



Artix ESB

Bindings and Transports, C++ Runtime

Version 5.0
July 2007

Making Software Work Together™

Bindings and Transports, C++ Runtime

IONA Technologies

Version 5.0

Published 31 Jul 2008

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Preface

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What is Covered in This Book

This book discusses the bindings and transports supported by the Artix ESB C++ 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. In the case of transports, such as Websphere MQ, it also discusses how to access some of the transports more advanced features.

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 C++ 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 three parts:

- [Part I on page 19](#) describes how to work with the message bindings.
- [Part II on page 139](#) describes how to work with the transports.
- [Part III on page 229](#) describes how to use other Artix ESB features that are contract driven. This includes codeset conversion and XSLT.

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 Librabry](#) [../library_intro/index.htm].

Part I. Bindings

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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 `WSDLbinding` 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 “Understanding How Endpoints are Defined WSDL” on page 195.

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 include:

- Artix Designer has wizards that lead you through the process of adding bindings to your contract.
- A number of the 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

Artix ESB C++ Runtime supports the following bindings:

- SOAP
- CORBA
- Fixed record length
- Pure XML
- Tagged (variable record length)
- TibrvMsg (a TIBCO Rendezvous format)
- Tuxedo's Field Manipulation Language (FML)

Using SOAP 1.1 Messages

Artix 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. In addition, you can define a SOAP binding that uses MIME multipart attachments.

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Adding a SOAP 1.1 Binding

Overview

Artix provides two ways to add a SOAP 1.1 binding for a logical interface:

1. Use Artix Designer as discussed in [Using Artix Designer on page 26](#).
 2. Use the command line tool **wsdltosoap** as described in [Using wsdltosoap on page 26](#).
-

Using Artix Designer

Artix Designer provides three ways of adding a SOAP 1.1 binding to a contract:

1. Select **Artix Designer** → **SOAP Enable**.
2. Select **Artix Designer** → **New Binding**.
3. Select **New Binding** from the context menu available in diagram view.

For more information on using Artix Designer, see Artix Designer's on-line help.

Using wsdltosoap

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

```
wsdltosoap {-i portType} {-n namespace} [-b binding] [-d dir] [-o file]
[-style {[document] | [rpc]}] [-use {[literal] | [encoded]}] [-quiet] [-verbose]
[-h] [-v] wsdl_file
```

The command has the following options:

<code>-i portType</code>	Specifies the name of the port type being mapped to a SOAP 1.1 binding.
<code>-n namespace</code>	Specifies the namespace to use for the SOAP 1.1 binding.
<code>-b binding</code>	Specifies the name for the generated SOAP binding. Defaults to <code>portTypeBinding</code> .
<code>-d dir</code>	Specifies the directory into which the new WSDL file is written.
<code>-o file</code>	Specifies the name of the generated WSDL file. Defaults to <code>wsdl_file-soap.wsdl</code> .

<code>-style</code>	Specifies the encoding style to use in the SOAP binding. Defaults to <code>document</code> .
<code>-use</code>	Specifies how the data is encoded. Default is <code>literal</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Specifies that the tool will display a usage message.
<code>-v</code>	Displays the tool's version.

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

Example

If your system had an interface that took orders and offered a single operation to process the orders it would be defined in an Artix contract similar to the one shown in [Example 1 on page 27](#).

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"/>
  </operation>
</portType>
</definitions>
```

```
<fault message="tns:badSize" name="sizeFault"/>
</operation>
</portType>
...
</definitions>
```

The SOAP binding generated for `orderWidgets` is shown in [Example 2 on page 28](#).

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 29](#). 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.



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 4 on page 30](#) shows a modified version of the `orderWidgets` service shown in [Example 1 on page 27](#). 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 would be responsible for adding the SOAP header in 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>
</definitions>
<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 could modify [Example 4 on page 30](#) so that the header value was a part of the input and output messages as shown in [Example 5 on page 32](#). In this case `keyVal` is a part of the input and output messages. In the `soap:body` element's `parts` attribute specifies that `keyVal` is not to 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>
```

Sending Data Using SOAP with Attachments

Overview

SOAP 1.1 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 1.1 messages. This technique is called using SOAP with attachments. SOAP attachments are defined in the W3C's *SOAP Messages with Attachments Note* (<http://www.w3.org/TR/SOAP-attachments>).

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 6 on page 34](#).

Example 6. 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 1.1 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 that the message body is going to be a multipart message that potentially contains binary data. The contents of the element define the parts of the message and their contents. `mime:multipartRelated` elements in Artix contain one or more `mime:part` elements that describe the individual parts of the message.

Describing a MIME multipart 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.

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 in an Artix contract:

1. Inside the `input` or `output` message you want to send as a MIME multipart message, add a `mime:multipartRelated` 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:multipartRelated` 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 1. mime:content Attributes

Attribute	Description
part	Specifies the name of the WSDL message <code>part</code> , from the parent message definition, that is used as the content of this part of the MIME multipart message being placed on the wire.
type	<p>The MIME type of the data in this message part. MIME types are defined as a type and a subtype using the syntax <i>type/subtype</i>.</p> <p>There are a number of predefined MIME types such as <code>image/jpeg</code> and <code>text/plain</code>. The MIME types are maintained by the Internet Assigned Numbers Authority (IANA) and described in detail in <i>Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies</i> (ftp://ftp.isi.edu/in-notes/rfc2045.txt) and <i>Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types</i> (ftp://ftp.isi.edu/in-notes/rfc2046.txt).</p>

- For each additional MIME part, repeat steps [Step 4 on page 35](#) and [Step 5 on page 35](#).

Example

[Example 7 on page 36](#) shows an Artix contract for 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 7. 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">
    <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>

```


Using SOAP 1.2 Messages

Artix provides tools to generate a SOAP 1.2 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 1.2 Binding	40
Adding Headers to a SOAP 1.2 Message	43

Adding a SOAP 1.2 Binding

Overview

Artix provides two ways to add a SOAP 1.2 binding for a logical interface:

- use Artix Designer as described in [Using Artix Designer on page 40](#).
- The second is the command line tool **wsdltosoap** as described in [Using wsdltosoap on page 40](#).



Note

Artix 4.1 only supports literal SOAP 1.2 messages.

Using Artix Designer

Artix Designer provides three ways of adding a SOAP 1.2 binding to a contract:

1. Select **Artix Designer** → **SOAP Enable**.
2. Select **Artix Designer** → **New Binding**.
3. Select **New Binding** from the context menu available in diagram view.

For more information on using Artix Designer, see Artix Designer's on-line help.

Using wsdltosoap

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

```
wsdltosoap {-soapversion 1.2} {-i portType} {-n namespace} [-b binding]
[-d dir] [-o file] [-style [[document] | [rpc]]] [-use {[literal] | [encoded]}]
[-quiet] [-verbose] [-h] [-v] wsdl_file
```

The command has the following options:

<code>-soapversion 1.2</code>	Specifies that the generated binding should use SOAP 1.2.
<code>-i portType</code>	Specifies the name of the port type being mapped to a SOAP binding.
<code>-n namespace</code>	Specifies the namespace to use for the SOAP binding.
<code>-b binding</code>	Specifies the name for the generated SOAP binding. Defaults to <code>portTypeBinding</code> .

<code>-d dir</code>	Specifies the directory into which the new WSDL file is written.
<code>-o file</code>	Specifies the name of the generated WSDL file. Defaults to <code>wSDL_file-soap.wsdl</code> .
<code>-style</code>	Specifies the encoding style to use in the SOAP binding. Defaults to <code>document</code> .
<code>-use</code>	Specifies how the data is encoded. Default is <code>literal</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Specifies that the tool will display a usage message.
<code>-v</code>	Displays the tool's version.



Important

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

Example

If your system had an interface that took orders and offered a single operation to process the orders it would be defined in an Artix contract similar to the one shown in [Example 8 on page 41](#).

Example 8. 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 9 on page 42](#).

Example 9. SOAP 1.2 Binding for `orderWidgets`

```

<binding name="orderWidgetsBinding" type="tns:orderWidgets">
  <wsoap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
  <operation name="placeWidgetOrder">
    <wsoap12:operation soapAction="" style="document"/>
    <input name="order">
      <wsoap12:body use="literal"/>
    </input>
    <output name="bill">
      <wsoap12:body use="literal"/>
    </output>
    <fault name="sizeFault">
      <wsoap12: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 header becomes part of the parent message. A 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 10 on page 43](#).

Example 10. SOAP Header Syntax

```
<binding name="headwig">
  <soap12:binding style="document" transport="http://schemas.xmlsoap.org/soap/http"/>
  <operation name="weave">
    <soap12:operation soapAction="" style="document"/>
    <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 2 on page 43](#).

Table 2. `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 whether the message parts are to be encoded using encoding rules. If set to <code>encoded</code> the message parts are encoded using the encoding rules specified by the value of the <code>encodingStyle</code> attribute. If set to <code>literal</code> , then the message parts are defined by the schema types referenced.

Attribute	Description
encodingStyle	Specifies the encoding rules used to construct the message.
namespace	Defines the namespace to be assigned to the header element serialized with <code>use="encoded"</code> .

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 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 11 on page 44](#) shows a modified version of the `orderWidgets` service shown in [Example 8 on page 41](#). This version has been modified so that each order has an `xsd:base64binary` value placed in the header of the request and response. The header is defined as being the `keyVal` part from the `widgetKey` message. In this case you would be responsible for adding the application logic to create the header because it is not part of the input or output message.

Example 11. 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="xsd: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 could modify [Example 11 on page 44](#) so that the header value was a part of the input and output messages as shown in [Example 12 on page 46](#). In this case `keyVal` is a part of the input and output messages. In the `soap12:body` elements the `parts` attribute specifies that `keyVal` is not to be inserted into the body. However, it is inserted into the header.

Example 12. 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>
```


Using Tuxedo's FML Buffers

Artix can send and receive messages packaged as FML buffers.

Overview

Tuxedo's native data format is FML. The FML buffers used by Tuxedo applications are described in one of two ways:

- A *field table file* that is loaded at runtime.
- A C header file that is compiled into the application.

A field table file is a detailed and user readable text file describing the contents of a buffer. It clearly describes each field's name, ID number, data type, and a comment. Using the FML library calls, Tuxedo applications map the field table description to usable `fldids` at runtime.

The C header file description of an FML buffer simply maps field names to their `fldid`. The `fldid` is an integer value that represents both the type of data stored in a field and a unique identifying number for that field.

Artix works with this data by mapping the native Tuxedo data descriptions into a WSDL `binding` element. As part of developing an Artix solution to integrate with legacy Tuxedo applications, you must add an FML binding to the contract describing the integration.

FML/XML Schema support

An FML buffer can only contain the data types listed in [Table 3 on page 49](#).

Table 3. FML Type Support

FML Type	XML Schema Type
short	xsd:short
short	xsd:unsignedShort
long	xsd:int
long	xsd:unsignedInt
float	xsd:float
double	xsd:double
string	xsd:string
string	xsd:base64Binary

FML Type	XML Schema Type
string	xsd:hexBinary

Important

Due to FML limitations, support for complex types is limited to `xsd:sequence` and `xsd:all`.

Mapping from a field table to an Artix contract

Creating an Artix contract to represent an FML buffer is a two-step process:

1. Create the logical data representation of the FML buffer in the Artix contract as described in [Mapping to logical type descriptions on page 50](#).
 2. Enter the FML binding information using Artix WSDL extensors as described in [Adding the FML binding on page 53](#).
-

Mapping to logical type descriptions

To create a logical data type to represent data in an FML buffer do the following:

1. If the C header file for the FML buffer does not exist, generate it from the field table using the Tuxedo `mkfldhdr` or `mkfldhdr32` utility program.
2. For each field in the FML buffer, create an `element` with the following attribute settings:
 - `name` is set to a string that identifies the field. This value is used to by the binding to correlate the logical type with the FML field.



Tip

The value of the `name` attribute does not need to match the name of the physical FML field.

- `type` is set to the appropriate XML Schema type for the type specified in the field table. See [FML/XML Schema support on page 49](#).
3. If your Tuxedo application has data fields that are always used together, you can group the corresponding elements into complex types.



Important

In Tuxedo, a WSDL `operation` is implicitly bound to the Tuxedo service used. So, when the Tuxedo extensor is configured for the WSDL `port` there must be a one-to-one mapping between the WSDL `operation` and the Tuxedo service. IONA recommends that you group elements into complex types only if they appear together in all exposed Tuxedo services.

Consider a Tuxedo application that returns personnel records on employees that needs to be exposed through a new web interface. The Tuxedo application uses the field table file shown in [Example 13 on page 51](#).

Example 13. `personnelInfo` Field Table File

```
# personnelInfo Field Table
# name      number   type      flags    comment
empId      100      long      -
name       101      string    -
age        102      short     -
dept       103      string    -
addr       104      string    -
city       105      string    -
state      106      string    -
zip        107      string    -
```

The C++ header file generated by the Tuxedo `mkfldhdr` tool to represent the `personnelInfo` FML buffer is shown in [Example 14 on page 51](#). Even if you are not planning to access the FML buffer using the compile-time method, you will need to generate the header file when using Artix because this will give you the `fldid` values for the fields in the buffer.

Example 14. `personnelInfo` C++ header

```
/*      fname      fldid      */
/*      -----      -----      */
#define empId      ((FLDID)8293) /* number: 100 type: long */
#define name       ((FLDID)41062) /* number: 101 type: string */
#define age        ((FLDID)102) /* number: 102 type: short */
#define dept       ((FLDID)41064) /* number: 103 type: string */
#define addr       ((FLDID)41065) /* number: 104 type: string */
#define city       ((FLDID)41066) /* number: 105 type: string */
```

```
#define state ((FLDID)41067) /* number: 106 type: string */
#define zip ((FLDID)41068) /* number: 107 type: string */
```

Before mapping the FML buffer into your contract, you need to look at the operations exposed by the Tuxedo application. Suppose it exposes two operations:

- `infoByName()` that returns the employee data based on a name search.
- `infoByID()` that returns the employee data based on the employee's ID number.

Because the employee data is always returned as a unit you can group it into a complex type as shown in [Example 15 on page 52](#).

Example 15. Logical description of `personneInfo` FML buffer

```
<types>
  <schema targetNamespace="http://soapinterop.org/xsd"
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:wSDL="http://schemas.xmlsoap.org/wSDL/">
    <complexType name="personnelInfo">
      <sequence>
        <element name="empId" type="xsd:int"/>
        <element name="name" type="xsd:string"/>
        <element name="age" type="xsd:short"/>
        <element name="dept" type="xsd:string"/>
        <element name="addr" type="xsd:string"/>
        <element name="city" type="xsd:string"/>
        <element name="state" type="xsd:string"/>
        <element name="zip" type="xsd:string"/>
      </sequence>
    </complexType>
    ...
  </schema>
</types>
```

The interface for your Tuxedo application would be mapped to a `portType` similar to [Example 16 on page 52](#).

Example 16. `personnelInfo` Lookup Interface

```
<message name="idLookupRequest">
  <part name="empId" type="xsd:int"/>
</message>
<message name="nameLookupRequest">
```

```

    <part name="empId" type="xsd:string"/>
  </message>
  <message name="lookupResponse">
    <part name="return" element="xsd1:personnelInfo"/>
  </message>

  <portType name="personnelInfoLookup">
    <operation name="infoByName">
      <input name="name" message="nameLookupRequest"/>
      <output name="return" message="lookupResponse"/>
    </operation>
    <operation name="infoByID">
      <input name="id" message="idLookupRequest"/>
      <output name="return" message="lookupResponse"/>
    </operation>
  </portType>

```

Flattened XML and FML

While XML Schema allows you to create structured data that is organized in multiple layers, FML data is flat. All of the elements in a field table exist on the same level. To handle this difference Artix flattens out the XML data when it is passed through the FML binding.

As a result, complex types defined in XML Schema are collapsed into their composite elements. For instance, the message `lookupResponse`, which uses the complex type defined in [Example 15 on page 52](#), would be equivalent to the message definition in [Example 17 on page 53](#) when processed by the FML binding.

Example 17. Flattened Message for FML

```

<message name="lookupResponse">
  <part name="empId" type="xsd:int"/>
  <part name="name" type="xsd:string"/>
  <part name="age" type="xsd:short"/>
  <part name="dept" type="xsd:string"/>
  <part name="addr" type="xsd:string"/>
  <part name="city" type="xsd:string"/>
  <part name="state" type="xsd:string"/>
  <part name="zip" type="xsd:string"/>
</message>

```

Adding the FML binding

To add the binding that maps the logical description of the FML buffer to a physical FML binding do the following:

1. Add the following line in the `definition` element at the beginning of the contract.

```
xmlns:tuxedo="http://schemas.iona.com/transport/tuxedo"
```

2. Create a new `binding` element in your contract to define the FML buffer's binding.
3. Add a `tuxedo:binding` element to identify that this binding defines an FML buffer.
4. Add a `tuxedo:fieldTable` element to the binding to describe how the element names defined in the logical portion of the contract map to the `fldid` values for the corresponding fields in the FML buffer.

The `tuxedo:fieldTable` has a mandatory `type` attribute. `type` can be either `FML` for specifying that the application uses FML16 buffers or `FML32` for specifying that the application uses FML32 buffers.

5. For each element in the logical data type, add a `tuxedo:field` element to the `tuxedo:fieldTable` element.

`tuxedo:field` defines how the logical data elements map to the physical FML buffer. It has two mandatory attributes:

Table 4. Attributes of the FML Binding's Field Element

Attribute	Description
<code>name</code>	Specifies the name of the element or message part that describes the field.
<code>id</code>	Specifies the <code>fldid</code> value for the field in the FML buffer

6. For each operation in the interface, create a standard WSDL `operation` element to define the operation being bound.
7. For each operation, add a standard WSDL `input` and `output` elements to the `operation` element to define the messages used by the operation.

- For each operation, add a `tuxedo:operation` element to the `operation` element.

For example, the binding for the `personalInfo` FML buffer, defined in [Example 13 on page 51](#), will be similar to the binding shown in [Example 18 on page 55](#).

Example 18. `personalInfo` FML binding

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="personalInfoService" targetNamespace="http://info.org/"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:tns="http://soapinterop.org/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:tuxedo="http://schemas.iona.com/transport/tuxedo">
...
  <binding name="personalInfoFMLBinding" type="tns:personalInfoLookup">
    <tuxedo:binding/>
    <tuxedo:fieldTable type="FML">
      <tuxedo:field name="empId" id="8293"/>
      <tuxedo:field name="name" id="41062"/>
      <tuxedo:field name="age" id="102"/>
      <tuxedo:field name="dept" id="41064"/>
      <tuxedo:field name="addr" id="41065"/>
      <tuxedo:field name="city" id="41066"/>
      <tuxedo:field name="state" id="41067"/>
      <tuxedo:field name="zip" id="41068"/>
    </fml:idNameMapping>
    <operation name="infoByName">
      <tuxedo:operation/>
      <input name="name"/>
      <output name="return"/>
    </operation>
    <operation name="infoByName">
      <tuxedo:operation/>
      <input name="name"/>
      <output name="return"/>
    </operation>
  </binding>
...
</definitions>
```


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.

Artix Designer provides a wizard for generating an XML binding from a logical interface. Alternatively, you can create an XML binding using any text or XML editor.

Using Artix Designer

You can add an XML binding to a contract by either selecting **Artix Designer** → **New Binding** or selecting **New Binding** from the context menu available in Artix Designer's diagram view. For more information see the on-line help provided with Artix Designer.

Hand editing

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

1. Add the namespace declaration to include the IONA extensions defining the XML binding. See [XML binding namespace on page 58](#).
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 58](#).
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 binding namespace

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

```
xmlns:xformat="http://celtix.objectweb.org/bindings/xmlformat"
```

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 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 19 on page 59](#) would generate an XML document with the root element `lineNumber`.

Example 19. Valid XML Binding Message

```
</type ...>
...
<element name="operatorID" type="xsd:int"/>
...
</types><message name="operator"><part name="lineNumber" ele
ment="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 20 on page 59](#) would generate an invalid XML document.

Example 20. 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 will generate an XML document similar to [Example 21 on page 59](#) for the message defined in [Example 20 on page 59](#). The Artix-generated XML document is invalid because it has two root elements: `pairName` and `entryNum`.

Example 21. Invalid XML Document

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

If you set the `rootNode` attribute, as shown in [Example 22 on page 60](#) 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 22. 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"/>
  </operation>
</binding>
```

An XML document generated from the input message would be similar to [Example 23 on page 60](#). Notice that the XML document now only has one root element.

Example 23. XML Document generated using the `rootNode` attribute

```
<entrants>
  <pairName>
    Fred&Linda
  </pairName>
  <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 `xmlformat:body` element inside of the message binding. For example, if you wanted the output message defined in [Example 22 on page 60](#) to have a different root element from the input message, you could override the binding's root element as shown in [Example 24 on page 60](#).

Example 24. Using `xmlformat:body`

```
<binding name="matildaXMLBinding" type="tns:dancingMatildas">

  <xmlformat:body rootNode="entrants"/>
</binding>
```

```
<operation name="register">
  <input name="contestant"/>
  <output name="entered">
    <xformat:body rootNode="entryStatus"/>
  </output>
</operation>
</binding>
```


Using Fixed Length Records

To make interoperating with mainframes and older systems easy, Artix ESB can send and receive messages formatted as fixed length records.

Overview

The Artix ESB fixed binding is used to represent fixed record length data. Common uses for this type of payload format are communicating with back-end services on mainframes and applications written in COBOL. Artix ESB provides several means for creating a contract containing a fixed binding:

- If you are integrating with an application written in COBOL and have the COBOL copybook defining the data to be used, you can import the copybook to create a contract.
 - If you have a description of the fixed data in some form other than a COBOL copybook, you can create a contract by describing the data.
 - If you have a logical interface you want to map to a fixed binding you can use Artix Designer to create a fixed binding.
 - You can enter the binding information using any text editor or XML editor.
-

Using Artix Designer

Artix Designer provides a number of tools for creating a contract with a fixed binding:

1. You can create a new contract from a COBOL copybook by selecting **New** → **File** → **WSDL from Dataset** and importing copybook.
2. You can create a new contract from a description of the fixed data by selecting **New** → **File** → **WSDL from Dataset**.
3. You can add a fixed binding to a contract by selecting **Artix Designer** → **New Binding**.
4. You can add a fixed binding using the context menu available in Artix Designer's diagram view.

For more information see the on-line help provided with Artix Designer.

Hand editing

To map a logical interface to a fixed binding you do the following:

1. Add the proper namespace reference to the `definition` element of your contract. See [Fixed binding namespace on page 64](#).
2. Add a WSDL `binding` element to your contract to hold the fixed binding, give the binding a unique `name`, and specify the port type that represents the interface being bound.
3. Add a `fixed:binding` element as a child of the new `binding` element to identify this as a fixed binding and set the element's attributes to properly configure the binding. See [fixed:binding on page 64](#).
4. For each operation defined in the bound interface, add a WSDL `operation` element to hold the binding information for the operation's messages.
5. For each operation added to the binding, add a `fixed:operation` child element to the `operation` element. See [fixed:operation on page 65](#).
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. For each `input`, `output`, and `fault` element in the binding, add a `fixed:body` child element to define how the message parts are mapped into the concrete fixed record length payload. See [fixed:body on page 65](#).

Fixed binding namespace

The IONA extensions used to describe fixed record length bindings are defined in the namespace `http://schemas.iona.com/bindings/fixed`. Artix tools use the prefix `fixed` to represent the fixed record length extensions. Add the following line to your contract:

```
xmlns:fixed="http://schemas.iona.com/bindings/fixed"
```

`fixed:binding`

`fixed:binding` specifies that the binding is for fixed record length data. Its attributes are described in [Table 5 on page 65](#).

Table 5. Attributes for `fixed:binding`

Attribute	Description
<code>justification</code>	Specifies the default justification of the data contained in the messages. Valid values are <code>left</code> and <code>right</code> . Default is <code>left</code> .
<code>encoding</code>	Specifies the codeset used to encode the text data. Valid values are any valid ISO locale or Internet Assigned Numbers Authority (IANA) codeset name. Default is <code>UTF-8</code> .
<code>padHexCode</code>	Specifies the hex value of the character used to pad the record.

The settings for the attributes on these elements become the default settings for all the messages being mapped to the current binding. All of the values can be overridden on a message-by-message basis.

`fixed:operation`

`fixed:operation` is a child element of the WSDL `operation` element and specifies that the operation's messages are being mapped to fixed record length data.

`fixed:operation` has one attribute, `discriminator`, that assigns a unique identifier to the operation. If your service only defines a single operation, you do not need to provide a discriminator. However, if your service has more than one service, you must define a unique discriminator for each operation in the service. Not doing so will result in unpredictable behavior when the service is deployed.

For each message used in the operation, you will need to include a [fixed:field on page 67](#) element whose `name` attribute is equal to the value of `discriminator` and whose `bindingOnly` attribute is set to `true`. This field will hold the the value used by the binding to discriminate between the operations. For more information see [fixed:field on page 67](#).

`fixed:body`

`fixed:body` is a child element of the `input`, `output`, and `fault` elements representing the messages being mapped to fixed record length data. It specifies that the message body is mapped to fixed record length data on the wire and describes the exact mapping for the message's parts.

To fully describe how a message is mapped into the fixed message do the following:

1. If the default justification, padding, or encoding settings for the attribute are not correct for this particular message, override them by setting the following optional attributes for `fixed:body`.

Table 6. Attributes for `fixed:body`

Attribute	Description
<code>justification</code>	Specifies how the data in the messages are justified. Valid values are <code>left</code> and <code>right</code> .
<code>encoding</code>	Specifies the codeset used to encode text data. Valid values are any valid ISO locale or IANA codeset name.
<code>padHexCode</code>	Specifies the hex value of the character used to pad the record.

2. For each part in the message the `fixed:body` element is binding, add the appropriate child element to define the part's concrete format on the wire.

The following child elements are used in defining how logical data is mapped to a concrete fixed format message:

- `fixed:field` maps message parts defined using a simple type. See [XML Schema Simple Types](#) in the *Writing Artix ESB Contracts*.
- `fixed:sequence` maps message parts defined using a sequence complex type. Complex types defined using `all` are not supported by the fixed format binding. See [Defining Data Structures](#) in the *Writing Artix ESB Contracts*.
- `fixed:choice` maps message parts defined using a choice complex type. See [Defining Data Structures](#) in the *Writing Artix ESB Contracts*.

3. If you need to add any fields that are specific to the binding and that will not be passed to the applications, define them using a `fixed:field` element with its `bindingOnly` attribute set to `true`.

When `bindingOnly` is set to `true`, the field described by the `fixed:field` element is not propagated beyond the binding. For input messages, this means that the field is read in and then discarded. For output messages, you must also use the `fixedValue` attribute.

The order in which the message parts are listed in the `fixed:body` element represent the order in which they are placed on the wire. It does not need to correspond to the order in which they are specified in the `message` element defining the logical message.

fixed:field

`fixed:field` is used to map simple data types to a fixed length record. To define how the logical data is mapped to a fixed field do the following:

1. Create a `fixed:field` child element to the `fixed:body` element representing the message.
2. Set the `fixed:field` element's `name` attribute to the name of the message part defined in the logical message description that this element is mapping.
3. If the data being mapped is of type `xsd:string`, a simple type that has `xsd:string` as its base type, or an enumerated type set, the `size` attribute of the `fixed:field` element.



Note

If the message part is going to hold a date you can opt to use the `format` attribute described in [step Step 4 on page 68](#) instead of the `size` attribute.

The `size` attribute specifies the length of the string record in the concrete fixed message. For example, the logical message part, `raverID`, described in [Example 25 on page 67](#) would be mapped to a `fixed:field` similar to [Example 26 on page 68](#).

Example 25. Fixed String Message

```
<message name="fixedStringMessage">
  <part name="raverID" type="xsd:string"/>
</message>
```

In order to complete the mapping, you must know the length of the record field and supply it. In this case, the field, `raverID`, can contain no more than twenty characters.

Example 26. Fixed String Mapping

```
<fixed:field name="raverID" size="20"/>
```

4. If the data being mapped is of a numerical type, like `xsd:int`, or a simple type that has a numerical type as its base type, set the `fixed:field` element's `format` attribute.

The `format` attribute specifies how non-string data is formatted. For example, if a field contains a 2-digit numeric value with one decimal place, it would be described in the logical part of the contract as an `xsd:float`, as shown in [Example 27 on page 68](#).

Example 27. Fixed Record Numeric Message

```
<message name="fixedNumberMessage">
  <part name="rageLevel" type="xsd:float"/>
</message>
```

From the logical description of the message, Artix has no way of determining that the value of `rageLevel` is a 2-digit number with one decimal place because the fixed record length binding treats all data as characters. When mapping `rageLevel` in the fixed binding the value of the `format` attribute would be `##. #`, as shown in

[Example 28 on page 68](#). This provides Artix with the meta-data needed to properly handle the data.

Example 28. Mapping Numerical Data to a Fixed Binding

```
<fixed:field name="rageLevel" format="##. #"/>
```

Dates are specified in a similar fashion. For example, the value of the `format` attribute for the date `12/02/72` is `MM/DD/YY`. When using the fixed binding it is recommended that dates are described in the logical part of the contract using `xsd:string`. For example, a message containing a date would be described in the logical part of the contract as shown in [Example 29 on page 69](#).

Example 29. Fixed Date Message

```
<message name="fixedDateMessage">
  <part name="goDate" type="xsd:string"/>
</message>
```

If `goDate` is entered using the standard short date format for US English locales, `mm/dd/yyyy`, you would map it to a fixed record field as shown in [Example 30 on page 69](#).

Example 30. Fixed Format Date Mapping

```
<fixed:field name="goDate" format="mm/dd/yyyy"/>
```

5. If the justification setting is not correct for this particular field, override it by setting the `justification` attribute. Valid values are `left` and `right`.
6. If you want the message part to have a fixed value no matter what data is set in the message part by the application, set the `fixed:field` element's `fixedValue` attribute instead of the `size` or the `format` attribute.

The `fixedValue` attribute specifies a static value to be passed on the wire. When used without `bindingOnly="true"`, the value specified by the `fixedValue` attribute replaces any data that is stored in the message part passed to the fixed record binding. For example, if `goDate`, shown in [Example 29 on page 69](#), were mapped to the fixed field shown in [Example 31 on page 69](#), the actual message returned from the binding would always have the date `11/11/2112`.

Example 31. fixedValue Mapping

```
<fixed:field name="goDate" fixedValue="11/11/2112"/>
```

7. If the data being mapped is of an enumerated type, see “Defining Enumerated Types” on page 43, add a `fixed:enumeration` child element to the `fixed:field` element for each possible value of the enumerated type.

`fixed:enumeration` takes two required attributes: `value` and `fixedValue`. The `value` attribute corresponds to the enumeration value as specified in the logical description of the enumerated type. The `fixedValue` attribute specifies the concrete value that will be used to represent the logical value on the wire.

For example, if you had an enumerated type with the values `FruityTooty`, `Rainbow`, `BerryBomb`, and `OrangeTango` the logical description of the type would be similar to [Example 32 on page 70](#).

Example 32. Enumeration Logical Mapping

```
<xs:simpleType name="flavorType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="FruityTooty"/>
    <xs:enumeration value="Rainbow"/>
    <xs:enumeration value="BerryBomb"/>
    <xs:enumeration value="OrangeTango"/>
  </xs:restriction>
</xs:simpleType>
```

When you map the enumerated type, you need to know the concrete representation for each of the enumerated values. The concrete representations can be identical to the logical or some other value. The enumerated type in [Example 32 on page 70](#) could be mapped to the fixed field shown in [Example 33 on page 70](#). Using this mapping Artix will write `OT` to the wire for this field if the enumerations value is set to `OrangeTango`.

