BEA SALT™

Administration Guide

Version 2.0
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Contents

CHAPTER 1

BEA SALT Administration Overview

The following sections provide an overview to BEA SALT administration topics:

- Basic Concepts for Administering BEA SALT
- BEA SALT Administrative Tasks and Tools

Basic Concepts for Administering BEA SALT

This section explains the following basic concepts for administering BEA SALT:

- Tuxedo Service Metadata
- BEA SALT Deployment Model

Tuxedo Service Metadata

Staring with the BEA Tuxedo 9.0 release, the Tuxedo Service Metadata Repository was developed to facilitate saving and retrieving Tuxedo service metadata. Tuxedo service metadata is a collection of Tuxedo service attributes that are especially useful in describing the request/response details of a Tuxedo service. The BEA SALT gateway server (`GWWS`), relies on the Tuxedo Service Metadata Repository for conversions between the Tuxedo request/response format (buffer types) and standard SOAP message format.

When exposing Tuxedo services as Web services using BEA SALT, you must define and load your Tuxedo service metadata in the Tuxedo Service Metadata Repository. BEA SALT can then define the corresponding SOAP message format from the Tuxedo service metadata.

When invoking external Web services from a Tuxedo application, BEA SALT provides a WSDL file converter, `wsdlcvt`. This command utility helps you to define Tuxedo service metadata from each Web service operation. The converted services are called SALT proxy services and can be invoked as normal Tuxedo services. SALT proxy services also need to be loaded in the Tuxedo Service Metadata Repository.

To retrieve the Tuxedo service metadata information, you must configure the Tuxedo Service Metadata Repository system server (`TMMETADATA`), to be booted in the Tuxedo application.

Note: `TMMETADATA` must be booted prior to using any BEA SALT gateway `GWWS` server.

For more information, see "Tuxedo Service Metadata Repository" and "Using Tuxedo Service Metadata Repository for BEA SALT" on page 2-1.

BEA SALT Deployment Model

Deploying the current BEA SALT version requires two configuration file types:

- SALT Web Service Definition File (`WSDF`)
- SALT Deployment File (`SALTDEPLOY`)

SALT Web Service Definition File

The SALT Web Service Definition File (`WSDF`) is an XML-based file used to define SALT Web service components (Web Service Bindings, Web Service Operations, Web Service Policies, and so on). The `WSDF` is a BEA SALT specific representation of the Web Service Definition Language data model. There are two `WSDF` types: native and non-native.

- Native `WSDF`

  A native `WSDF` is created manually. You must define a set of Tuxedo services and how they are exposed as Web services in the `WSDF`. It looks similar to the SALT 1.1 configuration file. The native `WSDF` is the input file for the SALT WSDL generator (`tmwsdlgen`). For more information, see "Configuring Native Tuxedo Services" on page 2-8.

