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SOAP Based Multiple Search

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Abstract: The Grid and the Web Services technologies are explain. Web Service for remote data access is described. A SOAP based software decision for multiple search in databases, is developed. Standardization issues are under consideration.
Key words: Web Services, Search, SOAP, Databases, PHP.

INTRODUCTION

There has been a great deal of attention and publicity about grid computing recently. The promise of grid computing is to integrate a variety of systems into a virtual supercomputer capable of aggregating resources such as, processor cycles and storage within a large network consisting of one or more organizations. One important component of grid computing is Web services. In general, Web services are modular applications or functions, which are generally independent and self-describing, that can be discovered and called across the Internet or an enterprise Intranet.

A software decision for multiple search in databases, realized as a web service, will be presented in this paper.

GRID AND WEB SERVICE TECHNOLOGIES

The term "the Grid" was coined in the mid1990s to denote a proposed distributed computing infrastructure for advanced science and engineering [2]. Grid Computing provides individuals, institutions or applications that build a virtual pool of resources and suitable interfaces and infrastructure in order to access and use them. Figure 1 presents a conceptual schematic of a general Grid [1]. Users have direct access to resources in an abstract virtual level that hides the physical assignments of resources to particular nodes. These resources can be computational resources, storage systems, data and meta-data or input and output devices.
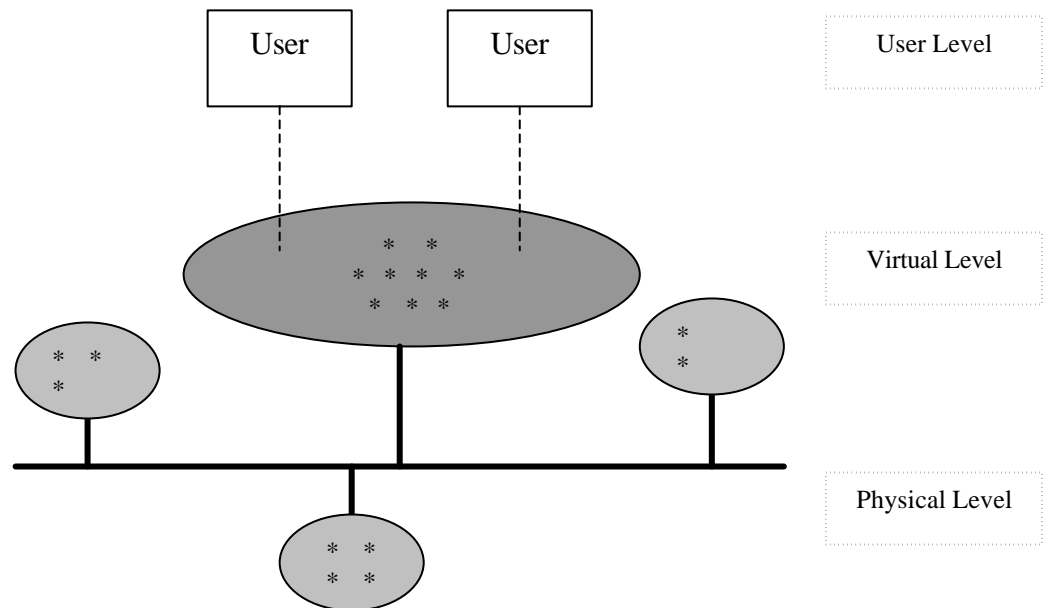

Fig.1 – Conceptual schema of a grid – users have direct access to the resources, represented by stars, without knowledge about their assignment.

Web services allow grids to be specified as services that can interoperate with each other. Wide range of grid services, particularly those focused on information services (queries) and on control can be developed as Web services [8].

The term Web services describes a standardized way of integrating applications using the XML, SOAP, WSDL and UDDI open standards (see [9]) over an Internet protocol backbone such as HTTP.

XML (eXtensible Markup Language)—A language specialized for Web documents, enabling the creation of tags customized to the company's needs and business logic. It not only has data but also contains metadata. It uses DTD and SCHEMA to describe the data.

SOAP (Simple Object Access Protocol)—A lightweight, XML-based messaging protocol that contains an envelope, header, and body, designed to exchange information in a decentralized, distributed environment.

WSDL (Web Services Definition Language)—An XML-based language used to give a description about the Web Services available in a UDDI.

UDDI (Universal Description, Discovery, and Integration)—An XML-based lookup service for locating Web Services in an Internet scenario.

