webMethods EntireX

EntireX XML/SOAP Wrapper

Version 10.7

October 2020

WEBMETHODS

This document applies to webMethods EntireX Version 10.7 and all subsequent releases.

Specifications contained herein are subject to change and these changes will be reported in subsequent release notes or new editions.

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Table of Contents

1 About this Documentation

Document Conventions

Convention	Description
Bold	Identifies elements on a screen.
`Monospace font`	Identifies service names and locations in the format *`folder.subfolder.service`*, APIs, Java classes, methods, properties.
`Italic`	Identifies: Variables for which you must supply values specific to your own situation or environment. New terms the first time they occur in the text. References to other documentation sources.
`Monospace font`	Identifies: Text you must type in. Messages displayed by the system. Program code.
{ }	Indicates a set of choices from which you must choose one. Type only the information inside the curly braces. Do not type the { } symbols.
|	Separates two mutually exclusive choices in a syntax line. Type one of these choices. Do not type the | symbol.
[ ]	Indicates one or more options. Type only the information inside the square brackets. Do not type the [ ] symbols.
...	Indicates that you can type multiple options of the same type. Type only the information. Do not type the ellipsis (...).

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Product Documentation

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- Ask questions and find answers in our discussion forums.
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- Open and update support incidents.
- Add product feature requests.

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2 Introduction to the XML/SOAP Wrapper

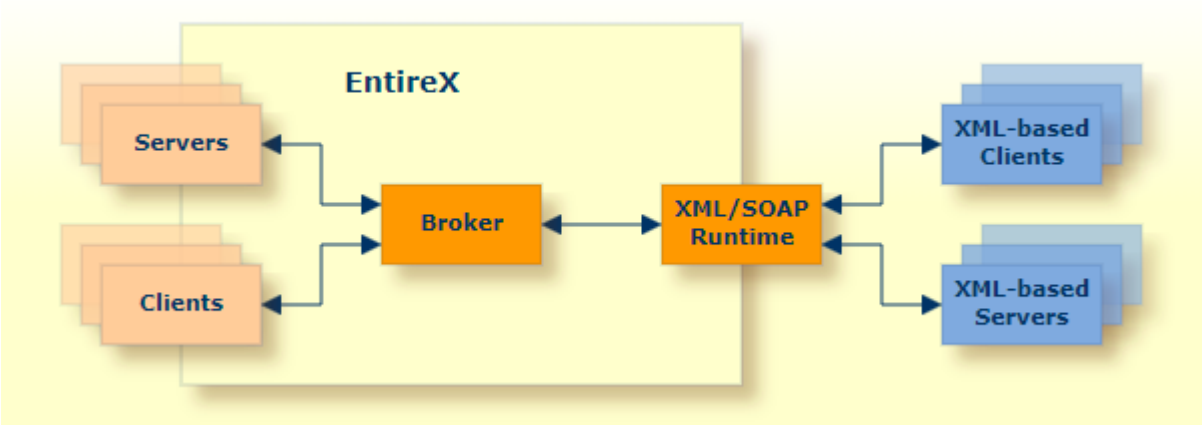
The EntireX XML/SOAP Wrapper enables XML-based communication to EntireX/Natural RPC servers and communication from EntireX/Natural RPC clients to XML-based servers.

XML/SOAP Wrapper Concepts

The EntireX XML/SOAP Wrapper and the RPC Server for XML/SOAP enable XML-based communication via XML/SOAP Wrapper. An EntireX RPC server or a Natural RPC Server can communicate with XML-based clients. Similarly, an EntireX RPC client or Natural RPC client can communicate with an XML-based server via RPC Server for XML/SOAP. EntireX participants (client or server) with an XML-based application (server or client) can be easily integrated with the Software AG Designer and the EntireX XML/SOAP Wrapper/ RPC Server for XML/SOAP.

The XML Mapping File is an XML file (file extension .xmm) generated by the EntireX XML Mapping Editor and used by the EntireX XML/SOAP Runtime, to map between XML documents and EntireX/Natural RPC parameters.

Communication is synchronous.



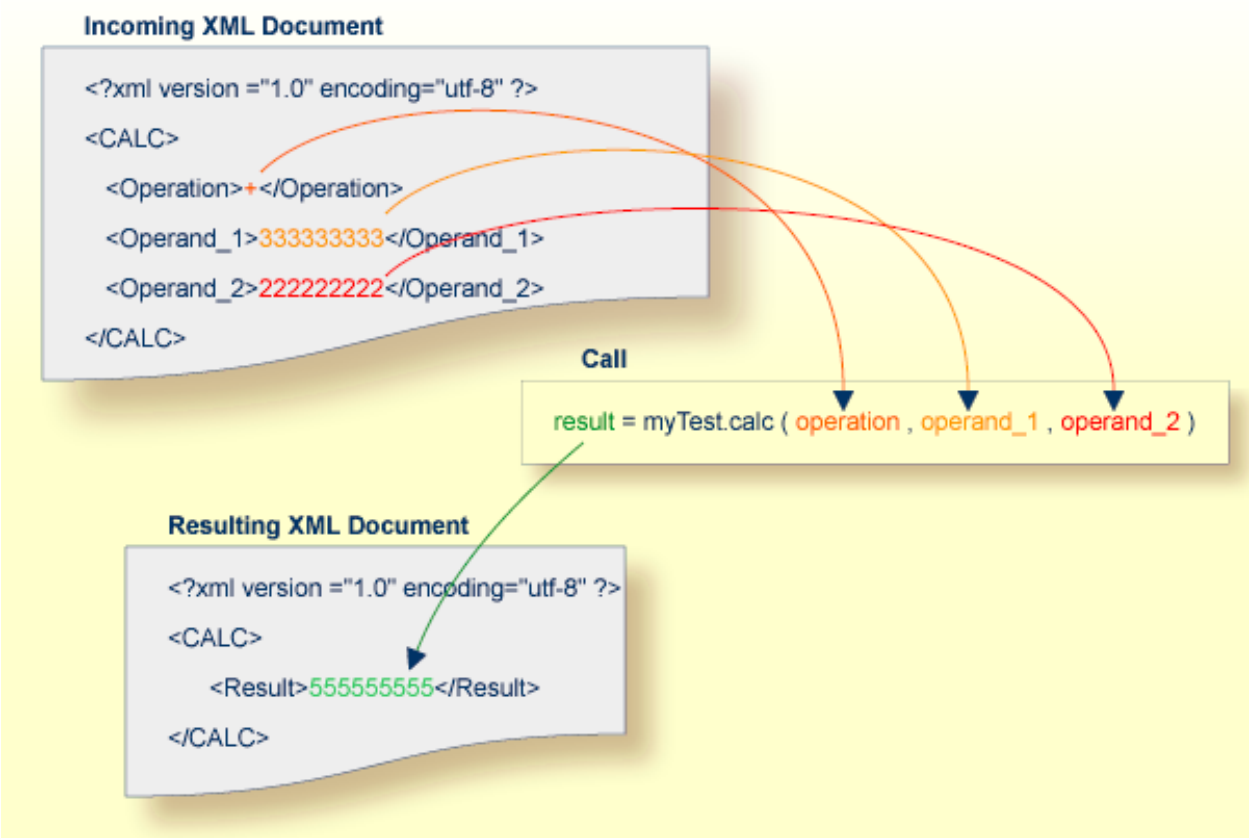
XML-based Clients Calling EntireX/Natural RPC Servers

The XML-based client sends an XML document to EntireX XML/SOAP Runtime.

From an incoming XML document, the EntireX XML/SOAP Runtime extracts (using the mapping file) the information necessary to call an EntireX/Natural RPC server. It executes the RPC. The result returned by the EntireX/Natural RPC server is used to create an outgoing XML document.

The XML-based client gets an XML document containing the response.

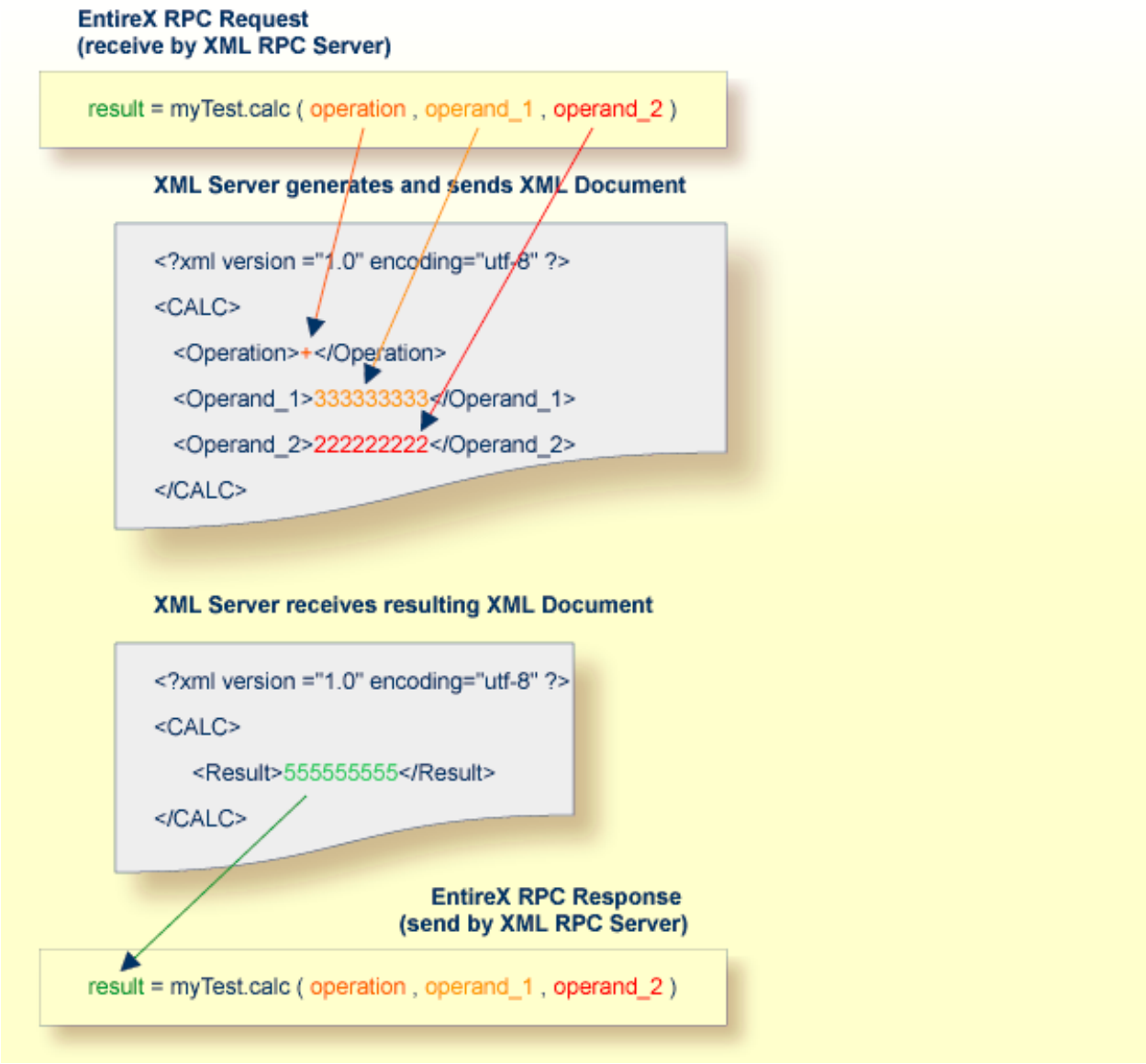
Mapping example: *calc*



A mapping editor is provided to map the XML structures to those of the server application.

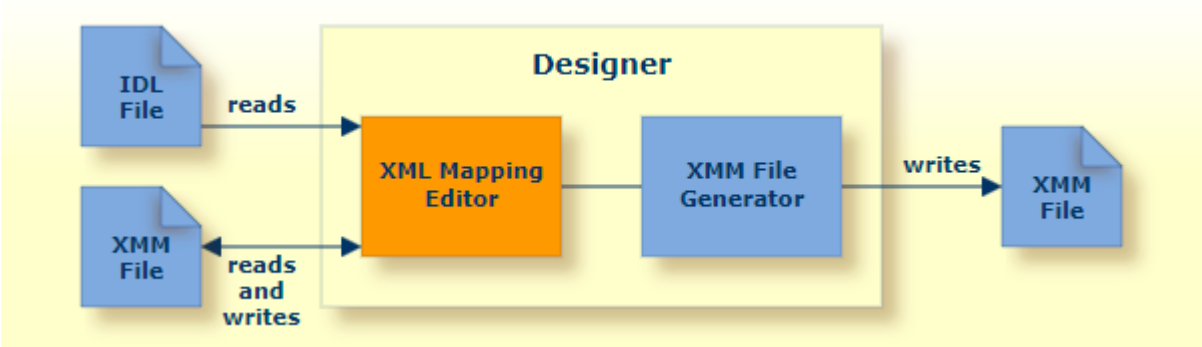
EntireX/Natural RPC Client Calling XML-based Servers

The RPC client sends a request to the RPC Server for XML/SOAP. The RPC Server for XML/SOAP translates (using the mapping file) the information of an EntireX client call to XML (so it can be understood by an application with an XML interface). The RPC Server for XML/SOAP sends the XML document to the XML-based server via HTTP(s) and receives an XML document from the XML-based server. It translates the received XML document and sends the response to the RPC client.


EntireX RPC Request
(receive by XML RPC Server)
result = myTest.calc (operation , operand_1 , operand_2)
XML Server generates and sends XML Document
<?xml version ="1.0" encoding="utf-8" ?>
<CALC>
<Operation>+</Operation>
<Operand_1>333333333</Operand_1>
<Operand_2>222222222</Operand_2>
</CALC>
XML Server receives resulting XML Document
<?xml version ="1.0" encoding="utf-8" ?>
<CALC>
<Result>555555555</Result>
</CALC>
EntireX RPC Response
(send by XML RPC Server)
result = myTest.calc (operation , operand_1 , operand_2)

Development Environment

During the development process, users map XML document structures to RPC parameters and vice versa, and generate the XMM (XML Mapping) File.



XML Mapping Editor

The input for the XML Mapping Editor is an existing Software AG IDL file. See *XML Mapping Editor*.

The XML Mapping Editor allows users to map the structure of an incoming XML document to the incoming parameters (IN, INOUT) of a Natural RPC Server and the parameters returned by the EntireX/Natural RPC server (OUT, INOUT) to the structure of the outgoing XML document.

To ease the development process, standard mappings can be created automatically. These can be modified and adapted.

Supported standard mappings are:

- element-oriented mapping
- attribute-oriented mapping
- SOAP-conformant mapping

See ***Basic IDL-XML Mapping***.

Generation Utilities

After the mapping process, the following runtime components can be generated:

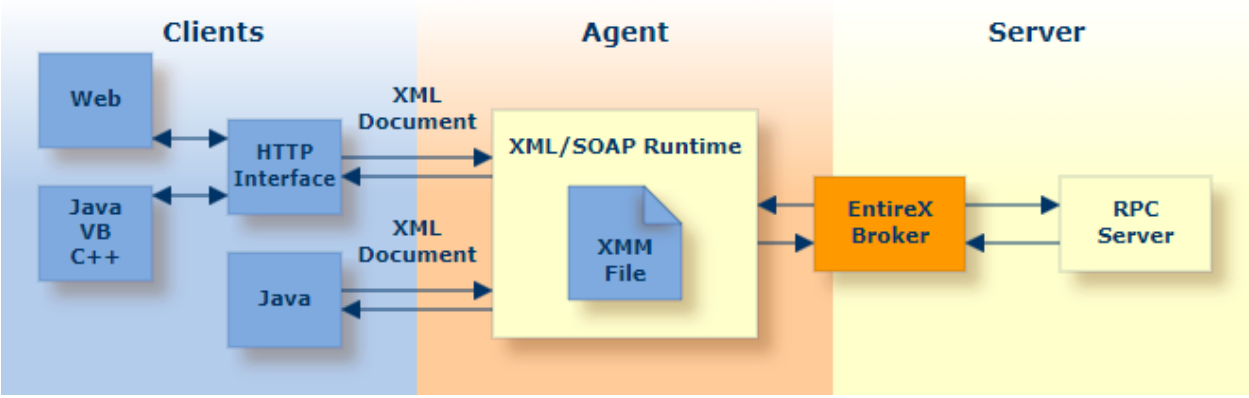
- **XML Mapping Files**
  are used at runtime to map between the XML documents and the EntireX/Natural RPC parameters.

XML/SOAP Runtime Environment

The EntireX XML/SOAP Runtime enables XML-based clients to communicate with an EntireX/Natural RPC Server; and it enables EntireX RPC clients to communicate with applications that have an XML or SOAP interface (via XML/SOAP Runtime).

XML Clients Communicating with EntireX/Natural RPC Servers

The incoming XML document is mapped by the generated XMM file to the EntireX/Natural RPC parameters, using the mapping files created during the development process. From the parameters returned by the EntireX/Natural RPC server, the generated XMM file creates the outgoing XML document, using the corresponding mapping files.



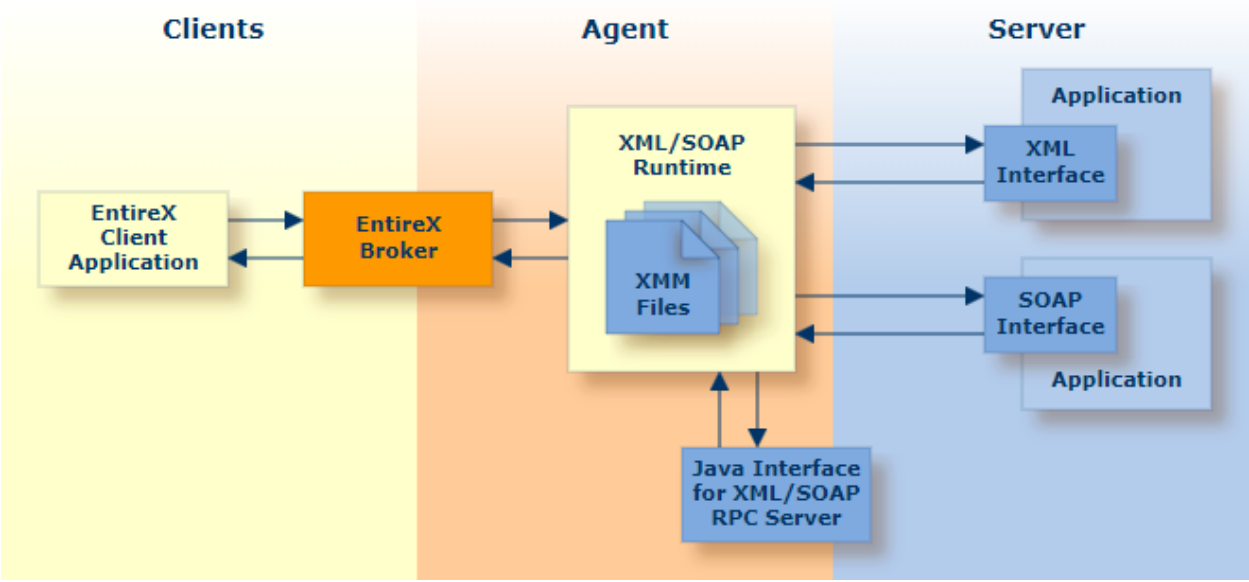
The XML/SOAP Runtime provides two client-side interfaces:

- **A Java interface**
  The Java interface can be used by Java clients. See *Client Using the Java Interface*.
- **An HTTP interface**
  The HTTP interface supports HTTP Post Request and HTTP Get Request. See *The HTTP Interface*.

To make it possible to call the XML/SOAP Runtime from within a Web server, see *Listener for XML/SOAP*.

EntireX Clients Communicating with XML or SOAP Interfaces

The XML/SOAP Runtime can connect EntireX clients to applications that have an XML or SOAP interface, for example SAP or PeopleSoft. These applications are then the XML server. Example: An EntireX client requests information of an SAP application. The request is sent to the EntireX Broker and the EntireX XML/SOAP Runtime (translated to XML there) and then to the SAP XML interface, processed by the SAP application. The response is returned the same way.



The XML/SOAP Runtime provides two server-side interfaces:

- **A Java interface**
  The Java interface can be used to modify the document and determine further processing.
- **An HTTP interface**
  The XML/SOAP document is sent to the specified target.

Glossary of Terms

RPC Server for XML/SOAP
The EntireX RPC Server for XML/SOAP allows RPC clients to communicate with target servers via HTTP(S). The RPC Server for XML/SOAP transforms RPC client calls into XML/SOAP calls. It works together with the XML/SOAP Wrapper.

XML-based Client
Client sends and receives data as an XML or SOAP document.

XML-based Server
Server receives and sends data as an XML or SOAP document (for example a Web service).

XML Mapping File

The XML Mapping File is an XML file (file extension .xmm) generated by the EntireX XML Mapping Editor and used by the EntireX XML/SOAP Runtime, to map between XML documents and EntireX/Natural RPC parameters.

XML/SOAP Runtime

The EntireX XML/SOAP Runtime enables XML-based clients to communicate with an EntireX/Natural RPC Server; and it enables EntireX RPC clients to communicate with applications that have an XML or SOAP interface (via XML/SOAP Runtime).

XML/SOAP Wrapper

The EntireX XML/SOAP Wrapper enables XML-based communication to EntireX/Natural RPC servers and communication from EntireX/Natural RPC clients to XML-based servers.

3 Migration Considerations for XML/SOAP Components

RPC Server for XML/SOAP

Update the start script to set the paths to current installation. If the properties file contains a path to the configuration file, you may need to adjust the path. The properties and configuration files can be used as before. See *Configuration File* in the RPC Server for XML/SOAP documentation for more information.

XML/SOAP Wrapper

Update the start script to set the paths to current installation.

Listener for XML/SOAP

The migration steps depend on the Web server you are using:

- **Using the Software AG Web Server based on Apache Tomcat / Software AG Runtime from Software AG Installation**
  Save your Web services (AAR files) and modified configuration files (that is, *axis2.xml*). You do not need to re-generate your Web services (AAR files). If the configuration was modified, perform the same modifications for the new installation and restart Software AG Web Server. Redeploy the web services (AAR files).

  Note: The new installation will use another port by default, which means that the Web clients need to be adjusted.

- **Using another Web Server**
  Save your Web services (AAR files) and modified configuration files (that is, *axis2.xml*). You do not need to re-generate your Web services (AAR files). For deployment of file *wsstack.war* and copying file *entirex.jar* to Web Services Stack, see the separate Web Services Stack documentation in the *Software AG Infrastructure Administrator's Guide*, also available under ***http://documentation.softwareag.com*** > *Guides for Tools Shared by Software AG Products*.

  If configuration was modified, perform the same modifications for new installation and restart the Web server. Redeploy the Web services (AAR files).

4 Using the XML/SOAP Wrapper

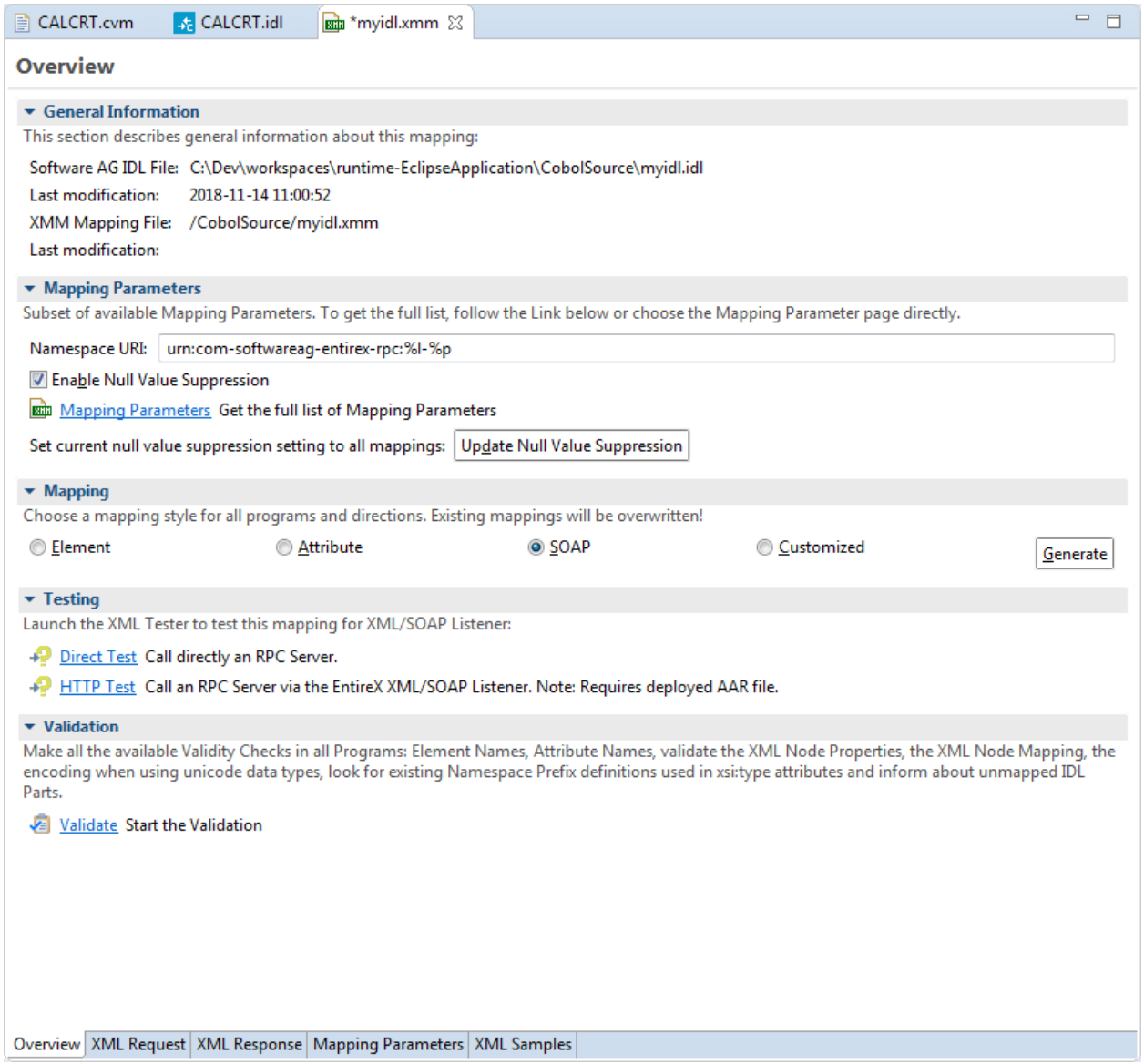
Mapping IDL Parameters to XML Structures

Use the *XML Mapping Editor* to map IDL parameters to XML structures.

