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Bindings and Transports, Java Runtime

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Preface

What is Covered in This Book

This book discusses the bindings and transports supported by the Artix ESB Java Runtime. It describes how the combination of WSDL elements and configuration is used to set-up a binding or a transport. It also discusses the advantages of using each of the bindings and transports.

Who Should Read This Book

This book is intended for people who are developing the contracts for endpoints that are going to be deployed into the Artix ESB Java Runtime. It assumes a working knowledge of WSDL and XML. It also assumes a working knowledge of the underlying middleware technology being discussed.

How to Use This Book

This book is broken into two parts:

- Part I on page 19 describes how to work with the message bindings.
- Part II on page 59 describes how to work with the transports.

The Artix ESB Documentation Library

For information on the organization of the Artix ESB library, the document conventions used, and where to find additional resources, see Using the Artix ESB Library[1].
See the entire documentation set at the Artix Product Documentation Web Site[2]

[1] http://documentation.progress.com/output/Iona/artix/5.6/library_intro/library_intro.pdf
[2] http://communities.progress.com/pcom/docs/DOC-106903

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Part I. Bindings

Understanding Bindings in WSDL

Bindings map the logical messages used to define a service into a concrete payload format that can be transmitted and received by an endpoint.

Overview

Bindings provide a bridge between the logical messages used by a service to a concrete data format that an endpoint uses in the physical world. They describe how the logical messages are mapped into a payload format that is used on the wire by an endpoint. It is within the bindings that details such as parameter order, concrete data types, and return values are specified. For example, the parts of a message can be reordered in a binding to reflect the order required by an RPC call. Depending on the binding type, you can also identify which of the message parts, if any, represent the return type of a method.

Port types and bindings

Port types and bindings are directly related. A port type is an abstract definition of a set of interactions between two logical services. A binding is a concrete definition of how the messages used to implement the logical services will be instantiated in the physical world. Each binding is then associated with a set of network details that finish the definition of one endpoint that exposes the logical service defined by the port type.

To ensure that an endpoint defines only a single service, WSDL requires that a binding can only represent a single port type. For example, if you had a contract with two port types, you could not write a single binding that mapped both of them into a concrete data format. You would need two bindings.

However, WSDL allows for a port type to be mapped to several bindings. For example, if your contract had a single port type, you could map it into two or more bindings. Each binding could alter how the parts of the message are mapped or they could specify entirely different payload formats for the message.

The WSDL elements

Bindings are defined in a contract using the WSDL`binding` element. The binding element has a single attribute, `name`, that specifies a unique name for the binding. The value of this attribute is used to associate the binding with an endpoint as discussed in *Defining Your Logical Interfaces*.

The actual mappings are defined in the children of the `binding` element. These elements vary depending on the type of payload format you decide to

use. The different payload formats and the elements used to specify their mappings are discussed in the following chapters.

Adding to a contract

Artix provides a number of tools for adding bindings to your contracts. These bindings can be generated using command line tools.

The tools will add the proper elements to your contract for you. However, it is recommended that you have some knowledge of how the different types of bindings work.

You can also add a binding to a contract using any text editor. When you hand edit a contract, you are responsible for ensuring that the contract is valid.

Supported bindings

The Artix ESB Java Runtime supports the following bindings:

- SOAP 1.1
- SOAP 1.2
- CORBA
- Pure XML

Using SOAP 1.1 Messages

Artix ESB provides a tool to generate a SOAP 1.1 binding which does not use any SOAP headers. However, you can add SOAP headers to your binding using any text or XML editor.

Adding a SOAP 1.1 Binding

Using wsdl2soap

To generate a SOAP 1.1 binding using **wsdl2soap** use the following command:

`wsdl2soap` {-i *`port-type-name`*} [-b *`binding-name`*] [-d *`output-directory`*] [-o *`output-file`*] [-n *`soap-body-namespace`*] [-style (document/rpc)] [-use (literal/encoded)] [-v] [[-verbose] | [-quiet]] *`wsdlurl`*

The command has the following options:

Option	Interpretation
`-i` *`port-type-name`*	Specifies the `portType` element for which a binding is generated.
`wsdlurl`	The path and name of the WSDL file containing the `portType` element definition.

The tool has the following optional arguments:

Option	Interpretation
`-b` *`binding-name`*	Specifies the name of the generated SOAP binding.
`-d` *`output-directory`*	Specifies the directory to place the generated WSDL file.
`-o` *`output-file`*	Specifies the name of the generated WSDL file.
`-n` *`soap-body-namespace`*	Specifies the SOAP body namespace when the style is RPC.
`-style` (`document`/`rpc`)	Specifies the encoding style (document or RPC) to use in the SOAP binding. The default is `document`.
`-use` (`literal`/`encoded`)	Specifies the binding use (encoded or literal) to use in the SOAP binding. The default is `literal`.
`-v`	Displays the version number for the tool.
`-verbose`	Displays comments during the code generation process.
`-quiet`	Suppresses comments during the code generation process.

The `-i port-type-name` and `wsdlurl` arguments are required. If the `-style rpc` argument is specified, the `-n soap-body-namspace` argument is also required. All other arguments are optional and may be listed in any order.

Important

wsdl2soap does not support the generation of `document/encoded` SOAP bindings.

For more information see wsdl2soap in *Artix ESB Java Runtime Command Reference*.

Example

If your system has an interface that takes orders and offers a single operation to process the orders it is defined in a WSDL fragment similar to the one shown in Example 1 on page 25.

Example 1. Ordering System Interface

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>

<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>
...
</definitions>
```

The SOAP binding generated for `orderWidgets` is shown in Example 2 on page 26.

Example 2. SOAP 1.1 Binding for `orderWidgets`

```
<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap:operation soapAction="" style="document"/>
      <input name="order">
        <soap:body use="literal"/>
      </input>
      <output name="bill">
        <soap:body use="literal"/>
      </output>
      <fault name="sizeFault">
        <soap:body use="literal"/>
      </fault>
  </operation>
</binding>
```

This binding specifies that messages are sent using the `document/literal` message style.

Adding SOAP Headers to a SOAP 1.1 Binding

Overview

SOAP headers are defined by adding `soap:header` elements to your default SOAP 1.1 binding. The `soap:header` element is an optional child of the `input`, `output`, and `fault` elements of the binding. The SOAP header becomes part of the parent message. A SOAP header is defined by specifying a message and a message part. Each SOAP header can only contain one message part, but you can insert as many SOAP headers as needed.

Syntax

The syntax for defining a SOAP header is shown in Example 3 on page 27. The `message` attribute of `soap:header` is the qualified name of the message from which the part being inserted into the header is taken. The `part` attribute is the name of the message part inserted into the SOAP header. Because SOAP headers are always document style, the WSDL message part inserted into the SOAP header must be defined using an element. Together the `message` and the `part` attributes fully describe the data to insert into the SOAP header.

Example 3. SOAP Header Syntax

```
<binding name="headwig">
  <soap:binding style="document"
                transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="weave">
      <soap:operation soapAction="" style="document"/>
      <input name="grain">
        <soap:body .../>
        <soap:header message="QName" part="partName"/>
      </input>
...
</binding>
```

As well as the mandatory `message` and `part` attributes, `soap:header` also supports the `namespace`, the `use`, and the `encodingStyle` attributes. These optional attributes function the same for `soap:header` as they do for `soap:body`.

Splitting messages between body and header

The message part inserted into the SOAP header can be any valid message part from the contract. It can even be a part from the parent message which is being used as the SOAP body. Because it is unlikely that you would want to send information twice in the same message, the SOAP binding provides

a means for specifying the message parts that are inserted into the SOAP body.

The `soap:body` element has an optional attribute, `parts`, that takes a space delimited list of part names. When `parts` is defined, only the message parts listed are inserted into the SOAP body. You can then insert the remaining parts into the SOAP header.

Example

Example 4 on page 28 shows a modified version of the `orderWidgets` service shown in Example 1 on page 25. This version has been modified so that each order has an xsd:base64binary value placed in the SOAP header of the request and response. The SOAP header is defined as being the `keyVal` part from the `widgetKey` message. In this case you are responsible for adding the SOAP header to your application logic because it is not part of the input or output message.

Example 4. SOAP 1.1 Binding with a SOAP Header

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<types>
  <schema targetNamespace="http://widgetVendor.com/types/widgetTypes"
          xmlns="http://www.w3.org/2001/XMLSchema"
          xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <element name="keyElem" type="xsd:base64Binary"/>
  </schema>
</types>

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>
<message name="widgetKey">
  <part name="keyVal" element="xsd1:keyElem"/>
```

```
</message>

<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>

<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap:operation soapAction="" style="document"/>
      <input name="order">
        <soap:body use="literal"/>
        <soap:header message="tns:widgetKey" part="keyVal"/>
      </input>
      <output name="bill">
        <soap:body use="literal"/>
        <soap:header message="tns:widgetKey" part="keyVal"/>
      </output>
      <fault name="sizeFault">
        <soap:body use="literal"/>
      </fault>
  </operation>
</binding>
...
</definitions>
```

You can modify Example 4 on page 28 so that the header value is a part of the input and output messages as shown in Example 5 on page 29. In this case `keyVal` is a part of the input and output messages. In the `soap:body` element's `parts` attribute specifies that `keyVal` cannot be inserted into the body. However, it is inserted into the SOAP header.

Example 5. SOAP 1.1 Binding for orderWidgets with a SOAP Header

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<types>
```

```
  <schema targetNamespace="http://widgetVendor.com/types/widgetTypes"
          xmlns="http://www.w3.org/2001/XMLSchema"
          xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <element name="keyElem" type="xsd:base64Binary"/>
  </schema>
</types>

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
  <part name="keyVal" element="xsd1:keyElem"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
  <part name="keyVal" element="xsd1:keyElem"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>

<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>

<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap:operation soapAction="" style="document"/>
      <input name="order">
        <soap:body use="literal" parts="numOrdered"/>
        <soap:header message="tns:widgetOrder" part="keyVal"/>
      </input>
      <output name="bill">
        <soap:body use="literal" parts="bill"/>
        <soap:header message="tns:widgetOrderBill" part="keyVal"/>
      </output>
      <fault name="sizeFault">
        <soap:body use="literal"/>
      </fault>
  </operation>
</binding>
...
</definitions>
```

Using SOAP 1.2 Messages

Artix ESB provides tools to generate a SOAP 1.2 binding which does not use any SOAP headers. You can add SOAP headers to your binding using any text or XML editor.

Adding a SOAP 1.2 Binding to a WSDL Document

Using wsdl2soap

To generate a SOAP 1.2 binding using **wsdl2soap** use the following command:

`wsdl2soap` {-i *`port-type-name`*} [-b *`binding-name`*] {-soap12} [-d *`output-directory`*] [-o *`output-file`*] [-n *`soap-body-namespace`*] [-style (document/rpc)] [-use (literal/encoded)] [-v] [[-verbose] | [-quiet]] *`wsdlurl`*

The tool has the following required arguments:

Option	Interpretation
`-i` *`port-type-name`*	Specifies the `portType` element for which a binding is generated.
`-soap12`	Specifies that the generated binding uses SOAP 1.2.
`wsdlurl`	The path and name of the WSDL file containing the `portType` element definition.

The tool has the following optional arguments:

Option	Interpretation
`-b` *`binding-name`*	Specifies the name of the generated SOAP binding.
`-soap12`	Specifies that the generated binding will use SOAP 1.2.
`-d` *`output-directory`*	Specifies the directory to place the generated WSDL file.
`-o` *`output-file`*	Specifies the name of the generated WSDL file.
`-n` *`soap-body-namespace`*	Specifies the SOAP body namespace when the style is RPC.
`-style` (`document`/`rpc`)	Specifies the encoding style (document or RPC) to use in the SOAP binding. The default is `document`.
`-use` (`literal`/`encoded`)	Specifies the binding use (encoded or literal) to use in the SOAP binding. The default is `literal`.
`-v`	Displays the version number for the tool.

Option	Interpretation
`-verbose`	Displays comments during the code generation process.
`-quiet`	Suppresses comments during the code generation process.

The `-i` *`port-type-name`* and *`wsdlurl`* arguments are required. If the `-style rpc` argument is specified, the `-n` *`soap-body-namspace`* argument is also required. All other arguments are optional and can be listed in any order.

Important

wsdl2soap does not support the generation of `document/encoded` SOAP 1.2 bindings.

For more information see wsdl2soap in *Artix ESB Java Runtime Command Reference*.

Example

If your system has an interface that takes orders and offers a single operation to process the orders it is defined in a WSDL fragment similar to the one shown in Example 6 on page 33.

Example 6. Ordering System Interface

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>

<portType name="orderWidgets">
```

```
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>
...
</definitions>
```

The SOAP binding generated for `orderWidgets` is shown in Example 7 on page 34.

