

# Hotel Information Agent System Using Web Service

Aye Aye Maw, Nwe Ni Aung  
University of Computer Studies, Thaton  
89ayeayemaw@gmail.com, nwe.nna@gmail.com

## Abstract

*Nowadays, hotels are in the large-scale distributed environments where each site offers services to user through transparent external communication. Web Services are becoming one of the most important paradigms for the interoperability and integrations of distributed software systems on the Internet. To effectively search information from different resources, Agent-based system can search automatically from databases and send information of user requests in timely fashions by using Web Services. This system enables the users to search hotel facilities and services according to user's requests through the hotel web sites. This system intends to support the required information to user by developing the information agent. Then, the information agent collects the information providing from respective web sites of hotel and acts as an agent/broker. Finally, users can get hotel information from four places and can access the required reservation in their desired hotels. Web Service is one of the technologies to reduce the complexity and time consuming. This system is developed by using Microsoft Visual Studio 2008, Microsoft SQL Server 2005 and ASP.Net Framework of Web Services and supports technologies to provide service mechanism of hotel information system.*

*Keywords:* Web Services, Information Agent, Hotel Information System

## 1. Introduction

The World Wide Web is evolving from a sea of information to a service oriented marketplaces and Web Service technology is the next wave of Internet computing. Web Service is one of the fastest growing areas of information technology in recent years. Web Services expose business processes over the Internet and promise more business opportunities by providing a common protocol that can be used by web applications to communicate with each other over the web. Web Services are described in eXtensible Markup Language (XML) and are communicated over existing Hyper Text Transfer Protocol (HTTP) infrastructure using Simple Object Access Protocol (SOAP). The foundation of Web

Services is laid by three significant standards: SOAP describes message format; Web Service Description Language (WSDL) gives self-describing interfaces of Web Services and Universal Description, Discovery and Integration (UDDI) provides means to locate appropriate Web Services. Publicizing Web Services is also done using UDDI.

The Web Service architecture does not attempt to prescribe a specific programming technology or internal implementation of Web Services. Nonetheless, Web Services are closely related to the agent programming paradigm. A Web Service is viewed as an abstract notion that must be implemented by a concrete agent. The agent is a concrete entity (a piece of software) that sends and receives messages while the service is the set of functionality that is provided [1].

Internet technology is rapidly improving, more and more people are using the Internet for their business growth and cost reduction in order to achieve their business goals. Currently, there are several Web Services that carry out different tasks in the Internet. They either work alone or cooperate with either Web Services to fulfill their tasks. They can be called by other applications; they can refer to other Web Services as well. Web Services are provided by agents who carry the roles appropriate for those services. Agents carry roles which are composed of services that are published as Web Services [5].

The notion of an agent is becoming increasingly important due to its natural metaphor for conceptualizing, designing and building complex distributed applications, and its generality, flexibility, modularity and ability to take advantage of distributed resources [7]. Agents improve system robustness (when one agent is destroyed, others can still carry out the task) and assist humans by reducing their work and information loads.

The purpose of the system is to provide effective web based information retrieval system on using XML Web Service Technology. In this system, a small prototype for Web Service is constructed. First, users can view detailed information for respective hotel web site. After viewing all hotels information, they can choose the hotel services according to location, hotel facilities, leisure facilities, room facilities and family facility. Therefore, they can know hotel information such as hotel name, city, hotel rating, telephone and address, etc. Then, they

can make hotel reservation. Web Service processes are popular in every field because these processes can save time for users and can be used easily. This system is implemented for hotel guests side only.

The remainder of the paper is organized as follows: some related works are reviewed in Section 2. Section 3 proposes the background theory of Agent-based Web Service. Section 4 presents the system design and creating and invoking Web Services are discussed in Section 5. Section 6 reviews the implementation of hotel information agent system. Finally, conclusion of the system is described in Section 7.

## 2. Related Works

Like any other software application, a Web Service performs a specific task or set of tasks. R.Bova et.al, [2] have proposed the classical travel agency. It involves several kinds of Web Services and composite tasks using these Web Services in an overall service: planning a journey. It defines the following available Web Services are grouped by semantic categories: (i) Travel ticket booking: *plane1* (cover flight from and to London), *plane2* (cover flights from and to Paris), *plane3* (covers flight from and to Milan and Trento), and *euro star*; (ii) Hotel booking: *paradise hotel* (in London and Paris), *coconut hotel* (in Milan and Trento); (iii) Car rental: *car1* (Milan, Trento), *car2* (all cited cities).