The mapping editor offers several mapping types:

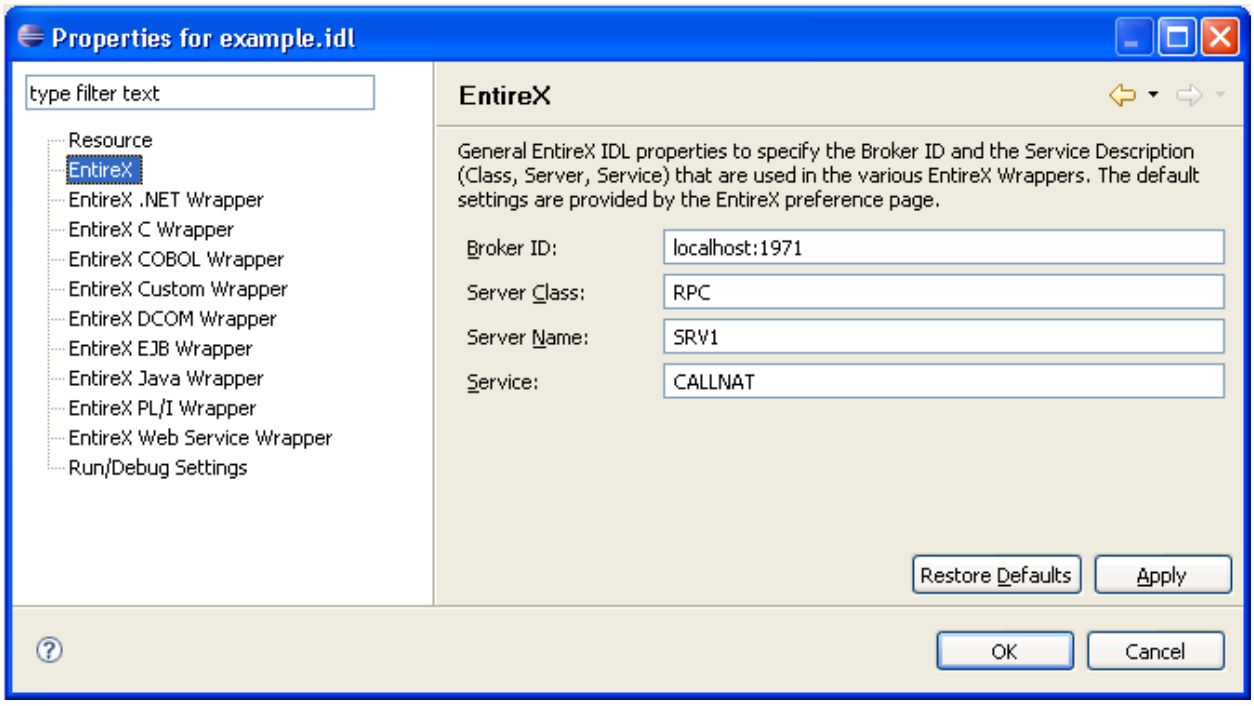
- element mapping: all IDL parameters map to elements in an XML document
- attribute mapping: all scalar/simple IDL parameters map to attributes; program name and complex types (groups and structures) map to elements
- SOAP mapping: a standard SOAP document is generated, IDL parameters map to elements in <Body>-part
- user-defined mapping: users create their own XML or SOAP documents and map the IDL parameters to elements or attributes of an XML document.

In addition, the mapping editor shows one of general information (**Overview** page), the request message (**XML Request**), response message within fault information (**XML Response** page), mapping parameters (**Mapping Parameters** page) or sample editor (**XML Samples** page) at one time.



Setting Wrapper Properties

Before you start the generation of the XMM file, select the IDL file and open the context menu to set the properties for this IDL file. The settings for an IDL file are inherited from the preferences (they provide the defaults):



To set the general options, path settings and XML options

1 Select **Preferences...** in the Windows menu of Eclipse.

2 Select **Software AG > EntireX**.

3 Select the tab **XML**.

4 Fill in the screen as follows:

Screen Item	Description
XML default encoding	This encoding is used for the XML/SOAP document sent, if the box “Use incoming encoding” is not checked (for XML-based clients) or if the RPC Server for XML/SOAP is used.
Use incoming encoding	Check this box to enable the XML/SOAP Wrapper to use same encoding for the incoming document as for the outgoing document.

5 Confirm the settings with **OK**.

After setting the general properties, set the properties specific to the IDL file. The settings for the XML/SOAP Wrapper classes are on the two tab pages: General and XML.

To set the IDL properties

1 In the file tree browser, select the IDL file to be processed.

2 To display the **Properties** window, use either the context menu or the **File** menu and choose **Properties**.

The subsequent screen will show the defaults you entered with **Tools > Options.**.

3 Use this page to specify the Broker ID, the server address (**Server class**, **Server name**, and **Service**) and other properties. If you do not enter Broker ID, server name, etc., the defaults (as entered in the **Tools** / **Options** menu) will be used.

4 Select the **XML** tab.

5 Complete the screen as follows:

Screen Item	Description
XML default encoding	This encoding is used for the XML/SOAP document sent, if the box "Use incoming encoding" is not checked (for XML-based Clients) or if the RPC Server for XML/SOAP is used.
Use incoming encoding	Check this box to enable the XML/SOAP Wrapper to use the same encoding for the incoming document as that used for the document sent.

6 Confirm the settings with **OK**.

Generating an XMM File

To generate the XMM file, use the Designer.

The IDL file, the XML file and the properties are used to generate an XMM file.

To generate the XMM file

1 Specify an IDL-XML mapping.

2 Save the mapping.

If you are using the default settings of the Software AG Designer, an XMM file is saved. The name of the XMM file is *<idl file name>.xmm*

Caution: If you modify the IDL file, the IDL-XML mapping file or the properties, you must re-generate the XMM file.

Default Values Used by the XML/SOAP Runtime

The XML/SOAP Runtime uses standard default values for all parameters (for EntireX RPC) and elements/attributes (for XML documents) if no value can be retrieved and no user default value is defined. The table below shows the standard default values for XML and RPC.

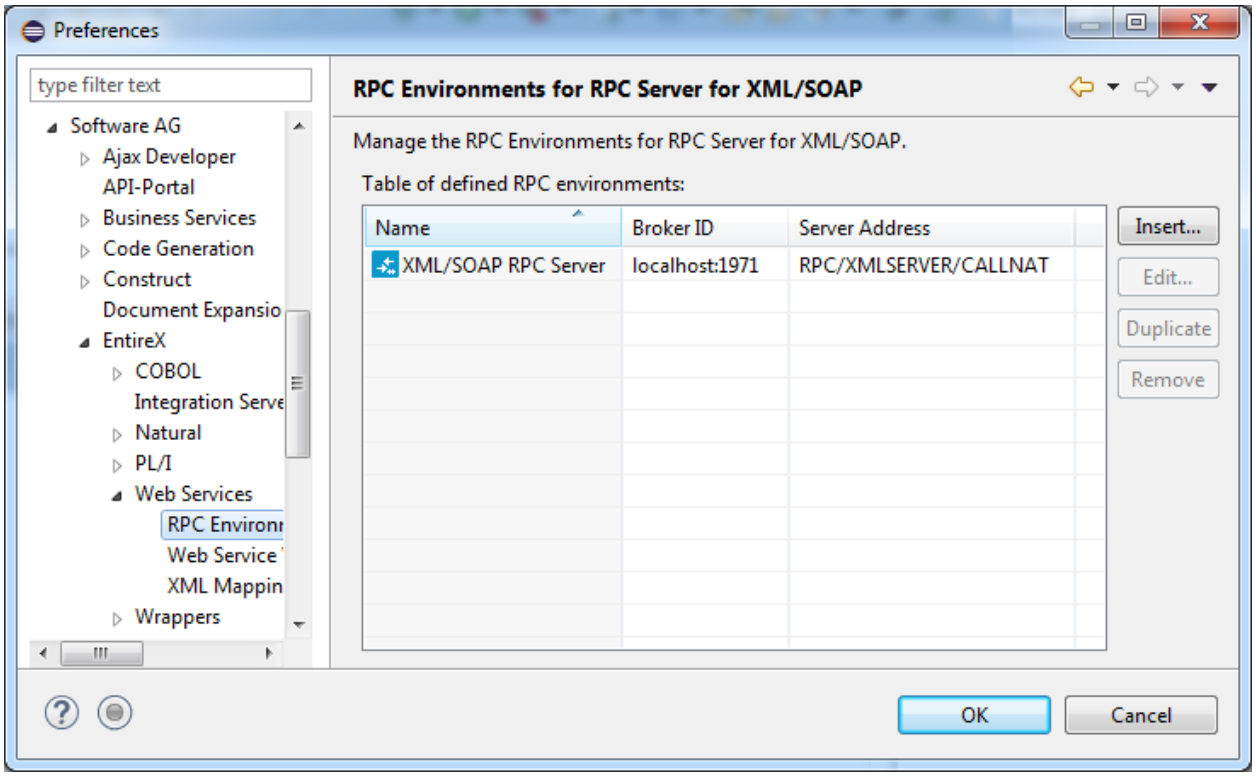
Value	Description	
A(*n*)	XML	Empty string with length 0.
	RPC	String with *n* blanks.
AV		Empty string with length 0.
B(*n*)		String with *n* zeros.
BV		Empty field with length 0.
K(*n*)	XML	Empty string with length 0.
	RPC	String with *n* blanks.
KV		Empty string with length 0.
L		false
I1		0
I2		0
I4		0
F4		0.0
F8		0.0
N		0.0
P		0.0
D		`new Date()`
T		`new Date()`
U(*n*)	XML	Empty Unicode string with length 0.
	RPC	Unicode String with *n* blanks.
UV	XML	Empty Unicode string with length 0.

5 RPC Environment Manager for RPC Server for XML/SOAP

The RPC environment for RPC Server for XML/SOAP is managed on the **Preferences** page.

Use the *RPC Environment Monitor* to check the availability of each RPC environment.

Using this wizard, you can add new RPC environments for RPC Server for XML/SOAP. To manage these RPC environments, open the **Preferences** page.



Note: A predefined RPC environment is provided for the default RPC Server for XML/SOAP. This RPC environment cannot be removed.

To edit an existing RPC environment

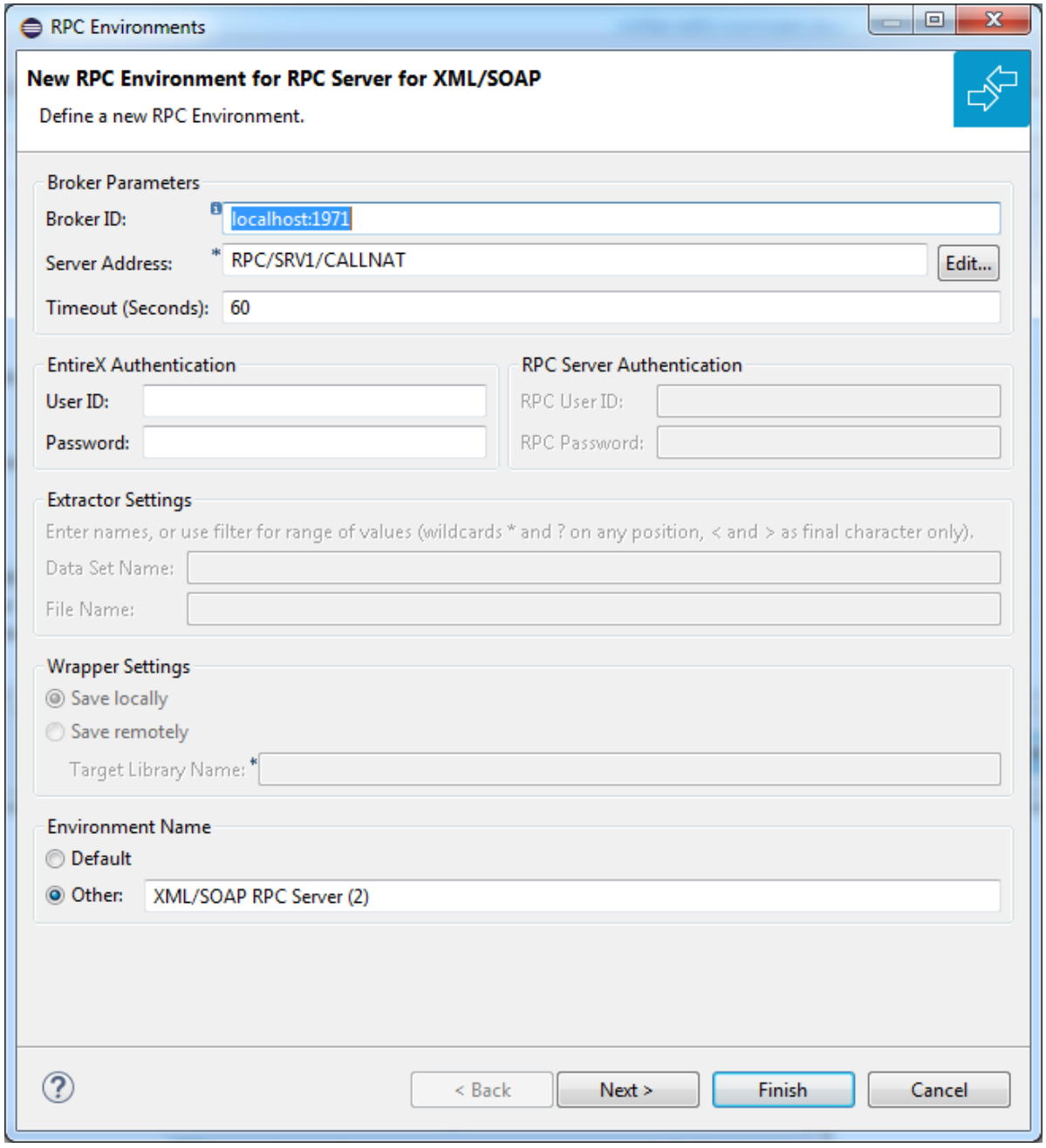
- Select the table row and press **Edit...**. If multiple entries are selected, the first entry is used.

To remove an RPC environment

- Slect the table row and press **Remove**. You can select multiple environments.

To create a new RPC environment

1 Choose **Insert...** to call the following screen:



2 Enter the required fields: **Broker ID**, **Server Address** and a unique **Environment Name**, which will have the default format *brokerID@serverAddress*. The given **Timeout** value must be in the range from 1 to 9999 seconds (default: 60).

EntireX Authentication describes the settings for the broker, and **RPC Server Authentication** describes the settings for the RPC server.

6 RPC Environment Monitor

The RPC Environment Monitor is part of the Software AG Designer. It is an Eclipse view that provides a quick overview of the availability of the defined RPC environments in your workspace.

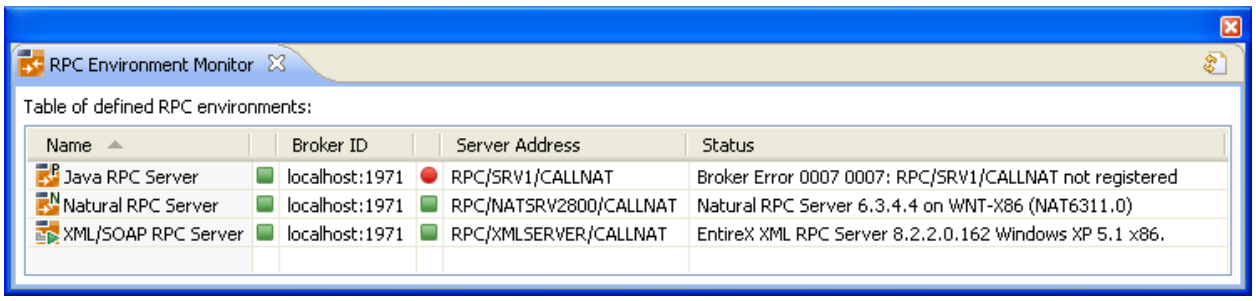
To open the RPC Environment Monitor from the EntireX perspective

- Choose **Window > Show View > RPC Environment Monitor**.

To open the RPC Environment Monitor from a non-EntireX perspective

- Choose **Window > Show View > Other > Software AG > RPC Environment Monitor**.

The RPC environments are managed on the **Preferences** page. See *RPC Environment Manager for RPC Server for XML/SOAP*.



The status check starts when the view is opened. To force an additional check, choose **Refresh** from the **Views** toolbar. The status check can be cancelled in the dialog that appears or within the Eclipse progress view. When the check is complete or if it cancelled, the following symbols indicate the status of the corresponding item. The table will be reloaded every time a status check is started to make sure all stored RPC environments are available.

Symbol	Status
	Running.
	Not running.
	Unknown (at the beginning of the check or if the check was cancelled).

Note: Additional status information (including error messages) is displayed when refreshing the view (by a ping command to all specified RPC servers).

7 EntireX XML Tester

Introduction to the EntireX XML Tester

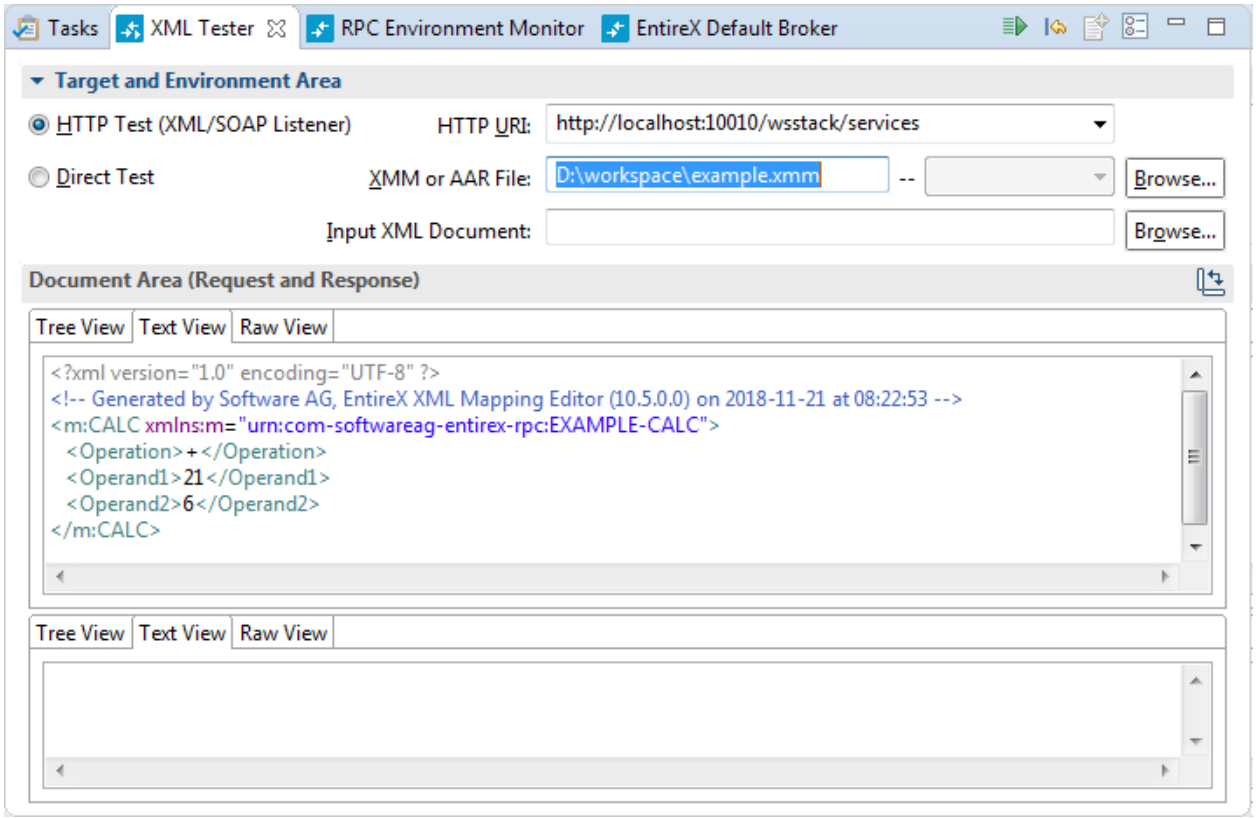
Using the EntireX XML Tester you can send an XML document to the EntireX Listener for XML/SOAP.

The EntireX XML Tester supports drag-and-drop editing, and you can restore the last used session within a workspace. If the mapping file has changed, the views for request and response are cleared.

The EntireX XML Tester is provided by the Designer as an Eclipse View and can be opened from the XML Mapping Editor or XML/SOAP Wrapper. It is also accessible from **Windows > Show View > Other... > Software AG > XML Tester**. The following test modes are available:

- Direct Test (Using the Java Interface)
- HTTP Test (Using the EntireX Listener for XML/SOAP)

See sample screen and description of options below.



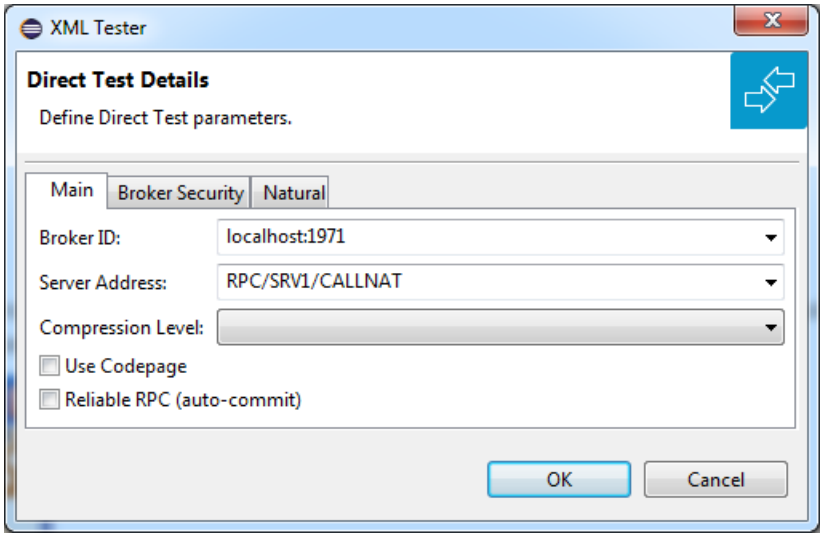
EntireX XML Tester Options

Name	Type	Description
Direct Test	Check box	Check this box to test the Java interface of the XML/SOAP Runtime. If checked, the **Settings** action will open the **Direct Test Details** dialog.
XMM or AAR File	Text field	The AAR file, which contains one or more mapping files (XMM files), or the XMM file, which contains the mapping information. Accept absolute path. If the file does not exist, the action **Create Sample XML...** is disabled. When the file is found, the Broker ID and Server Address are read and the corresponding fields in the **Direct Test Details** dialog are filled.
	Combo box	Behavior depends on content of field **XMM or AAR File**: ■ If this field contains an AAR file, this combo is enabled and filled with all the mappings stored in the archive. Select the mapping you want from the list. ■ If this field contains an XMM file, the combo box is disabled.
Browse...	Button	Open a **File open** dialog to select the XMM or AAR file from the file system.
HTTP Test	Check box	Check this box to test the HTTP interface (EntireX Listener for XML/SOAP) of the XML/SOAP Runtime. If checked, the **Settings** action will open the **HTTP/HTTPS Parameters** dialog.
HTTP URI to contact	Combo box	URI of the EntireX Listener for XML/SOAP. Will store the last ten called URLs.
Input XML Document to send	Text field	File name of the XML Document to be sent.
Browse...	Button	Open a **File open** dialog to select the XML Document file from the file system.
Create Sample XML...	Action 	Open the **Create Sample XML...** dialog, see below. If the text file for the XMM file does not contain a valid file path, the **Create Sample XML...** button is disabled.
input - area	Tree/Text/Raw view	Input field for the XML data to be sent to the Broker, this area is filled with the text/tree representation of the selected file, see **Input XML Document to send**. If empty, the **Play** action is disabled.
output - area	Tree/Text/Raw view	Output field for the XML data response from the Broker. By default, the response will be displayed in platform encoding. But if the XML data request contains a valid encoding in the XML declaration, this encoding will be used and a tooltip text will inform you of this. This view will also display the status and errors.
Settings	Action 	Open either **Direct Test Details** or **HTTP/HTTPS Parameters** dialog. See **Direct Test** and **HTTP Test** above.

Name	Type	Description
Play/Stop	Action /	Start/stop the test. This action is disabled if there is no text in the **input - area**.
Reset	Action	Reset the input and output areas.