Example 33. Fixed Ice Cream Mapping

```
<fixed:field name="flavor" size="2">
  <fixed:enumeration value="FruityTooty"
    fixedValue="FT"/>
  <fixed:enumeration value="Rainbow" fixedValue="RB"/>
  <fixed:enumeration value="BerryBomb"
    fixedValue="BB"/>
  <fixed:enumeration value="OrangeTango"
    fixedValue="OT"/>
</fixed:field>
```

Note that the parent `fixed:field` element uses the `size` attribute to specify that the concrete representation is two characters long. When

mapping enumerations, the `size` attribute will always be used to represent the size of the concrete representation.

fixed:choice

`fixed:choice` is used to map choice complex types into fixed record length messages. To map a choice complex type to a `fixed:choice` do the following:

1. Add a `fixed:choice` child element to the `fixed:body` element.
2. Set the `fixed:choice` element's `name` attribute to the name of the logical message part being mapped.
3. Set the `fixed:choice` element's optional `discriminatorName` attribute to the name of the field used as the discriminator for the union.

The value for `discriminatorName` corresponds to the name of a binding only `fixed:field` element that describes the type used for the union's discriminator as shown in [Example 34 on page 71](#). The only restriction in describing the discriminator is that it must be able to handle the values used to determine the case of the union. Therefore the values used in the union mapped in [Example 34 on page 71](#) must be two-digit integers.

Example 34. Using the discriminatorName Attribute

```
<fixed:field name="disc" format="##"
            bindingOnly="true"/>
<fixed:choice name="unionStation"
              discriminatorName="disc">
  ...
</fixed:choice>
```

4. For each element in the logical definition of the message part, add a `fixed:case` child element to the `fixed:choice` element.

fixed:case

`fixed:case` elements describe the complete mapping of a choice complex type element to a fixed record length message. To map a choice complex type element to a `fixed:case` do the following:

1. Set the `fixed:case` element's `name` attribute to the name of the logical definition's element.
2. Set the `fixed:case` element's `fixedValue` attribute to the value of the discriminator that selects this element. The value of the `fixedValue` attribute must correspond to the format specified by the `discriminatorName` attribute of the parent `fixed:choice` element.
3. Add a child element to define how the element's data is mapped into a fixed record.

The child elements used to map the part's type to the fixed message are the same as the possible child elements of a `fixed:body` element. As with a `fixed:body` element, a `fixed:sequence` is made up of `fixed:field` elements to describe simple types, `fixed:choice` elements to describe choice complex types, and `fixed:sequence` elements to describe sequence complex types.

[Example 35 on page 72](#) shows an Artix contract fragment mapping a choice complex type to a fixed record length message.

Example 35. Mapping a Union to a Fixed Record Length Message

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="fixedMappingsample" targetNamespace="http://www.iona.com/FixedService"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:fixed="http://schemas.iona.com/bindings/fixed"
  xmlns:tns="http://www.iona.com/FixedService"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<types>
  <schema targetNamespace="http://www.iona.com/FixedService"
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <xsd:complexType name="unionStationType">
      <xsd:choice>
        <xsd:element name="train" type="xsd:string"/>
        <xsd:element name="bus" type="xsd:int"/>
        <xsd:element name="cab" type="xsd:int"/>
        <xsd:element name="subway" type="xsd:string"/>
      </xsd:choice>
    </xsd:complexType>
  ...
```

```

</types>

<message name="fixedSequence">
  <part name="stationPart" type="tns:unionStationType"/>
</message>

<portType name="fixedSequencePortType">
  ...
</portType>

<binding name="fixedSequenceBinding"
  type="tns:fixedSequencePortType">
  <fixed:binding/>
  ...
  <fixed:field name="disc" format="###" bindingOnly="true"/>

  <fixed:choice name="stationPart"
    discriminatorName="disc">
    <fixed:case name="train" fixedValue="01">
      <fixed:field name="name" size="20"/>
    </fixed:case>
    <fixed:case name="bus" fixedValue="02">
      <fixed:field name="number" format="###"/>
    </fixed:case>
    <fixed:case name="cab" fixedValue="03">
      <fixed:field name="number" format="###"/>
    </fixed:case>
    <fixed:case name="subway" fixedValue="04">
      <fixed:field name="name" format="10"/>
    </fixed:case>
  </fixed:choice>
  ...
</binding>
...
</definition>

```

fixed:sequence

`fixed:sequence` maps sequence complex types to a fixed record length message. To map a sequence complex type to a `fixed:sequence` do the following:

1. Add a `fixed:sequence` child element to the `fixed:body` element.
2. Set the `fixed:sequence` element's `name` attribute to the name of the logical message part being mapped.

- For each element in the logical definition of the message part, add a child element to define the mapping for the part's type to the physical fixed message.

The child elements used to map the part's type to the fixed message are the same as the possible child elements of a `fixed:body` element. As with a `fixed:body` element, a `fixed:sequence` is made up of `fixed:field` elements to describe simple types, `fixed:choice` elements to describe choice complex types, and `fixed:sequence` elements to describe sequence complex types.

- If any elements of the logical data definition have occurrence constraints, see [Defining Data Structures](#) in the *Writing Artix ESB Contracts* on page 34, map the element into a `fixed:sequence` element with its `occurs` and `counterName` attributes set.

The `occurs` attribute specifies the number of times this sequence occurs in the message buffer. `counterName` specifies the name of the field used for specifying the number of sequence elements that are actually being sent in the message. The value of `counterName` corresponds to a binding-only `fixed:field` with at least enough digits to count to the value specified in `occurs` as shown in [Example 36 on page 74](#). The value passed to the counter field can be any number up to the value specified by `occurs` and allows operations to use less than the specified number of sequence elements. Artix ESB will pad out the sequence to the number of elements specified by `occurs` when the data is transmitted to the receiver so that the receiver will get the data in the promised fixed format.

Example 36. Using `counterName`

```
<fixed:field name="count" format="##" bindingOnly="true"/>
<fixed:sequence name="items" counterName="count" occurs="10">
  . . .
</fixed:sequence>
```

For example, a structure containing a name, a date, and an ID number would contain three `fixed:field` elements to fully describe the mapping of the

data to the fixed record message. [Example 37 on page 75](#) shows an Artix contract fragment for such a mapping.

Example 37. Mapping a Sequence to a Fixed Record Length Message

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="fixedMappingsample"
  targetNamespace="http://www.iona.com/FixedService"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:fixed="http://schemas.iona.com/bindings/fixed"
  xmlns:tns="http://www.iona.com/FixedService"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">

<types>
  <schema targetNamespace="http://www.iona.com/FixedService"
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <xsd:complexType name="person">
      <xsd:sequence>
        <xsd:element name="name" type="xsd:string"/>
        <xsd:element name="date" type="xsd:string"/>
        <xsd:element name="ID" type="xsd:int"/>
      </xsd:complexType>
      ...
    </types>

<message name="fixedSequence">
  <part name="personPart" type="tns:person"/>
</message>

<portType name="fixedSequencePortType">
  ...
</portType>

<binding name="fixedSequenceBinding"
  type="tns:fixedSequencePortType">
  <fixed:binding/>
  ...
  <fixed:sequence name="personPart">
    <fixed:field name="name" size="20"/>
    <fixed:field name="date" format="MM/DD/YY"/>
    <fixed:field name="ID" format="####"/>
  </fixed:sequence>
  ...
</binding>
...
```

```
</definition>
```

Example

[Example 38 on page 76](#) shows an example of a contract containing a fixed record length message binding.

Example 38. Fixed Record Length Message Binding

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

  <types>
    <schema targetNamespace="http://widgetVendor.com/types/wid
getTypes"
      xmlns="http://www.w3.org/2001/XMLSchema"
      xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">

      <xsd:simpleType name="widgetSize">
        <xsd:restriction base="xsd:string">
          <xsd:enumeration value="big"/>
          <xsd:enumeration value="large"/>
          <xsd:enumeration value="mungo"/>
          <xsd:enumeration value="gargantuan"/>
        </xsd:restriction>
      </xsd:simpleType>

      <xsd:complexType name="Address">
        <xsd:sequence>
          <xsd:element name="name" type="xsd:string"/>
          <xsd:element name="street1" type="xsd:string"/>
          <xsd:element name="street2" type="xsd:string"/>
          <xsd:element name="city" type="xsd:string"/>
          <xsd:element name="state" type="xsd:string"/>
          <xsd:element name="zipCode" type="xsd:string"/>
        </xsd:sequence>
      </xsd:complexType>

      <xsd:complexType name="widgetOrderInfo">
        <xsd:sequence>
          <xsd:element name="amount" type="xsd:int"/>
          <xsd:element name="order_date" type="xsd:string"/>
        </xsd:sequence>
      </xsd:complexType>
    </schema>
  </types>
</definitions>
```

```

        <xsd:element name="type" type="xsd1:widgetSize"/>
        <xsd:element name="shippingAddress" type="xsd1:Ad
dress"/>
    </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="widgetOrderBillInfo">
    <xsd:sequence>
        <xsd:element name="amount" type="xsd:int"/>
        <xsd:element name="order_date" type="xsd:string"/>
        <xsd:element name="type" type="xsd1:widgetSize"/>
        <xsd:element name="amtDue" type="xsd:float"/>
        <xsd:element name="orderNumber" type="xsd:string"/>

        <xsd:element name="shippingAddress" type="xsd1:Ad
dress"/>
    </xsd:sequence>
</xsd:complexType>
</schema>
</types>

<message name="widgetOrder">
    <part name="widgetOrderForm" type="xsd1:widgetOrderInfo"/>
</message>

<message name="widgetOrderBill">
    <part name="widgetOrderConformation" type="xsd1:widget
OrderBillInfo"/>
</message>

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

<binding name="orderWidgetsBinding" type="tns:orderWidgets">

    <fixed:binding/>
    <operation name="placeWidgetOrder">
        <fixed:operation discriminator="widgetDisc"/>
        <input name="widgetOrder">
            <fixed:body>
                <fixed:sequence name="widgetOrderForm">
                    <fixed:field name="amount" format="###"/>
                    <fixed:field name="order_date"
format="MM/DD/YYYY"/>

```

```

        <fixed:field name="type" size="2">
            <fixed:enumeration value="big" fixed
Value="bg"/>
            <fixed:enumeration value="large" fixed
Value="lg"/>
            <fixed:enumeration value="mungo" fixed
Value="mg"/>
            <fixed:enumeration value="gargantuan" fixed
Value="gg"/>
        </fixed:field>
        <fixed:sequence name="shippingAddress">
            <fixed:field name="name" size="30"/>
            <fixed:field name="street1" size="100"/>
            <fixed:field name="street2" size="100"/>
            <fixed:field name="city" size="20"/>
            <fixed:field name="state" size="2"/>
            <fixed:field name="zip" size="5"/>
        </fixed:sequence>
    </fixed:sequence>
</fixed:body>
</input>

    <output name="widgetOrderBill">
        <fixed:body>
            <fixed:sequence name="widgetOrderConformation">
                <fixed:field name="amount" format="###"/>
                <fixed:field name="order_date"
format="MM/DD/YYYY"/>
                <fixed:field name="type" size="2">
                    <fixed:enumeration value="big" fixed
Value="bg"/>
                    <fixed:enumeration value="large" fixed
Value="lg"/>
                    <fixed:enumeration value="mungo" fixed
Value="mg"/>
                    <fixed:enumeration value="gargantuan" fixed
Value="gg"/>
                </fixed:field>
                <fixed:field name="amtDue" format="####.##"/>
                <fixed:field name="orderNumber" size="20"/>
                <fixed:sequence name="shippingAddress">
                    <fixed:field name="name" size="30"/>
                    <fixed:field name="street1" size="100"/>
                    <fixed:field name="street2" size="100"/>
                    <fixed:field name="city" size="20"/>
                    <fixed:field name="state" size="2"/>
                    <fixed:field name="zip" size="5"/>
                </fixed:sequence>
            </fixed:sequence>
        </fixed:body>
    </output>

```

```
        </fixed:body>
    </output>
    </operation>
</binding>

<service name="orderWidgetsService">
    <port name="widgetOrderPort" binding="tns:orderWidgetsBind
ing">
        <http:address location="http://localhost:8080"/>
    </port>
</service>
</definitions>
```


Using Tagged Data

Artix has a binding that reads and writes messages where the data fields are delimited by specified characters.

Overview

The tagged data format supports applications that use self-describing, or delimited, messages to communicate. Artix can read tagged data and write it out in any supported data format. Similarly, Artix is capable of converting a message from any of its supported data formats into a self-describing or tagged data message.

Artix provides several ways of creating a contract with a tagged binding:

- Artix Designer can create a contract with a tagged binding from a description of the tagged data.
 - Artix Designer can create a tagged binding for an existing interface.
 - You can enter the binding information using any text editor or XML editor.
-

Using Artix Designer

Artix Designer provides a number of tools for creating a contract with a tagged binding:

1. You can create a new contract from a description of the tagged data by selecting **New** → **File** → **WSDL from Dataset**.
2. You can add a tagged binding to a contract by selecting **Artix Designer** → **New Binding**.
3. You can add a tagged binding using the context menu available in Artix Designer's diagram view.

For more information see the on-line help provided with Artix Designer.

Hand editing

To map a logical interface to a tagged data format do the following:

1. Add the proper namespace reference to the `definition` element of your contract. See [Namespace on page 82](#) .
2. Add a WSDL `binding` element to your contract to hold the tagged binding, give the binding a unique `name`, and specify the interface that represents the interface being bound.

3. Add a `tagged:binding` element as a child of the new `binding` element to identify this as a tagged binding and set the element's attributes to properly configure the binding.
4. For each operation defined in the bound interface, add a WSDL `operation` element to hold the binding information for the operation's messages.
5. For each operation added to the binding, add a `tagged:operation` child element to the `operation` element.
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. For each `input`, `output`, and `fault` element in the binding, add a `tagged:body` child element to define how the message parts are mapped into the concrete tagged data payload.

Namespace

The IONA extensions used to describe tagged data bindings are defined in the namespace `http://schemas.ionas.com/bindings/tagged`. Artix tools use the prefix `tagged` to represent the tagged data extensions. Add the following line to the `definitions` element of your contract:

```
xmlns:tagged="http://schemas.ionas.com/bindings/tagged"
```

tagged:binding

`tagged:binding` specifies that the binding is for tagged data format messages. Its ten attributes are explained in [Table 7 on page 82](#).

Table 7. Attributes for tagged:binding

Attribute	Purpose
<code>selfDescribing</code>	Required attribute specifying if the message data on the wire includes the field names. Valid values are <code>true</code> or <code>false</code> . If this attribute is set to <code>false</code> , the setting for <code>fieldNameValueSeparator</code> is ignored.

Attribute	Purpose
fieldSeparator	Required attribute that specifies the delimiter the message uses to separate fields. Valid values include any character that is not a letter or a number.
fieldNameValueSeparator	Specifies the delimiter used to separate field names from field values in self-describing messages. Valid values include any character that is not a letter or a number.
scopeType	Specifies the scope identifier for complex messages. Supported values are <code>tab(\t)</code> , <code>curlybrace({data})</code> , and <code>none</code> . The default is <code>tab</code> .
flattened	Specifies if data structures are flattened when they are put on the wire. If <code>selfDescribing</code> is <code>false</code> , then this attribute is automatically set to <code>true</code> .
messageStart	Specifies a special token at the start of a message. It is used when messages require a special character at the start of a the data sequence. Valid values include any character that is not a letter or a number.
messageEnd	Specifies a special token at the end of a message. Valid values include any character that is not a letter or a number.
unscopedArrayElement	Specifies if array elements need to be scoped as children of the array. If set to <code>true</code> , arrays take the form <code>echoArray{myArray=2;item=abc;item=def}</code> . If set to <code>false</code> , arrays take the form <code>echoArray{myArray=2;{0=abc;1=def;}}</code> . Default is <code>false</code> .
ignoreUnknownElements	Specifies if Artix ignores undefined elements in the message payload. Default is <code>false</code> .
ignoreCase	Specifies if Artix ignores the case with element names in the message payload. Default is <code>false</code> .

The settings for the attributes on these elements become the default settings for all the messages being mapped to the current binding.

tagged:operation

`tagged:operation` is a child element of the WSDL `operation` element and specifies that the operation's messages are being mapped to a tagged data format. It takes two optional attributes that are described in [Table 8 on page 84](#).

Table 8. Attributes for `tagged:operation`

Attribute	Purpose
<code>discriminator</code>	Specifies a discriminator to be used by the Artix runtime to identify the WSDL operation that will be invoked by the message receiver.
<code>discriminatorStyle</code>	Specifies how the Artix runtime will locate the discriminator as it processes the message. Supported values are <code>msgname</code> , <code>partlist</code> , <code>fieldvalue</code> , and <code>fieldname</code> .

tagged:body

`tagged:body` is a child element of the `input`, `output`, and `fault` messages being mapped to a tagged data format. It specifies that the message body is mapped to tagged data on the wire and describes the exact mapping for the message's parts.

`tagged:body` will have one or more of the following child elements:

- [tagged:field](#)
- [tagged:sequence](#)
- [tagged:choice](#)

They describe the detailed mapping of the message to the tagged data to be sent on the wire.

tagged:field

`tagged:field` is used to map simple types and enumerations to a tagged data format. Its two attributes are described in [Table 9 on page 85](#).

Table 9. Attributes for tagged:field

Attribute	Purpose
name	A required attribute that must correspond to the name of the logical message part that is being mapped to the tagged data field.
alias	An optional attribute specifying an alias for the field that can be used to identify it on the wire.

When describing enumerated types `tagged:field` will have a number of `tagged:enumeration` child elements.

tagged:enumeration

`tagged:enumeration` is a child element of `tagged:field` and is used to map enumerated types to a tagged data format. It takes one required attribute, `value`, that corresponds to the enumeration value as specified in the logical description of the enumerated type.

For example, if you had an enumerated type, `flavorType`, with the values `FruityTooty`, `Rainbow`, `BerryBomb`, and `OrangeTango` the logical description of the type would be similar to [Example 39 on page 85](#).

Example 39. Ice Cream Enumeration

```
<xs:simpleType name="flavorType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="FruityTooty"/>
    <xs:enumeration value="Rainbow"/>
    <xs:enumeration value="BerryBomb"/>
    <xs:enumeration value="OrangeTango"/>
  </xs:restriction>
</xs:simpleType>
```

`flavorType` would be mapped to the tagged data format shown in [Example 40 on page 85](#).

Example 40. Tagged Data Ice Cream Mapping

```
<tagged:field name="flavor">
  <tagged:enumeration value="FruityTooty"/>
  <tagged:enumeration value="Rainbow"/>
  <tagged:enumeration value="BerryBomb"/>
```

```
<tagged:enumeration value="OrangeTango"/>
</tagged:field>
```

tagged:sequence

`tagged:sequence` maps arrays and sequences to a tagged data format. Its three attributes are described in [Table 10 on page 86](#).

Table 10. Attributes for `tagged:sequence`

Attributes	Purpose
<code>name</code>	A required attribute that must correspond to the name of the logical message part that is being mapped to the tagged data sequence.
<code>alias</code>	An optional attribute specifying an alias for the sequence that can be used to identify it on the wire.
<code>occurs</code>	An optional attribute specifying the number of times the sequence appears. This attribute is used to map arrays.

A `tagged:sequence` can contain any number of `tagged:field`, `tagged:sequence`, or `tagged:choice` child elements to describe the data contained within the sequence being mapped. For example, a structure containing a name, a date, and an ID number would contain three `tagged:field` elements to fully describe the mapping of the data to the fixed record message. [Example 41 on page 86](#) shows an Artix contract fragment for such a mapping.

Example 41. Mapping a Sequence to a Tagged Data Format

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="taggedDataMappingsample" targetNamespace="http://www.iona.com/taggedService"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:fixed="http://schemas.iona.com/bindings/tagged"
  xmlns:tns="http://www.iona.com/taggedService"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
<types>
  <schema targetNamespace="http://www.iona.com/taggedService"
    xmlns="http://www.w3.org/2001/XMLSchema" xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
    <xsd:complexType name="person">
      <xsd:sequence>
        <xsd:element name="name" type="xsd:string"/>
        <xsd:element name="date" type="xsd:string"/>
        <xsd:element name="ID" type="xsd:int"/>
      </xsd:sequence>
    </xsd:complexType>
  </schema>
</types>
```

```

    </xsd:sequence>
  </xsd:complexType>
  ...
</types>
<message name="taggedSequence">
  <part name="personPart" type="tns:person"/>
</message>
<portType name="taggedSequencePortType">
  ...
</portType>
<binding name="taggedSequenceBinding"
  type="tns:taggedSequencePortType">
  <tagged:binding selfDescribing="false" fieldSeparat
or="pipe"/>
  ...
  <tagged:sequence name="personPart">
    <tagged:field name="name"/>
    <tagged:field name="date"/>
    <tagged:field name="ID"/>
  </tagged:sequence>
  ...
</binding>
  ...
</definition>

```

tagged:choice

tagged:choice maps unions to a tagged data format. Its three attributes are described in [Table 11 on page 87](#) .

Table 11. Attributes for tagged:choice

Attributes	Purpose
name	A required attribute that must correspond to the name of the logical message part that is being mapped to the tagged data union.
discriminatorName	Specifies the message part used as the discriminator for the union.
alias	An optional attribute specifying an alias for the union that can be used to identify it on the wire.

A `tagged:choice` may contain one or more `tagged:case` child elements to map the cases for the union to a tagged data format.

tagged:case

`tagged:case` is a child element of `tagged:choice` and describes the complete mapping of a union's individual cases to a tagged data format. It takes one required attribute, `name`, that corresponds to the name of the case element in the union's logical description.

`tagged:case` must contain one child element to describe the mapping of the case's data to a tagged data format. Valid child elements are `tagged:field`, `tagged:sequence`, and `tagged:choice`.

[Example 42 on page 88](#) shows an Artix contract fragment mapping a union to a tagged data format.

Example 42. Mapping a Union to a Tagged Data Format

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="fixedMappingsample" targetNamespace="http://www.iona.com/tagService"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:fixed="http://schemas.iona.com/bindings/tagged"
  xmlns:tns="http://www.iona.com/tagService"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema">
  <types>
    <schema targetNamespace="http://www.iona.com/tagService"
      xmlns="http://www.w3.org/2001/XMLSchema" xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
      <xsd:complexType name="unionStationType">
        <xsd:choice>
          <xsd:element name="train" type="xsd:string"/>
          <xsd:element name="bus" type="xsd:int"/>
          <xsd:element name="cab" type="xsd:int"/>
          <xsd:element name="subway" type="xsd:string"/>
        </xsd:choice>
      </xsd:complexType>
    ...
  </types>
  <message name="tagUnion">
    <part name="stationPart" type="tns:unionStationType"/>
  </message>
  <portType name="tagUnionPortType">
    ...
  </portType>
  <binding name="tagUnionBinding" type="tns:tagUnionPortType">
    <tagged:binding selfDescribing="false"
      fieldSeparator="comma"/>
  </binding>
</definitions>
```

```

...
<tagged:choice name="stationPart" discriminatorName="disc">
    <tagged:case name="train">
        <tagged:field name="name"/>
    </tagged:case>
    <tagged:case name="bus">
        <tagged:field name="number"/>
    </tagged:case>
    <tagged:case name="cab">
        <tagged:field name="number"/>
    </tagged:case>
    <tagged:case name="subway">
        <tagged:field name="name"/>
    </tagged:case>
</tagged:choice>
...
</binding>
...
</definition>

```

Example

[Example 43 on page 89](#) shows an example of an Artix contract containing a tagged data format binding.

Example 43. Tagged Data Format Binding

```

<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
    targetNamespace="http://widgetVendor.com/widgetOrderForm"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:tns="http://widgetVendor.com/widgetOrderForm"
    xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:tagged="http://schemas.iona.com/binings/tagged"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd1="http://widgetVendor.com/types/widgetTypes">
    <types>
        <schema targetNamespace="http://widgetVendor.com/types/wid
getTypes"
            xmlns="http://www.w3.org/2001/XMLSchema"
            xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
            <xsd:simpleType name="widgetSize">
                <xsd:restriction base="xsd:string">
                    <xsd:enumeration value="big"/>
                    <xsd:enumeration value="large"/>
                    <xsd:enumeration value="mungo"/>
                    <xsd:enumeration value="gargantuan"/>
                </xsd:restriction>
            </xsd:simpleType>

```

```

<xsd:complexType name="Address">
  <xsd:sequence>
    <xsd:element name="name" type="xsd:string"/>
    <xsd:element name="street1" type="xsd:string"/>
    <xsd:element name="street2" type="xsd:string"/>
    <xsd:element name="city" type="xsd:string"/>
    <xsd:element name="state" type="xsd:string"/>
    <xsd:element name="zipCode" type="xsd:string"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="widgetOrderInfo">
  <xsd:sequence>
    <xsd:element name="amount" type="xsd:int"/>
    <xsd:element name="order_date" type="xsd:string"/>
    <xsd:element name="type" type="xsd1:widgetSize"/>
    <xsd:element name="shippingAddress" type="xsd1:Ad
dress"/>
  </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="widgetOrderBillInfo">
  <xsd:sequence>
    <xsd:element name="amount" type="xsd:int"/>
    <xsd:element name="order_date" type="xsd:string"/>
    <xsd:element name="type" type="xsd1:widgetSize"/>
    <xsd:element name="amtDue" type="xsd:float"/>
    <xsd:element name="orderNumber" type="xsd:string"/>

    <xsd:element name="shippingAddress" type="xsd1:Ad
dress"/>
  </xsd:sequence>
</xsd:complexType>
</schema>
</types>
<message name="widgetOrder">
  <part name="widgetOrderForm" type="xsd1:widgetOrderInfo"/>
</message>
<message name="widgetOrderBill">
  <part name="widgetOrderConformation" type="xsd1:widget
OrderBillInfo"/>
</message>
<portType name="orderWidgets">
  <operation name="placeWidgetOrder">
    <input message="tns:widgetOrder" name="order"/>
    <output message="tns:widgetOrderBill" name="bill"/>
  </operation>
</portType>
<binding name="orderWidgetsBinding" type="tns:orderWidgets">

```

```

    <tagged:binding selfDescribing="false" fieldSeparator="pipe"/>
    <operation name="placeWidgetOrder">
      <tagged:operation discriminator="widgetDisc"/>
      <input name="widgetOrder">
        <tagged:body>
          <tagged:sequence name="widgetOrderForm">
            <tagged:field name="amount"/>
            <tagged:field name="order_date"/>
            <tagged:field name="type" >
              <tagged:enumeration value="big"/>
              <tagged:enumeration value="large"/>
              <tagged:enumeration value="mungo"/>
              <tagged:enumeration value="gargantuan"/>
            </tagged:field>
          </tagged:sequence>
          <tagged:sequence name="shippingAddress">
            <tagged:field name="name"/>
            <tagged:field name="street1"/>
            <tagged:field name="street2"/>
            <tagged:field name="city"/>
            <tagged:field name="state"/>
            <tagged:field name="zip"/>
          </tagged:sequence>
        </tagged:body>
      </input>
      <output name="widgetOrderBill">
        <tagged:body>
          <tagged:sequence name="widgetOrderConformation">
            <tagged:field name="amount"/>
            <tagged:field name="order_date"/>
            <tagged:field name="type">
              <tagged:enumeration value="big"/>
              <tagged:enumeration value="large"/>
              <tagged:enumeration value="mungo"/>
              <tagged:enumeration value="gargantuan"/>
            </tagged:field>
            <tagged:field name="amtDue"/>
            <tagged:field name="orderNumber"/>
            <tagged:sequence
name="shippingAddress">
              <tagged:field name="name"/>
              <tagged:field name="street1"/>
              <tagged:field name="street2"/>
              <tagged:field name="city"/>
              <tagged:field name="state"/>
              <tagged:field name="zip"/>
            </tagged:sequence>
          </tagged:sequence>
        </tagged:body>
      </output>
    </operation>
  </tagged:binding>

```

```
        </tagged:body>
    </output>
</operation>
</binding>
<service name="orderWidgetsService">
    <port name="widgetOrderPort" binding="tns:orderWidgetsBind
ing">
        <http:address location="http://localhost:8080"/>
    </port>
</service>
</definitions>
```

Using RMI

Artix provides a way for Artix Java applications to connect to a remote object using RMI. The remote object does not require a Web services front end, nor does it require the ability to understand SOAP. Artix will handle the message translation.

Procedure

To use RMI you need to do the following:

1. Add an RMI binding to the application's WSDL contract.
2. Add an RMI port definition to the application's WSDL contract.
3. Develop the application so that it uses an interface that extends `java.rmi.Remote`.
4. If you are developing a service, generate the RMI stubs using **rmic**.



Note

If you want to use RMI/IIOP, you need to specify the proper flags to **rmic** and extend the appropriate class.

5. Configure the application to load the RMI plug-in and the Java plug-in.

Namespace

The IONA extensions used for RMI information to a WSDL contract are defined in the namespace `http://schemas.ionac.com/bindings/rmi`. Artix tools use the prefix `rmi` to represent the RMI extensions. Add the following line to your contracts:

```
xmlns:rmi="http://schemas.ionac.com/bindings/rmi"
```

Adding RMI information to a contract

A contract for an Artix endpoint that uses RMI is slightly different than other contracts because the RMI connectivity feature of Artix does not use the interface generated from the logical interface definition. Instead, it uses the RMI interface of the object to which it will connect. Therefore, the `portType` element defining the logical interface can be left empty. If it is fully specified, it will be ignored by the runtime.

To specify that an endpoint is to use RMI you need to add an RMI binding definition and RMI endpoint definition to your contract. This is done using the `rmi:class` element and the `rmi:address` element.

The `rmi:class` element defines an RMI binding and is a child of the WSDL binding element. It has a single attribute, `name`, that specifies the fully qualified name of the Java interface of the RMI object to which your application connects. This interface must extend `java.rmi.Remote`.

The `rmi:address` element defines the connection information for an RMI endpoint. It has a single attribute, `url`, the specifies the JNDI URL the application will use to talk to remote objects.

Artix Designer provides a tool for adding an RMI binding to a contract. To use this tool select **Artix Designer** → **New Binding** or select **New Binding** from the context menu available in diagram view. For more information see the on-line help provided with Artix Designer.

[Example 44 on page 94](#) shows a contract fragment that defines an RMI endpoint.

Example 44. RMI Endpoint

```
...
<portType name="RMIPortType" />
<binding name="RMIBinding" type="tns:RMIPortType">
  <rmi:class name="foo.bar.MyRemoteInterface"/>
</binding>
```

Writing a service to use RMI

Unlike standard Artix Java services, Artix Java services using RMI do not require that you use the code generated by **wSDLtojava**. It does not require that the types adhere to the JAX-RPC mappings. The only requirement is that the service's implementation class must implement an interface that extends `java.rmi.Remote`.



Note

You can use the interface generated by **wSDLtojava** because the generated interface extends `java.rmi.Remote`.

You will need to generate RMI stubs for your implementation class using Sun's **rmic** compiler. If you want to use RMI/IIOP instead of plain RMI, you need to generate the RMI stubs using the proper flags. For more information on **rmic** see Sun's [RMIC documentation](http://java.sun.com/j2se/1.4.2/docs/tooldocs/solaris/rmic.html) [http://java.sun.com/j2se/1.4.2/docs/tooldocs/solaris/rmic.html].

Once you have implemented your service's application logic and generated the RMI stubs, you need to create a servant for the implementation object register the servant with the Artix bus. This is done using the standard Artix APIs as shown in [Example 45 on page 95](#) .

Example 45. Service for Using RMI

