PERSONALIZATION AND USER PROFILE STANDARDIZATION

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Abstract

Industry and end users interest in personalization of services and devices continues to increase. Many products and services already contain settings and preferences that are specific to that product and unrelated to any other. This paper presents a wider view of personalization and user profiles, making the preferences available to a range of services and devices. Behind every instance of personalization is a profile that stores the user preferences, context of use and other information that can be used to deliver a user experience tailored to the individual users' needs and preferences. In addition, the concept also supports the fact that users' needs depend on the context and current situation, e.g. "At home", "In a Meeting", "In the Car". In order for a range of services and devices to make use of the user preferences, there is a need for standardization of the preferences and the architecture that enables their use. The focus of this paper is on the architecture work within the standardization activities in the personalization and user profile management area, performed at European Telecommunications Standards Institute (ETSI) by the Specialist Task Force (STF) 342 [1]. The ETSI projects on personalization and user profiles are co-funded by EC/EFTA.

Key words

User profile, personalization, standardization, NGN (Next Generation Network)

1. Introduction

The motivation for this standardization work is the considerable benefits of personalization of services and devices for different stakeholders. The benefits for users are:

- A better user experience - in a range of situations.
- Preferences will only need to be defined once. Users will not have to re-enter their preferences each time they acquire new services and devices.

The benefits for telco operators, manufacturers and service providers are:

- Satisfied customers that will lead to better user loyalty.
- Generally, shorter service development time.
- Larger user segments reached more easily and quickly, thereby ensuring quicker uptake of ICT services and technologies.

For a single product or service it might be difficult for users to manage all of the information needed in their profile. It is therefore a challenge to develop a tool that supports users when they need to:

- Check what information is in their profile;
- Add to, change or delete information in their profile;
- Know when other entities access their profile;
- Understand how their profile affects the service or capabilities that they experience.

The work on personalization and user profiles emerged from earlier ETSI work on a Universal Communications Identifier (UCI) which is a unique identifier of the user rather than a range of identifiers of the many of communication devices or services (e.g. numbers of fixed phone at home/work, mobile

phones, fax and email addresses). Recent ETSI work identified how IMS based Next Generation Networks can be extended to support UCI (EG 284 004) [2]. As the ETSI work on user profile management emerged from the work on UCI it is reasonable to presume that the architectural solution identified to support UCI may well be a good foundation for the support of user profile management.

2. Why standardization is needed

Currently, the range of preferences and values that can be set by users are not consistent between different devices and services, or between comparable services and devices from different vendors. Therefore, it is impossible to transfer the settings that have been set for one particular device or service to another similar device or service in a way that ensures the same user experience.

With the aim of providing an enhanced user experience, it would be better if:

- Different devices or services of the same type had consistent groups of settings which had value ranges that produced identical effects. For example, for preferences like "loud volume" or "large text" to be useful, users wish them to always result in the same standardized user experiences.
- Settings in one proprietary form on one device or service can be converted to settings in another proprietary form on a similar device or service from a different supplier.

In order to achieve the best user experience, there is a need to ensure inter-operability of services, devices and the users' preferences defined in their profiles. The realization of this objective depends on standardization of personalization settings and preferences and the ways in which these are expressed. In addition, there is a need for standardizing an architecture that supports this concept. Two ETSI deliverables will be provided as the output of the STF 342 work:

- An ETSI Standard (ES) on standardized objects (including settings, values and operations) related to personalization and user profile management, a rule definition language for defining automatic activation of profiles and a common terminology and
- A Technical Specification (TS) on architectural issues related to networks, terminals and SmartCards which is intended for profile providers, telecom companies and device manufacturers who will implement and provide the underlying infrastructure and architecture of network and devices necessary to achieve the user profile management concept described in EG 202 325. This paper's focus is on describing the ongoing work on architectural issues.