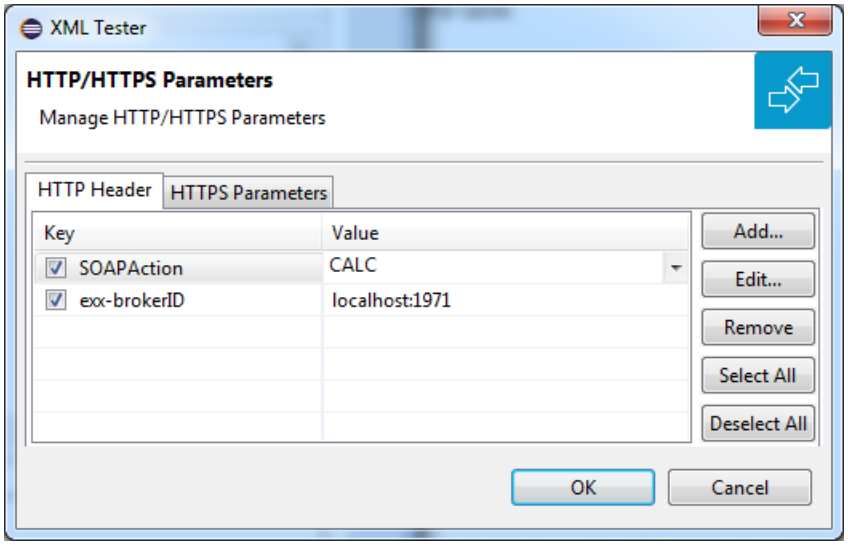
Direct Test Details Dialog

Use the **Direct Test Details** dialog to change the Direct Test parameters. The Broker ID, Server Address, the Security Settings, the Natural Settings can be modified for this EntireX XML Tester session. **Compression Level** is a non-editable box that contains all possible values. **Broker ID** and **Server Address** are editable dialog boxes and hold the last five used values. Use the **Reliable RPC** check box to turn reliable messaging on or off (mode is AUTO-COMMIT). See *Reliable RPC*.

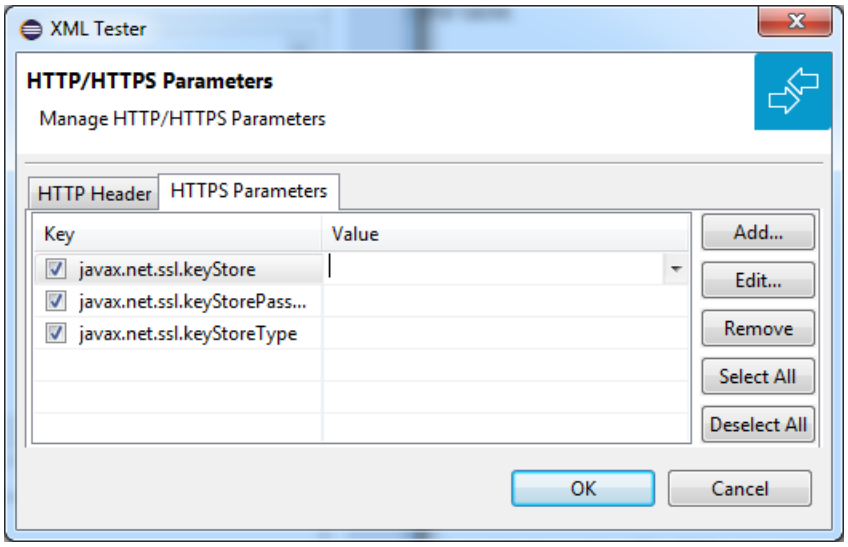


HTTP/HTTPS Parameters Dialog

With the **HTTP Header** tab you can add more information for the call and set the SOAPAction. An entry must be selected to be active. The **Value** box holds the last five used values for the corresponding property. It is editable, which means you can change a value by clicking directly in the table.



With the **HTTPS Parameters** tab you can set parameters required for an HTTPS connection. An entry must be selected to be active. The **Value** box holds the last five used values for the corresponding property. It is editable, which means you can change a value by clicking directly in the table.

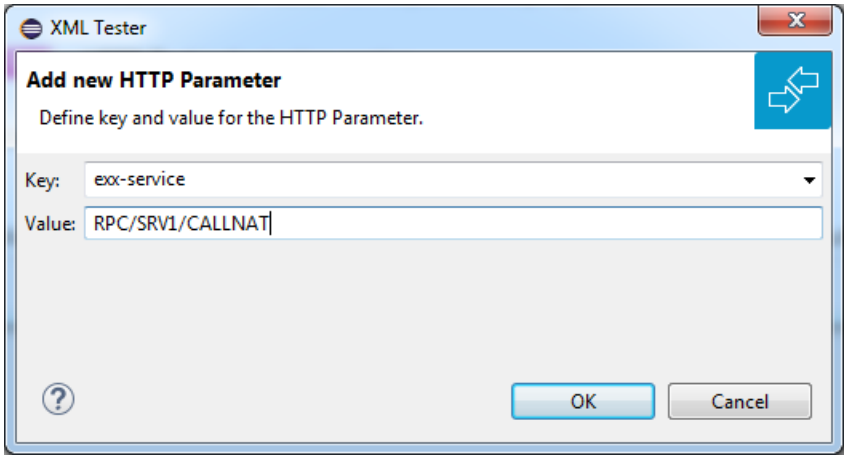


Add New HTTP Parameter Dialog

With the **Add new HTTP(S) Parameter** dialog you can add a new HTTP or HTTPS parameter. All Software AG's predefined HTTP parameters are listed in the **Key** box. For HTTPS, the **Key** box contains predefined properties for HTTPS communication.

Edit HTTP Parameter Dialog

With the **Edit HTTP(S) Parameter** dialog you can change the value of a property. The **Value** box is editable and holds the last five used values. The **Key** value for all predefined properties cannot be modified.



Using the EntireX XML Tester

Using the EntireX XML Tester you can send an XML document to the EntireX Listener for XML/SOAP.

To open the EntireX XML Tester

- In perspectives other than EntireX, choose **Window > Show View > EntireX XML Tester**, in other perspectives, choose **Window > Show View > Other ... > Software AG > XML Tester**.

  Or:

  Choose **Window > Open Perspective > Other...** and select EntireX Perspective. The **EntireX XML Tester** view is part of this perspective.

  Or:

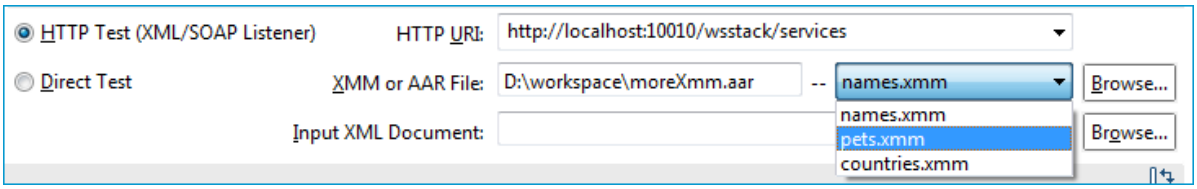
In the XML Mapping Editor, switch to the **Overview** page, choose **Direct Test** or **HTTP Test** in the testing section.

Or:

In the XML Mapping Editor, switch to page **XML Samples**, select one document, choose **EntireX XML Tester** in the context menu.

To run a test

1 Load the mapping information. In field **XMM or AAR File**, enter the absolute path to the AAR or XMM file that is being tested (you can use the **Browse...** button or a drag-and-drop operation). If you enter an AAR file, all mappings contained in the archive are listed in the combo box next to the **XMM or AAR File** field.



2 Select the testing interface (Java or HTTP):

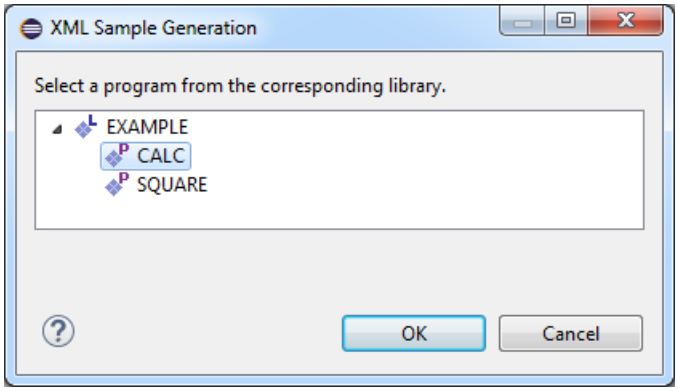
- Java interface: the **XMM or AAR File** field must contain the full path and name of an XMM or AAR archive. Choose the **Direct Test** option to use this interface.
- HTTP interface: enter the name of the URI of the running EntireX Listener for XML/SOAP. Choose the **HTTP Test** option to use this interface.

3 Complete the input area:

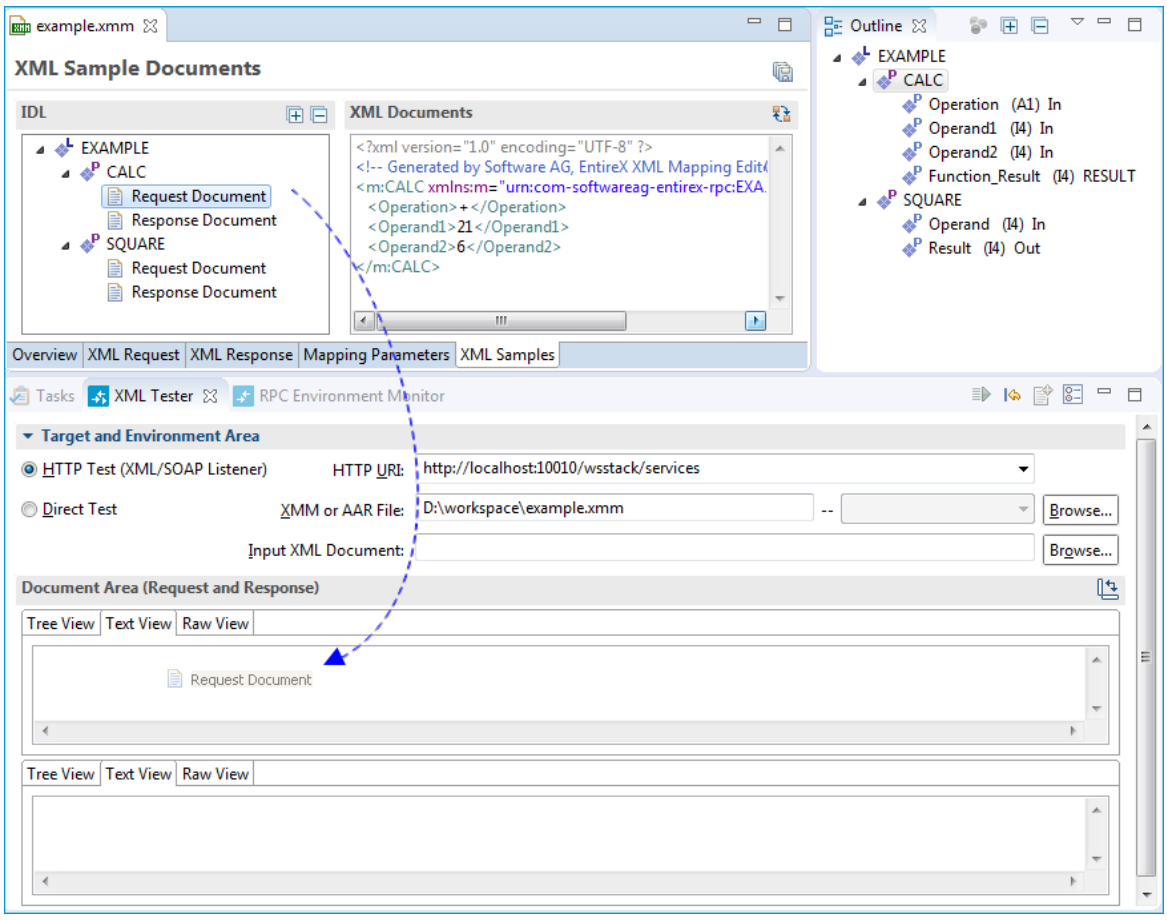
- Type your XML document.
- Use the **Create Sample XML...** button and follow the dialog.

  Note: If the IDL file contains only one library with one program, this is used for the sample generation without opening the dialog.

  Example dialog:



- Load sample document, using drag-and-drop operation on the sample page of XML Mapping Editor or file browser.



The following tabs are available:

- The **Text View** tab will try to color the request syntactically, making the XML easier to read.

- The **Raw View** tab is initially empty. When the first request is sent, it is filled with the exact message sent together with information on the request method and the used HTTP headers with their values.
- From then on the **Raw View** is displayed and is updated with the last sent request.

- Select an existing XML document (you can use the **Browse** button) and enter it in the field **Input XML file to send**.

4 If the testing interface is Java, the **Settings** action will open the **Direct Test Details** dialog.

The dialog contains the three tabs with the following settings:

- Main
- Broker Security
- Natural Security

See *Direct Test Details Dialog*.

5 If using option **HTTP Test**, the **Settings** action will open the **HTTP/HTTPS Parameters** dialog. The dialog contains two tabs with settings for the HTTP call:

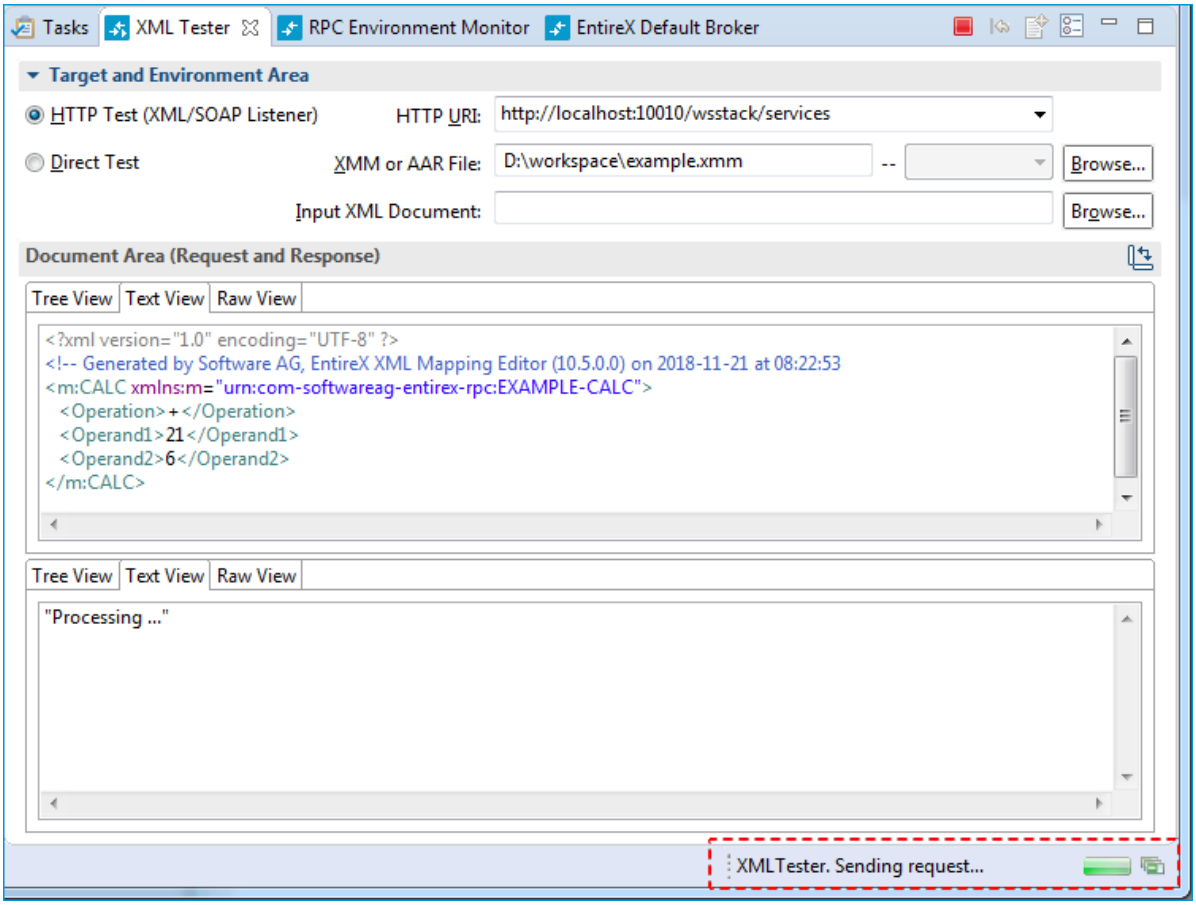
- HTTP Header
- HTTPS Parameters

See *HTTP/HTTPS Parameters Dialog*.

6 Send the request by choosing action **Play**. If the testing interface is HTTP, the **Sending request** dialog appears. Here you have several options:

- hide the dialog by pressing **Run in Background** button
- cancel the request. This will terminate the session with the server
- show details about all running Eclipse jobs

A progress bar on the Eclipse status bar shows to indicate that the request is being sent.



If you used the **Direct Test** option, you cannot cancel the request.

7 When a response is received, it is displayed in the output area. Errors are also displayed in the output area.

The **Text View** tab displays the XML response as formatted and syntactically colored text. The **Raw View** tab displays the response “as is”. Information on the used request method, response code and HTTP headers with their values is displayed for the XML response.

Using the Broker and RPC User ID/Password

EntireX supports two user ID/password pairs: a broker user ID/password pair and an (optional) RPC user ID/password pair sent from RPC clients to RPC servers. With EntireX Security, the broker user ID/password pair can be checked for authentication and authorization.

The RPC user ID/password pair is designed to be used by the receiving RPC server. This component's configuration determines whether the pair is considered or not. Useful scenarios are:

- Credentials for Natural Security

- Impersonation in the respective RPC Server documentation
- Web Service Transport Security with the RPC Server for XML/SOAP, see *XML Mapping Files*
- Service execution with client credentials for EntireX Adapter Listeners, see *Configuring Listeners*
- etc.

Sending the RPC user ID/password pair needs to be explicitly enabled by the RPC client. If it is enabled but no RPC user ID/password pair is provided, the broker user ID/password pair is inherited to the RPC user ID/password pair.

The check box **Enable Natural Logon** (see below) enables sending the RPC user ID/password pair in Direct Test mode. In HTTP test mode, the HTTP parameter exx-natural-security has to be set. If you do so, we strongly recommend using SSL/TLS. See *SSL/TLS, HTTP(S), and Certificates with EntireX*.

To use the broker and RPC user ID/password with Direct Test mode

1. Specify a broker user ID and broker user password in the **Broker Security** tab.
2. Activate the **Natural** tab and check the check box **Enable Natural Logon** to enable sending the RPC user ID/password pair.
3. If different user IDs and/or passwords are used for broker and RPC, enter `RPC User ID` and `RPC User Password` in the **Natural** tab to provide a different RPC user ID/password pair.
4. By default the library name sent to the RPC server is retrieved from the IDL file (see `library-definition` under *Software AG IDL Grammar* in the IDL Editor documentation). The library name can be overwritten. This is useful if communicating with a Natural RPC server. Specify a Natural library in the **Natural** tab.

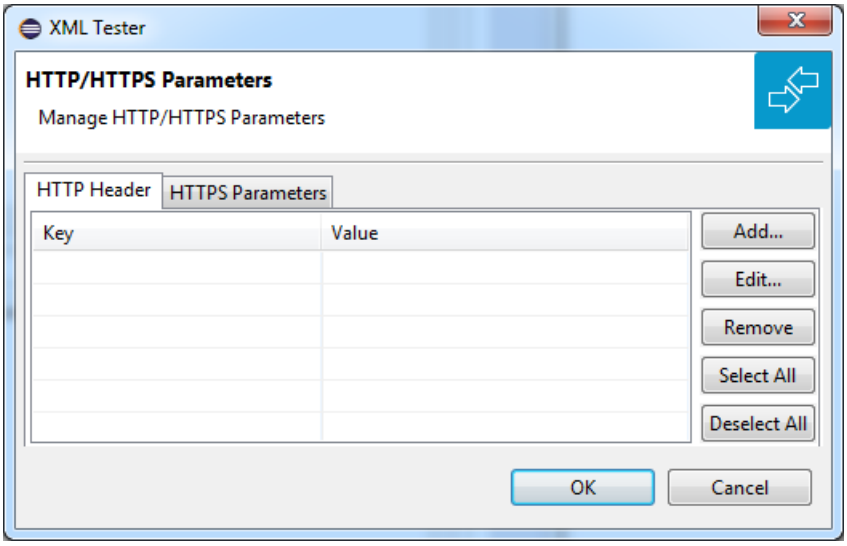
To use the broker and RPC user ID/password with HTTP Test mode

1. Activate the **HTTP Header** tab.
2. Add `exx-user` and `exx-password` as HTTP parameters.
3. Add HTTP parameter `exx-natural-security` to enable sending the RPC user ID/password pair.
4. If different user IDs and/or passwords are used for broker and RPC, add `exx-rpc-user` and `exx-rpc-password` as HTTP parameters to provide a different RPC user ID/password pair.
5. By default the library name sent to the RPC server is retrieved from the IDL file (see `library-definition` under *Software AG IDL Grammar* in the IDL Editor documentation). The library name can be overwritten. This is useful if communicating with a Natural RPC server. Specify a Natural library in HTTP parameter `exx-natural-library`.

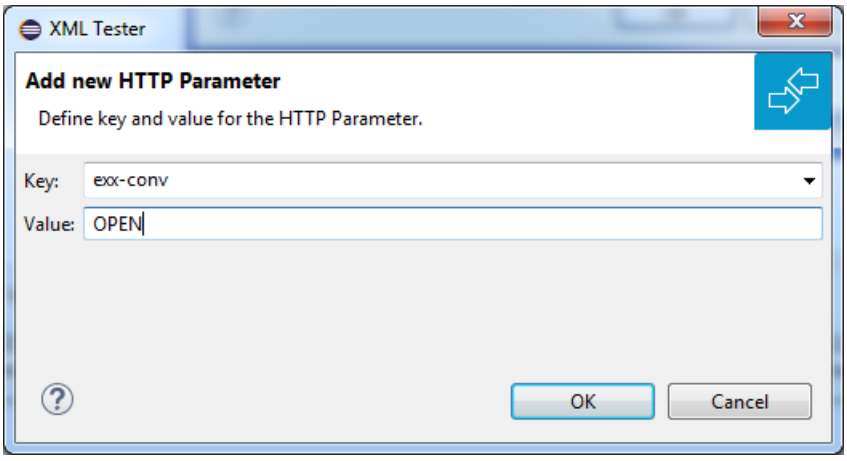
Using Conversational RPC

To use conversational RPC with HTTP Test mode

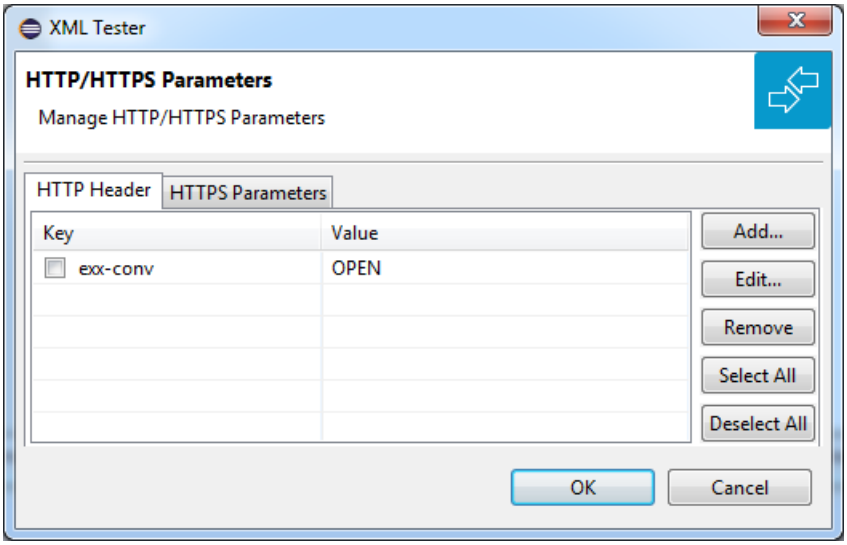
1 Open **Settings**.



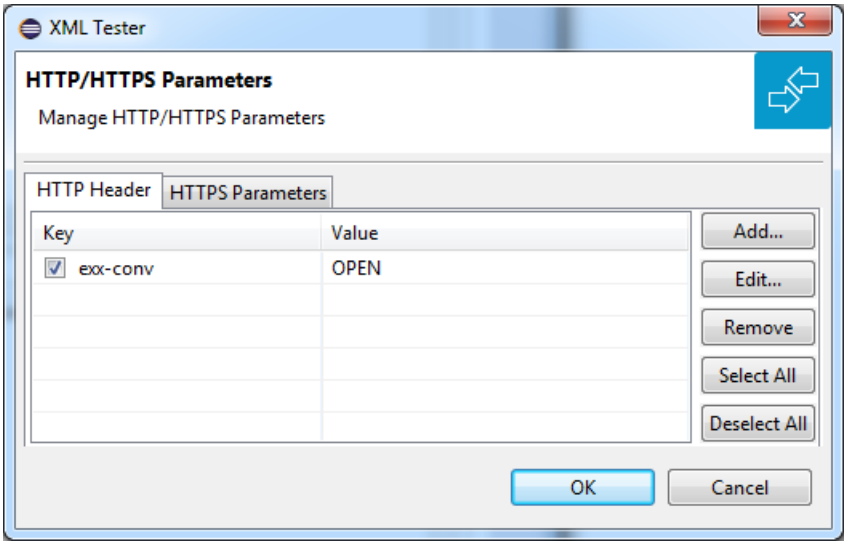
2 Add key `exx-conv` and set value to "OPEN".



3 Press **OK**.



4 Select `exx-conv`.



5 Press **OK**.

6 Send the request.

7 The response contains the `exx-xml-sessionID` used for conversational communication. This parameter is also added to HTTP/HTTPS parameters for the next call(s) automatically. The parameter `exx-conv` is deactivated simultaneously.

8
```
<!-- snippet with exx-xml-sessionID in response document -->
     <axis2ns1:EntireX xmlns:axis2ns1="urn:com.softwareag.entirex.xml.rt">
        <exx-xml-sessionID>XML610C044029044C05</exx-xml-sessionID>
     </axis2ns1:EntireX>
<!-- snippet -->
```

9 To finish the conversation, open the settings again, activate the `exx-conv` and set its value to "COMMIT" or "BACKOUT".

