Web Services Tips and Techniques White Paper

VERSION 2018

Contents

Web Services Tips and Techniques

This white paper complements the *Web Services* white paper, and is intended to provide useful information to assist a developer of JADE Web services. These tips and techniques are based on user feedback about the areas for which people have had the most questions.

Notes All references to the JADE platform in the following sections are relative to JADE 6.3.

All third-party software referred to in this document is based on a specific release, and the version that you download may not look or behave in the same manner that is described in this document.

For more details about the areas that are covered in this white paper, see the following subsections.

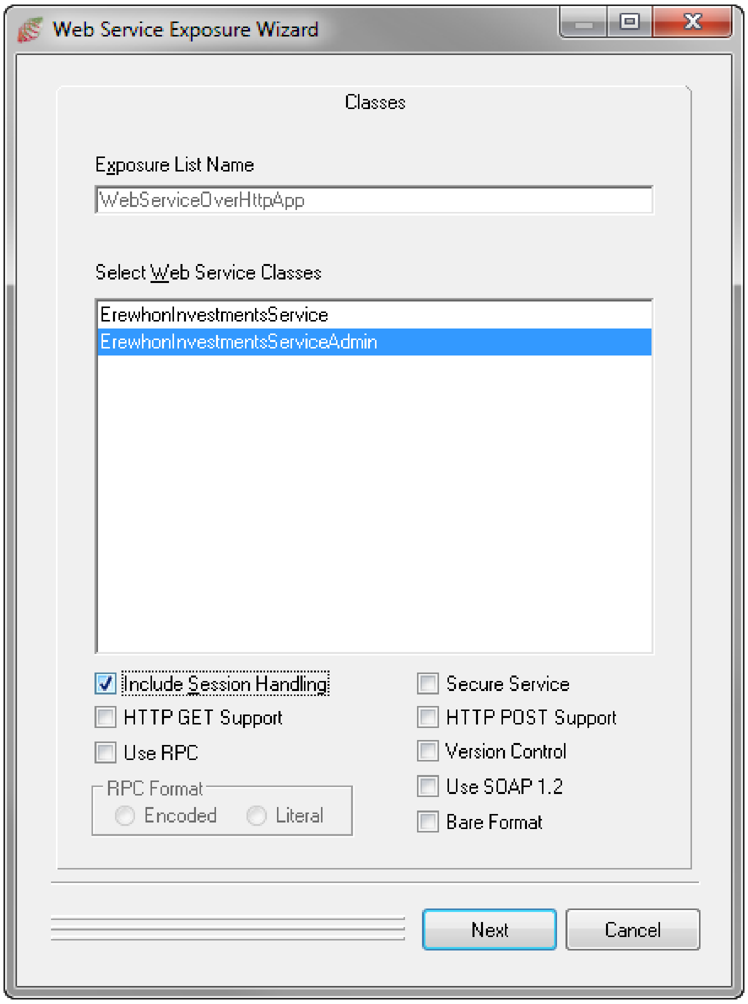
Session Management

Session management in Web services is optional and if required, it must be specified at design time; that is, this is not a deployment option because the generated WSDL has information relating to sessions. This section contains the following topics.

- Session Definition
- WSDL Generation
- Runtime Processing
- Using the Session Object
- Timing Out Sessions
- Removing Sessions

Session Definition

The inclusion of session management in a Web service is defined as part of the exposure list definition, as is shown in the following image.



Exposure List Name: WebServiceOverHttpApp

Select Web Service Classes:
- ErewhonInvestmentsService
- ErewhonInvestmentsServiceAdmin

- [x] Include Session Handling
- [ ] HTTP GET Support
- [ ] Use RPC
- RPC Format: Encoded / Literal
- [ ] Secure Service
- [ ] HTTP POST Support
- [ ] Version Control
- [ ] Use SOAP 1.2
- [ ] Bare Format

Check the **Include Session Handling** check box, to include session handling.

WSDL Generation

The WSDL that is generated will now include session handling information against every method.

The following is a snippet of a WSDL containing session-related information.

In the <types> definition section:

```
</xsd:complexType>
    <xsd:element name="JadeSessionHeader" type="tns:JadeSessionHeader"/>
    <xsd:complexType name="JadeSessionHeader">
    <xsd:sequence>
    <xsd:element name="sessionId" type="xsd:string"/>
```

```
        </xsd:sequence>
    </xsd:complexType>
```

In the message section:

```
    <message name="getClientJadeSessionHeader">
        <part name="sessionId" element="tns:JadeSessionHeader"/>
    </message>
```

In the <binding> section:

```
    <operation name="getClient">
    <soap:operation soapAction="urn:JadeWebServices/WebServiceOverHttpApp/getClient"
    style="document"/>
        <input>
            <soap:body use="literal" />
            <soap:header use="literal"
            message="tns:getClientJadeSessionHeader" part="sessionId"/>
        </input>
        <output>
            <soap:body use="literal" />
            <soap:header use="literal"
            message="tns:getClientJadeSessionHeader" part="sessionId"/>
        </output>
    </operation>
```

This information tells the target system to create a class called **JadeSessionHeader** with a single string property on import and to generate a SOAP header containing the session id at execution time.

Note As the <header> tag is defined in the <input> and <output> sections, this SOAP header is Input-Output.

Runtime Processing

At run time, the following processing occurs.

- The Web service client sends a request.
- The Web service receives the request, and if there is no SOAP header or the SOAP header does not have a session id, the Web service generates a header with a new session id in the response. If there is session id information, it is used to obtain the session object.
- The Web service client must send the generated session id with every request, or a new session will be created each time. Generally, your code does not have to do anything – the framework will handle the passing of this information.

The following is an example of a SOAP message with session information.

```
    <?xml version="1.0" encoding="utf-8"?>
    <soap:Envelope
        xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
        xmlns:xsd="http://www.w3.org/2001/XMLSchema"
        xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
        <soap:Header>
            <JadeSessionHeader
                xmlns="urn:JadeWebServices/WebServiceOverHttpApp/">
                <sessionId>0fd1c8984243d2f8</sessionId>
            </JadeSessionHeader>
        </soap:Header>
        <soap:Body>
            ...
        </soap:Body>
    </soap:Envelope>
```

Using the Session Object

When session management is used, a persistent instance of the subclass of **WebSession** in the current schema is created. This instance can be referred to in code using the **currentSession** system variable.

Additional properties and methods can be added to this class for storing state information. As this is a persistent instance, any updating of these properties must be done in transaction state.

Note The **currentSession** object is valid only for the duration of the Web service call. Any attempt to reference its properties or methods outside of this call (for example, in notification code) will result in a null object reference error.

Timing Out Sessions

Sessions can be set to automatically time out based on a configuration setting. This can be set in the Define Application dialog or dynamically configured at run time. When the timeout is set and there is no activity for the session within that time, the session is deleted. If this session is subsequently referenced, a SOAP fault (error code 11007) will be returned to the Web service client.

It is recommended that session timeouts be used to clean up unused sessions. The default message for this can be changed by re-implementing the **Application** class **timedOutSessionMessage** method. Note, however, that the string returned by this method must be a SOAP message. The response returned by this message is what will be returned to the Web service client if a subsequent request uses the session id of the timed-out session. For details, see "Removing Sessions", in the following section.

Note When all Web service applications are shut down or the database node is shut down, all Web sessions are deleted.

Removing Sessions

There may be situations where a session needs to be removed immediately; for example, when a user logs off. To do this, you can call the **WebSession** class **removeSession** method.

If you are removing the current session and want to return a specific message, you can call the **WebSession** class **removeSessionWithMessage** method, passing the message that you want to return.

In all other cases, if you want to send a message that differs from the default, you can reimplement the **Application** class **removeSessionMessage** method. Note, however that the string returned by this method must be a SOAP message. The response returned by this message is what will be returned to the Web service client if a subsequent request uses the session id of the removed session.

Tip One way to create a SOAP message in this case would be to create a **JadeSOAPException** instance, populate the **errorCode**, **errorItem**, and **extendedErrorText** properties, and then call the **createSOAPMessage** method to generate the SOAP-formatted message.

Performance Testing

This section contains the following topics.

- soapUI
- JADE Monitor

soapUI

Performance and scalabilty of JADE Web services can be tested by using the freely available soapUI tool. The use of this tool will be briefly demonstrated in this section. Version 3.0 of soapUI is used in this example.

Before we start, we should do the following.

1. Disable logging at the Web server.

   You do this in IIS by using the MMC snap-in. For details, see "Debugging", later in this document.

2. Minimize logging by **jadehttp**.

   If you turned tracing on in **jadehttp**, turn this off. For configuration options, see "Debugging", later in this document.

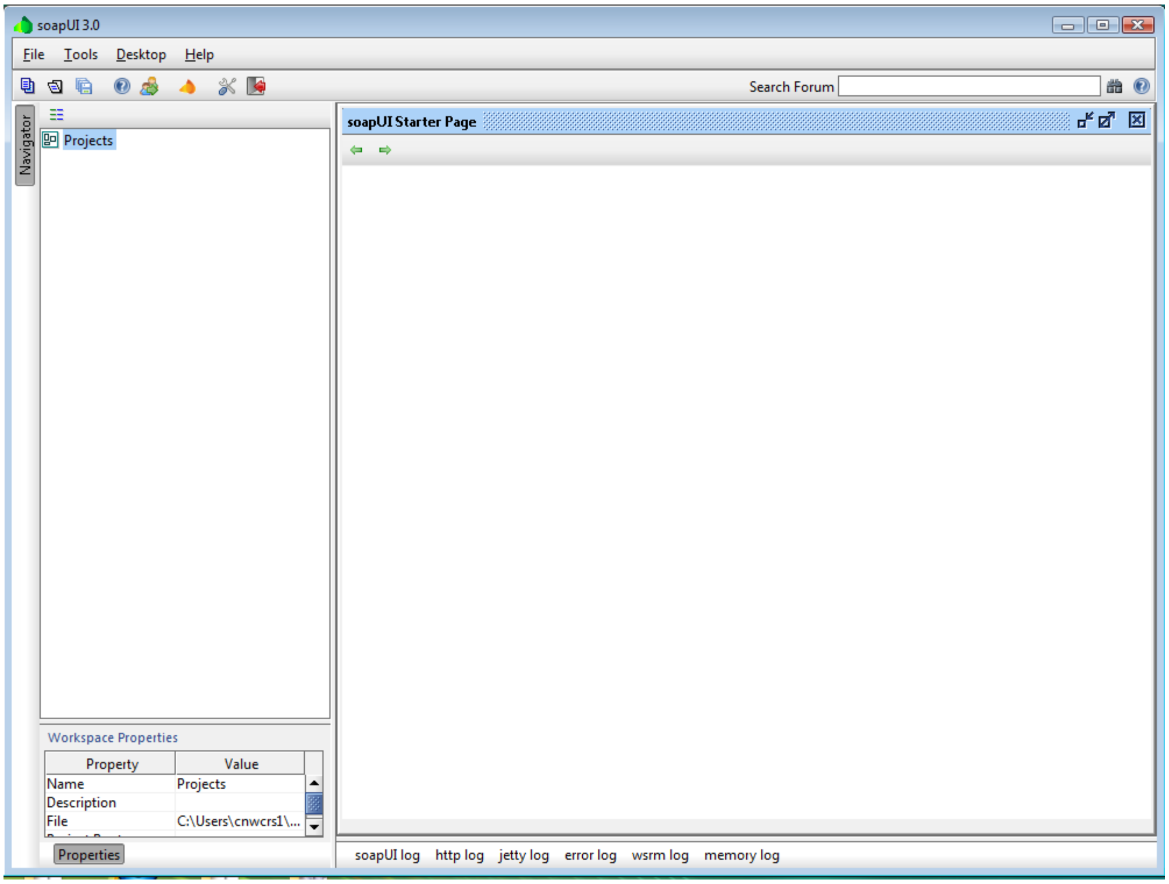
3. Turn off logging by the Web service application. For configuration options, see "Debugging", later in this document.

4. Change your Web service provider applications to be Web-enabled non-GUI applications. If you use the GUI version, your performance will be degraded, as the Web monitor status window is continually updated.

We will use **ErewhonInvestmentsViewSchema** in the Erewhon example system to demonstrate the use of soapUI.

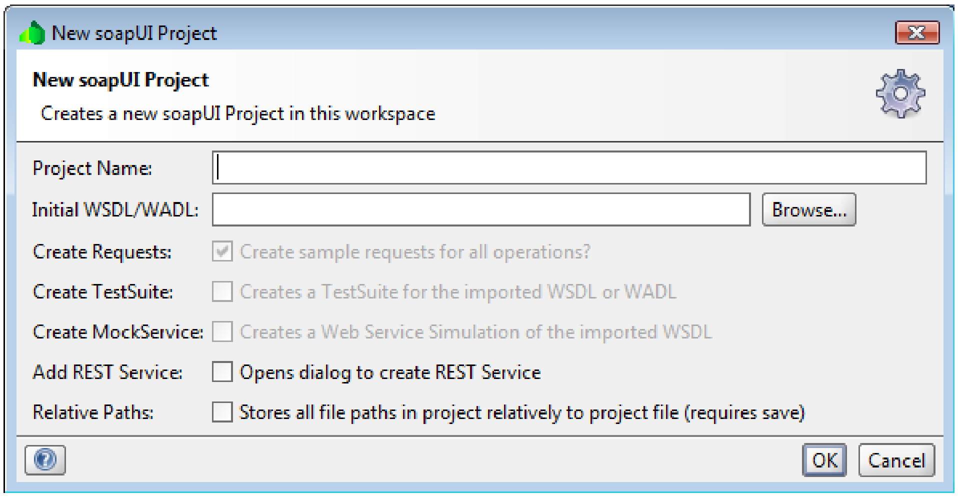
1. From the Application Browser, select the **WebServiceOverHttpApp** application.
2. On the **Web Options** sheet of the Define Application dialog, change the number of application copies to **5.**
3. Generate the WSDL.
4. Run the application.

You should have five copies of the application running. Now bring up soapUI, which will display the window shown in the following image.



Property	Value
Name	Projects
Description	
File	C:\Users\cnwcrs1\...

5. Select **New soapUI project** from the File menu, which will display the following dialog.



New soapUI Project

New soapUI Project

Creates a new soapUI Project in this workspace

Project Name:	
Initial WSDL/WADL:	
Create Requests:	✓ Create sample requests for all operations?
Create TestSuite:	Creates a TestSuite for the imported WSDL or WADL
Create MockService:	Creates a Web Service Simulation of the imported WSDL
Add REST Service:	Opens dialog to create REST Service
Relative Paths:	Stores all file paths in project relatively to project file (requires save)

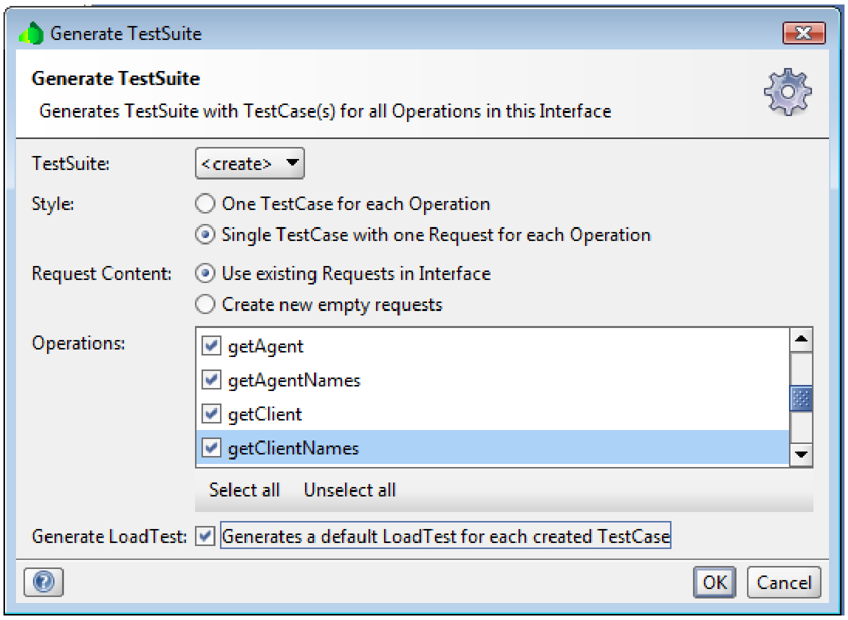
6. Specify the project name of **ErewhonWebServiceTest**.

7. Enter the WSDL path of the WSDL that was extracted previously.

8. Check the **Create TestSuite** check box.

9. Click **OK**.

The dialog shown in the following image is then displayed.



