Telio – Presence data and Fixed Mobile Convergence

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1 Introduction

1.1 Background for project

This report is the result of a student project done in the course INF5261 in spring 2007. The work was carried out in close relationship with, and under the guidance of, representatives of Telio AS. Telio is an IP telecommunications company listed at the Oslo stock market.

According to the company, and industry expectations, the upcoming trend in the telecommunication market will be the alignment of all major communication networks over technology currently used for data traffic on the Internet. The first effect of this trend is the current substitution of fixed-line telephony with Internet telephony using broadband communication. Mobile manufacturers now offer mobile phones that can do Internet telephony. The aim of Telio is to offer their users a seamless communication medium no matter what terminal they use. The move towards this future, the integration of data, voice, and video over a single network medium, is by the industry called Fixed-mobile convergence (FMC).

As part of work preparations the student group produced a wonder document listing research topics of interest [Wonder, 2007] within the area of FMC. During our contact and further discussions with Telio the research topic was narrowed down to presence data as a way to enhance and communicate user context. The scope of the research topic can be described as:

“Using mobility scenarios: identify and illustrate how presence and location data can communicate user context information, sustain user privacy, and add user value”

1.2 Presence – a review

Previous research carried out in computer media and design shows the power of presence information [Lombard et al., 1997]. However, in the area of mobile applications the amount of work has been more limited. Given that research communities of telecommunication and computer science have traditionally had little overlap this situation is understandable. Current telecommunication research into the role of presence information on mobile terminals has been driven by technology manufacturers [Nokia, 2004], [Ericsson, 2004]. Much research
follows the use of presence in successful instant messaging, a computer based chat system. Recreating such successful applications and services on mobile terminals is not trivial. The understanding of presence as viewed by the industry seems to be more technology minded than in other research communities. One industry definition is: “a presence service is any type of service which shares information about user’s status with other users... (such as location, user-defined schedule or preferred contact method)...”, [Nokia, 2004], [Lucent, 2004].

Other researchers, from the area of computer science, define presence to be a broader concept present in virtual experiences. Virtual experiences would be sensory or non-sensory experience of virtual objects. Using this approach El. Sawy et al. defines presence to be: “A psychological state in which virtual objects are experienced as actual objects in either sensory or non-sensory ways” [El Sawy et al., 2005]. According to their research some of the design fundamentals are wrong as presence on mobile terminals are misunderstood and misapplied. Their findings call for more emphasize on how mobile terminals, given their limitations, inherent advantages, and seamless medium, can provide increased user experience in a mobility context. Exploiting such advantages can extend the user experience by enhanced social interaction, improved personalization, and greater service efficacy.

Extensive research has been performed in the area of context-aware applications and pervasive computing [Charri et al., 2006], [Schilit et al., 1994]. The use of context-awareness and presence is not necessarily the same in the telecommunication community. The industry seems to think of context awareness, as more application specific, while presence is everything from presence infrastructure technology providing seamless connectivity to online/offline application status [Vincent, 2005]. It can be argued as done by Kakihara et al. that the context of the situation is as important for enhanced user experience as where and when it is taking place [Kakihara et al., 2001]. According to their work the mobility concept must be expanded beyond geographical mobility into social interaction. Work done by Harrison et al. on collaborative systems identifies that presence information and awareness of others helps the user complete activities by more seamless and efficient collaboration and communication [Harrison et al., 1996]. These findings give weight to the suggestion that detailed situational awareness increases the value of virtual social interaction.

Presence information can be further enhanced using local awareness [Carboni et al., 2004]. Here work is done using mobile phones with location awareness provided by built in GPS
technology. Location based presence is required to exploit and support location based activities in addition to seamlessly show changes of presence and connectivity. It can help social interaction by increased presence accuracy and enriching personalization.

Earlier research done on non-mobile systems shows that presence can mediate extra value for the user of the system [Lee et al., 2004]. Increased presence information on mobile terminals should therefore increase the value of the service to the user.