- Non-native `WSDF`

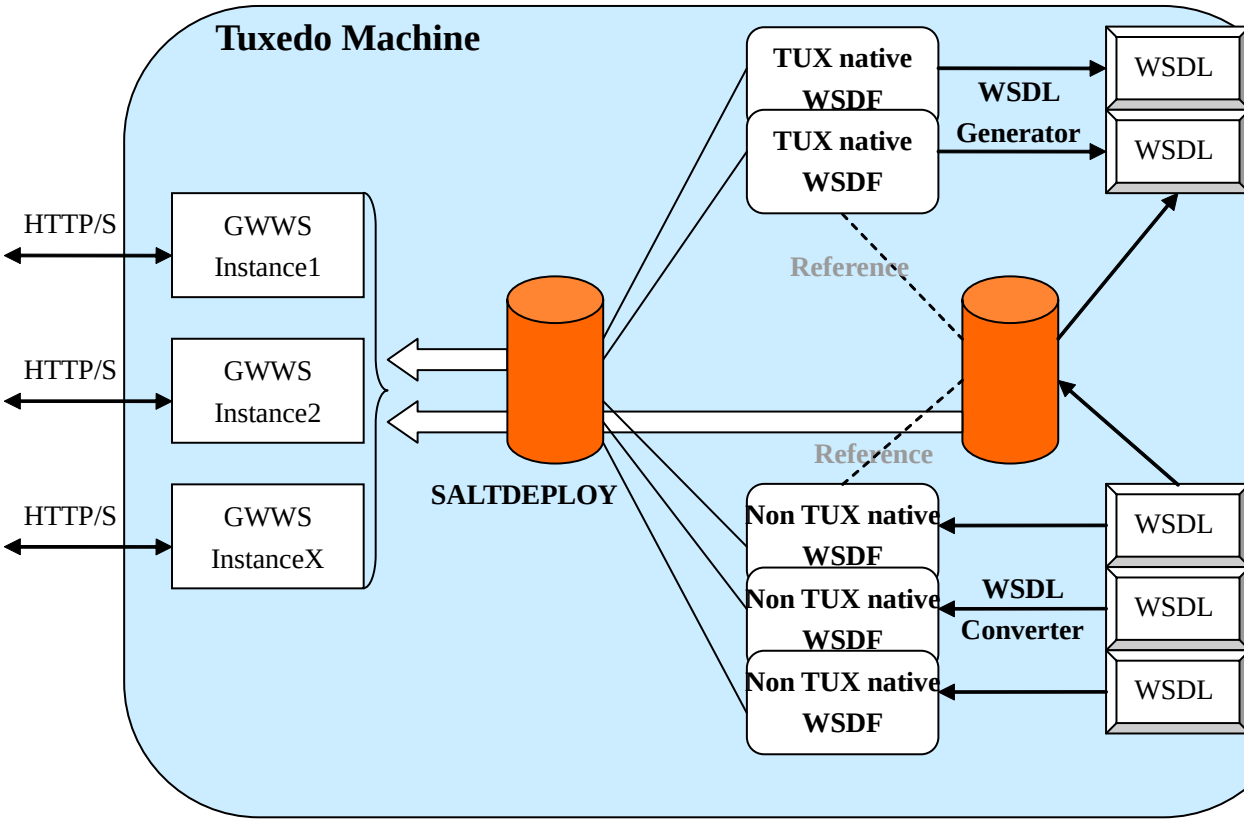
  A non-native `WSDF` is generated from an external WSDL file that has been converted using the SALT WSDL converter (`wsdlcvt`). Basically, you do not need to change the generated `WSDF` (except to configure advanced features). For more information, see "Configuring External Web Services" on page 2-13.

SALT Deployment File

The SALT Deployment File (`SALTDEPLOY`) is an XML-based file used to define BEA SALT `GWWS` server deployment information on a *per* Tuxedo machine basis. The `SALTDEPLOY` file lists all necessary `WSDF` files. It also specifies how many `GWWS` servers are deployed on a Tuxedo machine and associates inbound and outbound Web service endpoints for each `GWWS` server. The `SALTDEPLOY` file contains a system section where global resources are configured (including certificates and plug-in load libraries). For more information, see "Creating the SALT Deployment File" on page 2-19.

Figure 1-1 illustrates the BEA SALT deployment model.

Figure 1-1 SALT Deployment Model



BEA SALT Administrative Tasks and Tools

BEA SALT provides a set of command utilities for managing different parts of a BEA SALT application built on the BEA Tuxedo system. These utilities can be used for the following tasks:

- Configuring Your SALT Application Using Command-Line Utilities
- Administering Your SALT Application Using Command-Line Utilities

Configuring Your SALT Application Using Command-Line Utilities

You can configure your BEA SALT application by using command-line utilities. Specifically, you can use an XML editor to create and edit the configuration file (WSDF files and SALTDEPLOY file) for your application, and then use the command-line utility named `wsloadcf` to translate the XML files (SALTDEPLOY file and referenced WSDF files) to a binary file (SALTCONFIG). You are then ready to boot the SALT gateway (GWWS) servers.

