Web Services as a technology to support a global tourism offer

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Abstract

The wide diffusion of disintermediating Internet technologies poses a threat to the role of tourism intermediaries. Service Oriented Architecture and Web Services look to be one of the few practical ways to develop operational systems able to provide customers effective tools to satisfy their needs and to ease the travel intermediary chores in a highly dynamic market environment. This paper presents an implementation under development and analyses the advantages of the solution adopted. Possible future developments and extensions are outlined.

Keywords: Web services, Service Oriented Architecture, Tourism intermediaries, Destination management system

1 Introduction

Information and communication technologies (ICTs) and the online booking of travel and tourism products have had an enormous diffusion in the last years. All suppliers, in a highly competitive environment, have attempted to provide users with applications aimed at satisfying their needs and wishes. However, the problems

induced by legacy infrastructure limitations has produced a very fragmented and diverse set of possibilities. This fragmentation results in inefficiencies for both the user and the organisation proposing its services. The user is burdened with the problems in coordinating diverse resources, the organisations, mainly if they act as intermediaries, are affected by the difficulties in assembling several different service offerings (Bogdanovych et al., 2006; Sharda et al., 2006).

Even the quest for possible standardisations suffers from this situation. For example, the EU funded Harmonise project (www.harmo-ten.org), in pursuing the objective of creating a network supporting the data interoperability within the tourism industry, had identified and analysed several dozens data models and standards (Missikoff et al., 2003). Different modelling approaches, languages, and levels were being employed and a very high degree of semantic overlap and conflict characterise some of the major standards and project outputs even if there is a fair amount of consistency between them.

During its initial deployment phase, the Internet has "put online" a very wide audience. The result has been the creation of a completely new market, with promising development perspectives. In order to be able to exploit these opportunities, companies and organisations of any kind have pursued the objective to automate their productive chains, with extensive technological and organisational efforts. They have been busy mediating between the necessity to exchange information with the external world and the necessity to preserve their own autonomy.

Today, the new web based Service Oriented Architecture (SOA) seems to have the potentialities to provide effective and efficient solutions to these problems. Information exchanged can well be thought as a type of service. An organisation can provide information to the external world and, at the same time, be a user. In this two-way exchange paradigm is enclosed the innovation of a new service oriented architecture.

The SOA paradigm represents a revolution for the information technology community and the Web Services are a fundamental operational instrument. With them it is possible to consider the World Wide Web (WWW) a real distributed information system in which several services are made available. The WWW evolves from a purely hierarchical architecture, where the server transfers pages or applications, to a more "democratic" architecture in which specific servers, spread on the network, provide requesting computers with specific services as a result of local processing of applications or part of them (Erl, 2006).

A necessary condition to provide and use services via the Internet is the interoperability among information systems, which translates into the availability of a common descriptive language for the services. The Web Services (WS) represent the technological solution for this interoperability and the reference architecture is called Service Oriented Architecture (SOA) (CACM, 2003; IEEE, 2003).

Aim of this paper is to briefly discuss these new architecture and to describe an implementation highlighting the advantages of the solution chosen..

2 The SOA architecture

This architecture is depicted in Fig. 1. The whole picture can be schematically described by listing the three main components:

- *Service Broker*: manages the *registry* of available services; it allows to search for a specific service according to some specified characteristics;
- *Service Provider*: allows access to a service; the description is stored into the broker's registry;
- *Service Requestor*: the system requesting a service; it interacts with the broker by issuing a find command on the network in which it questions on available services. Once identified the most suitable one it connects the Service provider (with a bind command) and starts using the service with a use command.

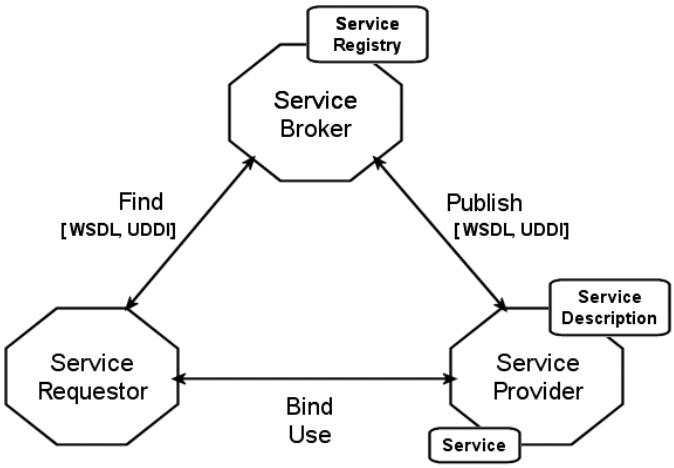

Fig. 1. A schematic view of the Service Oriented Architecture (SOA)

The SOA architecture defines and codes the roles of all the interested subjects and provides a service description language universally known as WSDL (Web Services Description Language) which allows the gathering of available services which are defined following the Universal Description, Discovery and Integration (UDDI) specifications (Christensen et al., 2001; UDDI, 2007).

