

FRAMEWORK FOR BUILDING OF A DYNAMIC USER COMMUNITY (EPH) *Sharing of Context-Aware, Public Interest Information or Knowledge through Always-on Services*

Monica Vlădoiu

Department of Informatics, PG University of Ploiești Romania, Bd. București, Nr. 39, Ploiești, Romania

Zoran Constantinescu

ZealSoft Ltd., Str. Tg. Neamț, Nr. 60, București, Romania

Keywords: User communities, social networks, social web, always-on services, context-aware information and knowledge, location-based information and knowledge, information and knowledge sharing.

Abstract: ePH aims to be a framework around a user-centred digital library core that stores regional information and knowledge and that boosts a self-developing community of transnational users around it. The digital library's content will be accessible through always-on context-aware services (location-based included). The users can get it or enhance it, according to their location: at home or office by using a computer, on road with a specific GPS-based device in the car, or off-line, off-road via mobile phone. The digital library will contain: public interest information (drugstores, hospitals, general stores, gas stations, entertainment places, restaurants, travel/accommodation, weather, routes etc.), historical/touristic/cultural information and knowledge, users' personal "war stories" (tracks, touristic tours, impressions, photos, short videos and so on), and users' additions, comments or updates to the content. This content will come alive to ePH users based on their contextual interest (e.g. geo-location). Our plan is to develop (as open source) the ePH system for our county of origin and to provide an easy-to-use how-to recipe to clone it for other regions.

1 INTRODUCTION

Our world is continually becoming more and more complex. New information is added every day to the overall body of existing knowledge. We may say that knowledge is the new global asset – so people have to be continually learning, crafting innovative solutions to changing circumstances, staying informed and responsive. Not only communications change in this new millennium, but also our perceptual response to the world in which we live, our construct of reality, and the nature of knowledge. Through the integration of satellite navigation receivers in mobile phones and in other means of communications, location-based services and personal mobility can be supported. User location is an important dimension in this new data-service world – it has the potential to make mobile services more relevant to users as

information is adjusted to the context (for example, weather information is adjusted to the region one is in) (Schiller and Voisard, 2004). Moreover, the information presented to users should be tailored to their context, being it personal or environmental. In case of a context-aware tourist guide, personal context can include the visitor's interests (e.g. history, architecture), the visitor's current location, attractions already visited and any refreshment preferences one might have. Environmental context could include: the time of day, or the opening times of attractions (Cheverst et al, 2000).

Furthermore, wireless has the potential to transform the e-services in three directions: accessibility, alerting and averting, and updating (Lemon et al, 2002). The increasing use of mobile terminals and infrastructure is making possible to communicate and access information from any location at any time (Hirsch, 2006). The convergence of mobile and web service technologies

enables and accelerates the development of new conceptual models for services (e.g. tracking applications) (Schiller and Voisard, 2004).

In many circumstances, information and knowledge are socially constructed. The IT mediated communication has permitted complex social networks to become a dominant form of social organization (Wellman, 1999). That is why emerging communities of users will play an important role in construction of our evolving Information and Knowledge Society.

We present here ePH, a framework for building of a dynamic user community that share public interest information and knowledge, which is accessible through always-on context-aware services (location-based included). The main objectives of this project are to build a user-centred Digital Library (DL) that stores regional information or knowledge and to boost a self-developing community of transnational users around it. The DL's content will be accessible through contextual services that are always available. In the first stage, the digital library will contain public interest information (drugstores, hospitals, general stores, gas stations, entertainment places, restaurants, travel and accommodation, weather, routes etc.), historical or cultural knowledge, and touristic information about a particular county. The ePH services will be personalized and context-aware (geo-location, around a situation, an idea or an entity etc.).

The core digital library will be user-centred. The users will be allowed to manipulate freely the content for their personal interest. They can get (access) it or enhance (contribute to) it, according to their location: at home or office by using a computer, on road by using a specific GPS-based (Global Positioning System) device in the car, or off-line/off-road via mobile phone.

The users can make additions, comments, or updates to the DL's content. The user-generated content will be personalized, as users can upload their personal "war stories" (tracks, touristic tours, impressions, geo-tagged photos, short videos/audios, impressions etc.). More, the whole ePH system will subscribe to the users' needs, goals and abilities.

Our challenging goal is to ensure the continuity of the service after the project work will be finished. This is feasible by creating a vibrant community that will "survive" to project development ending time. Moreover, the developers aim to start their own community, as they will provide both a quick how-to recipe for building similar "alive" frameworks and all related software as open source.