Example 7. SOAP 1.2 Binding for orderWidgets

```
<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap12:operation soapAction="" style="document"/>
      <input name="order">
        <soap12:body use="literal"/>
      </input>
      <output name="bill">
        <wsoap12:body use="literal"/>
      </output>
      <fault name="sizeFault">
        <soap12:body use="literal"/>
      </fault>
  </operation>
</binding>
```

This binding specifies that messages are sent using the `document/literal` message style.

Adding Headers to a SOAP 1.2 Message

Overview

SOAP message headers are defined by adding `soap12:header` elements to your SOAP 1.2 message. The `soap12:header` element is an optional child of the `input`, `output`, and `fault` elements of the binding. The SOAP header becomes part of the parent message. A SOAP header is defined by specifying a message and a message part. Each SOAP header can only contain one message part, but you can insert as many headers as needed.

Syntax

The syntax for defining a SOAP header is shown in Example 8 on page 35.

Example 8. SOAP Header Syntax

```
<binding name="headwig">
  <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="weave">
      <soap12:operation soapAction="" style="documment"/>
      <input name="grain">
        <soap12:body .../>
        <soap12:header message="QName" part="partName"
                       use="literal|encoded"
                        encodingStyle="encodingURI"
                        namespace="namespaceURI" />
      </input>
...
</binding>
```

The `soap12:header` element's attributes are described in Table 1 on page 35.

Table 1. `soap12:header` Attributes

Attribute	Description
`message`	A required attribute specifying the qualified name of the message from which the part being inserted into the header is taken.
`part`	A required attribute specifying the name of the message part inserted into the SOAP header.
`use`	Specifies if the message parts are to be encoded using encoding rules. If set to `encoded` the message parts are encoded using the encoding rules specified by the value of the `encodingStyle` attribute. If set to `literal`, the message parts are defined by the schema types referenced.
`encodingStyle`	Specifies the encoding rules used to construct the message.

Attribute	Description
`namespace`	Defines the namespace to be assigned to the header element serialized with `use="encoded"`.

Splitting messages between body and header

The message part inserted into the SOAP header can be any valid message part from the contract. It can even be a part from the parent message which is being used as the SOAP body. Because it is unlikely that you would send information twice in the same message, the SOAP 1.2 binding provides a means for specifying the message parts that are inserted into the SOAP body.

The `soap12:body` element has an optional attribute, `parts`, that takes a space delimited list of part names. When `parts` is defined, only the message parts listed are inserted into the body of the SOAP 1.2 message. You can then insert the remaining parts into the message's header.

Note

When you define a SOAP header using parts of the parent message, Artix ESB automatically fills in the SOAP headers for you.

Example

Example 9 on page 36 shows a modified version of the `orderWidgets` service shown in Example 6 on page 33. This version is modified so that each order has an xsd:base64binary value placed in the header of the request and the response. The header is defined as being the `keyVal` part from the `widgetKey` message. In this case you are responsible for adding the application logic to create the header because it is not part of the input or output message.

Example 9. SOAP 1.2 Binding with a SOAP Header

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<types>
  <schema targetNamespace="http://widgetVendor.com/types/widgetTypes"
```

```
           xmlns="http://www.w3.org/2001/XMLSchema"
           xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <element name="keyElem" type="xsd:base64Binary"/>
  </schema>
</types>

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>
<message name="widgetKey">
  <part name="keyVal" element="xsd1:keyElem"/>
</message>

<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>

<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap12:operation soapAction="" style="document"/>
      <input name="order">
        <soap12:body use="literal"/>
        <soap12:header message="tns:widgetKey" part="keyVal"/>
      </input>
      <output name="bill">
        <soap12:body use="literal"/>
        <soap12:header message="tns:widgetKey" part="keyVal"/>
      </output>
      <fault name="sizeFault">
        <soap12:body use="literal"/>
      </fault>
  </operation>
</binding>
...
</definitions>
```

You can modify Example 9 on page 36 so that the header value is a part of the input and output messages, as shown in Example 10 on page 38. In this

case `keyVal` is a part of the input and output messages. In the `soap12:body` elements the `parts` attribute specifies that `keyVal` should not be inserted into the body. However, it is inserted into the header.

Example 10. SOAP 1.2 Binding for orderWidgets with a SOAP Header

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
    xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/">

<types>
  <schema targetNamespace="http://widgetVendor.com/types/widgetTypes"
          xmlns="http://www.w3.org/2001/XMLSchema"
          xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <element name="keyElem" type="xsd:base64Binary"/>
  </schema>
</types>

<message name="widgetOrder">
  <part name="numOrdered" type="xsd:int"/>
  <part name="keyVal" element="xsd1:keyElem"/>
</message>
<message name="widgetOrderBill">
  <part name="price" type="xsd:float"/>
  <part name="keyVal" element="xsd1:keyElem"/>
</message>
<message name="badSize">
  <part name="numInventory" type="xsd:int"/>
</message>

<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
    <fault message="tns:badSize" name="sizeFault"/>
  </operation>
</portType>

<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="placeWidgetOrder">
      <soap12:operation soapAction="" style="document"/>
      <input name="order">
```

```
        <soap12:body use="literal" parts="numOrdered"/>
        <soap12:header message="tns:widgetOrder" part="keyVal"/>
      </input>
      <output name="bill">
        <soap12:body use="literal" parts="bill"/>
        <soap12:header message="tns:widgetOrderBill" part="keyVal"/>
      </output>
      <fault name="sizeFault">
        <soap12:body use="literal"/>
      </fault>
  </operation>
</binding>
...
</definitions>
```

Sending Binary Data Using SOAP with Attachments

SOAP attachments provide a mechanism for sending binary data as part of a SOAP message. Using SOAP with attachments requires that you define your SOAP messages as MIME multipart messages.

Overview

SOAP messages generally do not carry binary data. However, the W3C SOAP 1.1 specification allows for using MIME multipart/related messages to send binary data in SOAP messages. This technique is called using SOAP with attachments. SOAP attachments are defined in the W3C's *SOAP Messages with Attachments Note*[1].

Namespace

The WSDL extensions used to define the MIME multipart/related messages are defined in the namespace `http://schemas.xmlsoap.org/wsdl/mime/`.

In the discussion that follows, it is assumed that this namespace is prefixed with mime. The entry in the WSDL `definitions` element to set this up is shown in Example 11 on page 41.

Example 11. MIME Namespace Specification in a Contract

```
xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
```

Changing the message binding

In a default SOAP binding, the first child element of the `input`, `output`, and `fault` elements is a `soap:body` element describing the body of the SOAP message representing the data. When using SOAP with attachments, the `soap:body` element is replaced with a `mime:multipartRelated` element.

Note

WSDL does not support using `mime:multipartRelated` for `fault` messages.

The `mime:multipartRelated` element tells Artix ESB that the message body is a multipart message that potentially contains binary data. The contents of the element define the parts of the message and their contents.

[1] http://www.w3.org/TR/SOAP-attachments

`mime:multipartRelated` elements contain one or more `mime:part` elements that describe the individual parts of the message.

The first `mime:part` element must contain the `soap:body` element that would normally appear in a default SOAP binding. The remaining `mime:part` elements define the attachments that are being sent in the message.

Describing a MIME multipart message

MIME multipart messages are described using a `mime:multipartRelated` element that contains a number of `mime:part` elements. To fully describe a MIME multipart message you must do the following:

1. Inside the `input` or `output` message you are sending as a MIME multipart message, add a `mime:mulipartRelated` element as the first child element of the enclosing message.
2. Add a `mime:part` child element to the `mime:multipartRelated` element and set its `name` attribute to a unique string.
3. Add a `soap:body` element as the child of the `mime:part` element and set its attributes appropriately.

   Tip

   If the contract had a default SOAP binding, you can copy the `soap:body` element from the corresponding message from the default binding into the MIME multipart message.

4. Add another `mime:part` child element to the `mime:multipartReleated` element and set its `name` attribute to a unique string.
5. Add a `mime:content` child element to the `mime:part` element to describe the contents of this part of the message.

   To fully describe the contents of a MIME message part the `mime:content` element has the following attributes:

Table 2. `mime:content` Attributes

Attribute	Description
`part`	Specifies the name of the WSDL message `part`, from the parent message definition, that is used as the content of this part of the MIME multipart message being placed on the wire.

Attribute	Description
`type`	The MIME type of the data in this message part. MIME types are defined as a type and a subtype using the syntax *`type/subtype`*. There are a number of predefined MIME types such as `image/jpeg` and `text/plain`. The MIME types are maintained by the Internet Assigned Numbers Authority (IANA) and described in detail in *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies*[2] and *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*[3].

6. For each additional MIME part, repeat steps Step 4 on page 42 and Step 5 on page 42.

Example

Example 12 on page 43 shows a WSDL fragment defining a service that stores X-rays in JPEG format. The image data, `xRay`, is stored as an xsd:base64binary and is packed into the MIME multipart message's second part, `imageData`. The remaining two parts of the input message, `patientName` and `patientNumber`, are sent in the first part of the MIME multipart image as part of the SOAP body.

Example 12. Contract using SOAP with Attachments

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="XrayStorage"
    targetNamespace="http://mediStor.org/x-rays"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:tns="http://mediStor.org/x-rays"
    xmlns:mime="http://schemas.xmlsoap.org/wsdl/mime/"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema">

  <message name="storRequest">
    <part name="patientName" type="xsd:string"/>
    <part name="patientNumber" type="xsd:int"/>
    <part name="xRay" type="xsd:base64Binary"/>
  </message>
  <message name="storResponse">
    <part name="success" type="xsd:boolean"/>
  </message>

  <portType name="xRayStorage">
    <operation name="store">
```

[2] ftp://ftp.isi.edu/in-notes/rfc2045.txt
[3] ftp://ftp.isi.edu/in-notes/rfc2046.txt

```
      <input message="tns:storRequest" name="storRequest"/>
      <output message="tns:storResponse" name="storResponse"/>
    </operation>
  </portType>

  <binding name="xRayStorageBinding" type="tns:xRayStorage">
    <soap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
      <operation name="store">
      <soap:operation soapAction="" style="document"/>
      <input name="storRequest">
        <mime:multipartRelated>
          <mime:part name="bodyPart">
            <soap:body use="literal"/>
          </mime:part>
          <mime:part name="imageData">
            <mime:content part="xRay" type="image/jpeg"/>
          </mime:part>
        </mime:multipartRelated>
      </input>
      <output name="storResponse">
        <soap:body use="literal"/>
      </output>
    </operation>
  </binding>

