Architecture of a Semantic Framework for E-Tourism Applications

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Abstract

The paper describes the requirements of the next generation e-tourism systems. We offer an architecture framework that allows solving new business requirements in this area. We also describe the possible tools for the implementation of this framework.

Index Terms: E-Tourism, Semantic web, Semantic service oriented architecture, Web service.

I. INTRODUCTION

Current level of development of tourism allows it to be described as one of the most profitable businesses. Its share of the world market is more than 30%. Annual growth rate of investment in tourism industry is about 35%. Tourism covers up to 7% of world capital. According to the World Tourism Organization, the number of international travels reached 900 million in 2007, and growth to 200% by 2020 is predicted.

With growth of the industry, internet sales of tours are increasing. Already today more than 30% of all B2C transactions in that industry are occurred.

Increasing scale of the industry requires updating of the existing e-tourism infrastructure to allow the implementation of more intelligent services and to provide more opportunities for people in that business.

To date, there are no tools that cover all of the requirements of end-users in a single information environment. Existing services are aimed to solve specific tasks of tourism (route planning, hotel reservations, ticket ordering). There is no possibility to plan the trip based on user preferences evaluated from his ratings of previous journeys.

The implementation of next-generation e-tourism will help solve business problems, not only tourists, but also companies in the industry. For example, more intelligent tools of aggregation of tickets will help optimize the cost of tour operators.

The ultimate purpose of the e-tourism next-generation applications - free users from the routine tasks of travel planning, which contain manual selection of third-party services (such as ticket ordering, hotel booking) on certain criteria, ensuring consistency of services by time and searching potentially useful information associated with the travel.

II. E-TOURISM FRAMEWORK

A. Use cases

To describe the functional component of the e-tourism framework here is an example of using the final service, based on the technology:

- Use case 1: User wants to go skiing in April. This time period is critical to plan the travel. In this case, the approach of aggregation of all the ski resorts will be

wrong, because there is no snow in April in many countries. Thus, there is a need for correlation of weather data with the information about ski resorts, and their location. The system must automatically filter suggestions, and provide the user with the latest information. In addition to search for the resorts, the system must find transport tickets, offer booking options, as well as provide additional, potentially interesting information for users request (cost of equipment rental, information about the ski slopes, etc.).

- Use case 2: User without preferences towards the destination, but who wish to travel, spending the least possible amount of money. If he already used this e-tourism system, than the system can predict his preferences. For example, he does not need to specify that he is interested in excursions related to the historical events. Thus the system, in addition to searching the cheapest destinations determines the availability of historical excursions in each of these places, as well as the ratings of these excursions exposed by other user.

B. General requirements to the framework

On the base on these user scenarios we can formulate the basic requirements for e-tourism framework:
- The ability to link data from different sources.
- To make logical conclusions on the basis of existing data.
- Implement the concept of modular applications, simplifying development and connection of additional functionality to the existing system.
- Provide an opportunity to develop a variety of clients (web, mobile applications).
- Functionally, systems implemented using this framework should solve the following tasks, currently performed, by the various isolated services:
- Choose a country/city to visit.
- Choose a route (use of different forms of transport results in the need of manual planning and searching the cheapest route, which can took a lot of time).
- Identification of interesting places to visit, making the tourist route through the city. Recommendations should take into account the existing preferences of the user.
- Find places to stay (hotels, hostels, apartments).
- Find restaurants, cafes, grocery stores.
- Order additional services (car rental, guide services).
- Provide complete information support during the trip. The goal is to provide timely and relevant information about the destination (tourist attractions and potential routes, weather forecast), and about the current route (transfers, transit routes, places of public supply).
- Selection of countries and cities to travel based on weather data. For each search, in addition to the user's interests and prices, an evaluation criterion is weather at the destination point.

C. Architecture

To implement this functionality are proposed to use model and technologies of semantic web. This approach allows us to implement the functionality of linking tourism data. An important component of the functionality is the possibility of making logical conclusions based on existing data.

The architecture of the developed framework will be based on SOA-model (Service-oriented architecture), supplemented in accordance with the specific subject area.

Each system component is an independent module that provides an interface to integrate with other components through the technology of Web services. Application components can be physically distributed over different computing environments, which allow more flexibility to distribute the load on the system, and also promotes systems reliability.

Given the use of a semantic web, this approach is transformed into a SSOA (Semantic service-oriented architecture). Thus, it is possible to implement a third-party agents working with a certain component of the system, and does not affect the system as a whole. This approach will simplify integration with external systems through the services that cover all the features presented by the application.

Many of the application's internal services require a large amount of external data. In the absence of a data provider's support of semantic data it is possible to implement an additional service, which is required for translation of provider-specific representation into semantic representation.

Used architecture does not impose any restrictions on the infrastructure level. As computing resource can be used either a single server or a grid computer (and its implementation based on semantics - Semantic Grid).

D. Implementation

The framework is implemented on application layer. To implement the web services we propose to use WSDL-S, and build all of the implementation on top of the SOAP protocol. This protocol provides independence from the application layer protocols, and strictly defines the existing interfaces. As a framework to support this functionality can be used Apache Axis, Metro, Spring WS. For support semantic web functionalities, technologies based on the RDF (Resource Description Framework), OWL (Web Ontology Language), SPARQL will be used. At the moment, the most actively developing software in this area is Apache Jena project.

For the main ontology we propose to use OTA standards (OpenTravel Alliance). Ontologies will expand, with the definition of the additional service providers.

III. CONCLUSION

This paper describes a sematic framework, as a basis for the implementation of the next generation e-tourism systems. Requirements for this framework have been defined based on the business problems. As the core architecture approach, SSOA has been selected, and we have described the possible use cases. A common set of technologies that address the unique architectural requirements has been selected. However, the SSOA is still in its early experimentation state, which implies the need for extra practical research of the advantages of this technology.

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