```
public interface GreeterInterface extends java.rmi.Remote
{
    ...
}
public class RMIGreeter extends UnicastRemoteObject implements
    GreeterInterface
{
    ...
}

public class MyRMIService
{
    ...

    public static void main (String args[]) throws Exception
    {
        ...
        Servant servant = new SingleInstanceServant(new
RMIGreeter(), myWsdPath, bus);
        bus.registerServant(servant, new QName(tns, "MyRmiSer
vice"));
        ...
    }
}
```

Writing a client to use RMI

Implementing a client that uses the RMI binding is similar to implementing a standard Artix client in Java. You need to have access to the RMI interface implemented by the service. You use the interface to create a service proxy using the standard Artix `createClient()` method.

The only difference is that instead of casting the proxy returned from `createClient()` to the implementation class, you cast it to the RMI interface

class as shown in [Example 46 on page 96](#) . This gives you access to all of the remote object's methods including the ones used to manage the remote object. When the proxy connects to the service, it will download the stubs it needs for communicating.

Example 46. Client Using RMI

```
public class MyRMIClient
{
    ...
    public static void main (String args[]) throws Exception
    {
        ...
        // GreeterInterface defined in previous example.
        GreeterInterface proxy =
        (GreeterInterface)bus.createClient(wsdlUrl, serviceName,
                                         portName,
                                         GreeterInterface.class);
        ...
    }
}
```

For more information see [Developing Artix Applications with JAX-RPC](#) [[../jaxrpc_pguide/index.htm](#)].

Stub downloading

If the `java.rmi.server.codebase` property is not set and the RMI plug-in was loaded by a URL classloader, the RMI plug-in will set the codebase to the classpath of the classloader that loaded the plug-in. This effectively makes the server classpath available to the client for loading RMI stubs.

If the client and server are on the same host, the client does not need to have the stub paths explicitly on its classpath. If the RMI stubs are available via an FTP or HTTP url in the server's classpath, the client can download them on a different host.

For more on RMI class loading see <http://java.sun.com/j2se/1.4.2/docs/guide/rmi/codebase.html>.

Using RMI/IIOP

If you want to use RMI/IIOP instead of plain RMI, you need to do a few things differently:

- Use a corbaname URL as the value of `rmi:address` in your contract.
- Make sure your servant class extends `javax.rmi.PortableRemoteObject`.

- Specify the `-iiop` flag when running `rmic` to generate your stubs. For more information see Sun's [RMIC documentation](http://java.sun.com/j2se/1.4.2/docs/tooldocs/solaris/rmic.html) [<http://java.sun.com/j2se/1.4.2/docs/tooldocs/solaris/rmic.html>].
- Store the remote object's address in a CORBA naming service.

Configuring an application to use RMI

Unlike most Artix bindings, the RMI binding does not cause your application to automatically load the plug-ins it needs. To configure your application to use RMI you must add the following to your application's configuration:

```
orb_plugins=[..., "java", ...];  
java_plugins=["rmi"];
```

For more information see the [Artix Configuration Reference, C++ Runtime](#) [[././config_ref/cpp/index.htm](#)].



Note

RMI support is implemented using a JNI layer in the C++ runtime.

Limitations

The RMI support in Artix has the following limitations:

- The RMI support bypasses all Artix interceptors.
- The router does not support RMI.
- Applications using RMI must be explicitly configured to load the RMI plug-in and the Java plug-in. See the [Artix Configuration Reference, C++ Runtime](#) [[././config_ref/cpp/index.htm](#)].



Note

RMI support is implemented using a JNI layer in the C++ runtime.

- RMI is only available to Artix endpoints developed in Java.
- Artix security features are not available when using RMI.
- The APIs that resolve a service given only a QName do not work for services using RMI.

- You cannot register transient services with RMI.

Logging Errors

For ports that use the RMI binding you may see errors like this in the logs:

```
(IT_BUS.WSDL:0) E - WSDL for Port hello in service HelloRmiService xmlns="http://www.iona.com/com.iona.jbus.bindings.rmi.Hello" is not valid. It doesn't have any contents. ([RmiBinding])
```

These can be ignored.

Using Tibco Rendezvous Messages

Tibco Rendezvous applications typically use a Tibco specific data format called a TibrvMsg. Artix provides a very flexible mechanism for mapping messages into the TibrvMsg format. This allows you to integrate with existing Tibco/RV applications by service-enabling them.

The TibrvMsg binding provides default mappings for most XML Schema constructs to simplify defining a TibrvMsg in an Artix contract. The TibrvMsg binding also supports custom mappings between the messages defined in an Artix contract and the physical representation of a TibrvMsg. Custom mappings also support the inclusion of static binding-only data.

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Defining a TibrvMsg Binding

Overview

The Artix TibrvMsg binding provides a set of default mappings to make writing a binding simple. By default, messages are mapped into a root TibrvMsg such that parts defined using XML Schema native types become TibrvMsgFields of the root TibrvMsg and parts defined using complex types become TibrvMsgs within the root message. The elements comprising a complex type also follow the same default mapping behavior. The default mappings will work for most basic applications. For a detailed explanation of how WSDL types are mapped to TibrvMsg see [Artix Default Mappings for TibrvMsg on page 107](#) .

Procedure

To map a logical interface to a TibrvMsg:

1. Add the proper namespace reference to the `definition` element of your contract. See [Namespace on page 101](#) .
2. Add a WSDL `binding` element to your contract to hold the TibrvMsg binding, give the binding a unique `name`, and specify the port type that represents the interface being bound.
3. Add a `tibrv:binding` element as a child of the new `binding` element to identify this as a TibrvMsg binding and specify any global parameters.
4. For each operation defined in the bound interface, add a WSDL `operation` element to hold the binding information for the operation's messages.
5. For each operation in the binding, add a `tibrv:operation` child element and set its attributes.
6. For each operation in 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 port type definition of the logical operation.
7. For each `input` element in the binding, add a `tibrv:input` child element and set its attributes.
8. For each `output` element in the binding, add a `tibrv:output` child element and set its attributes.

9. To add custom message mappings see [Defining a Custom TibrvMsg Mapping on page 118](#) .

Namespace

The IONA extensions used to describe TibrvMsg bindings are defined in the namespace `http://schemas.iona.com/transport/tibrv`. Artix tools use the prefix `tibrv` to represent the tagged data extensions. Add the following line to the `definitions` element of your contract:

```
xmlns:tibrv="http://schemas.iona.com/transport/tibrv"
```

tibrv:binding

`tibrv:binding` is an immediate child of the WSDL `binding` element and identifies that the data is to be packed into a TibrvMsg. Its attributes are described in [Table 12 on page 101](#) .

Table 12. Attributes for tibrv:binding

Attribute	Purpose
<code>stringEncoding</code>	An optional attribute that specifies the character set used in encoding string data included in the message. The default value is <code>utf-8</code> .
<code>stringAsOpaque</code>	An optional attribute that specifies how string data is passed in messages. <code>false</code> , the default value, specifies that string data is passed as <code>TIRBMSG_STRING</code> . <code>true</code> specifies that string data is passed as <code>OPAQUE</code> .

In addition to the above properties, `tibrv:binding` can also specify a policy for how array data is handled for messages using the binding. The array policy is set using a child `tibrv:array` element. The array policy set at the binding level can be overridden on a per-operation basis, per-message basis, and a per-type basis. For information on defining array policies see [Defining Array Mapping Policies on page 113](#) .

The `tibrv:binding` element can also define binding-only message data using the `tibrv:msg` element, the `tibrv:field` element, or

`tibrv:context` element. Any binding-only data defined at the binding level is attached to all messages that use the binding.

tibrv:operation

`tibrv:operation` is the immediate child of a WSDL `operation` element. `tibrv:operation` has no attributes. It can, however, specify an operation-specific array policy using a child `tibrv:array` element. This array policy overrides any array policy set at the binding level. For information on defining array policies see [Defining Array Mapping Policies on page 113](#).

Within a `tibrv:operation` element you can also define binding-only message data using the `tibrv:msg` element, the `tibrv:field` element, or `tibrv:context` element. Any binding-only data defined at the operation level is attached to all messages that make up the operation.

tibrv:input

`tibrv:input` is the immediate child of a WSDL `input` element and defines a number of properties used in mapping the input message to a TibrvMsg. Its attributes are described in [Table 13 on page 102](#).

Table 13. Attributes for `tibrv:input`

Attribute	Purpose
<code>messageNameFieldPath</code>	An optional attribute that specifies the field path that includes the message name. If this attribute is not specified, the first field in the top level message will be used as the message name and given the value <code>IT_BUS_MESSAGE_NAME</code> .
<code>messageNameFieldValue</code>	An optional attribute that specifies the field value that corresponds to the message name. If this attribute is not specified, the WSDL message's name will be used.
<code>stringEncoding</code>	An optional attribute that specifies the character set used in encoding string data included in the message. This value will override the value set in <code>tibrv:binding</code> .
<code>stringAsOpaque</code>	An optional attribute that specifies how string data is passed in the message. <code>false</code> specifies that string data is passed as <code>TIRBMSG_STRING</code> .

Attribute	Purpose
	<code>true</code> specifies that string data is passed as <code>OPAQUE</code> . This value will override the value set in <code>tibrv:binding</code> .

In addition to the above properties, `tibrv:input` can also specify a policy for how array data is handled for messages using the binding. The array policy is set using a child `tibrv:array` element. The array policy set at this level overrides any policies set at the binding level or the operation level. For information on defining array policies see [Defining Array Mapping Policies on page 113](#) .

The `tibrv:input` element also defines any custom mappings between the WSDL messages defined in the contract and the physical TibrvMsg on the wire. A custom mapping can also include binding-only message data and context information. For information on defining custom data mappings see [Defining a Custom TibrvMsg Mapping on page 118](#) .

tibrv:output

`tibrv:output` is the immediate child of a WSDL `output` element and defines a number of properties used in mapping the output message to a TibrvMsg. Its attributes are described in [Table 14 on page 103](#) .

Table 14. Attributes for tibrv:output

Attribute	Purpose
<code>messageNameFieldPath</code>	An optional attribute that specifies the field path that includes the message name. If this attribute is not specified, the first field in the top level message will be used as the message name and given the value <code>IT_BUS_MESSAGE_NAME</code> .
<code>messageNameFieldValue</code>	An optional attribute that specifies the field value that corresponds to the message name. If this attribute is not specified, the WSDL message's name will be used.
<code>stringEncoding</code>	An optional attribute that specifies the character set used in encoding string data included in the message. This value will override the value set in <code>tibrv:binding</code> .

Attribute	Purpose
stringAsOpaque	An optional attribute that specifies how string data is passed in the message. <code>false</code> specifies that string data is passed as <code>TIBRMSG_STRING</code> . <code>true</code> specifies that string data is passed as <code>OPAQUE</code> . This value will override the value set in <code>tibrv:binding</code> .

In addition to the above properties, `tibrv:output` can also specify a policy for how array data is handled for messages using the binding. The array policy is set using a child `tibrv:array` element. The array policy set at this level overrides any policies set at the binding level or the operation level. For information on defining array policies see [Defining Array Mapping Policies on page 113](#) .

The `tibrv:output` element also defines any custom mappings between the WSDL messages defined in the contract and the physical `TibrvMsg` on the wire. A custom mapping can also include binding-only message data and context information. For information on defining custom data mappings see [Defining a Custom TibrvMsg Mapping on page 118](#) .

Example

[Example 47 on page 104](#) shows an example of an Artix contract containing a default `TibrvMsg` binding.

Example 47. Default TibrvMsg Binding

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
  targetNamespace="http://widgetVendor.com/widgetOrderForm"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:tns="http://widgetVendor.com/widgetOrderForm"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:tibrv="http://schemas.iona.com/transport/tibrv"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsd1="http://widgetVendor.com/types/widgetTypes">
  <types>
    <schema targetNamespace="http://widgetVendor.com/types/wid
getTypes"
      xmlns="http://www.w3.org/2001/XMLSchema"
      xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
      <xsd:complexType name="Address">
        <xsd:sequence>
```

```

        <xsd:element name="name" type="xsd:string"/>
        <xsd:element name="street" type="xsd:string"
            minOccurs="1" maxOccurs="5"/>
        <xsd:element name="city" type="xsd:string"/>
        <xsd:element name="state" type="xsd:string"/>
        <xsd:element name="zipCode" type="xsd:string"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="widgetOrderInfo">
    <xsd:sequence>
        <xsd:element name="amount" type="xsd:int"/>
        <xsd:element name="order_date"
            type="xsd:string"/>
        <xsd:element name="type" type="xsd:string"/>
        <xsd:element name="shippingAddress"
            type="xsd1:Address"/>
    </xsd:sequence>
</xsd:complexType>
<xsd:complexType name="widgetOrderBillInfo">
    <xsd:sequence>
        <xsd:element name="amount" type="xsd:int"/>
        <xsd:element name="order_date"
            type="xsd:string"/>
        <xsd:element name="type" type="xsd:string"/>
        <xsd:element name="amtDue" type="xsd:float"/>
        <xsd:element name="orderNumber"
            type="xsd:string"/>
        <xsd:element name="shippingAddress"
            type="xsd1:Address"/>
    </xsd:sequence>
</xsd:complexType>
</schema>
</types>

<message name="widgetOrder">
    <part name="widgetOrderForm"
        type="xsd1:widgetOrderInfo"/>
</message>

<message name="widgetOrderBill">
    <part name="widgetOrderConformation"
        type="xsd1:widgetOrderBillInfo"/>
</message>

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

```

```
</portType>

<binding name="orderWidgetsBinding"
  type="tns:orderWidgets">
  <tibrv:binding/>
  <operation name="placeWidgetOrder">
    <tibrv:operation/>
    <input name="widgetOrder">
      <tibrv:input/>
    </input>
    <output name="widgetOrderBill">
      <tibrv:output/>
    </output>
  </operation>
</binding>

<service name="orderWidgetsService">
  <port name="widgetOrderPort" binding="tns:orderWidgetsBind
ing">
    ...
  </port>
</service>
</definitions>
```

Artix Default Mappings for TibrvMsg

TIBRVMSG type mapping

Table 15 on page 107 shows how Artix maps XML Schema types into TibrvMsg data types.

Table 15. TIBCO to XSD Type Mapping

TIBRVMSG	XSD
TIBRVMSG_STRING	xsd:string
TIBRVMSG_BOOL	xsd:boolean
TIBRVMSG_I8	xsd:byte
TIBRVMSG_I16	xsd:short
TIBRVMSG_I32	xsd:int
TIBRVMSG_I64	xsd:long
TIBRVMSG_U8	xsd:unsignedByte
TIBRVMSG_U16	xsd:unsignedShort
TIBRVMSG_U32	xsd:unsignedInt
TIBRVMSG_U64	xsd:unsignedLong
TIBRVMSG_F32	xsd:float
TIBRVMSG_F64	xsd:double
TIBRVMSG_STRING	xsd:decimal
TIBRVMSG_DATETIME ^a	xsd:dateTime
TIBRVMSG_OPAQUE	xsd:base64Binary
TIBRVMSG_OPAQUE	xsd:hexBinary
TIBRVMSG_STRING	xsd:QName
TIBRVMSG_STRING	xsd:nonPositiveInteger

TIBRVMSG	XSD
TIBRVMSG_STRING	xsd:negativeInteger
TIBRVMSG_STRING	xsd:nonNegativeInteger
TIBRVMSG_STRING	xsd:positiveInteger
TIBRVMSG_STRING	xsd:time
TIBRVMSG_STRING	xsd:date
TIBRVMSG_STRING	xsd:gYearMonth
TIBRVMSG_STRING	xsd:gMonthDay
TIBRVMSG_STRING	xsd:gDay
TIBRVMSG_STRING	xsd:gMonth
TIBRVMSG_STRING	xsd:anyURI
TIBRVMSG_STRING	xsd:token
TIBRVMSG_STRING	xsd:language
TIBRVMSG_STRING	xsd:NMTOKEN
TIBRVMSG_STRING	xsd:Name
TIBRVMSG_STRING	xsd:NCName
TIBRVMSG_STRING	xsd:ID

^aWhile TIBRVMSG_DATETIME has microsecond precision, xsd:dateTime only supports millisecond precision. Therefore, Artix rounds all times to the nearest millisecond.

Sequence complex types

Sequence complex types are mapped to a `TibrvMsg` message as follows:

- The elements of the complex type are enclosed in a `TibrvMsg` instance.
- If the complex type is specified as a message part, the value of the `part` element's `name` attribute is used as the name of the generated `TibrvMsg`.

- If the complex type is specified as an element, the value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- The `TibrvMsg` id is 0.
- The elements are mapped to child `TibrvMsgField` instances of the wrapping `TibrvMsg`.
- If an element of the sequence is of a complex type, it will be mapped into a `TibrvMsg` instance that conforms to the default mapping rules.
- The value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsgField` instance.
- The child fields' ids are 0.
- The child fields are serialized in the same order as they appear in the schema definition.
- The child fields are deserialized in the same order as they appear in schema definition.

All complex types

All complex types are mapped to a `TibrvMsg` message as follows:

- The elements of the complex type are enclosed in a `TibrvMsg` instance.
- If the complex type is specified as a message part, the value of the `part` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- If the complex type is specified as an element, the value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- The `TibrvMsg` id is 0.
- The elements are mapped to child `TibrvMsgField` instances of the wrapping `TibrvMsg`.
- If an element of the all is of a complex type, it will be mapped into a `TibrvMsg` instance that conforms to the default mapping rules.

- The value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsgField` instance.
- The child field's ids are 0.
- The child fields are serialized in the same order as they appear in the schema definition.
- The child fields can be deserialized in any order.

Choice complex types

Choice complex types are mapped to a `TibrvMsg` message as follows:

- The elements of the complex type are enclosed in a `TibrvMsg` instance.
- If the complex type is specified as a message part, the value of the `part` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- If the complex type is specified as an element, the value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- The `TibrvMsg` id is 0
- There must only be one and only child field in this `TibrvMsg` message that corresponds to the active choice element.
- The child field has the name of the corresponding choice's active element name.
- The child field id is zero.
- During deserialization the binding runtime will extract the first child field from this message using index equal to 0 as the key. If no field is found then this choice is considered an empty choice.

NMTOKEN

NMTOKEN schema types are mapped as follows:

- The NMTOKEN is enclosed in a `TibrvMsg` instance.

- If the NMTOKEN is specified as a message part, the value of the `part` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- If the NMTOKEN is specified as an element, the value of the `element` element's `name` attribute is used as the name of the generated `TibrvMsg`.
- The `TibrvMsg` id is 0
- Each NMTOKEN is mapped to a child `TibrvMsgField` instance of this `TibrvMsg`.
- The names of the children fields are an ever increasing counter values beginning with 0.

Default mapping of arrays

XML Schema elements that are not mapped to native `Tibrv` scalar types and have `minOccurs != 1` and `maxOccurs != 1` are mapped as follows:

- Array elements are stored in a `TibrvMsg` instance at the same scope as the sibling elements of this array element.
- Array element names are a result of an expression evaluation. The expression is evaluated for every array element.
- The default array element name expression is `concat(xml:attr('name'), '_', counter(1, 1))`.
- If an instance of an array element has 0 elements then this array instance will have nothing loaded onto the wire. Currently this is not true for scalar arrays that are loaded as a single field.

Default mapping for scalar arrays

The XML Schema elements that are mapped to native `Tibrv` scalar types and have `minOccurs != 1` and `maxOccurs != 1` are mapped as follows:

- Array elements are stored in a `TibrvMsg` instance at the same scope as sibling elements of this array element.

- The binding utilizes the Tibrv native array mapping to store XML Schema arrays. Hence, there will be only one TibrvMsgField with the name equal to that of the XML Schema element name defining this array.

Defining Array Mapping Policies

Overview

Because TibrvMsg does not natively support sparsely populated arrays, the Artix TibrvMsg binding allows you to define how array elements are mapped into a TibrvMsg when they are written to the wire using the `tibrv:array` element. In addition, the Artix TibrvMsg binding allows you to define the naming schema used for array elements when they are mapped into TibrvMsgField instances.

Policy scoping

The `tibrv:array` element can define array properties at any level of granularity by making it the child of different TibrvMsg binding elements. [Table 16 on page 113](#) shows the effect of setting `tibrv:array` at different levels of a binding.

Table 16. Effect of `tibrv:array`

Child of	Effect
<code>tibrv:binding</code>	Sets the array policies for all messages in the binding.
<code>tibrv:operation</code>	Array policies set at the operation level only affect the messages defined within the parent <code>operation</code> element. They override any array policies set at the binding level.
<code>tibrv:input</code>	Array policies set at this level only affect the input message. They override any array policies set at the binding or operation level.
<code>tibrv:output</code>	Array policies set at this level only affect the output message. They override any array policies set at the binding or operation level.
<code>tibrv:msg</code>	Array policies set at this level affect only the fields defined within the <code>tibrv:msg</code> element. They override any array policies set at higher levels.
<code>tibrv:field</code>	Array policies set at this level affect only the TibrvMsg field being defined. They override any array policies set at higher levels.

Array policies

The array policies are set using the attributes of `tibrv:array`.

[Table 17 on page 114](#) describes the attributes used to set array policies.

Table 17. Attributes for `tibrv:array`

Attribute	Purpose
<code>elementName</code>	Specifies an expression that when evaluated will be used as the name of the <code>TibrvMsgField</code> to which array elements are mapped. The default element naming scheme is to concatenate the value of WSDL <code>element</code> <code>element's name</code> attribute with a counter. For information on specifying naming expressions see Custom array naming expressions on page 115 .
<code>integralAsSingleField</code>	Specifies how scalar array data is mapped into <code>TibrvMsgField</code> instances. <code>true</code> , the default, specifies that arrays are mapped into a single <code>TibrvMsgField</code> . <code>false</code> specifies that each member of an array is mapped into a separate <code>TibrvMsgField</code> .
<code>loadSize</code>	Specifies if the number of elements in an array is included in the <code>TibrvMsg</code> . <code>true</code> specifies that the number of elements in the array is added as a <code>TibrvMsgField</code> in the same <code>TibrvMsg</code> as the array. <code>false</code> , the default, specifies that the number of elements in the array is not included in the <code>TibrvMsg</code> .
<code>sizeName</code>	Specifies an expression that when evaluated will be used as the name of the <code>TibrvMsgField</code> to which the size of the array is written. The default naming scheme is to concatenate the value of WSDL <code>element</code> <code>element's name</code> attribute with <code>@size</code> . For information on specifying naming

Attribute	Purpose
	expressions see Custom array naming expressions on page 115 .

Sparse arrays

A sparse array is an array with some of the elements set to nil. For instance, if an array has 10 elements, the 3rd and fifth elements may be nil. Tibco/RV has no way of natively representing sparse arrays or nil element members. This presents two problems:

- Tibco/RV throws an exception when it encounters nil scalar values that are mapped to a TibrvMsgField.
- There is no mechanism for maintaining the element positions of the non-nil members of the array.

To solve both problems you would specify array policies such that the size of the array is written to the wire and that each element of the array is written to the wire as a separate TibrvMsgField. To specify that the array size is written to the wire use `loadSize="true"`. To specify that each member of the array is written in a separate TibrvMsgField use `integralAsSingleField="false"`.

The resulting TibrvMsg would have one field for each non-nil member of the array and a field specifying the size of the array. Artix can use this information to reconstruct the sparse array when it is passed through the TibrvMsg binding. A Tibco/RV application would need to implement the logic to handle the information.

Custom array naming expressions

When specifying a naming policy for array element names you use a string expression that combines XML properties, strings, and custom naming functions. For example, you could use the expression `concat(xml:attr('name'), '_', counter(1,1))` to specify that each element in the array `street` is named `street_n`.

[Table 18 on page 115](#) shows the available functions for use in building array element names.

Table 18. Functions Used for Specifying TibrvMsg Array Element Names

Function	Purpose
<code>xml:attr('attribute')</code>	Inserts the value of the named attribute.

Function	Purpose
<code>concat(item1, item2, ...)</code>	Concatenates all of the elements into a single string.
<code>counter(start, increment)</code>	Adds an increasing numerical value. The counter starts at <i>start</i> and increases by <i>increment</i> .

Example

[Example 48 on page 116](#) shows an example of an Artix contract containing a `TibrvMsg` binding that uses array policies. The policies are set at the binding level and:

- Force the name of the `TibrvMsg` containing array elements to be named `street0, street1, ...`
- Write out the number of elements in each street array.
- Force each element of a street array to be written out as a separate field.

Example 48. `TibrvMsg` Binding with Array Policies Set

```
<?xml version="1.0" encoding="UTF-8"?>
<definitions name="widgetOrderForm.wsdl"
targetNamespace="http://widgetVendor.com/widgetOrderForm"
xmlns="http://schemas.xmlsoap.org/wsdl/"
xmlns:tns="http://widgetVendor.com/widgetOrderForm"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
xmlns:tibrv="http://schemas.iona.com/transport/tibrv"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:xsd1="http://widgetVendor.com/types/widgetTypes">
  <types>
    <schema targetNamespace="http://widgetVendor.com/types/widgetTypes"
xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/">
      <xsd:complexType name="Address">
        <xsd:sequence>
          <xsd:element name="name" type="xsd:string"/>
          <xsd:element name="street" type="xsd:string"
minOccurs="1" maxOccurs="5"
nillable="true"/>
          <xsd:element name="city" type="xsd:string"/>
          <xsd:element name="state" type="xsd:string"/>
          <xsd:element name="zipCode" type="xsd:string"/>
        </xsd:sequence>
      </xsd:complexType>
    </schema>
  </types>
</definitions>
```

```

        </xsd:sequence>
    </xsd:complexType>
</schema>
</types>

<message name="addressRequest">
    <part name="resident" type="xsd:string"/>
</message>
<message name="addressResponse">
    <part name="address" type="xsd1:Address"/>
</message>

<portType name="theFourOneOne">
    <operation name="lookUp">
        <input message="tns:addressRequest" name="request"/>
        <output message="tns:addressResponse"
            name="response"/>
    </operation>
</portType>

<binding name="lookUpBinding" type="tns:theFourOneOne">
    <tibrv:binding>
        <tibrv:array elementName="concat(xml:attr('name'),
counter(0, 1))"
                    integralsAsSingleField="false"
                    loadSize="true"/>
    </tibrv:binding>
    <operation name="lookUp">
        <tibrv:operation/>
        <input name="addressRequest">
            <tibrv:input/>
        </input>
        <output name="addressResponse">
            <tibrv:output/>
        </output>
    </operation>
</binding>

<service name="orderWidgetsService">
    <port name="widgetOrderPort"
        binding="tns:orderWidgetsBinding">
        ...
    </port>
</service>
</definitions>

```

Defining a Custom TibrvMsg Mapping

Overview

For instances where the default mappings are insufficient to map the TibrvMsgs to corresponding WSDL messages, you can define custom mappings that allow you to specify exactly how the WSDL message parts are mapped into a TibrvMsg. Custom TibrvMsg mappings allow you to:

- override the native XML Schema type specification of contract elements.
- add binding-only elements to the TibrvMsg placed on the wire.
- place globally used contract elements in higher levels of the binding.
- change how contract elements are mapped into nested TibrvMsg structures.

Custom TibrvMsg binding elements are defined using a combination of [tibrv:msg](#) on page 133 elements and [tibrv:field](#) on page 133 elements.

Contract elements vs. binding-only elements

A *contract element* is an atomic piece of a message defined in the logical description of the interface being bound. It can be a native XML Schema type such as `xsd:int`, in which case it is mapped to a `TibrvMsgField`. Or it can be an instance of a complex type, in which case it is mapped to a `TibrvMsg`. For example, if a message has a part that is of type `xsd:string`, the part is a contract element. In contract fragment shown in [Example 49 on page 118](#), the message part `title` is a contract element that will be mapped to a `TibrvMsgField`. The message part `tale` is a contract element that will be mapped to a `TibrvMsg` that contains three `TibrvMsgField` entries.

Example 49. TibrvMsg Contract Elements

```
<types>
...
  <complexType name="leda">
    <sequence>
      <element name="castor" type="xsd:string"/>
      <element name="pollux" type="xsd:string"/>
      <element name="hellen" type="xsd:boolean"/>
    </sequence>
  </complexType>
```

```

...
</types>

<message name="taleRequest">
  <part name="title" type="xsd:string"/>
</message>

<message name="taleResponse">
  <part name="tale" type="xsd:leda"/>
</message>

```

A *binding-only element* is any artifact that is added to the message as part of the binding. The main purpose of a binding-only element is to add data required by a native Tibco application to a message produced by an Artix application. Binding-only elements are not passed back into an Artix application. However, a native Tibco application will have access to binding-only elements.

Scoping

You can add custom `TibrvMsg` binding elements to any of the `TibrvMsg` binding elements. The order in which custom `TibrvMsg` binding elements are serialized is as follows:

1. Immutable root `TibrvMsg` wrapper.
2. Custom elements defined in `tibrv:binding` are added for all messages.
3. Custom elements defined in `tibrv:operation` for all messages used by the WSDL operation.
4. Custom elements defined in `tibrv:input` or `tibrv:output` for the specific message.

If you define a binding-only element in the `tibrv:binding` element, it will be the first field in the `TibrvMsg` generated for all messages that are generated by the binding. If you also added a binding-only field in the `tibrv:operation` for the operation `getHeader`, messages used by `getHeader` would have both binding-only fields.



Note

If you add a custom mapped contract element at any scope above the `tibrv:input` or the `tibrv:output` level, you must be certain that it is part of the logical messages for all elements at a lower scope. For example, if a contract element is given a custom mapping in a `tibrv:operation`, the corresponding WSDL message must be used by both the input and output messages. If it is not an exception will be thrown.

Casting XMLSchema types

If the default mapping between the type of a contract element and the type of the corresponding `TibrvMsgField` is not appropriate, you can use the `type` attribute of `tibrv:field` to change the type of the contract element. The `type` attribute allows you to cast one native XML Schema type into another native XML Schema type.

When Artix finds a `tibrv:field` element whose name attribute corresponds to a `part` element defined in the contract, or an element of a complex type used as a part, and whose `type` attribute is set, it will convert the value of the message part into the specified type. For example, given the contract fragment in [Example 50 on page 120](#), the value of `input1` would be converted from an `int` to a `string`. So if `input1` had a value of `3`, the `TibrvMsg` binding would turn it into the string `'3'`.

Example 50. Casting in a TibrvMsg Binding

```
<definitions ...>
  ...
  <message name="request">
    <part name="input1" type="xsd:int"/>
  </message>
  <portType name="castor">
    <operation name="ascend">
      <input message="tns:request" name="day"/>
    </operation>
    ...
  </portType>

  <binding name="castorTib" portType="castor">
    <tibrv:binding/>
    <operation name="ascend">
```

```

<tibrv:operation/>
<input message="tns:request" name="day">
  <tibrv:input>
    <tibrv:field name="input1" type="xsd:string"/>
  </tibrv:input>
</input>
</operation>
...
</binding>
...
</definitions>

```

Table 19 on page 121 shows the matrix of valid casts for native XML Schema types.