Generate TestSuite

Generates TestSuite with TestCase(s) for all Operations in this Interface

TestSuite: <create>

Style: ( ) One TestCase for each Operation [✓ Single TestCase with one Request for each Operation]

Request Content: [✓ Use existing Requests in Interface] ( ) Create new empty requests

Operations:
- ✓ getAgent
- ✓ getAgentNames
- ✓ getClient
- ✓ getClientNames

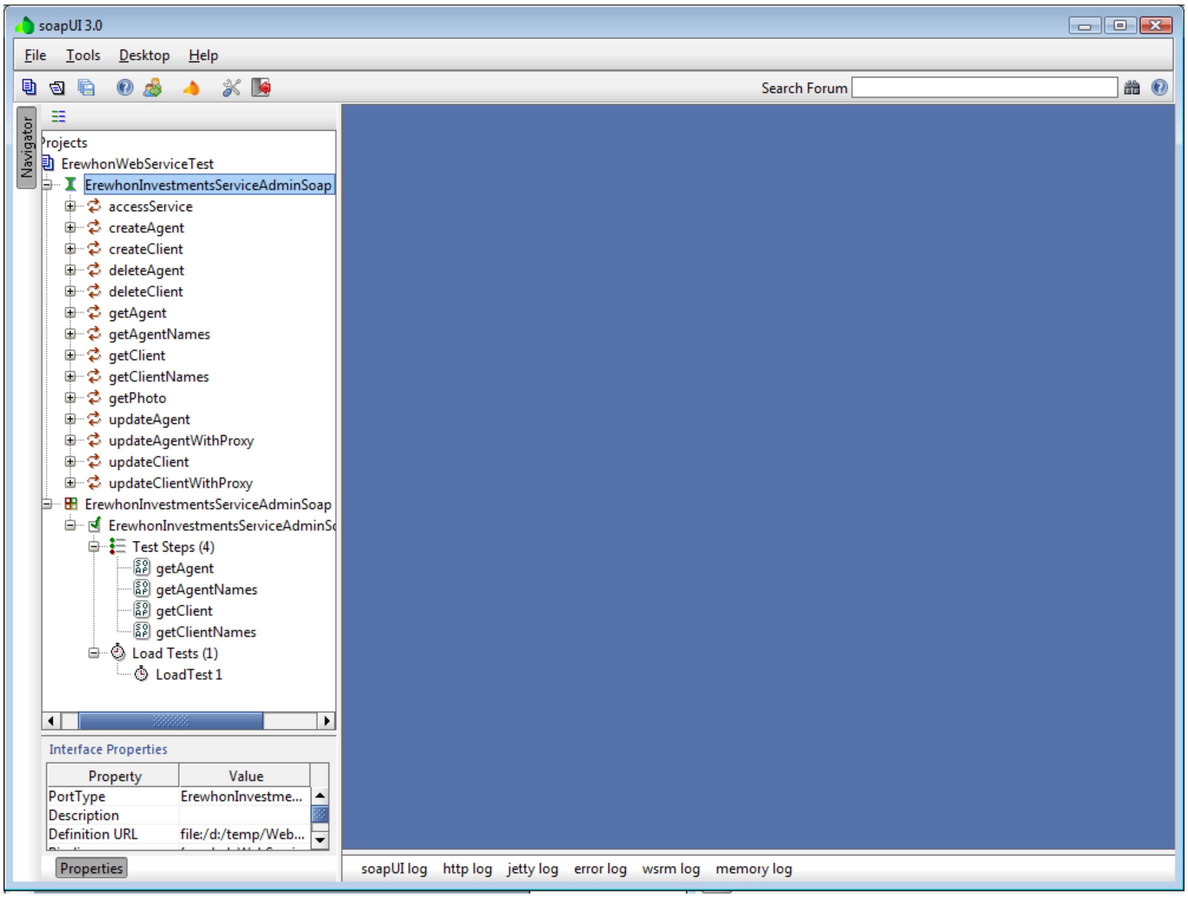
Select all Unselect all

Generate LoadTest: ✓ Generates a default LoadTest for each created TestCase

To keep this example simple, we create a test only for the four operations selected above. Unselect all other operations and then click **OK**.

When the request for a name for the test suite is displayed, click **OK**.

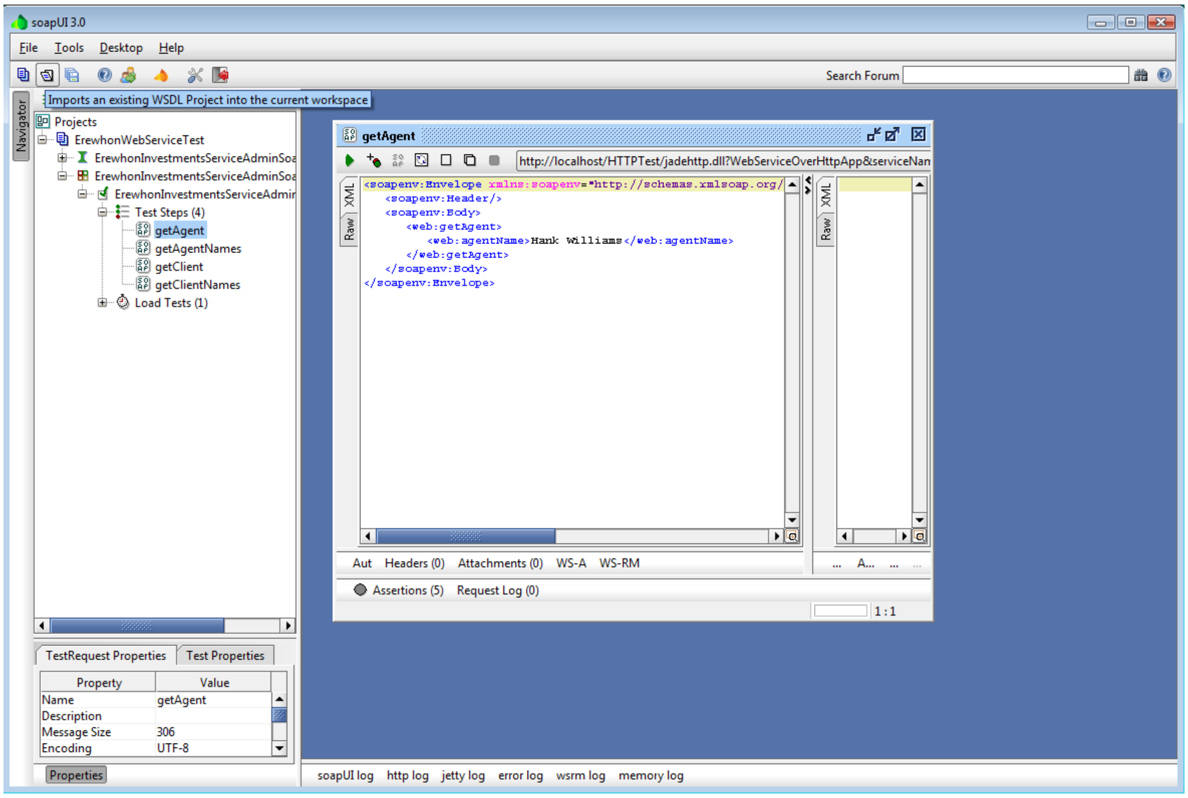
A window that looks like the example in the following image is then displayed. (You may need to expand your project to see this.)



Projects
ErewhonWebServiceTest
ErewhonInvestmentsServiceAdminSoap
accessService
createAgent
createClient
deleteAgent
deleteClient
getAgent
getAgentNames
getClient
getClientNames
getPhoto
updateAgent
updateAgentWithProxy
updateClient
updateClientWithProxy
ErewhonInvestmentsServiceAdminSoap
ErewhonInvestmentsServiceAdminS
Test Steps (4)
getAgent
getAgentNames
getClient
getClientNames
Load Tests (1)
LoadTest 1

Property	Value
PortType	ErewhonInvestme...
Description	
Definition URL	file:/d:/temp/Web...

We will need to enter some data for the **getAgent** and **getClient** methods. The following image is an example of the **getAgent** operation.


soapUI 3.0
File Tools Desktop Help
Search Forum
Imports an existing WSDL Project into the current workspace
Navigator
Projects
ErewhonWebServiceTest
ErewhonInvestmentsServiceAdminSoa
ErewhonInvestmentsServiceAdminSoa
ErewhonInvestmentsServiceAdmir
Test Steps (4)
getAgent
getAgentNames
getClient
getClientNames
Load Tests (1)
TestRequest Properties
Test Properties
Properties
getAgent
http://localhost/HTTPTest/jadehttp.dll?WebServiceOverHttpApp&serviceNan
XML
Raw
Aut Headers (0) Attachments (0) WS-A WS-RM
Assertions (5) Request Log (0)
1 : 1
soapUI log http log jetty log error log wsrm log memory log

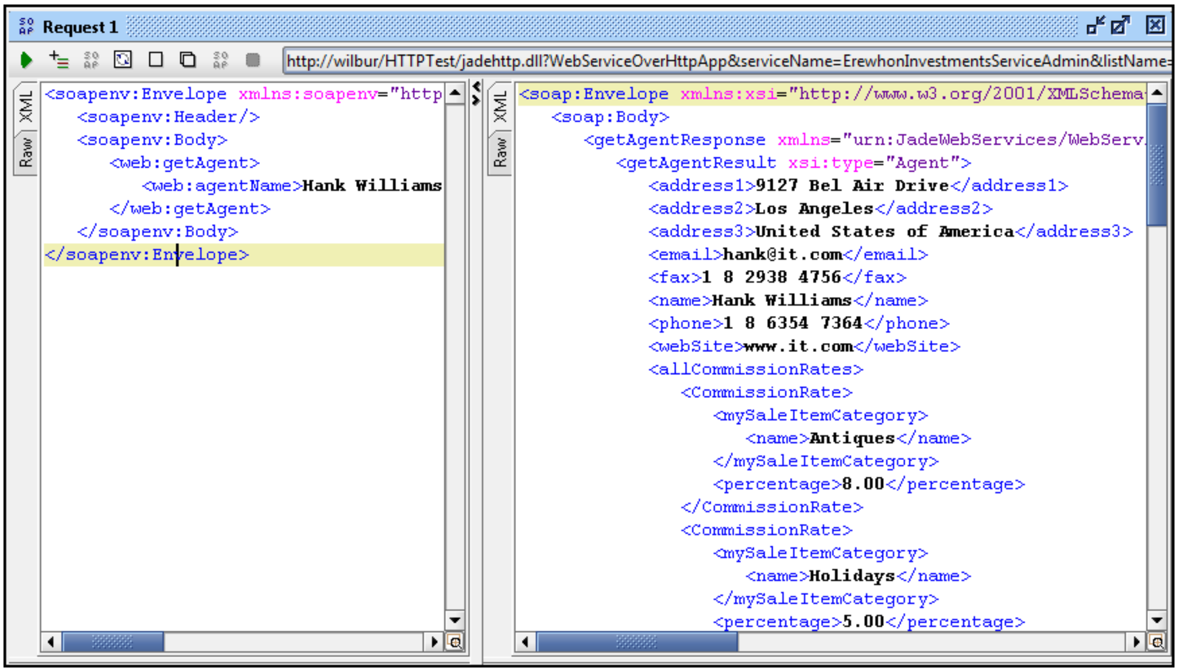
```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/
   <soapenv:Header/>
   <soapenv:Body>
      <web:getAgent>
         <web:agentName>Hank Williams</web:agentName>
      </web:getAgent>
   </soapenv:Body>
</soapenv:Envelope>
```

Property	Value
Name	getAgent
Description	
Message Size	306
Encoding	UTF-8

To do this, double-click on the **getAgent** entry under **Test Steps** and then specify **Hank Williams** between the *<web:agentName>* and the *</web:agentName>* tags. Similarly, specify **Brian Olsen** for the **getClient** request.

We are now ready to run the test.

Click the green arrow icon at the left of the getAgent window. This will call the Web service and return a SOAP message in the pane at the right, as shown in the following image.


Request 1
http://wilbur/HTTPTest/jadehttp.dll?WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=
XML
Raw

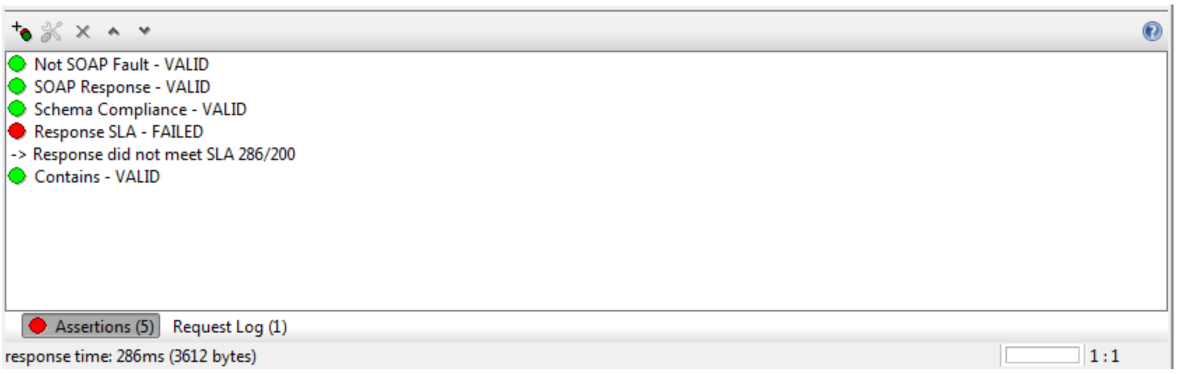
```
<soapenv:Envelope xmlns:soapenv="http
   <soapenv:Header/>
   <soapenv:Body>
      <web:getAgent>
         <web:agentName>Hank Williams
      </web:getAgent>
   </soapenv:Body>
</soapenv:Envelope>
```

```
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema
   <soap:Body>
      <getAgentResponse xmlns="urn:JadeWebServices/WebServ
         <getAgentResult xsi:type="Agent">
            <address1>9127 Bel Air Drive</address1>
            <address2>Los Angeles</address2>
            <address3>United States of America</address3>
            <email>hank@it.com</email>
            <fax>1 8 2938 4756</fax>
            <name>Hank Williams</name>
            <phone>1 8 6354 7364</phone>
            <webSite>www.it.com</webSite>
            <allCommissionRates>
               <CommissionRate>
                  <mySaleItemCategory>
                     <name>Antiques</name>
                  </mySaleItemCategory>
                  <percentage>8.00</percentage>
               </CommissionRate>
               <CommissionRate>
                  <mySaleItemCategory>
                     <name>Holidays</name>
                  </mySaleItemCategory>
                  <percentage>5.00</percentage>
```

You can also set up assertions for the call. In this example, set up five assertions as follows.

- Not SOAP fault
- SOAP Response
- Schema Compliance (WSDL compliance)
- Response SLA – set to 200 ms
- Response contains **Hank Williams**

The resulting assertions from this call are shown in the following image.

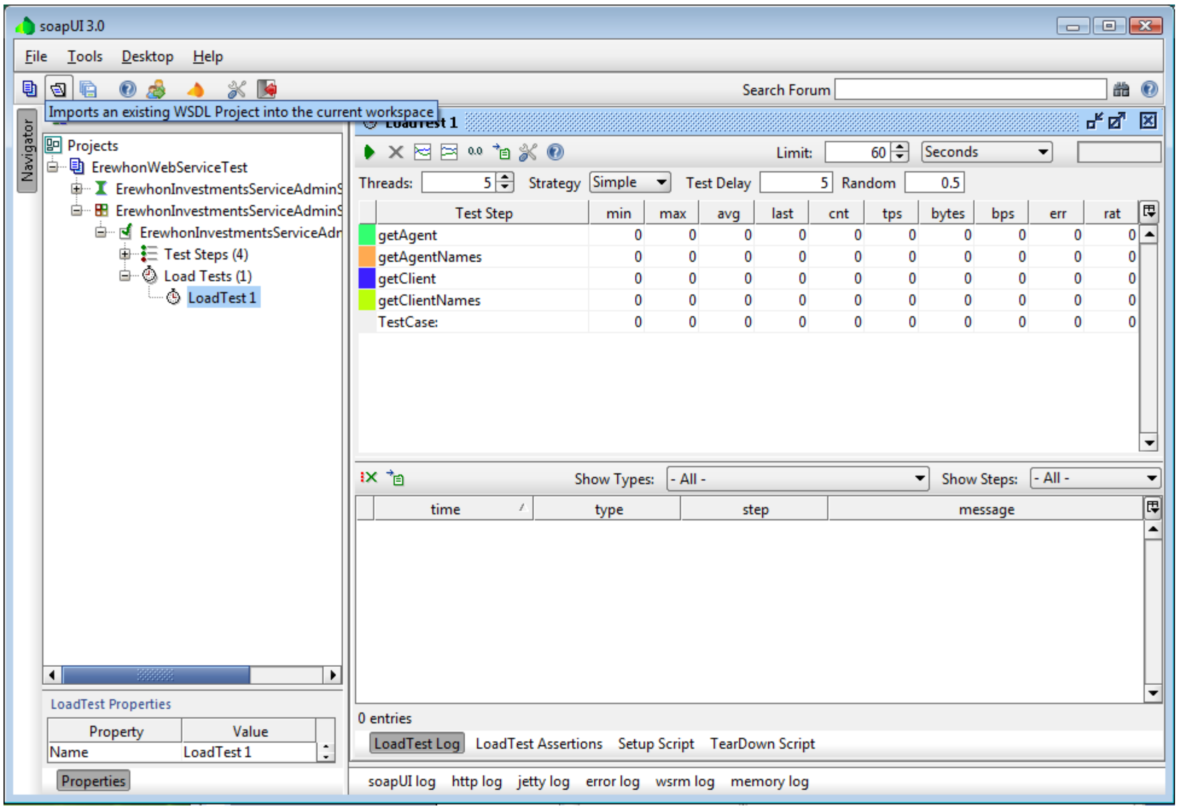


```
● Not SOAP Fault - VALID
● SOAP Response - VALID
● Schema Compliance - VALID
● Response SLA - FAILED
-> Response did not meet SLA 286/200
● Contains - VALID
```

The response time was greater than 200 ms (286ms), hence the Response SLA assertion failed.

See the http://www.soapui.org online reference for documentation about assertions.

You can also run the tests multiple times.