10 The conversation is closed with the next sent call.

8 Using the XML/SOAP Wrapper in Command-line Mode

Command-line Options

See *Using EntireX in the Designer Command-line Mode* for the general command-line syntax. The table below shows the command-line options for the XML/SOAP Wrapper.

Task	Command	Option	Description
Create SOAP-conformant XML mapping for all programs.	`-map:soap`		
	`-map:soap1.1`		Supported for compatibility with older versions.
Create attribute-preferred XML mapping for all programs.	`-map:xmlattributes`		
Create element-preferred XML mapping for all programs.	`-map:xmlelements`		
Create element-preferred XML mapping with XML Schema for all programs	`-map:xmlwithxsd`	`-namespace`	If *`namespace`* is specified, the namespace URI for the program node. XML Schema uses this namespace URI as the target namespace.
Create sample XML documents for all programs.	`-xml:sample`		

Example

```
<workbench> -map:soap /Demo/example.idl
```

where `<workbench>` is a placeholder for the actual EntireX design-time starter as described under *Using EntireX in the Designer Command-line Mode*.

The name of the IDL file includes the project name. In the example, the project *Demo* is used. If the IDL file name describes a file inside the Eclipse workspace, the name is case-sensitive.

If the first part of the IDL file name is not a project name in the current workspace, the IDL file name is used as a relative (based on the IDL file) or absolute file name in the file system. Thus, the IDL files do not need to be part of an Eclipse project.

Status and processing messages are written to standard output (stdout), which is normally set to the executing shell window.

Further Examples

Windows Example 1

```
<workbench> -map:soap C:\Temp\example.idl
```

Uses the IDL file *C:\Temp\example.idl* and generates the XML mapping file *example.xmm* in parallel to the IDL. Slashes and backslashes are permitted in the file name. Output to standard output:

```
Using workspace file: C:\myWorkspace\.
Processing IDL file: C:\Temp\example.idl
Store XML mapping file: C:\Temp\example.xmm
Exit value: 0
```

Windows Example 2

```
<workbench> -map:soap /Demo/example.idl
```

Generates XML mapping files for all IDL files in project */Demo*.

Linux Example 1

```
<workbench> -map:soap /Demo/example.idl
```

If the project *Demo* exists in the workspace and *example.idl* exists in this project, this file is used. Otherwise, */Demo/example.idl* is used from file system.

Linux Example 2

```
<workbench> -map:soap /Demo/example.idl
```

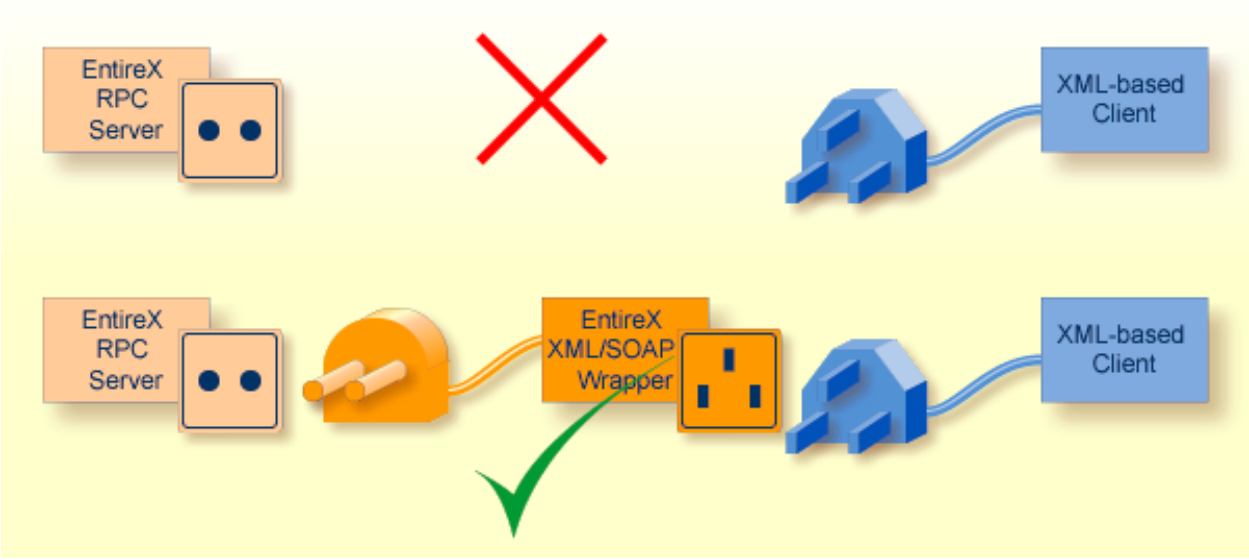
Generates XML mapping files for all IDL files in project *Demo* (or in folder */Demo* if the project does not exist).

9 Tracing the XML/SOAP Runtime

See *Tracing the XML/SOAP Runtime* UNIX | Windows.

10 Introduction to Writing Applications with the XML/SOAP Wrapper

Connecting between XML-based Clients and an EntireX RPC Server



Publish an Existing EntireX RPC Server for XML-based Clients

You have an existing EntireX RPC server and want to extend its availability to XML-based clients (e.g. offer the functionality of your server as a Web service). The simplest approach is to use the EntireX XML/SOAP Wrapper to convert your XML documents to EntireX RPCs and vice versa. Then the XML-based client will appear to communicate with an XML-based server.

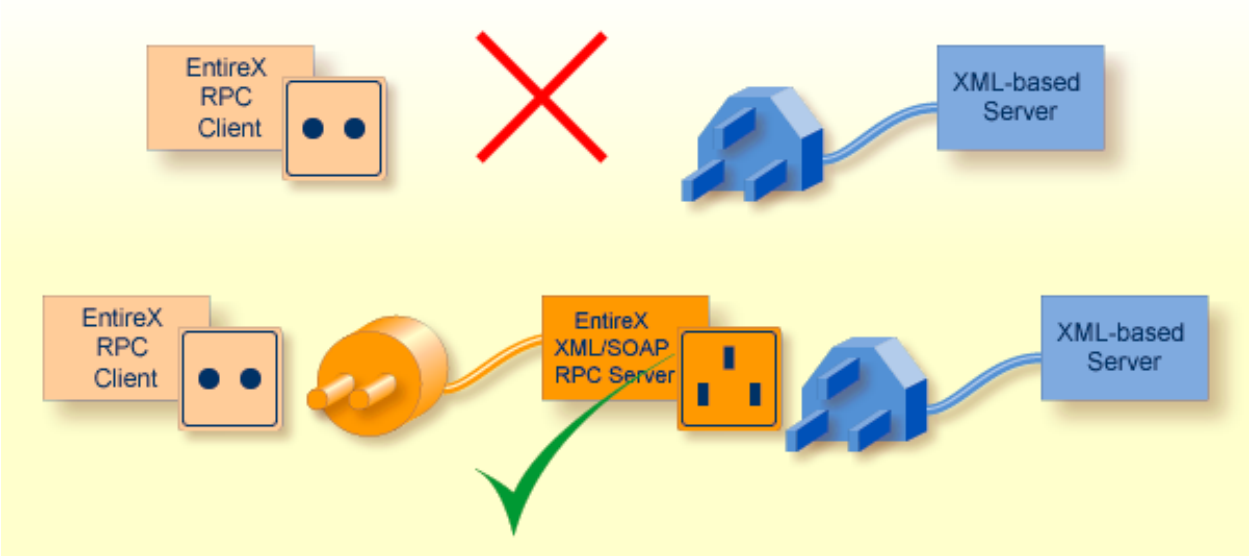
See *Writing Applications - Connect an Existing EntireX RPC Server with an XML-based Client*.

Use your XML-based Client and Connect to an EntireX RPC Server

You have an XML-based client that is to communicate with an EntireX RPC server or access a component accessible via an EntireX RPC server. The simplest approach is to use the EntireX XML/SOAP Wrapper to convert your XML documents to EntireX RPCs and vice versa. Then an XML-based client will appear to communicate with an XML-based server (your EntireX RPC server).

See *Writing Applications - Build an EntireX RPC Server and Use an Existing XML-based Client with It*.

Connecting EntireX Clients and XML-based Server



Involve an XML-based Server in your EntireX Application

You know or have written XML-based servers (e.g. Web services) and want to involve them in your EntireX application. The simplest approach is to use the EntireX RPC Server for XML/SOAP to convert your EntireX RPCs to XML documents and vice versa; the EntireX RPC Server for XML/SOAP handles the HTTP communication.

See *Writing Applications - Build an EntireX RPC Client and Use an Existing XML-based Server*.

Connect your RPC Client and the XML-based Server

You have an EntireX RPC client and want to implement your server application as an XML-based server and you want the EntireX RPC client to use this XML-based server. The simplest approach is to use the EntireX RPC Server for XML/SOAP to convert your EntireX RPCs to XML documents and vice versa; the EntireX RPC Server for XML/SOAP will handle the HTTP communication.

See *Writing Applications - Connect an Existing EntireX RPC Client to an XML-based Server*.

11 Writing Advanced Applications with the XML/SOAP Wrapper

See also *Generating a Web Service with HTTP Basic Authentication and UsernameToken Authentication for EntireX Authentication* under *Using the EntireX Web Services Wrapper*.

Listener for XML/SOAP

With the Listener for XML/SOAP you can define parameters inside the payload of a message. We recommend this approach rather than HTTP parameters. Define the setting in the SOAP header and under the first tag of XML document as follows:

SOAP Documents

```
...
<soap-env:Header>
  <exx:EntireX xmlns:exx="urn:com.softwareag.entirex.xml.rt">
    <!-tags with parameter setting e.g: -->
    <exx-natural-library>libraryname</exx-natural-library>
    <exx-natural-security>true</exx-natural-security>
  </exx:EntireX>
...
</soap-env:Header>
...
```

XML Documents

```
<root-tag>
  <exx:EntireX xmlns:exx="urn:com.softwareag.entirex.xml.rt">
    <!-tags with parameter setting e.g: -->
    <exx-natural-library>libraryname</exx-natural-library>
    <exx-natural-security>true</exx-natural-security>
  </exx:EntireX>
...
</root-tag>
```

Using Conversational RPC

It is assumed that you are familiar with the concepts of conversational and non-conversational RPC. See also *Conversational RPC* under *Common Features of Wrappers and RPC-based Components* in the RPC Programming documentation.

For conversational RPC you need an instantiated conversation object. See `Conversation`. Conversational RPC is enabled by passing a reference to this object to the method `setConversation`. See `setConversation`. Different stubs can participate in the same conversation if they use the same instance of a Conversation object. An RPC conversation is terminated by calling either the `closeConversation` method or the `closeConversationCommit` method for one stub.

XML/SOAP Wrapper (Java API)

To enable conversational RPC

- Create a Conversation object and set this with `setConversation` on the wrapper object.

  Different wrapper objects can participate in the same conversation if they use the same instance of a conversation object.

To abort a conversational RPC communication

- Call the `closeConversation` method.

To close and commit a conversational RPC communication

- Call the `closeConversationCommit` method.

Listener for XML/SOAP

Conversations can only be used in connection with sessions. If the session is interrupted, the conversation will be deleted.

To use conversational RPC

- Use the parameter `exx-conv` with the value OPEN.

To continue conversational RPC

- Pick up the parameter `exx-sessionID` in response and set the parameter as HTTP parameter or in the same way as in the response document inside the request document.

To abort a conversational RPC communication

- Use the parameter `exx-conv` with the value BACKOUT.

To close and commit a conversational RPC communication

- Use the parameter `exx-conv` with the value COMMIT.

See also *EntireX XML Tester for Conversational RPC*.

Caution: Natural RPC Servers and EntireX RPC Servers behave differently when ending an RPC conversation.

See also *Conversational RPC* under *Common Features of Wrappers and RPC-based Components* in the RPC Programming documentation.

Using Compression

Java-based EntireX applications (including applications using classes generated by the Java Wrapper) may compress the messages sent to and received from the broker. There is a general way to enable compression using broker ID, and another way that depends on whether you use the XML/SOAP Wrapper or the Listener for XML/SOAP.

Using Broker ID

You may append the keyword `compresslevel` with one of the values below to the Broker ID.

Examples

- localhost:1971?compresslevel=BEST_COMPRESSION
- localhost?poolsize=4&compresslevel=9

Both examples set the compression level to 9.

Using setCompressionLevel()

Set the compression level with the method `setCompressionLevel()` as an integer or a string argument.

You can use the constants defined in class `java.util.zip.Deflater`.

If the string

- starts with Y, compression is switched on with level 6,
- starts with N, compression is switched off (level 0).

Permitted values are the integers 0 - 9 and the corresponding strings:

`BEST_COMPRESSION`	level 9
`BEST_SPEED`	level 1
`DEFAULT_COMPRESSION`	level 6
`DEFLATED`	level 8
`NO_COMPRESSION`	level 0

Listener for XML/SOAP

To set the compression level

- Use the parameter `exx-compressLevel`. The values are described in the section above.

HTTP Proxy Settings

If the target server of your Web service has to be reached through a firewall, set and adjust to your needs the following properties:

- `-Dhttp.proxySet=true`
- `-Dhttps.proxySet=true`
- `-Dhttp.proxyHost=httpprox.mydomain.org`
- `-Dhttps.proxyHost=sslprox.mydomain.org`
- `-Dhttp.proxyPort=8080`
- `-Dhttps.proxyPort=443`
- `-Dhttp.nonProxyHosts=*mydomain.org|localhost`
- `-Dhttp.proxyUser`
- `-Dhttps.proxyUser`
- `-Dhttp.proxyPassword`
- `-Dhttps.proxyPassword`

Add the proxy settings to the start script.

HTTP Basic Authentication

Basic authentication is used for a target server if the attribute `basicAuthentication` is defined in the `TargetServer` block. Basic authentication is used for all calls associated with the defined XMM files for the `<TargetServer>`.

Basic authentication can be used with fixed credentials or credentials set from the RPC client application:

- If `<TargetServer>` contains attributes `user` and `password`, these settings are used for basic authentication.
- Otherwise the RPC client application must provide the credentials:
  - For how to send the RPC user ID/password pair from an RPC client, see *Using the Broker and RPC User ID/Password* (.NET Wrapper | Java Wrapper | C Wrapper | PL/I Wrapper | DCOM Wrapper | Web Services Wrapper | IDL Tester | Listener for XML/SOAP | Listener for IBM MQ).
  - For the COBOL Wrapper, refer to *Using Broker Logon and Logoff* and *Using RPC Authentication (Natural Security, Impersonation, Integration Server)*.

- For non-RPC clients, see **Using the Broker and RPC User ID/Password** under *EntireX XML Tester*.

See also *Generating a Web Service with HTTP Basic Authentication and UsernameToken Authentication for EntireX Authentication* under *Using the EntireX Web Services Wrapper*.

Using SSL/TLS with the RPC Server for XML/SOAP

To configure SSL/TLS to a target server

1 Using HTTPS to the target server requires setting Java SSL/TLS properties and changing the protocol of the target server's Web service in the configuration file (see *Configuration File*).

If the web service has to be called via HTTPS (SSL/TLS), the SSL client (here the XML/SOAP Wrapper) needs the correct certificate for the web service in the truststore to be able to communicate via SSL. The certificate can either be stored in the default truststore of the JVM or in the truststore specified with the following Java property:

```
-Djavax.net.ssl.trustStore=path_to_used_truststore
```

The SSL parameters must be included in quotes, for example

```
set SSL="-Djavax.net.ssl.trustStore=C:\myTrustStore.jks"
```

Note: This is only an example. You must provide a truststore that matches your environment.

The truststore keeps the trusted certificate of the web service host or the certificate of its signing (issuing) certificate authority. In the event of an SSL error, you can use the Java property `-Djavax.net.debug=all` to get more information. Add the SSL parameter to the start script of the XML/SOAP Wrapper and ensure it is passed to the start or Java. Example:

```
...
set SSL="-Djavax.net.ssl.trustStore=C:\myTrustStore.jks -Djavax.net.debug=all"
...
"%JAVA_HOME_BIN%java" %PROXY% %SSL% -classpath "%CLASSPATH%" ↩
com.softwareag.entirex.xml.rt.XMLRPCServer -p "%EXXPROP%" -c "%EXXCONF%" %*
```

There are additional Java properties, which are usually not needed. These are described in the Java documentation.

2 Optional. If you are using an HTTPS target server's Web service address located outside the firewall, set the following Java properties:

- `https.proxyHost`

- `https.proxyPort`
- `http.nonProxyHosts`
- `https.proxyUser`
- `https.proxyPassword`

3 Change the protocol of the target server's Web service address from `http` to `https` in the configuration file. Specify the fully qualified host name as `TargetServer`. The host name has to match the CN (Common Name) item of the host certificate. See also configuration file (see *Configuration File*). Example:

```
<?xml version="1.0" encoding="iso-8859-1" ?>
<EntireX
xmlns="http://namespaces.softwareag.com/entirex/xml/runtime/configuration" ↩
version="10.7"
>
    <XmlRuntime Version="1">
       <TargetServer name="https://targethost:8080/entirex/xmlrt">
            <xmms>
                <exx-xmm name="yourFile1.xmm" />
                <exx-xmm name="yourFile2.xmm" />
            </xmms>
        </TargetServer>
    </XmlRuntime>
</EntireX>
```

Null Value Suppression

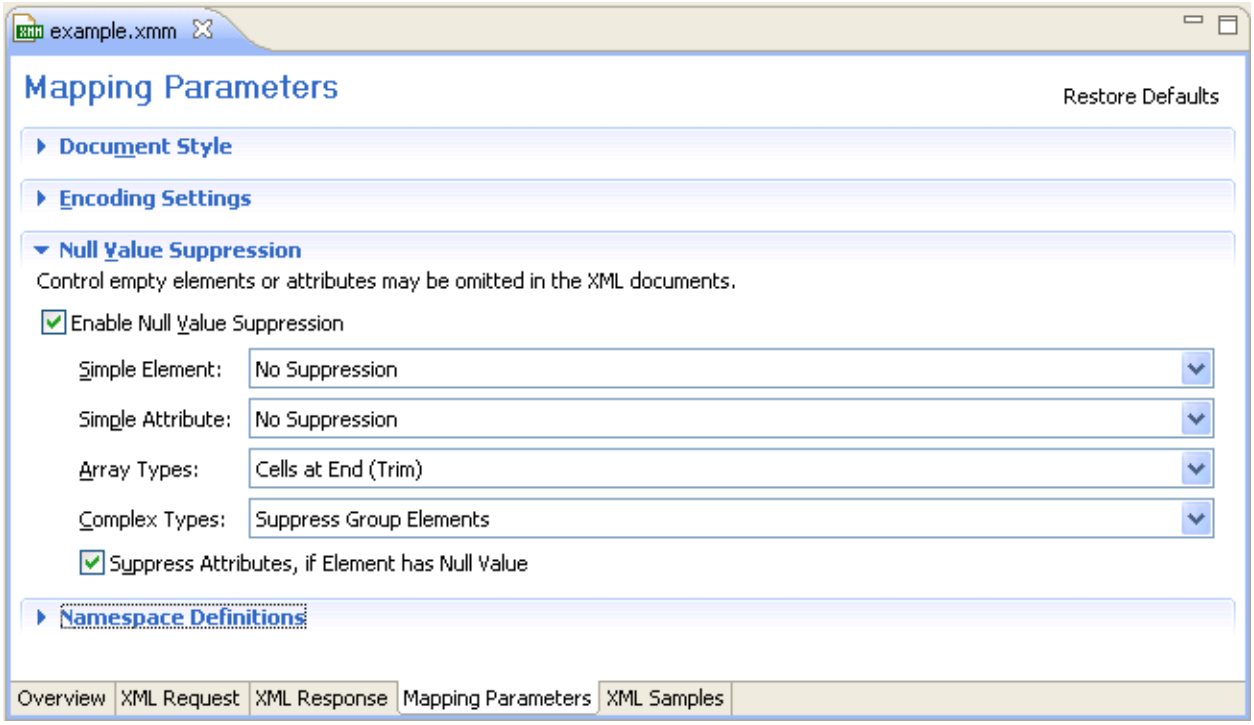
Introduction

The EntireX XML/SOAP Runtime introduced a feature called *null value suppression* to reduce to amount of data transferred between Web client and Web service. Null value suppression (NVS) allows you to hide tags or attributes with a specified value (so-called null value).

The different types of NVS are explained below. The EntireX XML Mapping Editor provides two ways of setting/modifying the NVS type:

- using a general setting on tab **Mapping Parameter**
- on each element or attribute in the definition of request/response on tab **XML Request/ XML Response**

For several data types, a null value is defined by default. See *Default Definition of Null Value*. To change one of these null values, open the **XML Request/XML Response** tab, select the element/attribute and modify the property of the null value manually. For this modification use the **Properties** view or the **Properties** dialog (open with the context menu).



Default Setting for Null Value Suppression

Data Type	Suppression Mode
Simple Elements	No Suppression
Simple Attributes	No Suppression
Array Types	Cells at end (trim)
Complex Types	Suppress group elements

Tip: The default setting for elements and attributes changed with version 7.3 from "Suppress Element/Attribute" to "No Suppression". The null value suppression for elements and attributes can be set independently. The null value suppression for Complex Types was introduced with version 7.3.

Definition and Examples of Null Value Suppression Mode

If there is a significant difference between pure XML and SOAP for a null value suppression mode, two examples are introduced.

Suppression Mode	Valid for
No Suppression	Elements, attributes
Elements	Elements
Attributes	Attributes
Cells at End (Trim)	Elements inside an array definition
All Empty Cells	Elements inside an array definition
Suppress Group Elements	Elements inside a group definition
Depends On Element	Attributes

No Suppression

The element or attribute is always present in document. The minimum and maximum occurrence of element/attribute must be set to one.

Example 1

XML Document	Displayed XML Document

`<prog>`
`  <integer>0</integer>`
`</prog>`
	`<prog>`
	`  <integer>0</integer>`
	`</prog>`

Elements

An element is hidden if

- the element value is equal to null value
- all attributes of the element can be suppressed
- the element has only subelements that can be suppressed

The minimum occurrence of element must be zero, and the maximum occurrence of element must be one.

Example 2

XML Document	Displayed XML Document
<prog> <gr> <integer>0</integer> </gr> </prog>	<prog />

Attributes

An attribute with null value is hidden.

The minimum occurrence of attribute must be zero, and the maximum occurrence of attribute must be one.

Example 3

XML Document	Displayed XML Document
<prog integer="0" name="Henry"/>	<prog name="Henry"/>

Cells at End (Trim)

All elements of array that fulfills the assertion of "Suppress Element/Attribute" are suppressed if its index is higher than the highest index of the non-suppressed element.

The minimum occurrence of elements must be lower than the maximum occurrence, and the maximum occurrence of elements must be the maximum number of elements or unlimited.

XML Document	Displayed XML Document
<prog> <array> <integer>0</integer> <integer>1</integer> <integer>0</integer> <integer>2</integer> <integer>0</integer> <integer>0</integer> </array> </prog>	<prog> <array> <integer>0</integer> <integer>1</integer> <integer>0</integer> <integer>2</integer> </array> </prog>

All Empty Cells

All elements of array that fulfills the assertion of NVS_FIELD are suppressed.

The minimum occurrence of elements must be lower than the maximum of occurrence and maximum occurrence of elements must be maximum number of elements or unlimited.

Example 5a

XML Document	Displayed XML Document
<prog> <array> <integer>0</integer> <integer>1</integer> <integer>0</integer> <integer>2</integer> <integer>0</integer> <integer>0</integer> </array> </prog>	<prog> <array> <integer>1</integer> <integer>2</integer> </array> </prog>

Example 5b (for SOAP documents the XML/SOAP Runtime creates position attributes)

SOAP Document	Displayed SOAP Document
<prog> <array> <integer>0</integer> <integer>1</integer> <integer>0</integer> <integer>2</integer> <integer>0</integer> <integer>0</integer> </array> </prog>	<prog> <array> <integer SOAP-ENC:position="[1]">1</integer> <integer SOAP-ENC:position="[3]">2</integer> </array> </prog>

Suppress Group Elements

The suppression mode allows you to suppress group information if - and only if - all elements of the group can be suppressed.

The minimum occurrence of elements must be zero.

Example 6

XML Document	Displayed XML Document
<prog> <person> <firstname>Henry</ firstname > <lastname>Miller</ lastname > <someInformation>2</ someInformation > </person> <person> <firstname></ firstname > <lastname></ lastname > <someInformation>0</ someInformation > </person> <person> <firstname>John</ firstname > <lastname>Miles</ lastname > <someInformation>0</ someInformation > </person> </prog>	<prog> <person> <firstname>Henry</ firstname > <lastname>Miller</ lastname > <someInformation>2</ ↩ someInformation > </person> <person/> <person> <firstname>John</ firstname > <lastname>Miles</ lastname > <someInformation>0</ ↩ someInformation > </person> </prog>

Depends On Element

Attribute of the element is visible if the element does not have the null value.

The minimum occurrence of attribute and associated element must be zero, and the maximum occurrence must be one.

Example 7

XML Document	Displayed XML Document
<prog type="integer">0 <parm type="integer">0</parm> </prog>	<prog />

Default Definition of Null Value

Data Types	Null Value
String	Empty String
Integer	0
Floating Point	0.0
Numeric	0.0
Time	No default definition
Date	No default definition

Data Types	Null Value
Binary	No default definition
Boolean	False

User-specified Settings

For further settings, use the method `setUserProperty` in `XMLRPCService` (EntireX XML/SOAP Runtime).

Map Fault to IDL Parameter

Introduction

The RPC Server for XML/SOAP maps the values of IDL parameters to XML/SOAP documents and vice versa. If the Web service responds with a fault document, this information is mapped to an error and returned to RPC client normally. With the optional feature **Map Fault to IDL Parameter** you can map values from a normal response and also from a fault document response. This means that no RPC error is returned to the RPC client; instead the fault information is contained in the IDL file. An RPC error is returned to the client only if internal error processing problems occurred within the RPC Server for XML/SOAP. This feature is available for SOAP and XML documents.