H.Deng et.al, [4] have presented agents and Web Services together in Web Service Agent-based Securities Trading Simulation System (STSS). Agents are wrapped as Web Services communicating and interacting with each other in an open environment. This system uses advantages of Web Services in communication and makes use of advantages of agent in autonomy and intelligence.

B.Kurt and D.CiteSeer [8] have developed a web- based information agent that assists the user in the process of performing a scientific literature search. The agent's Web interface can be used to find relevant papers from the database using keyword searches and then the agent can find papers which are similar to a given paper using word information and by analyzing common citations made by the paper. This system solves the problem of consuming the significant amounts of time and effort to find interesting and relevant publications on the Web.

Valle et.al, [12] use agent and Web Service together in pervasive computing environment with smart device to compose Web Service dynamically. They use semantic service description to abstractly describe services' functionality. Agents use these descriptions to form services.

K.CriagA [3] has described the use of software agents for extracting, integrating and mining online data sources to improve the ability to plan, monitor and optimize travel. In this system, the agents can dynamically extract data from online travel sources,

integrate this data, continuously monitor all aspects of a trip and exploit data mining to make predictions that can either save traveler money or improve the likelihood of a successful trip. This paper solves the problem of interacting information from a large number of sources such as information on flight schedules and prices, hotel locations, ground transportation options, weather conditions, airport delays and flight cancellation.

K.GraceNg and S.PaulA [6] have implemented about the opportunities and challenges of e-ticketing in public transportation. This paper describes e-ticketing strategies in transportation and briefly differentiates two closely related industrial-airlines and railways.

## 3. Methodologies of the System

This section describes the background theory of the system in three parts. The first part presents for agent and the second part proposes the service-oriented architecture and the third describes the Web Service.

### 3.1. Agent

Agent is a computer system that is situated in some environment, and that is capable of autonomous action in this environment in order to meet its design objectives.

The concept of an agent provides a convenient and powerful way to describe a complex software entity that is capable of acting with a certain degree of autonomy in order to accomplish tasks on behalf of its user. Related and derived concepts include intelligent agents (in particular exhibiting some aspect of Artificial Intelligence, such as learning and reasoning), autonomous agents (capable of modifying the way in which they achieve their objectives), distributed agents (being executed on physically distinct machines), multi-agent systems (distributed agents that do not have the capabilities to achieve an objective alone and thus must communicate) and mobile agents (agents that can relocate their execution onto different processors).

#### 3.1.1. Types of Agent

There are many different kinds of agent:

- Autonomous Agent
- Software Agent
- Intelligent Agent
- Mobile Agent
- Hybrid Agent
- Interface Agent or Conversational Agent
- Smart Agent
- Collaborative Agent
- Reactive Agent
- Heterogeneous Agent

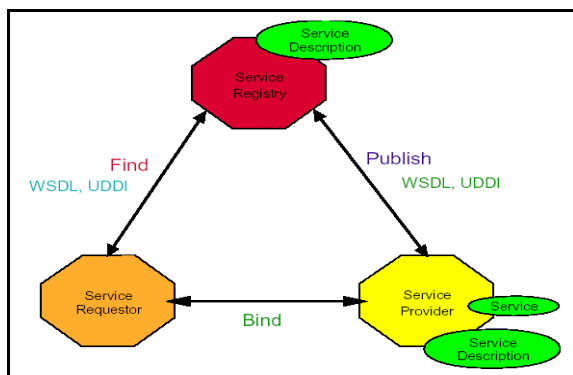
- Fuzzy Agent
- Data mining Agent
- Information Agent

### 3.1.2. Information Agent

This system has used the information agent for hotel Web Services. An information agent is a computational software entity that is capable of accessing one or multiple, potentially heterogeneous and distributed information sources, proactively acquiring, mediating, and maintaining relevant information or services on behalf of its human users or other agents, preferably just in time and anywhere. One key challenge of developing intelligent and cooperative information system is to balance the autonomy of networked data, information, and knowledge sources with the potential payoff of leveraging them by the appropriate use of such agents [9].

