

# Internet Databases Using SOAP Protocol and XML Standard

Martin Tsenov<sup>1</sup>

**Abstract** – The internet database application of SOAP protocol using XML is considered. Two methods of hierarchical system: two tiers and three tiers models are presented and the communication between client and server depends on XML and SOAP are explained.

**Keywords** – Database, Internet, SOAP, Xml

## I. Introduction

SOAP (Simple Object Access Protocol) is a simple, lightweight protocol for structured and strong-type information exchange in a decentralized, distributed environment. The protocol is based on XML (eXtensible Markup Language) and consists of three parts:

1. An envelope which describes the contents of the message and how to use it
2. A set of rules for serializing data exchanged between applications
3. A procedure to represent remote procedure calls, that is, the way in which queries and the resulting responses to the procedure are represented.

Similar to object distribution models (IIOP, DCOM...), SOAP can call methods, services, components and objects on remote servers. However, unlike these protocols, which use binary formats for the calls, SOAP uses text format (Unicode), with the help of XML to structure the nature of the exchanges.

SOAP can generally operate with numerous protocols (FTP, SMTP, POP...), but it is particularly well suited to the HTTP protocol. It defines a reduced set of parameters which are specified in the HTTP header, making it easier to pass through proxies and firewalls.

XML (Extensible Markup Language) is a flexible way to create common information formats and share both the format and the data on the World Wide Web, intranets, and elsewhere. For example, computer makers might agree on a standard or common way to describe the information about a computer product (processor speed, memory size, and so forth) and then describe the product information format with XML. Such a standard way of describing data would enable a user to send an intelligent agent (a program) to each computer maker's Web site, gather data, and then make a valid comparison. XML can be used by any individual or group of

individuals or companies that wants to share information in a consistent way.

XML is "extensible" because, unlike HTML, the markup symbols are unlimited and self-defining. XML is actually a simpler and easier-to-use subset of the Standard

Generalized Markup Language (SGML), the standard for how to create a document structure. It is expected that HTML and XML will be used together in many Web applications.

## II. Physical Implementation

### A. Theoretical Part

The main aim of the e-Shop is to obtain a selective search of the offered items in the REGNET system. The functionality of the system is realized by software decision, based on the SOAP protocol and XML [1] standards. SOAP (Simple Object Access Protocol) is a simple, lightweight protocol for structured and strong-type information exchange in a decentralized, distributed environment. The protocol is based on XML (eXtensible Markup Language).

SOAP messages are structured using XML. Within the framework of the remote procedure call (RPC), it represents the parameters of the methods, the return values and any potential error messages linked to the processes.

Coding SOAP messages in XML [2] enables universal communication between applications, services and platforms via the Internet. In order to do this, SOAP makes use of the descriptive nature of the XML language, thus transforming the content into an application.

In more technical terms, just as with an XML fragment, SOAP messages make references to different namespaces, enabling the content to be validated. They must therefore include a call to SOAP namespaces, making it possible to define and specify the use of standard tags in the message and to ensure compatibility between SOAP versions. As soon as a SOAP message is received, the SOAP tags are validated, as are the tags that express the subject of the message. If it fails, an error is generated (<http://www.w3.org/TR/SOAP/>).

Soap thus defines two namespaces:

<http://schemas.xmlsoap.org/soap/envelope/> for the envelope

<http://schemas.xmlsoap.org/soap/encoding/> for the coding

<sup>1</sup>Martin Tsenov is with Institute of Computer and Communication Systems - Bulgarian Academy of Sciences, Acad. G. Bonchev bl.2, 1113 Sofia, Bulgaria, e-mail: mcenov@hsh.iccs.bas.bg

```
xml_begin="<?xml version='1.0'?>\r\n".
"<SOAP-ENV:Envelopexmlns:SOAP-
ENV='http://schemas.xmlsoap.org/soap/envelope/'
xmlns:xsd='http://www.w3.org/2001/XMLSchema'
xmlns:xsi='http://www.w3.org/2001/XMLSchema-
instance'"
xmlns:SOAP-
ENC='http://schemas.xmlsoap.org/soap/encoding/'
xmlns:si='http://soapinterop.org/xsd'
SOAP ENV:encodingStyle='
http://schemas.xmlsoap.org/soap/encoding/'>\r\n".
"<SOAP-ENV:Body>\r\n";
$xml_end="</SOAP-ENV:Body>\r\n".
"</SOAP-ENV:Envelope>\r\n";
```

