

Personalisation in Telecom Business

Erik Lillevold and Josef Noll
Telenor R&D

Introduction

Personalisation of services in data and telecommunications is not a new problem. However, the explosive usage of Internet and Web in the last 5-10 years has indeed emphasised the problem. Even if the value of the services on Internet in civil and public life become better and better the lack of intelligent personalisation often harm the intended benefits.

The user will for example not be satisfied with a slow service response due to networks with low transmission rate, or a service presentation layout that does not fit the display of the user terminal, or get thousands of document titles as a result of an information search. From the service provider's side it is not possible and economically to make different versions of a service for every different terminal type and network. In the case of information search the provider usually does know enough about the individual user to do a more proper filtering of the information. The solution for the service provider should be to make only one basic service, obtain data about each individual person's preferences and the capabilities of the devices and access networks used by her/him, and finally adapt the presentation and content of the service accordingly.

Telenor R&D has together with telecom operators worked on the personalisation problem for quite some time based on work and recommendations done in larger consortiums like W3C and 3GPP. So far without success when it comes to products, probably because insufficient standards. Telenor R&D is therefore involved in EU IST FP 6 projects (e.g. ePerSpace, DAIDALOS) in addition several internal projects where personalisation is main objective.

World Wide Web Consortium (W3C)

The most known and perhaps the oldest work in the field of personalisation is the W3C initiative developing a protocol standard for Composite Capability/Preference Profile (CC/PP). This protocol is developed and used in cooperation with OMA (earlier WAP forum) to create a User Agent Profile (UAPROF), which defines a robust, extensible framework for describing and transmitting Capability and Preference Information (CPI) about the client, user, and network. Those standards are still far from being mature enough to solve the personalisation problem related to the changing environments and needs that the nomadic and mobile user encounters when moving around. W3C has therefore started a new activity called Device Independence Activity Working Group (DIWG) that substitutes CC/PP WG. Even though DIWG look at Personalisation from a broader perspective, it is still too limited to embrace the whole problem with Personalisation.

The bottom up approach taken by W3C and others will only solve particular subsets of the problem, e.g. how to make services device independent (DIWG). Common to those initiatives are the lack of a proper definition of the term "personalisation" as is required by a top down approach. However, this work has clarified many concepts and even specified protocols that may be used in a more comprehensive standardisation.

Wireless World Research Forum (WWRF)

The WWRF is a body that looks at personalisation from a total different and more revolutionary perspective called *the I-centric or user centric approach*. In the WWRF reference service architecture is **personalisation** one of the basic concepts, together with **context awareness** and **adaptation**. As this approach focuses on the user and thus supports Telecom objectives, we'll give it more room in this paper.

Personalisation

Personalisation is the concept of adapting services to the context, such as user preferences, user location, network and terminal capabilities, etc. It is considered to be a key factor for success or failure of future information and communication services, i.e. the information and services should become tailored to individual user preferences and characteristics as far as possible.

The main goal behind personalisation is to make usage more valuable, i.e. easier to use and more adaptive. It is believed that solving the problem of personalisation e.g. . to enable personalised filtering of the enormous amount of data available on the Web and make the perception of the information services more pleasant to users, will increase the perceived value of the services offered.

Context and Context Awareness

Services become personalised when they are tailored to the context a user is in at the moment. Whenever the context is changing, the services will adapt to the situation. The context in this sense consists of many aspects, like the needs, preferences, history, and behaviour of the user, location-related aspects like physical co-ordinates and velocity, but also technical aspects (bandwidth of the access network and capabilities of the terminal), business rules that apply, etc. Context information can thus be defined as any information that can be used to characterise the situation of an entity representing the user in the computer system.

Adaptability

The basic principle of adaptability is simple. When the context changes, then the behaviour of an application changes according to the desires and benefits of the use or more precisely according to profiles ascribed to her/him. In the future, IT-Services and context information should be dynamically adapted to the context by the use of some kind of automated learning functionality.

