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Original Contribution

WEB SERVICES – AN INSTRUMENT TO RESOLVE THE PROBLEMS OF INFORMATION SYSTEMS INTEGRATION

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ABSTRACT

This paper is a summary of the problems which occur in information system development. We suggest herein a solution to the integration problems of the information systems. Integration is shown as a three-level system - data integration, process integration and application integration. There are discussions about the advantages and disadvantages of this approach. It is our understanding that Web services are the suitable solution to the present problems as they allow layers of communication to be developed between applications that have already been built.

Key words: Web technologies, Internet, Information system, Architecture of the information system, Integration.

INTRODUCTION

The main tendency in economics is towards globalisation, due to the stormy development of Information technologies. More especially, Internet Information systems of different enterprises assume competitiveness and thus transform the development and realization of enterprise strategies. In consequence one of the main problems is how to realize their integration. This problem has raised awareness because of the existence of many information systems, created in different periods of time with the purpose of meeting different needs existing in the moment of their creation. As a result problems appear with the exchange of information between different applications and between information systems.

PURPOSE, METHODS AND RESULTS

The integration of information system is a research field of study, which focuses on combining different levels from several decades. Nowadays the integration of information systems is Internet-oriented [**Figure 1**].

In this aspect the problem has moved from "how to develop one brand new information system or an application" to "how to make the existing systems evaluate and integrate between them".

This problem can be viewed in two ways:

- Creation of a completely new system on the base of experience of existing systems and in this way to set from the beginning further evolution and integration
- Creation of an isolation layer, presenting a wrapping layer over the existing applications, which realizes the integration.

These ways are manifold and give us two directions of development. Both have advantages and disadvantages. The advantages of the first suggestion can be found in the development of a whole new system – all that has come has been taken into consideration. Moreover it has the potential to develop and integrate itself. The developed business model is based on the experience gained from the past. In this way old omission and problems are overcome. A feeble feature is the time required, because this is a complete process of development with all phases of the project life cycle. All this implies consumption of human and financial resources.

The second suggestion is the opposite of the first one – we presume that the systems function sufficiently well, that they have been tested and approved in the practice and that

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the disadvantages have been eliminated. The main problem is the integration with other systems because their integration is not set when they are created.

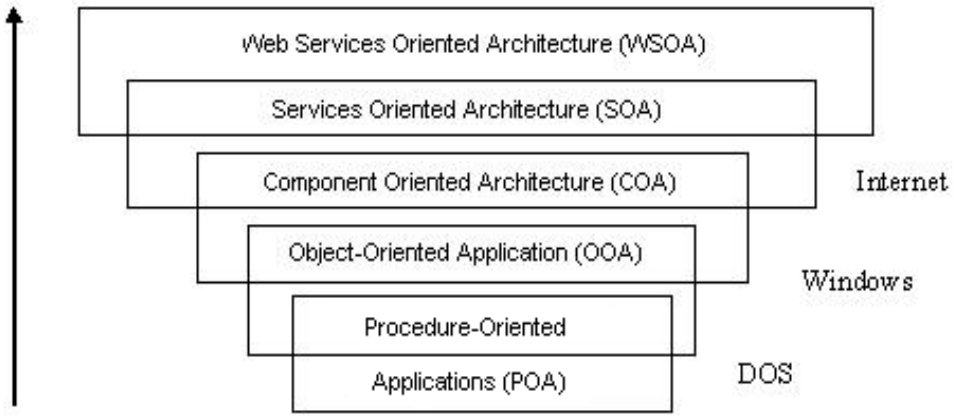

***Figure 1**: Evolution of IS applications*

We think that it is debatable which one is better, because the advantages of one are the disadvantages of the other. Everything depends on the needs and the potential of the enterprise.

We concentrate on the second suggestion – how to build the isolated layer overcoming the problems connected with integration. An instrument to deploy these layers in our opinion can be the Web Services. The main goal is to show how a middleware layer for integration can be developed with the help of the Web Services.

INTEGRATION

Most of the information systems are created to facilitate business activities. From the business point of view the integration ensures interaction between different actors – client, suppliers, etc. This type of integration is an "outside" integration.