### 3.2. Service-Oriented Architecture

The notion of service-oriented architectures as a means of facilitating inter-organisational computing. Essentially, service-oriented architectures are a way of developing distributed systems where the components of these systems are stand-alone services. These services may execute on geographically distributed computers. Standard protocols have been designed to support service communication and information exchange. Consequently, services are platform and implementation-language independent. Software systems can be constructed using services from different providers with seamless interaction between these services. Figure 1 illustrates how Web Services are used.



**Figure 1: Service Oriented Architecture**

Service providers design and implement services and specify these services in a language called WSDL. They also publish information about these services in a generally accessible registry using a publication standard called UDDI. Service requestors (sometimes called service clients) who wish to make use of a service, search the UDDI registry to discover

the specification of that service and to locate the service provider. They can then bind their application to that specific service and communicate with it, usually using a protocol called SOAP.

A service-oriented architecture is essentially a collection of services. These services communicate with each other. The communication can involve either simple data passing or it could involve two or more services coordinating some activity. Some means of connecting services to each other is needed. Service-oriented architectures are not a new thing. The first service-oriented architecture for many people in the past was with the use Distributed Component Object Model (DCOM) or Object Request Brokers (ORBs) based on the Common Object Request Broker Architecture (CORBA) specification [10].

### 3.3. Web Service

The term Web Services describes a standardized way of integrating Web-based applications using the XML, SOAP, WSDL and UDDI open standards over an Internet protocol backbone. XML is used to tag the data, SOAP is used to transfer the data, WSDL is used for describing the services available and UDDI is used for listing what services are available.

**XML:** XML is a World Wide Web Consortium (W3C) specification that defines a meta-language for describing data. In XML applications, data is described by surrounding it with customizable, text-based tags that give information about the data itself as well as its hierarchical structure. XML forms the basis for all modern Web Services, which use XML-based technologies to describe their interfaces and to encode their messages. WSDL, SOAP, and UDDI all use XML-based messaging that any machine can interpret.

**SOAP:** It is an XML protocol that is used to communicate with a Web Service. It provides a mechanism that allows one application to communicate with another application using XML. SOAP is similar to a shipment box for the XML message. It encapsulates the message, and enables it to be shipped over the network.

**WSDL:** This is the XML language that describes the Web Service. WSDL is an XML document that provides information about what the Web Service does, where to find it, and how it works. WSDL can be compiled to provide the code (client proxy) to connect to a Web Service. A document in which a Web Service is described using WSDL is termed as a WSDL document. Let's have a look at the fundamental structure of the WSDL document:

```
<definitions
  name="NewWebService"
  targetNamespace="http://NewWebService.com"
```

```

xmlns="http://schemas.xmlsoap.org/wsdl/">
<types>...</types>
<message>...</message>
<portType>...</portType>
<binding>...</binding>
<service>...</service>
</definitions>

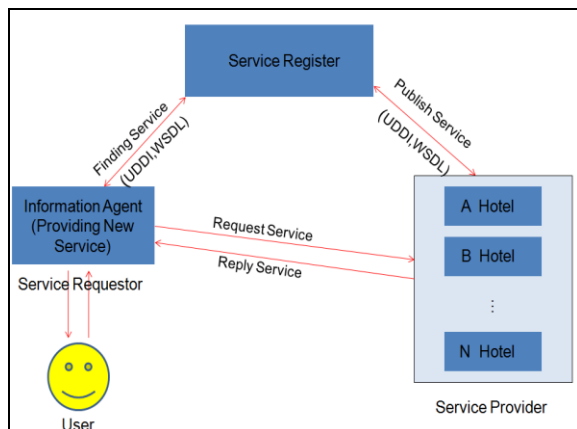
```

The first three elements; <types>, <message>, and <portType>, of the WSDL document describe the programming logic of the Web Service. The last two elements; <binding> and <service> provide details about things other than the code of the Web Service, such as communication protocol and address of the bindings.

**UDDI:** This is a Web Service registry and it facilitates the process of advertising and discovery of a Web Service. It manages information about service types and provider types. UDDI is a Web Service itself. UDDI is mainly used during development time. It can be used to find a service and bind to, or it can be used at runtime programmatically. One of the major purposes of UDDI is to provide an API for publishing and retrieving information about Web Services. The operations can be invoked by a SOAP call to the exposed methods of a certain Web Service [13].

