world, and (b) implements many of the functionality needed for the provision of mobile users' homepages. HTTP requests are tunneled within SMS messages sent from a mobile phone attached to the proxy to the WebSIM. The overall architecture is shown in Fig.1.

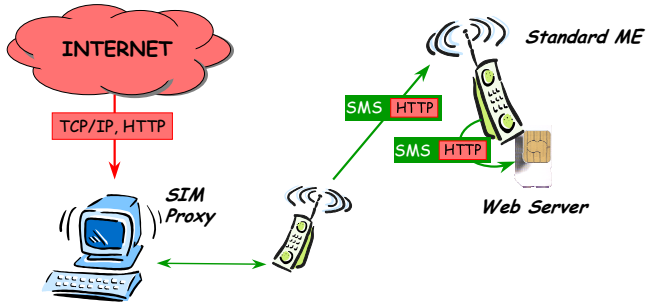

Figure 1. Tunneling HTTP over SMS

The Mobile Homepage WebSIM is an extension of the standard WebSIM that supports an additional URL of the form `GET /st/mhp/caller=name`. After incoming HTTP requests are parsed, the "commands" encoded in the URL are executed and the responses are sent back by SMS to the proxy. This command executed on the server returns a document of type *application/mobile-homepage* that describes in a very compact manner the current location of the mobile phone. Due to the structure of GSM this information contains (a) the country, (b) the operator network, and (c) a location information octet depending on the network. In addition a set of values is returned that can be configured by the mobile user and stored in the SIM. Overall, the returned information must fit into the 140 octets payload of standard SMS. Round trip times are about 10 seconds at average.

The current implementation operates in two modes controlled by the phone owner: (a) the information is served without interaction, or (b) the mobile user is shown a simple menu asking the mobile user, whether the request should be answered or not (see Fig. 2). The returned homepage is dy-

[2] Especially when you are young.

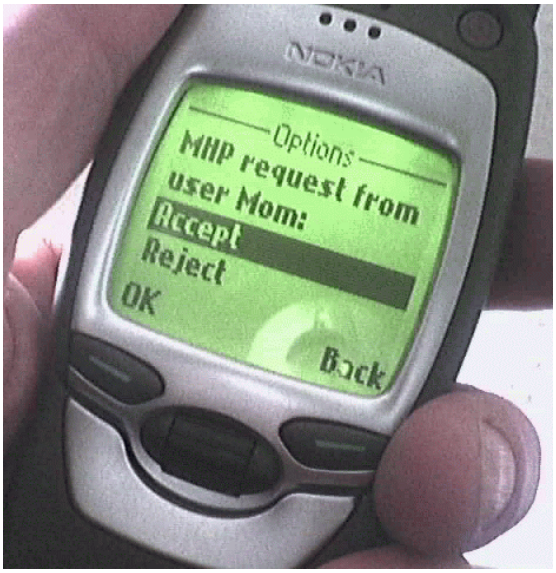

Figure 2. Homepage Menu on Mobile Phone

namically constructed from a homepage *template* that a mobile user personalizes arbitrarily. This template may include variables such as `$COUNTRY`, `$NETWORK`, `$AREA`, `$ITEM[`n`]` (addresses the configurable set of values from the phone), etc. The information returned in the response sets these variables and the template substitution takes place. Additionally, mappings from network and location information to coordinates and textual description of the location are maintained, which are accessible by other variables. We have implemented a database, mapping the location information octets available in our hometown to textual descriptions an city area maps for demonstration purposes. Hence, a mobile homepage template could look as follows:

```
<html><title>Homepage of Dad</title>
<body><h1>I'm Dad</h1><p>
I'm currently in $COUNTRY, somewhere
in $AREA. Have a look at this
<a href="$MAP">map</a> to see where
I am. Currently, I'm in $ITEM[3].
```

Here `$ITEM[3]` could, e.g., replaced by "a Meeting". Each mobile user has the ability to upload his/her homepage to the proxy and to define a password file containing user names and associated passwords. Web users are required to authenticate by means of HTTP basic authentication, i.e. standard Web-based login procedures.

3 Conclusion and Future Work

We have presented a system for providing mobile homepages of mobile users to Web users in the Internet. These homepages are dynamically adapted to the context a mobile user is currently in, such as location information or configurable text blocks describing the situation, such as being in a meeting.

There are many obvious issues that could be improved such as response length, access control, user interaction, etc. The main reason for this is the poor functionality of current mobile telephony with respect to bandwidth and protocols of the mobile on one hand, computational power and memory size of a SIM on the other. In the future mobile phones may allow for implementing a Web server that hosts more context data and other information and may offer a better user interface for configuration purposes.

Despite our system is restricted in its functionality we consider it as a valuable "proof-of-concept" for assessing and evaluating the concept of mobile homepages. We hope to have given another view on ubiquitous computing, asking what services mobile users themselves can offer to potential clients, and not vice versa.

References

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