Internet provides the transport protocols, which have become a de facto standard for the communication among computerised systems. These protocols, first of all HTTP (HyperText Transfer Protocol), allow all the connections described above, solving all problems which may occur in routing, transfer, filtering.

Within these well defined roles, the usage of services available on the network can evolve towards a very intricate scheme based on the recursive mechanisms naturally embedded in the WDSL language. From a practical point of view, this translates into the possibility to create a complex service built on simple elementary elements. In other words, it is possible to assemble a Travel & Tourism service as an aggregate of base services such as: transport, stay, excursions, amenities.

The service complexity leads to the necessity of completing the architectural design through the usage of some kind of instrument which has the role of regulating the overall flow (i.e.: a "transport" service must be available before being able to book a "stay" service). This requirement is fulfilled by BPEL4WS (Business Process Execution Language for Web Services). It is a language which allows the composition of diverse services and can be used as a specification language for each single component. This way it is possible to coordinate automatically the activities performed by various actors in order to achieve a common objective such as the approval of a request characterised by processes with a high number of instances and definite and repeatable execution rules (IBM, 2007; Leymann et al., 2006).

3 A case study

Sales and intermediary organisations need to rationalise a selling tool (B2B or B2C) capable of real time operations. In other words, they need to offer, without interruptions, only what is really available, as soon as this availability shows up. Online proprietary booking systems, today available on the Web, are not completely satisfactory from this point of view, they are often not very efficient or have problems in providing real time answers (Sharda et al., 2006). This lack of efficiency does not concern the single systems, but rather their ensemble. Many different tools, with big diversities in their operational characteristics, even if they have similar objectives. This diversity forces a variety of operative procedures which may confuse the user. The lack in real time, instead, is an intrinsic feature of the booking instrument as it is

usually designed. The system has a slave role, while the master functions are demanded to the operator which calls for an availability only when a specific request is present or relies on pre-defined availabilities which may suffer from updating problems.

A possible solution to overcome these limitations can be found in the improvement of the interactivity among the booking systems managed by tour operators or providers of tourist services. In this respect, the web services technology is a way to achieve this objective.

The case presented here concerns the system developed by ROBINTUR, an important Italian tourism distribution network comprising 120 travel agencies and belonging to the COOP Group. In this case, the interoperability translates into the possibility, at an application level, and in a transparent way for the user, to query, for example, availability or pricing of some product and to exploit the many possible automatic features a software system can have. Mechanisms for an automatic update of the offer are added to these main functionalities, thus giving an effective real time view, overcoming many of the traditional limitations.

ROBINTUR's network needs (in line with what discussed above) can be summarised as follows:

- automatic provision of the group's database with respect to availability and pricing;
- uniform interface for the booking systems in order to increase the operational capabilities of the front-office operators;
- possibility to try out tools for the comparison of different offers for an optimal composition of the final package.

The analysis of these requirements led to the choice of a SOA-WS based system. The advantages of such a framework over other possible implementations such as CORBA or DCOM have been extensively discussed in the literature (Bih, 2006; CACM, 2003; Erl, 2006; IEEE, 2003). They mainly consist in the recognised higher degree of interoperability interoperability due to the protocols and languages (XML, SOAP, WSDL and HTTP) which provide the basis on which Web Services are created. This choice has been deemed particularly suitable to support the strategic business model adopted. ROBINTUR development strategy is based on the implementation of a diversified network of travel agencies in which different forms of affiliation coexist: franchising, direct ownership, participation etc.

ROBINTUR group, in collaboration with In4matic, an Italian software house, has started a development project whose central element is the implementation of a series of SOAP-XML connectors to WS made available by some service providers and tour operators. As an example we analyse here the connector to the "Web Affiliation" system provided by COSTA Spa, a major player in the cruises market.

The implementation of a connector consists in organising a software layer which integrates the services offered by a Tour operator (the service provider). In our case, the service provider makes available a method called GetCatalog through which it is possible to have an XML version of the catalogue's contents to be locally cached and to be used as a feeding mechanism for the ROBINTUR database.