Deploying SOAP over HTTP makes it possible to use the SOAP decentralization method in the well-used environment of HTTP. Using SOAP over HTTP also enables resources already present on the Web to be unified by using the natural request/response mode of HTTP. The only constraint is that a SOAP message via HTTP must use the MIME type "text/xml". Fig. 1 presented the example SOAP network.

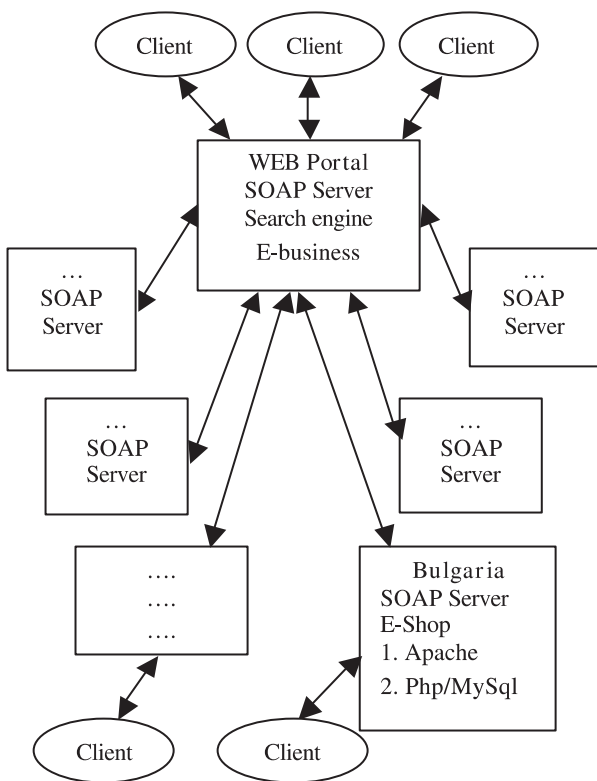


Fig. 1. Structure of the example SOAP network

**B. Structure of the E-business Center**

This Soap network was implemented in E-business portal, which is part of the REGNET project (www.regnet.org). REGNET aims to set up a functional Network of Cultural Service Centers through Europe which will provide IT-services dedicated to cultural heritage organizations and it is funded by European Commission. For software development

are used Apache web server [3] under Linux Operation System [4] (www.apache.org). For web programming language we used PHP [5] and MySql Server [6] for database. To exchange data between REGNET centers is used SOAP protocol. Sample source code is presented above.

```
//SOAP-request creating
$xml_body="<?xml version='1.0'?>\r\n".
"<SOAP-ENV:Envelopexmlns:SOAP-
ENV='http://schemas.xmlsoap.org/soap/envelope/'
xmlns:xsd='http://www.w3.org/2001/XMLSchema'
xmlns:xsi='http://www.w3.org/2001/XMLSchema-
instance'"
xmlns:SOAP-
ENC='http://schemas.xmlsoap.org/soap/encoding/'
xmlns:si='http://soapinterop.org/xsd'
SOAP-
ENV:encodingStyle='http://schemas.xmlsoap.org/soap/en-
coding/'>\r\n".
"<SOAP-ENV:Body>\r\n".
"<xml_body>\r\n".
" <action>Search</action>\r\n".
" <request>\r\n";
//$xml_body=" <pricetype>test</pricetype>\r\n";
if (isset($term))
$xml_body.="
<prodName>".$term."</prodName>\r\n";
if($term=="$xml_body.="
<prodName>%</prodName>\r\n";
if ($prices!="")
$xml_body.=" <price>".$prices."</price>\r\n".
" <tup>".$stup."</tup>\r\n";
if ($category_id!=0)
$xml_body.="
<category_id>".$category_id."</category_id>\r\n";
$xml_body.=" </request>\r\n".
"</xml_body>\r\n".
"</SOAP-ENV:Body>\r\n".
"</SOAP-ENV:Envelope>";
$xml_query=$xml_begin.$xml_body.$xml_end;
//$xml_body=";
```

At Fig. 1 and Fig. 2 are presented two methods of hierarchical system: two tiers and three tiers models for communications between client and E-business center.