LoadTest 1

Limit: 60 Seconds

Threads: 5 Strategy Simple Test Delay 5 Random 0.5

	Test Step	min	max	avg	last	cnt	tps	bytes	bps	err	rat
🟩	getAgent	0	0	0	0	0	0	0	0	0	0
🟧	getAgentNames	0	0	0	0	0	0	0	0	0	0
🟦	getClient	0	0	0	0	0	0	0	0	0	0
🟩	getClientNames	0	0	0	0	0	0	0	0	0	0
	TestCase:	0	0	0	0	0	0	0	0	0	0

Show Types: - All - Show Steps: - All -

time	type	step	message

0 entries

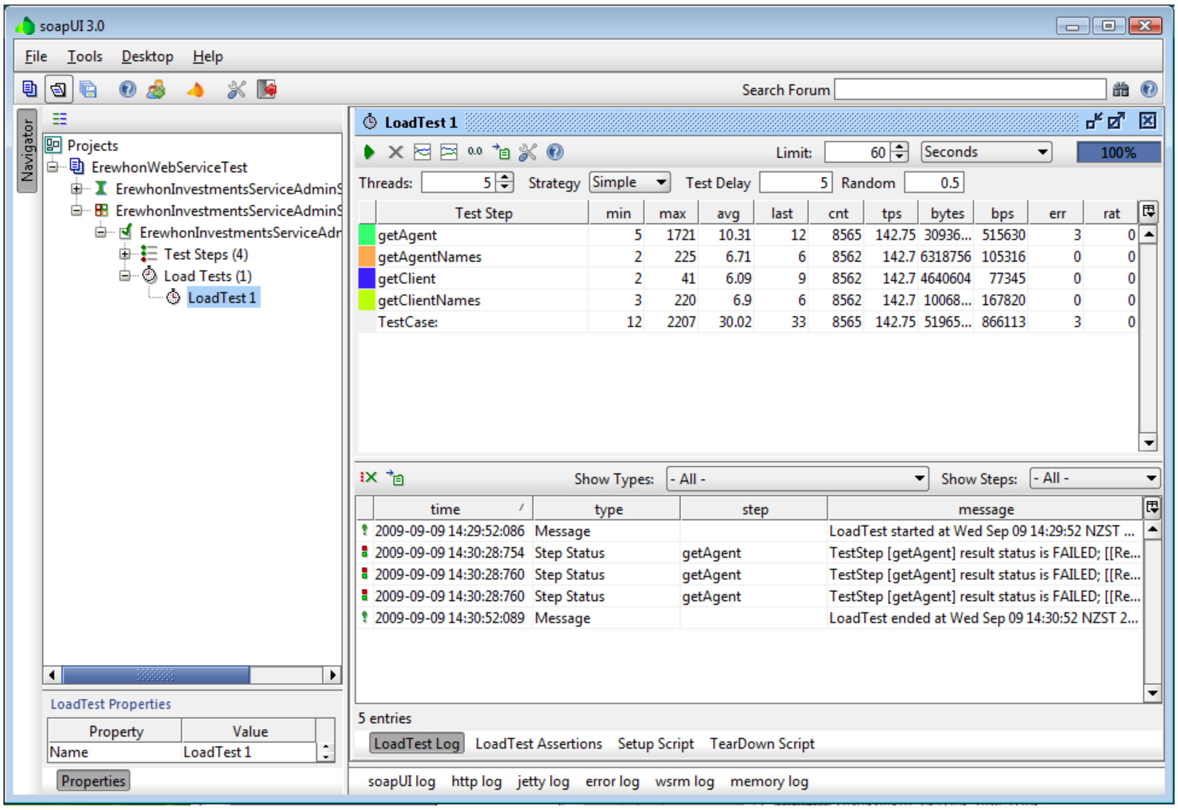
Property	Value
Name	LoadTest 1

Double-clicking on the **LoadTest1** item in the left pane will bring up the load test window at the right.

All of the items that we selected earlier are available for load testing.

There are several options to the test; for example, the number of threads, limit, strategy, and so on.

We are going to run the simple tests with a test delay of five ms, five threads, and running for one minute. Running this produces the following result.



Limit: 60 Seconds 100%

Threads: 5 Strategy Simple Test Delay 5 Random 0.5

	Test Step	min	max	avg	last	cnt	tps	bytes	bps	err	rat
🟩	getAgent	5	1721	10.31	12	8565	142.75	30936...	515630	3	0
🟧	getAgentNames	2	225	6.71	6	8562	142.7	6318756	105316	0	0
🟦	getClient	2	41	6.09	9	8562	142.7	4640604	77345	0	0
🟩	getClientNames	3	220	6.9	6	8562	142.7	10068...	167820	0	0
	TestCase:	12	2207	30.02	33	8565	142.75	51965...	866113	3	0

Show Types: - All - Show Steps: - All -

time	type	step	message
2009-09-09 14:29:52:086	Message		LoadTest started at Wed Sep 09 14:29:52 NZST ...
2009-09-09 14:30:28:754	Step Status	getAgent	TestStep [getAgent] result status is FAILED; [[Re...
2009-09-09 14:30:28:760	Step Status	getAgent	TestStep [getAgent] result status is FAILED; [[Re...
2009-09-09 14:30:28:760	Step Status	getAgent	TestStep [getAgent] result status is FAILED; [[Re...
2009-09-09 14:30:52:089	Message		LoadTest ended at Wed Sep 09 14:30:52 NZST 2...

5 entries

Property	Value
Name	LoadTest 1

The results show that we are getting transactions per second (that is, tps) of around 140. Note that in the **getAgent** case, there are three errors recorded and the bottom pane shows the reason. In this instance, all three errors relate to one of the assertions we added to the **getAgent** operation exceeding the required response time of 200ms. Putting in a longer delay will eliminate these errors but the transaction per second will then be fewer.

Scripts can be written to perform any initialization before the test is run (Setup Script) and to perform any finalization when the test is complete (TearDown Script). These tests can also be run without the user interface (UI). for more details, see the soapUI documentation.

The discussion in this section relates to measuring performance when providing a Web service. If you are now consuming an external Web service and want to measure performance as a JADE consumer, currently you will have to write your own test framework. If, however, you want to test just the performance of the Web service, you can obviously use the soapUI tool by the process mentioned in this section.

JADE Monitor

The JADE Monitor is useful for measuring performance. It can provide you with statistical information, method analysis, and file analysis to help you determine the bottlenecks in your system. For details, see the *JADE Monitor User's Guide*.

Debugging

Several debugging aids are available to help you to debug your Web service applications, as follows.

- JADE Debugger
- IIS logs, Jadehttp logs, Web application logs
- Method reimplementation to capture additional information
- Fiddler tool

For details, see the following subsections.

JADE Debugger

The JADE Debugger can be used to step through JADE code in a Web service application or a Web service consumer application. As the use of the debugger should be familiar to you as a JADE user, it is not described in this document. For details, see "Using the JADE Debugger", in Chapter 7 of the *JADE Development Environment User's Guide*.

Logging

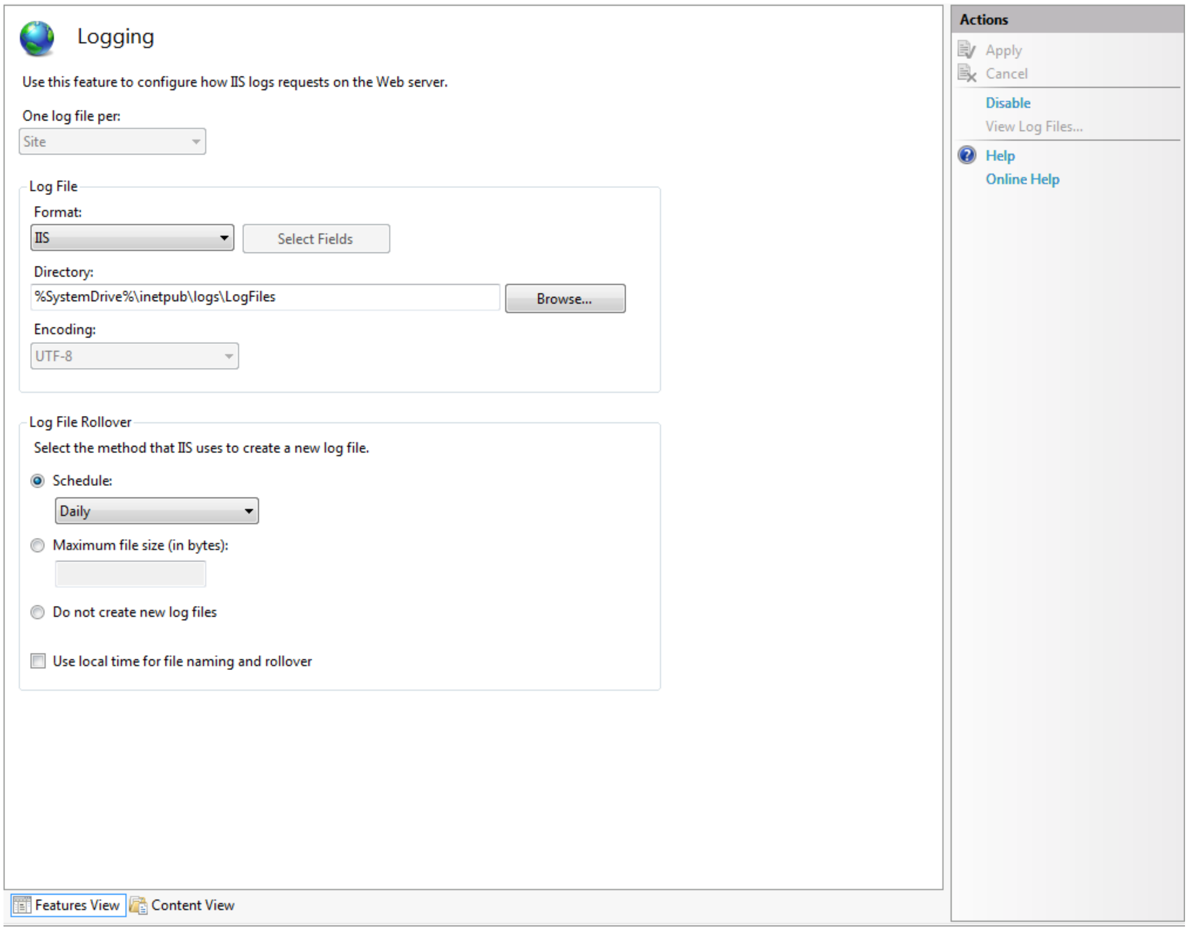
You can use IIS, Jadehttp, or Web application logs as a debugging tool for your Web service application. For details, see the following subsections.

- IIS
- Jadehttp
- Web Application

IIS

This section refers only to the use of IIS 7. For other releases, consult the appropriate documentation.

Logging can be enabled using the IIS Manager from the MMC console. From here, we can get to the logging options window by selecting **Default Web Site** and then selecting **Logging**, which displays the window shown in the following image.


Logging

Use this feature to configure how IIS logs requests on the Web server.

One log file per: Site

Log File

Format: IIS

Directory: %SystemDrive%\inetpub\logs\LogFiles

Encoding: UTF-8

Log File Rollover

Select the method that IIS uses to create a new log file.

[✓ Schedule:] Daily

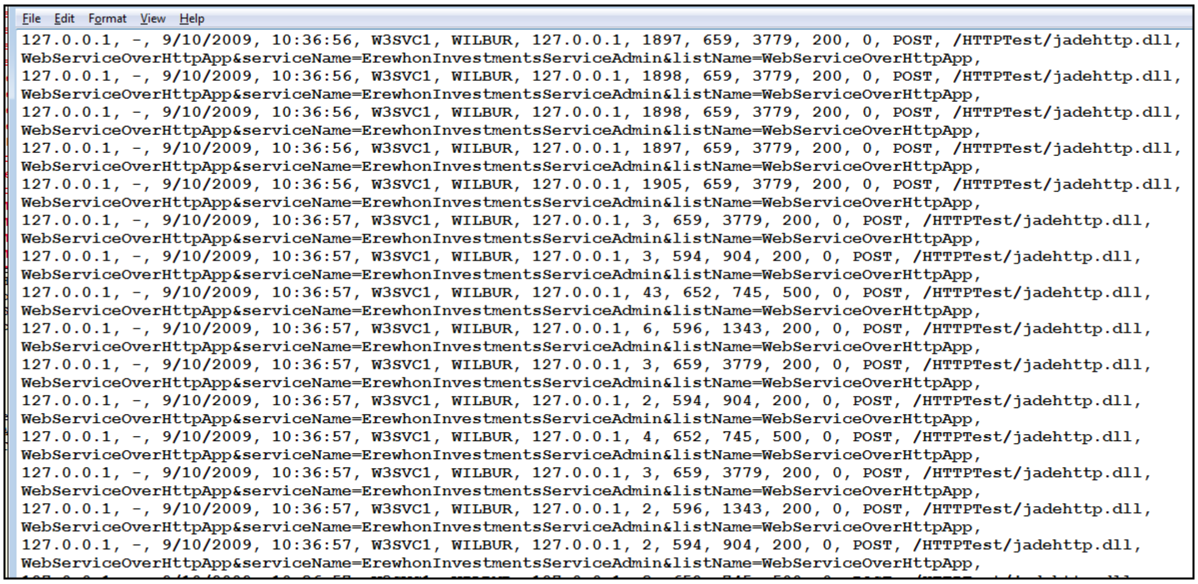
Maximum file size (in bytes):

Do not create new log files

Use local time for file naming and rollover

Set up options to meet your requirements. IIS format for the log file provides the most information. Make sure that logging is enabled (the Actions window will show **Disable**, if it is).

Making requests to your Web service will now log information similar to that shown in the following image.



```
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1897, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1898, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1898, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1897, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1905, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 3, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 3, 594, 904, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 43, 652, 745, 500, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 6, 596, 1343, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 3, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 2, 594, 904, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 4, 652, 745, 500, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 3, 659, 3779, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 2, 596, 1343, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
127.0.0.1, -, 9/10/2009, 10:36:57, W3SVC1, WILBUR, 127.0.0.1, 2, 594, 904, 200, 0, POST, /HTTPTest/jadehttp.dll,
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
```

The example in the above image is in IIS format. The IIS log file format is a fixed ASCII text-based format, so you cannot customize it.

The IIS log file format records the following data.

- Client IP address
- User name
- Date
- Time
- Service and instance
- Server name
- Server IP address
- Time taken
- Client bytes sent
- Server bytes sent
- Service status code (a value of 200 indicates that the request was fulfilled successfully)
- Windows status code (a value of 0 indicates that the request was fulfilled successfully)
- Request type
- Target of operation
- Parameters (the parameters that are passed to a script)

Not all fields will contain information. For fields for which there is no information, a hyphen (**-**) is displayed as a placeholder. If a field contains a non-printable character, it is replaced with a plus sign (**+**), to preserve the log file format. This typically occurs with virus attacks, when, for example, a malicious user sends carriage returns and line feeds that, if not replaced with the plus sign (**+**), would break the log file format.

The information provided by a single entry from the output displayed in the previous image, as follows, is listed in the following table.

```
127.0.0.1, -, 9/10/2009, 10:36:56, W3SVC1, WILBUR, 127.0.0.1, 1897, 659, 3779, 200,
0, POST, /HTTPTest/jadehttp.dll,
WebSer-
viceOver-
HttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp,
```

Field	Appears As	Description
Client IP address	127.0.0.1	The IP address of the client.
User name	-	The user is anonymous.
Date	9/10/2009	This log file entry was made on September 10, 2009.
Time	10:36:56	This log file entry was recorded at 10:36 A.M.
Service and instance	W3SVC1	This is a Web site, and the site instance is 1.
Server name	WILBUR	The name of the server.
Server IP	127.0.0.1	The IP address of the server.
Time taken	1897	This action took 1,897 milliseconds.
Client bytes sent	659	The number of bytes sent from the client to the server.
Server bytes sent	3779	The number of bytes sent from the server to the client.
Service status code	200	The request was fulfilled successfully.
Windows status code	0	The request was fulfilled successfully.
Request type	POST	The user issued a **POST** command.
Target of operation	/HTTPTest/jadehttp.dll	The user wants to connect to jadehttp.
Parameters	WebServiceOver …..	Parameters passed.

You can use a free Log Parser tool provided by Microsoft to analyze the IIS logs. Log Parser is a powerful, versatile tool that provides universal query access to text-based data.

Jadehttp

Tracing can be turned on in **jadehttp**, by parameters in the **jadehttp.ini** file, as follows.

```
[Jadehttp Logging]
trace=true
traceFile=d:\temp\web.log
traceFileSize=1000000
```

These settings specify that tracing is to be turned on, the trace file to use is in **d:\temp\web.log**, and the maximum file size before switching logs is 1,000,000 bytes.

The log will mainly consist of the following three types of messages, as follows.

- Sending data to Jade connection Id=
- Received:
- Sending reply to the Web Browser:

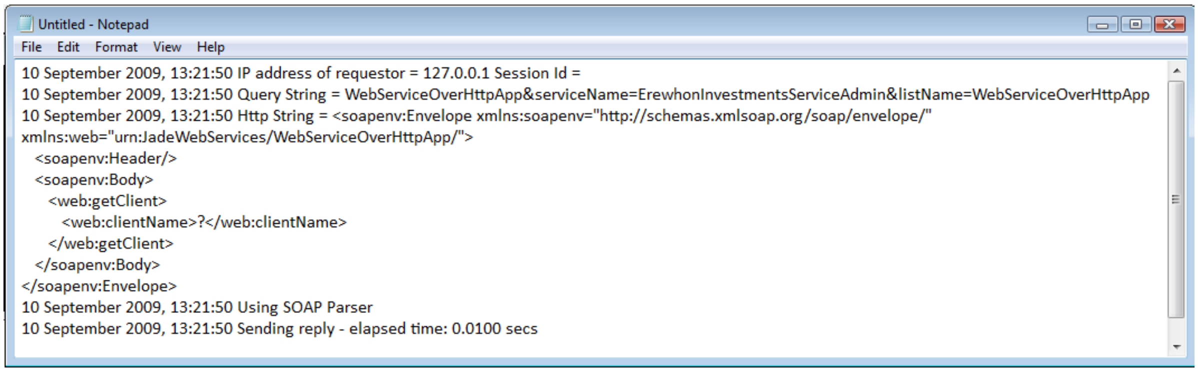
When the value of the **Trace** parameter is set to **true**, logging *does* occur but it does not log user data, only details of the message meta data; that is, it logs messages acknowledging only that a message has been received or sent and it does *not* include any of the text sent or received from the client, as this text could contain personal information, passwords, credit card details, and so on.

Note You cannot use this parameter to inspect and debug data passing through the **jadehttp** library.

Web Application

The information that is shown in the Web application monitor log when running the application as a GUI application can be captured to a file, either in GUI or in non-GUI mode. The ***log_file_name*** configuration file setting allows this output to be captured. For details, see "Configuring Web Applications", in Chapter 3 of the *JADE Web Application Guide*.