Fully automated learning seems to be a utopia. Starting from an empty set of knowledge would take a lot of time and the learning path would necessarily contain a lot of malfunctions that upset the user who will be ready to discard the functionality. Thus, eLearning applications have to take into account the current knowledge level to be accepted by the user.

User wishes are almost always inaccurate, incomplete and some times contradictory. To translate them into a set of rules precise enough for automated processing is difficult, but might the most suitable approach to follow.

State of the art

The first thing to do in the standardisation work is to agree upon a common way of categorising personalisation in factors. WWRF propose following **personalisation factors**:

- **User factors**: those factors that are about the interests of users, their preferences, usage behaviour, user and task characteristics. The user factors determine how the information should be personalised.
- **Information or content factors**: those factors that are about the properties of the information, e.g. the media type and whether there is content and/or associated meta-data. The information factors determine how the information can be personalised and these factors are more technology based.
- **Context factors**: all factors in the surrounding of the personalised information system and the user (e.g. current location, hardware, software, application domain, etc).

The personalisation factors are stored in **profiles**. Due to the nature of mobile services and use, the profile is gathered by multiple parties, stored in multiple places and used and managed by multiple stakeholders. The distributed nature of profiles must be supported by the architecture. Further, both globalisation and virtualisation of society have contributed to a greater privacy risk. With the perceived privacy being a mobile business enabler, protection of profile data and trust cannot be neglected in designing the service architecture for the next generation mobile systems.

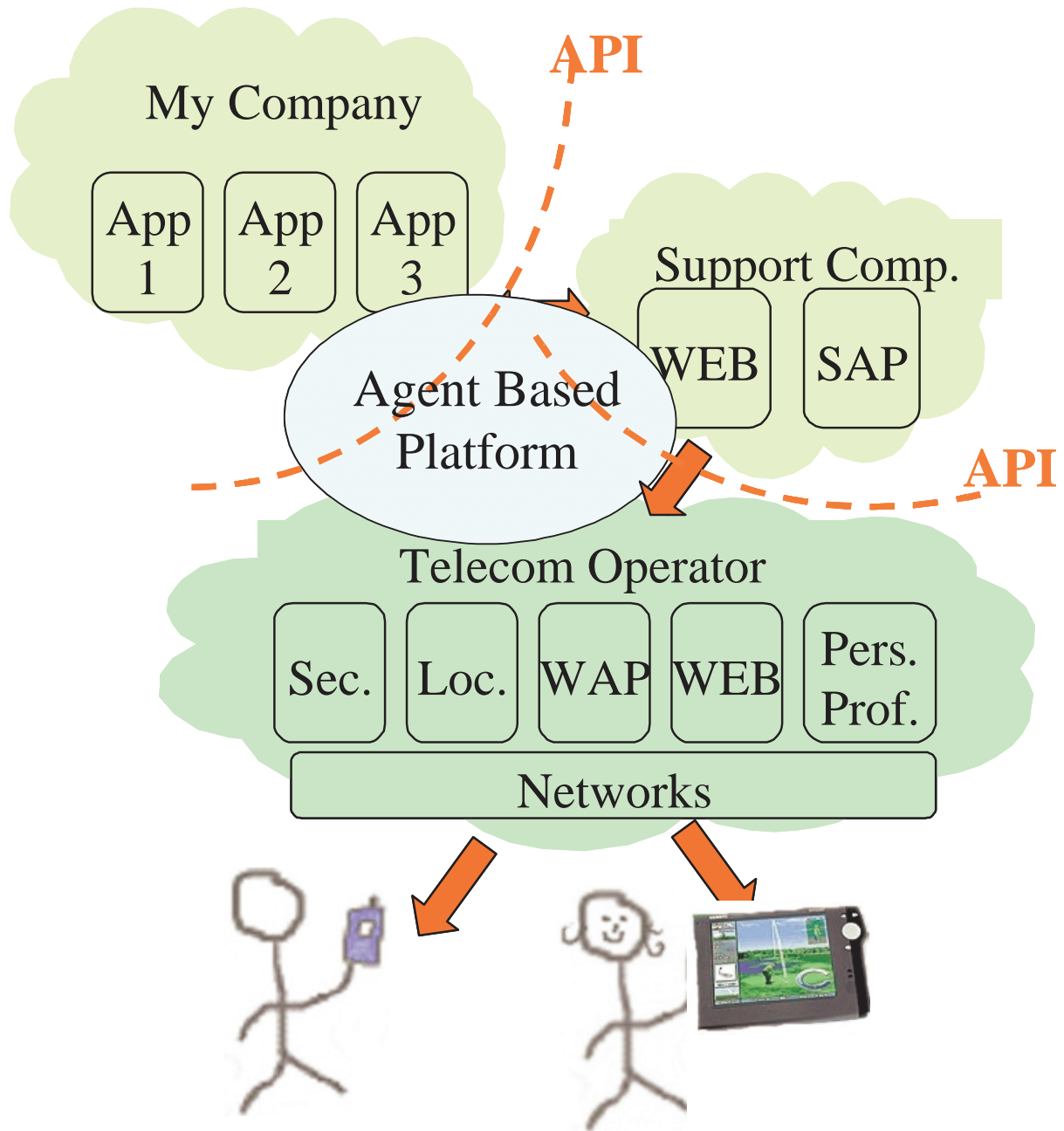
The implementation of the concept of personalisation is partly done by means of using profiles. All this profile data means you have to store and manage this data in a user-acceptable way, i.e. perceiving privacy is important. At the same time, profile data-exchange and accessibility must not be restricted too much in order to enable attractive and personalised mobile services (tailored to the user). Thus, we need solutions for profile data with respect to storage, format, coding, exchange, standards, and interoperability.