2 STATE OF THE ART AND EPH

The existent wireless devices (mobile phone, GPS, PDA etc.) give their users access to some public interest information, but that information is static and sparse, and the updates to it are rare, if any. The commercial off-the-shelf navigation systems (GARMIN GPS Navigator or similar) allow the browsing of some public interest information that is uploaded prior to the selling. Therefore the user is by no means always connected to a comprehensive, evolving repository of such information. On the contrast, the ePH digital library will be continuously growing with content from both developers and users. Therefore the content will be far richer and dynamic than in commercial wireless devices.

Moreover, those systems keep their user isolated from other users that utilize the same kind of device, and there is no communication thread between them whatsoever. With ePH, the users will be always able to communicate with others connected to the system, and to exchange general or private information with each other, so they will have a sense of being part of something alive. Further, the information and knowledge that ePH offer to its users can also be gathered and seamlessly provided from other publicly available sources. With ePH, the user can be continuously on- (in car, office, home, mobile phone), so the service will be always available.

As for other folksonomic undertakings, like Flickr or YouTube, they have as their main goal the users' entertainment, ePH aims to more than that, as the content of the core DL intends to be useful to its users in various directions: access to general or particular information and knowledge, instruction, education, traffic safety, entertainment, selection of the best service in several domains (e.g. in tourism, hospitals and clinics, schools, restaurants, flights and so on), etc. Compared to other websites that use folksonomic tagging, such as del.icio.us, which is a social bookmarking web service for storing, sharing, and discovering web bookmarks, ePH has the advantage of being supported by a digital library. This is a focused collection of digital objects, along with methods for manipulation of the collection. The ePH's digital library accords equal weight to user, for access, retrieval and modification, and to developer, playing a librarian role, for organization, selection, and maintenance of the collection. Metadata management will play an important role on increasing the searching and browsing facilities offered by the ePH's core digital library.

As it has been shown in The Strategic Agenda for Research in the Area of ICT for Mobility within

the FP7 programme, “there is a strong need to develop harmonized, interoperable, pan-European mobility services, context-aware, with wide availability to users and their interfaces”. Moreover, “seamless integration of Nomadic Devices into vehicle’s Human Machine Interface provide for high customer value, if data can be exchanged between home, car and portable use”. Our work tries to subscribe to these objectives and challenges.

3 EPH STRUCTURE AND OBJECTIVES

The ePH framework consists mainly from the core digital library, called ePHLib, and the communities that gravitate around it, i.e. the developers and the users, as it can be seen from Figure 1. The communications server provides the support for the always-on kind of service, regardless of the place where the user is when s/he needs that service (at home or office, on road, or elsewhere). The location server makes available the right service according to the location. The project benefits significantly from using <http://www.unde.ro>, a geo-spatial search engine we have developed (using Google Maps).

According to the brief description of the ePH framework, the operational objectives we pursue are:

- ⇒ *development of a working model for always-on services in the context of digital content use and user communities.* This model will take into account the challenges and opportunities that all actors involved in services have to face nowadays. The model will subscribe to novel models of social and blended networking that support the formation of sustainable cooperative communities. What is of major importance here is to understand the psychology of users in such systems, what influences them to join and support a particular community or to behave altruistically or cooperatively;
- ⇒ *setting up a methodology for implementation of this model so that it can become viable in real-world experiences,* as the ePH system will have to respond to day-to-day problems. These can be in a large range from virtual tours in a selected region with instructional or educational purposes, as well as with entertainment or informational goals, to issues of e-safety in transport (let us imagine a scenario taking place in a remote mountain region, in which the fuel is going down rapidly -

the ePH could display on user’s car device where the nearest gas station is);

- ⇒ *construction of the core user-centred digital library* that will contain public interest, regional information and knowledge, and *make it always available to its possible users* (general public, tourists, business persons, students, etc.) by its support for always-on services, according to the proposed working model. Its content must be reliable, accurate, relevant, comprehensive, and free to personal use. The most appropriate architecture and functionality for this digital library will be pursued. Furthermore, users' personal "war stories" can be uploaded, so ePHLib will have a personalized “face”;
- ⇒ *creation of an architecture for connecting various systems together in a multi-service overlay network* - here connectivity and data exchange issues between car, home/office and mobile phone have to be solved;
- ⇒ *development or adaptation of a specific GPS car device* to provide the ePH’s specific functionality, which, in a nutshell, is, *to support geo-location information providing and acquisition.* For example, the car device can simultaneously show the road map and highlight different points of interest (information about the closest gas station, pharmacy, hospital, accommodation etc., historical sites or touristic sights), or provide access to other users' stories about that geo-location. The user can also record his/her own impressions, or geo-tagged photos, etc. to be uploaded at a later time to the ePHLib (when the bandwidth will allow it). S/he may also get in touch with other on-line ePH users who are, at that moment, in the same geographic region (in a vehicle-to-vehicle way). More, the ePH system will be able to select and present the user with various points of interest within a given area (for instance, the drugstores or the general stores). The development of this device will be very challenging, as it will be innovative. More, the research has to determine the best ways to transmit information to the driver, so s/he will not get disturbed, while s/he is driving. In order to help the spreading of ePHLib’ use, the research and development have been tailored so that the device is low cost;
- ⇒ *subscribing this work to the evolution of GALILEO, which will be Europe’s global navigation satellite system,* and will provide a