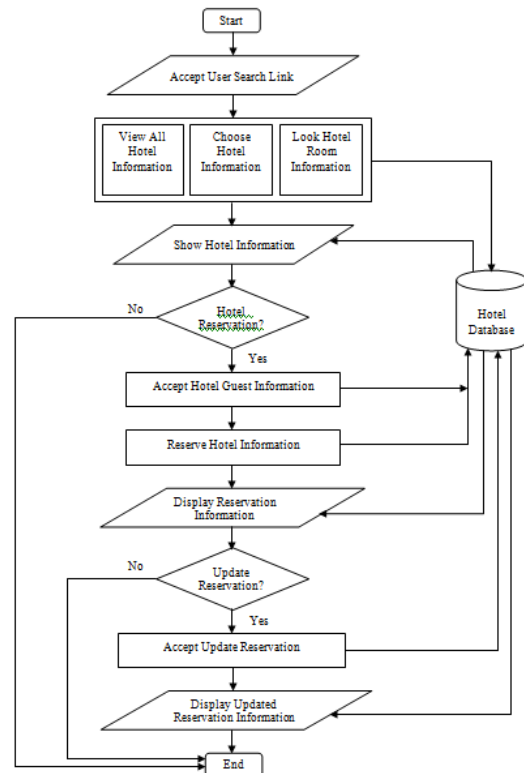
#### 4. System Design

The proposed hotel information system is an Agent-based system using Web Service technology. This system enables the users to search hotel facilities and services according to user's requests through the hotel web site. Then, the information agent will collect the information providing from respective web sites of hotel and acts as an agent/broker. In this case, Agent-based information system applying Web Service is used to reduce searching time and to achieve required information easily and effectively. Figure 2 shows the architecture of the proposed system.



**Figure 2: Architecture of Proposed System**

The architecture is targeted for *service requestor* as information agent, *service provider* as many hotel sites and *service registry (UDDI)* as provides the list of available services. The information agent plays a major role in the system. Then, users can choose services of hotels and view information (such as hotel name, city, hotel rating, phone number and address) of an individual hotel site and if desired to stay, they can make reservation. For the user side, they can access different hotels information and reserve different hotels at the same time. Figure 3 shows the process flow of hotel information system on .Net framework.



**Figure 3: Process flow of hotel reservation system**

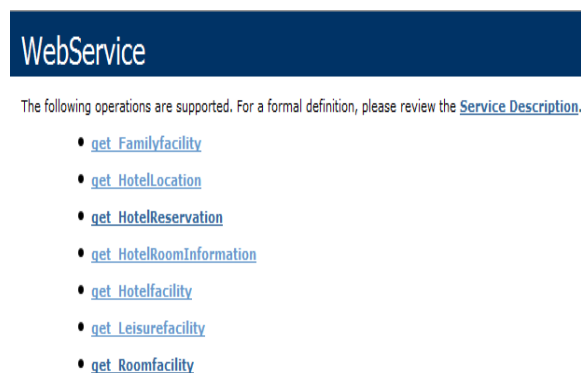
This system involves three parts. Firstly, users can view all hotels in Yangon, Mandalay, Bagan and Inlay. Then, the information agent gives the detailed hotel information for users. Secondly, they can choose the favorite hotel information in hotel location (including town centre, down town, hill side, pool side, near bazaar), hotel facilities (including air-conditioned rooms, restaurants, gift shop, beauty salon, etc.), room facilities (including air-conditioning, satellite TV, in-house movies, telephones, room safe, etc.), leisure facilities (including swimming pools, fitness centre, spa, massage, Jacuzzi, etc.) and family facility (including babysitting services) of many hotel sites. It can be matched user's requirements with the given hotels' facts and retrieved information for the user's wants. Finally, the system implements the hotel reservation services such as room type and room prices

information shows to the guest. This system also fills the guest information for making hotel reservation. And then, they can reserve their favorite hotels on the hotel web sites. If the guest wants to update reservation information, he/she update his/her information. After updating hotel reservation, the system displays the updated hotel reservation information.

## 5. Creating and invoking Web Services

The *WebMethod* attribute is the attribute to create the Web Services. By attaching a [*WebMethod*] header in C# to a public method or by using <*WebMethod*> in Visual Basic .NET, indicate that want to expose the functionality of that method as a Web Service. In one Web Service may include many [*WebMethod*]. One process represents one [*WebMethod*]. After writing these [*WebMethod*] for Web Services, .NET environment automatically generates SOAP protocol for these Web Services [11].