To illustrate presence related services, some examples are given in the table below:

<table>
<thead>
<tr>
<th>Consumer</th>
<th>Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Safety* (All)</td>
<td>Business Safety* (All)</td>
</tr>
<tr>
<td>➢ E911</td>
<td>➢ Employee Safety/ Safe-Zone</td>
</tr>
<tr>
<td>➢ Medical Alerts</td>
<td>Monitoring</td>
</tr>
<tr>
<td>➢ Amber Alerts</td>
<td>➢ Business Asset “Geo-Fences”</td>
</tr>
<tr>
<td>Family Security (Parents)</td>
<td>➢ Executive “Ethics” Monitoring</td>
</tr>
<tr>
<td>➢ Family Locator</td>
<td></td>
</tr>
<tr>
<td>➢ After-School Monitor</td>
<td></td>
</tr>
<tr>
<td>➢ Teen Tracker; Truancy Monitor</td>
<td></td>
</tr>
<tr>
<td>➢ Child Finder</td>
<td>Field Sales Force Management</td>
</tr>
<tr>
<td>➢ Pet Tracking</td>
<td>Field Technician Dispatch; Map</td>
</tr>
<tr>
<td>➢ Special Zone Tracking (Wi-Fi/Location)</td>
<td>Forwarding, Routing</td>
</tr>
<tr>
<td>1. Shopping Malls</td>
<td>Fleet Management; Pickup/Delivery</td>
</tr>
<tr>
<td>2. Public Events</td>
<td>Routing; Vehicle Management</td>
</tr>
<tr>
<td>3. Zoos</td>
<td>Office Presence (Location Plus State, enabling new forms of Business Instant Messaging)</td>
</tr>
<tr>
<td></td>
<td>➢ Facility Finder; Office Finder (Wi-Fi/Location)</td>
</tr>
</tbody>
</table>
### Mobile Games (Teenagers)
- Paintball or “Hide-And-Seek” or “Doom/James Bond”-type games
- Casino Market (”Musical Chairs” equivalent)
- Host of Others

### Social Enablers (Singles)
- Date Finder, Mobile Personals
- Buddy Finder
- City Guide
- Mobile Concierge
- Mobile Wallet

### “Viral” Communities (Many)
- Social General
- Community Specific
- One-Time “Specials” (Sports Events, Concerts, etc.)

### Education (College Admin, Students)
- Location-Sensitive Wi-Fi Partitioning
- Campus Navigation
- Community Connectivity (Location)

### Telemetry (Mobile Professionals)
- Navigation Assistance
- “Lo-Jack” Equivalents
- Near-Miss Alerts

### Telemetry (Businesses)
- Asset Security/Tracking
- Geo-Fences

<table>
<thead>
<tr>
<th>Telemetry (Mobile Professionals)</th>
<th>Telemetry (Businesses)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driving Directions, Navigation Aids, Weather Alerts, Road Assist (e.g. find gas)</td>
<td>Navigational Aids, Travel Assistance, Weather Alerts</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobile Games (Teenagers)</th>
<th>Vertical Industries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paintball or “Hide-And-Seek” or “Doom/James Bond”-type games</td>
<td>Medical (Wi-Fi/Location)</td>
</tr>
<tr>
<td>Casino Market (“Musical Chairs” equivalent)</td>
<td>Railroad Utilities (Rail Car Locations)</td>
</tr>
<tr>
<td>Host of Others</td>
<td>Shopping Malls (Wi-Fi/Location)</td>
</tr>
</tbody>
</table>

### Table 1. Examples of application areas that could use presence information

Yellow Pages (Many Permutations, such as ATM finder, Restaurant Finder, All the various shopping scenarios, etc.)
(Business) Yellow Pages (Many Permutations possible, including specialized YP per verticals above)
1.3 Selecting the user scenarios

In an article presented by Kenton O’Hara et al. called “Everyday Practices with Mobile Video Telephony” [O’Hara et al., 2006], a case study is done to look at the use of mobile video in different context. After studying 21 participants in the U.K in 2006 over a 5 week period they concluded that mobile video was for a niche marked. But they also saw that the marked could be increased by overcoming some important barriers to video call opportunities.

This article could easily be transferred to other new technologies, as FMC. As there are few services regarding context for presence, scenarios would give us an opportunity to look at different users in different perspectives, and give an overview of how a technology like this could survive in the market. Could it become more than a niche? [O’Hara et al., 2006]

To illustrate and identify aspects of user contexts and how presence and location based information can enhance the user experience we have selected the following 5 scenarios:

- The fresh computer science student (Innovator)
- The young CEO of a new tech firm (Early adaptor)
- A female professor at the faculty of informatics (Early majority)
- The farmer (Late majority)
- Laggards

The personas used in the scenarios are representatives of consumer groups according to adopter categories for technology diffusion. The category "laggards" is not a user scenario as they will adopt the technology at a late stage and are not relevant in this research study. The S-curve of technology diffusion describes how the diffusion of innovations spread out into the population [Schilling, 2005].
Figure 1. Rate of technology diffusion