Example

Note: This example illustrates the feature **Map Fault to IDL Parameter**. Other features mentioned here, such as renaming parameters or assigning a prefix/namespace to a parameter, are described elsewhere.

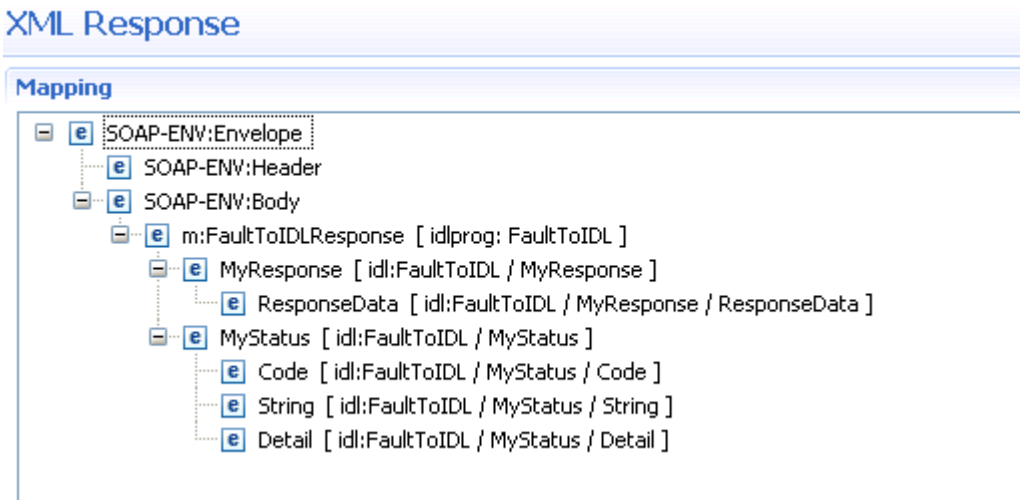
Sample IDL File

```
/* Sample IDL file
library 'Demo' is
  program 'FaultToIDL' is
    define data parameter
      1 MyRequest  In
      2  RequestData     (AV)
      1 MyResponse Out
      2  ResponseData    (AV)
      1 MyStatus   Out   ** parameters for fault information
      2   Code    (AV)
      2   String    (AV)
      2   Detail    (AV)
    end-define
```

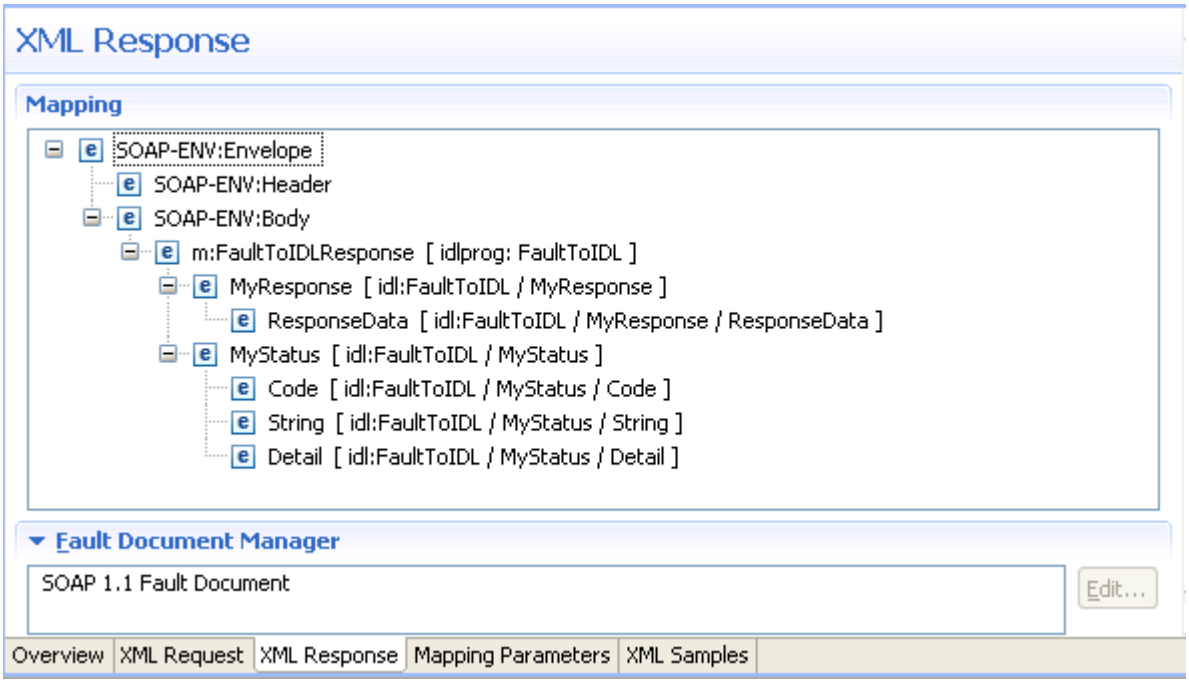
IDL-XML Mapping

To map fault items to IDL

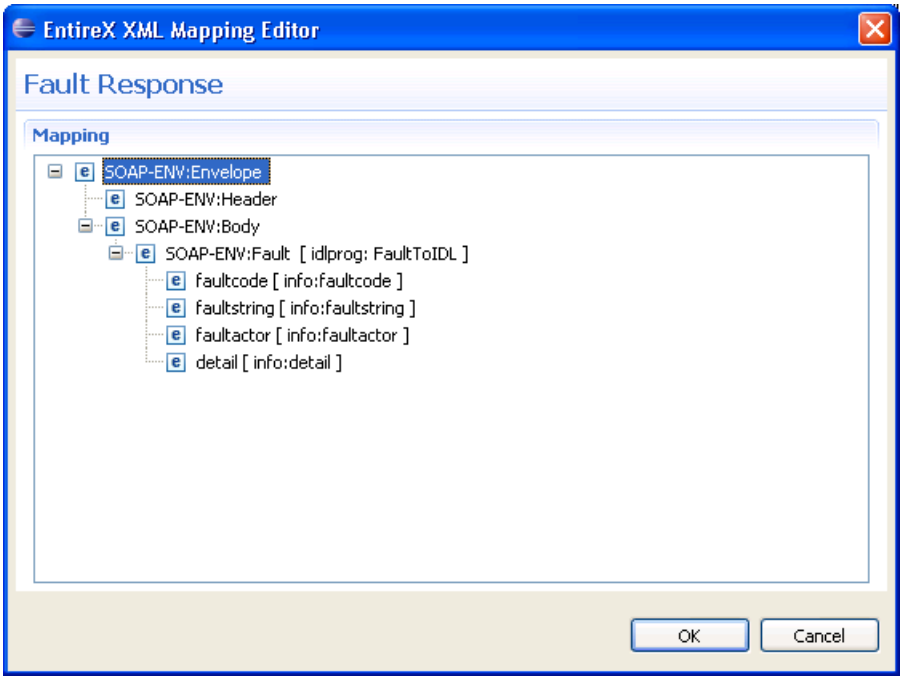
1 In the XML Mapping Editor, generate a (SOAP) mapping and select the response tab.



2 Remove the parameter `MyStatus`, including its children, because the regular response will not contain these parameters and the corresponding IDL parameters will be used for fault information later.

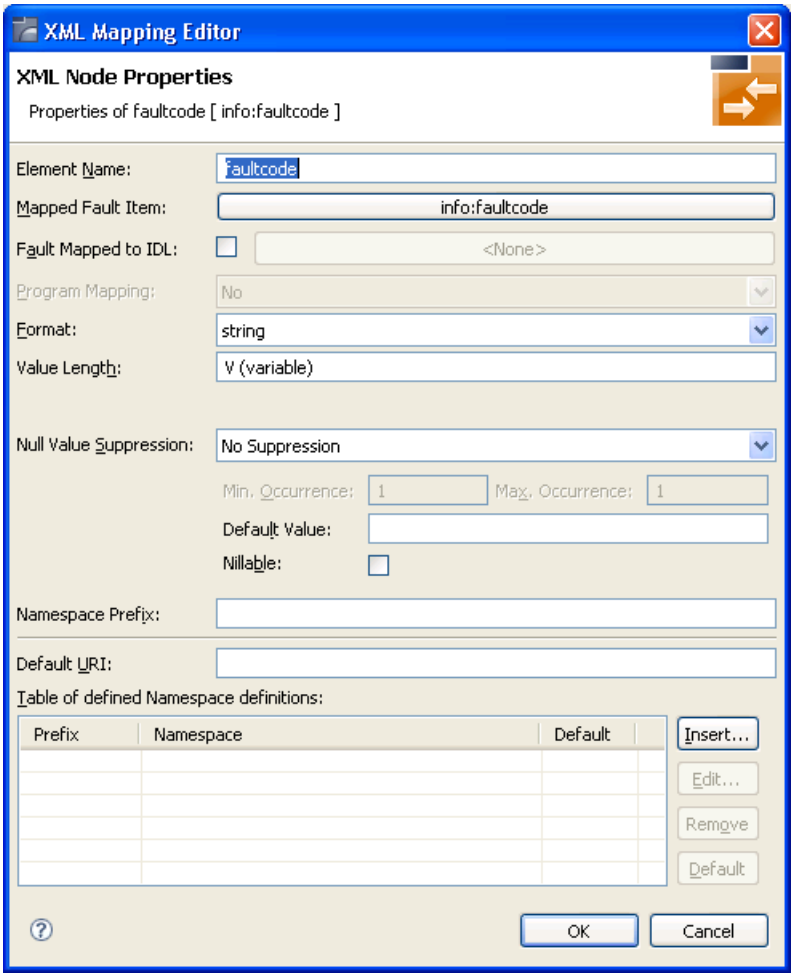


3 Open the Fault Document Manager (see bottom of opened tab **Response**) and select the document to open the following wizard:

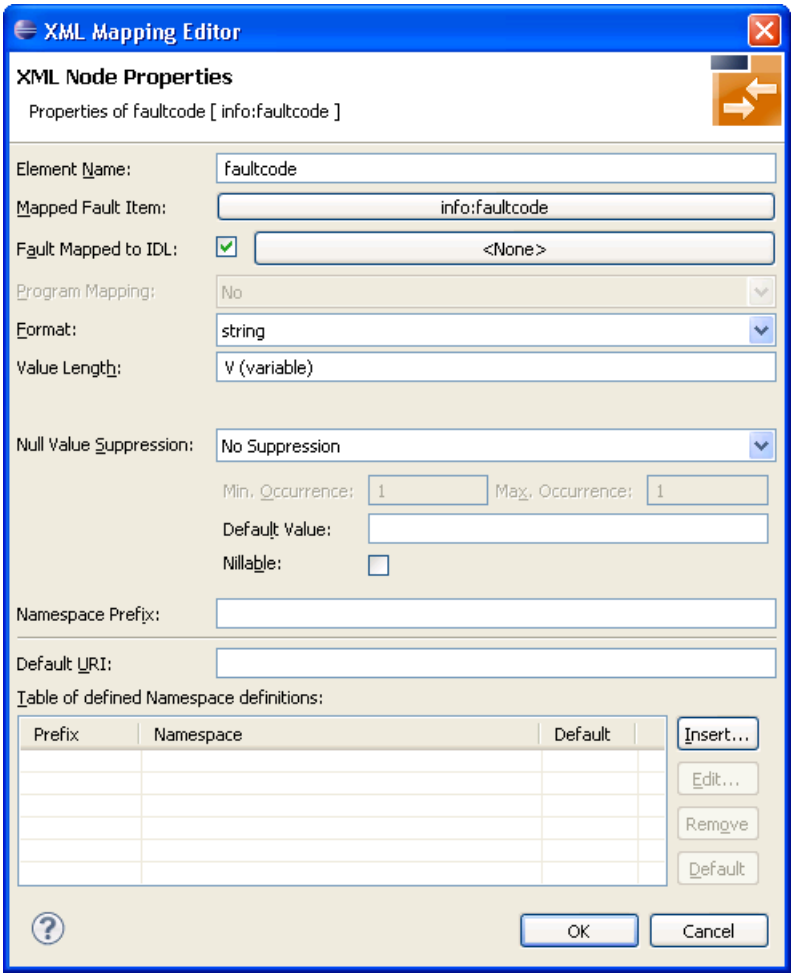


4 In the following steps, map "faultcode", "faultstring" and "detail" to IDL parameters. Fault item "faultactor" is not used in this example.

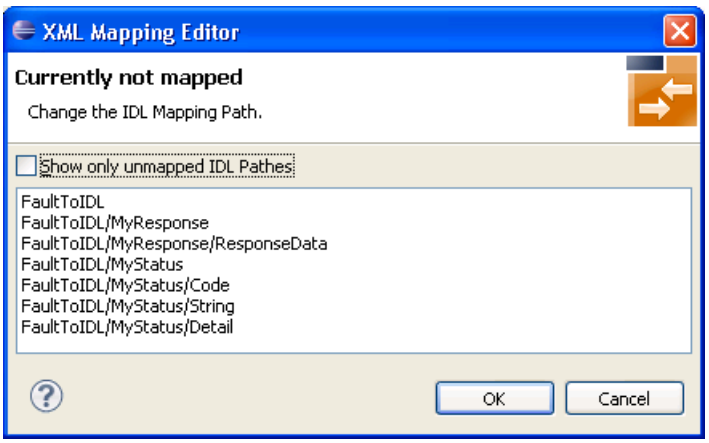
5 Select "faultcode" and open the properties shown on the following screen:



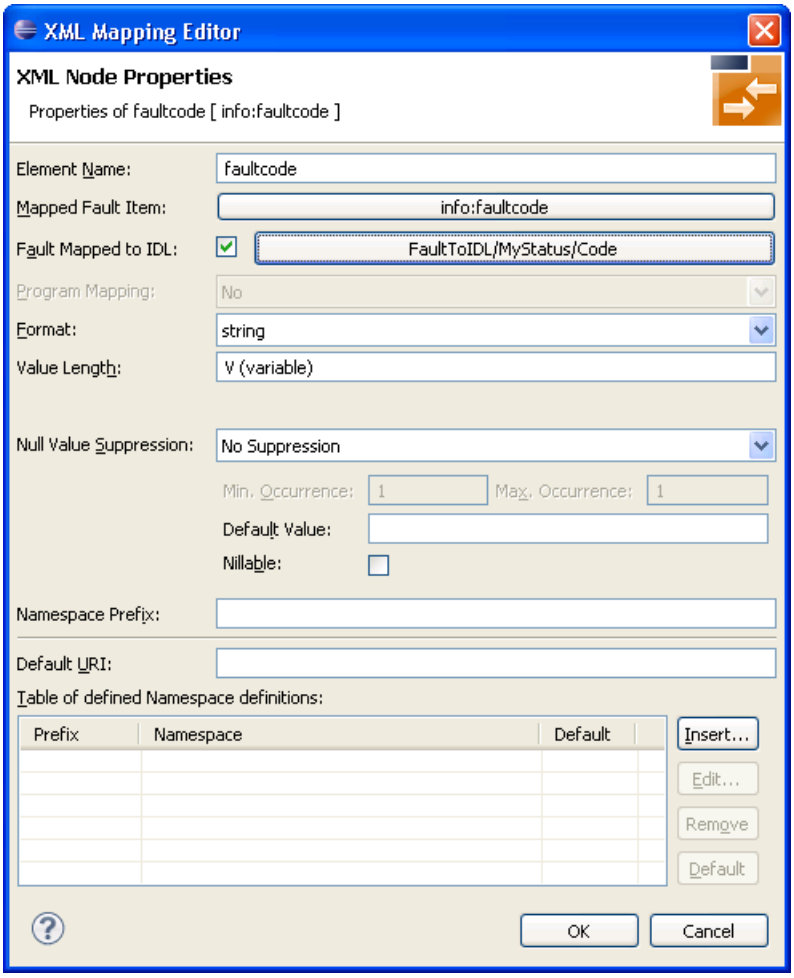
6 Check **Fault Mapped to IDL** to enable the mapping path button. In this example, a mapping path has not yet been entered and the button is labelled "<none>".



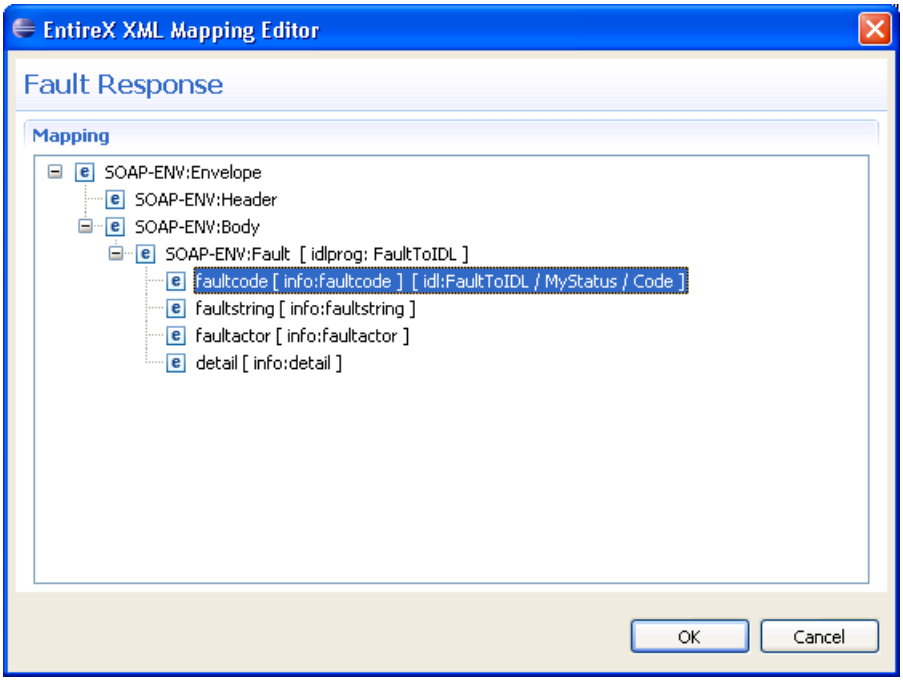
7 Press the mapping path button.



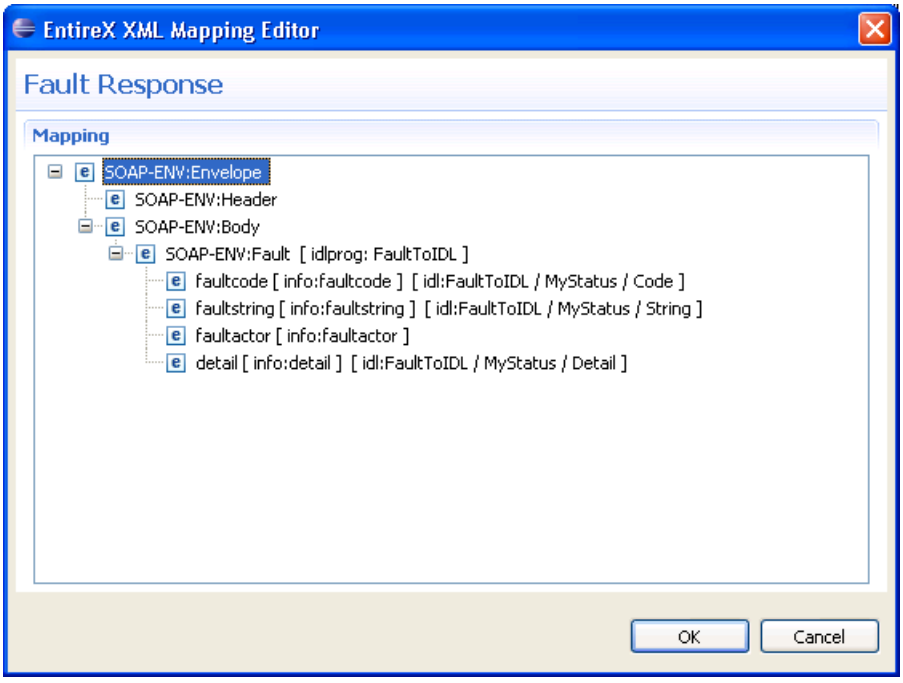
8 Select the path to IDL parameter, for example "FaultToIDL/MyStatus/Code" and choose **OK** to display the following screen:


XML Mapping Editor
XML Node Properties
Properties of faultcode [info:faultcode]
Element Name:
faultcode
Mapped Fault Item:
info:faultcode
Fault Mapped to IDL:
FaultToIDL/MyStatus/Code
Program Mapping:
No
Format:
string
Value Length:
V (variable)
Null Value Suppression:
No Suppression
Min. Occurrence:
1
Max. Occurrence:
1
Default Value:
Nillable:
Namespace Prefix:
Default URI:
Table of defined Namespace definitions:
Prefix
Namespace
Default
Insert...
Edit...
Remove
Default
OK
Cancel

9 Choose **OK**.



10 Repeat the steps above to select the fault items "faultstring" (path to IDL parameter e.g. "FaultToIDL /MyStatus/String") and "detail" (path to IDL parameter e.g. "FaultToIDL /MyStatus/Detail").



Note: The fault item "info:detail" contains the complete document fragment enclosed by an associated tag (in this example tag <detail>).

11 Choose **OK** to save the IDL-XML mapping.

In subsequent steps you need to

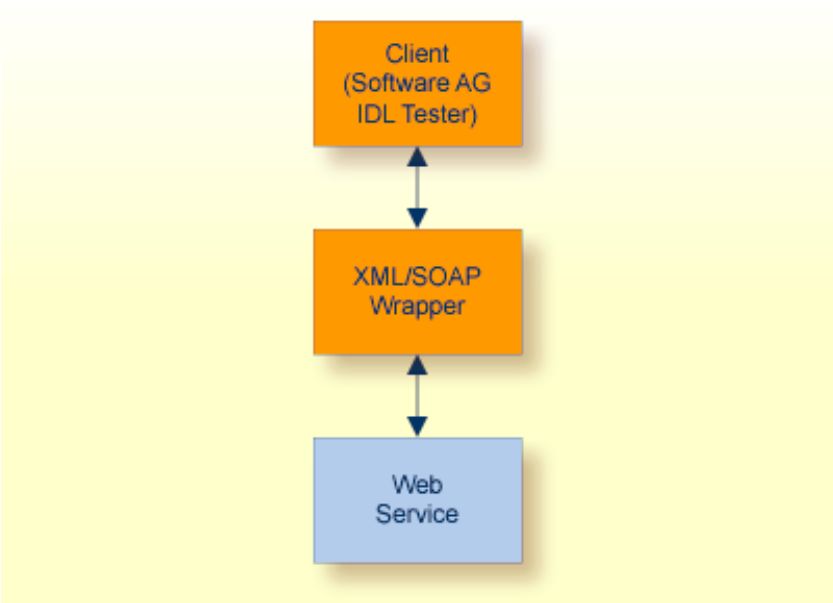
- Set up the RPC Server for XML/SOAP with this XMM.
- Set up a new Web service or use an existing one.

Testing the Fault Mapping

As a quick test, implement a Web service that behaves as follows:

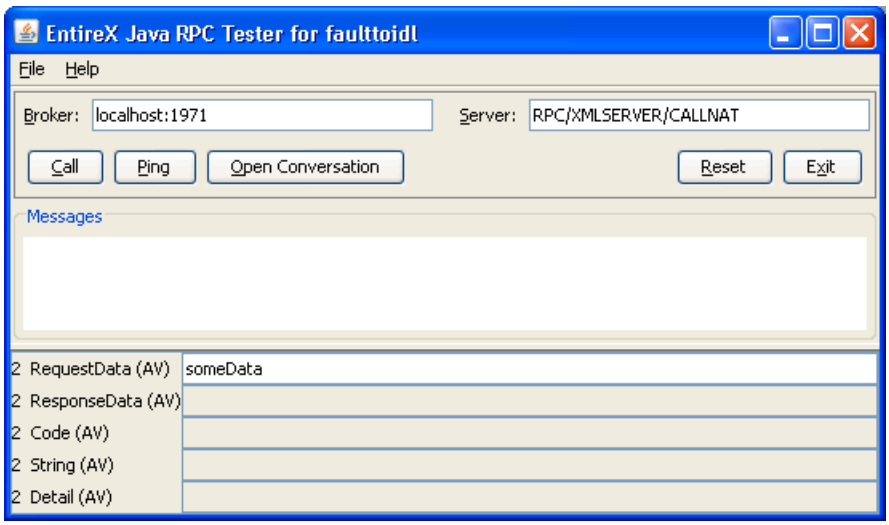
- If the "requestData" field contains any data except "throwException", the field "responseData" in the response document is set to a concatenation of the string "Receiving:" and the value of field "requestData". See Request 2).
- If the "requestData" field contains "throwException", the Web service responds with a SOAP fault.