  <service name="xRayStorageService">
    <port binding="tns:xRayStorageBinding" name="xRayStoragePort">
      <soap:address location="http://localhost:9000"/>
    </port>
  </service>
</definitions>
```

Sending Binary Data with SOAP MTOM

SOAP Message Transmission Optimization Mechanism (MTOM) replaces SOAP with attachments as a mechanism for sending binary data as part of an XML message. Using MTOM with Artix ESB requires adding the correct schema types to a service's contract and enabling the MTOM optimizations.

SOAP Message Transmission Optimization Mechanism (MTOM) specifies an optimized method for sending binary data as part of a SOAP message. Unlike SOAP with Attachments, MTOM requires the use of XML-binary Optimized Packaging (XOP) packages for transmitting binary data. Using MTOM to send binary data does not require you to fully define the MIME Multipart/Related message as part of the SOAP binding. It does, however, require that you do the following:

1. Annotate the data that you are going to send as an attachment.

   You can annotate either your WSDL or the Java class that implements your data.

2. Enable the runtime's MTOM support.

   This can be done either programmatically or through configuration.

3. Develop a `DataHandler` for the data being passed as an attachment.

Note

Developing `DataHandler`s is beyond the scope of this book.

Annotating Data Types to use MTOM

Overview

In WSDL, when defining a data type for passing along a block of binary data, such as an image file or a sound file, you define the element for the data to be of type xsd:base64Binary. By default, any element of type xsd:base64Binary results in the generation of a byte[] which can be serialized using MTOM. However, the default behavior of the code generators does not take full advantage of the serialization.

In order to fully take advantage of MTOM you must add annotations to either your service's WSDL document or the JAXB class that implements the binary data structure. Adding the annotations to the WSDL document forces the code generators to generate streaming data handlers for the binary data. Annotating the JAXB class involves specifying the proper content types and might also involve changing the type specification of the field containing the binary data.

WSDL first

Example 13 on page 46 shows a WSDL document for a Web service that uses a message which contains one string field, one integer field, and a binary field. The binary field is intended to carry a large image file, so it is not appropriate to send it as part of a normal SOAP message.

Example 13. Message for MTOM

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="XrayStorage"
    targetNamespace="http://mediStor.org/x-rays"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:tns="http://mediStor.org/x-rays"
    xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
    xmlns:xsd1="http://mediStor.org/types/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema">

  <types>
    <schema targetNamespace="http://mediStor.org/types/"
            xmlns="http://www.w3.org/2001/XMLSchema">
      <complexType name="xRayType">
        <sequence>
          <element name="patientName" type="xsd:string" />
          <element name="patientNumber" type="xsd:int" />
          <element name="imageData" type="xsd:base64Binary" />
        </sequence>
      </complexType>
      <element name="xRay" type="xsd1:xRayType" />
```

```
    </schema>
  </types>

  <message name="storRequest">
    <part name="record" element="xsd1:xRay"/>
  </message>
  <message name="storResponse">
    <part name="success" type="xsd:boolean"/>
  </message>

  <portType name="xRayStorage">
    <operation name="store">
      <input message="tns:storRequest" name="storRequest"/>
      <output message="tns:storResponse" name="storResponse"/>
    </operation>
  </portType>

  <binding name="xRayStorageSOAPBinding" type="tns:xRayStorage">
    <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
    <operation name="store">
      <soap12:operation soapAction="" style="document"/>
      <input name="storRequest">
        <soap12:body use="literal"/>
      </input>
      <output name="storResponse">
        <soap12:body use="literal"/>
      </output>
    </operation>
  </binding>
  ...
</definitions>
```

If you want to use MTOM to send the binary part of the message as an optimized attachment you must add the `xmime:expectedContentTypes` attribute to the element containing the binary data. This attribute is defined in the `http://www.w3.org/2005/05/xmlmime` namespace and specifies the MIME types that the element is expected to contain. You can specify a comma separated list of MIME types. The setting of this attribute changes how the code generators create the JAXB class for the data. For most MIME types, the code generator creates a `DataHandler`. Some MIME types, such as those for images, have defined mappings.

Note

The MIME types are maintained by the Internet Assigned Numbers Authority (IANA) and are described in detail in *Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message*

Bodies[1] and *Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types*[2].

Tip

For most uses you specify `application/octet-stream`.

Example 14 on page 48 shows how you can modify xRayType from Example 13 on page 46 for using MTOM.

Example 14. Binary Data for MTOM

```
...
  <types>
    <schema targetNamespace="http://mediStor.org/types/"
            xmlns="http://www.w3.org/2001/XMLSchema"
            xmlns:xmime="http://www.w3.org/2005/05/xmlmime">
      <complexType name="xRayType">
        <sequence>
          <element name="patientName" type="xsd:string" />
          <element name="patientNumber" type="xsd:int" />
          <element name="imageData" type="xsd:base64Binary"
                   xmime:expectedContentTypes="application/octet-stream"/>
        </sequence>
      </complexType>
      <element name="xRay" type="xsd1:xRayType" />
    </schema>
  </types>
...
```

The generated JAXB class generated for xRayType no longer contains a byte[]. Instead the code generator sees the `xmime:expectedContentTypes` attribute and generates a `DataHandler` for the imageData field.

Note

You do not need to change the `binding` element to use MTOM. The runtime makes the appropriate changes when the data is sent.

Java first

If you are doing Java first development you can make your JAXB class MTOM ready by doing the following:

[1] ftp://ftp.isi.edu/in-notes/rfc2045.txt
[2] ftp://ftp.isi.edu/in-notes/rfc2046.txt

1. Make sure the field holding the binary data is a `DataHandler`.
2. Add the `@XmlMimeType()` annotation to the field containing the data you want to stream as an MTOM attachment.

Example 15 on page 49 shows a JAXB class annotated for using MTOM.

Example 15. JAXB Class for MTOM

```
@XmlType
public class XRayType {
    protected String patientName;
    protected int patientNumber;
    @XmlMimeType("application/octet-stream")
    protected DataHandler imageData;
  ...
}
```

Enabling MTOM

By default the Artix ESB runtime does not enable MTOM support. It sends all binary data as either part of the normal SOAP message or as an unoptimized attachment. You can activate MTOM support either programmatically or through the use of configuration.

Using JAX-WS APIs

Both service providers and consumers must have the MTOM optimizations enabled. The JAX-WS APIs offer different mechanisms for each type of endpoint.

Service provider

If you published your service provider using the JAX-WS APIs you enable the runtime's MTOM support as follows:

1. Access the `Endpoint` object for your published service.

   The easiest way to access the `Endpoint` object is when you publish the endpoint. For more information see *Publishing a Service* in *Developing Artix® Applications with JAX-WS*.

2. Get the SOAP binding from the `Endpoint` using its `getBinding()` method, as shown in Example 16 on page 51.

   Example 16. Getting the SOAP Binding from an Endpoint

   ```
   // Endpoint ep is declared previously
   SOAPBinding binding = (SOAPBinding)ep.getBinding();
   ```

   You must cast the returned binding object to a `SOAPBinding` object to access the MTOM property.

3. Set the binding's MTOM enabled property to `true` using the binding's `setMTOMEnabled()` method, as shown in Example 17 on page 51.

   Example 17. Setting a Service Provider's MTOM Enabled Property

   ```
   binding.setMTOMEnabled(true);
   ```

Consumer

To MTOM enable a JAX-WS consumer you must do the following:

1. Cast the consumer's proxy to a `BindingProvider` object.

Tip

For information on getting a consumer proxy see *Developing a Consumer Without a WSDL Contract* in *Developing Artix® Applications with JAX-WS* or *Developing a Consumer From a WSDL Contract* in *Developing Artix® Applications with JAX-WS*.

2. Get the SOAP binding from the `BindingProvider` using its `getBinding()` method, as shown in Example 18 on page 52.

Example 18. Getting a SOAP Binding from a `BindingProvider`

```
// BindingProvider bp declared previously
SOAPBinding binding = (SOAPBinding)bp.getBinding();
```

3. Set the bindings MTOM enabled property to `true` using the binding's `setMTOMEnabled()` method, as shown in Example 19 on page 52.

Example 19. Setting a Consumer's MTOM Enabled Property

```
binding.setMTOMEnabled(true);
```

Using configuration

Overview

If you publish your service using XML, such as when deploying to a container, you can enable your endpoint's MTOM support in the endpoint's configuration file. For more information on configuring endpoint's see Artix ESB Deployment Guide (http://communities.progress.com/pcom/docs/DOC-105909).

Procedure

The MTOM property is set inside the `jaxws:endpoint` element for your endpoint. To enable MTOM do the following:

1. Add a `jaxws:property` child element to the endpoint's `jaxws:endpoint` element.
2. Add a `entry` child element to the `jaxws:property` element.
3. Set the `entry` element's `key` attribute to `mtom-enabled`.
4. Set the `entry` element's `value` attribute to `true`.

Example

Example 20 on page 53 shows an endpoint that is MTOM enabled.

Example 20. Configuration for Enabling MTOM

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:jaxws="http://cxf.apache.org/jaxws"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans-2.0.xsd

                            http://cxf.apache.org/jaxws http://cxf.apache.org/schema/jax
ws.xsd">

  <jaxws:endpoint id="xRayStorage"
                  implementor="demo.spring.xRayStorImpl"
                  address="http://localhost/xRayStorage">
    <jaxws:properties>
      <entry key="mtom-enabled" value="true"/>
    </jaxws:properties>
  </jaxws:endpoint>
</beans>
```

Using XML Documents

The pure XML payload format provides an alternative to the SOAP binding by allowing services to exchange data using straight XML documents without the overhead of a SOAP envelope.

XML binding namespace

The extensions used to describe XML format bindings are defined in the namespace `http://cxf.apache.org/bindings/xformat`. Artix ESB tools use the prefix xformat to represent the XML binding extensions. Add the following line to your contracts:

```
xmlns:xformat="http://cxf.apache.org/bindings/xformat"
```

Hand editing

To map an interface to a pure XML payload format do the following:

1. Add the namespace declaration to include the extensions defining the XML binding. See XML binding namespace on page 55.
2. Add a standard WSDL `binding` element to your contract to hold the XML binding, give the binding a unique `name`, and specify the name of the WSDL `portType` element that represents the interface being bound.
3. Add an `xformat:binding` child element to the `binding` element to identify that the messages are being handled as pure XML documents without SOAP envelopes.
4. Optionally, set the `xformat:binding` element's `rootNode` attribute to a valid QName. For more information on the effect of the `rootNode` attribute see XML messages on the wire on page 56.
5. For each operation defined in the bound interface, add a standard WSDL `operation` element to hold the binding information for the operation's messages.
6. For each operation added to the binding, add the `input`, `output`, and `fault` children elements to represent the messages used by the operation.

   These elements correspond to the messages defined in the interface definition of the logical operation.

7. Optionally add an `xformat:body` element with a valid `rootNode` attribute to the added `input`, `output`, and `fault` elements to override the value of `rootNode` set at the binding level.

Note

If any of your messages have no parts, for example the output message for an operation that returns void, you must set the `rootNode` attribute for the message to ensure that the message written on the wire is a valid, but empty, XML document.

XML messages on the wire

When you specify that an interface's messages are to be passed as XML documents, without a SOAP envelope, you must take care to ensure that your messages form valid XML documents when they are written on the wire. You also need to ensure that non-Artix ESB participants that receive the XML documents understand the messages generated by Artix ESB.

A simple way to solve both problems is to use the optional `rootNode` attribute on either the global `xformat:binding` element or on the individual message's `xformat:body` elements. The `rootNode` attribute specifies the QName for the element that serves as the root node for the XML document generated by Artix ESB. When the `rootNode` attribute is not set, Artix ESB uses the root element of the message part as the root element when using doc style messages, or an element using the message part name as the root element when using rpc style messages.

For example, if the `rootNode` attribute is not set the message defined in Example 21 on page 56 would generate an XML document with the root element `lineNumber`.

Example 21. Valid XML Binding Message

```
<type ...>
  ...
  <element name="operatorID" type="xsd:int"/>
  ...
</types><message name="operator"><part name="lineNumber" element="ns1:operatorID"/>
</message>
```

For messages with one part, Artix ESB will always generate a valid XML document even if the `rootNode` attribute is not set. However, the message in Example 22 on page 57 would generate an invalid XML document.

Example 22. Invalid XML Binding Message

```
<types>
  ...
  <element name="pairName" type="xsd:string"/>
  <element name="entryNum" type="xsd:int"/>
  ...
</types>