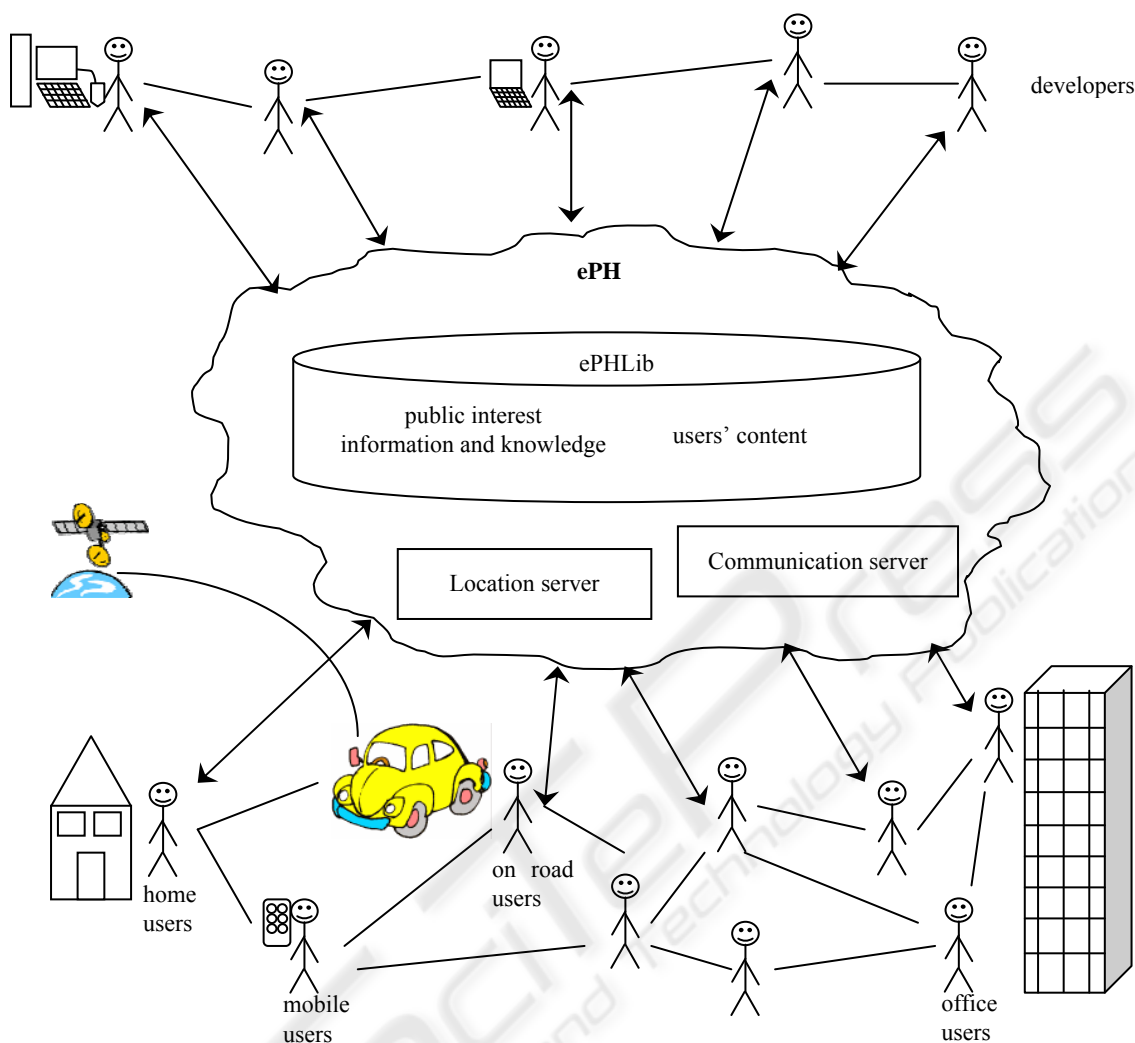


Figure 1: The ePH framework.