The following list identifies BEA SALT command-line utilities that you can use to configure your application:

- `wsloadcf(1)`

  A command that is initiated on each Tuxedo machine. It allows you to compile your application SALTDEPLOY file and referenced WSDF files into the binary SALTCONFIG file. The `wsloadcf` command loads the binary file to the location defined by the SALTCONFIG environment variable.

- `wsdlcvt(1)`

  A command that converts an external Web Service Description Language (WSDL) file into Tuxedo definition files (WSDF file, Tuxedo Service Metadata definition file, FML32 field table file and XML Schema file). The generated WSDF file is a non-native WSDF file used for SALT outbound calls specifically.

Since BEA SALT built on the BEA Tuxedo framework, you should also use the following BEA Tuxedo provided command-line utilities to configure BEA SALT specific items in a Tuxedo application:

- `tmloadcf(1)`

A command that runs on the master Tuxedo machine. It is used to compile the Tuxedo application UBBCONFIG file into the binary TUXCONFIG file. To boot BEA SALT gateway servers, you must define GWWS servers in the UBBCONFIG file.

- `tmloadrepos(1)`

  A command that runs on the machine where Tuxedo Service Metadata Repository System Server (`TMMETADATA`) is booted. It loads the Tuxedo service metadata definition text files into the binary Tuxedo Service Metadata Repository file. You must load all Tuxedo legacy services that are to be exposed as Web service operations in the Tuxedo Service Metadata Repository. You must also load all `wsdlcvt` generated SALT proxy services in the Tuxedo Service Metadata Repository.

Administering Your SALT Application Using Command-Line Utilities

You can use the command-line utility `wsadmin(1)` to perform administrative functions for BEA SALT gateway servers in your Tuxedo applications. Like the `tmadmin`, `dmadmin` and `qmadmin` commands, `wsadmin` is an interactive meta-command that enables you to run sub-commands.

In a BEA Tuxedo application, you can run `wsadmin(1)` on any machine to monitor and manage the SALT gateway servers defined in the Tuxedo application.

CHAPTER 2

Setting Up a BEA SALT Application

This section contains the following topics:

Using Tuxedo Service Metadata Repository for BEA SALT

BEA SALT leverages the Tuxedo Service Metadata Repository to define service contract information for both Tuxedo legacy services and SALT proxy services. Service contract information for all listed Tuxedo services is obtained by accessing the Tuxedo Service Metadata

Repository system service provided by the local Tuxedo domain. Typically, SALT calls the TMMETADATA system as follows:

- During `GWWS` server run-time.

  It calls the Tuxedo Service Metadata Repository to retrieve necessary Tuxedo service definition at the appropriate time.

- When tmwsdlgen generates a WSDL file.

  It calls the Tuxedo Service Metadata Repository to retrieve necessary Tuxedo service definitions and converts them to the WSDL description.

The following topics provide SALT-specific usage of Tuxedo Service Metadata Repository keywords and parameters:

- Defining Service-Level Keywords for BEA SALT
- Defining Service Parameters for BEA SALT

Defining Service-Level Keywords for BEA SALT

Table 2-1 lists the Tuxedo Service Metadata Repository service-level keywords used and interpreted by SALT.

Note: Metadata Repository service-level keywords that are not listed have no relevance to BEA SALT and are ignored when SALT components load the Tuxedo Service Metadata Repository.