The following image is an example of sample output.



```
10 September 2009, 13:21:50 IP address of requestor = 127.0.0.1 Session Id =
10 September 2009, 13:21:50 Query String = WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp
10 September 2009, 13:21:50 Http String = <soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:web="urn:JadeWebServices/WebServiceOverHttpApp/">
  <soapenv:Header/>
  <soapenv:Body>
    <web:getClient>
      <web:clientName>?</web:clientName>
    </web:getClient>
  </soapenv:Body>
</soapenv:Envelope>
10 September 2009, 13:21:50 Using SOAP Parser
10 September 2009, 13:21:50 Sending reply - elapsed time: 0.0100 secs
```

The messages captured by the application are as follows.

- IP address of the client.
- Query String – equivalent to the URL on a browser window.

- Http String – body of the POST message. This will have the SOAP request.
- Elapsed time from receiving the message to sending the response.
- Queue Depth – number of requests waiting to be processed.

This information can be analyzed to determine elapsed times, queue depth over time, and so on.

Method Re-implementation

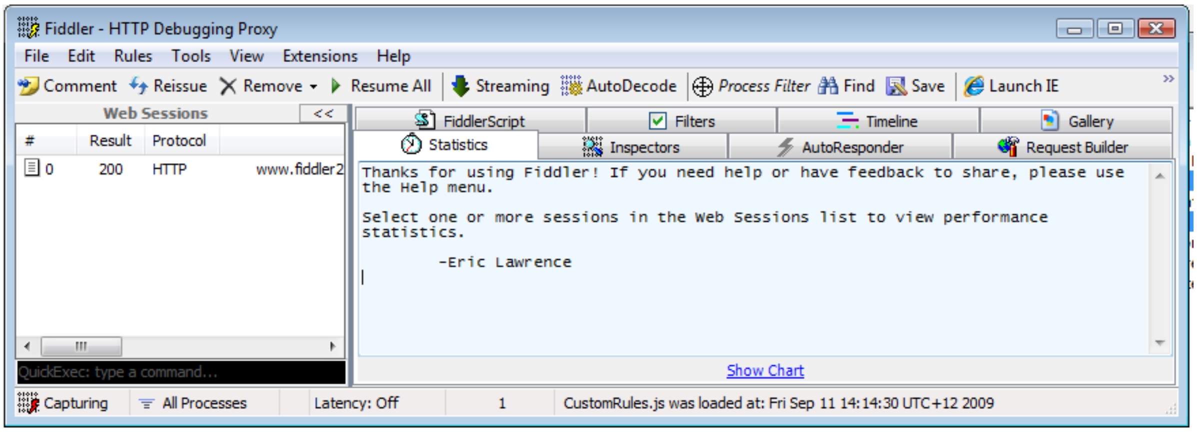
The **JadeWebServiceProvider** class **processRequest** method and the **JadeWebServiceProvider** class **reply** method can be re-implemented and the incoming and outgoing messages can be logged, along with other relevant information. In the **processRequest** method, log the **incomingMessage** property as the incoming Web service message and then call **inheritMethod**. In the **reply** method, call **inheritMethod** and log the returned string as the outgoing Web service message.

Similarly, on the consumer side, the **JadeWebServiceConsumer** class **invoke** method and the **JadeWebServiceConsumer** class **processReply** method can also be re-implemented to log information. In the **invoke** method, log the **inputMessage** parameter as the outgoing Web service message and then call **inheritMethod**. In the **processReply** method, log the **soapResponse** as the incoming Web service message and then call **inheritMethod**.

Fiddler

Fiddler is a Web Debugging Proxy that logs all HTTP or HTTPS traffic between your computer and the Internet. Fiddler enables you to inspect all HTTP or HTTPS traffic, set breakpoints, and "fiddle" with incoming or outgoing data. It includes a powerful event-based scripting subsystem. Fiddler is freeware that you can download from http://www.fiddler2.com/fiddler2/version.asp.

The start-up screen for Fiddler looks like the following.

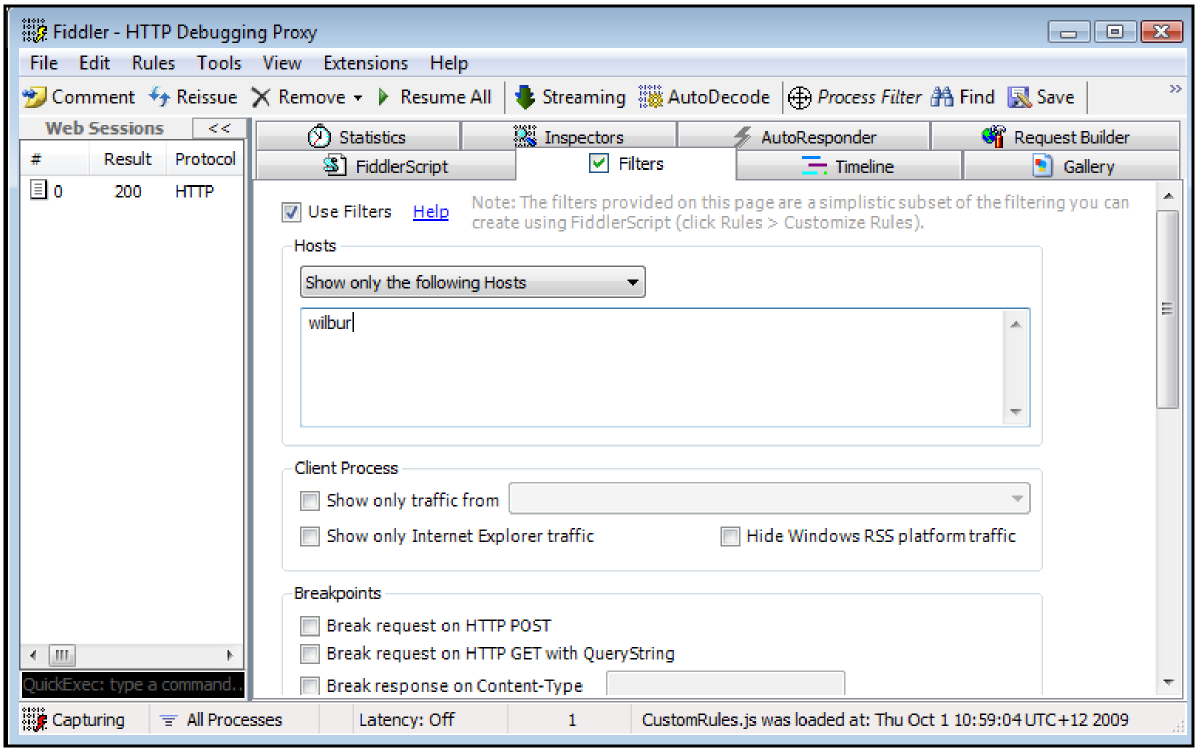

Fiddler - HTTP Debugging Proxy
File Edit Rules Tools View Extensions Help
Comment Reissue Remove Resume All Streaming AutoDecode Process Filter Find Save Launch IE
Web Sessions
FiddlerScript Filters Timeline Gallery
Statistics Inspectors AutoResponder Request Builder
Show Chart
QuickExec: type a command...

#	Result	Protocol	
0	200	HTTP	www.fiddler2

```
Thanks for using Fiddler! If you need help or have feedback to share, please use
the Help menu.

Select one or more sessions in the Web Sessions list to view performance
statistics.

        -Eric Lawrence
```

Capturing | All Processes | Latency: Off | 1 | CustomRules.js was loaded at: Fri Sep 11 14:14:30 UTC+12 2009

By default, Fiddler captures all traffic. To restrict the traffic to that in which you are interested, you can set up filters. In this example, we are going to restrict traffic to **wilbur**.


Fiddler - HTTP Debugging Proxy
File Edit Rules Tools View Extensions Help
Comment Reissue Remove Resume All Streaming AutoDecode Process Filter Find Save
Web Sessions <<
Statistics Inspectors AutoResponder Request Builder
FiddlerScript Filters Timeline Gallery

#	Result	Protocol
0	200	HTTP

[✓] Use Filters Help Note: The filters provided on this page are a simplistic subset of the filtering you can create using FiddlerScript (click Rules > Customize Rules).

Hosts
Show only the following Hosts
wilbur

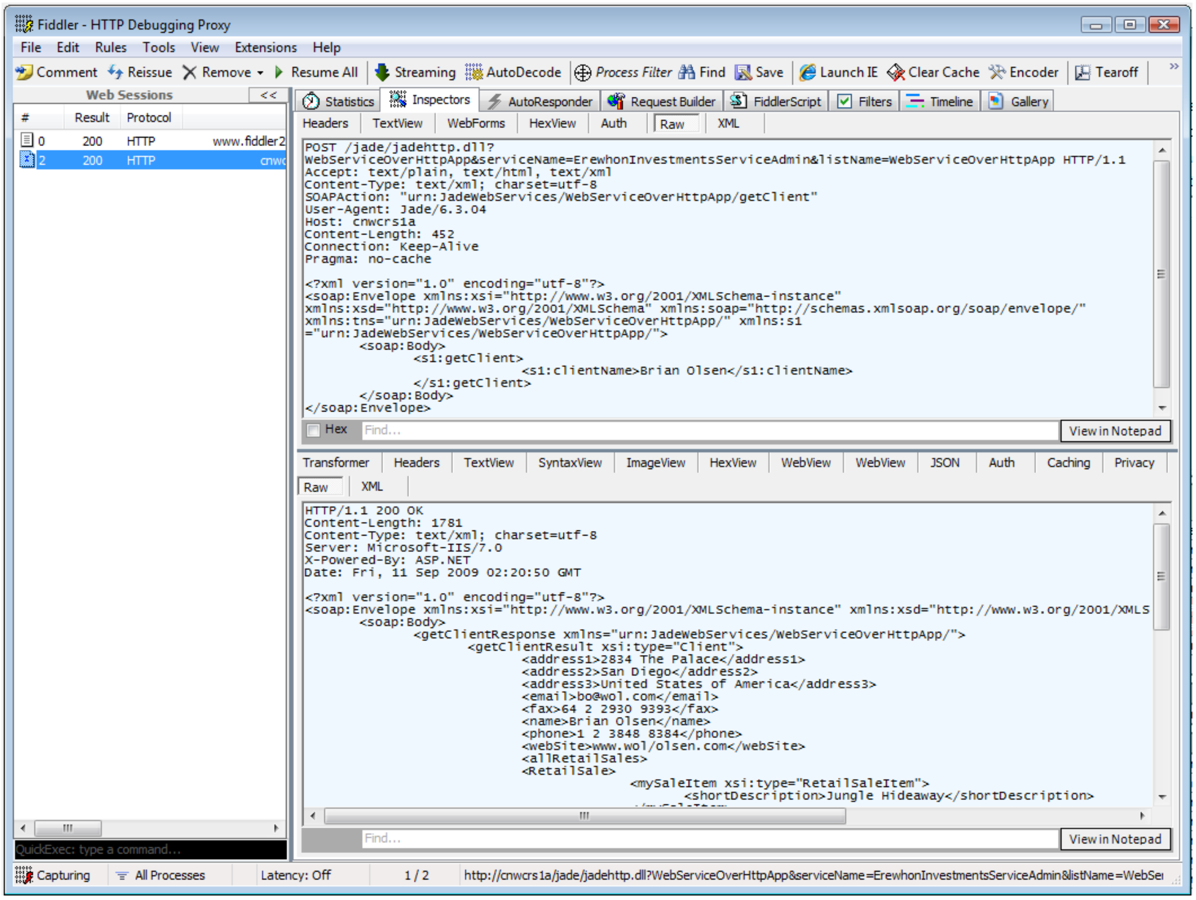
Client Process
[ ] Show only traffic from
[ ] Show only Internet Explorer traffic [ ] Hide Windows RSS platform traffic

Breakpoints
[ ] Break request on HTTP POST
[ ] Break request on HTTP GET with QueryString
[ ] Break response on Content-Type

QuickExec: type a command...

Capturing | All Processes | Latency: Off | 1 | CustomRules.js was loaded at: Thu Oct 1 10:59:04 UTC+12 2009

We will now select the **Inspectors** tab, to inspect the traffic. In this example, we have set up the Erewhon Web service on host wilbur. Now when a Web service client calls the Web service for the **getClient** operation on host wilbur, the following information can be observed in Fiddler.


Fiddler - HTTP Debugging Proxy
File Edit Rules Tools View Extensions Help
Comment Reissue Remove Resume All Streaming AutoDecode Process Filter Find Save Launch IE Clear Cache Encoder Tearoff
Web Sessions
Statistics Inspectors AutoResponder Request Builder FiddlerScript Filters Timeline Gallery
Headers TextView WebForms HexView Auth Raw XML
Hex Find... View in Notepad
Transformer Headers TextView SyntaxView ImageView HexView WebView WebView JSON Auth Caching Privacy
Raw XML
Find... View in Notepad
QuickExec: type a command...
Capturing All Processes Latency: Off 1 / 2

#	Result	Protocol	
0	200	HTTP	www.fiddler2
2	200	HTTP	cnwc

```
POST /jade/jadehttp.dll?
WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebServiceOverHttpApp HTTP/1.1
Accept: text/plain, text/html, text/xml
Content-Type: text/xml; charset=utf-8
SOAPAction: "urn:JadeWebServices/WebServiceOverHttpApp/getClient"
User-Agent: Jade/6.3.04
Host: cnwcrs1a
Content-Length: 452
Connection: Keep-Alive
Pragma: no-cache

<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema" xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="urn:JadeWebServices/WebServiceOverHttpApp/" xmlns:s1
="urn:JadeWebServices/WebServiceOverHttpApp/">
        <soap:Body>
                <s1:getClient>
                        <s1:clientName>Brian Olsen</s1:clientName>
                </s1:getClient>
        </soap:Body>
</soap:Envelope>
```

```
HTTP/1.1 200 OK
Content-Length: 1781
Content-Type: text/xml; charset=utf-8
Server: Microsoft-IIS/7.0
X-Powered-By: ASP.NET
Date: Fri, 11 Sep 2009 02:20:50 GMT

<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xmlns:xsd="http://www.w3.org/2001/XMLS
        <soap:Body>
                <getClientResponse xmlns="urn:JadeWebServices/WebServiceOverHttpApp/">
                        <getClientResult xsi:type="Client">
                                <address1>2834 The Palace</address1>
                                <address2>San Diego</address2>
                                <address3>United States of America</address3>
                                <email>bo@wol.com</email>
                                <fax>64 2 2930 9393</fax>
                                <name>Brian Olsen</name>
                                <phone>1 2 3848 8384</phone>
                                <webSite>www.wol/olsen.com</webSite>
                                <allRetailSales>
                                <RetailSale>
                                        <mySaleItem xsi:type="RetailSaleItem">
                                                <shortDescription>Jungle Hideaway</shortDescription>
```

```
http://cnwcrs1a/jade/jadehttp.dll?WebServiceOverHttpApp&serviceName=ErewhonInvestmentsServiceAdmin&listName=WebSe
```

We can see that another entry has been added to the left pane. Selecting this gives us the details of this call. Note that the **Raw** tab is selected for both the request and response in the previous example. This will give us the HTTP headers as well as the body of the messages.

Fiddler has many other features and it will prove to be a valuable tool for debugging Web services. This brief example shows how you can view messages from and to a Web service client.

Message Sizes

The maximum message size that can be handled by a JADE Web service is approximately 95M bytes. However, in general, message sizes should be kept small to improve performance and scalability. A review of our customers who use Web services shows that maximum message sizes tend to vary between about 1K bytes through to around 20M bytes.

Generating a large message can take a significant amount of time, depending on whether the message is generated from a large number of small objects or whether the main payload of the message is a string. For example, some applications use the Web service as a container to pass XML strings back and forth. In this case, the performance in generating and parsing the message will be insignificant, but this XML string will likely have to be subsequently parsed to obtain the information that it contains.

Note that the strings representing these messages are stored on the object, so you will need to make sure that your transient cache is big enough to hold these messages.

It is, of course, not always possible to control the size of the message; for example, when you are consuming an external Web service where the requirements are dictated by the Web service provider. In this situation where large messages are involved, be prepared to have a big transient cache and possibly slow message generation.

If your transient cache is not large enough to hold the object in the cache, you will get a 1018 *(No memory for buffers)* exception, which is likely to relate to the input message or the response message being too large. The input message is held on the **JadeWebServiceConsumer** class **soapRequest** property and is for the user to inquire upon. If you have no requirement to inspect this property in code, a possible workaround is to write a mapping method that nulls the value out, as shown in the following example.

```
soapRequest(set: Boolean; _value: String io) mapping, updating;
begin
    if set then
        _value := null;
    endif;
end;
```

You could log other information, check its length, or even truncate the string in this method. Note that if you are using the statistics logging provided by the framework, the soap request value will be whatever value it was set to in this mapping method.

This technique *cannot* be applied to the response message that is stored in the **JadeWebServiceConsumer** class **soapResponse** property. This means that if the response messages from the Web service can be large, you will still need to increase your transient cache size.

Web Server Setup

The JADE Web applications framework currently supports the following Web servers.