Table 19. Valid Casts for TibrvMsg Binding

Type	Full Support	Restricted Support ^a
byte	short, int, long, float, double, decimal, string, boolean	unsignedByte, unsignedShort, unsignedInt, unsignedLong
unsignedByte	short, unsignedShort, int, unsignedInt, long, unsignedLong, float, double, decimal, string, boolean	byte
short	int, long, float, double, decimal, string, boolean	byte, unsignedByte, unsignedShort, unsignedInt, unsignedLong
unsignedShort	byte, unsignedByte, short	int, unsignedInt, long, unsignedLong, float, double, decimal, string, boolean

Type	Full Support	Restricted Support ^a
int	long, decimal, string, boolean	byte, unsignedByte, short, unsignedShort, unsignedInt, unsignedLong, float, double
unsignedInt	long, unsignedLong, decimal, string, boolean	byte, unsignedByte, short, unsignedShort, int, float, double
long	decimal, string, boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, unsignedLong, float, double
unsignedLong	decimal, string, boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, long, float, double
float	double, decimal, string, boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, long, unsignedLong
double	decimal, string, boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, long, unsignedLong, float
decimal	string, boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, long, unsignedLong, float, double
string ^b		byte, unsignedByte, short, unsignedShort, int, unsignedInt, long,

Type	Full Support	Restricted Support ^a
		unsignedLong, float, double, decimal, boolean, QName, DateTime
boolean	byte, unsignedByte, short, unsignedShort, int, unsignedInt, long, unsignedLong, float, double	decimal, string
QName		string
DateTime		string

^aMust be within the appropriate value range.

^bIn addition to a, the syntax must also conform

Adding binding-only elements to a contract

As mentioned in [Scoping on page 119](#), a binding-only element can be added to a `TibrvMsg` binding at any point in its definition. Before adding a binding-only element you should determine the proper placement for its inclusion in the binding. For example, if you are interoperating with a Tibco system that expects every message to have a header, you would most likely add the header definition in the `tibrv:binding` element.

However, if the Tibco system required a static footer for every message, you would need to add the footer to the `tibrv:input` and `tibrv:output` elements. This is because of the serialization order of the elements in the `TibrvMsg` binding. Elements are added to the serialized message from the global scope to the local scope in order.

Binding-only elements are specified using a combination of `tibrv:msg` elements and `tibrv:field` elements. When specifying a binding-only element you need to specify a value for the `alias` attribute. The `alias` attribute specifies the name of the generated `TibrvMsg` element. For `tibrv:field` elements you also need to specify values for the `type` attribute and the `value` attribute. The `type` attribute specifies the XML Schema type of the element being added and the `value` attribute specifies the value to be placed in the resulting `TibrvMsgField`.

[Example 51 on page 124](#) shows a TibrvMsg binding that adds a static header to each message that is put on the wire.

Example 51. TibrvMsg Binding with Binding-only Elements

```
<binding name="headedTibcoBinding" portType="mythMaker">
  <tibrv:binding>
    <tibrv:msg alias="header">
      <tibrv:field alias="class" type="xs:string"
        value="greek"/>
      <tibrv:field alias="form" type="xs:string"
        value="poetry"/>
    </tibrv:msg>
  </tibrv:binding>
  <operation name="spinner">
    ...
  </operation>
  ...
</binding>
```

A message generated by the binding in [Example 51 on page 124](#) would have as its first member a TibrvMsg called header as shown in [Example 52 on page 124](#).

Example 52. TibrvMsg with a Header

```
TibrvMsg
{
  TibrvMsgField
  {
    name = "header";
    id = 0;
    data.msg =
    {
      TibrvMsgField
      {
        name = "class";
        id = 0;
        data.str = "greek";
        size = sizeof(data);
        count = 1;
        type = TIBRVMSG_STRING;
      }
    }
    TibrvMsgField
    {
      name = "form";
      id = 0;
      data.str = "poetry";
      size = sizeof(data);
    }
  }
}
```

```

        count = 1;
        type = TIBRVMSG_STRING;
    }
}
size = sizeof(data);
count = 1;
type = TIBRVMSG_MSG;
}
...
}

```

Placing binding-only elements between contract elements

In addition to adding extra-information at the beginning and end of messages, you can place binding-only elements between contract elements in a message. For example, the default mapping of the message `taleResponse`, defined in [Example 49 on page 118](#), would produce the `TibrvMsg` shown in [Example 53 on page 125](#).

Example 53. Default `TibrvMsg` Example

```

TibrvMsg
{
    TibrvMsgField
    {
        name = "tale";
        id = 0;
        data.msg =
        {
            TibrvMsgField
            {
                name = "castor";
                id = 0;
                data.str = "This one is a horse trainer.";
                size = sizeof(data);
                count = 1;
                type = TIBRVMSG_STRING;
            }
            TibrvMsgField
            {
                name = "pollux";
                id = 0;
                data.str = "This one is a boxxer.";
                size = sizeof(data);
                count = 1;
                type = TIBRVMSG_STRING;
            }
        }
    }
}

```

```

    {
        name = "hellen";
        id = 0;
        data.str = "false";
        size = sizeof(data);
        count = 1;
        type = TIBRVMSG_BOOL;
    }
}
size = sizeof(data);
count = 1;
type = TIBRVMSG_MSG;
}
...
}

```

If the Tibco application you are integrating with requires an additional `TibrvMsgField` or an additional `TibrvMsg` between `pollux` and `hellen`, as shown in [Example 54 on page 126](#), you could add it to the binding by redefining the mapping of the entire contract element to include a binding-only element.

Example 54. *TibrvMsg with added TibrvMsg Example*

```

TibrvMsg
{
    TibrvMsgField
    {
        name = "tale";
        id = 0;
        data.msg =
        {
            TibrvMsgField
            {
                name = "castor";
                id = 0;
                data.str = "This one is a horse trainer.";
                size = sizeof(data);
                count = 1;
                type = TIBRVMSG_STRING;
            }
            TibrvMsgField
            {
                name = "pollux";
                id = 0;
                data.str = "This one is a boxxer.";
                size = sizeof(data);
                count = 1;
            }
        }
    }
}

```

```

        type = TIBRVMSG_STRING;
    }
    TibrvMsgField
    {
        name = "clytemnestra";
        id = 0;
        data.msg =
        {
            TibrvMsgField
            {
                name = "father";
                id = 0;
                data.str = "tyndareus";
                size = sizeof(data);
                count = 1;
                type = TIBRVMSG_STRING;
            }
            TibrvMsgField
            {
                name = "husbands";
                id = 0;
                data.i32 = 2;
                size = sizeof(data);
                count = 1;
                type = TIBRVMSG_I32;
            }
        }
        size = sizeof(data);
        count = 1;
        type = TIBRVMSG_MSG;
    }
    TibrvMsgField
    {
        name = "hellen";
        id = 0;
        data.str = "false";
        size = sizeof(data);
        count = 1;
        type = TIBRVMSG_BOOL;
    }
    size = sizeof(data);
    count = 1;
    type = TIBRVMSG_MSG;
}
...
}

```

To add the binding-only element `clytemnestra` to the default binding of the message `leda` you would do the following:

1. Because the message `leda` is used as an output message, add a `tibrv:msg` child element to the `tibrv:output` element.
2. Set the `tibrv:msg` element's `name` attribute to the value of the corresponding contract message part that uses the type `leda`.
3. Add a `tibrv:field` element as a child of the `tibrv:msg` element.
4. Set the new `tibrv:field` element's `name` attribute to the value of the corresponding element's `name` attribute. In this instance, `castor`.
5. Repeat [Step 3 on page 128](#) and [Step 4 on page 128](#) for the second element, `pollux`, in `leda`.
6. To start the binding-only `TibrvMsg` element, add a `tibrv:msg` element after the `tibrv:field` element for `pollux`.
7. Set the new `tibrv:msg` element's `alias` attribute to `clytemnestra`.
8. Add a `tibrv:field` element as a child of the `tibrv:msg` element.
9. Set the `tibrv:field` element's `alias` attribute to `father`.
10. Set the `tibrv:field` element's `type` attribute to `xsd:string`.
11. Set the `tibrv:field` element's `value` attribute to `tyndareus`.
12. Repeat [Step 8 on page 128](#) through [Step 11 on page 128](#) for the second `TibrvMsgField` in `clytemnestra`.
13. On the same level as the `tibrv:field` elements mapping `castor` and `pollux`, add a `tibrv:field` element to map `helen`.

[Example 55 on page 129](#) shows a binding for the message shown in [Example 54 on page 126](#).

Example 55. TibrvMsg Binding with an Added Binding-only Element

```

<binding name="tibBinding">
  <tibrv:binding/>
  <operation ...>
    <tibrv:operation/>
    <input ...>
      <tibrv:input/>
    </input>
    <output name="response" message="tns:taleResponse">
      <tibrv:output>
        <tibrv:msg name="tale">
          <tibrv:field name="castor"/>
          <tibrv:field name="pollux"/>
          <tibrv:msg alias="clytemnestra">
            <tibrv:field alias="father" type="xsd:string"
              value="tyndareus"/>
            <tibrv:field alias="husbands" type="xsd:int"
              value="2"/>
          </tibrv:msg/>
          <tibrv:field name="hellen"/>
        </tibrv:msg/>
      </tibrv:output>
    </output>
  </operation>
</binding>

```

Creating a custom mapping for a message defined in the contract

Using the `tibrv:msg` elements and `tibrv:field` elements you can change how contract elements are broken into `TibrvMsgs` and `TibrvMsgFields`. For a detailed discussion of the default `TibrvMsg` mapping see [Artix Default Mappings for TibrvMsg on page 107](#) .

You can alter this default mapping to add more wrapping to the `TibrvMsgFields`. For instance, if a message consists of a single `xsd:string` part, it would be mapped to a `TibrvMsg` similar to the one shown in [Example 56 on page 129](#) .

Example 56. TibrvMsg for a String

```

TibrvMsg
{
  TibrvMsgField
  {
    name = "electra";
    id = 0;
    data.str = "forelorn";
    size = sizeof(data);
  }
}

```

```

    count = 1;
    type = TIBRVMSG_STRING;
  }
}

```

However, you could specify that instead of being mapped straight to a `TibrvMsgField`, it be mapped to a `TibrvMsg` containing a `TibrvMsgField` as shown in [Example 57 on page 130](#).

Example 57. `TibrvMsg` with a `TibrvMsg` with a `String`

```

TibrvMsg
{
  TibrvMsgField
  {
    name = "grandchild";
    id = 0;
    data.msg =
    {
      TibrvMsgField
      {
        name = "electra";
        id = 0;
        data.str = "forelorn";
        size = sizeof(data);
        count = 1;
        type = TIBRVMSG_STRING;
      }
    }
    size = sizeof(data);
    count = 1;
    type = TIBRVMSG_MSG;
  }
}

```

To increase the depth of the wrapping of contract elements you define a custom `TibrvMsg` mapping that adds the desired number of levels. Each new level of wrapping is specified by a `tibrv:msg` element. To create the message shown in [Example 57 on page 130](#) you would use a binding definition similar to the one shown in [Example 58 on page 130](#).

Example 58. `TibrvMsg` Binding with an Extra `TibrvMsg` Level

```

<binding name="tibBinding">
  <tibrv:binding/>
  <operation ...>
    <tibrv:operation/>
    <input ...>
      <tibrv:input>

```

```

    <tibrv:msg alias="gradnchild">
      <tibrv:field name="electra" type="xsd:string"/>
    </tibrv:msg>
  </input>
  ...
</operation>
</binding>

```

You can also use this feature to alter the wrapping of complex type elements. For example, if you were using the message defined in [Example 49 on page 118](#) the default `TibrvMsg` would consist of one `TibrvMsg`, `leda`, containing 3 fields, one for each element in the structure, wrapped by the root `TibrvMsg`. You could modify the mapping of the logical message to a `TibrvMsg` that resembles the one shown in [Example 59 on page 131](#). The two elements `castor` and `pollux` have been wrapped in a `TibrvMsg` called `brothers`.

Example 59. *TibrvMsg with Custom TibrvMsg Wrapping*

```

TibrvMsg
{
  TibrvMsgField
  {
    name = "tale";
    id = 0;
    data.msg =
    {
      TibrvMsgField
      {
        name = "brothers"
        id = 0;
        data.msg =
        {
          TibrvMsgField
          {
            name = "castor";
            id = 0;
            data.str = "This one is a horse trainer.";
            size = sizeof(data);
            count = 1;
            type = TIBRVMSG_STRING;
          }
          TibrvMsgField
          {
            name = "pollux";
            id = 0;
            data.str = "This one is a boxxer.";
            size = sizeof(data);
            count = 1;
          }
        }
      }
    }
  }
}

```

```

        type = TIBRVMSG_STRING;
    }
}
size = sizeof(data);
count = 1;
type = TIBRVMSG_MSG;
}
TibrvMsgField
{
    name = "hellen";
    id = 0;
    data.bool = false;
    size = sizeof(data);
    count = 1;
    type = TIBRVMSG_BOOL;
}
}
size = sizeof(data);
count = 1;
type = TIBRVMSG_MSG;
}
...
}

```

Adding additional levels of wrapping within a complex type is done the same way as it is done with a message part. You place additional `tibrv:msg` elements around the contract elements you want to be at a deeper level. [Example 60 on page 132](#) shows a binding fragment that would create the `TibrvMsg` shown in [Example 59 on page 131](#).

Example 60. Binding of a Complex Type with an Extra `TibrvMsg` Level

```

<binding name="tibBinding">
  <tibrv:binding/>
  <operation ...>
    <tibrv:operation/>
    <input ...>
      <tibrv:input>
        <tibrv:msg name="tale">
          <tibrv:msg alais="brothers">
            <tibrv:field name="castor" type="xsd:string"/>
            <tibrv:field name="pollux" type="xsd:string"/>
          </tibrv:msg>
          <tibrv:field name="hellen" type="xsd:boolean"/>
        </tibrv:msg>
      </tibrv:input>
    </input>
  ...

```

```
</operation>
</binding>
```

tibrv:msg

`tibrv:msg` instructs the binding runtime to create an instance of a `TibrvMsg`. Its attributes are described in [Table 20 on page 133](#).

Table 20. Attributes for `tibrv:msg`

Attribute	Purpose
<code>name</code>	Specifies the name of the contract element from which this <code>TibrvMsg</code> instance gets its value. If this attribute is not present, then the <code>TibrvMsg</code> is considered a binding-only element.
<code>alias</code>	Specifies the value of the <code>name</code> member of the <code>TibrvMsg</code> instance. If this attribute is not specified, then the binding will use the value of the <code>name</code> attribute.
<code>element</code>	Used only when <code>tibrv:msg</code> is an immediate child of <code>tibrv:context</code> . Specifies the QName of the element defining the context data to use when populating the <code>TibrvMsg</code> . See Adding Context Information to a <code>TibrvMsg</code> on page 135 .
<code>id</code>	Specifies the value of the <code>id</code> member of the <code>TibrvMsg</code> instance. The default value is 0.
<code>minOccurs/maxOccurs</code>	Used only with contract elements. The values must be identical to the values specified in the schema definition.

tibrv:field

`tibrv:field` instructs the binding to create an instance of a `TibrvMsgField`. Its attributes are described in [Table 21 on page 133](#).

Table 21. Attributes for `tibrv:field`

Attribute	Purpose
<code>name</code>	Specifies the name of the contract element from which this <code>TibrvMsgField</code> instance gets its value. If

Attribute	Purpose
	this attribute is not present, then the <code>TibrvMsgField</code> is considered a binding-only element.
alias	Specifies the value of the <code>name</code> member of the <code>TibrvMsgField</code> instance. If this attribute is not specified, then the binding will use the value of the <code>name</code> attribute.
element	Used only when <code>tibrv:field</code> is an immediate child of <code>tibrv:context</code> . Specifies the QName of the element defining the context data to use when populating the <code>TibrvMsgField</code> . See Adding Context Information to a TibrvMsg on page 135 .
id	Specifies the value of the <code>id</code> member of the <code>TibrvMsgField</code> instance. The default value is <code>0</code> .
type	Specifies the XML Schema type of the data being used to populate the <code>data</code> member of the <code>TibrvMsgField</code> instance. For a list of supported types, see Artix Default Mappings for TibrvMsg on page 107 .
value	Specifies the value inserted into the <code>data</code> member of the <code>TibrvMsgField</code> instance when the field is a binding-only element.
minOccurs/maxOccurs	Used only with contract elements. The values must be identical to the values specified in the schema definition.

Adding Context Information to a TibrvMsg

Overview

By using Artix contexts, you can define binding-only data that is dynamically generated and consumed by Artix applications. Contexts are a feature of the Artix programming model that allow application developers to pass metadata up and down the messaging chain. When using the TibrvMsg binding, you can instruct your Artix application to use context data to populate outgoing binding-only fields. On the receiving end, the TibrvMsg binding takes the information and uses it to populate a context in the application. For information on using contexts in Artix applications, see [Developing Artix Applications with C++ \[../prog_guide/index.htm\]](#) or [Developing Artix Applications with JAX-RPC \[../jaxrpc_pgguide/index.htm\]](#).

Telling the binding to get information from Artix contexts

When defining a custom TibrvMsg binding, you use the `tibrv:context` element to inform the binding that the immediate child element is populated from an Artix context. The immediate child of a `tibrv:context` element must be either a `tibrv:msg` element or a `tibrv:field` element depending on what type of information is contained in the context.

You would use `tibrv:msg` for context data that is an instance of a complex XML Schema type. You could also use `tibrv:msg` if you want an instance of a native XML Schema type wrapped in a TibrvMsg. You would use `tibrv:field` to insert context data that was an instance of a native XML Schema type as a TibrvMsgField.

When a `tibrv:msg` element or a `tibrv:field` element are used to insert context information into a TibrvMsg they use the `element` attribute in place of the `name` attribute. The `element` attribute specifies the QName used to register the context data with the Artix bus. It must correspond to a globally defined XML Schema element. Also, when inserting context information you cannot specify values for any other attributes except the `alias` attribute.

Application considerations

When using context data in your TibrvMsg binding there is some application-specific information you need to abide by:

- At least one piece of the integrated solution must be an Artix application to process the context data.

- The Tibrv binding will automatically register, but not create an instance of, any contexts used in its binding definition with the Artix bus. Contexts are registered using the QName of the element specified in the contract.
- For any context data that will be sent in an input message, client-side Artix applications are responsible for creating an instance of the appropriate context data in the request context container before the message is handed off to the binding.
- Context data sent from a client in an input message will be available to server-side Artix applications in the request context once the message has been processed by the binding.
- For any context data that will be sent in an output message, server-side Artix applications are responsible for creating an instance of the appropriate context data in the reply context container before the message is handed off to the binding.
- Context data sent from a server in an output message will be available to client-side Artix applications in the reply context once the message has been processed by the binding.

Example

If you were integrating with a Tibco server that used a header to correlate messages using an ASCII correlation ID, you could use the TibrvMsg binding's context support to implement the correlation ID on the Artix side of the solution. The first step would be to define an XML Schema element called `corrID` for the context that would hold the correlation ID. Then in your TibrvMsg binding definition you would include a `tibrv:context` element in the `tibrv:binding` element to specify that all messages passing through the binding will have the header. [Example 61 on page 136](#) shows a contract fragment containing the appropriate entries for this scenario.

Example 61. Using Context Data in a TibrvMsg Binding

```
<definitions
  xmlns:xsd1="http://widgetVendor.com/types/widgetTypes"
  ...>
<types>
  <schema
    targetNamespace="http://widgetVendor.com/types/widgetTypes"

    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:wSDL="http://schemas.xmlsoap.org/wSDL/">
    ...
```

```

    <element name="corrID" type="xsd:string"/>
    ...
  </schema>
</types>
...
<portType name="correlatedService">
...
</portType>
<binding name="tibrvCorrBinding"
  type="correlatedService">
  <tibrv:binding>
    <tibrv:context>
      <tibrv:field element="xsd1:corrID"/>
    </tibrv:context>
  </tibrv:binding>
  ...
</binding>
...
</definitions>

```

When you develop the Artix side of the solution, you will need to supply the logic for handling the context data stored in `corrID`. The context for `corrID` will be registered with the Artix bus using the QName `"http://widgetVendor.com/types/widgetTypes", "corrID"`. If the Artix side of your solution is a client, you will need to include logic to set an appropriate `corrID` in the request context before each request and to read each response's `corrID` from the response context. If the Artix side of your application is a server, you will need to include logic to read request's `corrID` from the request context and set an appropriate `corrID` in the reply context before sending the response.

Part II. Transports

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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 a number of tools for adding endpoints to your contracts. These include:

- Artix Designer has wizards that lead you through the process of adding endpoints to your contract.
- A number of the endpoint types 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 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

Artix ESB endpoint definitions are built using extensions defined for each of the transports Artix ESB C++ Runtime supports. Artix ESB C++ Runtime supports the following transports:

- HTTP
- BEA Tuxedo
- IBM WebSphere MQ
- TIBCO Rendezvous™
- IIOP
- CORBA
- Java Messaging Service
- File Transfer Protocol

Using HTTP

HTTP is the standard TCP/IP-based protocol used for client-server communications on the World Wide Web. The main function of HTTP is to establish a connection between a web browser (client) and a web server for the purposes of exchanging files and possibly other information on the Web.

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Adding an HTTP Endpoint to a Contract

Overview

Artix provides three ways of specifying an HTTP endpoint's address depending on the payload format you are using. SOAP 1.1 has a standardized `soap:address` element. SOAP 1.2 uses the `wsoap12:address` element. All other payload formats use Artix's `http:address` element.

As well as the standard `soap:address` element or `http:address` element, Artix provides a number of HTTP extensions. The Artix extensions allow you to specify a number of the HTTP port's configuration values in the contract.

SOAP 1.1

When you are sending SOAP 1.1 messages over HTTP you must use the `soap:address` element to specify the endpoint's address. It has one attribute, `location`, that specifies the endpoint's address as a URL.

[Example 62 on page 146](#) shows a `port` element used to send SOAP 1.1 messages over HTTP.

Example 62. SOAP 1.1 Port Element

```
<service name="artieSOAP11Service"><port binding="artieSOAP
Binding" name="artieSOAPPort"><soap:address location="ht
tp://artie.com/index.xml">
  </port>
</service>
```

SOAP 1.2

When you are sending SOAP 1.2 messages over HTTP you must use the `wsoap12:address` element to specify the endpoint's address. It has one attribute, `location`, that specifies the endpoint's address as a URL.

[Example 62 on page 146](#) shows a `port` element used to send SOAP 1.2 messages over HTTP.

Example 63. SOAP 1.2 Port Element

```
<service name="artieSOAP12Service">
  <port binding="artieSOAPBinding" name="artieSOAPPort">
    <wsoap12:address location="http://artie.com/index.xml">
```

```
</port>
</service>
```

Other payloads

When your messages are mapped to any payload format other than SOAP, such as fixed, you must use Artix's `http:address` element to specify the endpoint's address. Like the `soap:address` element, it has one attribute, `location`, that specifies the endpoint's address as a URL.

Using the command line tool

To use **wsdltoservice** to add an HTTP endpoint use the following options.

```
wsdltoservice {-transport soap/http} [-e service] [-t port] [-b binding]
[-a address] [-hssdt serverSendTimeout] [-hscvt serverReceiveTimeout]
[-hstrc trustedRootCertificates] [-hsuss useSecureSockets] [-hsct
contentType] [-hssc serverCacheControl] [-hsscse
supressClientSendErrors] [-hsscre supressClientReceiveErrors]
[-hshka honorKeepAlive] [-hsmpps serverMultiplexPoolSize] [-hsrurl
redirectURL] [-hscL contentLocation] [-hsce contentEncoding] [-hsst
serverType] [-hssc serverCertificate] [-hssc
serverCertificateChain] [-hsspK serverPrivateKey] [-hsspKp
serverPrivateKeyPassword] [-hcst clientSendTimeout] [-hccvt
clientReceiveTimeout] [-hctrc trustedRootCertificates] [-hcuss
useSecureSockets] [-hcct contentType] [-hccc clientCacheControl]
[-hcar autoRedirect] [-hcun userName] [-hcp password] [-hcat
clientAuthorizationType] [-hca clientAuthorization] [-hca accept]
[-hcal acceptLanguage] [-hcae acceptEncoding] [-hch host] [-hccn
clientConnection] [-hcck cookie] [-hcbt browserType] [-hcr referer]
[-hcps proxyServer] [-hcpun proxyUserName] [-hcpp proxyPassword]
[-hcpat proxyAuthorizationType] [-hcpa proxyAuthorization] [-hccce
clientCertificate] [-hcccc clientCertificateChain] [-hcpk
clientPrivateKey] [-hcpKp clientPrivateKeyPassword] [-o file] [-d
dir] [-L file] [[-quiet] | [-verbose]] [-h] [-v] wsdLurl
```

The `-transport soap/http` flag specifies that the tool is to generate an HTTP service. The other options are as follows.

Table 22. Options for Adding an HTTP Endpoint

Option	Description
<code>-transport soap/http</code>	If the payload being sent over the wire is SOAP, use <code>-transport soap</code> . For all other payloads use <code>-transport http</code> .
<code>-e service</code>	Specifies the name of the generated <code>service</code> element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the service is generated.
<code>-a address</code>	Specifies the value used in the <code>address</code> element of the port.
<code>-hssdt serverSendTimeout</code>	Specifies the number of milliseconds that the server can continue to try to send a response to the client before the connection is timed-out.
<code>-hscvt serverReceiveTimeout</code>	Specifies the number of milliseconds that the server can continue to try to receive a request from the client before the connection is timed-out.
<code>-hstrc trustedRootCertificates</code>	Specifies the full path to the X509 certificate for the certificate authority.
<code>-hsuss useSecureSockets</code>	Specifies if the server uses secure sockets. Valid values are <code>true</code> or <code>false</code> .
<code>-hsct contentType</code>	Specifies the media type of the information being sent in a server response.
<code>-hsc serverCacheControl</code>	Specifies directives about the behavior that must be adhered to by caches involved in the chain comprising a request from a client to a server.
<code>-hsscse suppressClientSendErrors</code>	Specifies whether exceptions are thrown when an error is encountered on receiving a

Option	Description
	client request. Valid values are <code>true</code> or <code>false</code> .
<code>-hsscre</code> <i>supressClientReceiveErrors</i>	Specifies whether exceptions are thrown when an error is encountered on sending a response to a client. Valid values are <code>true</code> or <code>false</code> .
<code>-hshka</code> <i>honorKeepAlive</i>	Specifies if the server honors client keep-alive requests. Valid values are <code>true</code> or <code>false</code> .
<code>-hsrurl</code> <i>redirectURL</i>	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.
<code>-hscl</code> <i>contentLocation</i>	Specifies the URL where the resource being sent in a server response is located.
<code>-hsce</code> <i>contentEncoding</i>	Specifies what additional content codings have been applied to the information being sent by the server, and what decoding mechanisms the client therefore needs to retrieve the information.
<code>-hsst</code> <i>serverType</i>	Specifies what type of server is sending the response to the client.
<code>-hssc</code> <i>serverCertificate</i>	Specifies the full path to the X509 certificate issued by the certificate authority for the server.
<code>-hsscc</code> <i>serverCertificateChain</i>	Specifies the full path to the file that contains all the certificates in the chain.
<code>-hsspk</code> <i>serverPrivateKey</i>	Specifies the full path to the private key that corresponds to the X509 certificate specified by <i>serverCertificate</i> .
<code>-hsspkip</code> <i>serverPrivateKeyPassword</i>	Specifies a password that is used to decrypt the private key.
<code>-hcst</code> <i>clientSendTimeout</i>	Specifies the number of milliseconds that the client can continue to try to send a request

Option	Description
	to the server before the connection is timed-out.
-hccvt <i>clientReceiveTimeout</i>	Specifies the number of milliseconds that the client can continue to try to receive a response from the server before the connection is timed-out.
-hctrc <i>trustedRootCertificates</i>	Specifies the full path to the X509 certificate for the certificate authority.
-hcuss <i>useSecureSockets</i>	Specifies if the client uses secure sockets. Valid values are <code>true</code> or <code>false</code> .
-hcct <i>contentType</i>	Specifies the media type of the data being sent in the body of the client request.
-hccc <i>clientCacheControl</i>	Specifies directives about the behavior that must be adhered to by caches involved in the chain comprising a request from a client to a server.
-hcar <i>autoRedirect</i>	Specifies if the server should automatically redirect client requests.
-hcun <i>userName</i>	Specifies the username the client uses to register with servers.
-hcp <i>password</i>	Specifies the password the client uses to register with servers.
-hcat <i>clientAuthorizationType</i>	Specifies the authorization mechanisms the client uses when contacting servers.
-hca <i>clientAuthorization</i>	Specifies the authorization credentials used to perform the authorization.
-hca <i>accept</i>	Specifies what media types the client is prepared to handle.
-hcal <i>acceptLanguage</i>	Specifies what language the client prefers for the purposes of receiving a response
-hcae <i>acceptEncoding</i>	Specifies what content codings the client is prepared to handle.
-hch <i>host</i>	Specifies the internet host and port number of the resource on which the client request is being invoked.

Option	Description
<code>-hccn <i>clientConnection</i></code>	Specifies if the client will open a new connection for each request or if it will keep the original one open. Valid values are <code>close</code> and <code>Keep-Alive</code> .
<code>-hcck <i>cookie</i></code>	Specifies a static cookie to be sent to the server.
<code>-hcbt <i>browserType</i></code>	Specifies information about the browser from which the client request originates.
<code>-hcr <i>referer</i></code>	Specifies the value for the client's referring entity.
<code>-hcps <i>proxyServer</i></code>	Specifies the URL of the proxy server, if one exists along the message path.
<code>-hcpun <i>proxyUserName</i></code>	Specifies the username that the client uses to be authorized by proxy servers.
<code>-hcpr <i>proxyPassword</i></code>	Specifies the password that the client uses to be authorized by proxy servers.
<code>-hcpat <i>proxyAuthorizationType</i></code>	Specifies the authorization mechanism the client uses with proxy servers.
<code>-hcpa <i>proxyAuthorization</i></code>	Specifies the actual data that the proxy server should use to authenticate the client.
<code>-hccce <i>clientCertificate</i></code>	Specifies the full path to the X509 certificate issued by the certificate authority for the client.
<code>-hcccc <i>clientCertificateChain</i></code>	Specifies the full path to the file that contains all the certificates in the chain.
<code>-hcpk <i>clientPrivateKey</i></code>	Specifies the full path to the private key that corresponds to the X509 certificate specified by <code>clientCertificate</code> .
<code>-hcpkp <i>clientPrivateKeyPassword</i></code>	Specifies a password that is used to decrypt the private key.
<code>-o <i>file</i></code>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.

Option	Description
<code>-d dir</code>	Specifies the output directory for the generated contract.
<code>-L file</code>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Displays the tool's usage statement.
<code>-v</code>	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference](#) [`./wsdl_ref/index.htm`].

Example

[Example 64 on page 152](#) shows the namespace entries you need to add to the `definitions` element of your contract to use the HTTP extensions.

Example 64. Artix HTTP Extension Namespaces

```
<definitions
  ...
  xmlns:http="http://schemas.iona.com/transport/http"
  ... >
```

[Example 65 on page 152](#) shows a `port` element for an endpoint that sends fixed data over HTTP.

Example 65. Generic HTTP Port

```
<service name="artieFixedService">
  <port binding="artieFixedBinding" name="artieFixedPort">
    <http:address location="http://artie.com/index.xml">
  </port>
</service>
```

Configuring an HTTP Endpoint

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Introduction

In addition to the `http:address` element or `soap:address` element used to specify the URL of an HTTP endpoint, Artix uses two other elements to define a number of other properties for HTTP endpoints: `http-conf:client` and `http-conf:server`.

The `http-conf:client` element specifies properties used to configure an HTTP client-side endpoint. The `http-conf:server` element specifies properties used to configure an HTTP server-side endpoint. The properties are specified as attributes to the elements. While the elements share many attributes there are differences.

To use the HTTP configuration elements, you need to include the following entry in your contract's `definition` element:

```
xmlns:http-conf="http://schemas.ionas.com/transport/http/configuration"
```

For a complete discussion of the specific attributes and their values see the [Artix WSDL Extension Reference](#) [../wsdl_ref/index.htm].