highly accurate, guaranteed GPS service, under civilian control. Thus, the project work can be a significant step to use technology (GPS in this case) to return value to the society;

⇒ *project progress will consider at any stage its potential for future maintenance and development*, and will have the work evolving under this requirement, so each stage will be documented properly. More, it is our intention to provide an easy-to-use recipe to clone it for other regions (including future work ideas and implementation hints). Perfective maintenance and evolution of this work is envisaged to be in direction of (1) processing the users' feedback and improving both the working model for always-on services and the DL's content accordingly, and of (2) consolidation of a

community of enthusiastic users that will contribute to extend the core DL to a comprehensive public interest DL and to clone it for other regions;

⇒ *making of the significant partial/final project results available to their potential users* - this will be done by pursuing a consistent dissemination strategy through specific means: ePH's portal, advertisements in active specific mailing lists, papers, presentations, or demonstrations to conferences, symposiums, or workshops, or in journals. Direct presentations in interested communities are also envisaged. In addition, a tree-like dissemination structure is envisaged through the users from the community, in a "words of mouth" manner (on-line with ePH or off-line). Moreover, the user

support will be constant and consistent, both from the portal developers and other users, in order to favour the enrolling within the ePH community and to feel the benefits of it.

Our research and development methodology is focused on doing a work, which results will be sound, with respect to viable theories and best practice in each of the field involved. As the work from the project is multi- and inter-disciplinary, it is expected to promote cross-fertilization of models and specific methods from the fields involved. This can foster synergies and generate new ideas in all the concerned areas.

4 CONCLUSIONS

There is a need for always-on services that offer personalised information and knowledge to users, which should provide a seamless user experience, irrespective of the terminal or communication network. More and more information about our environment is available with real-time updates. High added value for user is expected if information can be exchanged between home, car and portable use. There is a strong need to develop harmonised, interoperable, pan-European mobility services, context aware, with reliable contents and wide availability to users and their interfaces (European Commission, 2006).

The combination of various services make up a service-oriented architecture (Barry, 2003). Location-dependent services form an important group of mobile information services to be included in this architecture. There are two kind of such services: user requested and triggered. Former are typically information services, while later include emergency services, fleet tracking, tracing containers and so on (Hjelm, 2002). ePH is devised to offer both kind of such services.

While we, as developers, try to provide users with the best services, we must remember to move beyond structure and topology and start focusing on the dynamics that take place along the network links. To describe society we must dress the links of the social network with actual dynamical interactions between people (Barabasi, 2002).

Research in a number of academic fields has shown that social networks operate on many levels, from families up to the level of nations, and play a critical role in determining the way problems are solved, organizations are run, and the degree to which individuals succeed in achieving their goals. Online social networks for communities of people

who share interests and activities, or who are interested in exploring the interests and activities of others are primarily web based and provide a collection of various ways for users to interact, such as chat, messaging, email, video, voice chat, file sharing, blogging, discussion groups, and so on.

Users can benefit significantly by interacting with a like-minded community and finding a channel for their energy and giving. The main types of social networking services are those that contain directories of some categories (such as former classmates), are meant to connect with friends (usually with self-description pages), and recommended systems linked to trust. Popular methods now combine many of these, with MySpace and Facebook being the most widely used in the anglosphere (comScore, 2007). By July of 2006, over 140 different social networking sites were available on the web, with an estimated 200 million user profiles – even considering that many people register on a multiple sites or register on a single site with multiple personas, there remain tens of millions of people who are connecting daily with true or e-acquaintances and strangers (Anklam, 2005).

The most visible change from entering the Connected Age is that we suddenly have access to our peers, our friends, our colleagues and family members. Our communities now become ever present, so modern people are able to draw on the communities for assistance, information and support. One learns to search, share, and interact in a new way (Ahonen and Moore, 2005). Therefore, the social networks work as pools of heterogeneous information sources that are sometimes useful and influential for decision making, job changes, and so on (Haythornthwaite and Wellman, 2002).

More, given that social networks connect people at low cost, this can be also beneficial for entrepreneurs and businesses looking to expand their contact base. These networks often act as a customer relationship management tool for companies selling products and services. Companies can also use social networks for advertising in the form of banners and text ads. Since businesses operate globally, social networks can make it easier to keep in touch with contacts around the world.

