Database Web Services for the Oracle DBA

Presented by

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B2B SOLUTIONS

Basics/Terminology

A Web Service - is defined by the W3C as "a software system designed to support interoperable machine-to-machine interaction over a network". Web services are frequently just Web APIs that can be accessed over a network, such as the Internet, and executed on a remote system hosting the requested services.

The W3C Web service definition encompasses many different systems, but in common usage the term refers to clients and servers that communicate over the HTTP protocol used on the Web. Such services tend to fall into one of two camps: Big Web Services and RESTful Web Services.
(from Wikipedia)

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Basics/Terminology

- XML - The **Extensible Markup Language** (**XML**) is a general-purpose *specification* for creating custom markup languages. It is classified as an extensible language because it allows its users to define their own elements. Its primary purpose is to help information systems share structured data, particularly via the Internet, and it is used both to encode documents and to serialize data. (from Wikipedia)

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Basics/Terminology

- SOAP – **Simple Object Access Protocol** is a protocol for exchanging XML-based messages over computer networks, normally using HTTP/HTTPS. SOAP forms the foundation layer of the web services protocol stack providing a basic messaging framework upon which abstract layers can be built.

  As a layman's example of how SOAP procedures can be used, a correctly formatted call could be sent to a Web Service enabled web site - for example, a house price database - with the data ranges needed for a search. The site could then return a formatted XML document with all the required results and associated data (prices, location, features, etc). These could then be integrated directly into a third-party site.

  There are several different types of messaging patterns in SOAP, but by far the most common is the Remote Procedure Call (RPC) pattern, in which one network node (the *client*) sends a request message to another node (the *server*) and the server immediately sends a response message to the client. SOAP is the successor of XML-RPC, though it borrows its transport and interaction neutrality and the envelope/header/body from elsewhere, probably from WDDX. (from Wikipedia)

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Basics/Terminology

- SOA – **Service Oriented Architecture** is a method for systems development and integration where functionality is grouped around business processes and packaged as *interoperable services*. SOA also describes IT infrastructure which allows different applications to exchange data with one another as they participate in business processes. The aim is a *loose coupling* of services with operating systems, programming languages and other technologies which underlie applications. SOA separates functions into distinct units, or services, which are made accessible over a network in order that they can be combined and reused in the production of business applications. These services communicate with each other by passing data from one service to another, or by coordinating an activity between two or more services. SOA concepts are often seen as built upon, and evolving from older concepts of distributed computing and modular programming. ((from Wikipedia)

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Basics/Terminology

- The **Web Services Description Language** (WSDL, pronounced 'wiz-dəl' or spelled out, 'W-S-D-L') is an XML-based language that provides a model for describing Web services.

  The WSDL defines services as collections of network endpoints, or ports. The WSDL specification provides an XML format for documents for this purpose. The abstract definition of ports and messages are separated from their concrete use or instance, allowing the reuse of these definitions. A port is defined by associating a network address with a reusable binding, and a collection of ports define a service. Messages are abstract descriptions of the data being exchanged, and port types are abstract collections of supported operations. The concrete protocol and data format specifications for a particular port type constitutes a reusable binding, where the operations and messages are then bound to a concrete network protocol and message format. In this way, WSDL describes the public interface to the web service.

  WSDL is often used in combination with SOAP and XML Schema to provide web services over the Internet. A client program connecting to a web service can read the WSDL to determine what functions are available on the server. Any special datatypes used are embedded in the WSDL file in the form of XML Schema. The client can then use SOAP to actually call one of the functions listed in the WSDL.(from Wikipedia)

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How does the database fit in?

While there is much coverage of SOA and it is certainly buzzworthy for its power to integrate systems the Oracle database has the ability to directly access Web Services using multiple methods and easily integrate them for various processing needs.

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What kinds of things can be done?

- Access stock prices
- Query legacy systems
- Execute credit/funds transfers between secured systems
- Access/update systems running other software/databases
- Google Maps/Yahoo Maps

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Using Web Services from the DB

UTL_DBWS

UTL_HTTP

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Setting up to use DBWS

1) Check to make sure existing Java classes are all valid. If not you may need to reload your JVM (see Metalink note 276554.1):

```
SELECT owner, status, count(*) FROM DBA_OBJECTS

WHERE OBJECT_TYPE='JAVA CLASS` GROUP BY owner, status;
```

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Setting up to use DBWS

2) Download the appropriate callout utility for your version of the DB

- Pre 10G: http://download.oracle.com/technology/sample_code/tech/java/jsp/dbws-callout-utility.zip
- 10G: http://download.oracle.com/technology/sample_code/tech/java/jsp/dbws-callout-utility-10R2.zip
- 10G and 11G: http://download.oracle.com/technology/sample_code/tech/java/jsp/dbws-callout-utility-10131.zip

  After downloading unzip the utility to the <Oracle Home>\sqlj directory. You should end up with several dbwsclient*.jar files in the <Oracle Home>\sqlj\lib directory.