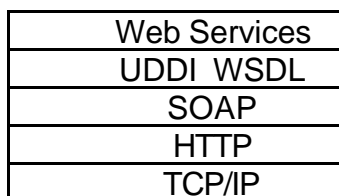These technologies form The Web Services Protocol Stack (fig. 1).

Web Services
UDDI WSDL
SOAP
HTTP
TCP/IP

Fig. 2

A Multiple Search Application

The application has a working title ArtInfo and proposes services for selective search in distributed database, located in different places. The database comprises information about Bulgarian works of art. The user can obtain the necessary information only by typing a keyword and without knowledge where the searching item is stored.

MySQL is the used Database Management System. The base fields of a database are shown on table 1. The tables of the database are stored on different machines – in our case these machines are http://hs18.iccs.bas.bg, http://hs19.iccs.bas.bg and http://www3.iccs.bas.bg.

Table 1

Field	Type
ID	Int(10)
Title	Varchar(50)
Author	Varchar(50)
Year	Year(4)
Materials	Varchar(20)
Style	Varchar(20)
Location	Varchar(50)

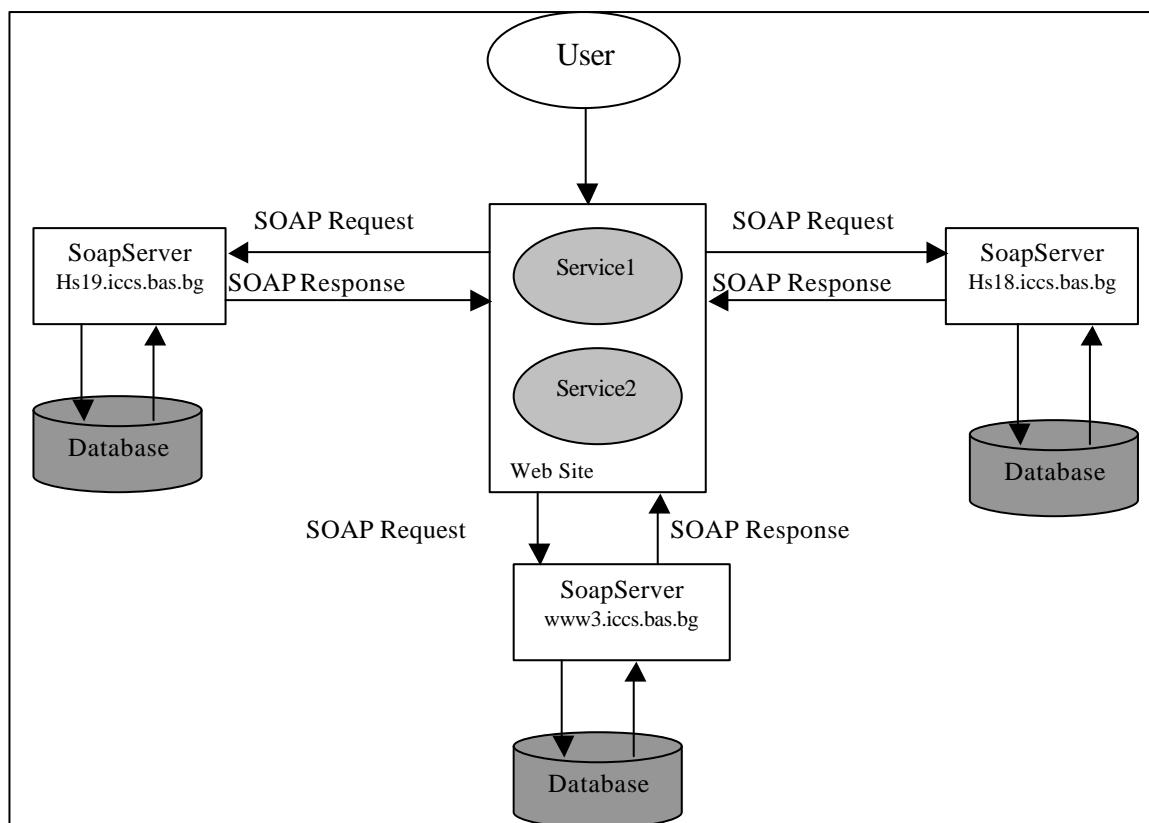The structure of the application is shown on fig. 3

Fig. 3.

Service1 and Service2 are proposed web services. In our case they are functions "Listing" and "Searching" for listing and searching items respectively. Grey ellipses, named Service1 and Service2 on fig.3, in fact present the user interface for mentioned functions and are clients for the real service-function which is invoked on the remote computer. SoapServer, the program that client communicates with by using SOAP protocol, is located on the machine (called end point), where the relevant database is stored.