The "inside" integration focuses on IT aspects and includes three levels of integration.

- Data integration;
- Process integration;
- Application integration.

Data integration is the first field of research (existing for more than 20 years) and this integration is applied already to DBMS. The level of data independence from the application is achieved.

The next two levels of integration are objects of research at the present. Still, there is no completely built, approved and standard technology for their integration.

To realize the integration several main requirements are necessary:

1. The interface language with universal character
2. An appropriate information environment (Internet).
3. Flexibility and independence of the interface from changes in the software environment.

The necessity of integration of information systems, applications, processes, data is due to evolution in the software technologies. As a result there are a number of applications and information systems, which operate in different environments or platforms with different data, specifications and formats. Each new client-side need leads to the creation of a new functionality in an application. In this way we have "closed" information systems, where evolution or shared use with another information system is impossible. Because of that there is a number of heterogenic information systems, which interact with one another. There are a lot of instruments to overcome the integration problems developed in the years, which did not give the expected results or had little success, imposing a lot of restrictions.

HOW WEB SERVICES CAN SOLVE THE PROBLEMS OF INTEGRATIONS?

In the last 10 years different concepts and architectures are developed and deployed. One instrument of integration, which we discuss in this article are Web Services. Our particular interest lies in their main goal, i.e. to represent each application as a multitude of services easily accessible through the network while at the same time each of them can be used separately.

The main idea is to get one existing application and to make it accessible for others services, regardless of the data models, the sent and received messages and the communication protocol.

In this manner the service can be used from several users and be shared between them. Because of the loosely coupled dependency between services the following occur:

- the modification in one service does not affect the application;
- they can be combined in different ways, depending on the specific needs;
- one group of services can be involved in different applications.

In this article we will try to present the Web Services concept for Web Service Management System (WSMS) without giving large technical details.

We will discuss 3 scenarios on how we reach Web services idea from simple application.

If we combined different autonomous and heterogeneous applications in domains according to their specific features we will have a premise to use services [**Figure 2**].

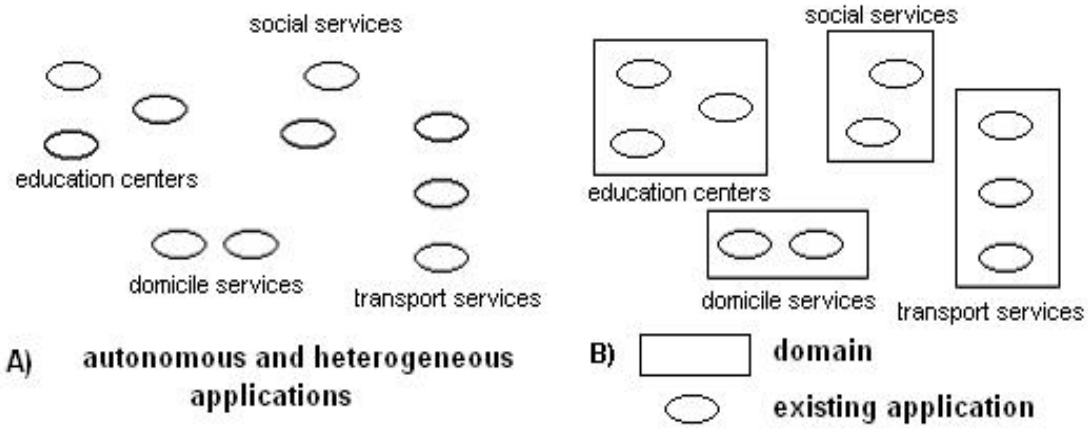

Figure 2: *Simple applications without Web Services*

For each domain we can create simple services that encapsulate applications and ensure communication between them. Next step is to create composite services that manage the activity of each simple service. Thus the communication will only be with services but not with applications. The composite services will ensure interaction between services from different domains [**Figure 3**].