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Setting up to use DBWS

3) It is recommended to insure you have a minimum of 96M shared_pool_size and 80M java_pool_size. Dependent on whether you're using Automatic Shared Memory Management make appropriate adjustments.
4) Load the Java classes.
   If loading to a specific schema:
   %ORACLE_HOME%\bin\loadjava –u <username>/<password> -r -v -f -genmissing dbwsclientws.jar dbwsclientdb102.jar
   If you want to available from any schema can load to SYS:
   %ORACLE_HOME%\bin\loadjava -u sys/<password> -r -v -f -genmissing -s -grant public dbwsclientws.jar dbwsclientdb102.jar

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Setting up to use DBWS

5) Run necessary grants (as SYS), change <schema> to the schema where the objects were installed.

```
execute dbms_java.grant_permission('<schema>','SYS:java.util.PropertyPermission','http.proxySet','write');

execute dbms_java.grant_permission('<schema>','SYS:java.util.PropertyPermission','http.proxyHost', 'write');

execute dbms_java.grant_permission('<schema','SYS:java.util.PropertyPermission','http.proxyPort', 'write');

execute dbms_java.grant_permission('<schema>','SYS:java.lang.RuntimePermission',
      'accessClassInPackage.sun.util.calendar','');

execute dbms_java.grant_permission('<schema>','SYS:java.lang.RuntimePermission','getClassLoader','');

execute dbms_java.grant_permission('<schema>','SYS:java.net.SocketPermission','*','connect,resolve');

execute dbms_java.grant_permission('<schema>','SYS:java.util.PropertyPermission','*','read,write');

execute dbms_java.grant_permission('<schema>','SYS:java.lang.RuntimePermission','setFactory','');
```

Ready to roll!

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Passing Parameters to WS

To determine the available parameters typically you can access the URL and information will be displayed about the parameters. For example:

http://interpressfact.net/webservices/getjoke.asmx

..or..

http://www.ecubicle.net/whois_service.asmx

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Publicly Available Web Services

X Methods

http://www.xmethods.net

WebServiceX

http://www.webservicex.net/WS/wscatlist.aspx

Yahoo

http://developer.yahoo.com/maps/rest/V1/geocode.html

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Consuming/Using a DBWS

- Setup a program or function to set appropriate parameters for UTL_DBWS for the desired service and inputs.
- Handle output or status appropriately
- Grant appropriate security settings for executing UTL_DBWS as well as any utility procedures that utilize it.

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Example Function

```
CREATE OR REPLACE FUNCTION get_whois_inp (in_domain VARCHAR2, in_info_to_return VARCHAR2) RETURN VARCHAR2 AS

  service_           utl_dbws.SERVICE;
  call_              utl_dbws.CALL;
  service_qname      utl_dbws.QNAME;
  port_qname         utl_dbws.QNAME;
  xoperation_qname   utl_dbws.QNAME;
  xstring_type_qname utl_dbws.QNAME;
  response           XMLTYPE;
  request            XMLTYPE;
  res_text           VARCHAR2(32767);
  pos_parm           NUMBER;
  pos_colon          NUMBER;
  pos_delim          NUMBER;
BEGIN
  -- utl_dbws.set_http_proxy('www-proxy:8080');
  service_qname := utl_dbws.to_qname(null, 'Whois');
  service_      := utl_dbws.create_service(service_qname);
  call_         := utl_dbws.create_call(service_);
  utl_dbws.set_target_endpoint_address(call_
                    , 'http://www.ecubicle.net/whois_service.asmx');

  utl_dbws.set_property( call_
                       , 'SOAPACTION_USE'
                       , 'TRUE'
                       );

  utl_dbws.set_property( call_
                       , 'SOAPACTION_URI'
                       , 'http://www.ecubicle.net/webservices/Whois'
                       );

  utl_dbws.set_property( call_
                      , 'OPERATION_STYLE'
                      , 'document'
                       );
```