- IIS on Windows
- Apache on Windows

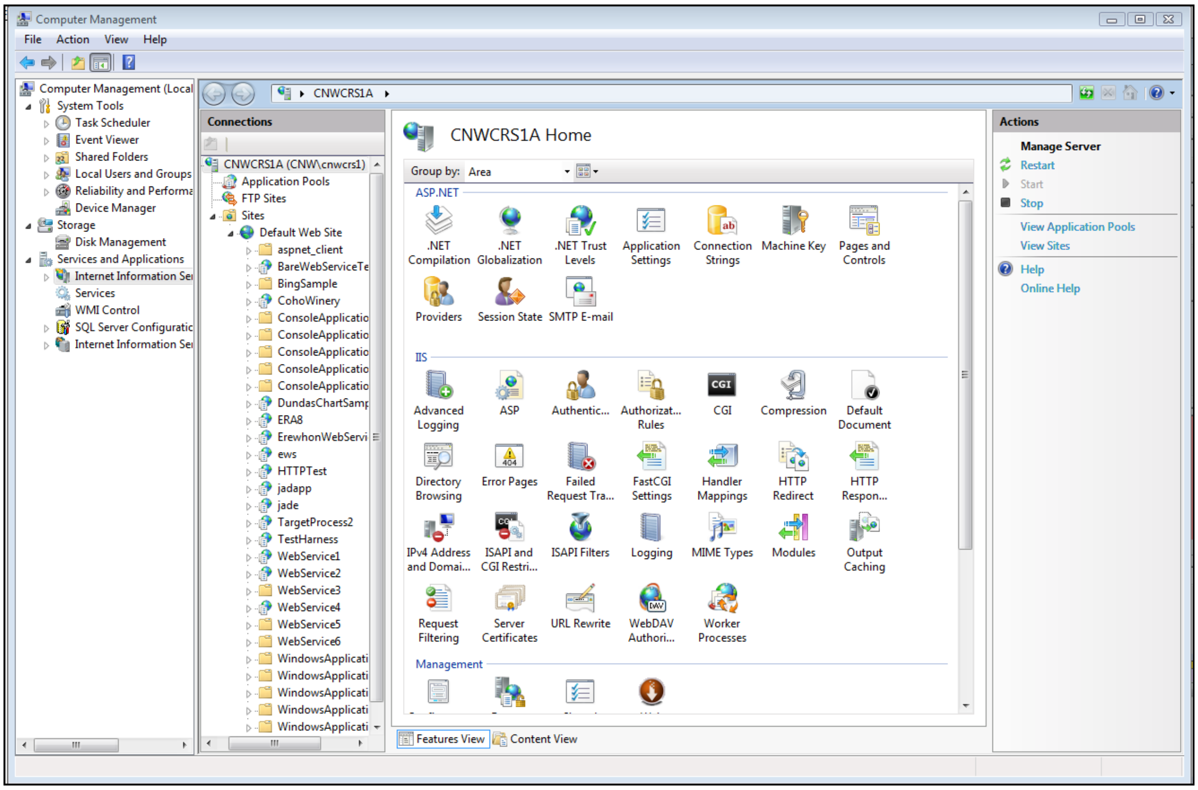
This section endeavors to explain how to set up IIS 7.0.

Note If you want to receive error messages from your JADE Web service, make sure that your Web server does not modify HTTP responses or returned errors.

The following example Web server setup assumes the following.

- IIS 7 is set up on your machine

Clicking on **Internet Information Services** under **Services and Applications** at the left shows you the display in the panes at the right. This will bring up the following window.



For the Web server to work with JADE Web applications, the following steps are required to be set up in IIS.

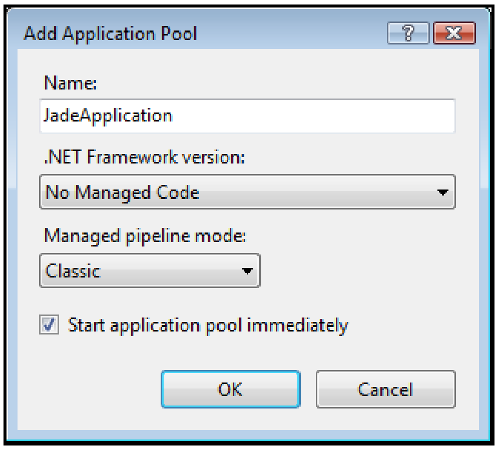
1. Create an application pool
2. Create a virtual directory
3. Set up the Handler Mappings
4. Set up ISAPI restrictions

For more details, see the following subsections.

Create an Application Pool

In the Computer Management window, click on **Application Pools** on the left (you might need to expand the list to see this) and then select **Add Application Pool** on the right. This will display the Add Application Pool dialog.

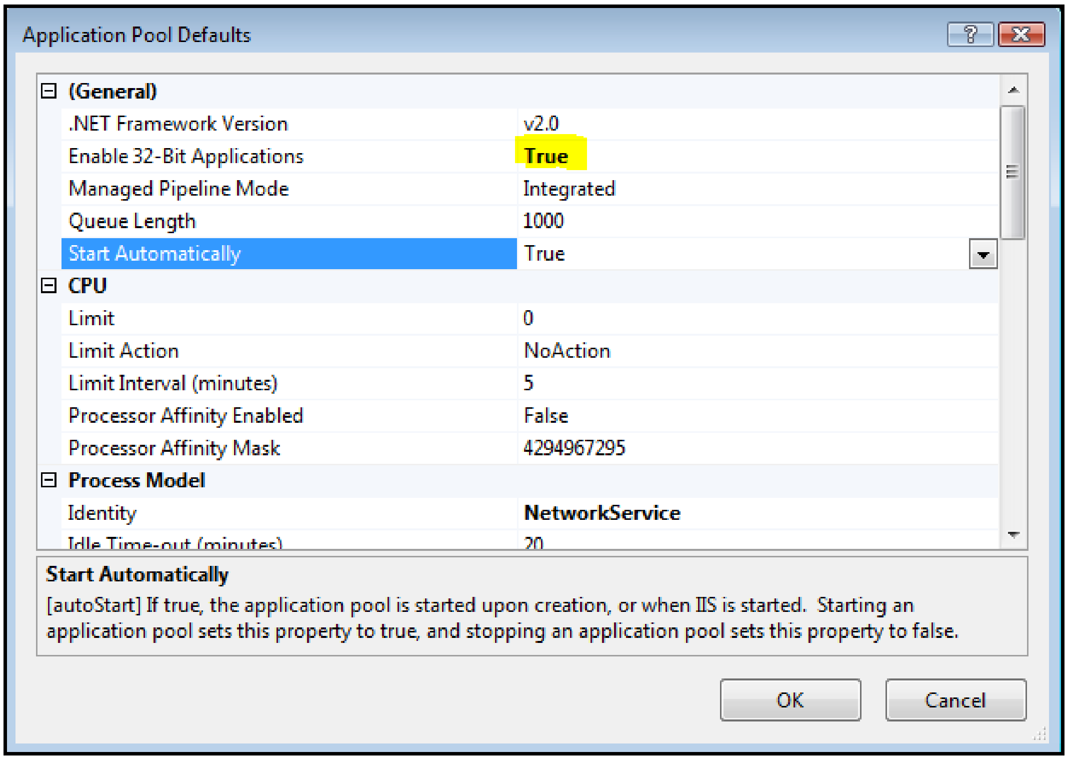
Fill in the entries shown in the following example and then click **OK**.


Add Application Pool

Name:	JadeApplication
.NET Framework version:	No Managed Code
Managed pipeline mode:	Classic

☑ Start application pool immediately

Now select **Set Application Pool Defaults** on the right of the Application Pool Defaults dialog, set **Enable 32-Bit Applications** to **True** if you are using the 32-bit **jadehttp.dll**; otherwise leave it as **False** and then click **OK**. Note that if you set this to **True** and use a 64-bit **jadehttp.dll**, Server Error 500 is likely to occur.


Application Pool Defaults

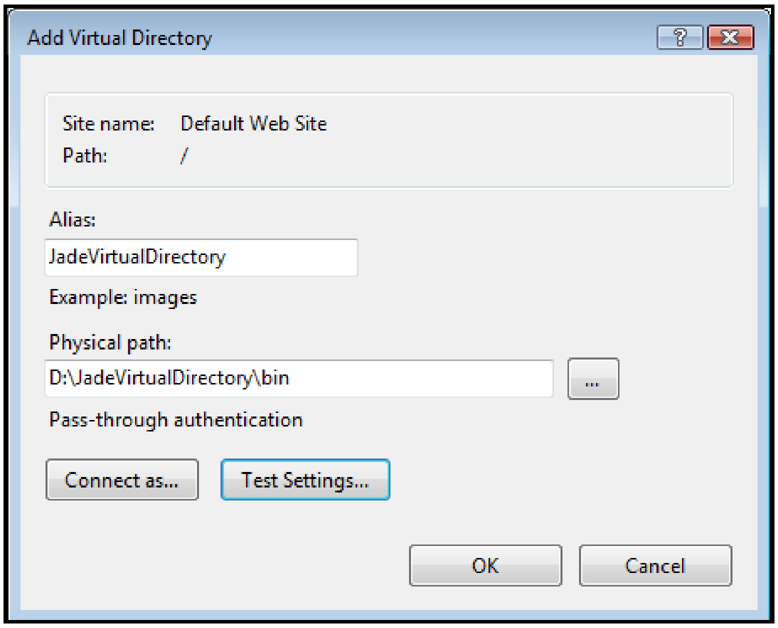
(General)	
.NET Framework Version	v2.0
Enable 32-Bit Applications	**True**
Managed Pipeline Mode	Integrated
Queue Length	1000
Start Automatically	True
CPU	
Limit	0
Limit Action	NoAction
Limit Interval (minutes)	5
Processor Affinity Enabled	False
Processor Affinity Mask	4294967295
Process Model	
Identity	**NetworkService**
Idle Time-out (minutes)	20

Start Automatically
[autoStart] If true, the application pool is started upon creation, or when IIS is started. Starting an application pool sets this property to true, and stopping an application pool sets this property to false.

Create a Virtual Directory

In the Computer Management window, click on **Default Web Site** on the left, right-click, and then select **Add Virtual Directory**.

Fill in the entries shown in the following dialog and then click **OK**.

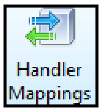


Site name: Default Web Site
Path: /
Alias: JadeVirtualDirectory
Example: images
Physical path: D:\JadeVirtualDirectory\bin
Pass-through authentication

Make sure that the folder specified in the **Physical path** text box is present, or you can create it by using the **...** button. This directory must contain the **jadehttp.dll**.

Edit a Handler Mapping

In the Computer Management window, click on the virtual directory that you created in the left pane and then double-click on the **Handler Mappings** icon in the middle pane.



This will bring up a list of handler mappings.

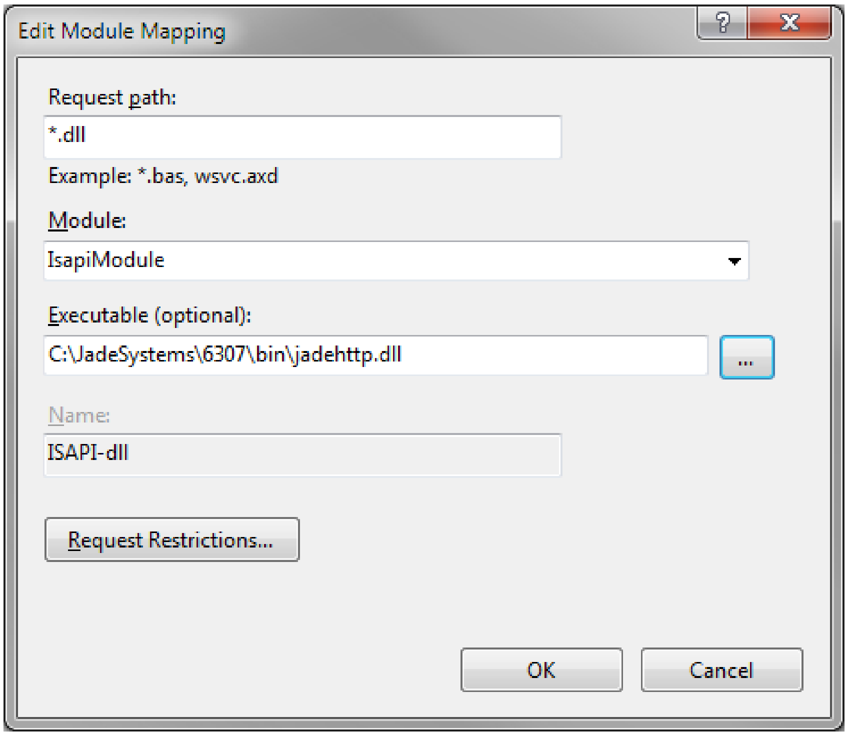
To edit the handler mappings for your virtual directory

1. Select **CGI-exe**.
2. Click **Edit Feature Permissions**.
3. Enable all three **Read**, **Script**, and **Execute** options.

4. Enable the **ISAPI-dll**, by performing the following actions.

   a. Select the **ISAPI-dll** handler mapping and then click **Edit**.

      The Edit Module Mapping dialog, shown in the following image, is then displayed.



Edit Module Mapping

Request path:
*.dll
Example: *.bas, wsvc.axd

Module:
IsapiModule

Executable (optional):
C:\JadeSystems\6307\bin\jadehttp.dll

Name:
ISAPI-dll

   b. Set the following values.

      – ***.dll**, in the **Request path** text box.

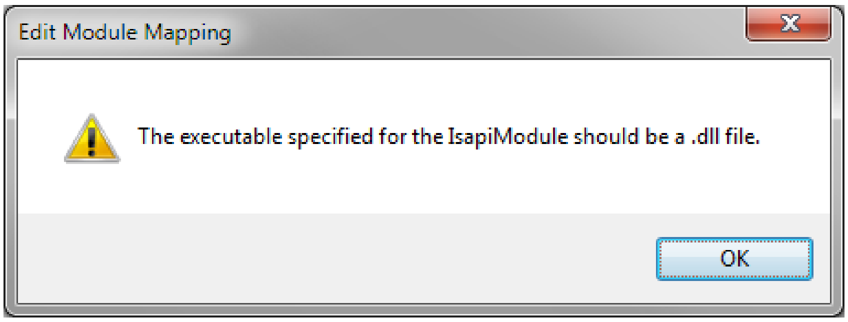
      – **IsapiModule**, in the **Module** list box.

      – The path and file name of your JADE system's **jadehttp.dll** executable, in the **Executable (optional)** text box.

   c. Click the **Request Restrictions** button to display the Request Restrictions dialog, select the **Execute** option on the **Access** sheet, and then click **OK**.

5. Click **OK** on the Edit Module Mapping dialog.

6. If the Edit Module Mapping message box, shown in the following image, is displayed, click **OK**.



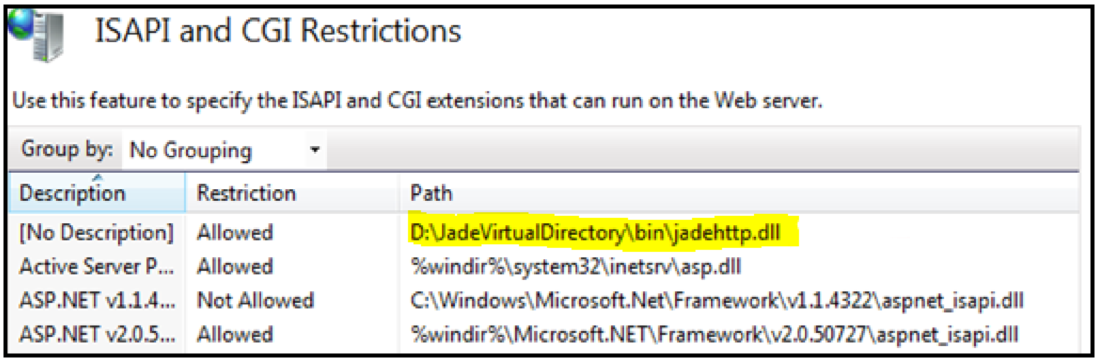
Edit Module Mapping

The executable specified for the IsapiModule should be a .dll file.

Set Up ISAPI Restrictions

In the Computer Management window, click on the machine name (which is at the top of the tree) in the left pane and then double-click on the **ISAPI and CGI Restrictions** icon in the middle pane.

This will show a list of ISAPI and CGI extensions, including the one you created in the previous section when you clicked **Yes** on the Add Module Mapping message box; that is, the one with [No Description] in the **Description** column.

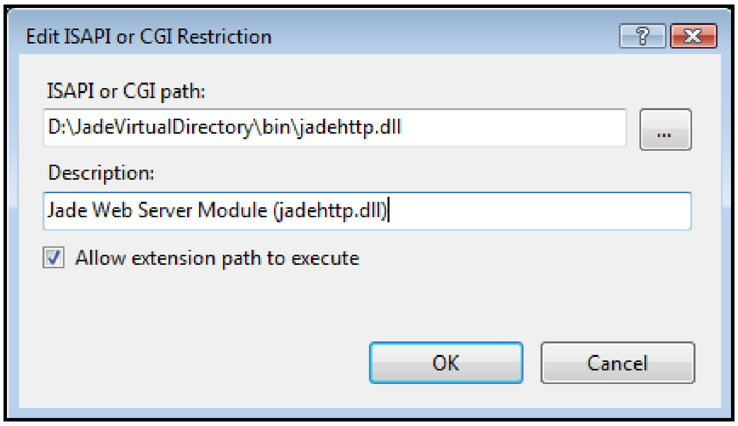

ISAPI and CGI Restrictions

Use this feature to specify the ISAPI and CGI extensions that can run on the Web server.

Group by: No Grouping

Description	Restriction	Path
[No Description]	Allowed	D:\JadeVirtualDirectory\bin\jadehttp.dll
Active Server P...	Allowed	%windir%\system32\inetsrv\asp.dll
ASP.NET v1.1.4...	Not Allowed	C:\Windows\Microsoft.Net\Framework\v1.1.4322\aspnet_isapi.dll
ASP.NET v2.0.5...	Allowed	%windir%\Microsoft.NET\Framework\v2.0.50727\aspnet_isapi.dll

Double-click on this entry and then enter a suitable description in the Edit ISAPI or CGI Restriction dialog that is displayed.


Edit ISAPI or CGI Restriction

ISAPI or CGI path: D:\JadeVirtualDirectory\bin\jadehttp.dll

Description: Jade Web Server Module (jadehttp.dll)

[✓] Allow extension path to execute

Make sure that the **Allow extension path to execute** check box is checked, and then click **OK**.

If you need to specify another virtual directory or physical directory, follow these same steps.

Note You should restart IIS if you make changes to any of the Web server settings.

Usage Statistics

This section contains the following topics.

- Web Service Client
- Web Service Application

Web Service Client

A JADE Web service client can access information related to the last Web service call. As there is a performance overhead in gathering statistics, this information is gathered only when you specifically request it. When the **JadeWebServiceConsumer** class **logStatistics** property is set to **true**, this information is gathered.