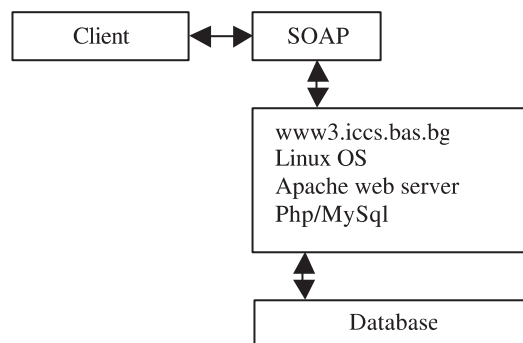


Fig. 2. Two tiers model

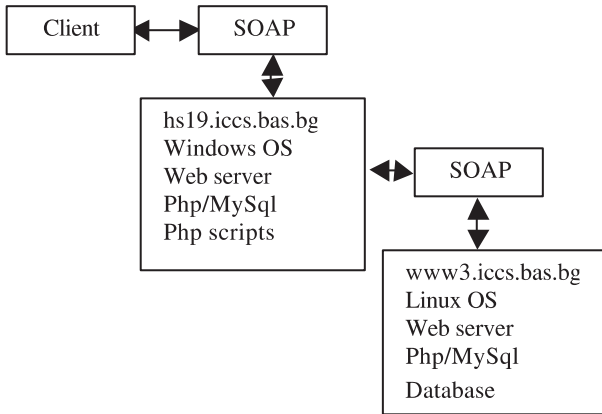


Fig. 3. Three tiers model

C. Software Components.

Apache web server [7]. The Apache HTTP Server Project is an effort to develop and maintain an open-source HTTP server for various modern desktop and server operating systems, such as UNIX and Windows NT. The goal of this project is to provide a secure, efficient and extensible server which provides HTTP services in sync with the current HTTP standards.

Php. Php [8] is a widely-used Open Source general-purpose scripting language that is especially suited for Web development and can be embedded into HTML.

MySQL database. For database is used MySQL Server [9]. The MySQL database server embodies an ingenious software architecture that maximizes speed and customizability. Extensive reuses of pieces of code within the software and an ambition to produce minimalist but functionally rich features have resulted in a database management system unmatched in speed, compactness, stability and ease of deployment. The unique separation of the core server from the table handler makes it possible to run MySQL under strict transaction control or with ultra fast transaction less disk access, whichever is most appropriate for the situation.

The structure of tables and field of the database are presented at Figures above: Table 1: item\_shop database table, Table 2: transaction database table.

Table 1.

Field	Type
item_no	varchar(20)
item_type	varchar(40)
title	varchar(60)
artist	varchar(60)
price	float
text	text
picture	blob
picture1	varchar(60)

Table 2.

Field	Type
order_no	int(11)
user_id	varchar(20)
item_no	varchar(20)
quantity	int(11)
date	date
status	varchar(20)

III. Structure of the Application

The SOAP communication module and server side programs are developed in PHP web programming language [5]. The descriptions of the function are presented above.

SOAP communication module – This module provide relation and links between clients, web portals and E-business centers. It based on SOAP protocol, defined by W3 consortium [10]. The simple source code is presented above.

```
//SOAP-request creating
...
$payload[]="HTTP/1.0 200 OK\r\n";
$payload[]="Status: 200\r\n";
$payload[]="Server: SOAPx4 Server v0.5\r\n";
$payload[]="Connection: Close\r\n";
$payload[]="Content-Type: text/xml; charset=UTF-8\r\n";
$payload[]="Content-Length:
".strlen($xml_query)."\r\n\r\n";
reset($payload);
foreach($payload as $hdr)
{
    header($hdr);
}
print $xml_query;
...
//SOAP-response creating
```