Specifying Send and Receive Timeout Limits

Overview

The most common values that needs to be configured for an HTTP endpoint are the ones controlling how long the endpoint will spend sending a receiving messages before issuing a timeout exception. Both client endpoints and server endpoints have two attributes that control their timeout behaviors: `SendTimeout` and `RecieveTimeout`.

Send timeout

The timeout limit for attempting to send a message is specified, for both the client-side and server-side, using the `SendTimeout` attribute. The timeout limit specifies the number of milliseconds an endpoint will spend attempting to transmit a message. It has a default setting of 30000 milliseconds.

This value may need to be adjusted if you are transmitting large messages as they take longer to send. Other factors that may effect the amount if time needed to transmit messages over HTTP are the speed of the network, distance between the endpoints, and the amount of traffic on the network. For example, if you were transmitting high-resolution photographs across the Atlantic, you may need to adjust the value of the `SendTimeout` attribute to 1200000 as shown in [Example 66 on page 155](#) .

Example 66. Setting the SendTimeout Attribute

```
<port ...>
  <soap:address ... />
  <http-conf:client SendTimeout="120000" />
</port>
```

Recieve timeout

The `RecieveTimeout` attribute specifies the amount of time an endpoint spends between when it initially receives the beginning of a message and the when it receives the last piece of data in the message. For example, if a client using the default settings sends a response to a service that takes 90 seconds to process the response, the client will not timeout. However, if it takes the client 45 seconds to read the response from the network, it will timeout.

The causes for long read times are similar to the reasons for long send times. Large messages, heavy network traffic, and large physical distances can all have an impact on the amount if time it takes an HTTP endpoint to receive a message. For example, if you are transmitting map data to a remote research facility, you may want to specify a value of 600000 for the `ReceiveTimeout` attribute of the remote endpoint as shown in [Example 67 on page 156](#) .

Example 67. Setting the ReceiveTimeout Attribute

```
<port ...>  
  <soap:address ... />  
  <http-conf:server ReceiveTimeout="600000" />  
</port>
```

Specifying a Username and a Password

Overview

Username/password authentication is a common way of requiring clients to identify themselves. By requiring a client to provide a username and a password, a server can keep a record of who is accessing it and determine if they are authorized to access the functionality requested. For example, many Wiki applications and blogging applications require a username and password before allowing content to be edited.

In Artix, the username and password presented by an HTTP endpoint are specified using the following attributes of the `http-conf:client` element:

- `UserName`
- `Password`

Be aware that these values will be visible to anyone that has access to the endpoint's contract. Using this style of authentication does not provide a high level of security. For information on using stronger security measures with Artix see the [Artix Security Guide](#) [../security_guide/index.htm].

Setting a username

You set a username using the `http-conf:client` element's `UserName` attribute. The value you specify is used to populate the username field in the HTTP header of all messages sent from the endpoint. Setting this attribute is optional. If no value is specified, Artix does not populate the username field of the HTTP header with a default value.

Setting a password

You set a password using the `http-conf:client` element's `Password` attribute. The value you specify is used to populate the password field in the HTTP header of all messages sent from the endpoint. It is an entirely optional attribute. If no value is specified, Artix does not populate the password field of the HTTP header with a default value.

Relationship between the attributes

The `UserName` attribute and the `Password` attribute are independent of each other. Although most applications that require a username also require a password, it is not mandatory that this pattern is followed. An application may just require a username for identification, or it may just use a password to provide a level of exclusivity.

Similarly, Artix does not require that the two attributes be used together. If an endpoint only needs to provide a password, you can provide a value for

the `Password` attribute without providing a value for the `UserName` attribute.

[Example 68 on page 158](#) shows an HTTP endpoint definition that specifies just a username.

Example 68. Specifying Just a Username

```
<port ...>
  <http:address ... />
  <http-conf:client UserName="Joe" />
</port>
```

The attributes and other security features

Specifying a username and password in an endpoint's contract does not effect the use of other Artix security features. You are not forced to use HTTPS when using a username or password. Similarly, you are not stopped from implementing your endpoint using WS-Security headers. For more details on using Artix's security features see the [Artix Security Guide](#) [./../security_guide/index.htm].

Configuring Keep-Alive Behavior

Overview

The default behavior of Artix endpoints is to open a connection and keep it open for as long as the client requires. However, it is not always desirable to keep a connection open over multiple requests. This can present a security problem. Artix endpoints can, therefore, be configured to close connections after each request/response cycle.

Making keep-alive requests

HTTP client endpoints are configured to make keep-alive requests using the `http-conf:client` element's `Conneciton` attribute. This attribute has two values: `close` and `Keep-Alive`.

`Keep-Alive` is the default. It specifies that the client endpoint wishes to keep its connections open for future requests. The client will request that the server keep the connection open. If the server does honor the request, the connection remains open until one of the endpoints dies. If the server does not honor the request, the client must open a new connection for each request.

`close` specifies that the client endpoint does not wish to keep its connections open for future requests. The client will always open a new connection for each request.

[Example 69 on page 159](#) shows a `port` element that defines an HTTP client endpoint that does not want to reuse connections.

Example 69. Specifying that the HTTP Connection is Closed

```
<port ...>
  <soap:address location="http://localhost:8080" />
  <http-conf:client Conneciton="close" />
</port>
```

Honoring keep-alive requests

HTTP server endpoints are not required to honor keep-alive requests. The default behavior of Artix HTTP server endpoints is the accept keep-alive requests. You can change this behavior using the `http-conf:server` element's `HonorKeepAlive` attribute. It has two values: `false` and `true`.

`true` is the default. It specifies that the server endpoint will honor all keep-alive requests. If a client connects to the server endpoint using at least HTTP 1.1 and requests that the connection is kept alive, the server endpoint

is left open. The client can continue to make requests over the original connection.

`false` specifies that the server endpoint rejects all keep-alive requests. Once the endpoint responds to a request it closes the connection used for the request/response sequence.

[Example 70 on page 160](#) shows a `port` element that defines an HTTP server endpoint that rejects keep-alive requests.

Example 70. Rejecting Keep-Alive Requests

```
<port ...>
  <soap:address location="http://localhost:8080" />
  <http-conf:server HonorKeepAlive="false" />
</port>
```

Specifying Cache Control Directives

Overview

A common method to reduce latency and control network traffic on the Web is to use caches that sit between server endpoints and client endpoints. These caches monitor the interactions between the endpoints. They store responses to requests as they are passed from a server endpoint to a client endpoint.

When a cache sees a request that it recognizes, it will check its stored responses. If a match is found, the cache will respond to the request on behalf of the server endpoint. The server endpoint will never know the request was made and the client endpoint will never know that it is getting a cached response.

While this optimizes the transaction time, it does pose a few possible problems:

- If a server endpoint collects usage statistics, it will not have accurate data.
- If the server endpoint frequently updates its data, the client endpoint may get a response that is out of date.

HTTP provides a mechanism for specifying cache behavior using the HTTP message header. You can configure these settings for your endpoints using the `CacheControl` attribute of both the `http-conf:server` element and the `http-conf:client` element.

Server endpoint settings

Server endpoints can tell caches how to handle the responses they issue. For example, a server endpoint can direct caches that its responses are stale after 10 seconds. These directives are only valid for the responses issued from a particular server endpoint.

[Table 23 on page 161](#) shows the valid values for `CacheControl` in `http-conf:server`.

Table 23. Settings for CacheControl on an HTTP Server Endpoint

Directive	Behavior
<code>no-cache</code>	Caches cannot use a particular response to satisfy subsequent client 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

Directive	Behavior
	the response. If no response header fields are specified, the restriction applies to the entire response.
<code>public</code>	Any cache can store the response.
<code>private</code>	Public (<i>shared</i>) 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.
<code>no-store</code>	Caches must not store any part of response or any part of the request that invoked it.
<code>no-transform</code>	Caches must not modify the media type or location of the content in a response between a server and a client.
<code>must-revalidate</code>	Caches must revalidate expired entries that relate to a response before that entry can be used in a subsequent response.
<code>proxy-revalidate</code>	Means the same as <code>must-revalidate</code> , except that it can only be enforced on shared caches and is ignored by private unshared caches. If using this directive, the <code>public</code> cache directive must also be used.
<code>max-age</code>	Specifies the maximum age, in seconds, of a cached response before it is stale.
<code>s-maxage</code>	Means the same as <code>max-age</code> , except that it can only be enforced on shared caches and is ignored by private unshared caches. The age specified by <code>s-maxage</code> overrides the age specified by <code>max-age</code> . If using this directive, the <code>proxy-revalidate</code> directive must also be used.
<code>cache-extension</code>	Specifies additional extensions to the other cache directives. Extensions might 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 at least

Directive	Behavior
	adhere to the behavior mandated by the standard directive.

Client endpoint settings

Client endpoints can tell caches what kinds of responses they will accept and how to handle the response they receive. For example, a client endpoint can direct caches not to store any responses that it receives. A client endpoint can also direct caches that it will only accept a cached response that is less than 5 seconds old.

[Table 24 on page 163](#) shows the valid settings for `CacheControl` in `http-conf:client`.

Table 24. Settings for CacheControl on HTTP Client Endpoint

Directive	Behavior
<code>no-cache</code>	Caches cannot use a particular response to satisfy subsequent client 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.
<code>no-store</code>	Caches must not store any part of a response or any part of the request that invoked it.
<code>max-age</code>	The client can accept a response whose age is no greater than the specified time in seconds.
<code>max-stale</code>	The client can accept a response that has exceeded its expiration time. If a value is assigned to <code>max-stale</code> , it represents the number of seconds beyond the expiration time of a response up to which the client can still accept that response. If no value is assigned, it means the client can accept a stale response of any age.
<code>min-fresh</code>	The client wants a response that will be still be fresh for at least the specified number of seconds indicated.
<code>no-transform</code>	Caches must not modify media type or location of the content in a response between a server and a client.

Directive	Behavior
<code>only-if-cached</code>	Caches should return only responses that are currently stored in the cache, and not responses that need to be reloaded or revalidated.
<code>cache-extension</code>	Specifies additional extensions to the other cache directives. Extensions might 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 at least adhere to the behavior mandated by the standard directive.

Managing Cookies in Artix Clients

Overview

Artix can send and receive cookies. It can also be configured to pass along a static cookie with all outgoing requests. While Artix can send and receive cookies, it is up to the application to set dynamic cookies and ensure they are properly managed.

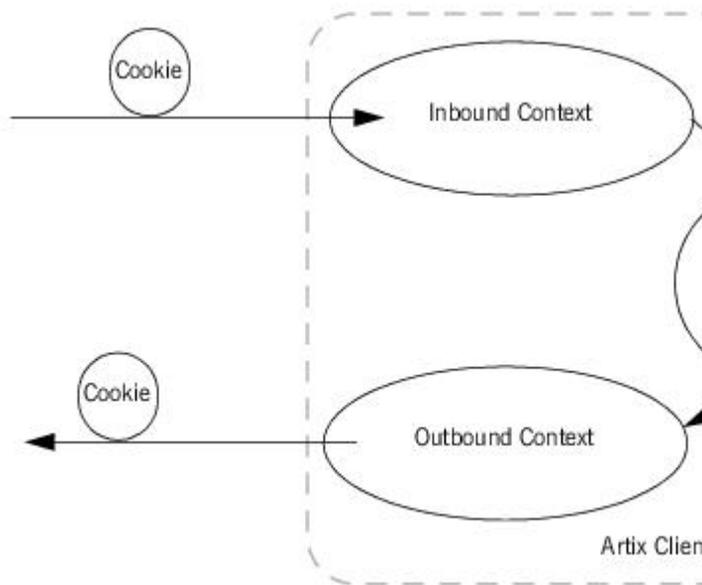
Sending static cookies

If you want your client to always attach a static cookie to its requests, you can specify this in the client's contract. The cookie is specified using the `cookie` attribute of the `http-conf:client` element.

How Artix processes cookies

Artix handles cookies using its context mechanism. For an HTTP application there are two contexts. One context is for incoming messages and the other is for outgoing messages. [Figure 1 on page 165](#) shows how an Artix client manages cookies.

Figure 1. Artix Cookie Processing



When a client makes a request it can save a cookie into its outbound context and it will be sent with all future requests. If a client receives a cookie from a service, that cookie is stored in the client's inbound context.

The received cookie does not have to be inspected. In order to inspect the contents of a received cookie, you will need to add the proper logic to your client using the Artix context APIs.

The received cookie is not automatically transferred to the out bound context. If you client needs to pass a received cookie along with future requests, you will need to add logic to your client so that it will transfer the received cookie from the client's inbound context to the outbound context.

More information

For information about setting cookies and using Artix contexts see the relevant programming guide:

- [Developing Artix Applications in C++](#) [../prog_guide/index.htm]
- [Developing Artix Applications in JAX-RPC](#) [../jaxrpc_guide/index.htm]

Using the Java Messaging System

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

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Defining a JMS Endpoint

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Introduction

Overview

Artix provides a transport plug-in that enables endpoints to use Java Messaging System (JMS) queues and topics. One large advantage of this is that Artix allows C++ applications to interact directly with Java applications over JMS.

Artix's JMS transport plug-in uses the Java Naming and Directory Interface (JNDI) to locate and obtain references to the JMS provider. Once Artix has established a connection to a JMS provider, Artix supports the passing of messages packaged as either a JMS `ObjectMessage` or a JMS `TextMessage`.

Message formatting

The JMS transport takes messages and packages them into either a JMS `ObjectMessage` or a `TextMessage`. When a message is packaged as an `ObjectMessage` the message's data, including any format-specific information, is serialized into a `byte[]` and placed into the JMS message body. When a message is packaged as a `TextMessage`, the message's data, including any format-specific information, is converted into a string and placed into the JMS message body.

When a message sent by Artix is received by a JMS application, the JMS application is responsible for understanding how to interpret the message and the formatting information. For example, if the Artix contract specifies that the binding used for a JMS endpoint is SOAP, and the messages are packaged as a `TextMessage`, the JMS application will receive a string containing all of the SOAP envelope information. For a message encoded using the fixed binding, the message will contain no formatting information, simply a string of characters, numbers, and spaces.

Namespace

The WSDL extensions used to define a JMS endpoint are specified in the namespace `http://celtix.objectweb.org/transport/jms`. To use the JMS extensions you will need to add the line shown [Example 71 on page 169](#) to the `definitions` element of your contract.

Example 71. JMS Extension's Namespace

```
xmlns:jms="http://celtix.objectweb.org/transport/jms"
```

Basic Endpoint Configuration

Overview

JMS endpoints need to know certain basic information about how to establish a connection to the proper destination. This information is provided using the `javax.jms:address` element and its child the `javax.jms:JMSNamingProperty` element. The `javax.jms:address` element's attributes specify the information needed to identify the JMS broker and the destination. The `javax.jms:JMSNamingProperty` element specifies the Java properties used to connect to the JNDI service.

address element

The basic configuration for a JMS endpoint is done by using a `javax.jms:address` element in your service's `port` element. The `javax.jms:address` element uses the attributes described in [Table 25 on page 170](#) to configure the connection to the JMS broker.

Table 25. JMS Port Attributes

Attribute	Description
<code>destinationStyle</code>	Specifies if the JMS destination is a JMS queue or a JMS topic.
<code>jndiConnectionFactoryName</code>	Specifies the JNDI name of the JMS connection factory to use when connecting to the JMS destination.
<code>jndiDestinationName</code>	Specifies the JNDI name of the JMS destination to which requests are sent.
<code>jndiReplyDestinationName</code>	Specifies the JNDI 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 171 .
<code>connectionUserName</code>	Specifies the username to use when connecting to a JMS broker.
<code>connectionPassword</code>	Specifies the password to use when connecting to a JMS broker.

JMSNamingProperties element

To increase interoperability with JMS and JNDI providers, the `javax.jms:address` element has a child element, `javax.jms:JMSNamingProperty`, that allows you to

specify the values used to populate the properties used when connecting to the JNDI provider. The `jms:JMSNamingProperty` element has two attributes: `name` and `value`. The `name` attribute specifies the name of the property to set. The `value` attribute specifies the value for the specified property.

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

- `java.naming.factory.initial`
- `java.naming.provider.url`
- `java.naming.factory.object`
- `java.naming.factory.state`
- `java.naming.factory.url.pkgs`
- `java.naming.dns.url>`
- `java.naming.authoritative`
- `java.naming.batchsize`
- `java.naming.referral`
- `java.naming.security.protocol`
- `java.naming.security.authentication`
- `java.naming.security.principal`
- `java.naming.security.credentials`
- `java.naming.language`
- `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.

Using a named reply destination

By default Artix endpoints using JMS create a temporary queue for the response queue. You can change this behavior by setting the `jndiReplyDestinationName` attribute in the endpoint's contract. An Artix 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. An Artix 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.

Examples

[Example 72 on page 172](#) shows an example of an Artix JMS port specification that uses dynamic queues.

Example 72. Artix JMS Port with DynamicQueues

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

[Example 73 on page 172](#) shows an example of an Artix JMS port specification that does not use dynamic queues.

Example 73. Artix JMS Port with Non-dynamic Queues

```
<service name="JMSService">
  <port binding="tns:Greeter_SOAPBinding" name="SoapPort">
    <jms:address jndiConnectionFactoryName="ConnectionFactory"
                jndiDestinationName="MyQueue" destination
Style="queue">
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                            value="org.activemq.jndi.ActiveM
QInitialContextFactory" />
      <jms:JMSNamingProperty name="java.naming.provider.url"
                            value="tcp://localhost:61616" />
      <jms:JMSNamingProperty name="queue.MyQueue" value="ex
ample.MyQueue" />
    </jms:address>
```

Alternate InitialContextFactory settings for using SonicMQ

```
</port>
</service>
```

If you are using Sonic MQ, you will need to use an alternative method of specifying the `InitialContextFactory` value. You specify a colon-separated list of package prefixes to force the JNDI service to instantiate a context factory with the class name

`com.ionajbus.jms.naming.sonic.sonicURLContextFactory` to perform lookups. This is shown in [Example 74 on page 173](#).

Example 74. JMS Port with Alternate InitialContextFactory Specification

```
<service name="JMSService">
  <port binding="tns:Greeter_SOAPBinding" name="SoapPort">
    <jms:address jndiConnectionFactoryName="sonic:jms/queue/con
nectionFactory"
                jndiDestinationName="sonic:jms/queue/hello
WorldQueue">
      <jms:JMSNamingProperty name="java.naming.factory.initial"
                            value="com.ionajbus.jms.nam
ing.sonic.sonicURLContextFactory" />
      <jms:JMSNamingProperty name="java.naming.provider.url"
                            value="tcp://localhost:61616" />
    </jms:address>
  </port>
</service>
```

Using the contract in [Example 74 on page 173](#), Artix would use the URL `sonic:jms/queue/helloWorldQueue` to get a reference to the desired queue. Artix would be handed a reference to a queue named `helloWorldQueue` if the JMS broker has such a queue.

Client Endpoint Configuration

The client endpoint's behaviors are configured using the `jms:client` element. The `jms:client` element is a child of the WSDL `port` element and has one attribute:

Table 26. Attributes of `jms:client`

Attribute	Description
<code>messageType</code>	Specifies how the message data will be packaged as a JMS message. <code>text</code> specifies that the data will be packaged as a <code>TextMessage</code> . <code>binary</code> specifies that the data will be packaged as an <code>ObjectMessage</code> .

This element is optional. The default behavior of a JMS client endpoint is to send text messages.

Server Endpoint Configuration

Overview

JMS server endpoints have a number of behaviors that are configurable in the contract. These include if the server uses durable subscriptions, if the server uses local JMS transactions, and the message selectors used by the endpoint.

server element

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

Table 27. Attributes of the `jms:server` Element

Attribute	Description
<code>useMessageIDAsCorrelationID</code>	Specifies whether JMS will use the message ID to correlate messages. The default is <code>false</code> .
<code>durableSubscriberName</code>	Specifies the name used to register a durable subscription. See Setting up durable subscriptions on page 175 .
<code>messageSelector</code>	Specifies the string value of a message selector to use. See Using message selectors on page 175 .
<code>transactional</code>	Specifies whether the local JMS broker will create transactions around message processing. The default is <code>false</code> . See Using reliable messaging on page 176 .

The `jms:server` element and all of its attributes are optional.

Setting up durable subscriptions

If you want to configure your server to use durable subscriptions, you can set the optional `durableSubscriberName` attribute. The value of the attribute is the name used to register the durable subscription.

Using message selectors

If you want to configure your server to use a JMS message selector, you can set the optional `messageSelector` attribute. The value of the attribute is the

string value of the selector. For more information on the syntax used to specify message selectors, see the JMS 1.1 specification.

Using reliable messaging

If you want your server to use the local JMS broker's transaction capabilities, you can set the optional `transactional` attribute to `true`.

When the `transactional` attribute is set, an Artix server's JMS transport layer will begin a transaction when it pulls a request from the queue. The server will then process the request and send the response back to the JMS transport layer. Once the JMS transport layer has successfully placed the response on the response queue, the transport layer will commit the transaction. So, if the Artix server crashes while processing a request or the transport layer is unable to send the response, the JMS broker will hold the request in the queue until it is successfully processed.

In cases where Artix is acting as a router between JMS and another transport, setting the `transactional` attribute will ensure that the message is delivered to the second server. The JMS portion of the router will not commit the message until the message has been successfully consumed by the outbound transport layer. If an exception is thrown during the consumption of the message, the JMS transport will rollback the message, pull it from the queue again, and attempt to resend it.

Using the Command Line Tool

To use **wsdltoservice** to add a JMS endpoint use the tool with the following options:

```
wsdltoservice {-transport jms} [-e service] [-t port] [-b binding] [-o
file] [-d dir] [-jnp propName:propVal...] [-jds [queuetopic]] [-jnf
connectionFactoryName] [-jdn destinationName] [-jrdn
replyDesinationName] [-jcun username] [-jcp password] [-jmt
[textbinar]] [-jms messageSelector] [-jumi [truefalse]] [-jtr
[truefalse]] [-jdsn durableSubscriber] [-L file] [[-quiet] | [-verbose]]
[-h] [-v] wsdurl
```

The `-transport jms` flag specifies that the tool is to generate a JMS endpoint. The other options are as follows:

Table 28. Command Line Options for Creating a JMS Endpoint

Option	Description
<code>-e service</code>	Specifies the name of the generated <code>service</code> element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the service is generated.
<code>-o file</code>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
<code>-d dir</code>	Specifies the output directory for the generated contract.
<code>-jnp propName:propVal</code>	Specifies any optional Java properties to use in connecting to the JNDI provider. This information is used to populate a <code>JMSNamingProperty</code> element. You can use this flag multiple times.
<code>-jds (queue/topic)</code>	Specifies if the JMS destination is a JMS queue or a JMS topic.

Option	Description
-jfn <i>connectionFactoryName</i>	Specifies the JNDI name bound to the JMS connection factory to use when connecting to the JMS destination.
-jdn <i>destinationName</i>	Specifies the JNDI name of the JMS destination to which Artix connects.
-jrjn <i>replyDestinationName</i>	Specifies the JNDI name of the JMS destination used for replies.
-jcun <i>username</i>	Specifies the username used to connect to the JMS broker.
-jcp <i>password</i>	Specifies the password used to connect to the JMS broker.
-jmt (text/binary)	Specifies how the message data will be packaged as a JMS message.
-jms <i>messageSelector</i>	Specifies a message selector to use when pulling messages from the JMS destination.
-jumi (true/false)	Specifies if the JMS message id should be used as the correlation id.
-jtr (true/false)	Specifies if the services uses local JMS transactions when processing requests.
-jdsn <i>durableSubscriber</i>	Specifies the name of the durable subscription to use.
-L <i>file</i>	Specifies the location of your Artix license file. The default behavior is to check IT_PRODUCT_DIR\etc\license.txt.
-quiet	Specifies that the tool runs in quiet mode.
-verbose	Specifies that the tool runs in verbose mode.
-h	Displays the tool's usage statement.
-v	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference](#) [./../wsdl_ref/index.htm].

Migrating to the 4.x JMS WSDL Extensions

Overview

The WSDL extensions used to configure a JMS endpoint were modified in the 4.0 release of Artix. This update makes Artix JMS endpoint definitions compatible with Celtix JMS endpoints. To make the transition as smooth as possible, Artix includes an XSLT script that can be used to automatically migrate an old JMS endpoint definition to a new JMS endpoint definition.

XSLT script

The XSLT script used to migrate old JMS endpoint definitions to 4.x JMS endpoints is called `oldjmswsdl_to_newjmswsdl.xsl` and it is located in `InstallDir/Artix/Version/etc/xslt/utilities/jms`. It will take any Artix contract containing a pre-4.x Artix JMS endpoint definition as input and output an equivalent Artix contract containing a 4.x Artix JMS endpoint.

Using the script with Artix

You can use Artix's XSLT processor to convert your JMS endpoints. To do so you run the Artix **xslttransform** command line tool using the options shown in [Example 75 on page 179](#).

Example 75. Running the Transformer with the JMS Migration Script

```
xslttransform -XSL oldjmswsdl_to_newjmswsdl.xsl -IN oldWsd1.wsdl -OUT newWsd1.wsdl
```

The XSLT processor will read the contract in `oldWsd1.wsdl`, transform the old JMS endpoint to a new JMS endpoint, and save the resulting contract in `newWsd1.wsdl`.

Using ActiveMQ as Your JMS Provider

Overview

Artix installs ActiveMQ, an open source JMS implementation, for you to use as a possible messaging system. All of the Artix JMS demos are configured to use ActiveMQ, so to run the demos you must start the ActiveMQ broker.

Setting the CLASSPATH

When you set your Artix environment using the **artix_env** script, the ActiveMQ jars are automatically added to your `CLASSPATH`.

If you don not want to set the Artix environment before starting ActiveMQ you need to add

`InstallDir/lib/activemq/activemq/3.2.1/activemq-rt.jar` to your `CLASSPATH`.

Starting the broker

To start the ActiveMQ JMS broker run the following command:

```
InstallDir/Artix/Version/bin/start_jms_broker
```

Stopping the broker

To shutdown the ActiveMQ JMS broker run the following command:

```
InstallDir/Artix/Version/bin/jmsbrokerinteract -sd
```

Security

By default, ActiveMQ's security features are turned off. To turn on ActiveMQ's security features see the ActiveMQ documentation.

More information

For more information on using ActiveMQ see the project's homepage at <http://activemq.org> [<http://activemq.org>].

Using IIOP

Using IIOP to send non-CORBA formats allows you to take advantages of CORBA services and QoS without using CORBA applications.

Overview

Artix allows you to use IIOP as a generic transport for sending data using any of the payload formats. When using IIOP as a generic transport, you define your endpoint's address using an `iiop:address` element. The benefit of using the generic IIOP transport is that it allows you to use CORBA services without requiring your applications to be CORBA applications. For example, you could use an IIOP tunnel to send fixed format messages to an endpoint whose address is published in a CORBA naming service.

Namespace

The namespace under which the IIOP extensions are defined is `http://schemas.ionac.com/bindings/iiop_tunnel`. If you are going to add an IIOP port by hand you will need to add this to your contract's `definition` element.

IIOP address specification

The IOR, or address, of the IIOP port is specified using the `iiop:address` element. You have four options for specifying IORs in Artix contracts:

- Specify the object's IOR directly in the contract, using the stringified IOR format:

```
IOR:22342....
```

- Specify a file location for the IOR, using the following syntax:

```
file:///file_name
```



Note

The file specification requires three backslashes (///).

- Specify that the IOR is published to a CORBA name service, by entering the object's name using the `corbaname` format:

```
corbaname:rir/NameService#object_name
```

For more information on using the name service with Artix see [Artix for CORBA \[../../corba_ws/index.htm\]](#).

- Specify the IOR using `corbaloc`, by specifying the port at which the service exposes itself, using the `corbaloc` syntax.

```
corbaloc:iiop:host:port/service_name
```

When using `corbaloc`, you must be sure to configure your service to start up on the specified host and port.

Specifying type of payload encoding

The IIOp transport can perform codeset negotiation on the encoded messages passed through it if your CORBA system supports it. By default, this feature is disabled so that the agents sending the message maintain complete control over codeset conversion. If you wish to enable automatic codeset negotiation use the following element:

```
<iiop:payload type="string"/>
```

Specifying POA policies

Using the optional `iiop:policy` element, you can describe the POA policies Artix will use when creating the IIOp endpoint. These policies include:

- [The POA name](#)
- [Persistence](#)
- [The system ID assigned to the POA](#)

Setting these policies lets you exploit some of the enterprise features of IONA's Orbix 6.x, such as load balancing and fault tolerance, when deploying an Artix endpoints using the IIOp transport. For information on using these advanced CORBA features, see the Orbix documentation.

POA name

Artix POAs are created with the default name of `WS_ORB`. To specify a name for the POA that Artix creates for an IIOp endpoint, you use the following:

```
<iiop:policy poaname="poa_name"/>
```

The POA name is used for setting certain policies, such as direct persistence and well-known port numbers in the CORBA configuration.

Persistence

By default Artix POAs have a persistence policy of `false`. To set the POA's persistence policy to `true`, use the following:

```
<iiop:policy persistent="true"/>
```

ID Assignment

By default Artix POAs are created with a `SYSTEM_ID` policy, meaning that their ID is assigned by Artix. To specify that the IIOB endpoint's POA should use a user-assigned ID, use the following:

```
<corba:policy serviceid="POAid"/>
```

This creates a POA with a `USER_ID` policy and an object id of `POAid`.

Using the command line tool

To use **wsdltoservice** to add an IIOB endpoint use the tool with the following options.

```
wsdltoservice {-transport iiop} [-e service] [-t port] [-b binding] [-a address] [-poa poaName] [-sid serviceId] [-pst persists] [-paytype payload] [-o file] [-d dir] [-L file] [[-quiet] | [-verbose]] [-h] [-v] wsdurl
```

The `-transport iiop` flag specifies that the tool is to generate an IIOB endpoint. The other options are as follows.

<code>-e service</code>	Specifies the name of the generated <code>service</code> element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the endpoint is generated.
<code>-a address</code>	Specifies the value used in the generated <code>iiop:address</code> elements.
<code>-poa poaName</code>	Specifies the value of the POA name policy.
<code>-sid serviceId</code>	Specifies the value of the ID assignment policy.

<code>-pst persists</code>	Specifies the value of the persistence policy. Valid values are <code>true</code> and <code>false</code> .
<code>-paytype payload</code>	Specifies the type of data being sent in the message payloads. Valid values are <code>string</code> , <code>octets</code> , <code>imsraw</code> , <code>imsraw_binary</code> , <code>cicsraw</code> , and <code>cicsraw_binary</code> .
<code>-o file</code>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
<code>-d dir</code>	Specifies the output directory for the generated contract.
<code>-L file</code>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Displays the tool's usage statement.
<code>-v</code>	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference \[../../wsdl_ref/index.htm\]](#).

Example

For example, an IIOP endpoint definition for the `personalInfoLookup` binding would look similar to [Example 76 on page 184](#):

Example 76. CORBA `personalInfoLookup` Port

```
<service name="personalInfoLookupService">
  <port name="personalInfoLookupPort"
        binding="tns:personalInfoLookupBinding">
    <iiop:address location="file:///objref.ior"/>
    <iiop:policy persistent="true"/>
    <iiop:policy serviceid="personalInfoLookup"/>
  </port>
</service>
```

Artix expects the IOR for the IIOP endpoint to be located in a file called `objref.ior`, and creates a persistent POA with an object id of `personalInfo` to configure the IIOP endpoint.