The Network Database is a RDBMS (Relational Data Base Management System) with an ORM (Object Relational Mapping) layer whose objective is to map the physical structure of the DB with the specific organisation of the data belonging to the single service providers. The feeding instrument is also equipped with a filtering mechanism in order to be able to perform special selections of the whole supply.

Fig. 2. Example screen for the ROBINTUR intranet application

ROBINTUR's Intranet application provides the user (travel agency's employee) with a series of screens to allow the choice of available offers. These screens are independent from the specific service providers and built on a Template Management logic. The latter allows to characterise inputs and outputs based on the type of service (a cruise will have cabins and ports, an hotel will have rooms and locations), without direct relations with the provider (Fig. 2).

One more layer creates a relationship between the intranet application and the syntax of the provider's methods (Fig. 3 contains an example of the methods used).

ListAvailableCruises

```
public Costa.WebAffiliation.BusinessComponents.Entities.Cruise[]
ListAvailableCruises(System.DateTime from, System.DateTime to, string
destinationCode, string shipCode, string portCode)
```

Retrieve all cruises: those cruises could be available or not, sellable or not. Possible parameter configuration are: (from), (from, to), (from, destination), (from, ship), (from, port), (from, to, destination),(from, to, ship), (from, to, port) (from, destination, ship), (from, to, destination, ship),(from, destination, port), (from, to, destination, port), (from, destination, ship, port), (from, to, destination, ship, port), (from, to, ship, port), (from, to, ship, port). Standard behaviours: - to omit a parameter set it as nil; - if the to date is nil, it is calculated as from + 30 days - the from date is always mandatory

Parameters:

`from` - search cruises scheduled from this date
`to` - search cruises scheduled to this date
`destinationCode` - search cruises associated with this destination
`shipCode` - search cruises scheduled on this ship
`portCode` - search cruises that sail from this port
Returns:
List of cruises

GetCruise

```
public Costa.WebAffiliation.BusinessComponents.Entities.Cruise
GetCruise(string CruiseCode)
```

Returns a fully-described cruise

Parameters:

`CruiseCode` - the cruise code to be returned
Returns:
a fully described cruise (including itinerary and segments of an itinerary)

Fig. 3. An example of the methods used

The interoperability with the service providers allows to design different systems for the research and the selection through which the agent, ROBINTUR in our case, can customise his broker function. The WS technology provides a new way to play this role. The first selection phase is performed through the management of the Network Database, and the implementation of specific XML connectors gives the possibility of a real time verification of pricing and availability of the different offers. This is a new opportunity for the intermediary, which has at disposal a new and effective tool to evaluate the best offers. On the other hand, it is also a good chance for the service provider who may be able to apply flexible provision policies (availability, booking, pricing etc.), in line with market's demand. Fig. 4 shows a schematic representation of the whole architecture of the system.

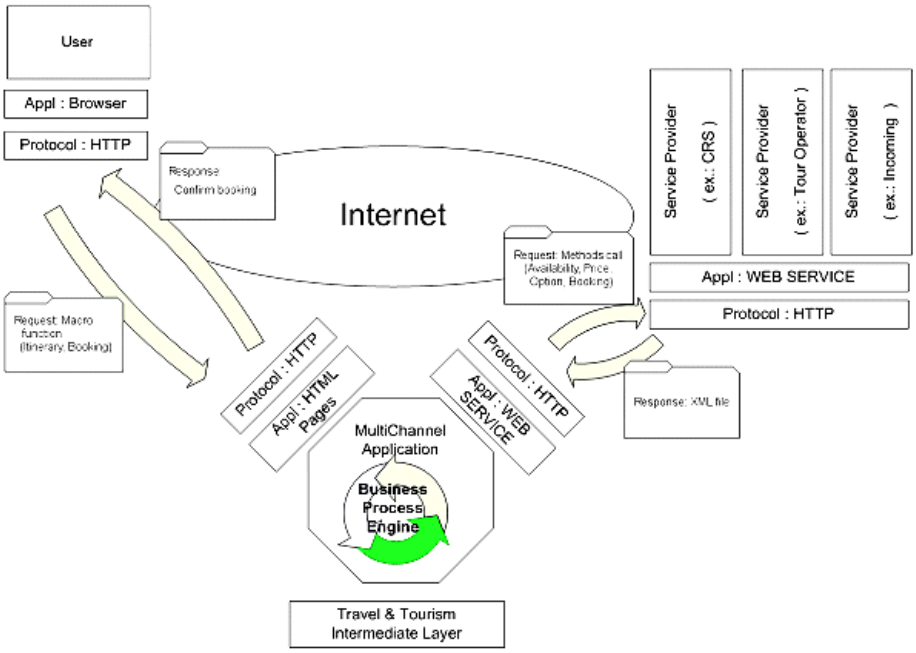

Fig. 4. The general architecture of the ROBINTUR system

As implemented, the WS technology can be seen as an innovative way to conceive a distribution channel as for rules and commercial mechanisms.