At the end of a Web service call, you can request this information by calling the **JadeWebServiceConsumer** class **getLastStatistics** method. This method takes a Boolean parameter that indicates whether you want only the statistical information (**true**) or all information (**false**). Setting this parameter to **true** will return an XML string similar to the following.

```
<?xml version="1.0" encoding="utf-8"?>
                       <WebServiceStatistics>
                       <name>ErewhonInvestmentsServiceAdmin</name>
                       <operation>getClient</operation>
                       <url>http://wilbur/jade/jadehttp.dll?WebServiceOverHttpApp&amp;
                       ErewhonInvestmentsServiceAdmin&amp;listName=WebServiceOverHttpA
                       <dateTime>11 September 2009, 14:44:08</dateTime>
                       <requestTime>5</requestTime>
                       <getResponseTime>692</getResponseTime>
                       <responseTime>21</responseTime>
                       <processingTime>26</processingTime>
                       <errorCode>0</errorCode>
                       <requestSize>452</requestSize>
                       <responseSize>1781</responseSize>
               </WebServiceStatistics>
```

Setting the parameter to **false** will return an XML string similar to the following.

```
<?xml version="1.0" encoding="utf-8"?>
                       <WebServiceStatistics>
                       <name>ErewhonInvestmentsServiceAdmin</name>
                       <operation>getClient</operation>
                       <url>http://wilbur/jade/jadehttp.dll?WebServiceOverHttpApp&amp;
                       ErewhonInvestmentsServiceAdmin&amp;listName=WebServiceOverHttpA
                       <dateTime>11 September 2009, 14:44:40</dateTime>
                       <requestTime>5</requestTime>
                       <getResponseTime>29</getResponseTime>
                       <responseTime>16</responseTime>
                       <processingTime>21</processingTime>
                       <errorCode>0</errorCode>
                       <requestSize>452</requestSize>
                       <responseSize>1781</responseSize>
                       <requestHeaders><![CDATA[Accept: text/plain
                       Accept: text/html
                       Accept: text/xml
                       Content-Type: text/xml; charset=utf-8
                       Host: wilbur
                       Pragma: no-cache
                       Proxy-Connection: Keep-Alive
                       SOAPAction: "urn:JadeWebServices/WebServiceOverHttpApp/getClie
                       User-Agent: Jade/6.3.04
                       ]]></requestHeaders>
```

```
                        <soapRequest><![CDATA[<?xml version="1.0" encoding="utf-8"?>
                        <soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-inst
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="urn:JadeWebServices/WebServiceOverHttpApp/"
xmlns:s1="urn:JadeWebServices/WebServiceOverHttpApp/">
                        <soap:Body>
                        <s1:getClient>
                        <s1:clientName>Brian Olsen</s1:clientName>
                        </s1:getClient>
                        </soap:Body>
                        </soap:Envelope>
                        ]]></soapRequest>
                        <responseHeaders><![CDATA[HTTP/1.1 200 OK
                        Content-Length: 1781
                        Content-Type: text/xml; charset=utf-8
                        Server: Microsoft-IIS/7.0
                        X-Powered-By: ASP.NET
                        Date: Fri, 11 Sep 2009 02:44:40 GMT
                        ]]></responseHeaders>
                        <soapResponse><![CDATA[<?xml version="1.0" encoding="utf-8"?>
                        <soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-inst
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
                        <soap:Body>
                        <getClientResponse xmlns="urn:JadeWebServices/WebServiceOverHtt
                        <getClientResult xsi:type="Client">
                        <address1>2834 The Palace</address1>
                        <address2>San Diego</address2>
                        <address3>United States of America</address3>
                        <email>bo@wol.com</email>
                        <fax>64 2 2930 9393</fax>
                        <name>Brian Olsen</name>
                        <phone>1 2 3848 8384</phone>
                        <webSite>www.wol/olsen.com</webSite>
                        <allRetailSales>
                        <RetailSale>
                        <mySaleItem xsi:type="RetailSaleItem">
                        <shortDescription>Jungle Hideaway</shortDescription>
                        </mySaleItem>
                        <price>6250000.00</price>
                        </RetailSale>
                        <RetailSale>
                        <mySaleItem xsi:type="RetailSaleItem">
                        <shortDescription>Wedding Ring</shortDescription>
                        </mySaleItem>
                        <price>8399.00</price>
                        </RetailSale>
                        </allRetailSales>
                        <allTenderSales>
                        <TenderSale>
                        <mySaleItem xsi:type="TenderSaleItem">
                        <shortDescription>Coffee Mill</shortDescription>
                        </mySaleItem>
                        <myTender>
                        <offer>1305.00</offer>
```

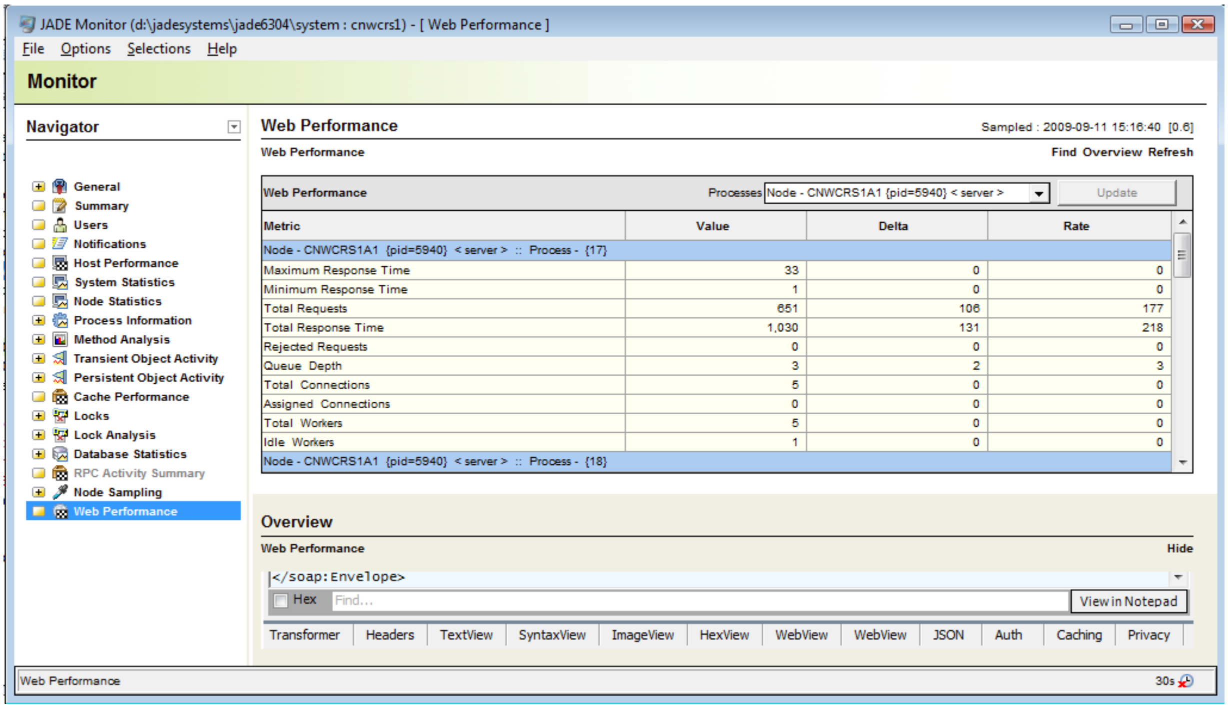
```
                <timeStamp>1999-11-17T00:55:00.000-00:00</timeStamp>
                </myTender>
                </TenderSale>
                <TenderSale>
                <mySaleItem xsi:type="TenderSaleItem">
                <shortDescription>Oil Painting</shortDescription>
                </mySaleItem>
                <myTender>
                <offer>7732.00</offer>
                <timeStamp>2000-02-05T19:25:00.000-00:00</timeStamp>
                </myTender>
                </TenderSale>
                </allTenderSales>
                </getClientResult>
                </getClientResponse>
                </soap:Body>
        </soap:Envelope>
```

This call returns the HTTP headers and the request and response message. As the messages can be large, if you want to capture statistical information only , set the parameter to **true**. The tags are described in the following table.

Field	Appears as...	Description
name	ErewhonInvestmentsServiceAdmin	The name of the Web service
operation	getClient	The name of the Web service operation
url	http://wilbur/jade/ ...	The URL of the request
dateTime	11 September 2009, 14:44:08	The date and time of the request
requestTime	5	Time to process and send the request
getResponseTime	692	Time taken by the Web service call
response	21	Time taken to process the response
errorCode	0	Error code of error when sending/receiving
requestSize	452	Size of request message
responseSize	1781	Size of response message
requestHeaders	![CDATA[Accept: text/plain …	HTTP Send headers
soapRequest	![CDATA[<?xml version="1.0" encoding="utf-8"?> ….	SOAP request message
responseHeaders	<![CDATA[HTTP/1.1 200 OK ….	HTTP response headers
soapResponse	<![CDATA[<?xml version="1.0" encoding="utf-8"?> ….	SOAP response message

Web Service Application

In the current release, there is no programmatic interface to obtain statistical information relating to a Web service application. Such information can be obtained by logging the Web application monitor output. The JADE Monitor has information relating to the Web service processes. An example of this is shown in the following image.



Web Performance Sampled : 2009-09-11 15:16:40 [0.6]

Web Performance

Processes: Node - CNWCRS1A1 {pid=5940} < server >

Metric	Value	Delta	Rate
Node - CNWCRS1A1 {pid=5940} < server > :: Process - {17}			
Maximum Response Time	33	0	0
Minimum Response Time	1	0	0
Total Requests	651	106	177
Total Response Time	1,030	131	218
Rejected Requests	0	0	0
Queue Depth	3	2	3
Total Connections	5	0	0
Assigned Connections	0	0	0
Total Workers	5	0	0
Idle Workers	1	0	0
Node - CNWCRS1A1 {pid=5940} < server > :: Process - {18}			

```
</soap:Envelope>
```

The Web service information that is monitored is listed in the following table.

Row Name	Description
Maximum Response Time	Maximum time in ms. for a message response
Minimum Response Time	Fastest response time in ms. for a message response
Total Requests	Total requests
Total Response Time	Total response time
Rejected Requests	Number of requests rejected (no available connections)
Queue Depth	Number of requests in the queue
Total Connections	Number of total connections
Assigned Connections	Number of connections currently in use
Total Workers	Number of application copies
Idle Workers	Number of applications that are idle

Consumer Asynchronous Calls

The steps involved in setting up a Web service to make asynchronous calls are as follows.

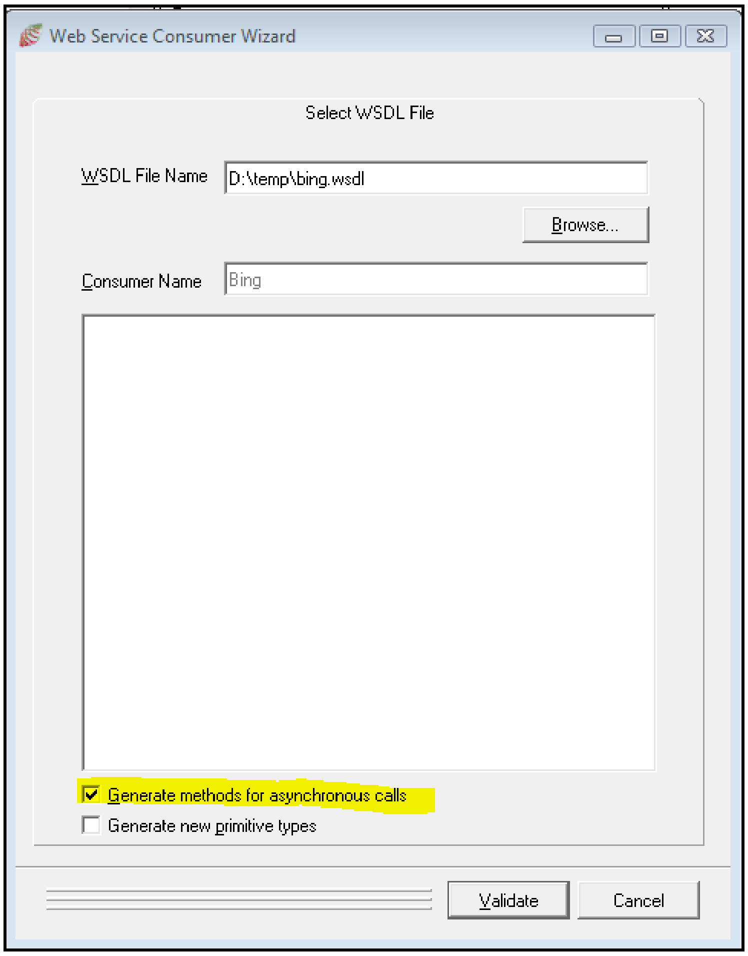
1. WSDL Import
2. Set up a worker application
3. Write code to handle asynchronous calls

For details, see the following subsections.

- WSDL Import
- Setting up a Worker Application
- Coding Example

WSDL Import

To generate the code for making asynchronous calls, check the **Generate methods for asynchronous calls** check box on the Web Service Consumer Wizard dialog, shown in the following image.



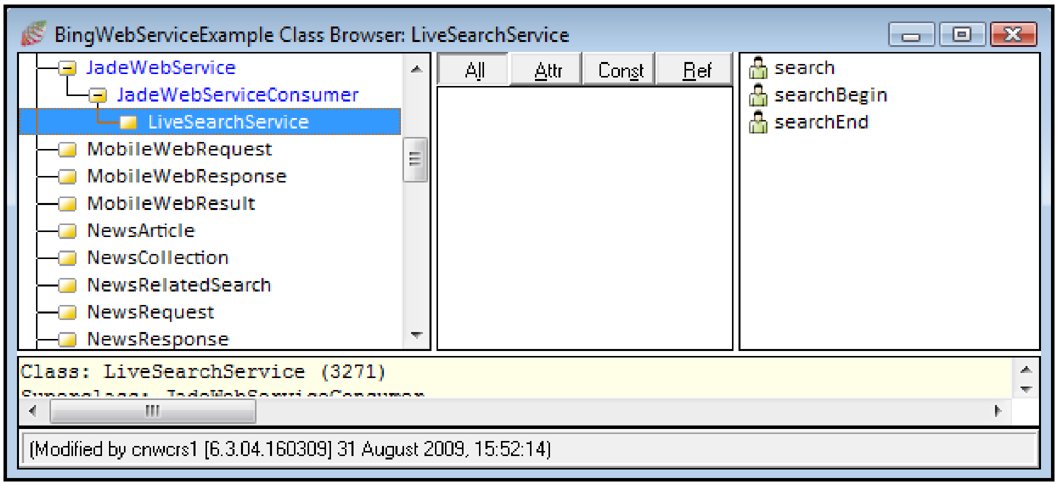
WSDL File Name: D:\temp\bing.wsdl

Consumer Name: Bing

[✓] Generate methods for asynchronous calls

[ ] Generate new primitive types

When you have done this, two additional methods will be generated for each Web service message defined in the WSDL, as shown in the following image.



```
Class: LiveSearchService (3271)
```

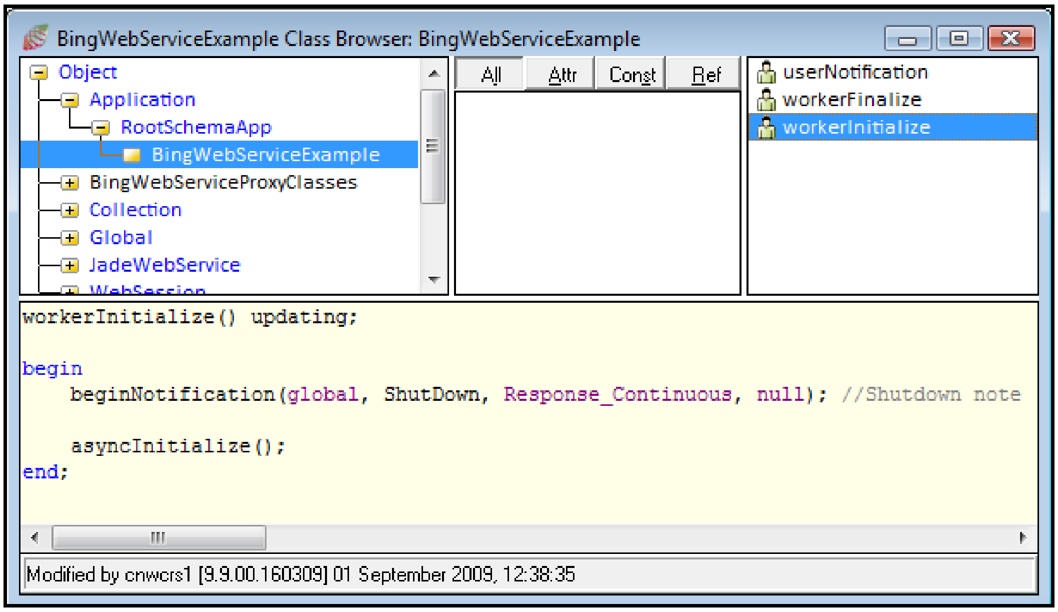
(Modified by cnwcrs1 [6.3.04.160309] 31 August 2009, 15:52:14)

The two additional methods have a **Begin** and **End** suffix. In this example, the **searchBegin** method is used to start the request and the **searchEnd** method is used to receive the response.

Setting up a Worker Application

To use asynchronous calls, set up a worker application that sends the request to the Web service. In its simplest form, the worker application can be a non-GUI application that is required to only implement the **initialize** and **finalize** methods.

The **initialize** method must call the **Application** class **asyncInitialize** method and the **finalize** method must call the **Application** class **asyncFinalize** method. In the supplied example schema, the **initialize** method is called **workerInitialize** and it is implemented as follows.