Table 2-1 BEA SALT Usage of Service-Level Keywords in Tuxedo Service Metadata Repository

Service-Level Keyword	BEA SALT Usage
`service`	The unique key value of the service. This value is referenced in the SALT WSDF file. For native Tuxedo services, this value can be the same as the Tuxedo advertised service name or an alias name differ from the actual Tuxedo advertised service name. For SALT proxy services, this value typically is the Web service operation local name.
`servicemode`	Determines the service mode (i.e., native Tuxedo service or SALT proxy service. The valid values are: • `tuxedo` represents a native Tuxedo service • `webservice` represents a SALT proxy service, i.e. a service definition converted from a wsdl:operation Do not use "`webservice`" to define a native Tuxedo service. This value is always used to define services converted from external Web services.
`tuxservice`	The actual Tuxedo advertised service name. If no value is specified, then the value is the same as the value in the `service` keyword. For native Tuxedo service, BEA SALT invokes the Tuxedo service defined using this keyword. For SALT proxy service, GWWS server advertises the service name using this keyword value.
`servicetype`	Determines the service message exchange pattern for the specified Tuxedo service. The following values specify mapping rules between the Tuxedo service types and Web Service message exchange pattern (MEP): • `service` corresponds to request-response MEP • `oneway` corresponds to oneway request MEP • `queue` corresponds to request-response MEP

Table 2-1 BEA SALT Usage of Service-Level Keywords in Tuxedo Service Metadata Repository

Service-Level Keyword	BEA SALT Usage
`inbuf`	Specifies the input buffer (request buffer) type for the service. For native Tuxedo services, the value can be any Tuxedo typed buffer type. The following values are Tuxedo reserved buffer types: `STRING, CARRAY, XML, MBSTRING, VIEW, VIEW32, FML, FML32, X_C_TYPE, X_COMMON, X_OCTET, NULL` (input buffer is empty) **Note:** The value is case sensitive, if `inbuf` specifies any other type other than the previous buffer types, the buffer is treated as a custom buffer type. For SALT proxy services, the value is always `FML32`.
`outbuf`	Specifies the output buffer (response buffer with `TPSUCCESS`) type for the service. For native Tuxedo services, the value can be any Tuxedo typed buffer type. The following values are Tuxedo reserved buffer types: `STRING, CARRAY, XML, MBSTRING, VIEW, VIEW32, FML, FML32, X_C_TYPE, X_COMMON, X_OCTET, NULL` (input buffer is empty) **Note:** The value is case sensitive, if `outbuf` specifies any other type other than the previous buffer types, the buffer is treated as a custom buffer type. For SALT proxy services, the value is always `FML32`.
`errbuf`	Specifies the error buffer (response buffer with `TPFAIL`) type for the service. For native Tuxedo services, the value can be any Tuxedo typed buffer type. The following values are Tuxedo reserved buffer types: `STRING, CARRAY, XML, MBSTRING, VIEW, VIEW32, FML, FML32, X_C_TYPE, X_COMMON, X_OCTET, NULL` (input buffer is empty) **Note:** The value is case sensitive, if `errbuf` specifies any other type other than the previous buffer types, the buffer is treated as a custom buffer type. For SALT proxy services, the value is always `FML32`.

Table 2-1 BEA SALT Usage of Service-Level Keywords in Tuxedo Service Metadata Repository

Service-Level Keyword	BEA SALT Usage
`inview`	Specifies the view name used by the service for the following input buffer types: `VIEW, VIEW32, X_C_TYPE, X_COMMON` BEA SALT requires that you specify the view name rather than accept the default `inview` setting. This keyword is for native Tuxedo services only.
`outview`	Specifies the view name used by the service for the following output buffer types: `VIEW, VIEW32, X_C_TYPE, X_COMMON` BEA SALT requires that you specify the view name rather than accept the default `outview` setting. This keyword is for native Tuxedo services only.
`errview`	Specifies the view name used by the service for the following error buffer types: `VIEW, VIEW32, X_C_TYPE, X_COMMON` BEA SALT requires that you specify the view name rather than accept the default `errview` setting. This keyword is for native Tuxedo services only.
`inbufschema`	Specifies external XML Schema element associated with the service input buffer. If this value is specified, BEA SALT incorporates the external schema in the generated WSDL to replace the default data type mapping rule for the service input buffer. This keyword is for native Tuxedo services only.

