Network of e-Services

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Abstract: Open standards for info-services in a global network of digital e-centres, integrating distributed services and data, thereby facilitating the networking of business, government and educational informational services is presented.

Key words: Computer’ Network, e-services, information technologies through Internet.

INTRODUCTION

This work is based on emerging technologies like XML, distributed search mechanisms applying Web Service Description Language (WSDL) and Unified Distributed Discovery and Integration (UDDI) metadata descriptions, registry and ontology developments. A key issue is to find solutions for integration of distributed data and knowledge. The development of a registry for services, replication between the registries, distributed search and integration of the result sets are key tasks in addressing this issue.

1. Technologies for implementation of E-Services in a Network

1.1. Intelligent e-centres network

The problems and peculiarities, which take place in finding information on the web include: Large and disparate volumes of information; multiple but isolated sources of information; sources are not shared or integrated; large variety of media formats of open source; volume of data too overwhelming to use appropriately; manual methods of aggregating data and lack of “complete picture” for available information.

The goal is developing a solution that integrates data from disparate sources and provides real-time access for intelligent applications. The concepts applied are: hypertext, meta tags and web service description.

1.2. Hypertext

The major impact of the web has been that it makes huge amount of data, information and info-services available on demand to a worldwide audience. But the web is not the world’s largest library. A library is a categorised and catalogued collection of material. Professional staff assists users searching for correct information and manages the collection. This is not the case with the web. To benefit from the web revolution we need to solve the following: the resource discovery problem; the false belief of abundance; the presentation problem; the size problem; the semantic problem.

Before the users can exploit the info-services offered by the web community, they must be aware of the existence of the information or service and the hosts from which it is available. Hence the resource discovery problem has to locate the resources, qualify them, rank them and identify those that offer the “best fit” for the users needs.

The false belief of abundance is a mistake. Too often the searcher believes that the search is performed thoroughly and well, even though the search may exclude large volumes of information. Browsers, filters and search engines are not able to distinguish advertising from scientific papers. Computers are limited to transmitting and presenting information from the web and cannot help in “understanding” the information. Resource discovery requires indexing of the information by skilled staff. The semantic classification of content is an important part of the integration and resource discovery process.
1.3. The Internet Search Engine

With the current size and growth of the WWW, human indexing is no longer practical. A special program, known as a “robot” explores the Internet and extracts data about the resources it encounters.

The extracted data is stored in a search set on the computer hosting search engine and it is refined and structured. The data set is queried through a client/user interface and the results are presented as an organised result set.

The robot captures the details of each search. The search is defined by two expressions: the first is the search (addition) and the other is a filter (subtraction). Ranking and presentation are important tasks for ensuring successful searches. The search engines use the Meta tags from the HTML documents to identify informational resources and services.

1.4. Meta tags

The Meta tags are sections of HTML pages that describe the content of web pages and therefore facilitate resource discovery. Content providers and web site owners use this mechanism to control the positioning and descriptions of their pages in the search engines. The Meta tags precede the opening <HTML> tag. It is the first element to be used on any page. To find info resources, the applicable Meta tags could be:

- `<meta http-equiv="expires", content="24 April 2003">` - describing that the service will no longer be valid;
- `<meta http-equiv="refresh", content="min;url=http://hsi.iccs.bas.bg">` - to redirect or refresh the actual service location;
- `<meta name="service" content="e-learning, e-living, e-job">` - the key words will be used to identify appropriate services;
- `<meta name="description" content="This is an e-learning system">` - this tag will lead the user in searching for appropriate service domains.

2. Web Services. Internal integration

Web Services are applications that are published, located and dynamically invoked across the Web. The services perform functions ranging from simple requests to complicated business processes. Once a Web Service is deployed, other applications and other Web Services can discover and invoke the deployed service.

2.1. Description of Services

**WSDL** describes a Web Service in XML format and is created by merging two distinct approaches to Web Service definition:

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WSDL works with several protocols including HTTP, MIME, and SOAP. It consists of four components: messages, port type, bindings and services and provides the following:
• Interoperability;
• List of services offered;
• List of ports for each service.
WSDL provides a model and a XML format for describing Web Services, starting with messages that are exchanged between the service provider and requestor. WSDL enables one to separate the description of the abstract functionality, offered by a service from concrete details of the service description such as “how” and “where”.