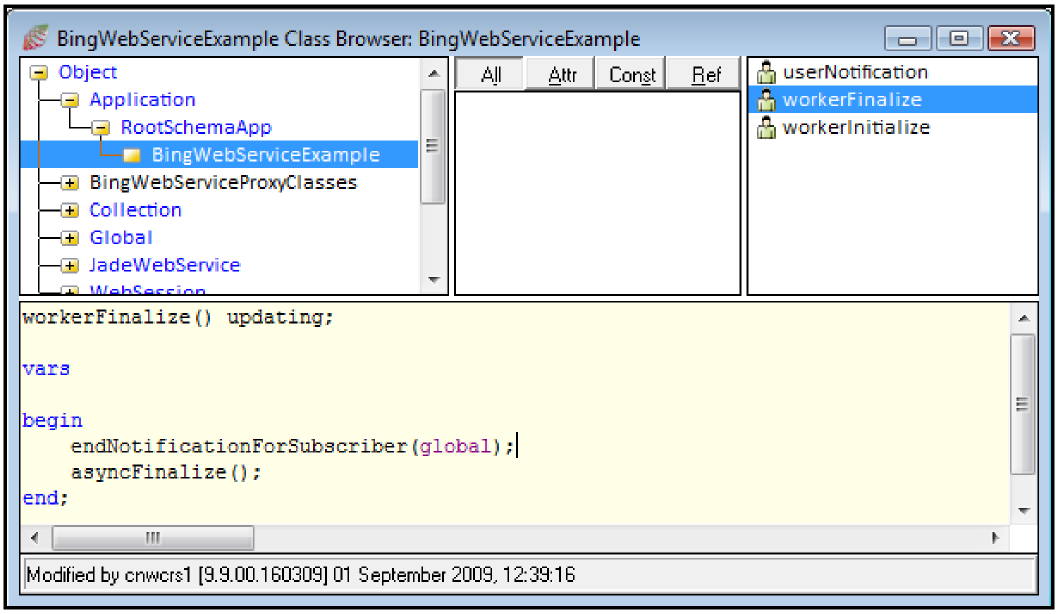


```
workerInitialize() updating;

begin
    beginNotification(global, ShutDown, Response_Continuous, null); //Shutdown note

    asyncInitialize();
end;
```

Modified by cnwcrs1 [9.9.00.160309] 01 September 2009, 12:38:35

The notification is so that the application can be shut down using a **causeEvent** call.

The **finalize** method is called **workerFinalize** and it is implemented as follows.



```
workerFinalize() updating;

vars

begin
    endNotificationForSubscriber(global);
    asyncFinalize();
end;
```

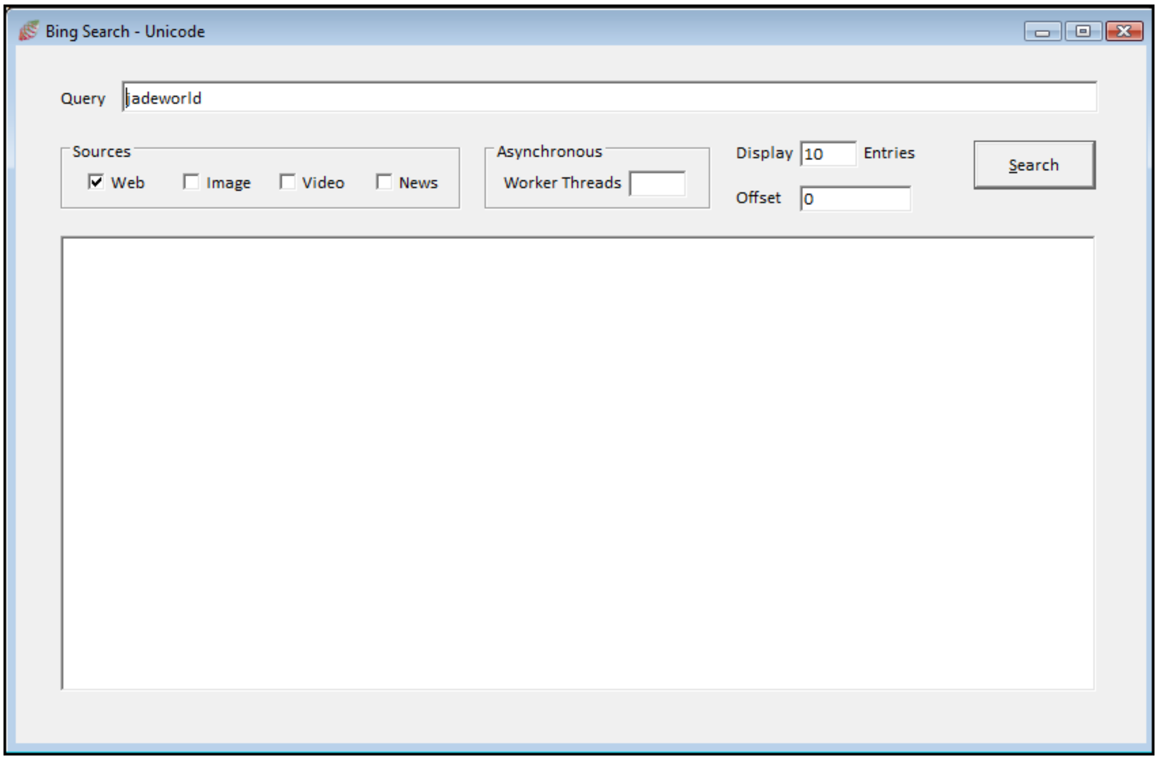
Modified by cnwcrs1 [9.9.00.160309] 01 September 2009, 12:39:16

The **userNotification** terminates the application when it receives a shutdown notification.

We create a worker non-GUI application called **WebServiceWorkerApp**.

Coding Example

The sample application has the following start up form, which is the only form.



Query: jadeworld
Sources: [✓ Web] Image Video News
Display 10 Entries
Offset 0

Although this application has been set up to call the Web services synchronously or asynchronously, this section discusses only the asynchronous operation.

The Bing Search Web service provides several sources on which the search can occur. In this example, we are using four of these (Web, image, video, and news) and allowing one or more of these to be selected for the search. The form also enables you to enter the number of worker processes to start. If the current number of worker processes is less than the specified number, additional worker processes will be started, up to the specified number.

To demonstrate the benefit and use of asynchronous operations, we will set up four workers, one for each of the sources, so that if all four sources are selected, all four search requests can be done asynchronously. Note that the Bing API actually lets you specify all of the sources in a single call. However, we are not doing so in this example, so that we can demonstrate the use of asynchronous calls.

The **Form** class that we are using is called **BingSearch**. In this class, we define a **webService** property, to hold a reference to the Web service consumer instance (an instance of **LiveSearchService**). This is initialized in the **load** method of the **BingSearch** class.

The following discussion concentrates on a method called **runAsync** on the **BingSearch** class.

1. Tell the consumer instance the name of the worker application, as follows.

```
webService.workerApp := "WebServiceWorkerApp";
```

2. Start the required number of copies of the worker applications, as follows.

```
vars
    c : Integer;
begin
    // get a count of apps already running
    c := getAppCount(webService.workerApp);
    while c < txtWorkers.text.Integer do
        c := c + 1;
        app.startApplicationWithParameter(currentSchema.name,
              webService.workerApp, null);
    endwhile;
end;
```

3. Set up the parameters to the Web service call, as follows (assuming that Web source is selected).

```
create searchRequestWeb;
create searchRequestWebParam;
searchRequestWeb.parameters := searchRequestWebParam;
searchRequestWebParam.appId := appID;
searchRequestWebParam.query := txtQuery.text;
searchRequestWebParam.sources.add("Web");
create webrequest transient;
searchRequestWebParam.web := webrequest;
webrequest.count := txtEntries.text.Integer;
webrequest.offset := txtOffset.text.Integer;
```

4. Set up the required parameters for each source on which we want to search and then initiate the asynchronous call by calling the **searchBegin** method on the Web service, passing the required parameter, as follows.

```
contextWeb := webService.searchBegin(searchRequestWeb);
objArray.add(contextWeb);
```

The **objArray** is a local variable, defined as follows.

```
objArray: JadeMethodContextArray;
```

Note **JadeMethodContextArray** is defined in this schema as a subclass of **ObjectArray** with membership **JadeMethodContext**. The variable is used as the parameter to the **processForMethods** method call, as we will see later.

5. Write similar code for each of the other sources. When all of the required asynchronous calls have been initiated, we then do the following.

```
context := process.waitForMethods(objArray);
```

Tip The **waitForMethods** method takes a variable number of parameters that must be of type **JadeMethodContext** or an array of **JadeMethodContext**, and where this number can vary, it is easier to code using the array.

This method now waits for one of the calls to complete. When a call is completed, the context variable will contain the **JadeMethodContext** of the call that was completed.

The following code fragment assumes that the context returned was for the *web* source.

```
response := webService.searchEnd(searchRequestWeb, contextWeb);
webresponse := response.parameters.web;
```

```
        text := null;
        if webresponse <> null then
            staStatusLine.caption := staStatusLine.caption & "Web = " &
                                     webresponse.total.String & " ";
            jrtResults.setCharacterFormat(true, jrtResults.fontName,
                                          jrtResults.fontSize, Red, 0, 0, 0, 0);
            foreach webresult in webresponse.results do
                text := text & webresult.title & CrLf & webresult.description &
                        CrLf & webresult.url & CrLf & CrLf;
            endforeach;
            jrtResults.append(text);
        endif;
```

The **searchEnd** method is now called on the Web service, to get the response object. The rest of the code in this fragment processes this response object.

6. Call **waitForMethods** again, as follows.

```
        context := process.waitForMethods(objArray);
```

When the context that is returned is null, all requests have been completed. The sample application is supplied with this white paper. For more information, see the *Asynchronous Method Calls* white paper.

Note By default, the Web services framework allows you to have two consecutive connections only open (as defined by the HTTP 1. specification, or four if you are using HTTP 1.0).

To increase the maximum number of allowed connections, change the Web service client's XML configuration file to a higher number. For details about configuring the Web service consumer, see "Configuring Web Applications", in Chapter 3 of the *JADE Web Application Guide*.

Using SOAP Headers

Even if you have done some fairly involved development of a JADE Web service, there is a possibility that you have never bothered with SOAP headers. In fact, it is not uncommon to put information in the body of your SOAP message that really should be in the header section of your message.

In the following subsections, we will look at what sort of information should go into the header, how you can read and write message headers in the JADE Web services framework, and how you can add to the current SOAP infrastructure by using SOAP headers.

SOAP Header Element

The specifications for a SOAP header element differ slightly between SOAP 1.1 and SOAP 1.2. The following discussion is based on SOAP 1.1.

A SOAP message consists of three elements: the top level **Envelope** element and two of its children (the **Header** element and the **Body** element).

The following is a SOAP message with all three of these elements.

```
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="urn:JadeWebServices/WebServiceOverHttpApp/"
xmlns:s1="urn:JadeWebServices/WebServiceOverHttpApp/">
<soap:Header>
```

```
        <s1:erewhonHeader>
        <s1:priority>HIGH</s1:priority>
            </s1:erewhonHeader>
        </soap:Header>
        <soap:Body>
            <s1:getClient>
                <s1:clientName>Brian Olsen</s1:clientName>
            </s1:getClient>
        </soap:Body>
    </soap:Envelope>
```

The **Body** element is where the main data in the message lives. The **Header** element is where any metadata that might describe the body, details of how the body should be processed, or simply extra information about the message can live. The **Header** element is optional, but if it exists, it must be the first child of the **Envelope** element. The **Header** element itself consists of zero or more child elements, referred to as *header blocks*. Each header block needs to be namespace-qualified.

The SOAP 1.1 specifications define three attributes that can apply to header blocks: the **encodingStyle** attribute, the **actor** attribute, and the **mustUnderstand** attribute. All three of these attributes are optional and they can be used in addition to any other attributes that you may want to include.

The **encodingStyle** attribute is used to indicate how the encapsulated data is encoded. The SOAP specification includes a mechanism for encoding data that includes data type information in XML attributes. This is becoming less popular as more and more people define their headers using XML Schema.

The **actor** attribute is used to indicate which node should process this particular header block. A SOAP message can be passed through a sequence of nodes, and it is conceivable that a header block may apply to one node in the sequence and not to others. You might set the **actor** attribute to the endpoint of the node, which will process the header block so that other nodes in the sequence will know to ignore it. The absence of the **actor** attribute implies that the header block is targeted for the ultimate recipient of the SOAP message. Note that the **actor** attribute has been renamed the **role** attribute in the SOAP 1.2 specification.

The **mustUnderstand** attribute is the way that a header block indicates that it must be understood and processed in accordance with any specifications that may be defined for the specified qualified element name. If the recipient does not know how to process the header block, it must generate a MustUnderstand fault and not proceed with any further processing of the message. The **mustUnderstand** attribute is a Boolean value, and if it is not present, it is assumed to be **false**.

Information to Put in the Header

The SOAP specifications are not clear about what information goes in the header. Those familiar with HTTP or MIME headers are probably used to seeing various sorts of metadata included with the main data in the message.

The focus of the SOAP header should be to help process the data in the body. It makes sense to include information about authentication or transactions, because this information will be involved in identifying the person or company who sent the body and in what context it will be processed. Expiration data could be included in the header to indicate when the data in the body may need to be refreshed. User account information could be included, in order to ensure that processing the message is performed only for a request that has been legitimately paid for.

Here's another factor in determining whether information should be included in SOAP headers.

- Will that information have broad application to a wide variety of SOAP messages?

If so, include it in the header. It makes more sense to define a single schema and insert it into the definition of one header element than to force inclusion of the same data into the body schemas of a large number of message definitions. For example, if you are defining several Web service methods that use common information, it may make sense to put these in the header rather than pass it in as a parameter. Authentication and routing are problems common to many XML Web services, so it makes sense that these specifications deal with information that lives in the Header element.

The stateless nature of Web services means that if you require state, SOAP headers can be used to relay this information. Within the JADE Web services framework, SOAP headers are used to relay session information when session handling is enabled.

The following SOAP header is generated when session handling is enabled.

```
<soap:Header>
    <JadeSessionHeader xmlns="urn:JadeWebServices/WebServiceOverHttpApp/">
        <sessionId>91b17de375a04d9b</sessionId>
    </JadeSessionHeader>
</soap:Header>
```

Defining SOAP Headers

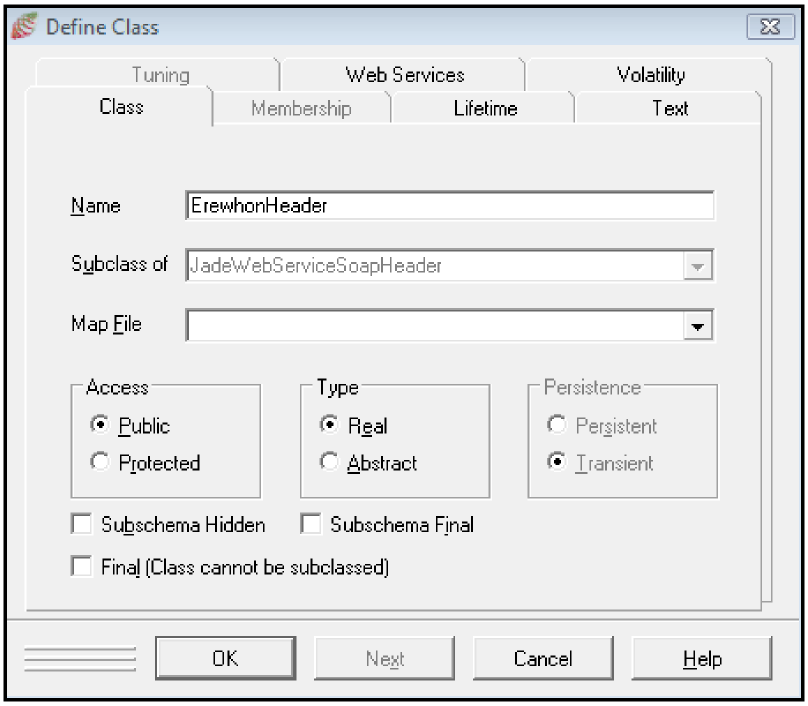
SOAP headers are defined by the Web service provider application. The steps to follow when defining these headers are as follows.

1. Create a subclass of the **JadeWebServiceSoapHeader** class.
2. Add properties to this class that you want to send in the SOAP header.
3. Add a property reference to this class in your Web service provider class.
4. Select the methods for which you want to generate the SOAP header.

The following simple example demonstrates how to create and use a SOAP header in JADE. The example uses the Erewhon Investments example system.

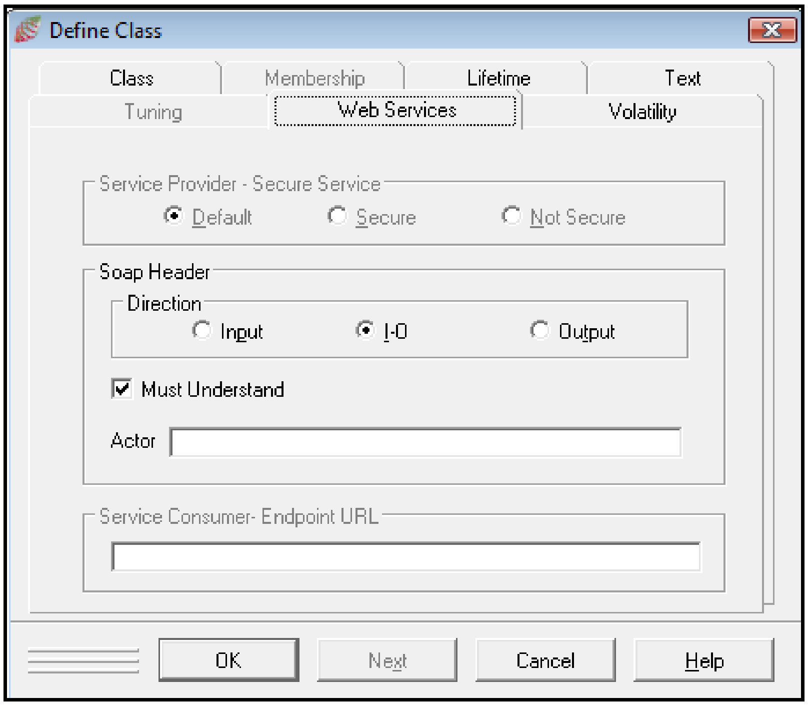
Step 1: Create a subclass of the JadeWebServiceSoapHeader class

Call this class **ErewhonHeader**. The class can be defined as shown in the following image.