Table 2-1 BEA SALT Usage of Service-Level Keywords in Tuxedo Service Metadata Repository

Service-Level Keyword	BEA SALT Usage
`outbufschema`	Specifies external XML Schema element associated with the service output buffer. If this value is specified, BEA SALT incorporates the external schema in the generated WSDL to replace the default data type mapping rule for the service output buffer. This keyword is for native Tuxedo services only.
`errbufschema`	Specifies external XML Schema element associated with the service error buffer. If this value is specified, BEA SALT incorporates the external schema in the generated WSDL to replace the default data type mapping rule for the service error buffer. This keyword is for native Tuxedo services only.

Defining Service Parameters for BEA SALT

The Tuxedo Service Metadata Repository interprets parameters as sub-elements encapsulated in a Tuxedo service typed buffer. Each parameter can have its own data type, occurrences in the buffer, size restrictions, and other Tuxedo-specific restrictions. Please note:

- VIEW, VIEW32, X_C_TYPE, or X_COMMON typed buffers

  Each parameter of the buffer should represent a VIEW/VIEW32 structure member.

- FML or FML32 typed buffers

  Each parameter of the buffer should represent an FML/FML32 field element that may be present in the buffer.

- STRING, CARRAY, XML, MBSTRING, and X_OCTET typed buffers

  Tuxedo treats these buffers holistically. At most, one parameter is permitted for the buffer to define restriction facets (such as buffer size threshold).

- Custom typed buffers

  Parameters facilitate describing details about the buffer type.

- FML32 typed buffers that support embedded VIEW32 and FML32 buffers

  Embedded parameters provide support.

Table 2-2 lists the Tuxedo Service Metadata Repository parameter-level keywords used and interpreted by SALT.

Note: Metadata Repository parameter-level keywords that are not listed have no relevance to BEA SALT and are ignored when SALT components load the Tuxedo Service Metadata Repository.

Table 2-2 BEA SALT Usage of Parameter-Level Keyword in Tuxedo Service Metadata Repository

Parameter-level Keyword	BEA SALT Usage
`param`	Specifies the parameter name. • VIEW, VIEW32, X_C_TYPE, or X_COMMON Specifies the view structure member name in the `param` keyword. • FML, FML32 Specifies the FML/FML32 field name in the `param` keyword. • STRING, CARRAY, XML, MBSTRING, or X_OCTET BEA SALT ignores the parameter definitions.
`type`	Specifies the data type of the parameter. **Note:** BEA SALT does not support `dec_t` and `ptr` data types.
`subtype`	Specifies the view structure name if the parameter type is `view32`. For any other typed parameter, BEA SALT ignores this value. **Note:** BEA SALT requires this value if the parameter type is `view32`. This keyword is for native Tuxedo service only.
`access`	The general definition applies for this parameter. To support Tuxedo TPFAIL scenario, the `access` attribute value has been enhanced. Original values: `in, out, inout, noaccess`. New added values: `err, inerr, outerr, inouterr`.
`count`	The general definition applies for this parameter. For BEA SALT, the value for the `count` parameter must be greater than or equal to `requiredcount`.
`requiredcount`	The general definition applies for this parameter. The default is 1. For BEA SALT, the value for the `count` parameter must be greater than or equal to `requiredcount`.

Table 2-2 BEA SALT Usage of Parameter-Level Keyword in Tuxedo Service Metadata Repository

Parameter-level Keyword	BEA SALT Usage
`size`	This optional keyword restricts the maximum byte length of the parameter. It is only valid for the following parameter types: `STRING, CARRAY, XML, and MBSTRING` If this keyword is not set, there is no maximum byte length restriction for this parameter. The value range is `[0, 2147483647]`
`paramschema`	Specifies the corresponding XML Schema element name of the parameter. It is generated by SALT WSDL converter. This keyword is for SALT proxy service only. Do not specify this keyword for native Tuxedo services.
`primetype`	Specifies the corresponding XML primitive data type of the parameter. It is generated by SALT WSDL converter according to SALT pre-defined XML-to-Tuxedo data type mapping rules. This keyword is for SALT proxy service only. Do not specify this keyword for native Tuxedo services.