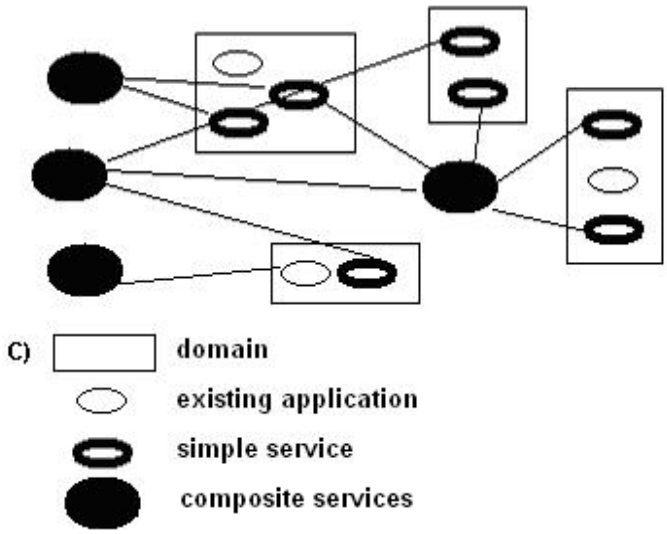

Figure 3: *Information systems, based on composite services*

The key problems that web services have to decide are rapid integration and assemblage, creating stable model of execution and ensuring good level of security.

Thus to create an WSMS for composite services we have to follow 5 further steps:

- encapsulation of existing services
- localisation of services
- assemblage of services
- execution of services
- surveillance of services

Concept of Web Services can be presented as a two-level composition – integration level and level of composition. On the integration level we have encapsulated native services unified in simple services. For example, on one side we have applications from, and, on the other side, we have web services used by a client connecting through the Internet [**Figure 4**].

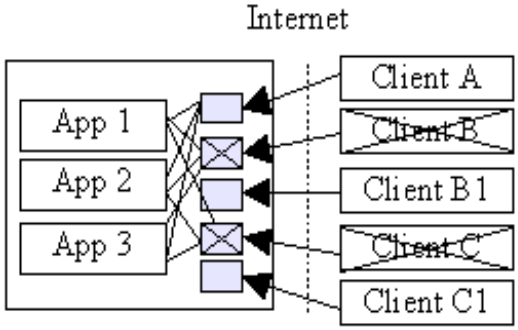

Figure 4: *Services encapsulation*

Each time different formats, interaction protocols, etc. evolve, the necessity to develop a system that provides independence arises. This system has to manage the communication and security, formats and interaction and to operate as "envelope" managing all this [**Figure 5**].

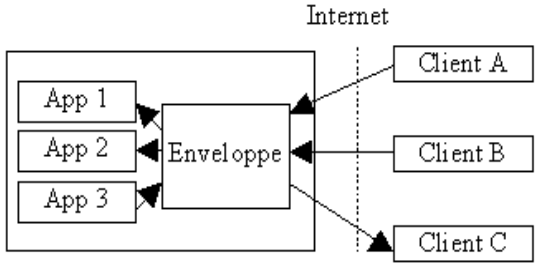

Figure 5: *Services encapsulation with envelop*

Communication management includes support of different communications protocols (HTML/HTTP, SOAP/HTTP, Java RMI, CORBA, DCOM...) and ensures automatic messages translation. Security management includes authentication mechanisms (HTTP, SSL).

For format management it is necessary to create interfaces corresponding to different messaging formats and convert these messages from input to output. All these can be achieved with technologies like XML, RDF.

Interaction management can be discussed on two levels:

- dispatch each message to the function associated with input/output service in accordance with the interaction task;
- translate their task sequences, correspondent to certain interaction protocol to another interaction protocol.

In this way the main problem that has to be resolved is to identify services, necessary for the realisation of one composition and to specify their interactions in high abstraction level whereas at the same time to distinguish elementary and composite services and specify data flows.

CONCLUSIONS

We can generalize that Web services make easy access to application situated in different servers. They can interact through networks independent from platform and program language. In this article we give some features on how Web Services can be used for integration. Their goal is to compose services for the integration of the applications. Along with them a layer ensured level of communications is developed. They function as an instrument for connecting applications. The integration of the information systems in present is important and an object of research. Web services are the appropriate decision of the shown problems, because they give opportunities for the development of layers for communication between already built applications. In this way they solve the problems of integration.

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