2 Understanding user context challenges

2.1 Context-awareness

Context-aware applications can be thought of as applications that try to support the user in carrying out tasks exploiting personal and domain data of the given situation. Schilit et al. describes it as: “Context-aware computing applications examine and react to user’s changing context in order to help and promote and mediate people’s interaction with each other and their environment” [Schilit et al., 2002]. From a mobility point of view the act of context-aware communication is significant. Following Schilit et al. it is possible to define context aware communication as: “the class of applications that apply knowledge of people’s context to reduce communication barriers”.

Different researchers have tried to build representations of the user context to be able to make judgment about which pieces of data are involved, and to understand the use of context information in a better way. Tryfona et al. describes a framework for identifying and
categorizing user context data [Tryfona et al., 2005]. According to their work on data
semantic of location based services, context information can be categorized into several
groups; Domain Data, Content Data, and Application Data. Content and application data
describes specific service data and location service setup data. Domain data are data related to
spatial and temporal dimensions of the user situation.

2.2 User context in Location-based services

The applicability of location based services (LBS) for users is dependent on the availability of
relevant information about the user context. The domain data model of such a service would
describe information related to an object’s position, location, movement and time. These four
aspects can be considered as fundamentals aspects defining a location based service.
Understanding the semantic of location versus position is also important. Position can be
thought of as an absolute, accurate geographical point while location can be thought of as a
sphere of interest available or viewable from that point [Tryfona et al., 2005]. Furthermore,
movement versus waiting can have significant impact on the task at hand for a user. Finally,
judging the significance of passing of time versus task progress and user control in scenarios
are also important usability features.

3 Presence and Location-based services

3.1 The Concept of presence in the world of FMC

The convergence of network communication standards is a prerequisite for the ability to
provide coherent, advanced, user services based on presence characteristics. The user will be
able to offer presence information through all their available devices such as fixed-phone,
mobile phone, soft-phone, and other more advanced IP based terminals.

There are several advantages for both caller and receivers in the future [Vincent, 2005]. First,
the receiver could always show his or her preferred presence to a potential caller. This
presence can be understood as the presence context of the receiver at any given time. Second,
it could provide the caller a way to efficiently decide the best communication interface
offered by the called party.
3.2 How Location can make a difference

Location-Based Services (LBS) can provide an enhancement of context based presence information by offering actual geographical positions into the communication. Many calls take place during “dead time”, like when traveling, e.g. with the metro. Tracking GPS coordinates, speed and direction might easily reveal when you are traveling and automatically change your status to e.g. “available for chit chat”. With this status visible to your friends, they might contact you if they also try to pass “dead time”.

3.3 Presence with LBS outdoors

BiM Active [Bim Active Mobile], a service for outdoor enthusiasts, re-purposes the mobile phone into a portable life recorder that can be taken with you to enhance outdoor activities and enable sharing personal location and relevant information with others. Lifestyle Applications like BiM Active utilize the GPS coordinates, speed and direction to log all outdoor activity and the user is able to upload all data from e.g. a jogging trip, and share that information with other enthusiasts. By constantly sharing you current whereabouts, we also get a presence service – were you at any time can see your movements on a map.

Fitness walking, running, cycling, hiking, mountain biking, GeoCaching, and other outdoor activities are part of a growing community that would enjoy a presence service that automatically detect and change your current profile and status. So that while out jogging, you mobile might be automatically set to silent – not to disturb your trip. And your status might be set to jogging, so that people trying to reach you might understand why you are unavailable – and know that in about 30 minutes your status should change again. By analyzing speed and location, the status can be changed to jogging if the speed range is correct for some minutes along with a location outside normal traffic roads. For status to change to cycling, speed has to be higher – while walking is around 5 km/h.
3.4 Presence in a micro environment

The use of location aware technology in mobile terminals such as GPS has some limitations. Typically, dense city centers with tall buildings and indoors environment limits the usability of signals from the above satellite systems. However, Bluetooth technology can provide a solution to this problem indoors.

Bluetooth solutions have several advantages with respect to wide adoption. It is cheap, it is accurate in a micro environment such as a building, and it has a framework for handling privacy issues [Huang, et al., 2004]. It allows the user to control the amount of presence information distributed to other users such as identity. The user location is not automatically tracked but dependent on explicit consent.

