A framework and tool for personalization of mobile services using Semantic Web

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Motivation:
The current personalization solutions are service specific and use their own conceptual model for representation of personalization information.

For example,
If one wants to synchronize its cellular phone calendar with Google Calendar, the cellular phone calendar needs to be told that Google refers to a calendar as "cals".

Such a personalization task could be quite complex and must done manually by the user. This motivated the authors to propose a framework for personalization of mobile services called Web Services Personalization Framework (WSPF), in this paper.

Features and notes:
1. Personalization of a service is the ability to allow a user U to adapt a service A to fit user U’s particular needs, and after such personalization, all subsequent service rendered by service A towards user U is changed accordingly.

2. Ontology: formally represents knowledge as a set of concepts within a domain, and the relationships between those concepts. It can be used to reason about the entities within that domain and may be used to describe the domain. The paper describes, the knowledge domain includes
   - The services themselves (i.e., what types of services exist and how do they relate to each other).
   - The personalization information used as part of these services (i.e., the different personalization information elements).

3. Goals of the framework as described in the paper:
   - To specify a framework for personalization of distributed services which is applicable for many types of devices and services, and in particular to support the requirements of mobile services.
   - To develop a tool which supports and simplifies the practical usage of this framework.

4. Requirements of the framework as described in the paper:
• Specifying what personalization information is used in a service (henceforth referred to as a personalization information specification).
• Specifying how developers of services can extract the personalization information specification of an existing service which is already supported by the personalization framework.
• Providing tools to simplify the complete process (from implementation time to run time) of personalizing existing and future services.

5. Components of Personalization framework:
• Ontology access: allows browsing the existing ontology of services.
• Generator: generates the personalization stub for a new service based on an existing service endpoint or the selection of a service concept in the ontology. The tool allows the developer to select individual personalization information elements to be supported by the service.
• Stub – a stub for simplifying the access to the required personalization information, and is based on the input given to the generator.
• Engine – supports the inference of personalization support at run time.

6. Personalization Information Provider (PIP): contains the personalization information specification for an existing service.

7. Design & implementation of the framework:
• If the service is already implemented and if the personalization elements are accessible, a mediation layer can be inserted to enable personalization. The mediation layer will communicate with the personalization layer to receive the personalization information which is used to configure the personalization elements.
• If the service is new and not yet implemented then personalization can be supported by having the personalization layer introduced in the XML Web Services layer. Two cases are now possible:
  • A new version of a service that is already defined in the WSPF: By what types of personalization information it is personalized and can either be retrieved directly from a running service instance, or from the PIP based on a service implementation identifier (e.g. using the artificial term "instantmessenger").
  • A new service in the WSPF: If the service concept exists in the personalization ontology the personalization information specification of the service concept will be extracted and used. If the service concept is new, it needs to be defined and added to the existing ontology at the Personalization Information Provider.

8. At Runtime:
   a. When the personalization stub is about to download personalization information from the PIP, it will request a personalization information element denoted by the name X (e.g. "notes" as in the calendar example in the introduction).
   b. However, if that personalization information uploaded to the PIP uses another term A to denote the same type of personalization information. To ensure the correct retrieval of all such information, the stub will contact the ontology and by inference find all the terms which are equivalent to term X, let’s say the equivalence class of X is \{ A, F, G \}.
c. The stub will then download all the personalization information elements related to the terms X, A, F and G in the PIP. When the tool accesses an existing service to retrieve its personalization information specification, the service is responsible for specifying:
   - The service specification,
   - The PIP,
   - The location of the personalization information storage.

Summary:
This paper proposes a framework for personalization of mobile services called Web Services Personalization Framework (WSPF). The framework is based on the Service-Oriented Architecture (SOA) concept and uses XML Web Services and Semantic Web technologies as foundations for enabling the personalization. A tool has been developed which simplifies the support for personalization when implementing services. The major enabling elements of the solution are ontologies.

Limitations:
The following requirements of the framework are not considered in the paper.
- Specifying how developers can extend the service ontology with support for new service concepts, new service implementations and new personalization information elements.
- Specifying how the location of the service ontology is coordinated.
- Specifying how the location of the personalization information is coordinated.
- Specifying how developers can query/browse the existing service ontologies and the personalization information elements supported by existing services.
- Supporting the various actions required on the actual personalization information; authentication of users, retrieval of data, upload of data, synchronization of data, transformation of the representation of the data etc.

Conclusion:
This paper proposes a framework called WSPF for personalization of mobile services based on SOA and Semantic Web technologies. An important piece of the framework is the personalization layer, which is supported by a tool, and which describes the appropriate steps towards enabling personalization of mobile services. Implementation time requirements and the middleware functionality for run time support of personalization are covered. This framework this framework can be used to provide effective solution for the current personalization solutions which are service specific and use their own conceptual model for representation of personalization information. Thus simplifying and automating the personalization task.