<message name="matildas">
  <part name="dancing" element="ns1:pairName"/>
  <part name="number" element="ns1:entryNum"/>
</message>
```

Without the `rootNode` attribute specified in the XML binding, Artix ESB will generate an XML document similar to Example 23 on page 57 for the message defined in Example 22 on page 57. The generated XML document is invalid because it has two root elements: `pairName` and `entryNum`.

Example 23. Invalid XML Document

```
<pairName>
  Fred&Linda
</pairName>
<entryNum>
  123
</entryNum>
```

If you set the `rootNode` attribute, as shown in Example 24 on page 57 Artix ESB will wrap the elements in the specified root element. In this example, the `rootNode` attribute is defined for the entire binding and specifies that the root element will be named entrants.

Example 24. XML Binding with rootNode set

```
<portType name="danceParty">
  <operation name="register">
    <input message="tns:matildas" name="contestant"/>
  </operation>
</portType>

<binding name="matildaXMLBinding" type="tns:dancingMatildas">
  <xmlformat:binding rootNode="entrants"/>
  <operation name="register">
    <input name="contestant"/>
    <output name="entered"/>
</binding>
```

An XML document generated from the input message would be similar to Example 25 on page 58. Notice that the XML document now only has one root element.

Example 25. XML Document generated using the rootNode attribute

```
<entrants>
  <pairName>
    Fred&Linda
  <entryNum>
    123
  </entryNum>
</entrants>
```

Overriding the binding's rootNode attribute setting

You can also set the `rootNode` attribute for each individual message, or override the global setting for a particular message, by using the `xformat:body` element inside of the message binding. For example, if you wanted the output message defined in Example 24 on page 57 to have a different root element from the input message, you could override the binding's root element as shown in Example 26 on page 58.

Example 26. Using `xformat:body`

```
<binding name="matildaXMLBinding" type="tns:dancingMatildas">
  <xmlformat:binding rootNode="entrants"/>
  <operation name="register">
    <input name="contestant"/>
    <output name="entered">
      <xformat:body rootNode="entryStatus";/>
    </output>
  </operation>
</binding>
```

Part II. Transports

Understanding How Endpoints are Defined in WSDL

Endpoints represent an instantiated service. They are defined by combining a binding and the networking details used to expose the endpoint.

Overview

An endpoint can be thought of as a physical manifestation of a service. It combines a binding, which specifies the physical representation of the logical data used by a service, and a set of networking details that define the physical connection details used to make the service contactable by other endpoints.

Endpoints and services

In the same way a binding can only map a single interface, an endpoint can only map to a single service. However, a service can be manifested by any number of endpoints. For example, you could define a ticket selling service that was manifested by four different endpoints. However, you could not have a single endpoint that manifested both a ticket selling service and a widget selling service.

The WSDL elements

Endpoints are defined in a contract using a combination of the WSDL `service` element and the WSDL `port` element. The `service` element is a collection of related `port` elements. The `port` elements define the actual endpoints.

The WSDL `service` element has a single attribute, `name`, that specifies a unique name. The `service` element is used as the parent element of a collection of related `port` elements. WSDL makes no specification about how the `port` elements are related. You can associate the `port` elements in any manner you see fit.

The WSDL `port` element has a single attribute, `binding`, that specifies the binding used by the endpoint. The `port` element is the parent element of the elements that specify the actual transport details used by the endpoint. The elements used to specify the transport details are discussed in the following sections.

Adding endpoints to a contract

Artix provides command line tools for adding a number of the endpoint types to your contracts.

The tools will add the proper elements to your contract for you. However, it is recommended that you have some knowledge of how the different transports used in defining an endpoint work.

You can also add an endpoint to a contract using any text editor. When you hand edit a contract, you are responsible for ensuring that the contract is valid.

Supported transports

Endpoint definitions are built using extensions defined for each of the transports the Artix ESB Java Runtime supports. This includes the following transports:

- HTTP
- IBM WebSphere MQ
- CORBA
- Java Messaging Service
- File Transfer Protocol

Using HTTP

HTTP is the underlying transport for the Web. It provides a standardized, robust, and flexible platform for communicating between endpoints. Becuase of these factors it is the assumed transport for most WS- specifications and is integral to RESTful architectures.*

Adding a Basic HTTP Endpoint

Overview

There are three ways of specifying an HTTP endpoint's address depending on the payload format you are using.

- SOAP 1.1 uses the standardized `soap:address` element.
- SOAP 1.2 uses the `soap12:address` element.
- All other payload formats use the `http:address element`.

SOAP 1.1

When you are sending SOAP 1.1 messages over HTTP you must use the SOAP 1.1 `address` element to specify the endpoint's address. It has one attribute, `location`, that specifies the endpoint's address as a URL. The SOAP 1.1 `address` element is defined in the namespace `http://schemas.xmlsoap.org/wsdl/soap/`.

Example 27 on page 64 shows a `port` element used to send SOAP 1.1 messages over HTTP.

Example 27. SOAP 1.1 Port Element

```
<definitions ...
             xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/" ...>
  ...
  <service name="SOAP11Service">
    <port binding="SOAP11Binding" name="SOAP11Port">
      <soap:address location="http://artie.com/index.xml">
    </port>
  </service>
  ...
<definitions>
```

SOAP 1.2

When you are sending SOAP 1.2 messages over HTTP you must use the SOAP 1.2 `address` element to specify the endpoint's address. It has one attribute, `location`, that specifies the endpoint's address as a URL. The SOAP 1.2 `address` element is defined in the namespace `http://schemas.xmlsoap.org/wsdl/soap12/`.

Example 28 on page 65 shows a `port` element used to send SOAP 1.2 messages over HTTP.

Example 28. SOAP 1.2 Port Element

```
<definitions ...
             xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/" ... >
  <service name="SOAP12Service">
    <port binding="SOAP12Binding" name="SOAP12Port">
      <soap12:address location="http://artie.com/index.xml">
    </port>
  </service>
  ...
</definitions>
```

Other messages types

When your messages are mapped to any payload format other than SOAP you must use the HTTP `address` element to specify the endpoint's address. It has one attribute, `location`, that specifies the endpoint's address as a URL. The HTTP `address` element is defined in the namespace `http://schemas.xmlsoap.org/wsdl/http/`.

Example 29 on page 65 shows a `port` element used to send an XML message.

Example 29. HTTP Port Element

```
<definitions ...
             xmlns:http="http://schemas.xmlsoap.org/wsdl/http/" ... >
  <service name="HTTPService">
    <port binding="HTTPBinding" name="HTTPPort">
      <http:address location="http://artie.com/index.xml">
    </port>
  </service>
  ...
</definitions>
```

Configuring a Consumer

HTTP consumer endpoints can specify a number of HTTP connection attributes including whether the endpoint automatically accepts redirect responses, whether the endpoint can use chunking, whether the endpoint will request a keep-alive, and how the endpoint interacts with proxies. In addition to the HTTP connection properties, an HTTP consumer endpoint can specify how it is secured.

A consumer endpoint can be configured using two mechanisms:

- Configuration
- WSDL

Using Configuration

Namespace

The elements used to configure an HTTP consumer endpoint are defined in the namespace `http://cxf.apache.org/transports/http/configuration`. It is commonly referred to using the prefix http-conf. In order to use the HTTP configuration elements you must add the lines shown in Example 30 on page 67 to the `beans` element of your endpoint's configuration file. In addition, you must add the configuration elements' namespace to the `xsi:schemaLocation` attribute.

Example 30. HTTP Consumer Configuration Namespace

```
<beans ...
       xmlns:http-conf="http://cxf.apache.org/transports/http/configuration
       ...
       xsi:schemaLocation="...
                           http://cxf.apache.org/transports/http/configuration
                              http://cxf.apache.org/schemas/configuration/http-conf.xsd
                           ...>
```

The conduit element

You configure an HTTP endpoint using the `http-conf:conduit` element and its children. The `http-conf:conduit` element takes a single attribute, `name`, that specifies the WSDL `port` element corresponding to the endpoint. The value for the `name` attribute takes the form *`portQName`*`.http-conduit`. Example 31 on page 67 shows the `http-conf:conduit` element that would be used to add configuration for an endpoint that is specified by the WSDL fragment <port binding="widgetSOAPBinding" name="widgetSOAPPort> when the endpoint's target namespace is `http://widgets.widgetvendor.net`.

Example 31. `http-conf:conduit` Element

```
...
  <http-conf:conduit name="{http://widgets/widgetvendor.net}widgetSOAPPort.http-conduit>
    ...
  </http-conf:conduit>
...
```

The `http-conf:conduit` element has child elements that specify configuration information. They are described in Table 3 on page 68.

Table 3. Elements Used to Configure an HTTP Consumer Endpoint

Element	Description
`http-conf:client`	Specifies the HTTP connection properties such as timeouts, keep-alive requests, content types, etc. See The `client` element on page 68.
`http-conf:authorization`	Specifies the parameters for configuring the basic authentication method that the endpoint uses preemptively. The preferred approach is to supply a Basic Authentication Supplier object.
`http-conf:proxyAuthorization`	Specifies the parameters for configuring basic authentication against outgoing HTTP proxy servers.
`http-conf:tlsClientParameters`	Specifies the parameters used to configure SSL/TLS.
`http-conf:basicAuthSupplier`	Specifies the bean reference or class name of the object that supplies the basic authentication information used by the endpoint, either preemptively or in response to a `401` HTTP challenge.
`http-conf:trustDecider`	Specifies the bean reference or class name of the object that checks the HTTP(S) `URLConnection` object to establish trust for a connection with an HTTPS service provider before any information is transmitted.

The client element

The `http-conf:client` element is used to configure the non-security properties of a consumer endpoint's HTTP connection. Its attributes, described in Table 4 on page 68, specify the connection's properties.

Table 4. HTTP Consumer Configuration Attributes

Attribute	Description
`ConnectionTimeout`	Specifies the amount of time, in milliseconds, that the consumer attempts to establish a connection before it times out. The default is `30000`. `0` specifies that the consumer will continue to send the request indefinitely.
`ReceiveTimeout`	Specifies the amount of time, in milliseconds, that the consumer will wait for a response before it times out. The default is `30000`. `0` specifies that the consumer will wait indefinitely.
`AutoRedirect`	Specifies if the consumer will automatically follow a server issued redirection. The default is `false`.
`MaxRetransmits`	Specifies the maximum number of times a consumer will retransmit a request to satisfy a redirect. The default is `-1` which specifies that unlimited retransmissions are allowed.

Attribute	Description
`AllowChunking`	Specifies whether the consumer will send requests using chunking. The default is `true` which specifies that the consumer will use chunking when sending requests. Chunking cannot be used if either of the following are true: • `http-conf:basicAuthSupplier` is configured to provide credentials preemptively. • `AutoRedirect` is set to `true`. In both cases the value of `AllowChunking` is ignored and chunking is disallowed.
`Accept`	Specifies what media types the consumer is prepared to handle. The value is used as the value of the HTTP Accept property. The value of the attribute is specified using multipurpose internet mail extensions (MIME) types.
`AcceptLanguage`	Specifies what language (for example, American English) the consumer prefers for the purpose of receiving a response. The value is used as the value of the HTTP AcceptLanguage property. Language tags are regulated by the International Organization for Standards (ISO) and are typically formed by combining a language code, determined by the ISO-639 standard, and country code, determined by the ISO-3166 standard, separated by a hyphen. For example, en-US represents American English.
`AcceptEncoding`	Specifies what content encodings the consumer is prepared to handle. Content encoding labels are regulated by the Internet Assigned Numbers Authority (IANA). The value is used as the value of the HTTP AcceptEncoding property.
`ContentType`	Specifies the media type of the data being sent in the body of a message. Media types are specified using multipurpose internet mail extensions (MIME) types. The value is used as the value of the HTTP ContentType property. The default is `text/xml`. For web services, this should be set to `text/xml`. If the client is sending HTML form data to a CGI script, this should be set to `application/x-www-form-urlencoded`. If the HTTP POST request is bound to a fixed payload format (as opposed to SOAP), the content type is typically set to `application/octet-stream`.
`Host`	Specifies the Internet host and port number of the resource on which the request is being invoked. The value is used as the value of the HTTP Host property. This attribute is typically not required. It is only required by certain DNS scenarios or application designs. For example, it indicates what host the client prefers for clusters (that is, for virtual servers mapping to the same Internet protocol (IP) address).
`Connection`	Specifies whether a particular connection is to be kept open or closed after each request/response dialog. There are two valid values:

Attribute	Description
	• `Keep-Alive` — Specifies that the consumer wants the connection kept open after the initial request/response sequence. If the server honors it, the connection is kept open until the consumer closes it. • `close`(default) — Specifies that the connection to the server is closed after each request/response sequence.
`CacheControl`	Specifies directives about the behavior that must be adhered to by caches involved in the chain comprising a request from a consumer to a service provider. See Consumer Cache Control Directives on page 73.
`Cookie`	Specifies a static cookie to be sent with all requests.
`BrowserType`	Specifies information about the browser from which the request originates. In the HTTP specification from the World Wide Web consortium (W3C) this is also known as the *user-agent*. Some servers optimize based on the client that is sending the request.
`Referer`	Specifies the URL of the resource that directed the consumer to make requests on a particular service. The value is used as the value of the HTTP Referer property. This HTTP property is used when a request is the result of a browser user clicking on a hyperlink rather than typing a URL. This can allow the server to optimize processing based upon previous task flow, and to generate lists of back-links to resources for the purposes of logging, optimized caching, tracing of obsolete or mistyped links, and so on. However, it is typically not used in web services applications. If the `AutoRedirect` attribute is set to `true` and the request is redirected, any value specified in the `Referer` attribute is overridden. The value of the HTTP Referer property is set to the URL of the service that redirected the consumer's original request.
`DecoupledEndpoint`	Specifies the URL of a decoupled endpoint for the receipt of responses over a separate provider->consumer connection. For more information on using decoupled endpoints see, Using the HTTP Transport in Decoupled Mode on page 84. You must configure both the consumer endpoint and the service provider endpoint to use WS-Addressing for the decoupled endpoint to work.
`ProxyServer`	Specifies the URL of the proxy server through which requests are routed.
`ProxyServerPort`	Specifies the port number of the proxy server through which requests are routed.
`ProxyServerType`	Specifies the type of proxy server used to route requests. Valid values are: • `HTTP`(default)

Attribute	Description
	• SOCKS

Example

Example 32 on page 71 shows the configuration of an HTTP consumer endpoint that wants to keep its connection to the provider open between requests, that will only retransmit requests once per invocation, and that cannot use chunking streams.

Example 32. HTTP Consumer Endpoint Configuration

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:http-conf="http://cxf.apache.org/transports/http/configuration"
       xsi:schemaLocation="http://cxf.apache.org/transports/http/configuration
                           http://cxf.apache.org/schemas/configuration/http-conf.xsd
                          http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd">


  <http-conf:conduit name="{http://apache.org/hello_world_soap_http}SoapPort.http-conduit">

    <http-conf:client Connection="Keep-Alive"
                      MaxRetransmits="1"
                      AllowChunking="false" />
  </http-conf:conduit>
</beans>
```