Learning to market to the social web requires that marketers, instead of continuing as broadcasters, to become aggregators of customer communities. They should participate in, organize, and encourage social networks to which people want to belong. The social web is the online place where people with common interest can gather to share thoughts, comments, and opinions (Weber, 2007).

The research and development of the ePH framework is multidisciplinary and interdisciplinary and tightly combines models and methods from various fields: Social and Blended Networking of User Communities, Digital Libraries, Context-aware Services, Intelligent Vehicles Systems, Geographical Information Systems, User and Human Interfaces, Virtual Reality, Electronics, Networks, Data Acquisition, Software Engineering, Instruction and Education. During this work, new, practical ways, for boosting a vibrant user community have to be devised in order to improve the dissemination process and to make real use of the ePH's content.

The current stage of this project is as follows: the geospatial engine unde.ro provides the basic functionality that is needed for ePH, the GPS car device, called gipix-102, is in prototype testing phase, and the vital cores of both the communication server and location server are functional as well. In parallel with these technical achievements, the working model for always-on services, in the context of digital content use and user communities, is under development. The dissemination process has already begun through making the site unde.ro known to various kinds of potential users.

This work can prove the potential to achieve wide deployment of public interest services and to provide for higher mobility of people and increased quality of life, through the provision of accessible and reliable information services. Users can benefit from utilizing the ePH framework facilities in various ways:

- easy-access to useful information or knowledge for anyone, at anytime, from anywhere, by using several at hand means;
- easier, safer, quicker, more informed and increased quality services (medical, schools, tourism, stores, gas stations, entertainment places, restaurants, travel and accommodation and so on);
- bringing historical, geographical and cultural information or knowledge to people in a more attractive and appealing way, given the interest and energy that people spend using PCs and gadgets;
- potential to boost a virtual community in which people who are interested in some particular topic can share information, impressions, hints, photos etc;
- make people more aware of the advantages of using IT for everyday life;

The ePH project integrates the advanced Information Society Technologies in everyday environments,

focuses on both individuals and communities, aspires to have a high social and educational impact, and, hopefully, to be a small step forward to the construction of e-Europe.

REFERENCES

- Ahonen T. T., Moore A., 2005. *Communities Dominate Brands*, Futuretext, London
- Anklam, P., 2007. *Net Work: A Practical Guide to Creating and Sustaining Networks at Work and in the World*, Butterworth-Heinemann, Boston
- Barry D.K., 2003. *Web Services and Service-Oriented Architectures: The Savvy Manager's Guide*, Morgan Kaufmann, San Francisco
- Barabasi A-L., 2002. *Linked – The New Science of Networks. How Everything is Connected to Everything Else and What it Means for Science, Business and Everyday Life*, Perseus Publishing. Cambridge, Massachusetts
- Cheverst K., Davies N., Mitchell K., Friday A., 2000. *Experiences of developing and deploying a context-aware tourist guide: the GUIDE project*, in Proceedings of the 6th annual international conference on Mobile computing and networking, pp.20-31, Boston, Massachusetts
- comScore. (2007) Social Networking Goes Global [online] Available from <<http://www.comscore.com/press/release.asp?press=1555>> [Accessed 25 November 2007]
- European Commission. (2006) Strategic Research Agenda ICT for Mobility [online]. Brussels: European Commission. Available from <http://ec.europa.eu/information_society/activities/esafety/doc/esafety_2006/sra_ict_for_mobility_v.3_final.pdf> [Accessed 10 April 2007]
- Haythornthwaite C., Wellman B., 2002. *The Internet in Everyday Life (Information Age Series)*, Blackwell Publishing, Malden, Massachusetts
- Hjelm J., 2002. *Creating Location Services for the Wireless Web*, Wiley, New York
- Hirsch F., Kemp J., Ilkka J., 2006. *Mobile Web Services: Architecture and Implementation*. Wiley, New York
- Lemon K.N., Newell F. B., Lemon L.J. 2002, The wireless rules for e-service. In R. T. Rust, P.K. Kannan (Eds.), *e-Service – New Directions in Theory and Practice* (pp. 200-232). M.E. Sharpe. New York
- Mika P., 2007, *Social Networks and the Semantic Web (Semantic Web and Beyond)*, Springer, New York
- Schiller J., Voisard A., 2004. *Location-Based Services*. Morgan Kaufmann, San Francisco
- Weber L., 2007. *Marketing to the Social Web*, Wiley, Hoboken, New Jersey
- Wellman, B., 1999. *Networks in the Global Village: Life in Contemporary Communities*, Westview Press. Boulder, Colorado.