Social and AR Applications Using the User’s Context and User Generated Content

Activity Context Representation: Techniques and Languages
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Social and AR Applications Using the User's Context and User Generated Content

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Abstract

The core business of Mobile Network Operators (MNO) has moved from network management and phone services to service providing.
In contrast to Information Communication Technology (ICT) service providers, MNOs handle large amounts of their customers' context data and generated content, which can be used to bring value-added services to customers and therefore, generate solid revenues.
Given this scenario, this paper describes how Telecom Italia (a major Italian MNO) has prototyped such type of services after a deep research performed in the context-awareness and context management field and using its user-generated content management facilities in federation with other platforms and systems.

Introduction

The core business of the Mobile Network Operators (MNO) has moved from pure network management and basic traditional phone services in a "walled garden" (such as phone calls and messaging) to a more challenging and not usual area: service providing.
Services in telecommunication, can now be anything from instant messaging between two persons connected to the network, to remote video surveillance by accessing a surveillance station over the Internet.
Potential competition as well as freedom of service creation has significantly increased. The main distinction between an MNO and other Information Communication Technology (ICT) service providers, is that MNOs handle large amounts of their customers' context data (location, presence, availability, etc.) and content (user generated multimedia messages, SMS, video streaming, etc.).
The most important aspect for a business success, is how to identify and use the later specific data to bring value-added services to the customers and therefore, increase the MNO's presence in the market, distinguishing from others and generating solid growing revenues.
Telecom Italia, a major Italian MNO, has prototyped such type of services after a long research performed in the context-awareness and context management field and using its user-generated content management facilities in federation with other platforms and systems. Moreover the operator is continuously involved in many EU projects, leading the context-awareness research and integration oriented to a social, augmented-reality, cloud-oriented, value-added service design and creation.

Technology enablers

Telecom Italia has been involved in many EU projects aimed to exploit context-awareness in different types of application domains and services. The following projects have contributed to the research and development of the context-awareness and content management used by Telecom Italia: C-CAST, Mobilife, MUSIC, OPUCE, PERSIST, SPICE, etc.
Actually, Telecom Italia is integrating the context-awareness and management platform within the 4CaaSt and FI-WARE EU funded projects where context-awareness is embedded into a cloud-enabled service creation and execution environment as a Server Enabler (i.e. Context as a Service Enabler). The access to this service enabler is performed through a RESTlike interface. In addition, the interface will be extended to support the

RESTful OMA defined NGSI standard and enforced with an automatic semantic data tagging and a SPARQL engine to handle semantic requests to the context data.

While the technology used by Telecom Italia is pretty mature for a simple provisioning of the context information, its usage is still under an intensive investigation, considering also obstacles posed by privacy laws and regulations in the EU.

The context management framework (described on figure 1) is in charge of managing the context data coming from the network and its supporting systems (location, provisioning, etc.), Internet services (social networks, content sharing platforms, etc.) and customers' mobile devices (presence, motion, acceleration, position, speed, location, noise, light, temperature, etc.).