Today, many home environments provide wireless LAN networks for use with personal computers. The combination of wireless LAN and personal, or micro, Bluetooth zones provides interesting perspectives for users. Given micro location capabilities at room level accuracy or beyond, mobile terminals connected to the wireless home environment could exhibit room awareness and increased user context relevance.

3.5 Technology limitations

The Global Positioning System (GPS) is currently the only fully functional Global Navigation Satellite System (GNSS). Position signals travel by line of sight, meaning they will pass through clouds, glass and plastic but will not go through most solid objects such as buildings and mountains. Therefore, such an LBS service will have limitations in populated cities and indoors – locations that often would call for a different presence.

Another disadvantage of today’s GPS receivers is the energy consumption, allowing mobile devices to work only 5-6 hours before needing battery replacement or recharging. This might change in the future.

The Global System for Mobile Communications (GSM) is the most popular standard for mobile phones in the world servicing 2 billion people in is used by more than 200 countries. By using triangular GSM base localization, based on signal strength from available GSM base station cells, it's possible to calculate a device's position down to an area of about 100 meters in highly populated areas. However, in less populated areas with fewer base stations and longer distances to each base station, calculations are less accurate. This kind of positioning is
being used commercially today [Bryhni]. Studies have shown that positioning might be more accurate than what is commercially used as of today [Varshavsky, A. et al., 2006].

3.6 Presence and user privacy

The potential privacy problems for presence-context based services are a big concern. One of the biggest concerns is that it can be possible to get a very detailed picture of a user's movements if they are using a wireless mobile device [Steinfield, 2002]. There is a potential for abuse of rights on users in different categories, mildly irritating (like advertising from shops) or serious and even dangerous situations. Criminals might check houses if they're empty, or people living in danger might be easier to locate. It is an area that has several important issues to look at.

Some principles to guide the provision of online services with focus on LBS is [Beinat, 2001][Langheinrich, 2001]:

- Notice the user about what information is collected and how it will be used and stored. Also who will have access and what options they have regarding different services?
- Users should have a choice to decide about their location use.
- Consent. A written contract should be signed from the user, so the operator can't give away any information openly
- Access. Full control on who has access to location based data-
- Anonymity. Users should keep their identity anonymous if they want
- Security. Information stored must be accurate. All information about users should be under secure conditions.
4 User scenarios

4.1 Personal communication of the future

The aspects of social networking are growing. Online services like Myspace, Facebook and different blogging tools are available for everyone, and are continuously growing in popularity. The reason for this is that it’s easy to adopt, and available. The most frequent reason for slow service acceptance in the past has been the difficulties in using and accessing new services [Wagner, M., et al, 2003].

![Diagram: Vision of Mobile personality in systems beyond FMC](image)

Figure 3: Vision of Mobile personality in systems beyond FMC [Wagner, M., et al, 2003].

For future applications to succeed and especially regarding mobile phones, it’s important that new services are intuitive and that the users convenient access to the services they personally need. To discuss how mobile services can become more intuitive, convenient a valuable for users the rest of this section 4 looks at user scenarios. For a quick overview of the scenarios see section 1.3.
4.2 Innovator: The fresh computer science student

He is fascinated by the potential and all the “cool” things that can be done with new technology. The idea of automating processes is exhilarating, so this student is particularly interesting in using presence to its full capability. He doesn't need a manual, and no matter how many features exist – it will never be enough.

So, being the typical innovator – he tries to automate every thinkable profile changes using context information. His first change was modifying the ring tone from being increasing and fairly low indoors, to being automatically changed to high ring tone and vibration while outdoors using context awareness [Korpipää, P. et al, 2003].

The next thing he would do is to identify all the nearby bases to his home and university, so that he could make specific profile changes to those two areas. While at University he is mostly in class, so the ring tone should be turned off and only the vibration will be active in case of a call or message. While at home, the phone is typically on a table so there is no need for vibration. Because of having identified two geographic locations, his online presence available to all his friends should reflect his location being university or home. After some time he got a bit annoyed by the phone being silent even when going to the local pub at campus, so he decided to use a single entry point positioning system instead – that would detect when he enter the university building [Salber, D. et al, 1999].

4.3 Early Adaptors: The young CEO of a new tech firm

This guy have founded this own tech company, and with a lot of investor money and employees – he have found himself running from meeting to meeting, keeping a high-paced and hectic day. Seeing the potential of how active use of presence can help him manage his day better, have made him one of the first early adaptors of this new feature – and at the same time keep him from doing embarrassing mistakes like forgetting to turn off the sound on the mobile phone before entering a meeting.