Using FTP

Artix allows endpoints to communicate using a remote FTP server as an intermediary persistent datastore. When using the FTP transport, client endpoints will put request messages into a folder on the FTP server and then begin scanning the folder for a response. Server endpoints will scan the request folder on the FTP server for requests. When a request is found, the service endpoint will get it and process the request. When the service endpoint finishes processing the request, it will post the response back to the FTP server. When the client sees the response, it will get the response from the FTP server.

Because of the file-based nature of the FTP transport and the fact that endpoints do not have a direct connection to each other, the FTP transport places the burden of implementing a request/response coordination scheme on the developer. The FTP transport also requires that you implement the logic determining how the request and response messages are cleaned-up.

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Adding an FTP Endpoint

Overview

You define an FTP endpoint using WSDL extensions that are placed within a `port` element of a contract. The WSDL extensions provided by Artix allow you to specify a number of properties for establishing the FTP connection. In addition, they allow you to specify some of the properties used to define the naming properties for the files used by the transport.

Namespace

To use the FTP transport, you need to describe the endpoint using the FTP WSDL extensions in the physical part of an Artix contract. The extensions used to describe a FTP port are defined in the following namespace: `xmlns:ftp="http://schemas.iona.com/transports/ftp"`

This namespace will need to be included in your contract's `definitions` element.

Defining the connection details

The connection details for the endpoint are defined in an `ftp:port` element. The `ftp:port` element has two attributes: `host` and `port`.

- The `host` attribute is required. It specifies the name of the machine hosting the FTP server to which the endpoint connects.
- The `port` attribute is optional. It specifies the port number on which the FTP server is listening. The default value is 21.

[Example 77 on page 186](#) shows an example of a `port` element defining an FTP endpoint.

Example 77. Defining an FTP Endpoint

```
<port name="FTPEndpoint">
  <ftp:port host="Dauphin" port="8080" />
</port>
```

In addition to the two required attributes, the `ftp:port` element has the following optional attributes:

Attribute	Description
<code>requestLocation</code>	Specifies the location on the FTP server where requests are stored. The default is <code>/</code> .
<code>replyLocation</code>	Specifies the location on the FTP server where replies are stored. The default is <code>/</code> .
<code>connectMode</code>	Specifies the connection mode used to connect to the FTP daemon. Valid values are <code>passive</code> and <code>active</code> . The default is <code>passive</code> .
<code>scanInterval</code>	Specifies the interval, in seconds, at which the request and reply locations are scanned for updates. The default is 5.

Specifying optional naming properties

You can specify optional naming policies using an `ftp:properties` element. The `ftp:properties` element is a container for a number `ftp:property` elements. The `ftp:property` elements specify the individual naming properties. Each `ftp:property` element has two attributes, `name` and `value`, that make up a name-value pair that are used to provide information to the naming implementation used by the endpoint.

The default naming implementation provided with Artix has two properties:

<code>staticFilemanes</code>	Determines if the endpoint uses a static, non-unique, naming scheme for its files. Valid values are <code>true</code> and <code>false</code> . The default is <code>true</code> .
<code>requestFilenamePrefix</code>	Specifies the prefix to use for file names when <code>staticFilemanes</code> is set to <code>false</code> .

For information on defining optional properties see [Using Properties to Control Coordination Behavior on page 199](#).

Coordinating Requests and Responses

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Introduction

Overview

FTP requires that messages are written out to a file system for retrieval. This poses a few problems. The first is determining a naming scheme that is agreed upon by all endpoints that use a common location on an FTP server. Client endpoints and the server endpoints they are making requests on need a method to coordinate requests and responses. This includes knowing which messages are intended for which endpoint.

The other problem posed by using a file system as a transport is knowing when a message can be cleaned-up. If a message is cleaned-up too soon, there is no way to re-read the message if something goes wrong while it is being processed. If a message is not cleaned-up soon enough, it is possible that the message will be processed more than once.

Artix requires that you implement the logic used to determine the file naming and clean-up logic used by your FTP endpoints. This is done by implementing four Java interfaces: two for the client-side and two for the server-side.

Default implementation

Artix provides a default implementation for coordinating requests and responses. The default implementation enables clients and servers to interact as if they are using a standard RPC mechanism. Message names are generated at runtime following a pattern based on the server endpoint's service name. Request messages are cleaned-up by the server endpoint when the corresponding response is written to the file system. Responses are cleaned-up by the client endpoint when they are read from the file system.

Implementing the Client's Coordination Logic

Overview

The client-side of the coordination implementation is made up of two parts:

- The filename factory is responsible for generating the filenames used for storing request messages on the FTP server and determining the name of the associated replies.
 - The reply lifecycle policy is responsible for cleaning-up reply files.
-

The filename factory

The client-side filename factory is created by implementing the interface `com.iona.jbus.transports.ftp.policy.client.FilenameFactory`.

[Example 78 on page 190](#) shows the interface.

Example 78. Client-Side Filename Factory Interface

```
package com.iona.jbus.transports.ftp.policy.client;

import javax.xml.namespace.QName;
import com.iona.webservices.wsdl.ext.ftp.FTPProperties;

public interface FilenameFactory
{
    void initialize(QName service, String port,
                  FTPProperties properties) throws Exception;

    String getNextRequestFilename() throws Exception;

    String getRequestIncompleteFilename(String requestFilename)
    throws Exception;

    String getReplyFilename(String requestFilename)
    throws Exception;

    FilenameFactoryPropertyMetaData[] getPropertiesMetaData();
};
```

The interface has four methods to implement:

`initialize()`

`initialize()` is called by the transport when it is loaded by the bus.

It receives the following:

- the QName of the service the client on which the client wants to make requests.
- the value of the `name` attribute for the `port` element defining the endpoint implementing the service.
- an array containing any properties you specified as `ftp:property` elements in your client's contract.

This method is used to set up any resources you need to implement naming scheme used by the client-side endpoints. For example, the default implementation uses `initialize()` to do the following:

1. Determine if the user wants to use static filenames based on an `ftp:property` element in the contract. For more information see [Using Properties to Control Coordination Behavior on page 199](#).
2. If so, it generates a static filename prefix for the requests.
3. If not, it uses the user supplied filename prefix for the requests.

`getNextRequestFilename()`

`getNextRequestFilename()` is called by the transport each time a request is sent out. It returns a string that the transport will use as the filename for the completed request message. For example, the default implementation creates a filename by appending a string representing the server endpoint's system address and the system time, in hexcode, to the prefix generated in `initialize()`.

`getRequestIncompleteFilename()`

`getRequestIncompleteFilename()` is called by the transport each time a request is sent out. It returns a string that the transport will use as the filename for the request message as it is being transmitted. For example, the default implementation creates a filename by appending a the request filename with `_incomplete`.

`getReplyFilename()`

`getReplyFilename()` is called by the transport when it starts listening for a response to a two-way request. It receives a string representing the name of the request's filename. It returns the name of the file that will contain the response to the specified request. For example, the default

implementation generates the reply filename by appending `_reply` to the request filename.

The reply lifecycle policy

The reply lifecycle policy is created by implementing the `com.iona.jbus.transports.ftp.policy.client.ReplyFileLifecycle` interface. [Example 79 on page 192](#) shows the interface.

Example 79. Reply Lifecycle Interface

```
package com.iona.jbus.transports.ftp.policy.client;

public interface ReplyFileLifecycle
{
    boolean shouldDeleteReplyFile(String fileName)
        throws Exception;

    String renameReplyFile(String fileName) throws Exception;
}
```

The interface has two methods to implement:

`shouldDeleteReplyFile()`

`shouldDeleteReplyFile()` is called by the transport after it completes reading in a reply. It receives the filename of the reply and returns a boolean stating if the file should be deleted. If `shouldDeleteReplyFile()` returns `true`, the transport deletes the reply file. If it returns `false`, the transport renames reply file based on the logic implemented in `renameReplyFile()`.

`renameReplyFile()`

`renameReplyFile()` is called by the transport if `shouldDeleteReplyFile()` returns `false`. It receives the original name of the reply file. It returns a string that contains the filename the transport uses to rename the reply file.

Configuring the client's coordination logic

If you choose to implement your own coordination logic for an FTP client endpoint, you need to configure the endpoint to load your implementation classes. This is done by adding two configuration values to the endpoint's Artix configuration scope:

- `plugins:ftp:policy:client:filenameFactory` specifies the name of the class implementing the client's filename factory.
- `plugins:ftp:policy:client:replyFileLifecycle` specifies the name of the class implementing the client's reply lifecycle policy.

Both classes need to be on the endpoint's classpath.

[Example 80 on page 193](#) shows an example of an Artix configuration scope that specifies an FTP client endpoint's coordination policies.

Example 80. Configuring an FTP Client Endpoint

```
ftp_client
{
  plugins:ftp:policy:client:filenameFactory="demo.ftp.policy.client.myFilenameFactory";
  plugins:ftp:policy:client:replyFileLifecycle="demo.ftp.policy.client.myReplyFileLifecycle";
};
```

For more information on configuring Artix see [Configuring and Deploying Artix Solutions, C++ Runtime](#) [../deploy/cpp/index.htm].

Implementing the Server's Coordination Logic

Overview

The server-side of the coordination implementation is made up of two parts:

- The filename factory is responsible for identifying which requests to dispatch and how to name reply messages.
 - The request lifecycle policy is responsible for cleaning-up request files.
-

The filename factory

The server-side filename factory is created by implementing the interface `com.iona.jbus.transports.ftp.policy.server.FilenameFactory`.

[Example 81 on page 194](#) shows the interface.

Example 81. Server-Side Filename Factory Interface

```
package com.iona.jbus.transports.ftp.policy.server;

import javax.xml.namespace.QName;

import com.iona.jbus.Bus;
import com.iona.transports.ftp.Element;
import com.iona.webservices.wsdl.ext.ftp.FTPProperties;

public interface FilenameFactory
{
    void initialize(Bus bus, QName service, String port,
                  FTPProperties properties) throws Exception;

    String getRequestFileNamesRegEx() throws Exception;

    Element[] updateRequestFiles(Element[] inElements)
    throws Exception;

    String getReplyIncompleteFilename(String requestFilename)
    throws Exception;

    String getReplyFilename(String requestFilename)
    throws Exception;

    FilenameFactoryPropertyMetaData[] getPropertiesMetaData();
}
```

The interface has six methods to implement:

`initialize()`

`initialize()` is called by the transport when it is activated by the bus. It receives the following:

- the bus that has activated the transport.
- the QName of the service to which the endpoint is implementing.
- the value of the `name` attribute for the `port` element defining the endpoint's connection details.
- an array containing any properties you specified as `ftp:property` elements in your server endpoint's contract.

This method is used to set up any resources you need to implement naming scheme used by the server-side endpoints. For example, the default implementation uses `initialize()` to do the following:

1. Determine if the user wants to use static filenames based on an `ftp:property` element in the contract. For more information see [Using Properties to Control Coordination Behavior on page 199](#).
2. If so, it generates a static filename prefix for the requests.
3. If not, it uses the user supplied filename prefix for the requests.

`getRequestFileRegex()`

`getRequestFileRegex()` is called by the transport when it initializes the server-side FTP listener. It returns a regular expression that is used to match request filenames intended for a specific server instance. For example, the default implementation returns a regular expression of the form

```
{wsdl:tns}_{wsdl:service(@name)}_{wsdl:port(@name)}_{reqUuid}.
```

`updateRequestFiles()`

`updateRequestFiles()` is called by the transport after it determines the list of possible requests and before it dispatches the requests to the service implementation for processing. It receives an array of `com.iona.transports.ftp.Element` objects. This array is a list of all the request messages selected by the request filename regular expression. `updateRequestFiles()` returns an array of `Element` objects containing

only the messages that are to be dispatched to the service implementation.

`getReplyIncompleteFilename()`

`getReplyIncompleteFilename()` is called by the transport when it is ready to post a response. It receives the filename of the request that generated the response. It returns a string that is used as the filename for the response as it is being written to the FTP server. For example, the default implementation returns `_incomplete` appended to request filename.

`getReplyFilename()`

`getReplyFilename()` is called by the transport after it finishes writing a response to the FTP server. It receives the filename of the request that generated the response. It returns a string that is used as the filename for the completed response. For example, the default implementation returns `_reply` appended to request filename.

`getPropertiesMetaData()`

`getPropertiesMetaData()` is a convenience function that returns an array of all the possible properties you can use to effect the behavior of the FTP naming scheme. The properties returned correspond to the values defined in the `ftp:properties` element. For more information see [Using Properties to Control Coordination Behavior on page 199](#).

The request lifecycle policy

The request lifecycle policy is created by implementing the `com.ionajbus.transports.ftp.policy.server.RequestFileLifecycle` interface. [Example 82 on page 196](#) shows the interface.

Example 82. Request Lifecycle Interface

```
package com.ionajbus.transports.ftp.policy.server;

public interface RequestFileLifecycle
{
    boolean shouldDeleteRequestFile(String fileName)
        throws Exception;

    String renameRequestFile(String fileName) throws Exception;
}
```

The interface has two methods to implement:

```
shouldDeleteRequestFile()
```

`shouldDeleteRequestFile()` is called by the transport after it completes writing in a response. It receives the filename of the request that generated the response and returns a boolean stating if the file should be deleted. If `shouldDeleteRequestFile()` returns `true`, the transport deletes the request file. If it returns `false`, the transport renames reply file based on the logic implemented in `renameRequestFile()`.

```
renameRequestFile()
```

`renameRequestFile()` is called by the transport if `shouldDeleteRequestFile()` returns `false`. It receives the original name of the request file. It returns a string that contains the filename the transport uses to rename the request file.

Configuring the server's coordination logic

If you choose to use your own coordination logic for an FTP server endpoint, you need to configure the endpoint to load the proper implementation classes. This is done by adding two configuration values to the endpoint's Artix configuration scope:

- `plugins:ftp:policy:server:filenameFactory` specifies the name of the class implementing the server's filename factory.
- `plugins:ftp:policy:server:requestFileLifecycle` specifies the name of the class implementing the server's request lifecycle policy.

Both classes need to be on the endpoint's classpath.

[Example 83 on page 197](#) shows an example of an Artix configuration scope that specifies an FTP server endpoint's coordination policies.

Example 83. Configuring an FTP Server Endpoint

```
ftp_client
{
  plugins:ftp:policy:server:filenameFactory="demo.ftp.policy.server.myFilenameFactory";
  plugins:ftp:policy:server:requestFileLifecycle
```

```
cycle="demo.ftp.policy.client.myReqFileLifecycle";  
};
```

For more information on configuring Artix see [Configuring and Deploying Artix Solutions, C++ Runtime \[./../deploy/cpp/index.htm\]](#).

Using Properties to Control Coordination Behavior

Overview

In order to ensure that your FTP client endpoints and FTP server endpoints are using the same coordination behavior, you may need to pass some information to the transports as they initialize. To make this information available to both sides of the application and still be settable at run time, the Artix FTP transport allows you to provide custom properties that are settable in an endpoint's contract. These properties are set using the `ftp:properties` element.

Properties in the contract

You can place any number of custom properties into port element defining an FTP endpoint. As described in [Specifying optional naming properties on page 187](#), the `ftp:properties` element is a container for one or more `ftp:property` elements. The `ftp:property` element has two attributes: `name` and `value`. Both attributes can have any string as a value. Together they form a name/value pair that your coordination logic is responsible for processing.

For example, imagine an FTP endpoint defined by the `port` element in [Example 84 on page 199](#).

Example 84. FTP Endpoint with Custom Properties

```
<port ...>
  <ftp:port ... />
  <ftp:properties>
    <ftp:property name="UseHumanNames" value="true" />
    <ftp:property name="LastName" value="Doe" />
  </ftp:properties>
</port>
```

The endpoint is configured using two custom FTP properties:

- `UseHumanNames` with a value of `true`.
- `LastName` with a value of `Doe`.

Supporting the properties

These properties are only meaningful if the coordination logic used by the endpoint supports them. If they are not supported, they are ignored.

The `initialize()` method of both the client-side filename factory and the server-side filename factory take a `com.iona.webservices.wsdl.ext.ftp.FTPProperties` object. The `FTPProperties` object is populated by the contents of the endpoints `ftp:properties` element when the transport is initialized.

The `FTPProperties` object can be used to access all of the properties defined by `ftp:property` elements. To access the properties you do the following:

1. Use the `getExtensors()` method to get an `Iterator` object.
2. Using the `Iterator` objects `next()` method, get the elements in the list.
3. Cast the return value of the `next()` method to an `FTPProperty` object.

Each `com.iona.webservices.wsdl.ext.ftp.FTPProperty` object contains one name/value pair from one `ftp:property` element. You can extract the value of the `name` attribute using the `FTPProperty` object's `getProperty()` with the constant `com.iona.webservices.wsdl.ext.ftp.FTPProperty.NAME`. You can extract the value of the `value` attribute using the `FTPProperty` object's `getProperty()` with the constant `com.iona.webservices.wsdl.ext.ftp.FTPProperty.VALUE`. Once you have the values of the properties, it is up to you to determine how they impact the coordination scheme.

[Example 85 on page 200](#) shows code for supporting the properties shown in [Example 84 on page 199](#).

Example 85. Using Custom FTP Properties

```
import com.iona.webservices.wsdl.ext.FTPProperties;
import com.iona.webservices.wsdl.ext.FTPProperty;

String nameTypeProp = "UseHumanNames";
String lastNameProp = "LastName";
for (Iterator it = properties.getExtensors(); it.hasNext();)
```

```

{
    FTPProperty property = (FTPProperty)it.next();
    String n = property.getProperty(FTPProperty.NAME);

    if (nameTypeProp.equals(n))
    {
        Boolean useHuman = new Boolean(property.getProperty(FTP
Property.VALUE));
    }

    if (lastNameProp.equals(n))
    {
        String lastName = property.getProperty(FTPProperty.VALUE);
    }
}

```

Filling in the filename factory property metadata

The server-side filename factory's `getPropertiesMetaData()` method is a convenience function that can be used to publish the supported custom properties. It returns the details of the supported properties in an array of `com.iona.jbus.transports.ftp.policy.server.FilenameFactoryPropertyMetaData` objects.

`FilenameFactoryPropertyMetaData` objects have three fields:

- `name` is a string that specifies the value of the `ftp:property` element's `name` attribute.
- `readOnly` is a boolean that specifies if you can set this property in a contract.
- `valueSet` is an array of strings that specify the possible values for the property.

`FilenameFactoryPropertyMetaData` objects do not have any methods for populating its fields once the object is instantiated. You must set all of the values using the constructor that is shown in [Example 86 on page 201](#).

Example 86. Constructor for `FilenameFactoryPropertyMetaData`

```

public FilenameFactoryPropertyMetaData(String n, boolean ro,
                                     String[] vs)
{

```

```
name = n;  
readOnly = ro;  
valueSet = vs;  
}
```

[Example 87 on page 202](#) shows code for creating an array to be returned from `getPropertiesMetaData()`.

Example 87. Populating the Filename Properties Metadata

```
FilenameFactoryPropertyMetaData[] propMetas = new FilenameFact  
oryPropertyMetaData[]  
{  
    new FilenameFactoryPropertyMetaData("UseHumanNames", false,  
                                         new String[]  
{Boolean.TRUE.toString(),  
Boolean.FALSE.toString()}),  
    new FilenameFactoryPropertyMetaData("LastName", false, null)  
};
```

The list of possible values specified for the property `LastName` is set to `null` because the property can have any string value.

Using WebSphere MQ

Artix can use WebSphere MQ to transport messages and leverage much of WebSphere's infrastructure to provide QoS.

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Adding a WebSphere MQ Endpoint

Overview

The description for an Artix WebSphere MQ endpoint is entered in a `port` element of the Artix contract containing the interface to be exposed over WebSphere MQ. Artix defines two elements to describe WebSphere MQ endpoints and their attributes:

- `mq:client` defines an endpoint for a WebSphere MQ client application.
- `mq:server` defines an endpoint for a WebSphere MQ server application.

You can use one or both of the WebSphere MQ elements to describe a WebSphere MQ endpoint. Each can have different configurations depending on the attributes you choose to set.

WebSphere MQ namespace

The WSDL extensions used to describe WebSphere MQ transport details are defined in the WSDL namespace

`http://schemas.ionas.com/transport/mq`. If you are going to add a WebSphere MQ port by hand you will need to include the following in the `definitions` tag of your contract:

```
xmlns:mq="http://schemas.ionas.com/transport/mq"
```

Required Attributes

When you define a WebSphere MQ endpoint you need to provide at least enough information for the endpoint to connect to its message queues. For any WebSphere application that means setting the `QueueManager` and `QueueName` attributes in the `port` element. In addition, if you are configuring a client that expects to receive replies from the server, you need to set the `ReplyQueueManager` and `ReplyQueueName` attributes of the `mq:client` element defining the client endpoint.

In addition, if you are deploying applications on a machine with a full MQ installation, you need to set the `Server_Client` attribute to `client` if the endpoint is going to use remote queues. This setting instructs Artix to load `libmqic` instead of `libmqm`.

Using the command line tool

To use **wsdltoservice** to add a WebSphere MQ endpoint use the tool with the following options.

```

wsdltoService {-transport mq} [-e service] [-t port] [-b binding] [-sqm
queueManager] [-sqn queue] [-srqm queueManager] [-srqn queue] [-smqn
modelQueue] [-sus usageStyle] [-scs correlationStyle] [-sam
accessMode] [-sto timeout] [-sme expiry] [-smp priority] [-smi
messageId] [-sci correlationId] [-sd delivery] [-st transactional]
[-sro reportOption] [-sf format] [-sad applicationData] [-sat
accountingToken] [-scn connectionName] [-sc convert] [-scr reusable]
[-scfp fastPath] [-said idData] [-saod originData] [-cqmq queueManager]
[-cqmq queue] [-crqm queueManager] [-crqn queue] [-cmqn modelQueue]
[-cus usageStyle] [-ccs correlationStyle] [-cam accessMode] [-cto
timeout] [-cme expiry] [-cmp priority] [-cmi messageId] [-cci
correlationId] [-cd delivery] [-ct transactional] [-cro reportOption]
[-cf format] [-cad applicationData] [-cat accountingToken] [-ccn
connectionName] [-cc convert] [-ccr reusable] [-ccfp fastPath] [-caid
idData] [-caod originData] [-caqn queue] [-cui userId] [-o file] [-d dir]
[-L file] [[-quiet] | [-verbose]] [-h] [-v] wsdlurl

```

The `-transport mq` flag specifies that the tool is to generate a WebSphere MQ service. The other options are as follows.

Table 29. Options for Adding a WebSphere MQ Endpoint

Option	Description
<code>-e service</code>	Specifies the name of the generated <code>service</code> element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the endpoint is generated.
<code>-sqm queueManager</code>	Specifies the name of the server's queue manager.
<code>-sqn queue</code>	Specifies the name of the server's request queue.
<code>-srqm queueManager</code>	Specifies the name of the server's reply queue manager.

Option	Description
-srqn <i>queue</i>	Specifies the name of the server's reply queue.
-smqn <i>modelQueue</i>	Specifies the name of the server's model queue.
-sus <i>usageStyle</i>	Specifies the value of the server's UsageStyle attribute. Valid values are Peer, Requester, or Responder.
-scs <i>correlationStyle</i>	Specifies the value of the server's CorrelationStyle attribute. Valid values are messageId, correlationId, or messageId copy.
-sam <i>accessMode</i>	Specifies the value of the server's AccessMode attribute. Valid values are peek, send, receive, receive exclusive, or receive shared.
-sto <i>timeout</i>	Specifies the value of the server's Timeout attribute.
-sme <i>expiry</i>	Specifies the value of the server's MessageExpiry attribute.
-smp <i>priority</i>	Specifies the value of the server's MessagePriority attribute.
-smi <i>messageId</i>	Specifies the value of the server's MessageId attribute.
-sci <i>correlationId</i>	Specifies the value of the server's CorrelationID attribute.
-sd <i>delivery</i>	Specifies the value of the server's Delivery attribute.
-st <i>transactional</i>	Specifies the value of the server's Transactional attribute. Valid values are none, internal, or xa.
-sro <i>reportOption</i>	Specifies the value of the server's ReportOption attribute. Valid values are none, coa, cod, exception, expiration, or discard.
-sf <i>format</i>	Specifies the value of the server's Format attribute.

Option	Description
-sad <i>applicationData</i>	Specifies the value of the server's <code>ApplicationData</code> attribute.
-sat <i>accountingToken</i>	Specifies the value of the server's <code>AccountingToken</code> attribute.
-scn <i>connectionName</i>	Specifies the name of the connection by which the adapter connects to the queue.
-sc <i>convert</i>	Specifies if the messages in the queue need to be converted to the system's native encoding. Valid values are <code>true</code> or <code>false</code> .
-scr <i>reusable</i>	Specifies the value of the server's <code>ConnectionReusable</code> attribute. Valid values are <code>true</code> or <code>false</code> .
-scfp <i>fastPath</i>	Specifies the value of the server's <code>ConnectionFastPath</code> attribute. Valid values are <code>true</code> or <code>false</code> .
-said <i>idData</i>	Specifies the value of the server's <code>ApplicationIdData</code> attribute.
-saod <i>originData</i>	Specifies the value of the server's <code>ApplicationOriginData</code> attribute.
-cqm <i>queueManager</i>	Specifies the name of the client's queue manager.
-cqn <i>queue</i>	Specifies the name of the client's request queue.
-crqm <i>queueManager</i>	Specifies the name of the client's reply queue manager.
-crqn <i>queue</i>	Specifies the name of the client's reply queue.
-cmqn <i>modelQueue</i>	Specifies the name of the client's model queue.
-cus <i>usageStyle</i>	Specifies the value of the client's <code>UsageStyle</code> attribute. Valid values are <code>Peer</code> , <code>Requester</code> , or <code>Responder</code> . The default value is <code>Requester</code> .

Option	Description
-ccs <i>correlationStyle</i>	Specifies the value of the client's <code>CorrelationStyle</code> attribute. Valid values are <code>messageId</code> , <code>correlationId</code> , or <code>messageId copy</code> .
-cam <i>accessMode</i>	Specifies the value of the client's <code>AccessMode</code> attribute. Valid values are <code>peek</code> , <code>send</code> , <code>receive</code> , <code>receive exclusive</code> , or <code>receive shared</code> .
-cto <i>timeout</i>	Specifies the value of the client's <code>Timeout</code> attribute.
-cme <i>expiry</i>	Specifies the value of the client's <code>MessageExpiry</code> attribute.
-cmp <i>priority</i>	Specifies the value of the client's <code>MessagePriority</code> attribute.
-cni <i>messageId</i>	Specifies the value of the client's <code>MessageId</code> attribute.
-cci <i>correlationId</i>	Specifies the value of the client's <code>CorrelationId</code> attribute.
-cd <i>delivery</i>	Specifies the value of the client's <code>Delivery</code> attribute.
-ct <i>transactional</i>	Specifies the value of the client's <code>Transactional</code> attribute. Valid values are <code>none</code> , <code>internal</code> , or <code>xa</code> .
-cro <i>reportOption</i>	Specifies the value of the client's <code>ReportOption</code> attribute. Valid values are <code>none</code> , <code>coa</code> , <code>cod</code> , <code>exception</code> , <code>expiration</code> , or <code>discard</code> .
-cf <i>format</i>	Specifies the value of the client's <code>Format</code> attribute.
-cad <i>applicationData</i>	Specifies the value of the client's <code>ApplicationData</code> attribute.
-cat <i>accountingToken</i>	Specifies the value of the client's <code>AccountingToken</code> attribute.
-ccn <i>connectionName</i>	Specifies the name of the connection by which the adapter connects to the queue.

Option	Description
-cc <i>convert</i>	Specifies if the messages in the queue need to be converted to the system's native encoding. Valid values are <code>true</code> or <code>false</code> .
-ccr <i>reusable</i>	Specifies the value of the client's <code>ConnectionReusable</code> attribute. Valid values are <code>true</code> or <code>false</code> .
-ccfp <i>fastPath</i>	Specifies the value of the client's <code>ConnectionFastPath</code> attribute. Valid values are <code>true</code> or <code>false</code> .
-caid <i>idData</i>	Specifies the value of the client's <code>ApplicationIdData</code> attribute.
-caod <i>originData</i>	Specifies the value of the client's <code>ApplicationOriginData</code> attribute.
-caqn <i>queue</i>	Specifies the remote queue to which a server will put replies if its queue manager is not on the same host as the client's local queue manager.
-cui <i>userId</i>	Specifies the value of the client's <code>UserIdentification</code> attribute.
-o <i>file</i>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
-d <i>dir</i>	Specifies the output directory for the generated contract.
-L <i>file</i>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
-quiet	Specifies that the tool runs in quiet mode.
-verbose	Specifies that the tool runs in verbose mode.
-h	Displays the tool's usage statement.
-v	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference](#) [../wsdl_ref/index.htm].

Example

An Artix contract exposing an interface, `monsterBash`, bound to a SOAP payload format, `Raydon`, on an WebSphere MQ queue, `UltraMan` would contain a `service` element similar to [Example 88 on page 210](#).

Example 88. Sample WebSphere MQ Port

```
<service name="Mothra">
  <port name="X" binding="tns:Raydon">
    <mq:server QueueManager="UMA"
              QueueName="UltraMan"
              ReplyQueueManager="WINR"
              ReplyQueueName="Elek"
              AccessMode="receive"
              CorrelationStyle="messageId copy"/>
  </port>
</service>
```

Specifying the WebSphere Library to Load

Overview

The version of the WebSphere MQ shared library loaded by an Artix MQ endpoint alters the types of queues that an endpoint can access. For example, if an Artix endpoint loads the MQ client shared library, it will only be able to use queues hosted on a remote machine. Artix provides an attribute in the MQ WSDL extensions that allows you to control which library is loaded.

The attribute

Both the `mq:server` element and the `mq:client` element support the attribute that is used to specify which MQ libraries to load. The `Server_Client` attribute specifies which shared libraries to load on systems with a full WebSphere MQ installation. [Table 30 on page 211](#) describes the settings for this attribute for each type of WebSphere MQ installation.

Table 30. WebSphere MQ `Server_Client` Attribute Settings

MQ Installation	Server_Client Value	Behavior
Full		The server shared library(<code>libmqm</code>) is loaded and the application will use queues hosted on the local machine.
Full	<code>server</code>	The server shared library(<code>libmqm</code>) is loaded and the application will use queues hosted on the local machine.
Full	<code>client</code>	The client shared library(<code>libmqic</code>) is loaded and the application will use queues hosted on a remote machine.
Client		The application will attempt to load the server shared library(<code>libmqm</code>) before loading the client shared library(<code>libmqic</code>). The application accesses queues hosted on a remote machine.
Client	<code>server</code>	The application will fail because it cannot load the server shared libraries.

MQ Installation	Server_Client Value	Behavior
Client	client	The client shared library(libmqic) is loaded and the application accesses queues hosted on a remote machine.

Example

[Example 89 on page 212](#) shows an a `service` element for an MQ endpoint that uses the MQ client shared library.

Example 89. ARTIX MQ Endpoint Using MQ Client Library

```
<service name="Mothra">
  <port name="X" binding="tns:Raydon">
    <mq:server QueueManager="UMA"
              QueueName="UltraMan"
              ReplyQueueManager="WINR"
              ReplyQueueName="Elek"
              Server_Client="client" />
  </port>
</service>
```

Using Queues on Remote Hosts

Overview

When interoperating between WebSphere MQ endpoints whose queue managers are on different hosts, Artix requires that you specify the name of the remote queue to which the server will post reply messages. This ensures that the server will put the replies on the proper queue. Otherwise, the server will receive a request message with the `ReplyToQ` field set to a queue that is managed by a queue manager on a remote host and will be unable to send the reply.