Test Scenario

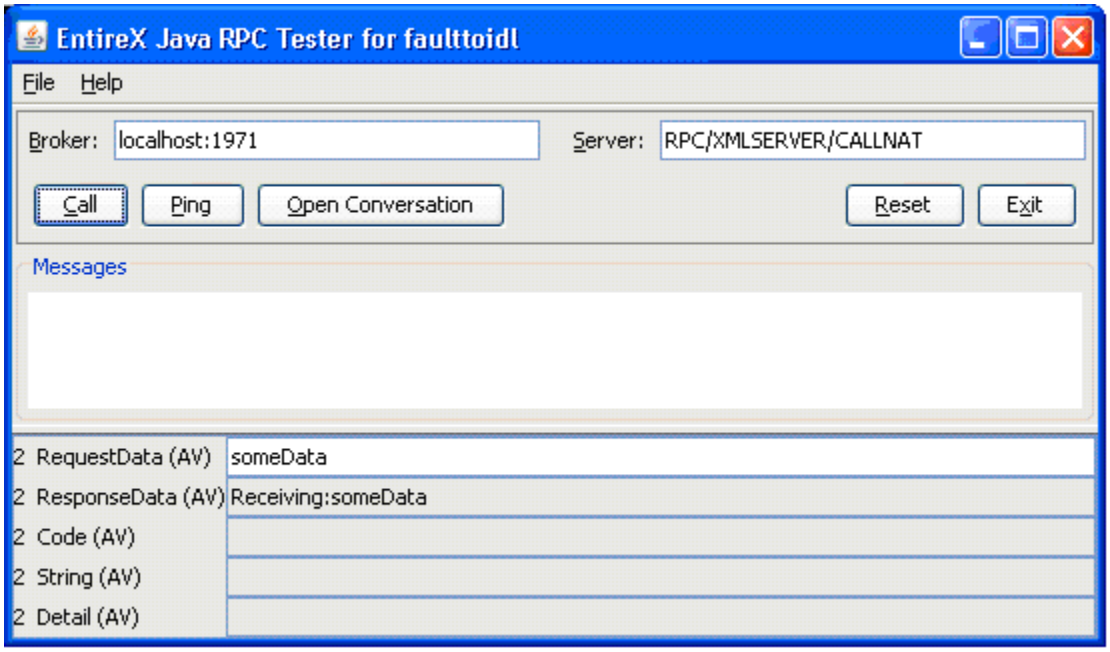


Request 1 (Expecting Normal Response)

The following screen illustrates a request that expects a normal response:

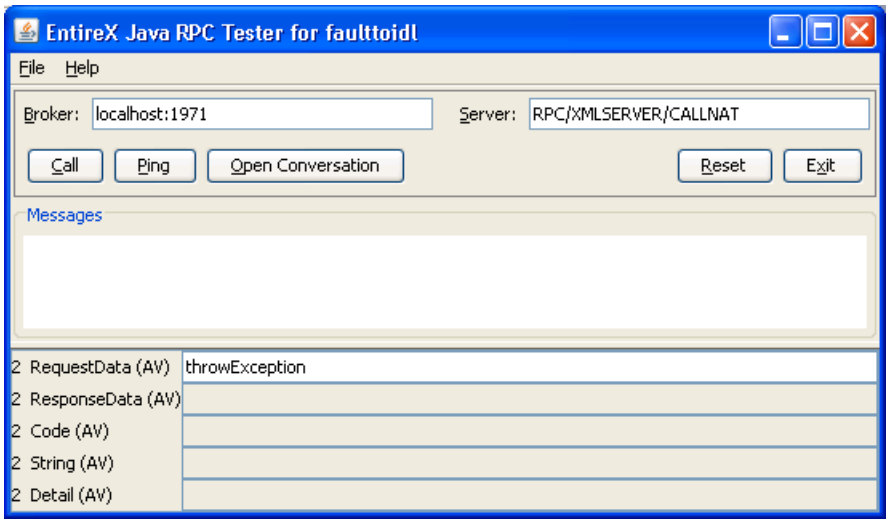


The following response is received (field responseData is filled):

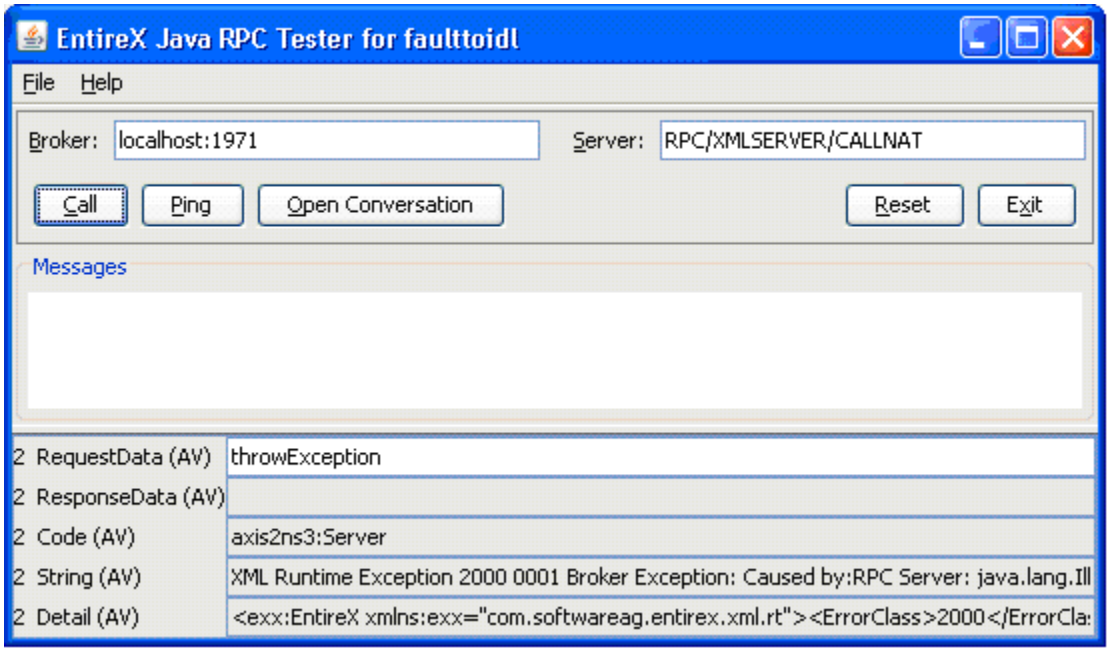


Request 2 (Expecting Fault Document)

The following screen illustrates a request where a fault document from the Web service is expected:



The following fault information is provided:



Whitespace Handling

The XML/SOAP Runtime trims whitespace in values by default. The whitespace handling is also determined by defining attribute `xml:space` (see XML specification) on element(s). The attribute `xml:space` has the higher priority and is inherited from children of the element recursively.

This section covers the following topics:

- Attribute xml:space
- Changing the Default for Whitespace Handling

Attribute xml:space

The attribute `xml:space` can be added in the XML Mapping Editor. Select an element and add new child, select the checkbox for xml:space and choose **OK**. Depending on the application, perform these steps for the request and/or response document definition. The attribute is added with value "preserve". If another value is required, open the properties on the attribute and change the default value.

Note: The XML/SOAP Runtime only supports the value "preserve" for attribute `xml:space`, all other values disable the preserving of whitespace (that is, whitespace is trimmed).

Changing the Default for Whitespace Handling

The steps required to keep whitespace as default depend on the EntireX component:

- **Listener for XML/SOAP**
  Add the following line to file axis2.xml in WS-Stack Web application:

```
<parameter name="exx-xml-space">preserve</parameter>
```

- **Java API (`XMLRPCService`)**
  Set the user property `entirex.sdk.xml.runtime.xmlspace`:

```
XMLRPCService rpcService = new XMLRPCService(...);
...
rpcService.setUserProperty("entirex.sdk.xml.runtime.xmlspace","preserve");
```

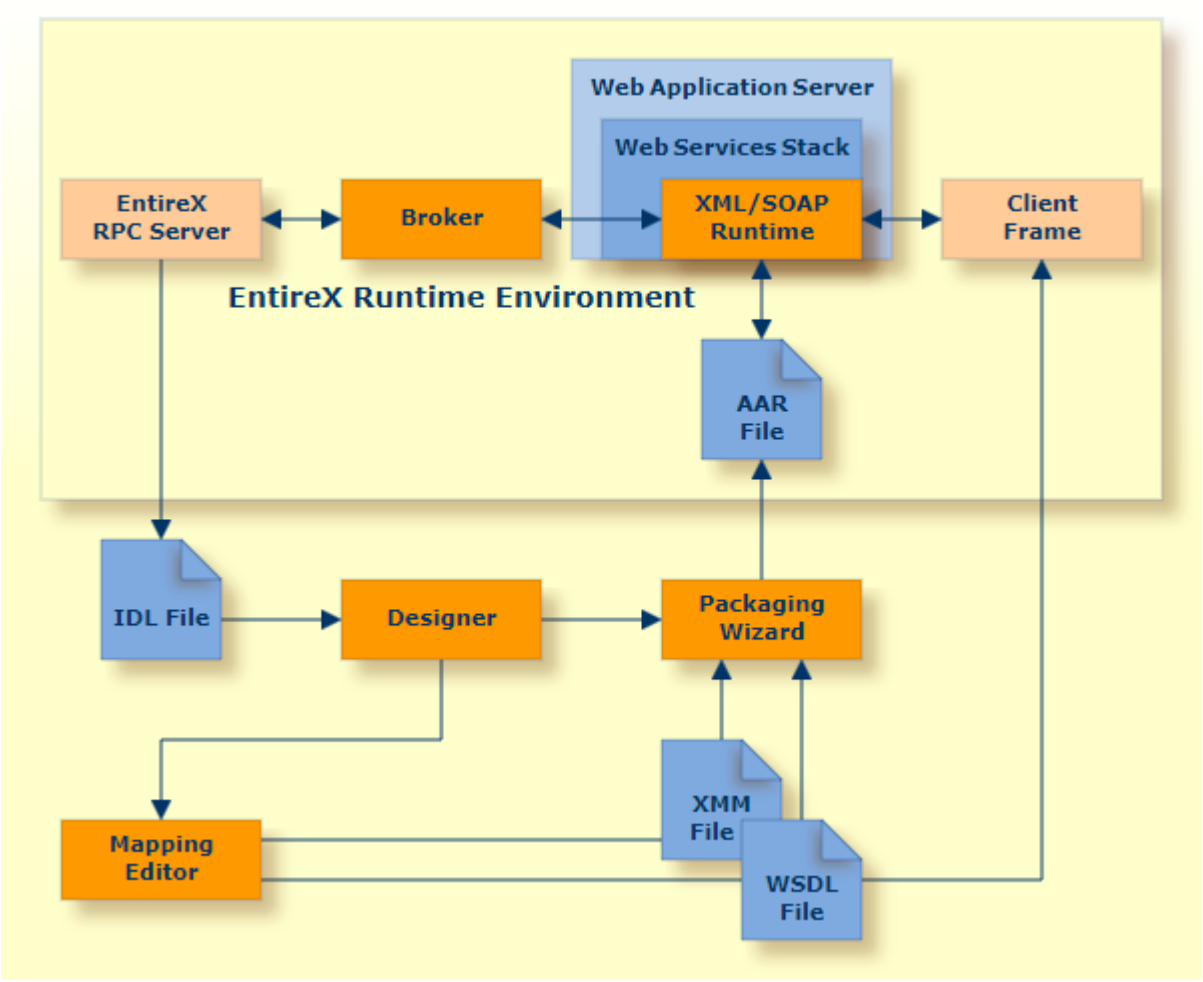
- **RPC Server for XML/SOAP**
  Add the following line to properties file of the RPC Server for XML/SOAP:

```
entirex.sdk.xml.runtime.xmlspace=preserve
```

12 Writing Applications - Connect an Existing EntireX RPC Server with an XML-based Client

This chapter describes how to connect an existing RPC server with an XML-based client, using a Web application that contains the EntireX XML/SOAP Runtime as part of Software AG Web Services Stack, or using the Java API of EntireX XML/SOAP Runtime.

Connect RPC Server with XML-based Client, using a Web Application



To generate the application, using a default SOAP mapping for the Web Service

- Select the IDL file that was used for creating the EntireX RPC server. From the context menu, choose and **Web Service > Generate Web Service...** and follow the instructions given by the wizard.

To generate the application, not using an XML Mapping or a non-Default SOAP Mapping

1 Select the IDL file that was used for creating the EntireX RPC server and open it with the EntireX XML Mapping Editor.

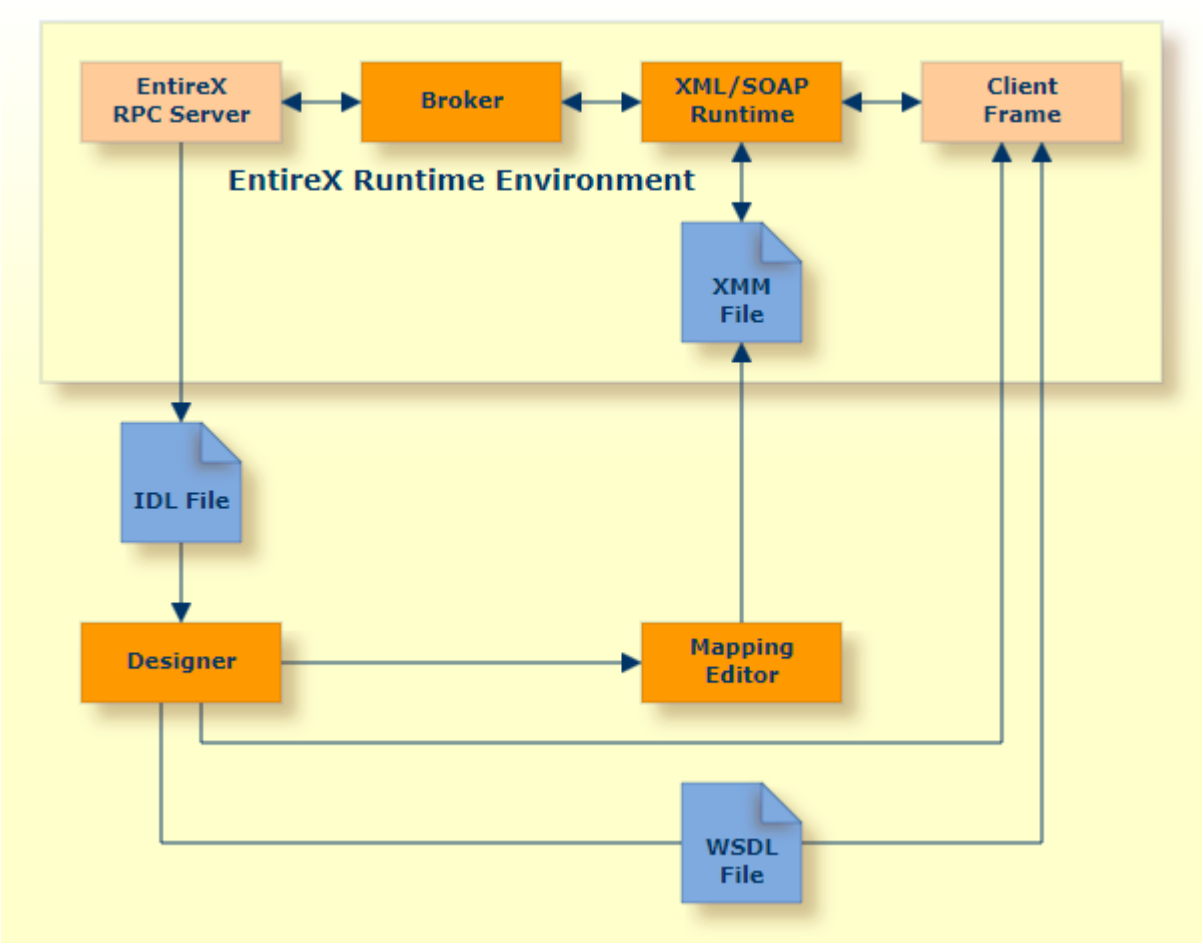
2 Select the mapping and press **Generate**. Save the mapping file.

3 Depending on the tools used for the generation of the XML-based client, create an XML Schema or WSDL for the generation of the XML-based client.

Select the IDL file, and from the context menu choose **Web Service > Generate Web Service...**.

For the generation of the XML Schema file: Select the XMM file and open the context menu. Choose **Generate XML Schema (XSD)...**.

Connect RPC Server with XML-based Client, using the Java API of EntireX XML/SOAP Runtime



To generate the application

1 Select the IDL file that was used for creating the EntireX RPC server and open it with the EntireX XML Mapping Editor.

2 Select the mapping **SOAP** and press **Generate**. Save the mapping file.

3 Depending on the tools used for the generation of the XML-based client, create an XML Schema or WSDL for the generation of the XML-based client.

Select the IDL file, and from the context menu choose **Web Service > Generate Web Service...**.

For the generation of the XML Schema file: Select the XMM file and from the context menu choose **Generate XML Schema (XSD)...**.

Note: If this is not possible, write an XML-based client.

4 Create an XML-based client with a suitable tool. Follow the instructions on the screen, or *Generating Web Services from Software AG IDL File*.

Running the Application

To run the application

1 Start the EntireX Broker (if required).

2 Configure and start the EntireX RPC server (if not started already).

3 Run the client application.

13 Writing Applications - Build an EntireX RPC Server and Use an Existing XML-based Client with It

Generation Process

To generate the application

1 If a WSDL file or an XML Schema file for the XML-based client exists, use the IDL Extractor for XML Schema or the IDL Extractor for WSDL, generating the IDL-XML mapping automatically.

Otherwise, write a suitable IDL file.

2 Select this generated or written IDL file and open the context menu to generate the desired server skeleton, or, if you are using Natural, write a Natural server.

Running the Application

To run the application

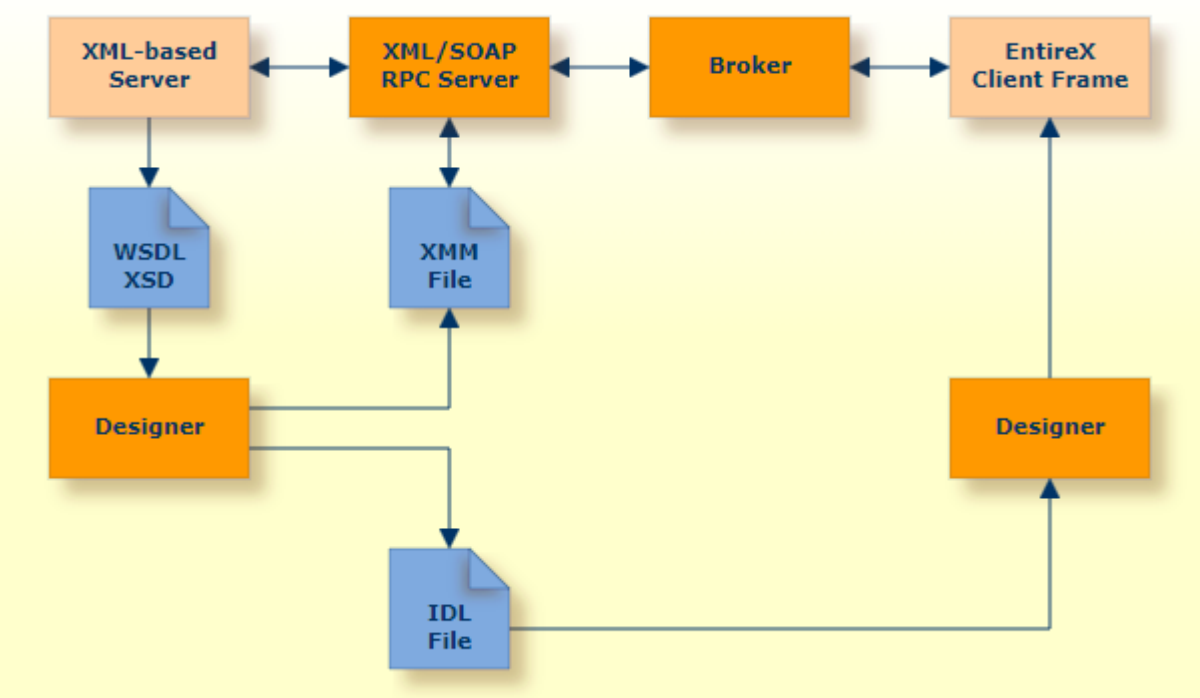
1 Start the EntireX Broker (if required).

2 Configure and start the EntireX RPC server or Natural RPC Server.

3 Run the client application.

14 Writing Applications - Build an EntireX RPC Client and Use an Existing XML-based Server

Generation Process



To generate the application

1 If a WSDL file or an XML Schema file for the XML-based server exists, use the IDL Extractor for XML Schema or the IDL Extractor for WSDL, generating the IDL-XML-Mapping automatically.

Otherwise, write a suitable IDL file.

2 Select this generated or written IDL and open the context menu to generate the desired client frame or, if you are using Natural, write a Natural client.

Running the Application

To run the application

1 Configure the RPC Server for XML/SOAP. See *RPC Server for XML/SOAP*.

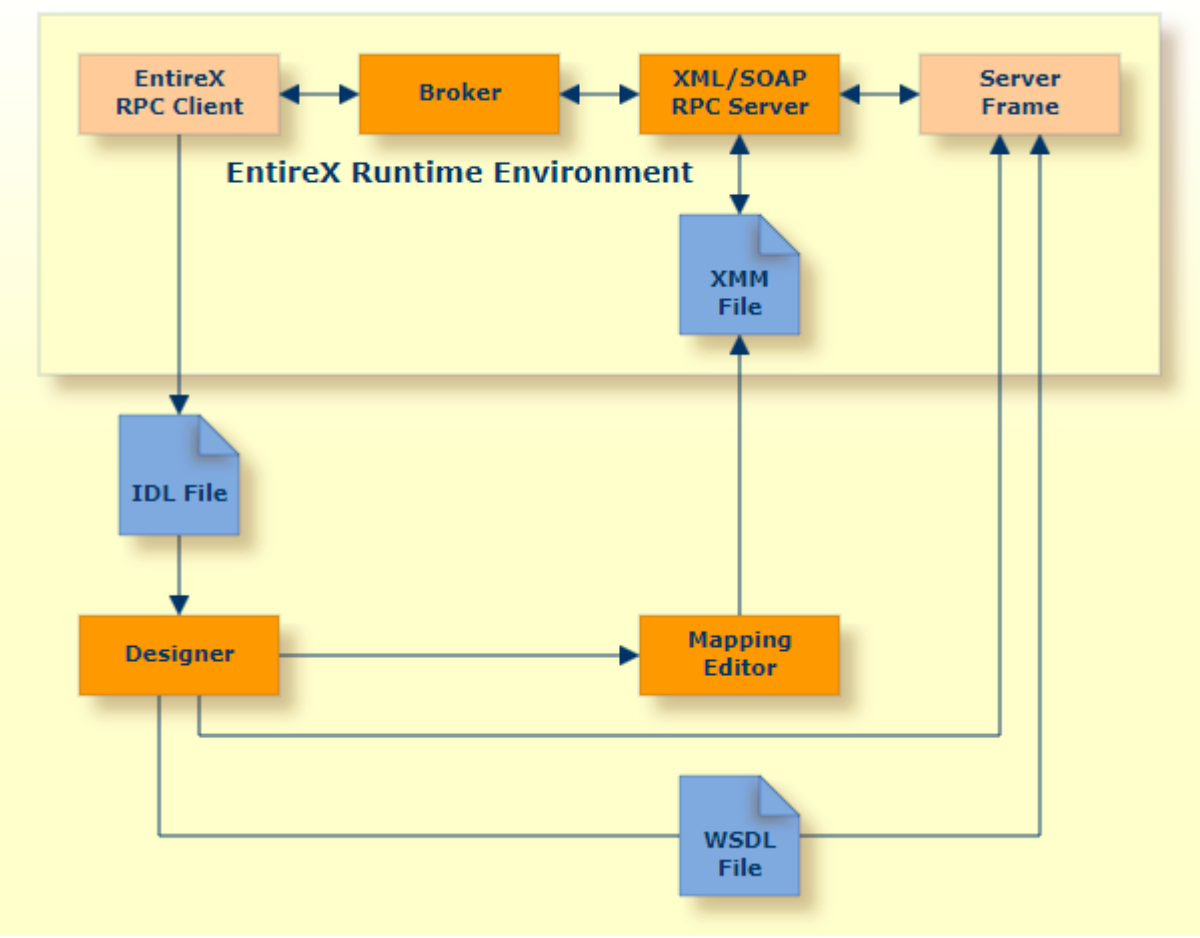
2 Start the EntireX Broker.

3 Start the RPC Server for XML/SOAP.

4 Run the client application.

15 Writing Applications - Connect an Existing EntireX RPC Client to an XML-based Server

Generation Process



To generate the application

1 Select the IDL file and open the context menu to create the EntireX RPC Client.

2 Select the IDL file and open with **EntireX XML Mapping Editor**. Select the mapping "SOAP" and choose **Generate**. Save the mapping.

Note: If an XML-based server does not exist, proceed as follows:

3 Depending on tools for generation of XML-based server create an XML Schema or WSDL for generation of XML-based server.

Select the IDL file and open the context menu. Select **Web Service > Generate Web Service...**.

For generation of XML Schema file: Choose **File > Save XML Schema as**.

Create an XML-based client with a suitable tool and the WSDL / XML Schema file.

For generation of XML Schema file: Select the XMM file and in the context menu choose **Generate XML Schema (XSD)...**.

Note: If this is not possible, write an XML-based server.

Running the Application

To run the application

1 Configure the RPC Server for XML/SOAP. See *RPC Server for XML/SOAP*.

2 Start the EntireX Broker (if required).

3 Start the RPC Server for XML/SOAP.

4 Run the client application.

16 Configuring Client and Server Applications

Configuring a Client to Call the EntireX XML/SOAP Runtime (Java API)

Configuration Information

The configuration information (which broker to use) is retrieved from the XMM file by default, or the client sets this information explicitly.

For information on available methods, see `XMLRPCService` (EntireX XML/SOAP Runtime); for available inherited methods, see `RPCService` (EntireX Java ACI).

For configuration of the behavior of XML/SOAP Runtime with `setUserProperty` see `XMLRPCService`.

Environment Settings

EntireX XML/SOAP Runtime requires correct setting for XML Stream Parser allowing access to JAXP methods. The classpath must contain the required JAR files.

The Java properties are:

```
javax.xml.stream.XMLInputFactory
    (default: com.ctc.wstx.stax.WstxInputFactory)
javax.xml.stream.XMLOutputFactory
    (default: com.ctc.wstx.stax.WstxOutputFactory)
```

These must be set for the client application if they differ from the default settings.