2.2. UDDI

UDDI (Universal Description, Discovery and Integration) is developed to design a structured public registry containing information for business and their services. UDDI will speed up interoperability and adaptation of Web Services through the establishment of:
• Standards-based specifications for service description and discovery;
• Shared operation of a business registry on the Web.

The Web services technology stack, based on standards is presented in Figure 2.
How UDDI Works

1. SW companies, standards bodies, and programmers populate the registry with descriptions of different types of services

2. Businesses populate the registry with descriptions of the services they support

3. UBR assigns a programmatically unique identifier to each service and business registration

4. Marketplaces, search engines, and business apps query the registry to discover services at other companies

5. Business uses this data to facilitate easier integration with each other over the Web (www.uddi.org)

2.3. Web service search mechanism

Applying the UDDI and WSDL convention the Web Service search mechanism is illustrated in Figure 4.

- Web Service Client
  - Web Browser
  - Windows application
  - WAP Mobile Phone
  - PDA

- Web Service
  - Any platform (Windows, Java, Unix etc ...)

Figure 4. Web Service Search Mechanisms

The Web Service Client could be a Web browser, Windows application, WAP Mobile phone or PDA. The Web Service will be supported by any major platform (Windows, JAVA, Unix).
2.4. Registry operation

The registry is replicated on a daily basis ensuring a complete set of “registered” records is available at each e-centre. All nodes support a common set of SOAP API's.

2.5. Communication with SOAP protocol

The SOAP protocol allows the exchange of XML documents. Implementations exist for C, Java, Perl, and Php. Toolkits exist for Apache and Microsoft based web servers. The SOAP protocols operate in the following way:

- The XML message is enclosed in a SOAP envelope;
- The message consists of a SOAP optional header and mandatory body;
- The header can specify security, routing or handling requirements;
- The body contains the actual XML message.

2.6. Architecture of Web Services

The interactions between the user (service requestor), the service providers and the registers of the services are shown on Figure 5. The general approach is that the user first searches for the appropriate info service through the register before addressing the required service.

Architecture Revisited

3. Network technological developments

3.1. Description and Sequence of Operation

One network of e-centres supports e-services for various domains: e-learning, e-business, e-government, etc. The e-centre has to support a functional structure, related to the common standards :

- **UDDI** - Service Registration Functional Level. The UDDI level has to operate daily on a peer basis. It will replicate and maintain lists of services accessible in the e-centre’s network.
- **WSDL** - Service Description Functional Level. The WSDL level describes the available services in the e-centre. When available, new services will be added to the list by the e-centre administrator.
- **SOAP** – Communication Functional Level. Common protocol applied for the web service invocation and for the result set transmissions.
• **API** – Services Functional Level. The real functions, objects, programs, which perform the information services, collect input data, format the inputs, and integrate the results.

• **DB** - Data Repository Functional Level. These are database repositories, which are part of the appropriate services.

The communications between the API, SOAP, WSDL and UDDI levels are via symbolic (string) messages in XML format. The negotiation between the user and the e-centre (see Figure 7) is as follows:

1. The user through the HTTP protocol enters a page, consisting of services available on the node, or offered by another e-centre.
2. Activating the appropriate service, input parameters for the services are provided by the user using input forms.
3. The service is invoked initiating queries to the set of e-nodes, referring to the service functionality. The communication between the invocation program and the e-centres is SOAP based.
4. The SOAP request is received by a software module, called a Service Server. This is a particular API, which satisfies the informational request by searching in and retrieving data stored in one or more databases. The databases operate under the supervision of the e-centre in which it resides.
5. The integration module of the API collects the result sets from the data retrieval. The result set can be an aggregation of data, received from the Servers of the remote e-centres.
6. The integrated results are presented by XSL style sheets and returned to the user as a result set.

**CONCLUSIONS**

The identification of available data and services in the Internet becomes a vital problem for the beneficial management of the virtual communities. Emerging standards and methodologies are under way and development like UDDI and WSDL.

The paper presents a system solution based on definition and support of a registry system, consisting metadata description of services and data. By initial replication the virtual community of e-centres support a common knowledge in distributed environment. This system solution is based on prospective standards, raised by the Internet software and development community.

**REFERENCES**

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