To invoke the Web Service methods by web applications, the requirement is to add web reference the required Web Service methods. Once the Web Service is created and declared, it can be searched in UDDI by the internet connection, through the add web reference dialog box. If the client application knows the IP address of Web Services, it can search directly the services by typing these address in URL address bar.



**WebService**

The following operations are supported. For a formal definition, please review the [Service Description](#).

- [get Familyfacility](#)
- [get HotelLocation](#)
- [get HotelReservation](#)
- [get HotelRoomInformation](#)
- [get Hotelfacility](#)
- [get Leisurefacility](#)
- [get Roomfacility](#)

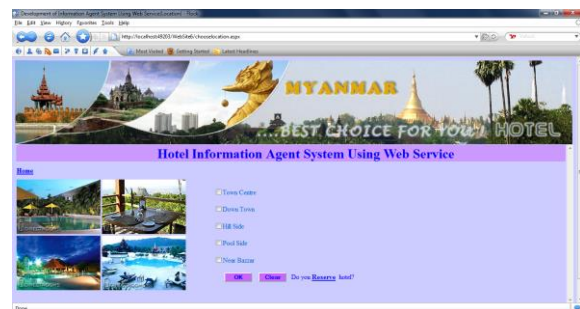
**Figure 4: Web Services for hotel information agent system**

Figure 4 shows the Web Services created in .NET framework. There are seven Web Services for hotel information system such as “get HotelLocation”, ”get Hotelfacility”, ”get Roomfacility”, “get Leisurefacility”, “get Familyfacility” which are used for retrieving hotel information such as hotel name, city, hotel rating, phone number and address and “get HotelRoomInformation” which is used for viewing room information. The “get HotelReservation” service which is also used to store the reservation information.

## 6. Implementation of Hotel Information Agent System

Web Services must be realized by concrete agents that send and receive messages, while the services are the resources characterized by the functionality provided. In the same way as agent performs tasks on behalf of user, Web Services provide this functionality on behalf of owners, people or organizations. In this system, hotels inform online user about their hotel's services on their own site. Each hotel has many branch hotels in different cities or different countries. The key to success in the network economy is the ability to create and modify process in concern with changing requirements. The key success of hotel reservation on distributed architecture is the ability to reduce the use of processing time and resources and produce better performance than traditional reservation.

Every guest can view hotel web site of the system. After that, he/she can choose the hotel information including hotel location, hotel facilities, room facilities, leisure facilities and family facility. Moreover, user looks hotel room information to make hotel reservation. The guest chooses the suitable facilities and services of the system is shown in Figure 5. The hotel information agent system gives the room type information for individual hotel. If user wants to reserve room, he/she fills up information on hotel guest information entry. Finally, user can make hotel reservation. Figure 6 illustrates showing hotel room information.



The screenshot shows a web browser displaying a page titled "MYANMAR ... BEST CHOICE FOR YOUR HOTEL". Below the header, there is a section "Hotel Information Agent System Using Web Service". On the left, there are several small images representing different hotel facilities like a spa, pool, and garden. On the right, there are radio buttons for selecting services: "Tennis Center", "Diving Tents", "Bill Table", "Pool Table", and "New Service". At the bottom right, there are "OK" and "Cancel" buttons and a prompt "Do you Reserve hotel?".

**Figure 5: Choosing Appropriate Services**



The screenshot shows a web browser displaying a page titled "MYANMAR ... BEST CHOICE FOR YOUR HOTEL". Below the header, there is a section "Hotel Information Agent System Using Web Service". Underneath, there is a "Hotel Room Information" section. It includes a form with "Guest Name" (filled with "Tadara") and "City" (filled with "Yangon"). Below the form is a table showing room types and prices:

Room Type	No of Rooms	Room Price
Single Room	52	1050
Double Room	52	1100
Triple Room	49	1300
Quadruple Room	50	1400
Standard Room	50	1400

At the bottom, there is a note: "If you want to reserve above room, you hit Reserve else you hit Home".

**Figure 6: Showing Hotel Room Information**

Everyone who enters system, the guest fills up information and selects correctly the desired hotels within four cities for reservation. The hotel

reservation system is shown in Figure 7. Figure 8 displays the hotel reservation information. If the guest wants to update reservation, he/she updates his/her information. After that, the system return results for the updated reservation information.