ETSI produces globally-applicable standards for Information and Communications Technologies (ICT), including fixed, mobile, radio, converged, broadcast and internet technologies and is officially recognized by the European Commission as a European Standards Organization. ETSI is a not-for-profit organization whose 700 ETSI member organizations benefit from direct participation and are drawn from 60 countries worldwide. For more information, please visit [16].

3. Ongoing Activities

The purpose is not to reinvent the wheel, but to build on as much existing work as possible. This will result in optimal use of project resources, and it will maximize interoperability. Previous ETSI work on user profile management (EG 202 325) [3] described the personalization and user profile management concept, and defined a large set of guidelines. It is necessary to identify what architectural solutions are required to deliver these guidelines. The solution for supporting UCI in IP Multimedia Subsystem (IMS) based Next Generation Networks (NGN) is being examined as a potentially relevant solution. Examination of other possible architectural options requires:

- A thorough analysis of the guidelines in EG 202 325;
- A coherent and clear way of representing the concepts behind those guidelines;
- Examining the approach behind user profile solutions documented in other standards;
- Looking for gaps between architectural options and the set of requirements.

3.1. Requirements

The technical requirements for the development of the architecture are based on previous ETSI work, ETSI EG 202 325, which describes the personalization and profile concept and presents a large set of guidelines to telco operators, manufacturers and service providers. That work was performed at ETSI Technical Committee Human Factors with the aim of maximizing human and social benefit. The purpose was to meet all users' needs, including young, elderly and those with various impairments. Also the requirements of other relevant stakeholders such as service and device developer were identified.

The original ETSI work on user profile management, produced hundreds of guidelines that described what a user should expect from a user profile management system. These guidelines referred to many aspects of user profile management including:

- the support environment that allows the user to view and edit their user profile;
- the execution environment that ensures that the user's preferences are met;
- the environment that allows user profiles to be quickly created according to a pre-defined template;
- the way that user profiles can have a static part and parts that are activated according to the current context of the user.

It was impossible to completely group and classify these guidelines, as each guideline could address several different concepts. It was therefore necessary to try to list all of these concepts and then identify which of them were addressed by each guideline. This level of analysis identified 133 concepts which were a diverse mixture that included:

- fundamental objects in a user profile management architecture;
- object attributes;
- user perceptions;
- processes;
- constraints.

From these concepts an (OWL) ontology has been generated, which describes the user profile approach that was described in EG 202 325. Initially it was being developed entirely from the concepts that were described above. However, the current approach is to add to and adapt an existing ontology that was developed by IST-FP6 project SPICE (Service Platform for Innovative Communication Environment) [4]. A goal is to standardize preferences and provide a common terminology useful to describe them. Therefore special attention has been on legacy works defining objects managing profile information. Various approaches are under analysis in standardization bodies such as 3GPP, W3C, OMA and ETSI TISPAN. The project analyses settings in existing services and devices.

3.2 Architecture – Functional Entities

The ongoing project develops an architectural framework that covers network and terminal issues, as some of the functionality could be implemented in the network and some in the terminals and SmartCards. In order for a profile to be effective, the following three functional entities have been detected.

Profile Storage Agent - Store and retrieve the profile data; It is likely that there will be multiple profile storage locations. These locations will probably not store the total profile but only components that apply to a device or service, and the various locations may have different persistence and priority levels. The profile storage agent stores information about the profile data and the locations of data repositories of profile data. Users require the data to be stored in a secure manner with user agreed levels of privacy applied to the availability and distribution of that data. Ideally, profile data should always be available, over all networks, from all supported devices and services, including fixed and mobile services allowing service continuity and optimal user experience. Data at different locations should be kept consistent, which may be ensured by synchronization of data and transaction security. However, although the user's profile data is distributed amongst devices and services, it should be possible to ensure that users can have the concept of centralized profiles which cover all of their devices and services.