4 Strategic evolutions

The development project objectives are to reduce of about 30% the burden and the time of the operational activities and the preliminary results confirm the possibility to achieve this outcome. The savings are mainly due to the superior integration with the tour operators' booking systems and to the much higher reliability of the pricing for the possibility to react in real time to any variation the basic package components may have. More than that, however, the system is able to provide the group's agencies with effective tools to reinforce their role as intermediaries. Role which has been brought into question by the wide diffusion of "disintermediating" Internet technologies (Law et al., 2004; Licata et al., 2001).

The project presented here is a first step of a strategic plan which will bring ROBINTUR to fully exploit the possibilities of ICTs in their operations. They are deemed essential for the networked organisation chosen as business model. In this scenario, the most important development concerns the consolidation of the knowledge assets of the company through the design of a system capable to package dynamically the products offered.

As many scholars and practitioners highlight, the future tourism intermediary will be deeply affected by Dynamic Packaging technologies which will provide the possibility to overcome the idea of tourist offers as simple sum of elementary components such as a transfer and an accommodation (Buhalis & O'Connor, 2005; Daniele & Frew, 2006).

A key factor for achieving the strategic opportunities of dynamic packaging is, without doubts, an extensive integration of the diverse tourism information systems. In other words, to successfully develop dynamic packaging applications, it is necessary to integrate the nonstandard way of defining e-tourism products and services. The emerging Web services technologies seem a natural candidate for dealing with this lack of standards (Cardoso & Lange, 2007).

A dynamic package is a complex aggregate of service segments whose composition is completely free and demanded to the user, without necessarily starting from predefined combinations. In this setting, even relatively simple segments, as identified today, could be further decomposed and recombined in different ways. The SOA architecture and the availability of SOA compliant information systems is a founding element of such an evolutionary scenario. Dynamic Packaging, in fact, has as structural necessity the capability to access tourism services with all their attributes, description, availability, pricing, booking, via simple and dynamic connections such as SOAP sessions or data access through standard formats (XML).

These necessities can be satisfied, in the view of ROBINTUR, only by massively using WS technologies in the framework of a service provider information system. Furthermore, reengineering policies or middleware software layers will be indispensable. An important role, in this scenario, is played by BPEL languages and by the capabilities to manage the service construction process from Dynamic Packaging viewpoint.

The evolution of Information Systems towards a SOA architecture is considered to be a new opportunity for the tourism intermediaries, mainly the one aiming at serving niche or specialty travels, with a very fragmented offering, as in the case of ROBINTUR. The evolutionary scenario sees an evolution towards a logic of Dynamic Packaging where the travel and tourism offer will be built based on highly specialised service segments and where the implementation of a recommendation system can greatly help the user in making well informed choices (Rabanser & Ricci, 2005).

These considerations can also be easily extended to any organisation responsible for the management and the marketing of a set of diverse tourism operators such as a destination management organisation. Collecting this offer on a territory and casting it with technological instruments able to answer in real time to the fundamental requests of availability and pricing can open markets unthinkable today. To do that, however, some essential conditions must be met, namely, the availability of interfaces which are easily embeddable in host systems (see examples such as Amazon or Google) and the identification of new stakeholders for these WS oriented open systems. In this group it is possible to include the new web-based engines (agency networks, vertical search engines, specialised portals).

5 Concluding remarks

Although quite promising, the SOA architecture, and its most “visibile” product, the Web services, have found only limited application in today’s tourism information systems. The description of ROBINTUR’s project has shown a feasible way to implement a SOA based system which is proving its effectiveness.

The possible evolutions of this type of systems, mainly with respect to the dynamic packaging needs of tourism intermediary operators have been briefly discussed. This architecture seems to be an ideal setup also for a modern destination management organisation wishing to provide its actual and potential visitors with efficient information tools about the resources of the territory.

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