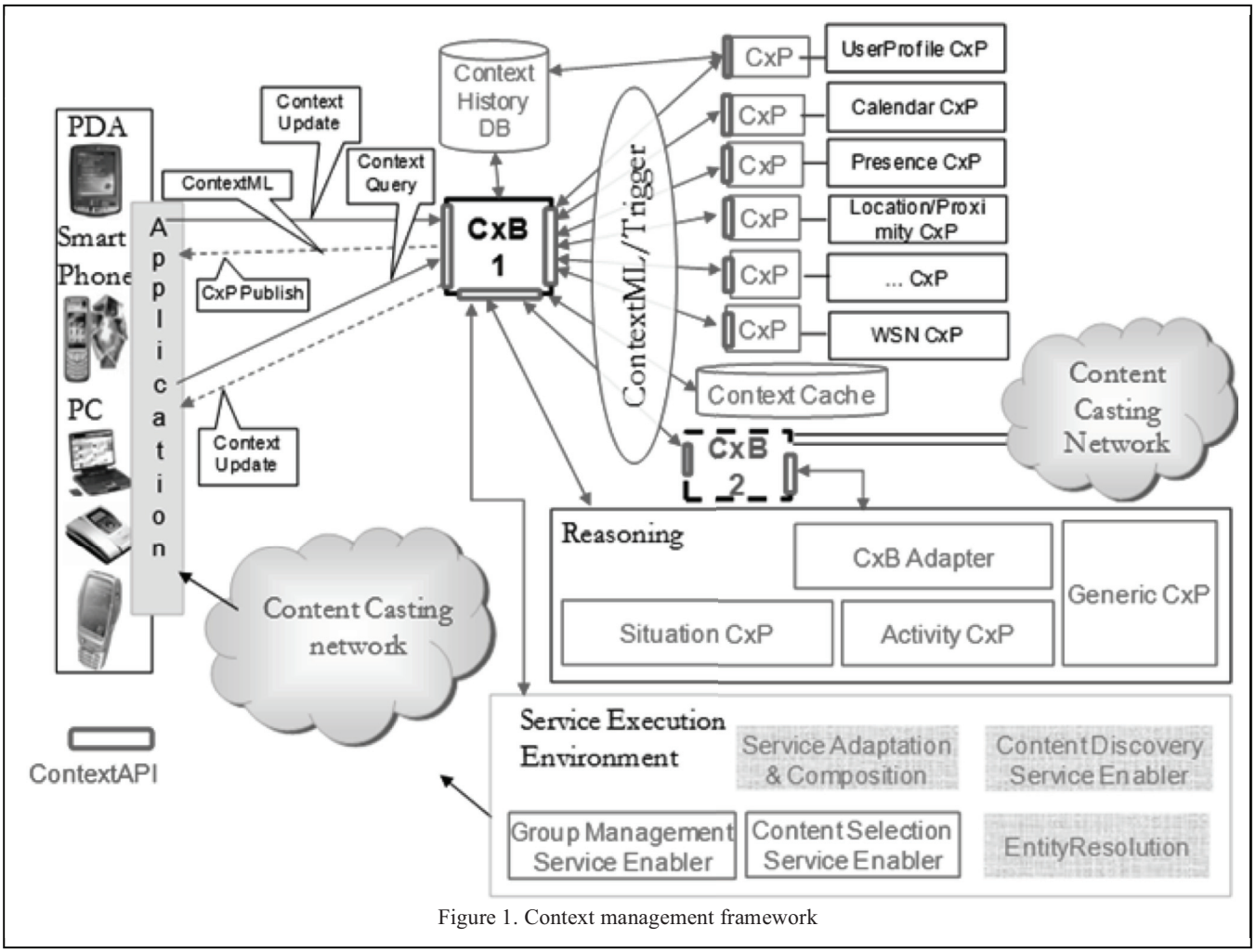

Figure 1. Context management framework

Relevant standardization

Context, context management and context-awareness are already topics of works within following standardization bodies:

- OMA: Mobile Advertising (MobAdv) and Next Generation Service Interface (NGSI) MobSocNet
- IETF: SenML
- Open Geospatial Consortium (OGC)
- W3C: Device API Working Group (DAP)

Supported interfaces

Currently, the interface supported by the context-awareness platform is based on HTTP – using a RESTlike interface and/or representation formalisms written in ContextML for simple context information requests and CQL for more complex conditional queries and subscriptions. Moreover, the secondary OMA RESTful NGSI interface is supported as well.

Involved modules

The most relevant modules of the context and content management platforms for the current service development are the following:

- Advanced User Profile (AUP), allows provisioning of the customers' data, including their Social Networks' access credentials (such as username/password or OAuth2 tokens), and a registry of their subscribed

services. The applications and the modules described below retrieve user's information from this component.