You specify this server's local reply queue name in the `mq:client` element's `AliasQueueName` attribute when you define it in the client endpoint's contract.

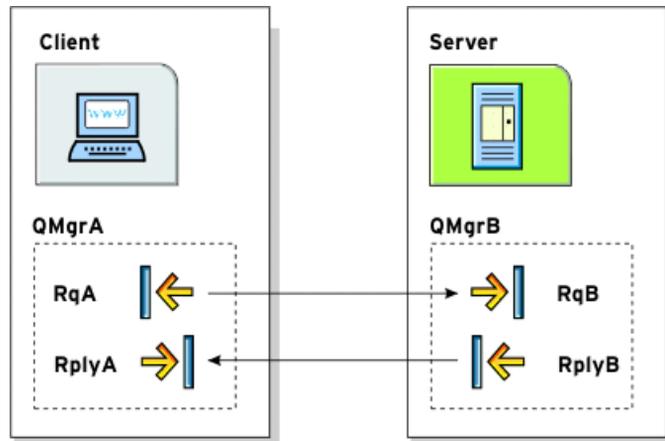
Effect of AliasQueueName

When you specify a value for the `AliasQueueName` attribute in an `mq:client` element, you alter how Artix populates the request message's `ReplyToQ` field and `ReplyToQMgr` field. Typically, Artix populates the reply queue information in the request message's message descriptor with the values specified in the `ReplyQueueManager` attribute and the `ReplyQueueName` attribute. Setting the `AliasQueueName` attribute causes Artix to leave `ReplyToQMgr` empty, and to set `ReplyToQ` to the value of the `AliasQueueName` attribute. When the `ReplyToQMgr` field of the message descriptor is left empty, the sending queue manager inspects the queue named in the `ReplyToQ` field to determine who its queue manager is and uses that value for `ReplyToQMgr`. The server puts the message on the remote queue that is configured as a proxy for the client's local reply queue.

Example

If you had a system defined similar to that shown in [Figure 2 on page 214](#), you would need to use the `AliasQueueName` attribute setting when configuring your WebSphere MQ client. In this set up the client is running on a host with a local queue manager `QMGrA`. `QMGrA` has two queues configured. `RqA` is a remote queue that is a proxy for `RqB` and `RplyA` is a local queue. The server is running on a different machine whose local queue manager is `QMGrB`. `QMGrB` also has two queues. `RqB` is a local queue and `RplyB` is a remote queue that is a proxy for `RplyA`. The client places its request on `RqA` and expects replies to arrive on `RplyA`.

Figure 2. MQ Remote Queues



The `port` elements for the client and server for this deployment are shown in [Example 90 on page 214](#). The `AliasQueueName` attribute is set to `RplyB` because that is the remote queue proxying for the reply queue in server's local queue manager. The `ReplyQueueManager` attribute and the `ReplyQueueName` attribute are set to the client's local queue manager so that it knows where to listen for responses. In this example, the server's `ReplyQueueManager` attribute and `ReplyQueueName` attribute do not need to be set because you are assured that the client is populating the request's message descriptor with the needed information for the server to determine where replies are sent.

Example 90. Setting Up WebSphere MQ Ports for Intercommunication

```
<mq:client QueueManager="QMGrA" QueueName="RqA"
  ReplyQueueManager="QMGrA" ReplyQueueName="RplyA"
  AliasQueueName="RplyB"
  Format="string" Convert="true"/>
<mq:server QueueManager="QMGrB" QueueName="RqB"
  Format="String" Convert="true"/>
```

Using WebSphere MQ's Transaction Features

Overview

Artix endpoints that use WebSphere MQ as their transport can take advantage of WebSphere MQ's internal transaction features. By using these features you can make WebSphere MQ a reliable message transport.

WebSphere MQ's transaction features can also interact with Artix's transaction features. For a complete description of using Artix's transaction features and how they interact with WebSphere MQ, see either [Artix Transactions Guide, C++](#) [../transactions/cpp/index.htm] or [Artix Transactions Guide, JAX-RPC](#) [../transactions/java/index.htm].

Specifying a transaction style

You specify how an Artix endpoint uses WebSphere MQ's transaction features using the `Transactional` attribute. Both the `mq:client` element and the `mq:server` element support the `Transactional` attribute.

The values of the `Transactional` attribute are explained in [Table 31 on page 215](#).

Table 31. WebSphere MQ Transactional Attribute Settings

Attribute Setting	Description
<code>none</code> (Default)	The messages are not part of a transaction. No rollback actions will be taken if errors occur.
<code>internal</code>	The messages involved in an invocation are part of a transaction with WebSphere MQ serving as the transaction manager. Each invocation is a separate transaction.
<code>xa</code>	The messages involved in an invocation are part of a flowed transaction with WebSphere MQ serving as an enlisted resource manager. Each invocation is a separate transaction.

Correlation to persistence

If you set your MQ endpoint to use one of the transactional styles, you must also ensure that it uses persistent messages. You do this by setting the `Delievery` attribute of the element defining the endpoint to `persistent`. For example if you are defining an endpoint that represents an MQ server that

uses internal transactions, you set the `mq:server` element's `Delivery` attribute to `persistent`.

Reliable MQ messages

When the `Transactional` attribute to `internal` for an Artix endpoint, the following happens during request processing:

1. When a request is placed on the endpoint's request queue, MQ begins a transaction.
 2. The endpoint processes the request.
 3. Control is returned to the server transport layer.
 4. If no reply is required, the local transaction is committed and the request is permanently discarded.
 5. If a reply message is required, the local transaction is committed and the request is permanently discarded only after the reply is successfully placed on the reply queue.
 6. If an error is encountered while the request is being processed, the local transaction is rolled back and the request is placed back onto the endpoint's request queue.
-

Example

[Example 91 on page 216](#) shows the `mq:server` element for an MQ endpoint whose requests will be part of transactions managed by WebSphere MQ. Note that the `Delivery` attribute must be set to `persistent` when using transactions.

Example 91. MQ Client Setup to use Transactions

```
<mq:server QueueManager="herman" QueueName="eddie"  
  ReplyQueueManager="gomez" ReplyQueueName="lurch"  
  UsageStyle="responder" Delivery="persistent"  
  CorrelationStyle="correlationId"  
  Transactional="internal"/>
```

Setting a Value of the Message Descriptor's Format Field

Overview

WebSphere MQ messages have a `Format` field in their message descriptors. Message receivers use this field to determine the nature of the data in the message. What the message receiver does with this information is the responsibility of the application developer. Artix, however, uses the `Format` field to determine if the contents of a message are to undergo codeset conversion.

You can specify the value placed in the message descriptor's `Format` field using the `Format` attribute. This attribute is supported by both the `mq:client` element and the `mq:server` element and its value is a string specifying the name of the message's format.

Special values

The `Format` attribute can take the special values described in [Table 32 on page 217](#).

Table 32. WebSphere MQ Format Attribute Settings

Attribute Setting	Description
<code>none</code> (Default)	Corresponds to <code>MQFMT_NONE</code> . No format name is specified.
<code>string</code>	Corresponds to <code>MQFMT_STRING</code> . <code>string</code> specifies that the message contains data of character data. The message data may be either single-byte characters or multi-byte characters.
<code>unicode</code>	Corresponds to <code>MQFMT_STRING</code> . <code>unicode</code> specifies that the message contains data of Unicode characters. (Unicode is not supported in Artix at this time.)
<code>event</code>	Corresponds to <code>MQFMT_EVENT</code> . <code>event</code> specifies that the message reports the occurrence of an WebSphere MQ event. Event messages have the same structure as command messages.

Attribute Setting	Description
programmable command	<p>Corresponds to <code>MQFMT_PCF.programmable</code> command specifies that the message data is in a user-defined format (PCF) message.</p> <p>For more information, consult the IBM Programmable Command Formats Administration Interfaces documentation at http://publibfp.boulder.ibm.com/epubs/html/csqzac03/csqzac030d.htm#t</p>

Using codeset conversion

Artix uses the value of the `Format` field in an MQ message header to determine if the message data should be converted into a host systems native codeset. If the `Format` field is set to `MQFMT_STRING`, Artix will attempt to convert the data into the host's native codeset. If the `Format` field has any other value, Artix will not attempt to perform codeset conversion.

If you are interoperating with systems that use a different codeset than the system your endpoint is hosted on, you need to set the `Format` attribute of the Artix endpoint to string. This is particularly important when you are interoperating with WebSphere MQ applications hosted on a mainframe because the data needs to be converted into the systems native data format. Not doing so will result in the mainframe receiving corrupted data.

Example

[Example 92 on page 218](#) shows an `mq:client` element that defines an endpoint used for making requests against a server on a mainframe system. In this particular example, we are talking directly to the mainframe queue manager.

Example 92. WebSphere MQ Client Talking to the Mainframe

```
<mq:client QueueManager="Mainframe_Request_Queue_Manager"
  QueueName="Application_request_queue_name"
  ReplyQueueManager="Mainframe_Reply_Queue_Manager"
  ReplyQueueName="Application_reply_queue_name"
  Server_Client="client" Format="string" Convert="true" />
```

In this example, you will also need to set the `MQSERVER` environment variable. The section *Using a Remote MQ Server* in [Artix Technical Use Cases](#) [<http://www.iona.com/support/docs/artix/5.0/cookbook/index.htm>] explains this in detail.

Using TIBCO Rendezvous

The TIBCO Rendezvous transport lets you use Artix to integrate systems based on TIBCO Rendezvous (TIB/RV) software.

Supported features

Table 33 on page 219 shows the matrix of TIBCO Rendezvous features Artix supports.

Table 33. Supported TIBCO Rendezvous Features

Feature	Supported	Not Supported
Server-Side Advisory Callbacks	x	
Certified Message Delivery	x	
Fault Tolerance (TibrvFtMember/Monitor)		x
Virtual Connections (TibrvVcTransport)		x
Secure Daemon (rvsd/TibrvSDContext)		x
TIBRVMSG_IPADDR32		x
TIBRVMSG_IPPORT16		x

Namespace

To use the TIB/RV transport, you need to define the endpoint using TIB/RV in the physical part of an Artix contract. The extensions used to describe a TIB/RV endpoint are defined in the namespace:

```
xmlns:tibrv="http://schemas.iona.com/transport/tibrv"
```

This namespace will need to be included in your Artix contract's definition element.

Describing the port

As with other transports, the TIB/RV transport specifications are contained within a `port` element. Artix uses `tibrv:port` to describe the attributes of a TIB/RV endpoint. The only required attribute for a `tibrv:port` element is `serverSubject` which specifies the subject to which the server listens.

Using the command line tools

To use `wsdltoervice` to add a TIB/RV endpoint use the following options.

```

wsdltoervice {-transport tibrv} [-e service] [-t port] [-b binding] [-tss
subject] [-tcst subject] [-tbt bindingType] [-tcl callbackLevel] [-trdt
timeout] [-tts transportService] [-ttn transportNetwork] [-ttbm
batchMode] [-tqp priority] [-tqlp queueLimitPolicy] [-tqme
queueMaxEvents] [-tqda queueDiscardAmount] [-tcs cmSupport] [-tctsn
cmTransportServerName] [-tctcn cmTransportClientName] [-tctro
cmTransportRequestOld] [-tctln cmTransportLedgerName] [-tctsl
cmTransportSyncLedger] [-tctra cmTransportRelayAgent] [-tctdtl
cmTransportDefaultTimeLimit] [-tclca cmListenerCancelAgreements]
[-tcqtsn cmQueueTransportServerName] [-tcqtcn
cmQueueTransportClientName] [-tcqtw
cmQueueTransportWorkerWeight] [-tcqtws
cmQueueTransportWorkerTasks] [-tcqtsw
cmQueueTransportSchedulerWeight] [-tcqtsh
cmQueueTransportSchedulerHeartbeat] [-tcqtssa
cmQueueTransportSchedulerActivation] [-tcqtct
cmQueueTransportCompleteTime] [-tmnfv messageNameFieldValue]
[-tmnfp messageNameFieldPath] [-tbfi bindingFieldId] [-tbfn
bindingFieldName] [-o file] [-d dir] [-L file] [[-quiet] | [-verbose]] [-h]
[-V] wsdlurl

```

The `-transport tibrv` flag specifies that the tool is to generate a TIB/RV service. The other options are as follows.

Table 34. Options for Adding a TIB/RV Endpoint

<code>-e service</code>	Specifies the name of the generated service element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the endpoint is generated.
<code>-tss subject</code>	Specifies the subject to which the server listens.

<code>-tcst <i>subject</i></code>	Specifies the prefix to the subject on which the client listens for replies.
<code>-tbt <i>bindingType</i></code>	Specifies the message binding type. Valid values are <code>msg</code> , <code>xml</code> , <code>opaque</code> , or <code>string</code> .
<code>-tcl <i>callbackLevel</i></code>	Specifies the server-side callback level when TIB/RV system advisory messages are received. Valid values are <code>INFO</code> , <code>WARN</code> , or <code>ERROR</code> .
<code>-trdt <i>timeout</i></code>	Specifies the client-side response receive dispatch timeout.
<code>-tts <i>transportService</i></code>	Specifies the UDP service name or port for TibrvNetTransport.
<code>-ttn <i>transportNetwork</i></code>	Specifies the binding network addresses for TibrvNetTransport.
<code>-ttbm <i>batchMode</i></code>	Specifies if the TIB/RV transport uses batch mode to send messages. Valid values are <code>DEFAULT_BATCH</code> and <code>TIMER_BATCH</code> .
<code>-tqp <i>priority</i></code>	Specifies the queue priority.
<code>-tqlp <i>queueLimitPolicy</i></code>	Valid values are <code>DISCARD_NONE</code> , <code>DISCARD_NEW</code> , <code>DISCARD_FIRST</code> , or <code>DISCARD_LAST</code> .
<code>-tqme <i>queueMaxEvents</i></code>	Specifies the queue max events.
<code>-tqda <i>queueDiscardAmount</i></code>	Specifies the queue discard amount.
<code>-tcs <i>cmSupport</i></code>	Specifies if Certified Message Delivery support is enabled. Valid values are <code>true</code> or <code>false</code> .
<code>-tctsn <i>cmTransportServerName</i></code>	Specifies the server's TibrvCmTransport correspondent name.
<code>-tctcn <i>cmTransportClientName</i></code>	Specifies the client TibrvCmTransport correspondent name.

-tctro <i>cmTransportRequestOld</i>	Specifies if the endpoint can request old messages on start-up. Valid values are true or false.
-tctl n <i>cmTransportLedgerName</i>	Specifies the TibrvCmTransport ledger file.
-tctsl <i>cmTransportSyncLedger</i>	Specifies if the endpoint uses a synchronous ledger. Valid values are true or false.
-tctra <i>cmTransportRelayAgent</i>	Specifies the endpoint's TibrvCmTransport relay agent.
-tctdtl <i>cmTransportDefaultTimeLimit</i>	Specifies the default time limit for a Certified Message to be delivered.
-tclca <i>cmListenerCancelAgreements</i>	Specifies if Certified Message agreements are canceled when the endpoint disconnects. Valid values are true or false.
-tcqtsn <i>cmQueueTransportServerName</i>	Specifies the server's TibrvCmQueueTransport correspondent name.
-tcqtcn <i>cmQueueTransportClientName</i>	Specifies the client's TibrvCmQueueTransport correspondent name.
-tcqtw <i>cmQueueTransportWorkerWeight</i>	Specifies the endpoint's TibrvCmQueueTransport worker weight.
-tcqtws <i>cmQueueTransportWorkerTasks</i>	Specifies the endpoint's TibrvCmQueueTransport <i>worker tasks</i> parameter.
-tcqtsw <i>cmQueueTransportSchedulerWeight</i>	Specifies the TibrvCmQueueTransport scheduler weight parameter.
-tcqtsh <i>cmQueueTransportSchedulerHeartbeat</i>	Specifies the endpoint's TibrvCmQueueTransport scheduler heartbeat parameter.

<code>-tcqtsa</code> <i>cmQueueTransportSchedulerActivation</i>	Specifies the <code>TibrvCmQueueTransport scheduler activation</code> parameter.
<code>-tcqtct</code> <i>cmQueueTransportCompleteTime</i>	Specifies the <code>TibrvCmQueueTransport complete time</code> parameter.
<code>-tmnfv</code> <i>messageNameFieldValue</i>	Specifies the message name field value.
<code>-tmnfp</code> <i>messageNameFieldPath</i>	Specifies the message name field path.
<code>-tbfi</code> <i>bindingFieldId</i>	Specifies the binding field id.
<code>-tbfn</code> <i>bindingFieldName</i>	Specifies the binding field name.
<code>-o</code> <i>file</i>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
<code>-d</code> <i>dir</i>	Specifies the output directory for the generated contract.
<code>-L</code> <i>file</i>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Displays the tool's usage statement.
<code>-v</code>	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference \[../wsdl_ref/index.htm\]](#).

Example

[Example 93 on page 223](#) shows an Artix description for a TIB/RV endpoint.

Example 93. TIB/RV Port Description

```
<service name="BaseService">
  <port binding="tns:BasePortBinding" name="BasePort">
```

```
<tibrv:port serverSubject="Artix.BaseService.BasePort"/>  
</port>  
</service>
```

Using Tuxedo

Artix allows services to connect using Tuxedo's transport mechanism. This provides them with all of the qualities of service associated with Tuxedo.

Tuxedo namespaces

To use the Tuxedo transport, you need to describe the endpoint using Tuxedo in the physical part of an Artix contract. The extensions used to describe a Tuxedo endpoint are defined in the following namespace:

```
xmlns:tuxedo="http://schemas.iona.com/transport/tuxedo"
```

This namespace will need to be included in your Artix contract's `definition` element.

Defining the Tuxedo services

As with other transports, the Tuxedo transport description is contained within a `port` element. Artix uses `tuxedo:server` to describe the attributes of a Tuxedo endpoint. `tuxedo:server` has a child element, `tuxedo:service`, that gives the bulletin board name of a Tuxedo endpoint. The bulletin board name for the endpoint is specified in the element's `name` attribute. You can define more than one Tuxedo service to act as an endpoint.

Mapping operations to a Tuxedo service

For each of the Tuxedo services that are endpoints, you must specify which of the operations bound to the endpoint being defined are handled by the Tuxedo service. This is done using one or more `tuxedo:input` child elements. `tuxedo:input` takes one required attribute, `operation`, that specifies the WSDL operation that is handled by this Tuxedo service endpoint.

Using the command line tools

To use **wsdltoservice** to add a Tuxedo endpoint use the tool with the following options.

```
wsdltoservice {-transport tuxedo} [-e service] [-t port] [-b binding]
[-tsn tuxService] [-tfn tuxService:tuxFunction] [-ton
tuxService:operation] [-o file] [-d dir] [-L file] [[-quiet] | [-verbose]]
[-h] [-v] wsdurl
```

The `-transport tuxedo` flag specifies that the tool is to generate a Tuxedo service. The other options are as follows.

Table 35. Options for Adding a Tuxedo Service

Option	Description
<code>-e service</code>	Specifies the name of the generated <code>service</code> element.
<code>-t port</code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b binding</code>	Specifies the name of the binding for which the endpoint is generated.
<code>-tsn tuxService</code>	Specifies the name the service uses when registering with the Tuxedo bulletin board.
<code>-tfn</code> <code>tuxService:tuxFunction</code>	Specifies the name of the function to be used on the specified Tuxedo bulletin board.
<code>-ton</code> <code>tuxService:operation</code>	Specifies the WSDL operation that is handled by the specified Tuxedo endpoint.
<code>-o file</code>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
<code>-d dir</code>	Specifies the output directory for the generated contract.
<code>-L file</code>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Displays the tool's usage statement.
<code>-v</code>	Displays the tool's version.

For more information about the specific attributes and their values see the [Artix WSDL Extension Reference \[../wsdl_ref/index.htm\]](#).

Example

An Artix contract exposing the `personalInfoService` as a Tuxedo endpoint would contain a `service` element similar to [Example 94 on page 227](#).

Example 94. Tuxedo Port Description

```
<service name="personalInfoService">
  <port binding="tns:personalInfoBinding" name="tuxInfoPort">
    <tuxedo:server>
      <tuxedo:service name="personalInfoService">
        <tuxedo:input operation="infoRequest"/>
      </tuxedo:service>
    </tuxedo:server>
  </port>
</service>
```


Part III. Other Artix ESB Features

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Working with CORBA

CORBA, unlike the other platforms supported by Artix, specifies both a mapping between the logical messages and a network protocol. Because these two cannot be decoupled, Artix provides extensions for both and requires that they be used together. To further enforce the coupling of the CORBA payload format and the CORBA network protocol all Artix tools that generate CORBA extensions generate them in sets.

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Adding a CORBA Binding

Overview

CORBA applications use a specific payload format when making and responding to requests. The CORBA binding, described using an IONA extension to WSDL, specifies the repository ID of the IDL interface represented by the port type, resolves parameter order and mode ambiguity in the operations' messages, and maps the XML Schema data types to CORBA data types.

In addition to the binding information, Artix also uses a `corba:typemap` element to unambiguously describe how data is mapped to CORBA data types. For primitive types, the mapping is straightforward. However, complex types such as structures, arrays, and exceptions require more detailed descriptions. For a detailed description of the CORBA type mappings see [Artix for CORBA \[../../corba_ws/index.htm\]](#).

Options

To add a CORBA binding to an Artix contract you can choose one of the following methods:

- Use Artix Designer. Artix Designer provides a wizard that automatically generates the binding and type map information for a specified port type.
 - Use the **wsdltocorba** command line tool. The command line tool automatically generates the binding and type map information for a specified port type. See [Using wsdltocorba on page 234](#).
 - Enter the binding and typemap information by hand using a text editor or XML editor. This option provides you the flexibility to customize the binding. However, hand editing Artix contracts can be a time consuming process and provides no error checking mechanisms. For information on the WSDL extensions used to specify a CORBA binding see [Mapping to the binding on page 236](#).
-

Using wsdltocorba

The **wsdltocorba** tool adds CORBA binding information to an existing Artix contract. To generate a CORBA binding use the following command:

```
wsdltocorba {-corba} {-i portType} [-d dir] [-b binding] [-o file] [-props namespace] [-wrapped] [-L file] [[-quiet] | [-verbose]] [-h] [-v] wsdl_file
```

The command has the following options:

Table 36. Options for Adding a CORBA Binding

<code>-corba</code>	Instructs the tool to generate a CORBA binding for the specified port type.
<code>-i portType</code>	Specifies the name of the port type being mapped to a CORBA binding.
<code>-d dir</code>	Specifies the directory into which the new WSDL file is written.
<code>-b binding</code>	Specifies the name for the generated CORBA binding. Defaults to <code>portTypeBinding</code> .
<code>-o file</code>	Specifies the name of the generated WSDL file. Defaults to <code>wSDL_file-corba.wsdl</code> .
<code>-props namespace</code>	Specifies the namespace to use for the generated CORBA typemap
<code>-wrapped</code>	Specifies that the generated CORBA binding uses wrapper types.
<code>-L file</code>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-quiet</code>	Specifies that the tool runs in quiet mode. No output will be shown on the console. This includes error messages.
<code>-verbose</code>	Specifies that the tool runs in verbose mode.
<code>-h</code>	Specifies that the tool will display a usage message.
<code>-v</code>	Displays the tool's version.

The generated WSDL file will also contain a CORBA endpoint with no address specified. To complete the endpoint specification you can do so manually or use Artix Designer.

WSDL namespace

The WSDL extensions used to describe CORBA data mappings and CORBA transport details are defined in the WSDL namespace <http://schemas.ionas.com/bindings/corba>. To use the CORBA extensions you will need to include the following in the `definitions` tag of your contract:

```
xmlns:corba="http://schemas.ionas.com/bindings/corba"
```

Mapping to the binding

The extensions used to map a logical operation to a CORBA binding are described in detail below:

- `corba:binding`

`corba:binding` indicates that the binding is a CORBA binding. This element has one required attribute: `repositoryID`. The `repositoryID` attribute specifies the full type ID of the interface. The type ID is embedded in the object's IOR and therefore must conform to the IDs that are generated from an IDL compiler. These are of the form:

```
IDL:module/interface:1.0
```

The `corba:binding` element also has an optional attribute, `bases`, that specifies that the interface being bound inherits from another interface. The value for `bases` is the type ID of the interface from which the bound interface inherits. For example, the following IDL:

```
//IDL
interface clash{};
interface bad : clash{};
```

would produce the following `corba:binding`:

```
<corba:binding repositoryID="IDL:bad:1.0"
    bases="IDL:clash:1.0"/>
```

- `corba:operation`

`corba:operation` is an IONA-specific element of the `operation` element and describes the parts of the operation's messages. `corba:operation` takes a single attribute, `name`, which duplicates the name given in `operation`.

- `corba:param`

`corba:param` is a child of `corba:operation`. Each `part` element of the input and output messages specified in the logical operation, except for the

part representing the return value of the operation, must have a corresponding `corba:param` element. The parameter order defined in the binding must match the order specified in the IDL definition of the operation. The `corba:param` element has the following required attributes:

Table 37. Attributes of `corba:param`

Attribute	Description
<code>mode</code>	Specifies the direction of the parameter. The values directly correspond to the IDL directions: <code>in</code> , <code>inout</code> , <code>out</code> . Parameters set to <code>in</code> must be included in the input message of the logical operation. Parameters set to <code>out</code> must be included in the output message of the logical operation. Parameters set to <code>inout</code> must appear in both the input and output messages of the logical operation.
<code>idltype</code>	Specifies the IDL type of the parameter. The type names are prefaced with <code>corba:</code> for primitive IDL types, and <code>corbatm:</code> for complex data types, which are mapped out in the <code>corba:typeMapping</code> portion of the contract.
<code>name</code>	Specifies the name of the parameter as given in the logical portion of the contract.

- `corba:return`

`corba:return` is a child of `corba:operation` and specifies the return type, if any, of the operation. It has two attributes:

Attribute	Description
<code>name</code>	Specifies the name of the parameter as given in the logical portion of the contract.
<code>idltype</code>	Specifies the IDL type of the parameter. The type names are prefaced with <code>corba:</code> for primitive IDL types and <code>corbatm:</code> for complex data types which are mapped out in the <code>corba:typeMapping</code> portion of the contract.

- `corba:raises`

`corba:raises` is a child of `corba:operation` and describes any exceptions the operation can raise. The exceptions are defined as fault messages in the logical definition of the operation. Each fault message must have a corresponding `corba:raises` element. `corba:raises` has one required attribute, `exception`, which specifies the type of data returned in the exception.

In addition to operations specified in `corba:operation` tags, within the WSDL `operation` element, each `operation` element in the binding must also specify empty `input` and `output` elements as required by the WSDL specification. The CORBA binding specification, however, does not use them.

For each fault message defined in the logical description of the operation, a corresponding `fault` element must be provided in the `operation` element, as required by the WSDL specification. The `name` attribute of the `fault` element specifies the name of the schema type representing the data passed in the fault message.

Example

For example, a logical interface for a system to retrieve employee information might look similar to `personalInfoLookup`, shown in

[Example 95 on page 238](#).

Example 95. *personalInfo lookup port type*

```
<message name="personalLookupRequest">
  <part name="empID" type="xsd:int"/>
</message>
<message name="personalLookupResponse">
  <part name="return" element="xsd1:personalInfo"/>
</message>
<message name="idNotFoundException">
  <part name="exception" element="xsd1:idNotFound"/>
</message>
<portType name="personalInfoLookup">
  <operation name="lookup">
    <input name="empID" message="personalLookupRequest"/>
    <output name="return"
      message="personalLookupResponse"/>
    <fault name="exception" message="idNotFoundException"/>
  </operation>
</portType>
```

The CORBA binding for `personalInfoLookup` is shown in [Example 96 on page 239](#).

Example 96. `personalInfoLookup` CORBA Binding

```
<binding name="personalInfoLookupBinding"
  type="tns:personalInfoLookup">
  <corba:binding repositoryID="IDL:personalInfoLookup:1.0"/>
  <operation name="lookup">
    <corba:operation name="lookup">
      <corba:param name="empId" mode="in"
        idltype="corba:long"/>
      <corba:return name="return"
        idltype="corbatm:personalInfo"/>
      <corba:raises exception="corbatm:idNotFound"/>
    </corba:operation>
  </operation>
  <input/>
  <output/>
  <fault name="personalInfoLookup.idNotFound"/>
</binding>
```

Creating a CORBA Endpoint

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Procedure

Generally, when you are creating a CORBA endpoint with Artix, you need to do two things:

1. **Specify** the port information in the Artix contract so that Artix can instantiate the appropriate port.
2. **Generate** the IDL describing your service so that a native CORBA application can understand the interfaces of the new service.

Configuring an Artix CORBA Endpoint

Overview

CORBA endpoints are described using the IONA-specific WSDL elements `corba:address` and `corba:policy` within the WSDL `port` element, to specify how a CORBA object is exposed.

Namespace

The namespace under which the CORBA extensions are defined is `http://schemas.iona.com/bindings/corba`. If you are going to add a CORBA endpoint by hand you will need to add this to your contract's `definition` element.

CORBA address specification

The IOR of the CORBA object is specified using the `corba:address` element. You have four options for specifying IORs in Artix contracts:

- Specify the object's IOR directly in the contract, using the stringified IOR format:

```
IOR:22342...
```

- Specify a file location for the IOR, using the following syntax:

```
file:///file_name
```



Note

The file specification requires three backslashes (///).

- Specify that the IOR is published to a CORBA name service, by entering the object's name using the `corbaname` format:

```
corbaname:rir/NameService#object_name
```

For more information on using the name service with Artix see [Artix for CORBA \[../../corba_ws/index.htm\]](#).

- Specify the IOR using `corbaloc`, by specifying the port at which the endpoint exposes itself, using the `corbaloc` syntax.

```
corbaloc:iiop:host:port/service_name
```

When using `corbaloc`, you must be sure to configure your endpoint to start up on the specified host and port.

Specifying POA policies

Using the optional `corba:policy` element, you can describe a number of POA policies the endpoint will use when creating the POA for connecting to a CORBA application. These policies include:

- [the name of the generated POA](#)
- [if persistence is used](#)
- [the ID of the generated POA](#)

Setting these policies lets you exploit some of the enterprise features of IONA's Orbix 6.x, such as load balancing and fault tolerance, when deploying an Artix integration project. For information on using these advanced CORBA features, see the Orbix documentation.

POA name

Artix POAs are created with the default name of `WS_ORB`. To specify the name of the POA Artix creates to connect with a CORBA object, you use the following:

```
<corba:policy poaname="poa_name"/>
```

Persistence

By default Artix POAs have a persistence policy of `false`. To set the POA's persistence policy to `true`, use the following:

```
<corba:policy persistent="true"/>
```

ID assignment

By default Artix POAs are created with a `SYSTEM_ID` policy, meaning that their ID is assigned by the ORB. To specify that the POA connecting a specific object should use a user-assigned ID, use the following:

```
<corba:policy serviceid="POAid"/>
```

This creates a POA with a `USER_ID` policy and an object id of `POAid`.

Using the command line tool

You can use the **`wsdltoservice`** command line tool to add a CORBA endpoint definition to an Artix contract. To use **`wsdltoservice`** to add a CORBA endpoint use the tool with the following options.

```
wsdltoservice {-transport corba} [-e service] [-t port] [-b binding] [-a
address] [-poa poaName] [-sid serviceId] [-pst persists] [-o file] [-d
dir] [-L file] [[-q] | [-V]] [-h] wsdurl
```

The `-transport corba` flag specifies that the tool is to generate a CORBA endpoint. The other options are as follows.