Software components of the application are:

1 Apache web server (http://www.apache.org) is an open-source HTTP server, developed by Apache Software Foundation, for various operating systems, such as UNIX and WINDOWS.

2 MySQL Server (http://www.mysql.org) is an open-source database server, developed, distributed and supported by MySQL AB.

3 PHP (http://www.php.net), a widely-used Open Source server-side scripting language, is especially suited for Web development and can be embedded into HTML.

4 NuSOAP – SOAP implementation, deployed with PHP scripting language by Nusphere corp. http://www.nusphere.com. It has been used by the program-client and the program SoapServer .

5 The main client scripts are search_soap.php and list.php, by which the user can obtain the selective search into the database. The base code of the program is listed bellow. Three objects according to used three machines with their URL are instantiated. The search in three databases is occurred at the same time by these three objects.

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```
//Pass the relevant end-point

$SoapServerURL1="http://hs18.iccs.bas.bg/Server/ SOAPServer.php";
$SoapServerURL2="http://hs19.iccs.bas.bg/Server/ SOAPServer.php";
$SoapServerURL3="http://www3.iccs.bas.bg/Server/ SOAPServer.php";

// instantiate soap client objects

$soapclient1 = new soapclient("$SoapServerURL1");
$soapclient2 = new soapclient("$SoapServerURL2");
$soapclient3 = new soapclient("$SoapServerURL3");

//Invoke the service

$book1 = $soapclient1->call ("Listing", array (),"urn:nusphere-web-services");
$book2 = $soapclient2->call ("Listing", array (),"urn:nusphere-web-services");
$book3 = $soapclient3->call ("Listing", array (),"urn:nusphere-web-services");

if ($hits = $soapclient1->call("Searching",array("pattern"=>$pattern),"urn:nusphere-web-
services")){
        foreach($hits as $data){
                $result .= "$data[Title] $data[Author] $data[Style]: $data[Location]<br>";
        }
}
elseif($hits = $soapclient2->call("Searching",array("pattern"=>$pattern),"urn:nusphere-
web-services")){
        foreach($hits as $data){
                $result .= "$data[Title] $data[Author] $data[Style]: $data[Location]<br>";
        }
}
elseif($hits = $soapclient3->call("Searching",array("pattern"=>$pattern),"urn:nusphere-
web-services")){
        foreach($hits as $data){
                $result .= "$data[Title] $data[Author] $data[Style]: $data[Location]<br>";
        }
} else {

        // report error
        print "error:<br>";
}
…
```

6 The SoapServer program, which is used for communication with the client on one hand, and with the database server on the other hand.

The programs soap_search.php, list.php on one hand and SoapServer.php on the other hand are responsible for the realization of the necessary remote data access and data management. These programs are communicating with each other using SOAP messages.

```
// call the add_to_map() method for each "service" (function)
// this method returns an associative array of all the item records

$server->add_to_map(
      "Listing",       // function name
      array (),                  // array of input types
      array ("array")           // array of output types
);
function Listing(){
      global $item;
      $items = array();
      $Sql = "SELECT ID, Title,  Author, Year, Style, Location
        FROM   arts
        ORDER BY Author";
        $ResultList = $item->DB_Query($Sql);
      while ($Row = mysql_fetch_assoc($ResultList)){
            $items[] = new soapval("item","SOAPStruct",$Row);
      }
      return $items;
}

// this method accepts a pattern as argument
// returns associative array of matching items and info

$server->add_to_map(
      "Searching",       // function name
      array ("string"),       // array of input types
      array ("array")            // array of output types
);

function Searching($pattern){
      global $item;
      $matches = array ();
      $Sql ="
      SELECT ID, Title, Author, Year, Style, Location
      FROM   arts
      WHERE Title regexp '$pattern'
              OR Autor regexp '$pattern'
              OR Style regexp '$pattern'
            OR Style regexp '$pattern'
            OR Location regexp '$pattern'
      ORDER BY Autor";
        $ResultList = $item->DB_Query($Sql);
      while ($Row = mysql_fetch_assoc($ResultList)){
            $matches[] = $Row;
      }
      return $matches;
}
// Call the service method to initiate transaction
// and send response
$server->service($HTTP_RAW_POST_DATA);
…
```

The application ArtInfo can be reach at http://hs18.iccs.bas.bg .

CONCLUSIONS AND FUTURE WORK

The Grid and the Web Services technologies were explained. Remote data access implemented as web services was described. The practical application of SOAP based multiple search in databases, was developed. More complex web services, integrated in information system, accessible through WAN and WAP are our future plans.

REFERENCES

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[7] http://www.php.net

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