Configuring Native Tuxedo Services

This section describes the required and optional configuration tasks for exposing native Tuxedo services as Web Services:

- Creating a Native WSDF
- Using WS-Policy Files
- Generating a WSDL File from a Native WSDF

Creating a Native WSDF

To expose a set of Tuxedo services as Web services through one or more HTTP/S endpoints, a native `WSDF` must be defined.

Each native `WSDF` must be defined with a unique `WSDF` name. A `WSDF` can define one or more <`WSBinding`> elements for more Web service application details (such as SOAP protocol details, the Tuxedo service list to be exposed as web service operations, and so on).

Defining WSBinding Object

Each WSBinding object is defined using the <WSBinding> element. Each WSBinding object must be defined with a unique WSBinding id within the WSDF. The WSBinding id is a required indicator for the SALTDEPLOY file reference used by the GWWS.

Each WSBinding object can be associated with SOAP protocol details by using the <SOAP> sub-element. By default, SOAP 1.1, document/literal styled SOAP messages are applied to the WSBinding object.

Listing 2-1 shows how SOAP protocol details are redefined using the <SOAP> sub-element.

Listing 2-1 Defining SOAP Protocol Details for a WSBinding

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
      <Service name="toupper" />
      <Service name="tolower" />
    </Servicegroup>
    <SOAP version="1.2" style="rpc" use="encoded">
      <AccessingPoints>
        ...
      </AccessingPoints>
    </SOAP>
  </WSBinding>
</Definition>
```

Within the <SOAP> element, a set of access endpoints can be specified. The URL value of these access endpoints are used by corresponding GWWS servers to create the listen HTTP/S protocol port. It is recommended to specify one HTTP and HTTPS endpoint (at most) for each GWWS server for an *inbound* WSBinding object.

Each WSBinding object must be defined with a group of Tuxedo services using the <Servicegroup> sub-element. Each <Service> element under <Servicegroup> represents a Tuxedo service that can be accessed from a Web service client.

Defining Service Object

Each service object is defined using the <Service> element. Each service must be specified with the "name" attribute to indicate which Tuxedo service is exposed. Usually, the "name" value is used as the key value for obtaining Tuxedo service contract information from the Tuxedo Service Metadata Repository.

Listing 2-2 shows how a group of services are defined for WSBinding.

Listing 2-2 Defining a Group of Services for a WSBinding

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
      <Service name="toupper" />
      <Service name="tolower" />
    </Servicegroup>
    ...
  </WSBinding>
</Definition>
```

Configuring Message Conversion Handler

You can create your own plug-in functions to customize SOAP XML payload and Tuxedo typed buffer conversion routine. For more information, see Using BEA SALT Plug-ins in *BEA SALT Programming Web Services* and "Configuring Plug-in Libraries" on page 2-26.

Once a plug-in is created and configured, it can be referenced using the <service> element to specify user-defined data mapping rules for that service. The <Msghandler> element can be defined at the message level (<Input>, <Output> or <Fault>) to specify which implementation of "P_CUSTOM_TYPE" category plug-in should be used to do the message conversion. The <Msghandler> element content is the Plug-in name.

Listing 2-3 shows a service that uses the "MBCONV" custom plug-in to convert input and "XMLCONV" custom plug-in to convert output.