- Context Broker (CB), it handles the context data (coming from the context providers) that later on can be required by the applications to attach context-based meta-data to user-generated content. It also interacts with the AUP module and applications can invoke it in any moment to retrieve the contextual information of a specific platform user at a given moment in the time.
- TeamLife, a content management system. Through its APIs, it is possible to store and retrieve UGC and its associated information. The system is available to the entire platform. By interacting with the Context Broker, content can be automatically enriched with the contextual information available when generated. On the other hand, it communicates with AUP as well, to handle the platform users.

All this modules are also involved into the LOD (Linked Open Data) automatic tagging process of the user-generated content that enables the semantic search and browsing of content, which is out-of-scope of this paper.

Applications

The most interesting and valuable achievements from a Telecom Italia's perspective are applications involving context-awareness and UGC management platforms, which are currently divided into two categories:

- Social Applications
- Augmented Reality

Social eBook reading

Social applications are most relevant for customers with the social appealing.

The book reading, for example, is much more interesting

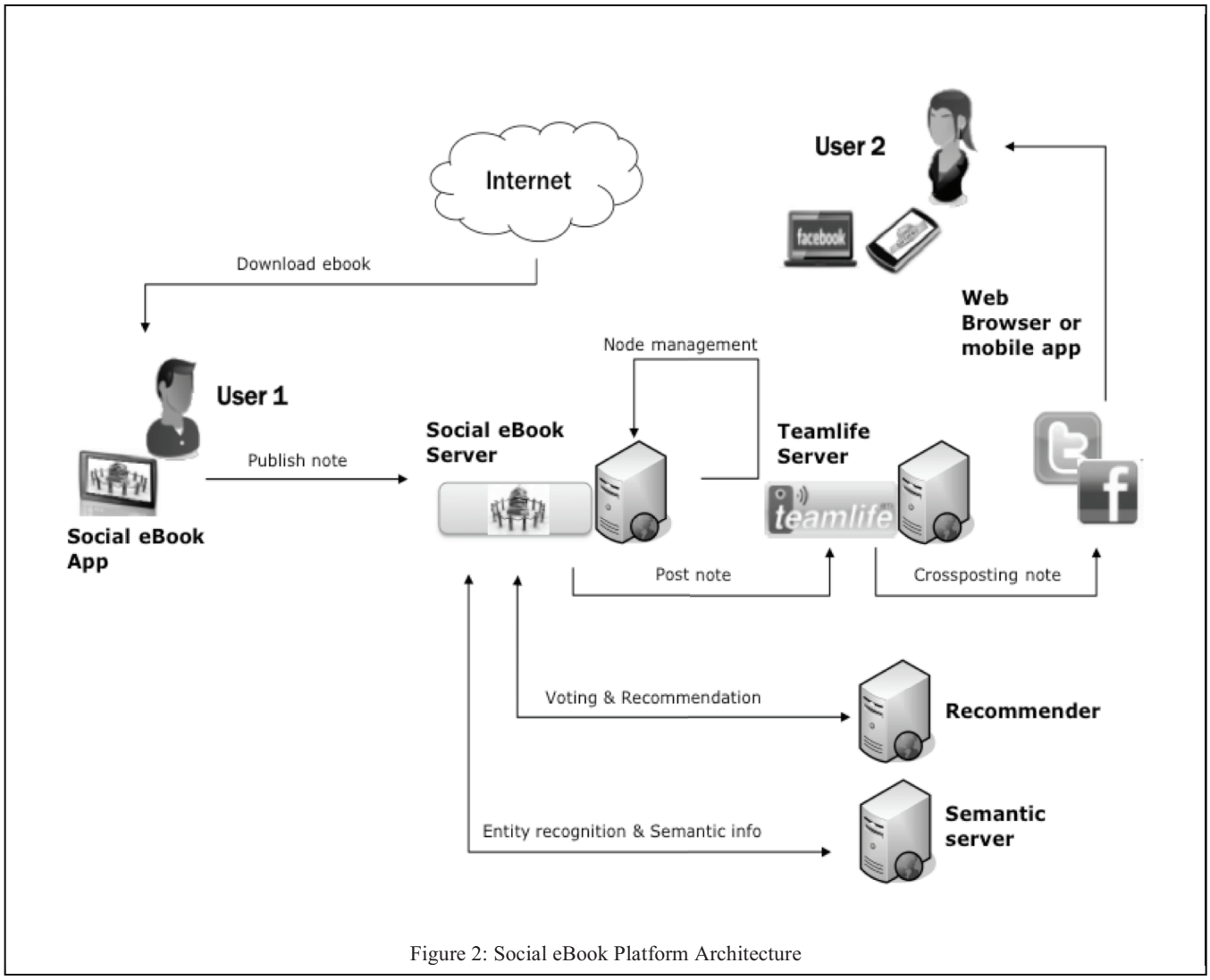

Figure 2: Social eBook Platform Architecture

and complete as an experience: if it involves a group of readers, sharing their comments over the same paragraph or even contributing to the book. Groups of readers can be built based on social network relationships. The comments over a reading text can be shared into the social network, thus propagating to other users based on a configuration. Each note can be shared by the users through a specific interface to the most used social network such us Facebook or Twitter. Through this interface friends or followers can see what the users did, read their notes and add comments or retweet the note giving more results to this piece of information. A specific interface from the social network to the system node platform could be provided in order to extract and enrich notes with information provided by users on the social network platforms. One of the most important features is the possibility to use the notes functionality to add automatic information from semantic source. The application provides the current test to a semantic entity extractor platform, the semantic platform recognizes into the text each relevant entity such as places, names, concepts and use it to perform queries to different semantic web sources. The main results could be returned and showed by the application to the user interface giving to the user the possibility to save it as a note that add extra information to the book.