Using WSDL

Namespace

The WSDL extension elements used to configure an HTTP consumer endpoint are defined in the namespace `http://cxf.apache.org/transports/http/configuration`. It is commonly referred to using the prefix http-conf. In order to use the HTTP configuration elements you must add the line shown in Example 33 on page 72 to the `definitions` element of your endpoint's WSDL document.

Example 33. HTTP Consumer WSDL Element's Namespace

```
<definitions ...
      xmlns:http-conf="http://cxf.apache.org/transports/http/configuration
```

The client element

The `http-conf:client` element is used to specify the connection properties of an HTTP consumer in a WSDL document. The `http-conf:client` element is a child of the WSDL `port` element. It has the same attributes as the `client` element used in the configuration file. The attributes are described in Table 4 on page 68.

Example

Example 34 on page 72 shows a WSDL fragment that configures an HTTP consumer endpoint to specify that it does not interact with caches.

Example 34. WSDL to Configure an HTTP Consumer Endpoint

```
<service ...>
  <port ...>
    <soap:address ... />
    <http-conf:client CacheControl="no-cache" />
  </port>
</service>
```

Consumer Cache Control Directives

Table 5 on page 73 lists the cache control directives supported by an HTTP consumer.

Table 5. `http-conf:client` Cache Control Directives

Directive	Behavior
no-cache	Caches cannot use a particular response to satisfy subsequent requests without first revalidating that response with the server. If specific response header fields are specified with this value, the restriction applies only to those header fields within the response. If no response header fields are specified, the restriction applies to the entire response.
no-store	Caches must not store either any part of a response or any part of the request that invoked it.
max-age	The consumer can accept a response whose age is no greater than the specified time in seconds.
max-stale	The consumer can accept a response that has exceeded its expiration time. If a value is assigned to max-stale, it represents the number of seconds beyond the expiration time of a response up to which the consumer can still accept that response. If no value is assigned, the consumer can accept a stale response of any age.
min-fresh	The consumer wants a response that is still fresh for at least the specified number of seconds indicated.
no-transform	Caches must not modify media type or location of the content in a response between a provider and a consumer.
only-if-cached	Caches should return only responses that are currently stored in the cache, and not responses that need to be reloaded or revalidated.
cache-extension	Specifies additional extensions to the other cache directives. Extensions can be informational or behavioral. An extended directive is specified in the context of a standard directive, so that applications not understanding the extended directive can adhere to the behavior mandated by the standard directive.

Configuring a Service Provider

HTTP service provider endpoints can specify a number of HTTP connection attributes including if it will honor keep alive requests, how it interacts with caches, and how tolerant it is of errors in communicating with a consumer.

A service provider endpoint can be configured using two mechanisms:

- Configuration
- WSDL

Using Configuration

Namespace

The elements used to configure an HTTP provider endpoint are defined in the namespace `http://cxf.apache.org/transports/http/configuration`. It is commonly referred to using the prefix http-conf. In order to use the HTTP configuration elements you must add the lines shown in Example 35 on page 75 to the `beans` element of your endpoint's configuration file. In addition, you must add the configuration elements' namespace to the `xsi:schemaLocation` attribute.

Example 35. HTTP Provider Configuration Namespace

```
<beans ...
       xmlns:http-conf="http://cxf.apache.org/transports/http/configuration
       ...
       xsi:schemaLocation="...
                           http://cxf.apache.org/transports/http/configuration
                              http://cxf.apache.org/schemas/configuration/http-conf.xsd
                           ...>
```

The destination element

You configure an HTTP service provider endpoint using the `http-conf:destination` element and its children. The `http-conf:destination` element takes a single attribute, `name`, that specifies the WSDL `port` element that corresponds to the endpoint. The value for the `name` attribute takes the form *`portQName`*`.http-destination`. Example 36 on page 75 shows the `http-conf:destination` element that is used to add configuration for an endpoint that is specified by the WSDL fragment <port binding="widgetSOAPBinding" name="widgetSOAPPort> when the endpoint's target namespace is `http://widgets.widgetvendor.net`.

Example 36. `http-conf:destination` Element

```
...
  <http-conf:destination name="{http://widgets/widgetvendor.net}widgetSOAPPort.http-destin
ation>
    ...
  </http-conf:destination>
...
```

The `http-conf:destination` element has a number of child elements that specify configuration information. They are described in Table 6 on page 76.

Table 6. Elements Used to Configure an HTTP Service Provider Endpoint

Element	Description
`http-conf:server`	Specifies the HTTP connection properties. See The `server` element on page 76.
`http-conf:contextMatchStrategy`	Specifies the parameters that configure the context match strategy for processing HTTP requests.
`http-conf:fixedParameterOrder`	Specifies whether the parameter order of an HTTP request handled by this destination is fixed.

The server element

The `http-conf:server` element is used to configure the properties of a service provider endpoint's HTTP connection. Its attributes, described in Table 7 on page 76, specify the connection's properties.

Table 7. HTTP Service Provider Configuration Attributes

Attribute	Description
`ReceiveTimeout`	Sets the length of time, in milliseconds, the service provider attempts to receive a request before the connection times out. The default is `30000`. `0` specifies that the provider will not timeout.
`SuppressClientSendErrors`	Specifies whether exceptions are to be thrown when an error is encountered on receiving a request. The default is `false`; exceptions are thrown on encountering errors.
`SuppressClientReceiveErrors`	Specifies whether exceptions are to be thrown when an error is encountered on sending a response to a consumer. The default is `false`; exceptions are thrown on encountering errors.
`HonorKeepAlive`	Specifies whether the service provider honors requests for a connection to remain open after a response has been sent. The default is `false`; keep-alive requests are ignored.
`RedirectURL`	Specifies the URL to which the client request should be redirected if the URL specified in the client request is no longer appropriate for the requested resource. In this case, if a status code is not automatically set in the first line of the server response, the status code is set to `302` and the status description is set to `Object Moved`. The value is used as the value of the HTTP RedirectURL property.
`CacheControl`	Specifies directives about the behavior that must be adhered to by caches involved in the chain comprising a response from a service provider to a consumer. See Service Provider Cache Control Directives on page 79.

Attribute	Description
`ContentLocation`	Sets the URL where the resource being sent in a response is located.
`ContentType`	Specifies the media type of the information being sent in a response. Media types are specified using multipurpose internet mail extensions (MIME) types. The value is used as the value of the HTTP ContentType location.
`ContentEncoding`	Specifies any additional content encodings that have been applied to the information being sent by the service provider. Content encoding labels are regulated by the Internet Assigned Numbers Authority (IANA). Possible content encoding values include `zip`, `gzip`, `compress`, `deflate`, and `identity`. This value is used as the value of the HTTP ContentEncoding property. The primary use of content encodings is to allow documents to be compressed using some encoding mechanism, such as zip or gzip. Artix ESB performs no validation on content codings. It is the user's responsibility to ensure that a specified content coding is supported at application level.
`ServerType`	Specifies what type of server is sending the response. Values take the form *`program-name/version`*; for example, `Apache/1.2.5`.

Example

Example 37 on page 77 shows the configuration for an HTTP service provider endpoint that honors keep-alive requests and suppresses all communication errors.