This founder have like our student put up a single entry point positioning system that detects when he is entering and leaving the office [Salber, D. et al, 1999] – so that the phone automatically enter silent mode (only vibration) avoiding those embarrassing moments. Like most business people, he has a smart phone that constantly synchronizes with Outlook – not
just email, but also his calendar and scheduled meetings. While out traveling, the phone automatically switches to silent while at those scheduled meetings. The founder typically uses the bus for going home, and sometimes he ends up taking the bus during rush hour. It is a 5 minute walk to the bus stop, and during the rush hour the bus might be as much as 10 minutes delayed. On the way to the bus stop, he passes both a cafeteria and grocery store. He decides to use his context information to know the closest stopping spot where the bus is currently located with an estimated arrival time. He discover that there is a number of wireless network that he pass when leaving the work, so he add them all as triggers and program the device to bring up a web page with the desired information along with a notification sound and vibration. With one limit, that the information will only be shown during rush hour – so that he will not get the web page while arriving at work. Doing this, he often realizes that there is time to enter the cafeteria or grocery store, and some times even both.

Using the same method, he is able to update his online presence with “Drinking beers” – since there is a wireless network at the local pub that he sometimes go to with his colleges. He passes the same pub on the way to the bus, so he put a limit on consistent signal for more than 5 minutes before his presence is being updated.

4.4 Early Majority: A female professor at the faculty of informatics

This professor is in her forties, and besides teaching technology subjects, she enjoys using technology to enhance her own life quality and make everyday life a bit more interesting. She has for a long time been reading about how presence opens up a new world of possibilities, and one day she decides to start using this on her cell phone. After reading the user's manual, she manage to set up the presence application included in her cell phone and soon feels familiar with the most important functions. She configures her presence information to automatically show "At work" on weekdays 08 - 16. Traveling between home and work she spends 40 minutes using public transport, and decides she wants to be "Available for chat" during this time. When she arrives home she enjoys dining with the rest of the family, catching up on each others daily activities. She hates interruptions at this time of day, and the family has agreed to set their mobiles in silent mode or turn them off. She configures her phone to show "Family activities" from when she usually gets home till after the news at 19.30. Then she wants to be "Available for chat" for the rest of the evening until she goes to bed at 23.30.
The approach of a statically configured presence status reflects her availability quite well for her weekly tasks. In addition she also updates her status manually when needed, especially during the weekends, when no regular activities are configured. Some of her friends use presence enabled cell phones, but most don't. Therefore, people are still calling when she's busy. And even worse, some people actually being able to view her presence status, just don't care about it and don't respect she doesn't want to be called all day long. She gets quite provoked by this attitude, and after some weeks, she starts turning off her phone, like she did before, when she doesn't want to be called. She soon stops updating her presence status manually, as she realizes that actually, the only thing the presence application does for her, is automatically setting her cell phone in silent mode during dinner time and in the night. As she turns off her cell phone at these moments anyway, presence does not all. She finally decides to disable the presence application. Why broadcast this info while getting nothing back?

4.5 Late Majority: The farmer

The farmer is an old man, and every Friday he has a delivery route where he delivers vegetables to customers in the area, and to some shops. It is always the same route, same customers, just minor changes in quantities, and every now and then a new customer is added. Everything is printed out on paper after his son convinced him to start using a computer for CRM and accounting.

One day a salesman from the CRM service provider offers him a new module. It will tell his customers when he’s on his way to deliver their goods, using presence information based on GPS and GSM triangular positioning. The system will tell his customers about what time he’ll be at their place, and if some customers are not ready for deliver, it will even try to recalculate his delivery route. He’ll just need to buy a SmartPhone with an included GPS receiver. He is quite skeptic, but he takes the offer.

He registers all his customers’ cell phone number on his CRM system and sending out SMS about when he will be there and what the order is. If he’s more than 20 minutes late, the customers will get a message telling them the newly calculated time of arrival.

The first customers that is not satisfied tells the farmer that she received a message that he would arrive an hour before usual so she had to hurry home. But then she got a new message
that he would arrive at the regular time. He gets upset, but the next day his son does some statically configured delivery appointments into the CRM presence module to better reflect his fathers’ delivery routine. He also increases time used for each delivery by 10 minutes, allowing more time for smalltalk with customers. This way the schedule should be more accurate. The new configurations works well, but the customers do wonder if they really need to receive SMS when he’ll be there same time as usual, and he disables this function.