Configuring a Client to Call the EntireX XML/SOAP Runtime (Listener for XML/SOAP)

Configuration Information

The configuration information (for the EntireX Broker) is retrieved from one of the following sources:

- XMM file (lowest priority) by default
- configuration xml-init.xml inside the Web service description (AAR file) generated by Packaging Wizard
- configuration of EntireX Web service in an external configuration file
- HTTP/payload parameters (highest priority)

See also *Listener for XML/SOAP*.

Environment Settings

EntireX XML/SOAP Runtime requires correct setting for the XML Stream Parser to allow access to JAXP methods. The classpath must contain the required JAR files. The Java properties are:

```
javax.xml.stream.XMLInputFactory
    (default: com.ctc.wstx.stax.WstxInputFactory)
javax.xml.stream.XMLOutputFactory
    (default: com.ctc.wstx.stax.WstxOutputFactory)
```

If the settings differ from the default settings, set them in the start script of the Web server.

Configuring an RPC Server for XML/SOAP

The RPC Server for XML/SOAP reads configuration data from configuration file (lowest priority), property file and command line (highest priority). You can define location and name of property file and configuration file as command-line parameters. The property file may define the JAXP parameters and the location and name of the configuration file. Default for the properties file is *entirex.xmlrpcserver.properties* and for configuration file *entirex.xmlrpcserver.configuration.xml* located in the working directory. The configuration file (in XML format) contains information about EntireX Broker and a list of target servers, including the mapping file associated with them. If a configuration file or a properties file contains non-encrypted or base64-encoded passwords, the passwords are replaced by the encrypted ones.

See *RPC Server for XML/SOAP*.

17 Deployment to RPC Server for XML/SOAP and Dynamic Configuration of RPC Server for XML/SOAP

Introduction

The Designer supports two methods of modifying the configuration of RPC Server for XML/SOAP:

- deploy an XMM to a specified RPC Server for XML/SOAP directly
- interact with RPC Server for XML/SOAP to perform configuration changes

The changes are activated immediately without restarting the RPC Server for XML/SOAP.

Notes:

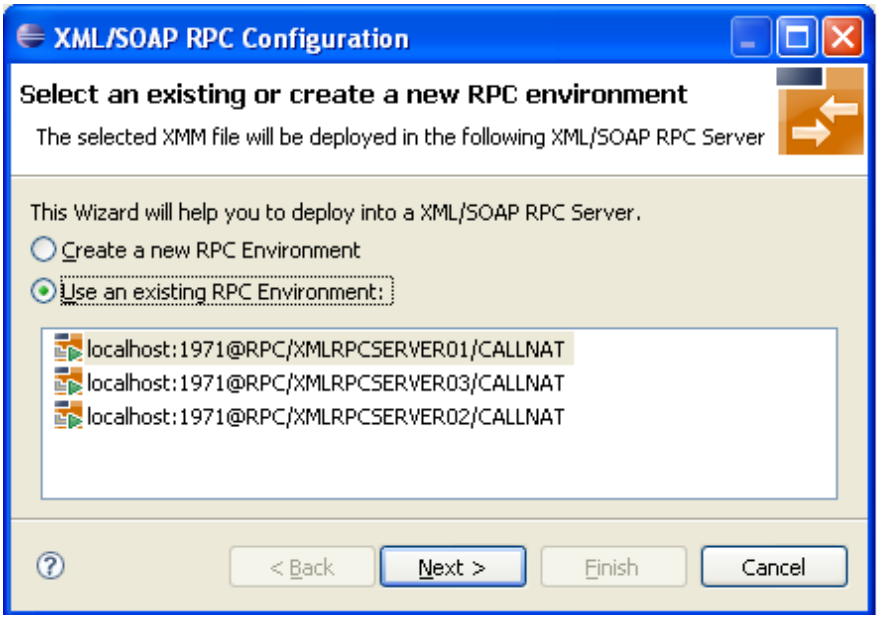
1. Setting the property `entirex.server.allowdevelopment` in the XML/SOAP RPC Server's properties file (default name: *entirex.xmlrpcserver.properties*) to "true" (default) *enables* deployment and dynamic configuration; setting this property to "false" *disables* deployment and dynamic configuration.
2. A deploy call with XMM and WSDL may transport a large amount of data. We therefore recommend you increase the value of broker attribute `MAX-MESSAGE-LENGTH` in the attribute file.

Deploying an XMM File to RPC Server for XML/SOAP

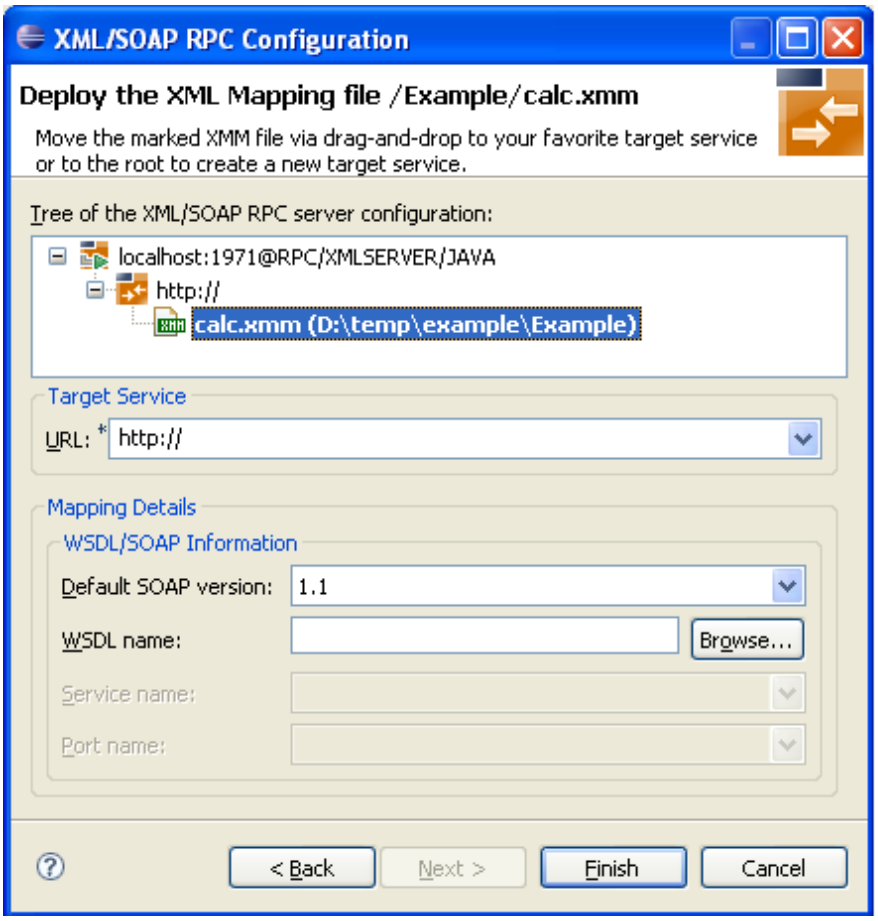
To deploy an XMM file to RPC Server for XML/SOAP

1 Select an XMM file.

2 From the context menu, choose **Deploy to EntireX XML/SOAP RPC Server ...** to display the following screen:



3 Create a new RPC environment for Broker ID and server address or select an RPC Server for XML/SOAP from the list.



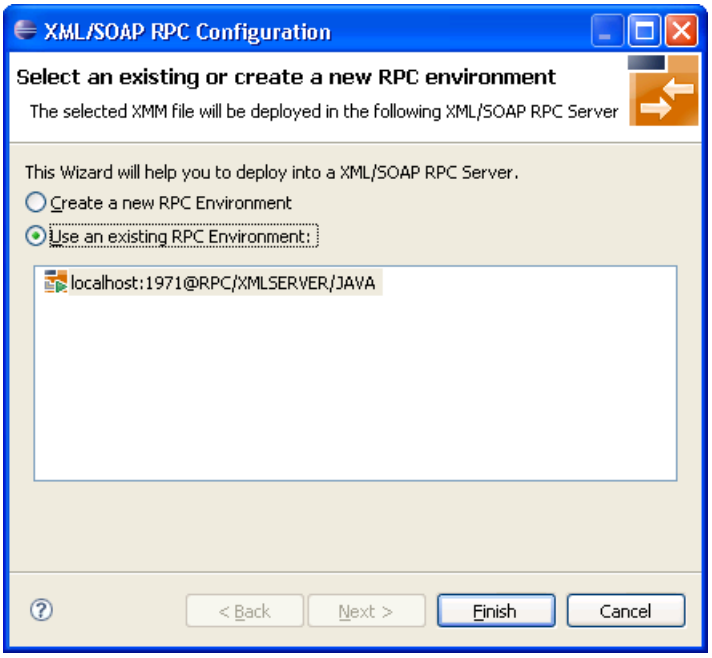
4 Complete the configuration by adding URL and, optionally, the WSDL file. If a WSDL file with same name exists in directory, the field is filled by default. Choose **Finish**.

Undeploying an XMM File from RPC Server for XML/SOAP

To undeploy an XMM file from RPC Server for XML/SOAP

1 Select an XMM file.

2 From the context menu, choose **Undeploy from EntireX XML/SOAP RPC Server ...** to display the following screen:



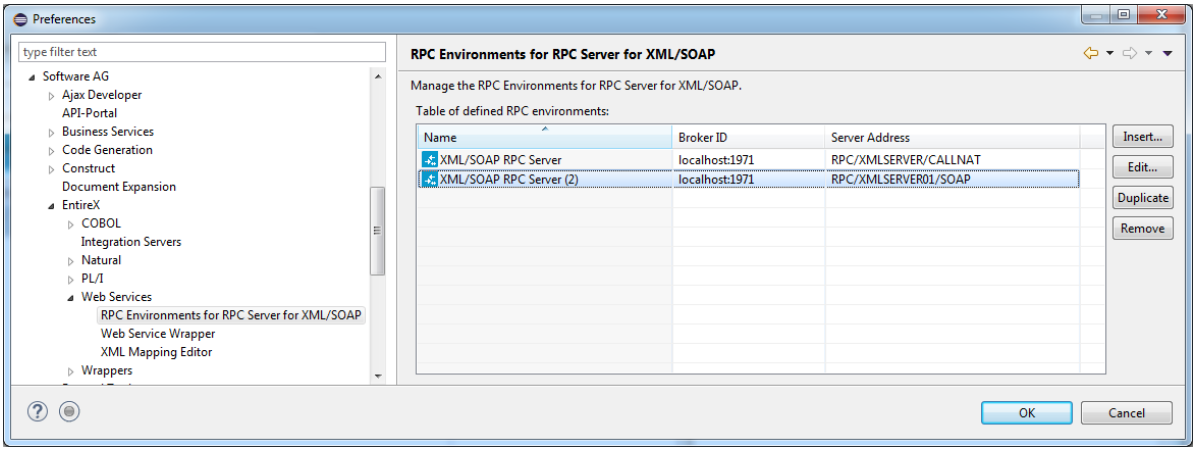
3 Create a new RPC environment for broker ID and server address, or select an RPC server from the list.

4 Choose **Finish**.

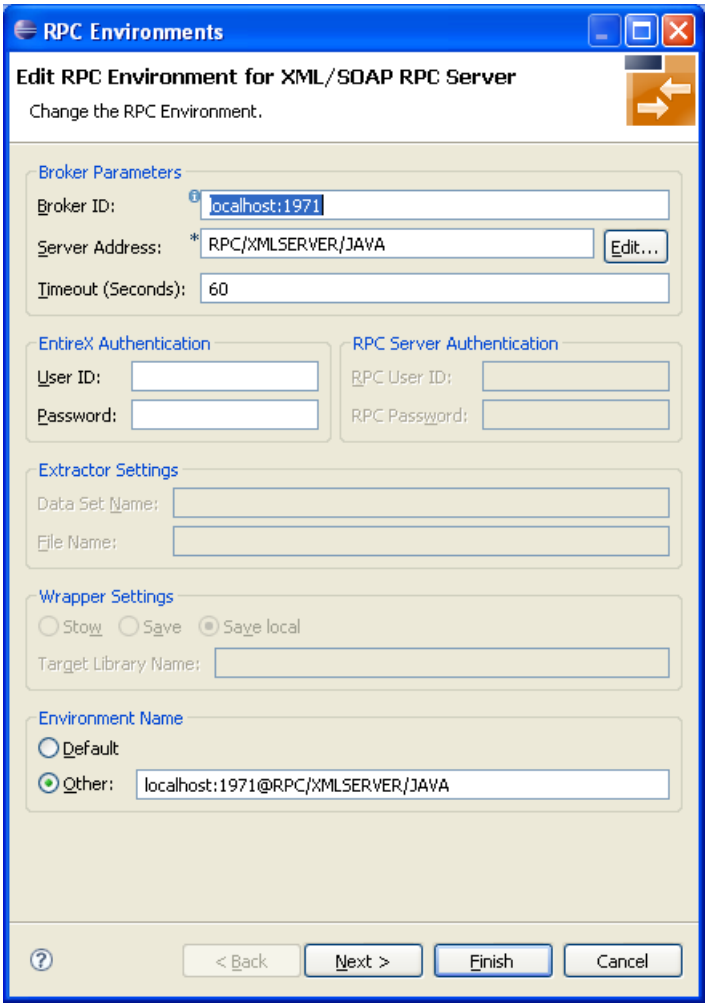
Configuring RPC Server for XML/SOAP Dynamically

To configure an XML/SOAP RPC Server dynamically

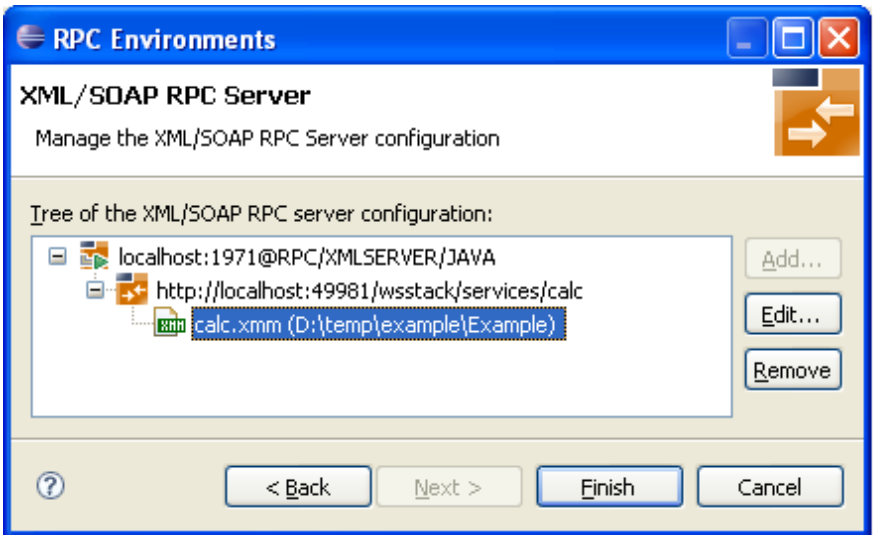
1 From the **Window** menu, choose **Preferences** to display a screen similar to the one below:



2 Select an XML/SOAP RPC Server environment or create a new one.



3 Choose **Next** to view or manage the configuration of Web services.



4 The second wizard page allows you to add, modify and remove service addresses and their configuration as well as add, modify and remove XMM file in the selected configuration. The graphical user interface supports drag-and-drop operations.

18 Examples

Example 1: Existing Natural Client that Connects to a Web Service

Natural Program

```
* CALC     : CLIENT                                                    *
* ---------------------------------------------------------------- *
DEFINE DATA
LOCAL
  01 #OPERATOR                (A1)
  01 #OPERAND1                (I4)
  01 #OPERAND2                (I4)
  01 #RESULT                  (I4)
*
  01 #MSG                     (A60)
END-DEFINE
* ---------------------------------------------------------------- *
ASSIGN #OPERAND1 = 12345
ASSIGN #OPERATOR = '+'
ASSIGN #OPERAND2 = 67890
ASSIGN #RESULT   = 0
*
CALLNAT 'CALC' #OPERATOR  (AD=O)
               #OPERAND1  (AD=O)
               #OPERAND2  (AD=O)
               #RESULT    (AD=A)
*
COMPRESS #OPERAND1 #OPERATOR #OPERAND2 '=' #RESULT
            INTO #MSG LEAVING NO SPACE
*
PRINT #MSG
* ---------------------------------------------------------------- *
END
```

- Use the IDL Extractor for Natural to get the IDL file. In the EntireX perspective, use **New > IDL Extractor for Natural** . In other perspectives, use **New > Other... > Software AG > IDL Extractor for Natural**.

Software AG IDL

```
Library 'Example' Is
 Program 'Calc' Is
  Define Data Parameter
   1 Operator        (A1) In
   1 Operand_1       (I4) In
   1 Operand_2       (I4) In
   1 Function_Result (I4) Out
  End-Define
```

- Select the IDL file and open the context menu.
- Choose **Web Service > Generate Web Service...**, and the XMM and WSDL file will be generated. See *Web Services Wrapper*.

Example.wsdl

```
<?xml version="1.0" encoding="utf-8"?>
<definitions name="example" ↩
targetNamespace="http://namespace.softwareag.com/entirex/xml/mapping"
   xmlns="http://schemas.xmlsoap.org/wsdl/" ↩
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/" ↩
xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
   xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/" ↩
xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
   xmlns:tns="http://namespace.softwareag.com/entirex/xml/mapping" ↩
xmlns:sn0="urn:com-softwareag-entirex-rpc:EXAMPLE">
   <types>
      <xsd:schema targetNamespace="urn:com-softwareag-entirex-rpc:EXAMPLE">
         <xsd:element name="CALC">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Operator" type="xsd:string"/>
                  <xsd:element name="Operand_1" type="xsd:int"/>
                  <xsd:element name="Operand_2" type="xsd:int"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
         <xsd:element name="CALCResponse">
            <xsd:complexType>
               <xsd:sequence>
                  <xsd:element name="Function_Result" type="xsd:int"/>
               </xsd:sequence>
            </xsd:complexType>
         </xsd:element>
      </xsd:schema>
   </types>
   <message name="CALCSoapIn">
      <part name="parameters" element="sn0:CALC"/>
```

```
   </message>
   <message name="CALCSoapOut">
      <part name="parameters" element="sn0:CALCResponse"/>
   </message>
   <portType name="EXAMPLEPort">
      <operation name="CALC">
         <input message="tns:CALCSoapIn"/>
         <output message="tns:CALCSoapOut"/>
      </operation>
   </portType>
   <binding name="EXAMPLESOAP11Binding" type="tns:EXAMPLEPort">
      <soap:binding style="document" ↩
transport="http://schemas.xmlsoap.org/soap/http"/>
      <operation name="CALC">
         <soap:operation soapAction="CALC"/>
         <input>
            <soap:body use="literal"/>
         </input>
         <output>
            <soap:body use="literal"/>
         </output>
      </operation>
   </binding>
   <binding name="EXAMPLESOAP12Binding" type="tns:EXAMPLEPort">
      <soap12:binding style="document" ↩
transport="http://schemas.xmlsoap.org/soap/http"/>
      <operation name="CALC">
         <soap12:operation soapAction="CALC"/>
         <input>
            <soap12:body use="literal"/>
         </input>
         <output>
            <soap12:body use="literal"/>
         </output>
      </operation>
   </binding>
   <service name="example">
      <port name="EXAMPLESOAP11Port" binding="tns:EXAMPLESOAP11Binding">
         <soap:address location="http://localhost:10010/wsstack/example"/>
      </port>
      <port name="EXAMPLESOAP12Port" binding="tns:EXAMPLESOAP12Binding">
         <soap12:address location="http://localhost:10010/wsstack/example"/>
      </port>
   </service>
</definitions>
```

- Create a service skeleton with Apache Axis.

```
java -classpath org.apache.axis.wsdl.WSDL2Java --server-side --skeletonDeploy true ↩
Example.wsdl
```

- And write an implementation of this service.

```
/**
 * Service.java
 *
 * Implementation of ExamplePort
 * generated by the Apache Axis WSDL2Java emitter.
 */

package com.softwareag.namespace;

public class Service implements ExamplePort
{
    public int calc(java.lang.String operator_, int operand_1, int operand_2)
    throws java.rmi.RemoteException
    {
    int result = 0;
        if (operator_.equals("+"))
    {
      result = operand_1 + operand_2;
    }
        else if (operator_.equals("-"))
    {
      result = operand_1 - operand_2;
    }
        else if (operator_.equals("*"))
    {
      result = operand_1 * operand_2;
    }
        else if (operator_.equals("/"))
    {
      result = operand_1 / operand_2;
    }
    return result;
    }
}
```

- Build and deploy the service (see Apache Axis documentation).
- Configure the RPC Server for XML/SOAP

entirex.xmlrpcserver.properties

```
# jaxp parameters
# if jaxp properties are not set in system properties
#
# xmlruntime configuration file
entirex.sdk.xml.runtime.configurationfile=.entirex.xmlrpcserver.configuration.xml
```

entirex.xmlrpcserver.configuration.xml

```
<?xml version="1.0" encoding="iso-8859-1" ?>
<EntireX
    xmlns="http://namespaces.softwareag.com/entirex/xml/runtime/configuration" ↩
version="7.1.1">
    <XmlRuntime Version="1">
         <BrokerInfo>
            <BrokerId>localhost:1971</BrokerId>
            <ServerAddress>RPC/SRV1/CALLNAT</ServerAddress>
        </BrokerInfo>
     <TargetServer name="http://localhost:8080/axis/services/ExamplePort">
            <XmmList>
                <!-the name of XMM file-->
                <Xmm name="./Calc.xmm" />
            </XmmList>
        </TargetServer>
    </XmlRuntime>
</EntireX>
```

- start the RPC Server for XML/SOAP:

```
java com.softwareag.entirex.xml.rt.XMLRPCServer
```

Example 2: Publish an EntireX RPC Server for Web Clients

Software AG IDL File

```
library 'UserList' is
    program 'Add' is
        define data parameter
        1 Name (AV) In
        end-define

   program 'Retrieve' is
        define data parameter
        1 Name (AV/V) Out
        end-define
```

To publish the EntireX RPC/SOAP server

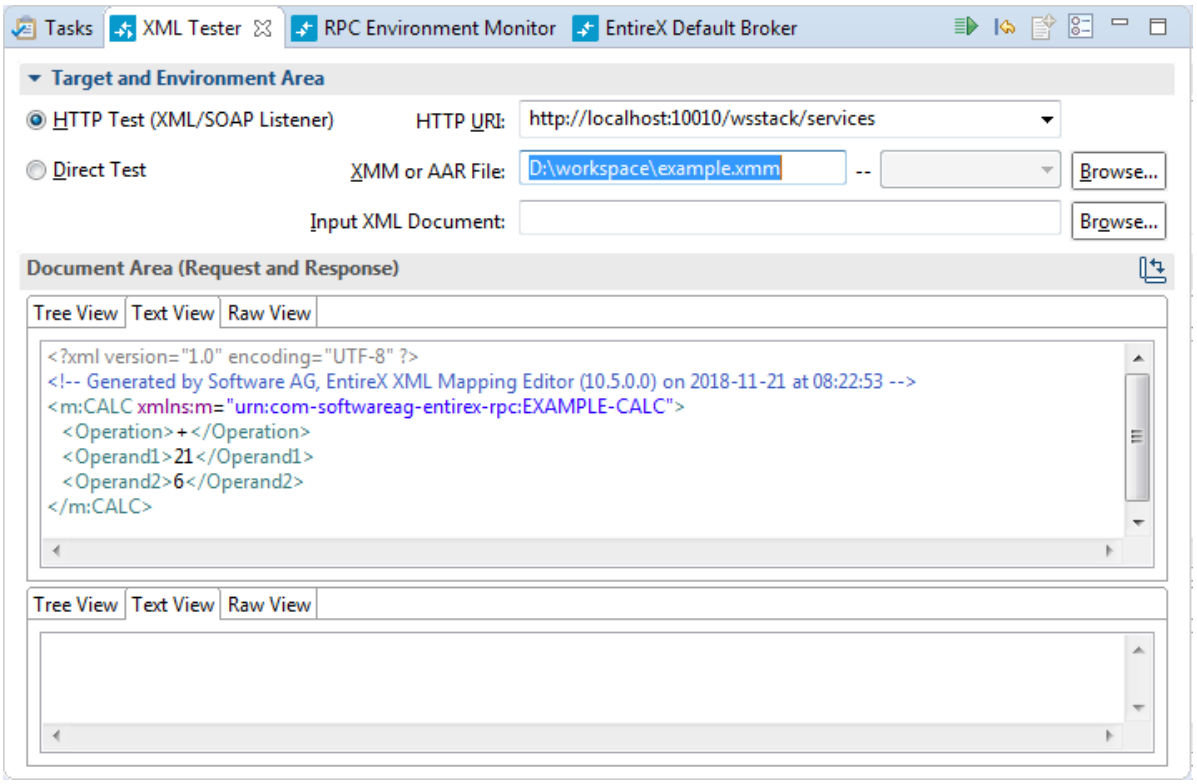
1 Create a new IDL file *User List* (Using: **New > Software AG IDL file** or **New > Others ... > Software AG > Software AG IDL file**).

2 Select the IDL file and generate the RPC server from the context menu.

3 Select the IDL file, and from the context menu choose **Web Service > Generate Web Service...**. Generate and deploy the AAR file with the Packaging Wizard.

4 Select the tab **XML Samples** in the EntireX XML Mapping Editor and save one or all sample documents.

5 Select the request document in the tree and open the XML Tester with the context menu.



6 Change the URL to the required address, for example: *http://localhost:10010/wsstack/services/example*. Choose **Send**. The response document will be displayed in the lower portion of the screen.

19 Frequently Asked Questions (FAQ) and Troubleshooting

Listener for XML/SOAP

- If you receive message `2000 0007: Incoming XML document is invalid`, there could be a difference between the mapping and the document, for example an element-preferred mapping (XMM file) does not match the SOAP document.
- Deploying/calling an EntireX Web service fails with `com.softwareag.wsstack.ui.deployment.DeploymentException: com.softwareag.entirex.xml.rt.WSSServiceLifeCycle`.