Example 37. HTTP Service Provider Endpoint Configuration

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:http-conf="http://cxf.apache.org/transports/http/configuration"
       xsi:schemaLocation="http://cxf.apache.org/transports/http/configuration
                           http://cxf.apache.org/schemas/configuration/http-conf.xsd
                          http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd">


  <http-conf:destination name="{http://apache.org/hello_world_soap_http}SoapPort.http-des
tination">
    <http-conf:server SuppressClientSendErrors="true"
                      SuppressClientReceiveErrors="true"
                      HonorKeepAlive="true" />
  </http-conf:destination>
</beans>
```

Using WSDL

Namespace

The WSDL extension elements used to configure an HTTP provider endpoint are defined in the namespace `http://cxf.apache.org/transports/http/configuration`. It is commonly referred to using the prefix http-conf. To use the HTTP configuration elements you must add the line shown in Example 38 on page 78 to the `definitions` element of your endpoint's WSDL document.

Example 38. HTTP Provider WSDL Element's Namespace

```
<definitions ...
      xmlns:http-conf="http://cxf.apache.org/transports/http/configuration
```

The server element

The `http-conf:server` element is used to specify the connection properties of an HTTP service provider in a WSDL document. The `http-conf:server` element is a child of the WSDL `port` element. It has the same attributes as the `server` element used in the configuration file. The attributes are described in Table 7 on page 76.

Example

Example 39 on page 78 shows a WSDL fragment that configures an HTTP service provider endpoint specifying that it will not interact with caches.

Example 39. WSDL to Configure an HTTP Service Provider Endpoint

```
<service ...>
  <port ...>
    <soap:address ... />
    <http-conf:server CacheControl="no-cache" />
  </port>
</service>
```

Service Provider Cache Control Directives

Table 8 on page 79 lists the cache control directives supported by an HTTP service provider.

Table 8. `http-conf:server` Cache Control Directives

Directive	Behavior
no-cache	Caches cannot use a particular response to satisfy subsequent requests without first revalidating that response with the server. If specific response header fields are specified with this value, the restriction applies only to those header fields within the response. If no response header fields are specified, the restriction applies to the entire response.
public	Any cache can store the response.
private	Public (*shared*) caches cannot store the response because the response is intended for a single user. If specific response header fields are specified with this value, the restriction applies only to those header fields within the response. If no response header fields are specified, the restriction applies to the entire response.
no-store	Caches must not store any part of the response or any part of the request that invoked it.
no-transform	Caches must not modify the media type or location of the content in a response between a server and a client.
must-revalidate	Caches must revalidate expired entries that relate to a response before that entry can be used in a subsequent response.
proxy-revalidate	Does the same as must-revalidate, except that it can only be enforced on shared caches and is ignored by private unshared caches. When using this directive, the public cache directive must also be used.
max-age	Clients can accept a response whose age is no greater that the specified number of seconds.
s-max-age	Does the same as max-age, except that it can only be enforced on shared caches and is ignored by private unshared caches. The age specified by s-max-age overrides the age specified by max-age. When using this directive, the proxy-revalidate directive must also be used.
cache-extension	Specifies additional extensions to the other cache directives. Extensions can be informational or behavioral. An extended directive is specified in the context of a standard directive, so that applications not understanding the extended directive can adhere to the behavior mandated by the standard directive.

Configuring the Jetty Runtime

Overview

The Jetty runtime is used by HTTP service providers and HTTP consumers using a decoupled endpoint. The runtime's thread pool can be configured, and you can also set a number of the security settings for an HTTP service provider through the Jetty runtime.

Namespace

The elements used to configure the Jetty runtime are defined in the namespace `http://cxf.apache.org/transports/http-jetty/configuration`. It is commonly referred to using the prefix httpj. In order to use the Jetty configuration elements you must add the lines shown in Example 40 on page 80 to the `beans` element of your endpoint's configuration file. In addition, you must add the configuration elements' namespace to the `xsi:schemaLocation` attribute.

Example 40. Jetty Runtime Configuration Namespace

```
<beans ...
       xmlns:httpj="http://cxf.apache.org/transports/http-jetty/configuration
       ...
       xsi:schemaLocation="...
                           http://cxf.apache.org/transports/http-jetty/configuration
                              http://cxf.apache.org/schemas/configuration/http-jetty.xsd
                          ...>
```

The engine-factory element

The `httpj:engine-factory` element is the root element used to configure the Jetty runtime used by an application. It has a single required attribute, `bus`, whose value is the name of the `Bus` that manages the Jetty instances being configured.

Tip

The value is typically `cxf` which is the name of the default `Bus` instance.

The `httpj:engine-factory` element has three children that contain the information used to configure the HTTP ports instantiated by the Jetty runtime factory. The children are described in Table 9 on page 81.

Table 9. Elements for Configuring a Jetty Runtime Factory

Element	Description
`httpj:engine`	Specifies the configuration for a particular Jetty runtime instance. See The `engine` element on page 81.
`httpj:identifiedTLSServerParameters`	Specifies a reusable set of properties for securing an HTTP service provider. It has a single attribute, `id`, that specifies a unique identifier by which the property set can be referred.
`httpj:identifiedThreadingParameters`	Specifies a reusable set of properties for controlling a Jetty instance's thread pool. It has a single attribute, `id`, that specifies a unique identifier by which the property set can be referred. See Configuring the thread pool on page 82.

The engine element

The `httpj:engine` element is used to configure specific instances of the Jetty runtime. It has a single attribute, `port`, that specifies the number of the port being managed by the Jetty instance.

Tip

You can specify a value of `0` for the `port` attribute. Any threading properties specified in an `httpj:engine` element with its `port` attribute set to `0` are used as the configuration for all Jetty listeners that are not explicitly configured.

Each `httpj:engine` element can have two children: one for configuring security properties and one for configuring the Jetty instance's thread pool. For each type of configuration you can either directly provide the configuration information or you can provide a reference to a set of configuration properties defined in the parent `httpj:engine-factory` element.

The child elements used to provide the configuration properties are described in Table 10 on page 81.

Table 10. Elements for Configuring a Jetty Runtime Instance

Element	Description
`httpj:tlsServerParameters`	Specifies a set of properties for configuring the security used for the specific Jetty instance.

Element	Description
`httpj:tlsServerParametersRef`	Refers to a set of security properties defined by a `identifiedTLSServerParameters` element. The `id` attribute provides the id of the referred `identifiedTLSServerParameters` element.
`httpj:threadingParameters`	Specifies the size of the thread pool used by the specific Jetty instance. See Configuring the thread pool on page 82.
`httpj:threadingParametersRef`	Refers to a set of properties defined by a `identifiedThreadingParameters` element. The `id` attribute provides the id of the referred `identifiedThreadingParameters` element.

Configuring the thread pool

You can configure the size of a Jetty instance's thread pool by either:

- Specifying the size of the thread pool using a `identifiedThreadingParameters` element in the `engine-factory` element. You then refer to the element using a `threadingParametersRef` element.
- Specifying the size of the of the thread pool directly using a `threadingParameters` element.

The `threadingParameters` has two attributes to specify the size of a thread pool. The attributes are described in Table 11 on page 82.

Note

The `httpj:identifiedThreadingParameters` element has a single child `threadingParameters` element.

Table 11. Attributes for Configuring a Jetty Thread Pool

Attribute	Description
`minThreads`	Specifies the minimum number of threads available to the Jetty instance for processing requests.
`maxThreads`	Specifies the maximum number of threads available to the Jetty instance for processing requests.

Example

Example 41 on page 83 shows a configuration fragment that configures a Jetty instance on port number 9001.

Example 41. Configuring a Jetty Instance

```
<beans xmlns="http://www.springframework.org/schema/beans"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:sec="http://cxf.apache.org/configuration/security"
  xmlns:http="http://cxf.apache.org/transports/http/configuration"
  xmlns:httpj="http://cxf.apache.org/transports/http-jetty/configuration"
  xmlns:jaxws="http://java.sun.com/xml/ns/jaxws"
  xsi:schemaLocation="http://cxf.apache.org/configuration/security
          http://cxf.apache.org/schemas/configuration/security.xsd
            http://cxf.apache.org/transports/http/configuration
            http://cxf.apache.org/schemas/configuration/http-conf.xsd
            http://cxf.apache.org/transports/http-jetty/configuration
            http://cxf.apache.org/schemas/configuration/http-jetty.xsd
            http://www.springframework.org/schema/beans
            http://www.springframework.org/schema/beans/spring-beans-2.0.xsd">
  ...

  <httpj:engine-factory bus="cxf">
    <httpj:identifiedTLSServerParameters id="secure">
      <sec:keyManagers keyPassword="password">
        <sec:keyStore type="JKS" password="password"
                      file="certs/cherry.jks"/>
      </sec:keyManagers>
    </httpj:identifiedTLSServerParameters>

    <httpj:engine port="9001">
      <httpj:tlsServerParametersRef id="secure" />
      <httpj:threadingParameters minThreads="5"
                                 maxThreads="15" />
    </httpj:engine>
  </httpj:engine-factory>
 </beans>
```

Using the HTTP Transport in Decoupled Mode

Overview

In normal HTTP request/response scenarios, the request and the response are sent using the same HTTP connection. The service provider processes the request and responds with a response containing the appropriate HTTP status code and the contents of the response. In the case of a successful request, the HTTP status code is set to `200`.

In some instances, such as when using WS-RM or when requests take an extended period of time to execute, it makes sense to decouple the request and response message. In this case the service providers sends the consumer a `202 Accepted` response to the consumer over the back-channel of the HTTP connection on which the request was received. It then processes the request and sends the response back to the consumer using a new decoupled server->client HTTP connection. The consumer runtime receives the incoming response and correlates it with the appropriate request before returning to the application code.

Configuring decoupled interactions

Using the HTTP transport in decoupled mode requires that you do the following:

1. Configure the consumer to use WS-Addressing.

   See Configuring an endpoint to use WS-Addressing on page 84.

2. Configure the consumer to use a decoupled endpoint.

   See Configuring the consumer on page 85.

3. Configure any service providers that the consumer interacts with to use WS-Addressing.

   See Configuring an endpoint to use WS-Addressing on page 84.

Configuring an endpoint to use WS-Addressing

Specify that the consumer and any service provider with which the consumer interacts use WS-Addressing.

You can specify that an endpoint uses WS-Addressing in one of two ways:

- Adding the `wswa:UsingAddressing` element to the endpoint's WSDL `port` element as shown in Example 42 on page 85.

Example 42. Activating WS-Addressing using WSDL

```
...
<service name="WidgetSOAPService">
  <port name="WidgetSOAPPort" binding="tns:WidgetSOAPBinding">
    <soap:address="http://widgetvendor.net/widgetSeller" />
    <wswa:UsingAddressing xmlns:wswa="http://www.w3.org/2005/02/addressing/wsdl"/>
  </port>
</service>
...
```

- Adding the WS-Addressing policy to the endpoint's WSDL `port` element as shown in Example 43 on page 85.

Example 43. Activating WS-Addressing using a Policy

```
...
<service name="WidgetSOAPService">
  <port name="WidgetSOAPPort" binding="tns:WidgetSOAPBinding">
    <soap:address="http://widgetvendor.net/widgetSeller" />
    <wsp:Policy xmlns:wsp="http://www.w3.org/2006/07/ws-policy">
      <wsam:Addressing xmlns:wsam="http://www.w3.org/2007/02/addressing/metadata">
        <wsp:Policy/>
      </wsam:Addressing>
    </wsp:Policy>
  </port>
</service>
...
```

Note

The WS-Addressing policy supersedes the `wswa:UsingAddressing` WSDL element.

Configuring the consumer

Configure the consumer endpoint to use a decoupled endpoint using the `DecoupledEndpoint` attribute of the `http-conf:conduit` element.

Example 44 on page 86 shows the configuration for setting up the endpoint defined in Example 42 on page 85 to use use a decoupled endpoint. The consumer now receives all responses at `http://widgetvendor.net/widgetSellerInbox`.

Example 44. Configuring a Consumer to Use a Decoupled HTTP Endpoint

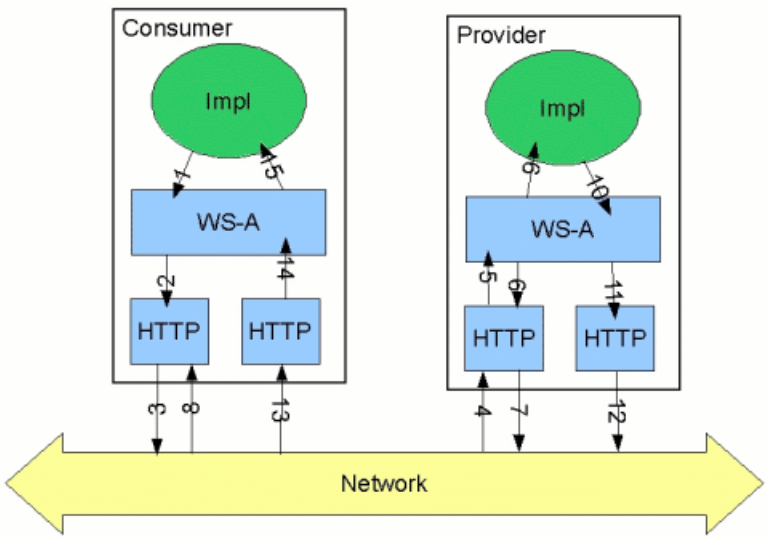
```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:http="http://cxf.apache.org/transports/http/configuration"
       xsi:schemaLocation="http://cxf.apache.org/transports/http/configuration
                           http://cxf.apache.org/schemas/configuration/http-conf.xsd
                          http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd">