Listing 2-3 Configuring Message Conversion Handler for a Service

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
      <Service name="toupper" >
        <Input>
          <Msghandler>MBCONV</Msghandler>
        </Input>
        <Output>
          <Msghandler>XMLCONV</Msghandler>
        </Output>
     </Service>
    </Servicegroup>
    ...
  </WSBinding>
</Definition>
```

Using WS-Policy Files

Advanced Web service features can be enabled by configuring WS-Policy files (for example, Reliable Messaging and Web Service Message-Level Security). You may need to create WS-Policy files to use these features. The Web Service Policy Framework specifications provides a general purpose model and syntax to describe and communicate the policies of a Web Service.

To use WS-Policy files, the <Policy> element should be defined in the WSDF to incorporate these separate WS-Policy files. Attribute location is used to specify the policy file path, both abstract and relative file path are allowed. Attribute use is optionally used by message level assertion policy files to specify the applied messages, request (input) message, response (output) message, fault message, or the combination of the three.

There are two different sub-elements in the WSDF that reference WS-Policy files:

- <Servicegroup>
  - If a WS-Policy file consists of Web Service Endpoint level Assertions, e.g. Reliable Messaging Assertion, the WS-Policy file applies to all endpoints that serving this <Servicegroup>.

  - If a WS-Policy file consists of Web Service Operation level Assertions, e.g. Security Identity Assertion, the WS-Policy file applies to all services listed in this <Servicegroup>.
  - If a WS-Policy file consists of Web Service Message level Assertions, e.g. Security SignedParts Assertion, the WS-Policy file applies to input, output and/or fault messages of all services listed in this <Servicegroup>.
    - Note: BEA SALT only supports request message level assertions for the current release. You must only specify use="input" for message level assertion policy files.

- <Service>
  - If a WS-Policy file consists of Web Service Operation level Assertions, e.g. Security Identity Assertion, the WS-Policy file applies to this particular service.
  - If a WS-Policy file consists of Web Service Message level Assertions, e.g. Security SignedParts Assertion, the WS-Policy file applies to input, output and/or fault messages of this particular service.
    - Note: BEA SALT only supports request message level assertions for the current release. You must only specify use="input" for message level assertion policy files.

BEA SALT provides some pre-packaged WS-Policy files for most frequently used cases. These WS-Policy files are located under directory $TUXDIR/udataobj/salt/policy. These files can be referenced using location="salt:<policy_file_name>".

Listing 2-4 shows a sample of using WS-Policy Files in the native WSDF file.

Listing 2-4 A Sample of Defining WS-Policy Files in the WSDF File

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
      <Policy location="./endpoint_policy.xml" />
      <Policy location="/usr/resc/all_input_msg_policy.xml" use="input" />
      <Service name="toupper">
        <Policy location="service_policy.xml" />
        <Policy location="/usr/resc/input_message_policy.xml"
                use="input" />
      </Service>
```

```
      <Service name="tolower" />
    </Servicegroup>
    ....
  </WSBinding>
</Definition>
```

For more information, see "Specifying the Reliable Messaging Policy File in the WSDF File" and "Using WS-SecurityPolicy Files".

Generating a WSDL File from a Native WSDF

Once a Tuxedo native WSDF is created, the corresponding WSDL file can be generated using the SALT WSDL generation utility, `tmwsdlgen`. The following example command generates a WSDL file named "`app1.wsdl`" from a given `WSDF` named "`app1.wsdf`":

```
tmwsdlgen -c app1.wsdf -o app1.wsdl
```

Note: Before executing `tmwsdlgen`, the `TUXCONFIG` environment variable must be set correctly and the relevant Tuxedo application using `TMMETADATA` must be booted.

You can optionally specify the output WSDL file name using the '`-o`' option. Otherwise, `tmwsdlgen` creates a default WSDL file named "`tuxedo.wsdl`".

If the native WSDF file contains Tuxedo services that use `CARRAY` buffers, you can specify `tmwsdlgen` options to generate different styled WSDL files for `CARRAY` buffer mapping. By default, `CARRAY` buffers are mapped as `xsd:base64Binary` XML data types in the SOAP message. For more information, see Data Type Mapping and Conversions in the *BEA SALT Programming Web Services* and tmwsdlgen in the *BEA SALT Reference Guide*.