Name: ErewhonHeader
Subclass of: JadeWebServiceSoapHeader
Map File:
Access: [✓ Public] Protected
Type: [✓ Real] Abstract
Persistence: Persistent [✓ Transient]
☐ Subschema Hidden
☐ Subschema Final
☐ Final (Class cannot be subclassed)

We will define the options for the header on the **Web Services** sheet, as shown in the following image.



Service Provider - Secure Service: [✓ Default] Secure Not Secure
Soap Header
Direction: Input [✓ I-O] Output
☑ Must Understand
Actor:
Service Consumer- Endpoint URL:

We have defined the SOAP header direction as **I-O** (the default value is **Input**). The following meanings apply to this setting.

- Input – This means that the SOAP header is provided by the Web service client and input to the Web service. The Web service itself does not send a SOAP header.
- I-O – Both the Web service client and the Web service send this header.
- Output – Only the Web service sends this header. The Web service client receives this header but does not send it back.

The **Must Understand** attribute is set to **true**. (Its usage was explained in the previous section.)

Step 2: Add properties to the class

Add the following single **String** property to this class.

```
Name: priority, type: String, length: 30, access: public
```

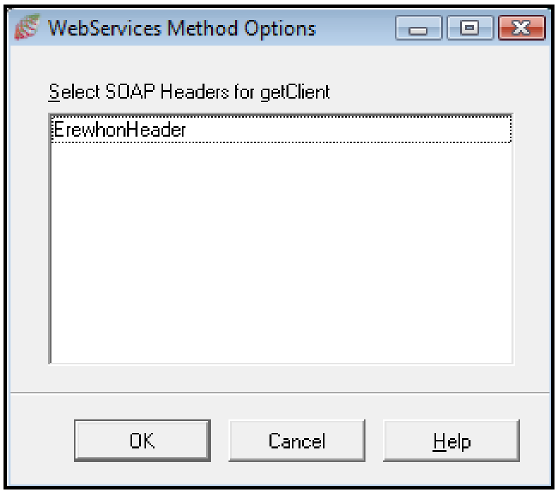
Step 3: Add a property reference to this class in your Web service provider class

Add the following property reference to the SOAP header class created in step 1 to the **ErewhonInvestmentsService** class.

```
Name: erewhonHeader, type: ErewhonHeader, access: public
```

Step 4: Select the methods for which you want to generate the SOAP header

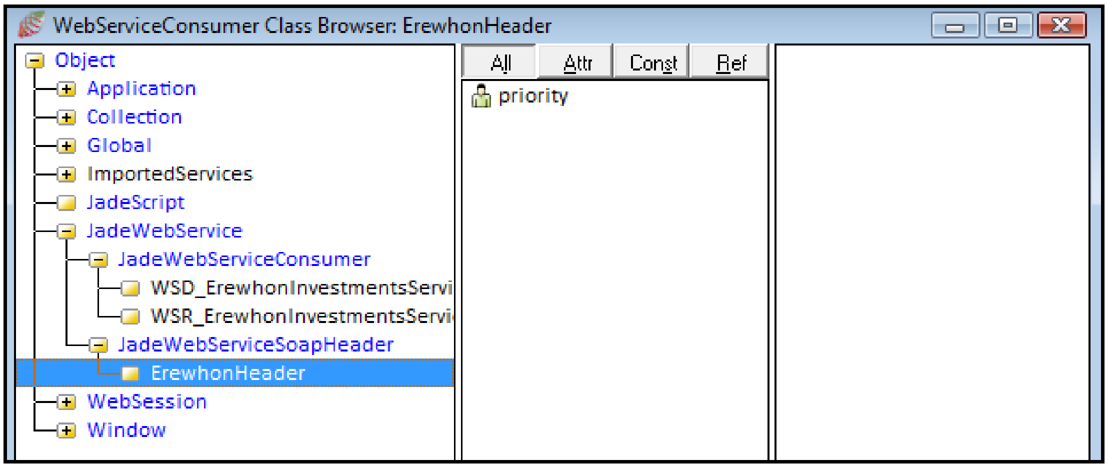
Add the header to the **ErewhonInvestmentsService** class **getClient** method. To do this, right-click on this method and then select the **Web Services Options** menu item. This displays the dialog shown in the following image.



Select the **ErewhonHeader** entry and then click **OK**.

That's it for defining the header.

When the WSDL is generated, all of the required information for the SOAP header is generated. Importing this Web service into a client now creates a subclass of the **JadeWebServiceSoapHeader** class on the client, as shown in the following image.



You can now create an instance of this class and set its **priority** property to send to the Web service, as follows.

```
vars
    wsc    : WSD_ErewhonInvestmentsService;
    was    : GetClient;
    wasr   : GetClientResponse;
    header : ErewhonHeader;
begin
    create wsc;
    create was;
    // create the header and assign this to the property
    create header;
    header.priority := 'HIGH';
    wsc.erewhonHeader := header;
    was.clientName := "Brian Olsen";
    wasr := wsc.getClient(was);
epilog
    delete was;
    delete wsc;
end;
```

The SOAP message that is generated from this call includes the SOAP header, as follows.

```
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="urn:JadeWebServices/WebServiceOverHttpApp/"
xmlns:s1="urn:JadeWebServices/WebServiceOverHttpApp/">
    <soap:Header>
        <s1:erewhonHeader>
            <s1:priority>HIGH</s1:priority>
        </s1:erewhonHeader>
    </soap:Header>
    <soap:Body>
        <s1:getClient>
```

```
            <s1:clientName>Brian Olsen</s1:clientName>
        </s1:getClient>
    </soap:Body>
</soap:Envelope>
```

The Web service can now check the header and decide whether to give this request a **HIGH** priority or not. If it does not, it can then set the priority value to **MEDIUM**, for example, and when the Web service client gets this header back, it knows that it's request for **HIGH** priority was rejected.

If you had several of these methods where the header is applicable, you need only to hook up these methods with the header. If you did *not* have this header, this value would need to be passed as a parameter on each applicable method. If you then wanted to send additional parameters, you would need to add this to all affected methods. This can become cumbersome and error-prone. Another way of looking at this is that SOAP headers provide you with ‘parameter refactoring’ for Web services.

Inserting Authentication Headers

The JADE Web service WSDL import feature imports only headers that are defined in the WSDL. There are cases where the headers are not defined in the WSDL but are required by the Web service. An example of this is Web services security (WS-Security).

The following example shows how we can insert a header into the SOAP message before it is sent. The example demonstrates the use of the UserNameToken Profile.

Refer to http://www.oasis-open.org/committees/download.php/16782/wss-v1.1-spec-os-UsernameTokenProfile.pdf for a detailed explanation on the use of this profile in Web services security.

First, we create an **insertSecurityHeader** method in the **JadeWebServiceConsumer** subclass, as follows.

```
insertSecurityHeader(userName, password: String): String;
vars
    header: String;
begin
    header := '<soap:Header>' & CrLf;
    header := header & '<wsse:Security xmlns:wsse="http://docs.oasis-open.org/wss
              /2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">' & CrLf;
    header := header & '<wsse:UsernameToken>' & CrLf;
    header := header & '<wsse:Username>' & userName & '</wsse:Username>' & CrLf;
    header := header & '<wsse:Password>' & password & '</wsse:Password>' & CrLf;
    header := header & '</wsse:UsernameToken>' & CrLf;
    header := header & '</wsse:Security>' & CrLf;
    header := header & "</soap:Header>" & CrLf;
    return header;
end;
```

We then re-implement the **JadeWebServiceConsumer** class **invoke** method, as follows.

```
invoke(inputMessage: String): String updating;
vars
    msg: String;
    p: Integer;
begin
    p := inputMessage.pos("<soap:Body>", 1);
    msg := inputMessage[1 : p - 1];
    msg := msg & insertSecurityHeader('fredbloggs', 'password');
    // put the appropriate username and password in here
    msg := msg & inputMessage[p : end];
```

```
        return inheritMethod(msg);
    end;
```

This will then generate a SOAP message that looks like the following.

```
    <?xml version="1.0" encoding="utf-8"?>
    <soap:Envelope xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
    xmlns:tns="https://tpvs.hmrc.gov.uk/dpsauthentication">
        <soap:Header>
            <wsse:Security xmlns:wsse="http://docs.oasis-
            open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
                <wsse:UsernameToken>
                    <wsse:Username>fredbloggs</wsse:Username>
                    <wsse:Password>password</wsse:Password>
                </wsse:UsernameToken>
            </wsse:Security>
        </soap:Header>
        <soap:Body>
            ...
        </soap:Body>
    </soap:Envelope>
```

Denial of Service

This section contains the following topics.

- Badly-Formed Messages
- Handling Badly-Formed Messages

Badly-Formed Messages

The issue we are going to deal with here is how we can best deal with the risk of non-malicious flooding leading to denial of service, resulting from badly-formed messages.

Badly-formed messages that are detected in the JADE Web service framework are of several types, as follows.

- Badly-formed XML (for example, no end tags)
- Badly-formed SOAP messages (for example, with no <Body> element)
- UTF-8 illegal byte sequence errors (ANSI systems or invalid UTF-8)
- Invalid data (for example, string too long)
- Client-side exceptions

When any of these exceptions occur, your code can trap these exceptions in a global exception handler, but the incoming data is not available to be inspected. The following subsections discuss each of these in turn.

Badly-Formed XML

The XML parser can generate exceptions in the range 8901 through 8910, although only some of these apply to Web services. Specifically, mismatched tags, missing namespaces, and missing tags are some of the things that cause exception 8901 (*XML parser error*).

This exception code is returned to the client, but the input message is not available to your exception handler.

Badly-Formed SOAP Messages

A SOAP message at a minimum must have an <Envelope> tag and a <Body> tag.

If the <Envelope> tag is missing, the SOAP parser will assume that the request is from the Test Harness and will respond with an HTML page. If the client is not a browser or it is not expecting HTML, this causes exception 11052 (*The service returned a fault message*) at the client.

If the <Body> tag is missing, the SOAP parser will not have the name of the Web service method to call and returns error 11002 *(Web Service method does not exist)*. This exception code is returned to the client, but the input message is not available to your exception handler.

UTF-8 Illegal Byte Sequence Errors (Error Code 1418)

When this exception occurs while the message is being processed, the **Application** class **jadeWebServiceInputError** method is called. This method can be re-implemented in your **Application** subclass. The method is passed the incoming message as a binary value to be inspected or logged, or both inspected and logged.

While further processing of this message cannot continue, you can define a suitable error message to be returned to the caller.

Invalid Data

When a message is being processed, transient objects are being created and property values being set on these transients. At this point, the following exceptions can occur because of invalid data.

- 1035 (*String/Binary too long*)
- 4033 and 4043 (*Result of expression overflows Decimal precision*)

When either of these exceptions occurs, the Web services framework creates a SOAP exception with details of the property in error so that the Web service client knows which property value was invalid. The original exception that was raised is then passed back to the next exception handler.

Note Not all invalid data are handled. For example, an integer overflow does not create a special SOAP exception message so the Web service client will not know what caused the overflow problem.

Client-Side Exceptions

This category refers to exceptions that are raised only on the Web service client as a result of one of the following.

- Version number mismatch
- Invalid exposure list name
- Session timed out
- The requested service is a secure service
- Invalid response message

In these cases, no exception is raised in the Web service application.

Handling Badly-Formed Messages

This section contains the following topics, which enable you to handle badly-formed message.

Use Session Handling

It is much easier to track within JADE where badly-formed messages are coming from if session handling is enabled.

With sessions, you can keep track of state information like the frequency of errors for a specified session, types of errors, IP addresses, and other useful information. When an exception occurs, you can log this information using the **currentSession** system variable.

Use Web Server Logging

As discussed under "Logging", earlier in this document, Web servers can provide useful information like IP addresses, message sizes, and elapsed time. These can be analyzed to provide debugging information when users are experiencing problems.

Minimize Error Reporting

Logging detailed exception information is time-consuming, particularly if there is a continuous stream of badly-formed messages coming into the service. By keeping track of the message source and the frequency of the same types of errors, you can minimize detailed reporting of the same error over and over again.

Use Unicode JADE

If you find that you are getting a high frequency of UTF-8 conversion errors, you should consider converting your system to use Unicode JADE.

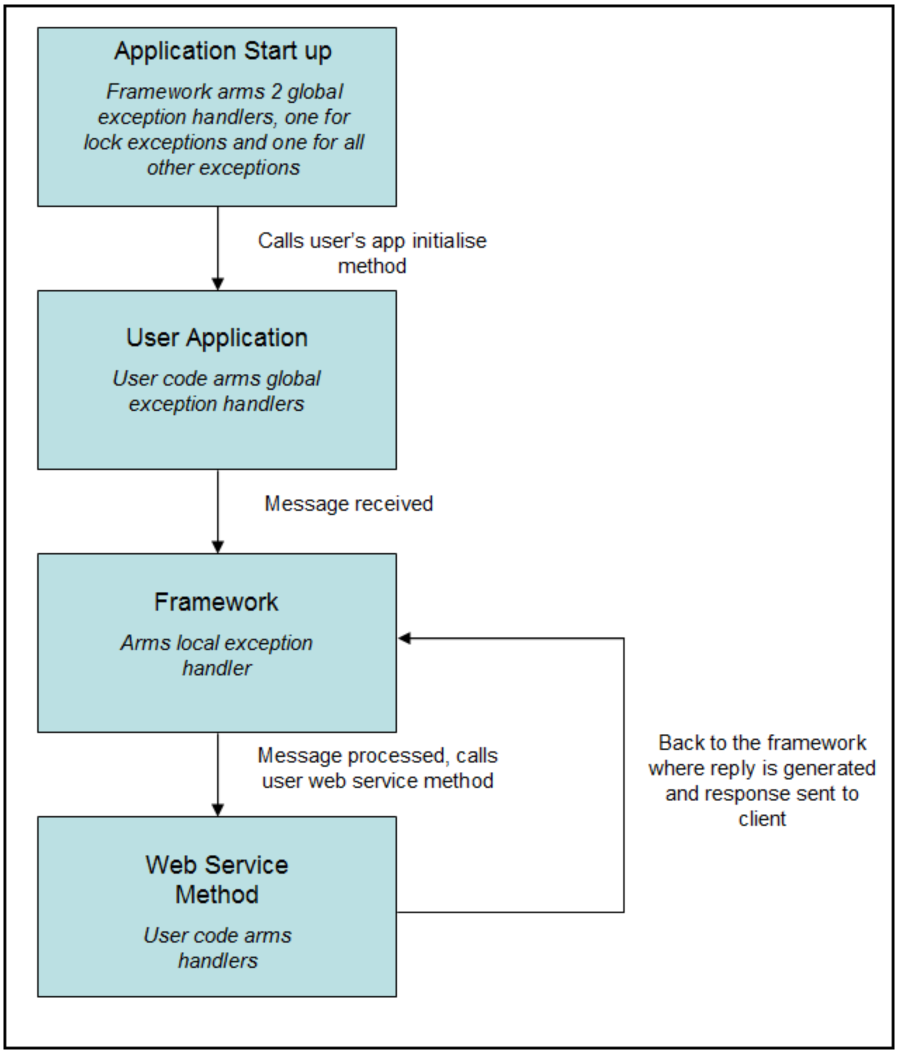
Refer to Chapter 4 of the *JADE Runtime Application Guide* for details about converting an ANSI system to Unicode.

Inform Users

Based on the information gathered, it should be possible to tell if the badly formed messages are coming from a specific source. In this case, the user should be informed of the problem.

Exception Handling

A Web service application arms several exception handlers. The following image shows where the exception handlers are armed.


Application Start up
Framework arms 2 global exception handlers, one for lock exceptions and one for all other exceptions
Calls user's app initialise method
User Application
User code arms global exception handlers
Message received
Framework
Arms local exception handler
Message processed, calls user web service method
Back to the framework where reply is generated and response sent to client
Web Service Method
User code arms handlers

The exception handler stack will look like the following.

```
<Web Service Method>   user exception handlers, can be local or global
<Framework>            framework local exception handler
<User Application>     user global exception handlers
<Web Application>      global exception handlers in the framework initialize method
```

The order of execution of the exception handlers is that local exception handlers are executed first, then the global ones. Within this, the most-recently armed handler is executed first. For example, if the exceptions were armed in the following order:

1. <framework global 1>
2. <framework global 2>
3. <user global 1>

4. <framework local 1>
5. <user global 2>
6. <user local 1>

The exception handler execution will be as follows, assuming **Ex_Pass_Back**.

1. <user local 1>
2. <framework local 1>
3. <user global 2>
4. <user global 1>
5. <framework global 2>
6. <framework global 1>

Note the change in order between the arming and the execution for <framework local 1> and <user global 2>.

Where your code arms an exception handler, it is safe to do an **Ex_Abort_Exception**, except for the following cases.

- Connection exceptions in the range 31000 through 31999
- Licence exceeded exceptions 5503 and 5504

These exception types must be handled by the Web application framework and your exception handlers must do an **Ex_Pass_Back**.

In addition, the framework also handles lock exceptions. When a lock exception is encountered, it will retry the lock based on the number of times specified in the ***<lock_retries>*** element in the configuration file. For details, see Chapter 3 of the *JADE Web Application Guide*. See also "Global Exception Handlers", in the *JADE Exception Handling* white paper.

If you want to trap lock exceptions in your code, you will need to arm local exception handlers. The framework's local exception handler guards against exceptions that occur when receiving and processing the input and when generating and sending the reply.

The following exceptions are handled by the framework's local exception handler.

- Connection exceptions in the range 30000 through 32999.
- Lock exceptions.
- String/Binary too long (1035) or decimal precision errors (4033 and 4043). In these cases, the SOAP exception that is raised will contain details of the property in error.
- UTF-8 decoding exception (1418). When this occurs, you are given the option of inspecting the binary value that was sent, by re-implementing the **Application** class **jadeWebServiceInputError** method. The returned string from this method is sent back to the Web service client. The default message that is returned is:

```
Input is not encoded as valid UTF-8
```