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Example Function

```
request := XMLTYPE('<Whois xmlns="http://www.ecubicle.net/webservices/">'
                   ||'<servername>whois.tucows.com</servername>'
                   ||' <port>43</port>'
                   ||' <domain>'||in_domain||'</domain> </Whois>');

 response := utl_dbws.invoke(call_, request);
 res_text := response.extract('//WhoisResult/child::text()'
                    , 'xmlns="http://www.ecubicle.net/webservices/"').getstringval();

 IF in_info_to_return = 'Name Server'
 THEN
   pos_parm := instr(res_text,'Name Server:');
   pos_colon := instr(res_text,':',pos_parm);
   pos_delim := instr(res_text,'&lt',pos_colon);
 ELSIF in_info_to_return = 'Updated Date'
 THEN
   pos_parm := instr(res_text,'Updated Date');
   pos_colon := instr(res_text,':',pos_parm);
   pos_delim := instr(res_text,'&lt',pos_colon);

 ELSIF in_info_to_return =  'Expiration Date'
 THEN
   pos_parm := instr(res_text,'Expiration Date');
   pos_colon := instr(res_text,':',pos_parm);
   pos_delim := instr(res_text,'&lt',pos_colon);
 ELSE
   -- Nothing specified return all
    return res_text;
 END IF;

 return substr(res_text,pos_colon+1,(pos_delim-1)-pos_colon);

END;
/
```

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Things to Watch

- Proxy – If you need a proxy you'll need to specify appropriate settings in a call to set_http_proxy.

  Ex: utl_dbws.set_http_proxy('www-proxy:8080');

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Things to Watch

- Authentication – If the web service requires authentication you'll need to add settings as needed for USERNAME and PASSWORD using utl_dbws.set_property.
  Ex: utl_dbws.set_property(call_, 'USERNAME', 'scott');

  NOTE: There have been some issues reported with Basic auth corrected in a patch so review Metalink if you have issues. Can use UTL_HTTP to workaround.

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Another way!

Using the UTL_DBWS will get the job done and is more cognizant of dealing with the service BUT you can also use UTL_HTTP.

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Another way!

```
CREATE OR REPLACE PROCEDURE WHOIS_HTTP IS
   soapPacket varchar2(4000);
   soapReturn varchar2(4000) := 'error';
   url varchar2(500);
   http_req utl_http.Req;
   http_resp utl_http.Resp;
begin
  url := 'http://www.ecubicle.net/whois_service.asmx';
  soapPacket :=  '<?xml version="1.0" encoding="utf-8"?>
            <soap12:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap12="http://www.w3.org/2003/05/soap-envelope">
              <soap12:Body>
                <Whois xmlns="http://www.ecubicle.net/webservices/">
                  <servername>whois.tucows.com</servername>
                  <port>43</port>
                  <domain>b2bsol.com</domain>
                </Whois>
              </soap12:Body>
            </soap12:Envelope> ';

   http_req := utl_http.begin_request(url, 'POST',utl_http.HTTP_VERSION_1_1);
   utl_http.set_persistent_conn_support(http_req,true);  -- keep connection open
   utl_http.set_body_charset(http_req, 'UTF-8');
   utl_http.set_header(http_req, 'Content-Type', 'application/soap+xml');
   utl_http.set_header(http_req, 'Content-Length', length(soapPacket));
   utl_http.write_text(http_req,soapPacket);
   http_resp := utl_http.get_response(http_req);
   dbms_output.PUT_LINE(http_resp.status_code);
   dbms_output.put_line(http_resp.reason_phrase);
   IF (http_resp.status_code =utl_http.HTTP_OK ) THEN
        utl_http.read_text(http_resp, soapReturn);
   end if;
   utl_http.end_response(http_resp);
   dbms_output.put_line(substr(soapReturn,1,255));
   dbms_output.put_line(substr(soapReturn,256,255));

END;
```

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Other Considerations

Performance

Security

Clear Specifications on Inputs/Outputs – To insure correct handling of datatyping and return status/values.

Error Handling – Conditions outside the DB may impact success/failure of calls

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Host your Own!

- This presentation has focused on consuming Web services with UTL_DBWS and UTL_HTTP but if you also want to provide a web service there is more to learn!!
- Using JPublisher or JDeveloper with an application server you can create PL/SQL packages and expose them as Web services.

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References/Resources

Examples and samples...

http://www.oracle.com/technology/sample_code/tech/java/jsp/dbwebservices.html

Metalink Doc: 412666.1 – Using UTL_DBWS to Make a Database Callout to a Document Style Web Service

Technet - Virtualize Your Oracle Database with Web Services (Kuassi Mensah)

http://www.oracle.com/technology/pub/articles/mensah_dws.html

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Resources

This presentation will be available at:

VOUG Website: www.voug.org

B2B Website: www.b2bsol.com (under Resources)

Email: gmays@b2bsol.com

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