Register – this function realizes the registration of the user and saves their data in the database server MySQL. The information, required from the user is name, surname, user id, password, e-mail, country. The simple source code is presented above.

```
<?php
require 'functions.php';
// Check if all the form entries are entered, if any form
entry
// is missing then send, error message page
if ( (trim($form_name)=="")|| (trim($form_password)=="")
|| (trim($form_user_id)=="")|| (trim($form_password)=="")
|| (trim($form_password1)=="")||
(trim($form_email_id)=="")|| (trim($form_phone)=="")||
(trim($form_city)=="") || (trim($form_country)=="") ) {
    header("Location:error2.htm"); exit();
} else if ($form_password != $form_password1) {
    // If both the passwords are not the same then generate
error message
    header("Location:error3.htm");
    exit(); } else {
```

```
// Open a persistent connection with the Database
if (!$link = mysql_pconnect ($DB_SERVER,
$DB_LOGIN, $DB_PASSWORD)) {
    DisplayErrMsg(sprintf("internal error %d:%s\n",
        mysql_errno(), mysql_error()));
    exit(); }
// Create the user record
$balance = 0.00;
if (!$newresult = mysql_db_query($DB, "INSERT
INTO user_profile
(name,user_id,password,city,
country,email_id,phone_number,
account_balance) VALUES
('$form_name','$form_user_id','$form_password',
'$form_city',
'$form_country',
'$form_email_id', '$form_phone',
$balance)")) {
    DisplayErrMsg(sprintf("internal error %d:%s\n",
        mysql_errno(), mysql_error()));
    exit(); }
// If Registration Successful, then display, else error

header("Location:registration_success.htm");
exit(); } ?>
```

Search – this function realize a selective search of the offered items in the e-Shop. The data of the items are saved in the distributed database and used SOAP communication modul. The searching can be restricted by few categories: type, title, artist and price. The simple source code is presented above.

```
/SOAP-request sending
function send ($soap_data,$path,$server)
{
    global $outgoing_payload;
    $incoming_payload="";
    $action='urn:soapBI';
    $port='80';
    $fp = fsockopen($server,$port,$errno,$errstr,3);
    $outgoing_payload =
        "POST ".$path." HTTP/1.0\r\n".
        "User-Agent: SOAPx4 v0.5\r\n".
        "Host: ".$server."\r\n".
        "Content-Type:text/xml\r\nContent-Length:
        ".strlen($soap_data)."\r\n".
        "SOAPAction: \"\$action\"".".\r\n\r\n".
        $soap_data;
    // send
    ...
    mysql_connect($host,$user,$userpass)
        or die("Connect failed");
    if(mysql_select_db($base)==FALSE)
        { ... }
```

Items – whit this function can be listed the whole items catalogue.

Today Shop – this function is the shop cart of the user.

The e-shop can be reach at <http://www3.iccs.bas.bg> or [http://hs19.iccs.bas.bg/Eth\\_shop/](http://hs19.iccs.bas.bg/Eth_shop/)

#### IV. Conclusion

The application of SOAP protocol in E-comers Solution was presented. Two methods of hierarchical system: two tiers and three tiers models for communication between client and server depend on SOAP protocol were explained and presented. The e-Shop was developed.

#### References

- [1] Alex Homer, *XML in IE5 Programmer's Reference*, Wrox Press, 1999.
- [2] Lee Anne Phillips, *Using XML*, QUE, 2000.
- [3] Peter Wainwright, *Professional Apache*, Wrox, November 1999
- [4] David Pitts, Bill Ball, et al., *Red Hat Linux 6*, Sams, 1999.
- [5] Christopher Scollo, Jesus Castagnetto, Deepak Veliath, Harish Rawat, Sascha Schumann, *Professional PHP Programming*, Wrox, December 1999
- [6] Paul Dubois, *MySql*, New Riders, 2000.
- [7] <http://www.apache.org>
- [8] <http://www.php.net>
- [9] <http://www.mysql.org>
- [10] <http://www.w3.org/TR/SOAP/>