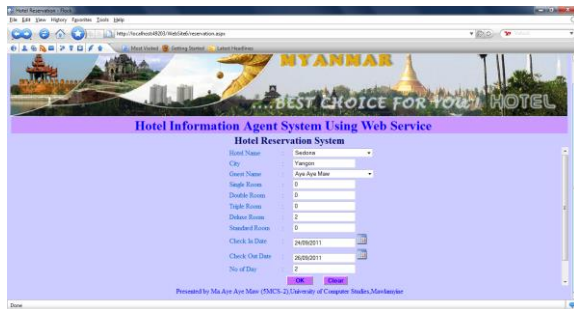


Figure 7: Hotel Reservation System

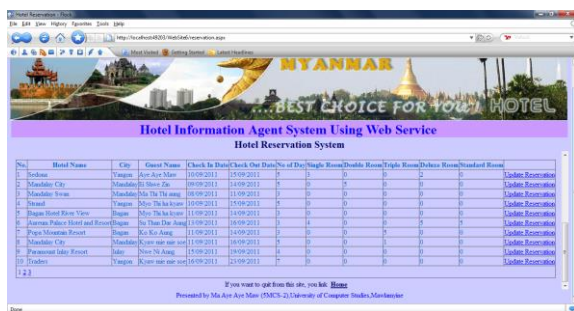


Figure 8: Displaying Hotel Reservation Information

## 7. Conclusion

Web Service technology is a promising computing paradigm for application integration over the Internet. This system describes the implementation of hotel information agent system using Web Service. According to the system, users can view the hotel information from four places and access the required reservation in their desired hotels. If user wants to update reservation information, this system can also be able to update hotel reservation.

This approach allows the creation of an environment where new Web-based information systems can be developed quickly and easily, supports integration technology and handles metadata and language variants in a generic way. The system can provide Web Services for multiple users. Web Services enable heterogeneous systems to communicate by standardizing technical communication objects and reducing the cost of integration. By using this system, multiple users can access to the information of hotel web sites. This system can reduce the user's processing time and customer's overheads. It can also support better performance, faster response time and useful information to hotel guests.

## REFERENCE

- [1] Booth, D.Haas, H.McCabe, F.Newcomer, E.Champion, M.Ferris, C.Orchard, "Web Services Architecture", 2003. World Wide Web Consortium (W3C). <http://www.w3.org/TR/ws-arch>.
- [2] R.Bova, S.Hassas, S.Benbernou, "An Immune System-Inspired Approach for Composite Web Services Reuse".
- [3] K.Criaga, "Building Software Agents for Planning, Monitoring and Optimizing Travel".
- [4] J.Deng et.al, "Web Service Agents Based Securities Trading Simulation System", Pacific Asia Conference on Information Systems (PACIS) 2005, Paper 32.
- [5] A.Durmus and N.Erdogan, "An Agent-based Web Services Market", Istanbul Technical University, Istanbul, Turkey.
- [6] K.GraceNg and S.PaulA, "e-ticketing Strategy and Implementation in an Open Access System", 2006, March.
- [7] H.T.El-Khatib, "Web Services-Based Integration of Heterogeneous Databases Using a Multi-Agent System", College of information Technology, United Arab Emirates University, Al Ain, P.O.Box 17555, United Arab Emirates.
- [8] O.Emil, "Match-Making Web Service", ISSN 1650-2647.
- [9] M.Klusck, "Information Agent Technology for the Internet", Survey paper. Journal Data & Knowledge Engineering, Elsevier Science, 36(3), 2000.
- [10] B.Kurt and D.CiteSeer, "An Autonomous Web Agent for Automatic Retrieval and Identification of Interesting Publications", 2<sup>nd</sup> International Conference on Autonomous Agents, 1988, May.
- [11] C.Ullman, D.Foggon, D.Maharry, K.Watson, "Programming Microsoft .NET XML Web Services", ISBN 0-735-61912-3.
- [12] Valle, M.Ramparany, F.Vercouter, "A Multi Agent System for Dynamic Service Composition in Ambient Intelligence Environments", LNCS, Vol. 3468. Springer, Heidelberg, 2005.
- [13] <http://www.codeproject.com>