  <http:conduit name="{http://widgetvendor.net/services}WidgetSOAPPort.http-conduit">
    <http:client DecoupledEndpoint="http://widgetvendor.net:9999/decoupled_endpoint" />
  </http:conduit>
</beans>
```

How messages are processed

Using the HTTP transport in decoupled mode adds extra layers of complexity to the processing of HTTP messages. While the added complexity is transparent to the implementation level code in an application, it might be important to understand what happens for debugging reasons.

Figure 1 on page 87 shows the flow of messages when using HTTP in decoupled mode.

Figure 1. Message Flow in for a Decoupled HTTP Transport



A request starts the following process:

1. The consumer implementation invokes an operation and a request message is generated.
2. The WS-Addressing layer adds the WS-A headers to the message.

   When a decoupled endpoint is specified in the consumer's configuration, the address of the decoupled endpoint is placed in the WS-A ReplyTo header.
3. The message is sent to the service provider.

4. The service provider receives the message.
5. The request message from the consumer is dispatched to the provider's WS-A layer.
6. Because the WS-A ReplyTo header is not set to anonymous, the provider sends back a message with the HTTP status code set to `202`, acknowledging that the request has been received.
7. The HTTP layer sends a `202 Accepted` message back to the consumer using the original connection's back-channel.
8. The consumer receives the `202 Accepted` reply on the back-channel of the HTTP connection used to send the original message.

   When the consumer receives the `202 Accepted` reply, the HTTP connection closes.
9. The request is passed to the service provider's implementation where the request is processed.
10. When the response is ready, it is dispatched to the WS-A layer.
11. The WS-A layer adds the WS-Addressing headers to the response message.
12. The HTTP transport sends the response to the consumer's decoupled endpoint.
13. The consumer's decoupled endpoint receives the response from the service provider.
14. The response is dispatched to the consumer's WS-A layer where it is correlated to the proper request using the WS-A RelatesTo header.
15. The correlated response is returned to the client implementation and the invoking call is unblocked.

Using JMS

JMS is a standards based messaging system that is widely used in enterprise Java applications.

Namespaces

WSDL Namespace

The WSDL extensions for defining a JMS endpoint are defined in the namespace `http://cxf.apache.org/transports/jms`. In order to use the JMS extensions you will need to add the line shown in Example 45 on page 90 to the definitions element of your contract.

Example 45. JMS Extension Namespace

```
xmlns:jms="http://cxf.apache.org/transports/jms"
```

Configuration Namespace

The Artix ESB JMS endpoint configuration properties are specified under the `http://cxf.apache.org/transports/jms` namespace. In order to use the JMS configuration properties you will need to add the line shown in Example 46 on page 90 to the beans element of your configuration.

Example 46. JMS Configuration Namespaces

```
xmlns:jms="http://cxf.apache.org/transports/jms"
```

Basic Endpoint Configuration

JMS endpoints need to know certain basic information about how to establish a connection to the proper destination. This information can be provided in one of two places:

- Configuration
- WSDL

Using Configuration

Overview

JMS endpoints are configured using Spring configuration. You can configure the server-side and consumer-side transports independently.

The JMS address information is provided using the `jms:address` element and its child, the `jms:JMSNamingProperties` element. The `jms:address` element's attributes specify the information needed to identify the JMS broker and the destination. The `jms:JMSNamingProperties` element specifies the Java properties used to connect to the JNDI service.

Note

Information in the configuration file will override the information in the endpoint's WSDL file.

Configuration elements

You configure a JMS endpoint using one of the following configuration elements:

`jms:conduit`

The `jms:conduit` element contains the configuration for a consumer endpoint. It has one attribute, `name`, whose value takes the form `{`*`WSDLNamespace`*`}`*`WSDLPortName`*`.jms-conduit`.

`jms:destination`

The `jms:destination` element contains the configuration for a provider endpoint. It has one attribute, `name`, whose value takes the form `{`*`WSDLNamespace`*`}`*`WSDLPortName`*`.jms-destination`.

The address element

JMS connection information is specified by adding a `jms:address` child to the base configuration element. The `jms:address` element uses the attributes described in Table 12 on page 93 to configure the connection to the JMS broker.

Table 12. JMS Endpoint Attributes

Attribute	Description
`destinationStyle`	Specifies if the JMS destination is a JMS queue or a JMS topic.
`jndiConnectionFactoryName`	Specifies the JNDI name bound to the JMS connection factory to use when connecting to the JMS destination.
`jmsDestinationName`	Specifies the JMS name of the JMS destination to which requests are sent.
`jmsReplyDestinationName`	Specifies the JMS name of the JMS destinations where replies are sent. This attribute allows you to use a user defined destination for replies. For more details see Using a Named Reply Destination on page 97.
`jndiDestinationName`	Specifies the JNDI name bound to the JMS destination to which requests are sent.
`jndiReplyDestinationName`	Specifies the JNDI name bound to the JMS destinations where replies are sent. This attribute allows you to use a user defined destination for replies. For more details see Using a Named Reply Destination on page 97.
`connectionUserName`	Specifies the user name to use when connecting to a JMS broker.
`connectionPassword`	Specifies the password to use when connecting to a JMS broker.

The JMSNamingProperties element

To increase interoperability with JMS and JNDI providers, the `jms:address` element has a child element, `jms:JMSNamingProperties`, that allows you to specify the values used to populate the properties used when connecting to the JNDI provider. The `jms:JMSNamingProperties` element has two attributes: `name` and `value`. `name` specifies the name of the property to set. `value` attribute specifies the value for the specified property. `jms:JMSNamingProperties` element can also be used for specification of provider specific properties.

The following is a list of common JNDI properties that can be set:

1. `java.naming.factory.initial`
2. `java.naming.provider.url`
3. `java.naming.factory.object`
4. `java.naming.factory.state`

5. `java.naming.factory.url.pkgs`
6. `java.naming.dns.url`
7. `java.naming.authoritative`
8. `java.naming.batchsize`
9. `java.naming.referral`
10. `java.naming.security.protocol`
11. `java.naming.security.authentication`
12. `java.naming.security.principal`
13. `java.naming.security.credentials`
14. `java.naming.language`
15. `java.naming.applet`

For more details on what information to use in these attributes, check your JNDI provider's documentation and consult the Java API reference material.

Example

Example 47 on page 94 shows a Artix ESB configuration entry for configuring the addressing information for a JMS consumer endpoint.

Example 47. Addressing Information in a Artix ESB Configuration File

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:ct="http://cxf.apache.org/configuration/types"
       xmlns:jms="http://cxf.apache.org/transports/jms"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd"
                                              http://cxf.apache.org/jaxws ht
tp://cxf.apache.org/schemas/jaxws.xsd
                          http://cxf.apache.org/transports/jms http://cxf.apache.org/schem
as/configuration/jms.xsd">
  <jms:conduit name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-conduit">
    <jms:address destinationStyle="queue"
                 jndiConnectionFactoryName="myConnectionFactory"
```

```
                jndiDestinationName="myDestination"
                jndiReplyDestinationName="myReplyDestination"
                connectionUserName="testUser"
                connectionPassword="testPassword">
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                             value="org.apache.cxf.transport.jms.MyInitialContextFactory"
/>
      <jms:JMSNamingProperty name="java.naming.provider.url"
                             value="tcp://localhost:61616" />
    </jms:address>
  </jms:conduit>
</beans>
```

Using WSDL

Overview

If you prefer to configure your endpoint using WSDL, you can specify JMS endpoints as a part of a WSDL service definition. The `jms:address` element is a child of the WSDL `port` element.

Important

Information in the configuration file will override the information in the endpoint's WSDL file.

The address element

The basic configuration for a JMS endpoint is done by using a `jms:address` element as the child of your service's `port` element. The `jms:address` element used in WSDL is identical to the one used in the configuration file. Its attributes are listed in Table 12 on page 93. Like the `jms:address` element in the configuration file, the `jms:address` WSDL element also uses a `jms:JMSNamingProperties` child element to specify additional information needed to connect to a JNDI provider.

Example

Example 48 on page 96 shows an example of a JMS WSDL `port` specification.

Example 48. JMS WSDL Port Specification

```
<service name="JMSService">
  <port binding="tns:Greeter_SOAPBinding" name="SoapPort">
    <jms:address jndiConnectionFactoryName="ConnectionFactory"
                 jndiDestinationName="dynamicQueues/test.Celtix.jmstransport" >
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                             value="org.activemq.jndi.ActiveMQInitialContextFactory" />
      <jms:JMSNamingProperty name="java.naming.provider.url"
                             value="tcp://localhost:61616" />
    </jms:address>
  </port>
</service>
```

Using a Named Reply Destination

Overview

By default, Artix ESB endpoints using JMS create a temporary queue for sending replies back and forth. If you prefer to use named queues, you can configure the queue used to send replies as part of an endpoint's JMS configuration.

Setting the reply destination name

You specify the reply destination using either the `jmsReplyDestinationName` attribute or the `jndiReplyDestinationName` attribute in the endpoint's JMS configuration. A client endpoint will listen for replies on the specified destination and it will specify the value of the attribute in the `ReplyTo` field of all outgoing requests. A service endpoint will use the value of the `jndiReplyDestinationName` attribute as the location for placing replies if there is no destination specified in the request's `ReplyTo` field.

Example

Example 49 on page 97 shows the configuration for a JMS client endpoint.

Example 49. JMS Consumer Specification Using a Named Reply Queue

```
<jms:conduit name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-conduit">
    <jms:address destinationStyle="queue"
                 jndiConnectionFactoryName="myConnectionFactory"
                 jndiDestinationName="myDestination"
                 jndiReplyDestinationName="myReplyDestination" >
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                             value="org.apache.cxf.transport.jms.MyInitialContextFactory"
/>
      <jms:JMSNamingProperty name="java.naming.provider.url"
                             value="tcp://localhost:61616" />
    </jms:address>
  </jms:conduit>
```

Consumer Endpoint Configuration

JMS consumer endpoints specify the type of messages they use. JMS consumer endpoint can use either a JMS `ByteMessage` or a JMS `TextMessage`. When using an `ObjectMessage` the consumer endpoint uses a byte[] as the method for storing data into and retrieving data from the JMS message body. When messages are sent, the message data, including any formating information, is packaged into a byte[] and placed into the message body before it is placed on the wire. When messages are received, the consumer endpoint will attempt to unmarshall the data stored in the message body as if it were packed in a byte[].

When using a `TextMessage`, the consumer endpoint uses a string as the method for storing and retrieving data from the message body. When messages are sent, the message information, including any format-specific information, is converted into a string and placed into the JMS message body. When messages are received the consumer endpoint will attempt to unmarshall the data stored in the JMS message body as if it were packed into a string.

When native JMS applications interact with Artix ESB consumers, the JMS application is responsible for interpreting the message and the formatting information. For example, if the Artix ESB contract specifies that the binding used for a JMS endpoint is SOAP, and the messages are packaged as `TextMessage`, the receiving JMS application will get a text message containing all of the SOAP envelope information.

A consumer endpoint can be configured in one of two ways:

- Configuration
- WSDL

Tip

The recommended method is to place the consumer endpoint specific information into the Artix ESB configuration file for the endpoint.

Using Configuration

Specifying the message type

Consumer endpoint configuration is specified using the `jms:conduit` element. Using this configuration element, you specify the message type supported by the consumer endpoint using the `jms:runtimePolicy` child element. The message type is specified using the `messageType` attribute. The `messageType` attribute has two possible values:

Table 13. `messageType` Values

`text`	Specifies that the data will be packaged as a `TextMessage`.
`binary`	specifies that the data will be packaged as an `ByteMessage`.

Example

Example 50 on page 99 shows a configuration entry for configuring a JMS consumer endpoint.