Table 38. Options for Adding a CORBA Endpoint

Argument	Descriptions
<code>-e <i>service</i></code>	Specifies the name of the generated <code>service</code> element.
<code>-t <i>port</i></code>	Specifies the value of the <code>name</code> attribute of the generated <code>port</code> element.
<code>-b <i>binding</i></code>	Specifies the name of the binding for which the service is generated.
<code>-a <i>address</i></code>	Specifies the value used in the <code>corba:address</code> element of the port.
<code>-poa <i>poaName</i></code>	Specifies the value of the POA name policy.
<code>-sid <i>serviceId</i></code>	Specifies the value of the ID assignment policy.
<code>-pst <i>persists</i></code>	Specifies the value of the persistence policy. Valid values are <code>true</code> and <code>false</code> .
<code>-o <i>file</i></code>	Specifies the filename for the generated contract. The default is to append <code>-service</code> to the name of the imported contract.
<code>-d <i>dir</i></code>	Specifies the output directory for the generated contract.
<code>-L <i>file</i></code>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
<code>-q</code>	Specifies that the tool runs in quiet mode. No output will be shown on the console. This includes error messages.
<code>-h</code>	Specifies that the tool will display a usage message.

Argument	Descriptions
-v	Specifies that the tool runs in verbose mode.

Example

For example, a CORBA port for the `personalInfoLookup` binding would look similar to [Example 97 on page 245](#):

Example 97. CORBA personalInfoLookup Port

```
<service name="personalInfoLookupService">
  <port name="personalInfoLookupPort"
    binding="tns:personalInfoLookupBinding">
    <corba:address location="file:///objref.ior"/>
    <corba:policy persistent="true"/>
    <corba:policy serviceid="personalInfoLookup"/>
  </port>
</service>
```

Artix expects the IOR for the CORBA object to be located in a file called `objref.ior`, and creates a persistent POA with an object id of `personalInfo` to connect the CORBA application.

Generating CORBA IDL

Overview

Artix clients that use a CORBA transport require that the IDL defining the interface exists and be accessible. Artix provides tools to generate the required IDL from an existing WSDL contract. The generated IDL captures the information in the logical portion of the contract and uses that to generate the IDL interface. Each `portType` element in the contract generates an IDL module.

From the command line

The `wsdltocorba` tool compiles Artix contracts and generates IDL for the specified CORBA endpoint. To generate IDL use the following command:

```
wsdltocorba { -idl } { -b binding } [-corba] [-i portType] [-d dir] [-o file]
[-L file] [[-q] | [-V]] [-h] wSDL_file
```

The command has the following options:

Table 39. Options for Generating IDL

Option	Description
-idl	Instructs the tool to generate an IDL file from the specified binding.
-b <i>binding</i>	Specifies the CORBA binding from which IDL is to be generated.
-corba	Instructs the tool to generate a CORBA binding for the specified port type.
-i <i>portType</i>	Specifies the name of the port type being mapped to a CORBA binding.
-d <i>dir</i>	Specifies the directory into which the new WSDL file is written.
-o <i>file</i>	Specifies the name of the generated WSDL file. Defaults to <code>wSDL_file.idl</code> .
-L <i>file</i>	Specifies the location of your Artix license file. The default behavior is to check <code>IT_PRODUCT_DIR\etc\license.txt</code> .
-q	Specifies that the tool runs in quiet mode. No output will be shown on the console. This includes error messages.
-V	Specifies that the tool runs in verbose mode.

Option	Description
-h	Specifies that the tool will display a usage message.

By combining the `-idl` and `-corba` flags with **wsdltocorba**, you can generate a CORBA binding for a logical operation and then generate the IDL for the generated CORBA binding. When doing so, you must also use the `-i portType` flag to specify the port type from which to generate the binding and the `-b binding` flag to specify the name of the binding from which to generate the IDL.

Using the Artix Transformer

The Artix transformer allows you to perform message transformations, data validation, and interface versioning without having to write additional code.

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Using the Artix Transformer as a Service

Overview

Using the Artix transformer, you can create a Web service that does simple tasks such as converting dates into the proper format or generating HTML output without writing any code. You can also develop services to validate the format of requests before they are sent to a busy server for processing.

The data processing is performed by the Artix transformer which uses an XSLT script to determine how to process the data.

Procedure

To use the Artix transformer as a service you:

1. Define the data, interface, binding, and transport details for the server in an Artix contract.
 2. Write the XSLT script that defines the data processing you want the transformer to perform.
 3. Configure the service with the transformer's configuration details.
-

Defining the server

The contract for a service that is implemented by the Artix transformer is the same as the Artix contract for any other service in Artix. You need to define the complex types, if any, that the service uses. Then you need to define the messages used by the service to receive and respond to requests.

Once the data types and messages are defined, you then define the service's interface. The only limitation for a service that is implemented by the Artix Transformer is that it cannot have any fault messages. The interface can define multiple operations. Each operation will be processed using different XSLT scripts.

After defining the logical details of the service, you need to define the binding and network details for the service. The transformer can use any of the bindings and transports supported by Artix. For information on adding a binding for the transformer read [Bindings and Transports, C++ Runtime on page 1](#) or [Bindings and Transports, C++ Runtime on page 1](#).

Writing the scripts

The XSLT scripts tell the transformer what it needs to do to process the data it receives. The scripts can be as simple or complex as they need to be to perform the task. The only requirement is that they are valid XSLT documents.

For more information about writing XSLT scripts read [Writing XSLT Scripts on page 260](#).

Configure the transformer

The Artix transformer is an Artix plug-in and can be loaded by an Artix process. This provides a great deal of flexibility in how you configure and deploy the process. There are two common deployment patterns for deploying the Artix transformer as a service. The first is to configure the transformer to load into the Artix container. The second is to configure the transformer to load directly into the client process which is making requests against it.

For a detailed discussion of how to configure and deploy the Artix Transformer see [Configuring and Deploying Artix Solutions, C++ Runtime](#) [././deploy/cpp/index.htm].

Using Artix to Facilitate Interface Versioning

Overview

One of the most common and difficult problems faced in large scale client server deployments is upgrading systems. For example, if you change the interface for your server to add new functionality or streamline communications, you then need to change all of the clients that access the server. This can mean upgrading thousands of clients that may be scattered across the globe.

The Artix transformer provides a solution to this problem that allows you to slowly upgrade the clients without disrupting their ability to function. Using the transformer you can develop an XSLT script that converts messages between the different interfaces. Then you can place the transformer between the old clients and the new server. This solution eliminates the need for operating two versions of the same server, or trying to do a massive client and server upgrade. It also does this without requiring you to do any custom programming.

Procedure

To use the Artix transformer for interface versioning do the following:

1. Create a composite Artix contract defining both versions of the interfaces that need to be supported.
 2. Define an interface for the transformer that defines operations for mapping the interfaces.
 3. Add a SOAP binding to the contract for the transformer's interface.
 4. Add an HTTP port to the contract to define how the transformer can be contacted.
 5. Write the XSLT scripts that define the message transformations.
 6. Configure the transformer.
 7. Configure the Artix chain builder to create a chain containing the transformer and the server on which clients will make requests.
-

Creating a composite contract

While the server and the client applications can be run without knowledge of the other's interface, the transformer responsible for translating the messages between to the two interface versions must know about all of the

interface versions used. This includes all data type definitions and message definitions used by both versions of the interface.

You can create this composite contract in several ways. The most straightforward way is to create a new contract which imports both the new interface's contract and the old interface's contract. To import the contracts you place an `import` element for each contract just after the `definitions` element in the new contract and before any other elements in the new contract. The `import` element has two attributes. `location` specifies the pathname of the file containing the contract that is being imported. `namespace` defines the XML namespace under which the imported contract can be referenced.

For example, if you were creating a composite contract for interface versioning you would have two contracts; one for the server with the updated interface and one for the client using the legacy interface. The file name for the server's contract is `r2e2.wsdl` and the contract for the client is `r2e1.wsdl`. For simplicity, they are located in the same directory as the composite contract. The composite contract importing both versions of the interface is shown in [Example 98 on page 253](#).

Example 98. Composite WSDL

```
<?xml version="1.0" encoding="UTF-8"?><definitions
name="transformer"
  targetNamespace="http://www.widgets.com/transformer"
  xmlns="http://schemas.xmlsoap.org/wsdl/"
  xmlns:r1="http://www.widgets.com/r2e2Server"
  xmlns:r2="http://www.widgets.com/r2e1Client"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:tns="http://www.widgets.com/transformer"
  xmlns:w3="http://schemas.xmlsoap.org/wsdl/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"><import loca
tion="r2e2.wsdl"
  namespace="http://www.widgets.com/r2e2Server/><import
location="r2e1.wsdl"
  namespace="http://www.widgets.com/r2e1Cli
ent"/></definitions>
```

Note that in the `definitions` element of the contract, XML namespace shortcuts are defined for the imported contracts namespace. This makes using items defined in the imported contracts much easier.

Define the transformer's interface

Once you have imported all versions of the interface that you need to support into the transformer's composite contract, you need to define the transformer's interface. The transformer must have one operation defined for each transformation that is required to support all of the interface versions. For example, if you only changed the structure of the request message in when upgrading the server's interface, the transformer only needs one operation because the transformation is only one way. If you changed both the request and response messages, the transformer's interface will need two operations; one for the request message and one for the response.

The operation to transform a request from the client to the proper format for the server takes the client's message as its `input` element and the server's message as its `output` message. The operation to transform a response from the server to the proper format for a client takes the server's outgoing message as its `input` element and the client's incoming message as its `output` element.



Note

Fault messages are not supported.

When adding the operations, be sure to use the proper namespaces when referencing the messages for the different versions of the interface. Using the wrong namespaces could result in an invalid contract at the very least. If the contract is valid, and the namespaces are incorrect, your system will behave erratically.

For example, if the interface in [Example 98 on page 253](#) was updated so that both the client's request and the server's response need to be transformed the transformer's interface would need two operations. In this example the name of the request message is `widgetRequest` and the name of the response message is `widgetResponse`. The interface for the transformer, `versionTransform`, is shown in [Example 99 on page 254](#).

Example 99. Versioning Interface

```
<portType name="versionTransform"><operation name="requestTransform"><input name="oldRequest" message="r1:widgetRequest"/><out
```

```

put name="newRequest" message="r2:widgetRequest"/>
</operation>
<operation name="responseTransform">
  <input name="newResponse" message="r2:widgetResponse"/>
  <output name="oldReponse" message="r1:widgetResponse"/>
</operation>
</portType>

```

In the operation transforming the request, `requestTransform`, the input message is taken from the namespace `r1` which is the namespace under which the client's contract is imported. The output message is taken from `r2` which is the namespace under which the server's contract is imported. For the response message transformation, `responseTransform`, the order is reversed. The input message is from `r2` and the output message is from `r1`.

Defining the physical details for the transformer

After defining the operations used in transforming between the different version of the interface, you need to define the binding and network details for the transformer. The transformer can use any of the bindings and transports supported by Artix. For information on adding a binding for the transformer read [Chapter 1 on page 23](#). For information on adding network details for the transformer read [Chapter 10 on page 143](#).

Writing the XSLT scripts

The XSLT scripts tell the transformer what it needs to do to process the data it receives. The scripts can be as simple or complex as they need to be to perform the task. The only requirement is that they are valid XSLT documents. For more information about writing XSLT scripts read [Writing XSLT Scripts on page 260](#).

Configuring the transformer

The Artix transformer is an Artix plug-in and can be loaded by an Artix process. This provides a great deal of flexibility in how you configure and deploy the process. For a detailed discussion of how to configure and deploy the Artix transformer see [Configuring and Deploying Artix Solutions, C++ Runtime \[../deploy/cpp/index.htm\]](#).

When using the transformer to do interface versioning, you need to deploy it as part of a service chain. To build a service chain in Artix you deploy the Artix chain builder. Like the transformer, the chain builder is an Artix plug-in and provides a number of deployment options. One way of deploying the chain builder along with the transformer is to deploy it alongside the transformer in an Artix container.

For a detailed discussion of how to configure and deploy the Artix chain builder see [Configuring and Deploying Artix Solutions, C++ Runtime](#) [./../deploy/cpp/index.htm].

WSDL Messages and the Transformer

Overview

Conceptually, the Artix transformer works on XML representations of the data passed along the wire. Your XSLT scripts are written based on the WSDL descriptions of the message's being processed. This relieves you of the burden of understanding how the data on the wire is represented.

Incoming messages

The virtual XML document the transformer uses as input is created by using the Artix contract to map the raw data from the input port into a DOM facade. The mapping is done as follows:

- If the message is defined using the doc-literal styles, the transformer uses the message part's schema definition to create a representation of the message.
- If the message is not defined using the doc-literal style, the transformer does the following to build an XML representation of the message:
 1. the name of the message's root element is the QName of the `message` element referred to by the operation's `input` element.
 2. Each `part` element in the input message is placed in an element derived from the `name` attribute of the `part` element.
 3. If the part is of a complex type, or an element of a complex type, the type's elements appear inside of the element containing the part.

For example, if you had a service defined by the WSDL fragment in [Example 100 on page 257](#) and the transformer implemented the operation `configure` the XML document would be constructed using the message `oldClientInput`, which is the input message.

Example 100. WSDL Fragment for Transformer

```
<definitions targetNamespace="vehicle.demo.example"
  xmlns:tns="vehicle.demo.example"
  ...>
<types ...>
...
  <complexType name="vehicleType">
    <element name="vin" type="xsd:string" />
    <element name="model" type="xsd:string" />
  </complexType>
</types>
```

```

</complexType>
</types>
...
<message name="original">
  <part name="vehicle" type="xsd:vehicleType"/>
  <part name="name" type="xsd:string"/>
</message>
<message name="transformed">
  <part name="vehicle" type="xsd:string"/>
  <part name="firstName" type="xsd:string"/>
  <part name="lastName" type="xsd:string"/>
</message>
...
<portType name="parkingLotMeter">
  <operation name="configure">
    <input name="oldClientInput" message="tns:original"/>
    <output name="updatedInput" message="tns:transformed"/>
  </operation>
  ...
</portType>
...

```

When the message is reconstructed, the transformer uses the input message's name, given in the `input` element, as the name of the root element of the XML document. It then uses the message parts and the schema types to recreate the data as an XML message. So if the transformer was using the contract defined in [Example 100 on page 257](#) an input message processed by the transformer could look like [Example 101 on page 258](#).

Example 101. Transformer Input Message

```

<ns1:oldClientInput xmlns:ns1="vehicle.demo.example">
  <vehicle>
    <vin>0123456789</vin>
    <model>Prius</model>
  </vehicle>
  <name>Old MacDonald</name>
</oldClientInput>

```

Outbound message

The results from the transformer goes through the reverse of the process that turns the input message into a virtual XML document. The transformer uses the output message definition from the Artix contract to place the result message back onto the wire in the proper payload format. If the result message is not properly formed this attempt will fail, so you must be careful when writing your XSLT script to ensure that the results match the expected format.

When the result message is deconstructed, the transformer expects the following:

- If the output message is defined using the doc-literal style, the message must match the schema defining the message's part.
- If the output message is not defined using the doc-literal style, then the following must be true:
 - The name of the message's root element is the QName of the message element referred to by the `output` element in the contract.
 - There are the same number of elements in the result as there are `part` elements in the output message definition.
 - The elements in the result are based on the `name` attributes of the `part` elements in the output message definition.
 - The data contained in the element representing the output message's `part` elements matched the XML Schema definitions in the contract.

For example, a result message for the `configure` operation defined in [Example 100 on page 257](#) would look like [Example 102 on page 259](#).

Example 102. Transformer Output Message

```
<ns1:updatedInput xmlns:ns1="vehicle.demo.example">>
  <vehicle>Prius</vehicle>
  <firstName>Old</firstName>
  <lastName>MacDonald</lastName>
</updatedInput>
```

Using element names

You can configure the transformer to use the element name of the message parts instead of the value of the `part` element's `name` attribute. For more information see [Configuring and Deploying Artix Solutions, C++ Runtime \[././deploy/cpp/index.htm\]](#).

Writing XSLT Scripts

Overview

XML Stylesheet Language Transformations(XSLT) is a language used to describe the transformation of XML documents. The current W3C standard for XSLT is 1.0 and can be read at the W3C web site (<http://www.w3.org/TR/xslt>). XSLT documents, called scripts, are well-formed XML documents that describe how a source XML document is transformed into a resulting XML document. It can be used to perform tasks as simple as splitting a name entry into first and last name entries and as complex as validating that a complex XML document matches the expectations of an interface described in a WSDL document.

Procedure

Writing an XSLT script can be done in a number of ways and using a number of tools. The steps given here assume that you are writing fairly simple scripts using a text editor.

To write a XSLT script do the following:

1. Create an XML stylesheet with the required `xsl:transform` element.
2. Determine which elements in your source message need to be processed and create `xsd:template` elements for each of them.
3. For each element that has a matching template element, define how you want the element processed to produce a new output document.
4. If child elements need to be processed as part of processing a parent element, define a template for the child element and apply it as part of the parent element's template using `xsd:apply-templates`.

Elements of an XSLT Script

Overview

An XSLT script is essentially an XML stylesheet containing a special set of elements that instruct an XSLT engine in the processing of other XML documents. An XSLT script must be defined in an `xsl:transform` element or an `xsl:stylesheet` element. In addition, it needs at least one valid top-level element to define the transformation.

The transform element

The `xsl:transform` element denotes that the document is an XML stylesheet. The `xsl:stylesheet` element can be used in place of the `xsl:transform` element. They are equivalent.

When creating an XSLT script you must set the version attribute to 1.0 to inform the transformer what version of XSLT you are using. In addition, you must provide an XML namespace shortcut for the XSLT namespace in the `xsl:transform` element. [Example 103 on page 261](#) shows a valid `xsl:transform` element for an XSLT script.

Example 103. XSLT Script Stylesheet Element

```
<xsl:transform version="1.0"
               xmlns:xsl="http://www.w3.org/1999/XSL/Trans
form">
...
</stylesheet>
```

Top-level elements

While all that is needed to make an XML document a valid XSLT script is the `xsl:transform` element, the `xsl:transform` element does not provide any instructions for processing data. The data processing instructions in an XSLT script are provided by a number of top-level XSLT elements. These element's include:

- `xsl:import`
- `xsl:include`
- `xsl:strip-space`
- `xsl:preserve-space`

- `xsl:output`
- `xsl:key`
- `xsl:decimal-format`
- `xsl:namespace-alias`
- `xsl:attribute-set`
- `xsl:variable`
- `xsl:param`
- `xsl:template`

An XSLT script can have any number and combination of top-level elements. Other than `xsl:import`, which must occur before any other elements, the top-level elements can be used in any order. However, be aware that the order determines the order in which processing steps happen.

Example

[Example 104 on page 262](#) shows a simple XSLT script that transforms `SSN` elements into `acctNum` elements.

Example 104. Simple XSLT Script

```
<xsl:transform version = '1.0'
               xmlns:xsl='http://www.w3.org/1999/XSL/Trans
form'>
  <xsl:template match="SSN">
    <acctNum>
      <xsl:value-of select="."/>
    </acctNum>
  </xsl:template>
</xsl:stylesheet>
```

Using this XSLT script the transformer would change a message that contained `<SSN>012457890</SSN>` into a message that contained `<acctNum>012457890</acctNum>`.

XSLT Templates

Overview

XSLT processors use templates to determine the elements on which to apply a set of transformations. Documents are processed from the top element through their structure to determine if elements match a defined template. If a match is found, the rules specified by the template are applied.

To write a template in XSLT you need to do the following:

1. Create an `xsl:template` element.
 2. Provide the path to the source element it processes.
 3. Write the processing rules.
-

`xsl:template` elements

Templates are defined using `xsl:template` elements. These elements take one required attribute, `match`, which specifies the source element that triggers the rules. In addition, you can use the `name` attribute to give the template a unique identifier for referencing it elsewhere in the contract.

Specifying the source elements

You specify the elements of the source document to which template rules are matched using the `match` attribute of the `xsl:template` element. The source elements are specified using the syntax specified by the XPath specification (<http://www.w3.org/TR/xpath>). The source element address looks very similar to a file path where slash(/) specifies the root element and child elements are listed in top down order separated by a slash(/). For example to specify the `surname` element of the XML document shown in [Example 105 on page 263](#), you would specify it as `/name/surname`.

Example 105. Sample XML Document

```
<name>
  <firstname>
    Joe
  </firstname>
  <surname>
    Friday
```

```
</surname>
<name>
```

Template matching order

XSLT processors start processing with the `<xsl:template match="/">` element if it is present. All of the processing directives for this template act on the top-level elements of the source document. For example, given the XML document shown in [Example 105 on page 263](#) any processing rules specified in `<xsl:template match="/">` would apply to the `name` element. In addition, specifying a template for the root element(`/`) forces you to make all your source element paths explicit from the root element. The XSLT script shown in [Example 106 on page 264](#) generates the string `Friday` when run on [Example 105 on page 263](#).

Example 106. XSLT Script with Root Element Template

```
<xsl:transform version = '1.0'
  xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
  <xsl:template match="/">
    <xsl:value-of select="/name/surname"/>
  </xsl:template>
</xsl:transform>
```

You do not need to specify a template for the root element of the source document in an XSLT script. When you omit the root element's template the processor treats all template paths as though they originated from the source documents top level element. The XSLT script in [Example 107 on page 264](#) generates the same output as the script in [Example 106 on page 264](#).

Example 107. XSLT Script without Root Element Template

```
<xsl:transform version = '1.0'
  xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
  <xsl:template match="surname">
    <xsl:value-of select="."/>
  </xsl:template>
</xsl:transform>
```

Template rules

The contents of an `xsl:template` element define how the source document is processed to produce an output document. You can use a combination of XSLT elements, HTML, and text to define the processing rules. Any plain text and HTML that are used in the processing rules are placed directly into the output document. For example, if you wanted to generate an HTML document

from an XML document you would use an XSLT script that included HTML tags as part of its processing rules. The script in [Example 108 on page 265](#) takes an XML document with a `title` element and a `subTitle` element and produces an HTML document where the contents of `title` are displayed using the `<h1>` style and the contents of `subTitle` are displayed using the `<h2>` style.

Example 108. XSLT Template with HTML

```
<xsl:transform version = '1.0'
  xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
  <xsl:template match="/">
    <h1>
      <xsl:value-of select="//title"/>
    </h1>
    <h2>
      <xsl:value-of select="//subTitle"/>
    </h2>
  </xsl:template>
</xsl:transform>
```

Applying templates to child elements

You can instruct the XSLT processor to apply any templates defined in the script to the children of the element being processed using an `xsl:apply-templates` element as one of the rules in a template.

`xsl:apply-templates` instructs the XSLT processor to treat the current element as a root element and run the templates in the script against it.

For example you could rewrite [Example 108 on page 265](#) as shown in [Example 109 on page 265](#) using `xsl:apply-templates` and defining a template for the `title` and `subTitle` elements.

Example 109. XSLT Template Using apply-templates

```
<xsl:transform version = '1.0'
  xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
  <xsl:template match="/">
    <xsl:apply-templates/>
  </xsl:template>
  <xsl:template match="title">
    <h1>
      <xsl:value-of select="."/>
    </h1>
  </xsl:template>
```

```
<xsl:template match="subTitle">
  <h2>
    <xsl:value-of select="."/>
  </h2>
</xsl:template>
</xsl:transform>
```

You can use the optional `select` attribute to limit the child elements to which the templates are applied. `select` takes an XPath value and operates in the same manner as the `match` attribute of `xsl:template`.

Example

For example, if your ordering system produced bills that looked similar to the XML document in [Example 110 on page 266](#), you could use an XSLT script to reformat the bill for a system that required the customer's name in a single element, `name`, and the city and state to be in a comma-separated field, `city`.

Example 110. Bill XML Document

```
<widgetBill>
  <customer>
    <firstName>
      Joe
    </firstName>
    <lastName>
      Cool
    </lastName>
  </customer>
  <address>
    <street>
      123 Main Street
    </street>
    <city>
      Hot Coffee
    </city>
    <state>
      MS
    </state>
    <zipCode>
      3942
    </zipCode>
  </address>
  <amtDue>
    123.50
  </amtDue>
</widgetBill>
```

The XSLT script shown in [Example 111 on page 267](#) would result in the desired transformation.

Example 111. XSLT Script for widgetBill

```
<xsl:transform version = '1.0'
  xmlns:xsl='http://www.w3.org/1999/XSL/Transform'>
❶ <xsl:template match="widgetBill">
  <xsl:element name="widgetBill">
    <xsl:apply-templates/>
  </xsl:element>
</xsl:template>
<xsl:template match="customer">
❷ <xsl:element name="name">
  <xsl:value-of select="concat(//firstName,' ',//last
Name)"/>
</xsl:element>
</xsl:template>
<xsl:template match="address">
❸ <xsl:element name="address">
  <xsl:copy-of select="//street"/>
  <xsl:element name="city">
    <xsl:value-of select="concat(//city,', ',//state)"/>
  </xsl:element>
  <xsl:copy-of select="//zipCode"/>
</xsl:element>
</xsl:template>
❹ <xsl:template match="amtDue">
  <xsl:copy-of select="."/>
</xsl:template>
</xsl:transform>
```

The script does the following:

- ❶ Creates an element, `widgetBill`, in the output document and places the results of the other templates as its children.
- ❷ Creates an element, `name`, and sets its value to the result of the concatenation.
- ❸ Creates an element, `address`, and sets its value to the results of the rules. `address` will contain a copy of the `street` element from the source document, a new element, `city`, that is a concatenation, and a copy of the `zipCode` element from the source document.
- ❹ Copy the `amtDue` element from the source document into the output document.

Processing the document in [Example 110 on page 266](#) with this XSLT script would result in the XML document shown in [Example 112 on page 268](#).

Example 112. Processed Bill XML Document

```
<widgetBill>
  <customer>
    Joe Cool
  </customer>
  <address>
    <street>
      123 Main Street
    </street>
    <city>
      Hot Coffee, MS
    </city>
    <zipCode>
      3942
    </zipCode>
  </address>
  <amtDue>
    123.50
  </amtDue>
</widgetBill>
```

Common XSLT Functions

Overview

XSLT provides a range of capabilities in processing XML documents. These include conditional statements, looping, creating variables, and sorting. However, there are a few common functions that are used to generate output documents. These include:

- [xsl:value-of](#)
 - [xsl:copy-of](#)
 - [xsl:element](#)
-

xsl:value-of

`xsl:value-of` creates a text node in the output document. It has a required `select` attribute that specifies the text to be inserted into the output document.

The value of `select` is evaluated as an expression describing the data to insert. It can contain any of the XSLT string functions, such as `concat()`, or an XSLT axis describing an element in the source document.

Once the `select` expression is evaluated the result is placed in the output document.

xsl:copy-of

`xsl:copy-of` copies data from the source document into the output document. It has a required `select`. The value of `select` is an expression describing the elements to be copied.

When the result of evaluating the expression is a tree fragment, the complete fragment is copied into the output document. When the result is an element, the element, its attributes, its namespaces, and its children are copied into the output document. When the result is neither an element nor a result tree fragment, the result is converted to a string and then inserted into the output document.

xsl:element

`xsl:element` creates an element in the output document. It takes a required `name` attribute that specifies the name of the element that is created. In

In addition, you can specify a `namespace` for the element using the optional `namespace` attribute.

Using Codeset Conversion

Some bindings do not natively support codeset conversion. Artix provides WSDL extensions and a plug-in that add codeset conversion to these bindings.

Overview

While many of the bindings supported by Artix provide a means for handling codeset conversion, some do not. It is also possible that any custom bindings you developed do not support codeset conversion. To allow bindings that do not natively support codeset conversion to participate in environments where more than one codeset is used, Artix provides an i18n message-level interceptor that will perform codeset conversion on the message buffer before it is placed on the wire.

The i18n interceptor can be configured by defining the codeset conversion in your endpoint's Artix contract using an Artix port extensor. You can also configure the i18n interceptor programmatically using the context mechanism. The programmatic settings will override any settings described in the contract. For more information on using the context mechanism see the appropriate development guide for your development environment.

Configuring Artix to use the i18n interceptor

Before your application can use the generic i18n interceptor for code conversion you must configure the Artix bus to load the required plug-ins and add the interceptor to the appropriate message interceptor lists. To configure your application to use the i18n interceptor do the following:

1. If your application includes a client that needs to use codeset conversion, add `i18n-context:I18nInterceptorFactory` to the `binding:artix:client_message_interceptor_list` variable for your application.
2. If your application includes a service that needs to use codeset conversion, add `i18n-context:I18nInterceptorFactory` to the `binding:artix:server_message_interceptor_list` variable for your application.

For more information on configuring Artix see [Configuring and Deploying Artix Solutions, C++ Runtime \[././deploy/cpp/index.htm\]](#).

Describing the codeset conversions in the contract

You define the codeset conversions performed by the i18n interceptor in the `port` element defining an endpoint. There are two extensors used to define

the codeset conversions. One, `i18n-context:server`, is for service providers and the other, `i18n-context:client`, is for clients. They both provide settings for how both incoming messages and outgoing messages are to be encoded. These extensions are defined in the namespace `http://schemas.iona.com/bus/i18n/context`.

To define the codeset conversions performed by the i18n interceptor do the following:

1. Add the following line to the `definitions` element of your contract.

```
xmlns:i18n-context="http://schemas.iona.com/bus/i18n/context"
```

2. If your application provides a service that requires codeset conversion add a `i18n-context:server` element to the port definition of the service endpoint.

[Table 40 on page 272](#) shows the attributes for the `i18n-context:server` element. These attributes define how message codesets are converted.

Table 40. Attributes for the `i18n-context:server` Element

Attribute	Description
<code>LocalCodeSet</code>	Specifies the server's native codeset. The default is the codeset specified by the local system's <code>locale</code> setting.
<code>OutboundCodeSet</code>	Specifies the codeset into which replies are converted. The default is the codeset specified in <code>InboundCodeSet</code> .
<code>InboundCodeSet</code>	Specifies the codeset into which requests are converted. The default is the codeset specified in <code>LocalCodeSet</code> .

3. If your application includes a client that requires codeset conversion add an `i18n-context:client` element to the port definition of the service endpoint.

[Table 41 on page 273](#) describes the attributes used by the `i18n-context:client` element for defining how message codesets are converted.

Table 41. Attributes for the `i18n-context:client` Element

Attribute	Description
<code>LocalCodeSet</code>	Specifies the server's native codeset. Default is the codeset specified by the local system's locale setting.
<code>OutboundCodeSet</code>	Specifies the codeset into which requests are converted. The default is the codeset specified in <code>LocalCodeSet</code> .
<code>InboundCodeSet</code>	Specifies the codeset into which replies are converted. The default is the codeset specified in <code>OutboundCodeSet</code> .

Example

The contract fragment in [Example 113 on page 273](#) shows a port definition for an endpoint that defines a server/client pair. The server uses UTF-8 as its local codeset and the client uses ISO-8859-1 as its local codeset.

Example 113. Specifying Codeset Conversion

```
...
<service name="convertedService">
  <port binding="tns:convertedFixedBinding"
        name="convertedPort">
    <http:address location="localhost:0"/>
    <i18n:client LocalCodeSet="ISO-8859-1"
                OutboundCodeSet="UTF-8"
                InboundCodeSet="ISO-8859-1"/>
    <i18n:server LocalCodeSet="UTF-8"
                OutboundCodeSet="ISO-8859-1"/>
  </port>
</service>
...
```

Using the endpoint definition above, the client will convert its requests into UTF-8 before sending them to the server. The server will convert its replies into ISO-8859-1 before sending them to the client. The client's inbound

codeset is set to ISO-8859-1 because if left unset the value would have defaulted to UTF-8. The client would then perform an extra conversion.

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