Furthermore, gathering of profile data and keeping it up-to-date with the changing needs and context of the user is an important issue. Thus another a profile learning functionality to give solutions for profile gathering, updating profile data, and dynamically adapting the profile data to new situations (location, time, user needs, and network capabilities).

Implementing personalised services

To implement personalisation we need “intelligent” software technology that allows creation components that represents the personal needs and wishes of every individual user. Many apparently different technologies have

popped up recently claiming to solve the personalisation issue, e.g. Semantic Web, Service Grid, Peer-to-Peer, etc. However, one the most mature candidate of those enabling technologies is agent technology. In order to try this out, Telenor R&D has taken an initiative to establish a Norwegian Network of Excellence among the most advanced R&D institutions and universities in Norway. The experimental environment will hopefully be as seen on the figure below, where a 3rd party service provider (“My Company) build new applications and services based on existing Web services and others accessed by some Sever Access Protocol (SAP) offered by “Support Companies”. Telecom Operators several service capabilities such as user location, user terminal and network profile, user presence, etc. All component functions and capabilities are glued together by an Agent Based Service Platform offering a personalised end-user service adapted to the temporary situation.

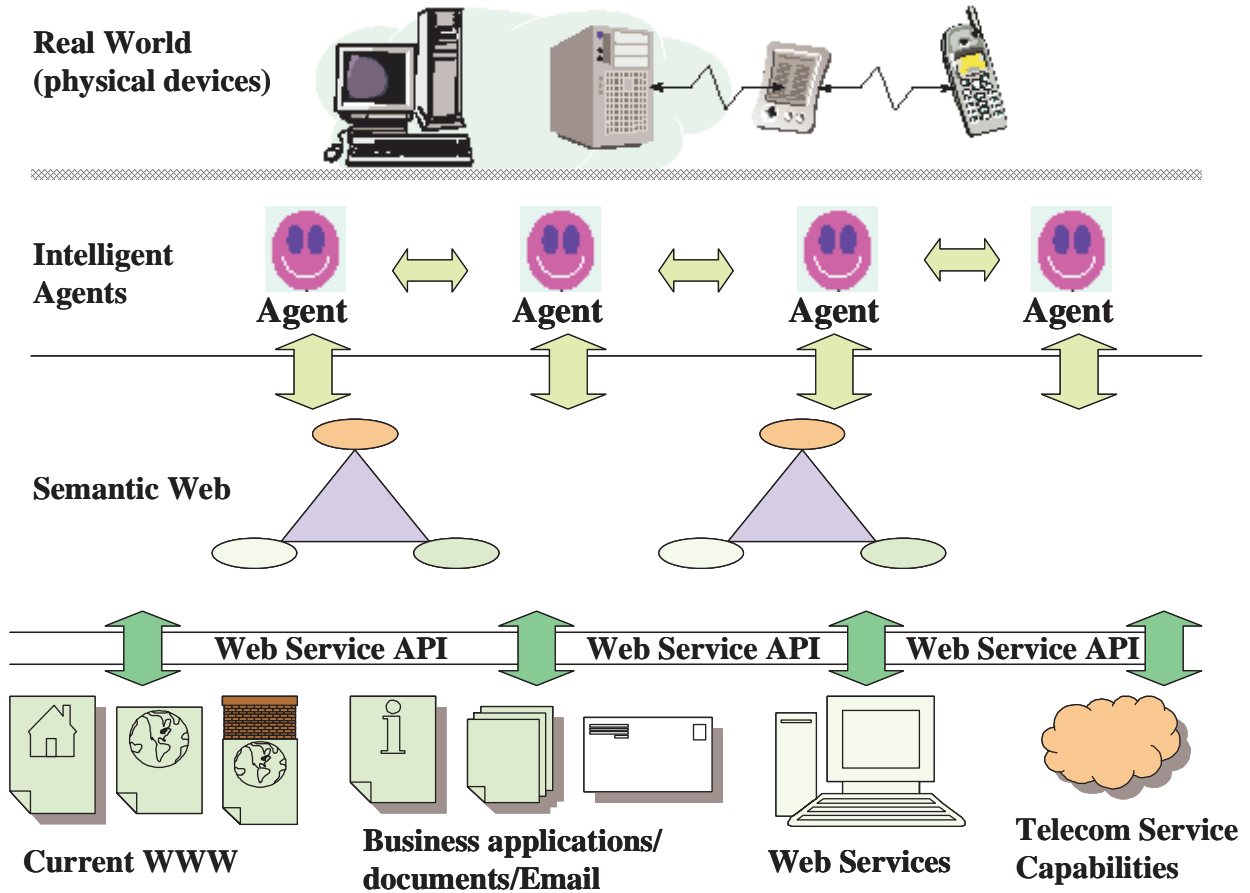


Agent technology

Intelligent software agent technology is one of the most important emerging ICT technology of the last years. It plays the role of an important enabler for highly distributed and complex solutions, self-organising, and collaborative systems and services. In particular agent technology is predestined for the integration of Web-Services (e.g. Microsoft's .NET or Sun's J2EE) being supported by many suppliers. Agent technology has the

ability to communicate, co-ordinate and associate the usage of learning, do scheduling and other advanced techniques like matchmaking and even move agents to other platforms. All these features make agents and agent based systems a valuable metaphor in computing and make them attractive when it comes to implementing requirements like personalisation, context awareness and adaptation in next-generation telecommunications services.

Agent-Based does not mean pure agent technology, but a mix of agent and today's service provisioning technologies such as existing and new Web services, but also other open interface technologies like 3 GPP's OSA APIs that may be converted to Web Service APIs.



Telenor is involved in a number of projects dealing with personalisation, both through IST, Eurescom, national and corporate activities. Main focus is currently on the adaptation of content to the user device, such that the Eurescom P1203 vision: "It works, it is simple, and it is personalised" will become true.