Example 50. Configuration for a JMS Consumer Endpoint

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:ct="http://cxf.apache.org/configuration/types"
       xmlns:jms="http://cxf.apache.org/transports/jms"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd"

                                                 http://cxf.apache.org/jaxws ht
tp://cxf.apache.org/schemas/jaxws.xsd
                          http://cxf.apache.org/transports/jms http://cxf.apache.org/schem
as/configuration/jms.xsd">
   ...
  <jms:conduit name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-conduit">
    <jms:address ... >
                    ...
    </jms:address>
                    ...
    <jms:runtimePolicy messageType="binary"/>
    ...
  </jms:conduit>
  ...
</beans>
```

Using WSDL

Specifying the message type

The type of messages accepted by a JMS consumer endpoint is configured using the optional `jms:client` element. The `jms:client` element is a child of the WSDL `port` element and has one attribute:

Table 14. JMS Client WSDL Extensions

`messageType`	Specifies how the message data will be packaged as a JMS message. `text` specifies that the data will be packaged as a `TextMessage`. `binary` specifies that the data will be packaged as an `ByteMessage`.

Example

Example 51 on page 100 shows the WSDL for configuring a JMS consumer endpoint.

Example 51. WSDL for a JMS Consumer Endpoint

```
<service name="JMSService">
  <port binding="tns:Greeter_SOAPBinding" name="SoapPort">
    <jms:address jndiConnectionFactoryName="ConnectionFactory"
                 jndiDestinationName="dynamicQueues/test.Celtix.jmstransport" >
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                             value="org.activemq.jndi.ActiveMQInitialContextFactory" />
      <jms:JMSNamingProperty name="java.naming.provider.url"
                             value="tcp://localhost:61616" />
    </jms:address>
    <jms:client messageType="binary" />
  </port>
</service>
```

Provider Endpoint Configuration

JMS provider endpoints have a number of behaviors that are configurable. These include:

- how messages are correlated
- the use of durable subscriptions
- if the service uses local JMS transactions
- the message selectors used by the endpoint

Service endpoints can be configure in one of two ways:

- Configuration
- WSDL

Tip

The recommended method is to place the provider endpoint specific information into the Artix ESB configuration file for the endpoint.

Using Configuration

Specifying configuration data

Provider endpoint configuration is specified using the `jms:destination` configuration element. Using this configuration element, you can specify the provider endpoint's behaviors using the `jms:runtimePolicy` element. When configuring a provider endpoint you can use the following `jms:runtimePolicy` attributes:

Table 15. Provider Endpoint Configuration

Attribute	Description
`useMessageIDAsCorrealationID`	Specifies whether the JMS broker will use the message ID to correlate messages. The default is `false`.
`durableSubscriberName`	Specifies the name used to register a durable subscription.
`messageSelector`	Specifies the string value of a message selector to use. For more information on the syntax used to specify message selectors, see the JMS 1.1 specification.
`transactional`	Specifies whether the local JMS broker will create transactions around message processing. The default is `false`.[a]

[a]Currently,setting the `transactional` attribute to `true` is not supported by the runtime.

Example

Example 52 on page 102 shows a Artix ESB configuration entry for configuring a provider endpoint.

Example 52. Configuration for a Provider Endpoint

```
<beans xmlns="http://www.springframework.org/schema/beans"
       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
       xmlns:ct="http://cxf.apache.org/configuration/types"
       xmlns:jms="http://cxf.apache.org/transports/jms"
       xsi:schemaLocation="http://www.springframework.org/schema/beans
                           http://www.springframework.org/schema/beans/spring-beans.xsd"
                                          http://cxf.apache.org/jaxws ht
tp://cxf.apache.org/schemas/jaxws.xsd
                           http://cxf.apache.org/transports/jms http://cxf.apache.org/schem
as/configuration/jms.xsd">
   ...
  <jms:destination name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-destination">

                      ...
```

```
    <jms:runtimePolicy messageSelector="cxf_message_selector"
                       useMessageIDAsCorrelationID="true"
                       transactional="true"
                       durableSubscriberName="cxf_subscriber" />
    ...
  </jms:destination>
  ...
</beans>
```

Using WSDL

Configuring the endpoint

Provider endpoint behaviors are configured using the optional `jms:server` element. The `jms:server` element is a child of the WSDL `wsdl:port` element and has the following attributes:

Table 16. JMS Provider Endpoint WSDL Extensions

Attribute	Description
`useMessageIDAsCorrealationID`	Specifies whether JMS will use the message ID to correlate messages. The default is `false`.
`durableSubscriberName`	Specifies the name used to register a durable subscription.
`messageSelector`	Specifies the string value of a message selector to use. For more information on the syntax used to specify message selectors, see the JMS 1.1 specification.
`transactional`	Specifies whether the local JMS broker will create transactions around message processing. The default is `false`. [a]

[a] Currently,setting the `transactional` attribute to `true` is not supported by the runtime.

Example

Example 53 on page 104 shows the WSDL for configuring a JMS provider endpoint.

Example 53. WSDL for a JMS Provider Endpoint

```
<service name="JMSService">
  <port binding="tns:Greeter_SOAPBinding" name="SoapPort">
    <jms:address jndiConnectionFactoryName="ConnectionFactory"
                 jndiDestinationName="dynamicQueues/test.Celtix.jmstransport" >
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                             value="org.activemq.jndi.ActiveMQInitialContextFactory" />
      <jms:JMSNamingProperty name="java.naming.provider.url"
                             value="tcp://localhost:61616" />
    </jms:address>
    <jms:server messageSelector="cxf_message_selector"
                useMessageIDAsCorrelationID="true"
                transactional="true"
                durableSubscriberName="cxf_subscriber" />
  </port>
</service>
```

JMS Runtime Configuration

In addition to configuring the externally visible aspects of your JMS endpoint, you can also configure aspects of its internal runtime behavior. There are three types of runtime configuration:

- JMS session pool configuration
- Consumer specific configuration
- Provider specific configuration

JMS Session Pool Configuration

The JMS configuration allows you to specify the number of JMS sessions an endpoint will keep in a pool.

Configuration element

You use the `jms:sessionPool` element to specify the session pool configuration for a JMS endpoint. The `jms:sessionPool` element is a child of both the `jms:conduit` element and the `jms:destination` element.

The `jms:sessionPool` element's attributes, listed in Table 17 on page 106, specify the high and low water marks for the endpoint's JMS session pool.

Table 17. Attributes for Configuring the JMS Session Pool

Attribute	Description
`lowWaterMark`	Specifies the minimum number of JMS sessions pooled by the endpoint. The default is `20`.
`highWaterMark`	Specifies the maximum number of JMS sessions pooled by the endpoint. The default is `500`.

Example

Example 54 on page 106 shows an example of configuring the session pool for a Artix ESB JMS provider endpoint.

Example 54. JMS Session Pool Configuration

```
...
<jms:destination name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-destination>

  <jms:address ... >
    ...
  </jms:address>
  ...
  <jms:sessionPool lowWaterMark="10"
                   highWaterMark="5000" />
  ...
</jms:destination>
...
```

Consumer Specific Runtime Configuration

The JMS consumer configuration allows you to specify two runtime behaviors:

- the number of milliseconds the consumer will wait for a response.
- the number of milliseconds a request will exist before the JMS broker can remove it.

Configuration element

You configure consumer runtime behavior using the `jms:clientConfig` element. The `jms:clientConfig` element is a child of the `jms:conduit` element. It has two attributes that are used to specify the configurable runtime properties of a consumer endpoint.

Configuring the response timeout interval

You specify the interval, in milliseconds, a consumer endpoint will wait for a response before timing out using the `jms:clientConfig` element's `clientReceiveTimeout` attribute. The default timeout interval is 2000.

Configure the request time to live

You specify the interval, in milliseconds, that a request can remain unreceived before the JMS broker can delete it using the `jms:clientConfig` element's `messageTimeToLive` attribute. The default time to live interval is 0 which specifies that the request has an infinite time to live.

Example

Example 55 on page 107 shows a configuration fragment that sets the consumer endpoint's request lifetime to 500 milliseconds and its timeout value to 500 milliseconds.

Example 55. JMS Consumer Endpoint Runtime Configuration

```
...
<jms:conduit name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-conduit">
  <jms:address ... >
    ...
  </jms:address>
  ...
  <jms:clientConfig clientReceiveTimeout="500"
                    messageTimeToLive="500" />
  ...
</jms:conduit>
...
```

Provider Specific Runtime Configuration

The provider specific configuration allows you to specify to runtime behaviors:

- the amount of time a response message can remain unreceived before the JMS broker can delete it.
- the client identifier used when creating and accessing durable subscriptions.

Configuration element

You configure provider runtime behavior using the `jms:serverConfig` element. The `jms:serverConfig` element is a child of the `jms:destination` element. It has two attributes that are used to specify the configurable runtime properties of a provider endpoint.

Configuring the response time to live

The `jms:serverConfig` element's `messageTimeToLive` attribute specifies the amount of time, in milliseconds, that a response can remain unread before the JMS broker is allowed to delete it. The default is `0` which specifies that the message can live forever.

Configuring the durable subscriber identifier

The `jms:serverConfig` element's `durableSubscriptionClientId` attribute specifies the client identifier the endpoint uses to create and access durable subscriptions.

Example

Example 56 on page 108 shows a configuration fragment that sets the provider endpoint's response lifetime to 500 milliseconds and its durable subscription client identifier to `jms-test-id`.

Example 56. Provider Endpoint Runtime Configuration

```
...
<jms:destination name="{http://cxf.apache.org/jms_endpt}HelloWorldJMSPort.jms-destination">

  <jms:address ... >
    ...
  </jms:address>
  ...
  <jms:serverConfig messageTimeToLive="500"
                    durableSubscriptionClientId="jms-test-id" />
  ...
</jms:destination>
...
```

Using WebSphere MQ

Artix ESB connects to WebSphere MQ using MQ's JMS APIs. It is set up using the standard Artix ESB JMS transport configuration.

Overview

To configure an endpoint to use WebSphere MQ you need to provide the following information:

- The class name of MQ's initial context factory.
- The URL of MQ's JNDI provider.

Important

In addition to the above, you will also need to provide the standard JMS configuration information.

Tip

This information can be provided as part of an endpoint's WSDL document or in an endpoint's configuration.

JMS Addressing Information

Regardless of the JMS provider in use, you will always need to provide some standard addressing information using the `jms:address` element's attributes. Table 18 on page 109 shows the attributes needed when using WebSphere MQ's JMS interface.

Table 18. `jms:address` Attributes for Using WebSphere MQ

Attribute	Description
`destinationStyle`	WebSphere MQ supports both queues and topics.
`jndiConnectionFactoryName`	The JNDI name for the connection factory can be any string. You will need to use this value when providing the WebSphere MQ specific JMS properties.
`jndiDestinationName`	The JNDI name for the destination can be any string. You will need to use this value

Attribute	Description
	when providing the IBM WebSphere MQ specific JMS properties.

The JNDI Initial Context Factory

You specify the WebSphere MQ JNDI initial context factory using a `jms:JMSNamingProperty` element. As shown in Example 57 on page 110, the value of the `name` attribute is `java.naming.factory.initial` and the value of the `value` attribute is `com.ibm.mq.jms.context.WMQInitialContextFactory`.

Example 57. Specifying the JNDI Initial Context Factory

```
<jms:address ...>
  <jms:JMSNamingProperty name="java.naming.factory.initial"
                         value="com.ibm.mq.jms.context.WMQIni
tialContextFactory" />
  ...
</jms:address>
```

Important

`com.ibm.mq.jms.context.WMQInitialContextFactory` is only available in the IBM supplied SupportPac ME01.

The JNDI Provider URL

You specify the JNDI provider's URL using a `jms:JMSNamingProperty` element. The value of the `name` attribute is `java.naming.provider.url`. The value of the `value` attribute is the URL at which WebSphere MQ's broker is running.

There are two options for a JNDI provider when using WebSphere MQ:

- The default WebSphere MQ installation includes JNDI providers for local file systems and LDAP servers.
- SupportPac ME01, available from IBM, provides support for using a WebSphere MQ queue manager as a JNDI repository. It can dynamically generate JMS administrable objects, based on actual queues on the queue manager.

For more information about setting up JNDI providers for use with WebSphere MQ, see the WebSphere MQ documentation.

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