When the system detect and entity as a place, the semantic source could also provide localization information and can be used as extra fields for searching extra contents such as multimedia user generated contents that match the same localization information.

Traditional search could also be provided in order to add extra information using the World Wide Web as a common source for multimedia and extra information, such as image, video, audio and text extra information related to words or sentences written in the book.

At the same time the note platform can provide its information to other applications in order to show note in their target interface based on localization information.

Moreover the same application provides some accessibility functions, which extend the book-reading experiences also to the people with limited capacities such as blindness, by reading the text through a text to speech (TTS) engine and low vision, by adjusting the size of the fonts.

This application fits perfectly into education initiatives aiming to schools' digitalization, allowing the interactive education processes to avoid the hard-printed books and making possible the exchange of instant messages (alternative to chat) between teacher and students. The high-level architecture of the service is shown in the figure 2 above.

At the moment, this service is being exploited by Telecom Italia mainly as a social effect initiative aimed to support limited capacity people and improve the efficiency of the education process in schools. However economic introits are also possible through eBooks distribution supporting this social comments exchange features.

Augmented Reality

This category of services includes applications that increase the completeness or that customize the perception of the surrounding environment using mobile devices and underlying context-aware content managements systems. Augmented reality leverages two different technologies:

- Sensing by sensors locally embedded into environment, building a smart-space;
- Content enrichment by adding meta-data tagged content available in a remote source, mashed up and linked to a space.

An example of the first service concept is the smart-home concept (currently under evaluation and in trials by Telecom Italia in conjunction with appliance manufacturers), where sensors and smart sensors are embedded into the home appliances. In this case a customer can be updated about their status and maintain the equipment using the real-time online documentation available in place through her/his smartphone. A concept sketch is shown in the figure 3 below.

Figure 3: Augmented Reality Home view

The second technology provides additional information to the customer looking at his surroundings through their camera-phone (mobile smartphone equipped with a camera). This information is based on his location, preferences and social relationships. It also provides an augmented view with only the content information relevant for the customers, such the description of a monument, the nearby friends and the details of the near restaurants.