  For the Listener for XML/SOAP you need to set up a Web server and install Software AG Common Web Services Stack to this Web server. See *Installing Web Services Stack in a Web Server*.

  After successful installation: If *entirex.jar* was not added to *wsstack.war*, copy or upload *inst_dir*/*EntireX*/*classes*/*entirex.jar* to the *WEB-INF*/*lib* folder in the Web Services Stack application folder.

RPC Server for XML/SOAP

- Server does not start
  - Check classpath
  - If a file is not found:
    - Check location of property file, configuration file or XMM(s)
- RPC Server for XML/SOAP starts but receives an HTTP error for several reasons. Check the received information fault document. If there is no information fault document, start RPC Server for XML/SOAP again with trace (level = ADVANCED) and analyze the trace (look for the fault document).
- RPC Server for XML/SOAP gets the following error message: "`Caused by: java.lang.ClassCastException: org.apache.xerces.jaxp.SAXParserFactoryImpl cannot be cast to javax.xml.stream.XMLInputFactory`". To correct the error, modify the properties file by redefining the parameter for the XML stream parser as follows:

```
entirex.sdk.xml.runtime.xmlparserfactory=com.ctc.wstx.stax.WstxInputFactory
```

- RPC Server for XML/SOAP gets the following error message: "`Error 2000 0082: Unknown RPC library or RPC program. ...`". Check that the XMM file containing this library/program is added to the RPC Server for XML/SOAP configuration file, that is, the required `TargetServer` section is not commented out.

Note: The default configuration file (*entirex.xmlrpcserver.configuration.xml*) contains the sample section `TargetServer`, which is commented out.

In any case, check the following:

- Configuration file: TargetServer attribute “name” is not fully qualified
  - Name may require a domain specification
  - Name only contains target without service specification or/and with wrong port (non-default port)
- Mapping
  - Mapping does not match service requirements
  - SOAPAction value is wrong or undefined
- Connection cannot be established or connection failed
  - Wrong HTTP setting

    Change / set Java properties `http.proxyHost`, `http.proxyPort`, `httpsproxyHost`, `https.proxyPort`
  - Application error (service side)

RPC Server for XML/SOAP in the Software AG Runtime

Use file *<installation home>/profiles/CTP/configuration/logging/log_config.xml* to configure the logging settings. The log file *sag-osgi.log* or *wrapper.log* is written to directory *<installation home>/profiles/CTP/logs*.

To analyse the log, search for lines containing "EXX" and check the status/error:

EXX: Configuration Error: Reading configuration file fails.	
Explanation	The entirex.servers.properties cannot be loaded.
Action	The file must be located in directory *<installation home>\EntireX\etc\exx\workspace* and be accessible.

EXX: Reading configuration fails: File does not exist.

Explanation The file entirex.servers.properties cannot be found.

Action Validate the installation.

EXX: XML/SOAP RPC Server does not start. Reason: :1:".

Explanation The server cannot start for reason :1:.

Action

1. Validate the properties and configuration file settings (see also log).
2. Validate if the properties and configuration are correct.
3. Validate if the paths of XMM files in configuration file are correct and the files are accessible.

20 Reference - HTTP and Java Interface

Client Using the Java Interface

See also the delivered example `XMMInvoker` and `XMLRPCService` (EntireX XML/SOAP Runtime).

Step 1: Writing the Client Program

To write the client program

1 Initialize the `Broker` Object:

```
Broker broker = new Broker(brokerID, userID);
// if a logon should be issued
 broker.logon(password);
```

2 Initialize the `XMLRPCService` Object:

```
XMLRPCService service;
service = new XMLRPCService(xmmfilename);//constructor with XMM
```

or

```
XMLRPCService service;
service = new XMLRPCService(broker, serverName, xmmfilename);
```

3 Initialize the `Conversation` Object:

For one `XMLRPCService`, only one conversation may be used at a time.

```
  private Conversation conv;
  conv = new Conversation(service);
```

4 Assign the incoming XML document:

```
String xmlDocument = "<?xml version="1.0" encoding="iso8859-1"?>" +
"<CALC Operation=\"-\" Operand_1=\"1000000611\"
Operand_2=\"1000000288\"></CALC>";
```

5 Invoke the Service.

Non-conversational:

```
try
{
  String result = service.invokeXML(xmlDocument);
}
catch (XMLException e)
{
   // Error handling ...
}
catch (BrokerException e)
{
  // Error handling ...
}
catch (Exception e)
{
  // Error handling ...
}
```

Conversational:

```
try
{
  service.setConversation(conv);
  String result = service.invokeXML(xmlFromFile(filename));
  service.closeConversationCommit();
}
catch (XMLException e)
{
   // Error handling ...
}
catch (BrokerException e)
{
  // Error handling ...
}
catch (Exception e)
{
  // Error handling ...
}
```

The string result contains the returned document. It should be:

```
<CALC Function_result="899" />
```

Step 2: Running the Client Program

The definition of the Java classpath must include

- the generated XMM file, see *Generating an XMM File*
- the *entirex.jar* file (delivered in the directory <*EntireX Home*>/*classes*)
- the files for an XMLStreamParser, for example the delivered *wstx-asl.jar* and *stax-api.jar* (in the directory <*EntireX Home*>/*classes*)

The Java Interface

Class XMLRPCService

`XMLRPCService` extends `com.softwareag.entirex.aci.RPCService`. See `XMLRPCService` (EntireX XML/SOAP Runtime).

The HTTP Interface

The *Listener for XML/SOAP* supports HTTP `POST` Request and HTTP `GET` Request. The following HTTP headers and parameters are available. Use them from the *EntireX XML Tester* or other third-party XML tools:

Header/Parameter	Direction	Description
`exx-brokerID`	IN	If this attribute is set, it overwrites both the properties of the XMM file and the settings of the servlet initialization.
`exx-service`	IN	The service name is the triplet of server class/server name/service. If this attribute is set, it overwrites both the properties of the XMM file and the settings of the servlet initialization.
`exx-userID`	IN	The user ID specified here is used for calling the broker.
`exx-password`	IN	The password specified here is used for calling the broker.
`exx-use-security`	IN	Deprecated. An internal automatic routine makes this parameter obsolete. Possible values: `true` | `false`.
`exx-rpc-userID`	IN	The RPC user ID specified here is used for Natural Security. If no RPC user ID and no RPC password is defined, the values of `exx-userID` and `exx-password` are used for these values.
`exx-rpc-password`	IN	The RPC password specified here is used for Natural Security. If no RPC user ID and no RPC password is defined, the values of `exx-userID` and `exx-password` are used for these values.

Header/Parameter	Direction	Description
`exx-natural-security`	IN	Possible values: `true` | `false`. Determines whether Natural Security is used. See *Using the Broker and RPC User ID/Password*.
`exx-natural-library`	IN	The Natural library. Applicable only if `exx-natural-security` is "`true`". See *Using the Broker and RPC User ID/Password*.
`exx-use-codepage`	IN	Determines the encoding the *Listener for XML/SOAP* uses to communicate with EntireX Broker. See *RPC Call (Broker Request)* in the Listener for XML/SOAP documentation.
`exx-compresslevel`	IN	Sets the compression level. See *Using Compression* under *Writing Advanced Applications - EntireX Java ACI*.
`exx-compression`	IN	Possible values: `true` |`false`. See ***Using Compression***.
`exx-xml-sessionID`	IN OUT	This HTTP header is returned from the servlet to the client application. If the client returns it to the servlet with the preceding call, the same session will be used. For conversations, the `exx-conv` parameter is also required.
`exx-xml-info`	OUT	In this HTTP header additional information is returned.
`exx-xml-error`	OUT	In this HTTP header error information is returned.
`exx-conv`	IN	Possible values: `OPEN` | `COMMIT` | `BACKOUT`. Conversations can only be used in connection with sessions. If the session is interrupted, the conversation is deleted.
`exx-reliable`	IN	Possible values: `AUTO-COMMIT` | `OFF`. See ***Reliable RPC for XML/SOAP Wrapper***.
`exx-messageID`	OUT	The message ID of the RPC request (if available).
`exx-correlationID`	OUT	The message ID of the RPC reply (if available).

21 XML Structures and IDL-XML Mapping

To understand the functionality and usage of the XML Mapping Editor, it is necessary to look at the possible XML structures and how they are mapped to Software AG IDL.

XML Structure Description

An XML structure is the type of an XML document, that is, the blueprint to build or parse the XML document. Every program of every library within a Software AG IDL file corresponds to at least two XML structures: one for the incoming and one for the outgoing XML document. The Error or Fault directions are also described as XML structures. There are InErr and OutErr XML structures that are returned by the broker or server in case of broker or data errors or servicing problems. The XML structures all start with one root node (corresponding to the library/program combination of the Software AG IDL file), and all XML elements and attributes are linked under that root node and may be further cascaded.

The XML structure may be represented as a tree of XML structure nodes (so-called XML parts). For the EntireX XML/SOAP Wrapper, no cyclic XML structures (that is, non-tree XML structures) are allowed because mapping to Software AG IDL parts would be illegal. However, in general this is not a severe restriction because Software AG IDL parts may not be cyclic either.

The XML parts have various properties. Important properties are the node name (tag name) and the node type (element or attribute). Other properties are the data type and length, minimum and maximum occurrence, the default values, the encoding, or the used or defined namespace. XML parts may have links to IDL nodes (their IDL mapping links, see below).

In the XML Mapping Editor, the XML structures are displayed as node trees. For XML structures, sample XML documents can be generated to visualize the expected or generated XML documents.

Basic IDL-XML Mapping

Mapping between IDL and XML describes the location of the data in the XML documents that correspond to the RPC parameters. Getting data for the RPC request is called incoming direction, putting RPC response data into an XML document is called outgoing direction. RPC parameters can correspond to elements or attributes.

There are various basic strategies for generating elements or attributes from a given Software AG IDL. The most important strategies are:

- Element-preferred mapping: Model the library/program and every IDL parameter as an element. The elements are cascaded in the same way as their IDL counterparts. The tree of IDL parts and the tree of XML elements are very similar. Arrays or repeated groups may get envelope elements.

- Attribute-preferred mapping: Model the library/program as root element. Model Arrays and repeated groups as elements, possibly with envelope elements around them. Model all other IDL parameters as attributes.
- SOAP: Construct a SOAP message format according to the SOAP specification. Every Software AG IDL part relates to an element in the SOAP:Body portion. Further fine-tuning according to the specification may be done.

Some users prefer element modelling, others like to add attributes to existing elements wherever possible. To minimize the work of building XML structures in the XML Mapping Editor, default mappings are available. The XML Mapping Editor allows you to choose an element-preferred, an attribute-preferred or a SOAP-conformant strategy (plus various detail level switches). The element-preferred mode generates only element nodes, whereas the attribute-preferred mode generates attributes wherever possible.

Example

IDL File

```
Library 'EXAMPLE' Is
 Program 'CALC' Is
  Define Data Parameter
   1 Operation (A1) In
   1 Operand_1 (I4) In
   1 Operand_2 (I4) In
   1 Function_result (I4) Out
  End-Define
```

Element-preferred Mode

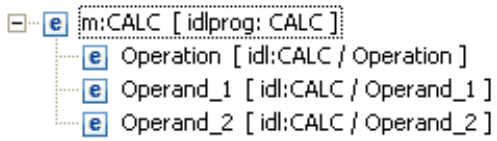
In the element-preferred mode, the IDL is mapped to the incoming XML document:

```
<CALC>
    <Operation> ... </Operation>
    <Operand_1> ... </Operand_1>
    <Operand_2> ... </Operand_2>
</CALC>
```

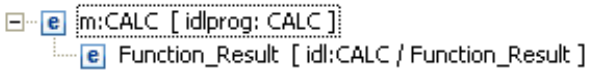
and the outgoing XML document:

```
<CALC>
    <Function_result> ... </Function_result>
</CALC>
```

The corresponding XML structure trees are:



and



Attribute-preferred Mode

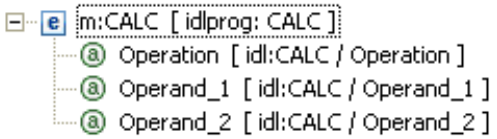
In the attribute-preferred mode, the Software AG IDL above is mapped to the incoming XML document:

```
<CALC Operation="..." Operand_1="..." Operand_2="..."/>
```

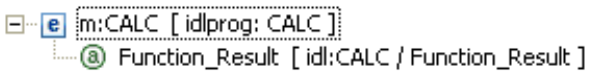
and the outgoing XML document.

```
<CALC Function_result="..."/>
```

The corresponding XML structure trees are:



and



SOAP-conformant Mapping

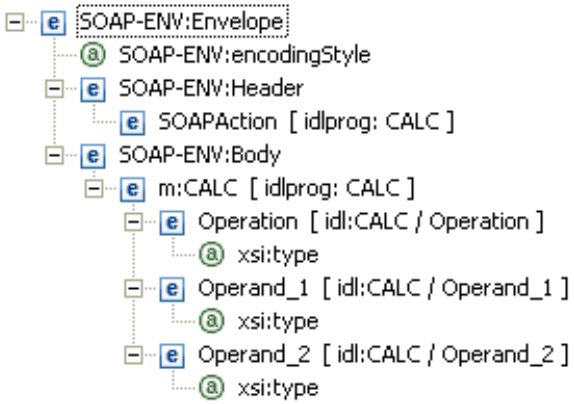
In SOAP-conformant mapping or the SOAP-conformant mode, the above Software AG IDL is mapped to the incoming XML document:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding">
   <SOAP-ENV:Header></SOAP-ENV:Header>
   <SOAP-ENV:Body>
      <CALC>
         <Operation xsi:type="SOAP-ENC:string">...</Operation>
         <Operand_1 xsi:type="SOAP-ENC:int">...</Operand_1>
         <Operand_2 xsi:type="SOAP-ENC:int">...</Operand_2>
      </CALC>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

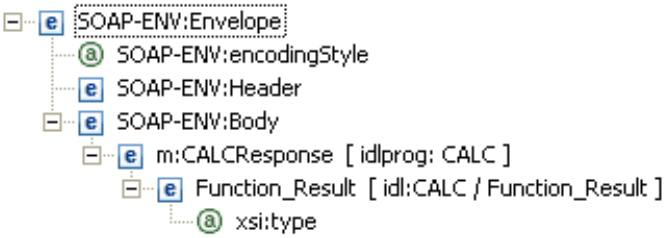
and the outgoing XML document:

```
<SOAP-ENV:Envelope xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding">
   <SOAP-ENV:Header></SOAP-ENV:Header>
   <SOAP-ENV:Body>
      <CALCResponse>
         <Function_result xsi:type="SOAP-ENC:int">...</Function_result>
      </CALCResponse>
   </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```

The corresponding XML structure trees:



and



Arrays

The IDL may contain array parameters, that is, basic data types that are to be repeated for a specified number of times. See following example:

```
...
1 Operation (A1/5) In
...
```

The `Operation` may be repeated 5 times. In this case `Operation` must correspond to an XML element, because with attributes the repetition cannot be modelled. The corresponding XML document may then contain up to 5 `Operation` elements:

```
...
<Operation> ... </Operation>
<Operation> ... </Operation>
<Operation> ... </Operation>
<Operation> ... </Operation>
<Operation> ... </Operation>
...
```

or it may contain a surrounding parent element (envelope) `Operation`:

```
...
<Operations>
   <Operation> ... </Operation>
   <Operation> ... </Operation>
   <Operation> ... </Operation>
   <Operation> ... </Operation>
   <Operation> ... </Operation>
</Operations>
...
```

A switch in the XML Mapping Editor determines whether arrays get a surrounding parent element or not.

There is a maximum of three dimensions per IDL array. Each of the dimensions can have upper and lower bounds defined. The format is as follows:

```
1 Operation (A1/3,6,8) In
```

which corresponds to a possible XML document:

```
<Operations1>
   <Operations2>
      <Operations3>
         <Operation> ... </Operation>
         ...
      </Operations3>
      ...
   </Operations2>
   ...
</Operations1>
```

and XML structure:

```
...
Operations1 (element)
   Operations2 (element, minocc=1, maxocc=3)
      Operations3 (element, minocc=1, maxocc=6)
         Operation (element, minocc=1, maxocc=8)
```

Groups

The IDL may contain entries that represent groups of parameters.

Example

```
Library 'EXAMPLE' Is
 Program 'ADD' Is
  Define Data Parameter
   1 Parameters In
    2 Operand_1 (I4)
    2 Operand_2 (I4)
   1 Function_result (I4) Out
  End-Define
```

The entry parameters are a group of two Operands. Groups will always be converted to XML elements; the group elements will be mapped either to elements or to attributes.

Element-preferred mode

```
<ADD>
   <Parameters>
      <Operand_1> "..." </Operand_1>
      <Operand_2> "..." </Operand_2>
   </Parameters>
</ADD>
```

Attribute-preferred mode

```
<ADD>
   <Parameters Operand_1="..." Operand_2="..."/>
</ADD>
```

Array of Groups

Groups can be used in arrays, for example:

```
1 myparams (/5,4) In
  2 Operation (I4)
  2 Description (A80)
  2 Mygroup
    3 Operand_1 (I2)
    3 Operand_2 (I2)
  2 Options (A1/4)
```

Using the element-preferred mode, this IDL structure may be mapped to:

```
<Myparms1>
   <Myparms2>
     <Myparms>
       <Operation> "..." </Operation>
       <Description> "..." </Description>
       <Mygroup>
         <Operand_1> "..." </Operand_1>
         <Operand_2> "..." </Operand_2>
       </Mygroup>
       <Options1>
         <Options>"..."</Options>
         ...
       </Options1>
     </Myparms>
     ...
   </Myparms2>
   ...
</Myparms1>
```

The corresponding XML structure for the element-preferred strategy is then:

```
...
Myparms1 (element)
  Myparms2 (element, minocc=1, maxocc=5)
    Myparms (element, minocc=1, maxocc=4)
    Operation (element, I4)
    Description (element, A80)
    Mygroup (element, group, minocc=1, maxocc=1)
      Operand_1 (element, I2)
      Operand_2 (element, I2)
   Options1 (element, minocc=1, maxocc=4)
      Options (element, A1)
```

Grouping XML Elements or Attributes

You can introduce new elements by grouping one or more existing elements or attributes.

This is especially useful when the IDL contains many simple data types that could be semantically grouped. This will increase the level of hierarchies in the XML document without affecting the IDL.

Example

```
Library 'EXAMPLE' Is
  Program 'SIMPLE' Is
    Define Data Parameter
      1 par1 (A1) In
      1 par2 (A1) In
      1 par21 (A1) In
      1 par22 (I1) In
      1 par23 (I4) In
      1 par3 (A1) In
      1 par31 (I2) In
      1 par32 (I4) In
      1 par4 (I1) In
      1 par5 (A1) In
    End-Define
```

will be transformed by the attribute-preferred strategy to:

```
<SIMPLE par1="..." par2="..." par21="..."
par22="..."

par3="..." par31="..." par32="..."
par4="..." par5="..."/>
```

or with the element-preferred strategy to:

```
<SIMPLE>
   <par1> ... </par1>
   <par2> ... </par2>
   <par21> ... </par21>
   <par22> ... </par22>
   <par23> ... </par23>
   <par3> ... </par3>
   <par31> ... </par31>
   <par32> ... </par32>
   <par4> ... </par4>
   <par5> ... </par5>
<SIMPLE>
```

You can now reorganize the XML structure, for example to:

```
<SIMPLE par1="..." par4="..." par5="...">
     <par2 par21="..." par22="..." par23="...">... </par2>
     <par3 par31="..." par32="..."> ... </par3>
</SIMPLE>
```

IN / OUT / IN OUT Parameters

The incoming XML request must correspond to the incoming `IN` and `IN OUT` IDL parameters, and the (created) outgoing XML response must contain the `IN OUT` and `OUT` IDL parameters. In the incoming XML structure, there is no difference between `IN` and `IN OUT` parameters; the same applies to `IN OUT` and `OUT` parameters for the outgoing XML document.

Make sure that all IDL parameters marked as `IN` are properly mapped to (incoming) XML parts. Otherwise, the XML/SOAP Runtime can only assign a null representation (value “0”, empty string, Boolean “false” etc.) to the respective unmapped IDL parameters. This is probably not the desired value to be sent to the server. The XML Mapping Editor issues a warning when unmapped IN parameters are found.

22 XML Schema Standards Conformance (XML/SOAP Wrapper)

XML Schema Parser Standards Conformance

The XML Schema styles "Garden of Eden", "Russian Doll", "Salami Slice" and "Venetian Blind" are supported. Each `xsd:element` declaration containing at least one `xsd:element` or `xsd:attribute` will be interpreted as an IDL program.

Supported Features

- Element declaration
- Model group definition: group
- Model groups: all, choice, sequence
- Attribute declarations
- Attribute group definitions
- Simple type definitions
- Complex type definitions
- Wildcards: any (limited)
- Type derivation (limited)
- Anonymous types
- Nested element declaration (Russian doll design)
- Separate symbol spaces for elements, types, groups and attribute groups
- Abstract and/or Equivalency classes (limited)
- Target namespace resolver
- xsi:type
- Built-in simple types (primitive; simple derivation such as “restriction”)
- Constraining facets
- Date/time as per ISO 8601
- Import
- Include (limited)

Unsupported Features

- Identity constraints: unique, key, keyref: cannot be translated into XML structure nodes
- Block
- Built-in simple types (e.g. union)
- Regular expressions in data types or patterns (only supported for date/time values)
- Substitution group
- Recursive data type definition

XML Schema Writer Standards Conformance

Supported Features

- Element declaration
- Attribute declarations
- Model groups: choice, sequence
- Nested element declaration (Russian doll design)
- Type derivation (limited)
- Anonymous types
- Simple type definitions
- Complex type definitions
- Built-in simple types (primitive; simple derivation such as “restriction”)
- Constraining facets
- Date/time as per ISO 8601 subset
- Annotations for XML mapping information
- Separate symbol spaces for elements, types, groups and attribute groups
- xsi:type (limited)

Unsupported Features

- Other Model groups or group definition (e.g. attribute groups)
- Wildcards: any
- Abstract and/or Equivalency classes (limited)

23 Reliable RPC for XML/SOAP Wrapper

Introduction to Reliable RPC

Reliable RPC is used to send messages to a persisted Broker service. The messages are described by an IDL program and contain only IN parameters. The client interface object and the server interface object are generated from the IDL file, using the EntireX XML/SOAP Wrapper. For the generation there are no options to set.

Reliable RPC is enabled at runtime. The client has to set the mode for reliable RPC.

For XML/SOAP Wrapper, the only supported mode is `AUTO_COMMIT`, which commits each message directly after sending it.

The server is implemented and configured in the same way as for normal RPC.

Writing a Client

The client has to set the parameter `exx-reliable` in the HTTP header or in the XML/SOAP payload. See ***The HTTP Interface*** for list of supported HTTP headers and parameters.

Broker Configuration

A Broker configuration with `PSTORE` is recommended. This enables the Broker to store the messages for more than one Broker session. These messages are still available after Broker restart. The attributes `STORE`, `PSTORE`, and `PSTORE-TYPE` in the Broker attribute file can be used to configure this feature. The lifetime of the messages and the status information can be configured with the attributes `UOW-DATA-LIFETIME` and `UOW-STATUS-LIFETIME`. Other attributes such as `MAX-MESSAGES-IN-UOW`, `MAX-UOWS` and `MAX-UOW-MESSAGE-LENGTH` may be used in addition to configure the units of work. See *Broker Attributes*.

24 SOAP and Web Services (Listener for XML/SOAP)

The EntireX XML/SOAP Wrapper supports SOAP version 1.1 and 1.2 and enables you to create Web services easily.

See also *Web Services Wrapper*.

SOAP Support

The XML Mapping Editor provides a default mapping for SOAP, both for the currently displayed program as well as for all programs in all libraries of the current IDL file. That is, the latter function can be used to easily SOAP-enable all programs in an IDL file. See *IDL to XML Mapping with the XML Mapping Editor*. The following mapping parameters can be chosen to fine-tune the SOAP default mapping:

- XML Schema URN for the XML Schema version to be used. This will define the xsd prefix in the `SOAP-ENV:Envelope` element, at the beginning of the SOAP message.
- Namespace URI of the "payload" element node (this is the singleton element under the `SOAP-ENV:Body` element). Various SOAP toolkits require certain namespace settings. The namespace prefix will always be "m".

Note that the SOAP default mapping also works for the "error" direction, where it defines the "standard" SOAP fault message structure, as described in the specification.

The XML/SOAP Runtime detects whether SOAP is used in incoming messages. If so, the special elements and attributes of the SOAP specification (`SOAP-ENV:Envelope`, `SOAP-ENV:Body`, `type`, `arrayType` etc.) are handled accordingly.

Web Services

Web services are programmable, distributed application components accessible on the Web using solely standard internet protocols. See *Introduction to Web Services in EntireX*.

You may create Web services with the EntireX Listener for XML/SOAP by wrapping IDL programs in SOAP message structures, as described in the preceding section, and then generating service descriptions for them using the WSDL Wizard. The service descriptions use the de facto standard WSDL (Web Service Description Language) format.

To make Web services out of your IDL programs

1 Select the IDL file that you want to turn into one or more Web services.

2 From the context menu, choose **Open With ... > EntireX XML Mapping Editor** and choose SOAP for mapping. Choose **Generate**.

3 Set up a servlet engine and configure the Listener for XML/SOAP. See *Listener for XML/SOAP*.

4 Select the XMM file. Open the context menu and choose **Generate Web Service from EntireX Mapping...**.

Or:

Select the IDL file. Open the context menu and choose **Web Service > Generate Web Service**.

5 The generated WSDL file and the deployment unit (AAR file) can be found in the same folder as the IDL file.

See *IDL Extractor for WSDL*.