Profile Processing Agent - Process the profile data and initiate achievement of the behaviour encoded in the profile rules. In order that the rules in a profile can be translated into the behaviour the user desires, it is necessary for the profile processing agent to operate upon the rules. The profile processing agent is responsible for ensuring that all the operations required by the profile rules are carried out and it will need to initiate operations on a variety of devices and services referred to in the profile. For efficiency and effectiveness it is likely that the processing agent will have functionality distributed between multiple devices and services. This distribution of the processing agent functionality will also minimize the need to simultaneously access profile data stored in multiple locations i.e. processing agent functionality can be co-located with the most relevant profile data.

Profile Activation Agent - Activate and de-activate the profile in the appropriate circumstances; the profile activation agent is responsible for the activation and de-activation of profiles, when needed. This activation may be rule driven, as a result of a user request or as a result of an event such as when a device is turned on or off.

3.3 Mapping to Legacy Network Standard Architectures and Technologies

Having captured and fully described the requirements for user profile management, it is necessary to identify a system architecture that will support these requirements. Recent ETSI work on "Incorporating Universal Communications Identifier (UCI) support into the specification of Next Generation Networks (NGN)", described in EG 284 004 [2], showed how UCI could be supported by an IMS based NGN with relatively small extensions to the existing standard NGN architecture. It has been shown that the various entities provided by the NGN, as already defined, are able to deliver the majority the functionality that was specified in the UCI abstract architecture described in the earlier work on UCI (i.e. the Personal User Agent and the Service Agent functionality). This work has been based on mapping of the UCI functional entities to NGN functional entities shown in table 1:

UCI functional entity	PUA decomposition entities	NGN functional entity	Notes
PUA	User Profile Data (including rules)	UPSF	
	Content Monitoring	NGN Presence Server	
	Rule Processing Logic + UCI Store (Contact Book) + UCI Monitoring + Content Data Store	AS	
	Message Handling	CSCF	The CSCF can act as Proxy CSCF (P-CSCF), Serving CSCF (S-CSCF) or Interrogating CSCF (I-CSCF).
SA	-	MGCF, SGF (BGCF, MGCF, SG)	For IMS to PSTN/ISDN connection. The functional entities in the brackets apply if Breakout Gateway Control Function (BGCF) is involved in the session. The involvement of BGCF to the session depends on the transit scenario supported by IMS.
NOTE: Where border control functions (e.g. IBCF) are used, PUAs will communicate with each other via these border control functions. There is nothing inherent in using these border control functions that should impact on the UCI use cases in any way. Where border controls are used, it is no longer possible to identify a single NGN functional entity, but logically the two PUAs still communicate directly with each other.			

Table 1: Mapping UCI and NGN functional entities

Abbreviations:

PUA (Personal User Agent)
SA (Service Agent)
UPSF (User Profile Server Function)
NGN (Next Generation Network)
IMS (IP Multimedia System)
BGCF (Breakout Gateway Control Function)
AS (Application Server)
CSCF (Call Session Control Function)
MGCF (Media Gateway Control Function)
SGF (Signalling Gateway Function)
PSTN (Public Switched Telephone Network)
ISDN (Integrated Services Digital Network)

In particular, EG 284 004 [2] identified the need for a new class of Application Server that accesses user profile data and processes profile rules. However, the internal behaviour of this Application Server does not need to be standardized. The expectation is that the profile data held in the UPSF will meet the minimum requirement needed to provide personalized services to specific users based on the existence of suitable service subscriptions. This level of profile data will not include many of the preferences and rules described in and implied by EG 202 325. This would therefore imply the need to either greatly broaden the data held in the UPSF or for there to be additional profile storage directly associated with the Application Server. As the ETSI work on user profile management originated from work on UCI, it is reasonable to suppose that the solution may be a very close fit for what is required to support user profile management.