The Augmented Reality content server contains a description of the points of interest (POIs) as geo-tagged data objects and matching the customers' context, including preferences, with the information contained in those objects lead to an additional visualization layer on the top of the view seen by the phone's camera as shown in the figure 4. Also the customer-related social networks' information such as buddies, friends and friends-of-friends can be visualized near to the customer, thus adding value to the services.

More complex and valuable services can be created by mixing two technologies, hence providing information embedded into the environment (acquired from the local sensors) mixed with information from remote servers, including user-generated content and knowledge about customers' social relationships.

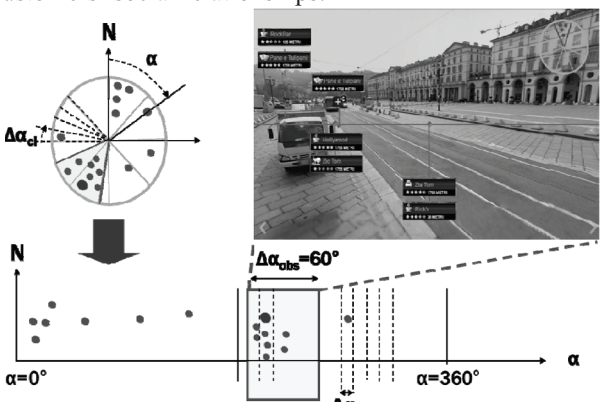

Figure 4: Augmented Reality view

This service is targeted to increase the usage of the data channel provided by the mobile operator and moreover could be either sold as an application pay-per-use or used to increase the appealing of the operator over the competitors.

Conclusions

The approach of a major Italian MNO to exploit mobile context-awareness based services was presented. It goes from building a solid foundation for handling customers' context to the creation of applications on top of it. Innovative applications provide value-added services to end-users by taking advantage of their collected context data and generated content.

Two prototypes were presented: a social reading application, that enhances normal book-reading experiences by introducing the social component and the user's contextual information and an augmented reality application, that brings an enriched perception of the current customer's environment using his location, preferences and social relationships.

By means of its solid platform fundamentals, the operator can focus on the design of new applications to generate novel services to maintain existing clients and also attract new ones, thus generate more revenues.

In order to deploy the context-awareness platform into a production environment, some issues like user's information privacy have to be acknowledged.

References

Moltchanov B., Fra' C., Valla M., Licciardi C.A. 2011. Context Management Framework and Context Representation for MNO. In *Proceedings of the Activity Context Workshop*, San Francisco, Calif. USA: AAAI Press

Moltchanov B., Mannweiler C., and Simoes J. 2010. Context-awareness enabling new business models in smart spaces. In *Proceedings of the Third conference on Smart Spaces and next generation wired, and 10th international conference on Wireless networking*, St. Petersburg, Russia.

Venezia C., Marengo M. 2010. Context Awareness Aims at Novel Fruition Models: Augmented Reality May be the Killer Application for Context Awareness. In *Proceeding of the Embedded and Ubiquitous Computing (EUC), IEEE/IFIP 8th International Conference*, 392-396.

http://www.ict-ccast.eu

http://www.ist-mobilife.org

http://www.ist-music.eu

http://www.opuce.tid.es

http://www.ict-persist.eu

http://www.ist-spice.org

http://4caast.morfeo-project.org

http://www.fi-ware.eu

http://www.openmobilealliance.org/Technical/release_program/ngsi_v1_0.aspx

http://lists.w3.org/Archives/Public/public-xg-federatedsocialweb/2011Dec/0000.html

http://tools.ietf.org/html/draft-jennings-senml-08

http://lists.w3.org/Archives/Public/public-xg-federatedsocialweb/2011Dec/0000.html

http://www.w3.org/2009/dap