After two months of using the device, most deliveries are statically configured. Almost none of his customers want the SMS warning, unless he is much later than usual.

One day the SmartPhone containing all information about deliveries crashes. The memory card's file-system is messed up, and he has to ask each customer what they've actually ordered. By luck he manage to remember each customer he is supposed to visit this day, but again he doesn't feel comfortable. From now on, he decides, he'll always print his delivery lists and bring them on paper. When it's time to renew the agreement with the CRM service provider, he decides to quit using and paying for the presence module. After all, he mostly does it the old way anyway.
5 Adoption barriers

The various scenarios use different categories listed in the "Technology diffusion S-curve" which describes how the diffusion of innovations spread out into the population [Schilling, 2005]. That way we see how innovators and early adaptors start using the new technology, which is of out-most importance for further adoption in the market. The big questions are if this new technology will cross the chasm, or remain a toy for those specially interested? Our scenarios indicate the latter, something that those technology advanced people will adapt and enjoy - while others might give it a try, but finally give it up due to the endless tweaking necessary to make it work like desired. In addition to all necessary configurations, there are many technological limitations that will cause difficulties for adopting the service. Like in the scenario with the Farmer using the Smartphone, he would need a charger in his car because of the massive consumption of battery caused by the GPS unit - reducing battery life down to 6 hours. The unavailability of GPS signal indoors, and the many minutes it takes to locate your position are also factors that make LBS difficult to get off the ground.

We find the complexity in configuring the service to be the major bottleneck, so while it might be very clear how to want the phone to behave based on various context - actually doing the necessary configuration might become too big of a challenge for most less tech savvy people. This leads to an interesting analogy to the recent study “Everyday Practices with Mobile Video Telephony” [O’Hara et al., 2006] that highlight many of the challenges that new technologies face. While a technology might seem brilliant following the classic assumption that more is better, the article show clearly that many social and practical challenges have to be overcome as well. This is also true for a context service, and given the nature of such a service, with all traffic going through the IP protocol – it should be possible to do remote configuration through your service provider. So that instead using hours trying to figure out all the settings, you just call a five digit number, say what you want and support will take care of the rest. Then the next challenge would be to educate the user about the possibilities.
6 Discussion

The current trend of FMC in the telecom industry will most likely provide consumers and business with new and enhanced mobile services. If mobile communication possibilities develop towards a seamless communication medium, as promised by the industry, many challenges must be overcome to achieve success with the users. This study has used user scenarios as a vehicle to try to identify some of these challenges with regards to context-awareness, presence, location, user privacy, and user value.

Some of the key values that we have discussed are; technology fascination and willingness to explore service capabilities, time management and mistake avoidance, life quality and unwanted interruptions, cost of service and configuration complexity, information overload and increased reliability on computerization. All of these topics can be thought of as aspects of user value. From our discussion on adoption barriers, and work done by O’Hara et al. on social and practical barriers of videophone usage [O’Hara et al., 2006], we see that sometimes it can be difficult to extract the intended user value leaving the user with extra costs in financial, labor, or confidence.

The issue of user privacy is complex and can have many unwanted and potential serious consequences. Inherent in the FMC vision users might traverse many official or unofficial network segments in everyday life. The provisioning of a safe, coherent privacy regime is a major challenge for the industry. Help can be found in the privacy principles drawn up in the work of Beinat, E., and others [Beinat, E., 2001], [Langheinrich, M., 2001]. From a user point of view it is also about controlling the publication of his, or her, own privacy information. The use of context-aware services and presence publication regimes can alleviates some of these challenges from a control point of view. Additional presence and personalization richness could be achieved with the use of location-based information.

Sometimes understanding the mobility context of the user means filtering away all unnecessary information, perhaps working with clue like information, or inaccurate data, while still being of value to the user. Increased understanding of mobility design principles utilizing the advantages of mobile devices as suggested by El Sawy et al. can be of value in this respect [El Sawy et al., 2005]. We also suggest that combining such an approach with a representational framework for identifying and describing the user situation could be fruitful.
Perhaps tomorrow’s communication and social interaction will blur the distinction between the physical and the virtual world. This could lead to a state of virtual “everywhereness” where people interact and communicate like we do in the real world today, but through different virtual world experiences.
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