In elaborating the ontology and developing the architecture description, the work of other standardization bodies, industry groups and research projects are being studied to identify other approaches to user profile management that have been specified. To date, it appears that most of these approaches to user profile management describe profiles that contain information that a network or service provider requires in order to operate and manage a service subscription on behalf of a subscriber. Most of these profiles are owned and managed by the network/ service provider and the end-user is given little or no opportunity to manage the information in the profile. In practice many of these profiles might better be described as "profiles containing service subscriber information" rather than "user profiles". In contrast to these other approaches, EG 202 325 describes profiles that are primarily owned by an end-user and that contain information that this person requires in order to use networks and services in ways that meet their personal preferences. So it appears that the work being done in STF342 is complementary to many existing "user profile" approaches and is an addition that should bring users much greater control over their services and devices. A first step toward this direction has been made in the context of TISPAN work which differentiates two roles related to user and subscriber which can be assigned to the same or to different actors. [5] captures the explicitly separation between the user profile from the subscriber profile, e.g. all the parameters related to the services and network accesses assigned to the user.

In particular, three categories of profile information are addressed [6]: i) IMS related data, in the UPSF ii) Authentication data (e.g. user identity, list of supported authentication methods, cryptographic keys) coming from the Profile Database Function (PDBF), inside the Network Access Subsystem; iii) Access data coming from the Connectivity Session Location and Repository Function (CLF), inside the NASS, which provides some temporary information like the identity of the user equipment, related network location information, and further context information as well, like the geographical location information, as well as the user network QoS profile and user preferences regarding the privacy of location information.

However this profile information doesn't cover profile data coming from specific applications. Thus, STF 342 is taking into account further standard technologies developed by several different Standard Development Organizations. Obviously it appears that convergence toward a uniform format handling configuration parameters and settings for several different services could represent a meaningful step ahead. For example, OMA XML Document Management (XML) [7] aims to become the supporting technology for accessing and manipulating data coming from different communication services in TISPAN NGN [8]. XDM defines architecture and a protocol allowing an application server implementing the XDM client interface to handle information stored in various network repositories in form of XML documents. NGN applications such as Presence [9], Push to Talk Over Cellular (PoC) [10], Instant Messaging (IM) [11], use such a format.

Moreover, the STF 342 framework will also address functionalities inside the user equipment. New generations of SmartCards (e.g. (U)SIMs) hold an increasing amount of profile data as well as processing capability, which makes them useful for implementation of the profile concept. Also other means such as USB sticks and RFID (Radio-frequency identification) can be useful. Even Bluetooth or Wi-Fi personal devices could potentially store profile data. Thus, standard technologies able to manage and synchronize data contained inside the user equipment will be considered as well. Of particular relevance, OMA Device Management (DM) [12], which, in the context of 3GPP GUP has been chosen as an alternative to having a GUP "Repository Access Function" inside the end user equipment, as DM allows remote managing of device configuration in an efficient way, especially optimized for wireless and cellular connections.

3.4 STF 342 and IST-SMS Trial

In close cooperation with ETSI STF 342, the IST-Simple Mobile Services (IST-SMS) Project will start a trial in Spring and Autumn 2008 which will see the University of Rome Tor Vergata acting as a profile provider – thus following creation, storage, processing, maintenance of different user profiles – for at least 100 students. Participants will be provided with a special SIM card able to store sensitive profile data, identity information and digital certificates to prove user's identity. The interface toward this SIM card will be based on an implementation of OMA Smart Card Web Server [13] which allows information stored in the card be accessed from the user equipment. Relevant for STF342, the trial will develop a prototype implementation of "Profile Objects", evaluating the use of technologies and supporting mechanisms coming from emerging data formats like Microformats [14] and Google Data API [15] in order to access commonly used information like personal information, calendars, locations, contacts, etc. Possible trial goals also include evaluation of mechanisms for activation, deactivation and processing of profiles, either manually or driven by context information (e.g. presence, location, time and other kinds of real world context information). Finally, this trial will be useful to evaluate the use of a unique user identifier in the form of a SIP address mostly compliant with the UCI concept [2].

4. Conclusion

Personalization will be critical to the uptake and success of new and advanced ICT services and devices. Profiles promise to ease the conflict between the benefits of common technology deployments versus diverse social and cultural demands, and variations in individual physical and cognitive abilities and preferences. Based on the ETSI standardization work in this area, the future ICT services and devices will become part of a totally new era with radically enhanced end user experiences.

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