Configuring External Web Services

To invoke an external Web Service from Tuxedo, the following configuration tasks need to be performed:

- Converting a WSDL file into Tuxedo Definitions
- Post Conversion Tasks

Converting a WSDL file into Tuxedo Definitions

BEA SALT provides a WSDL conversion command utility to convert external WSDL files into Tuxedo definitions. The WSDL file is converted using Extensible Stylesheet Language Transformations (XSLT) technology. Apache Xalan Java 2.7.0 is bundled in SALT installation package and is used as the default XSLT toolkit.

BEA SALT WSDL converter is composed of two parts:

- The xsl files, which process the WSDL file.
- The command utility, `wsdlcvt`, invokes the Xalan toolkit. This wrapper script provides a user friendly WSDL Converter interface.

The following sample command converts an external WSDL file and generates Tuxedo definition files.

```
wsdlcvt -i http://api.google.com/GoogleSearch.wsdl -o GSearch
```

Table 2-3 lists the Tuxedo definition files generated by BEA SALT WSDL Converter.

Table 2-3 Tuxedo Definition Files generated by BEA SALT WSDL Converter

Generated File	Description
Tuxedo Service Metadata Repository input file	BEA SALT WSDL Converter converts each `wsdl:operation` to a Tuxedo service metadata syntax compliant service called SALT proxy service. SALT proxy services are advertised by `GWWS` servers to accept ATMI call from Tuxedo applications.
FML32 field table definition file	BEA SALT maps each `wsdl:message` to a Tuxedo FML32 typed buffer. BEA SALT WSDL Converter decomposes XML Schema of each message and maps each basic XML snippet as an FML32 field. The generated FML32 fields are defined in a definition table file, and the field name equals to the XML element local name by default. To access a SALT proxy service, Tuxedo applications must refer to the generated FML32 fields to handle the request and response message. FML32 environment variables must be set accordingly so that both Tuxedo applications and GWWS servers can map between field names and field identifier values. **Note:** You may want to re-define the generated field names due to field name conflict or some other reason. In that case, both Tuxedo Service Metadata Definition input file and FML32 field table definition file must be changed accordantly. For more information, see "Resolving Naming Conflict For the Generated SALT Proxy Service Definitions".
Non-native WSDF file	BEA SALT WSDL Converter converts the WSDL file into a WSDF file, which can be deployed to GWWS servers in the SALT deployment file for outbound direction. The generated WSDF file is so-called non-native WSDF file. **Note:** Please do not deploy non-native WSDF files for inbound direction.
XML Schema files	WSDL embedded XML Schema and imported XML Schema (XML Schema content referenced with `<xsd:import>`) are saved locally as `.xsd` files. These files are used by GWWS servers and need to be saved under the same directory. **Note:** New XML Schema environment variables `XSDDIR` and `XSDFILES` must be set accordingly so that GWWS servers can load these `.xsd` files.

WSDL-to-Tuxedo Service Metadata Keyword Mapping

Table 2-4 lists WSDL Element-to-Tuxedo Service Metadata Definition Keyword mapping rules.

Table 2-4 WSDL Element-to-Tuxedo Service Metadata Definition Mapping

WSDL Element	Corresponding Tuxedo Service Metadata Definition Keyword	Note
/wsdl:definitions /wsdl:portType /wsdl:operation @name	`service`	SALT proxy service name. The keyword value equals to the operation local name.
	`tuxservice`	SALT proxy service advertised name in Tuxedo system. If the wsdl operation local name is less than 15 characters, keyword value equals to the operation local name, otherwise the keyword value is the first 15 characters of the operation local name.
/wsdl:definitions /wsdl:portType /wsdl:operation /wsdl:input	`inbuf=FML32`	WSDL operation messages are always mapped as Tuxedo FML32 buffer type. Please do not change the buffer type any way. **Note:** For more information about wsdl message and FML32 buffer mapping, see XML-to-Tuxedo Data Type Mapping for External Web Services in the *BEA SALT Programming Web Services*.
/wsdl:definitions /wsdl:portType /wsdl:operation /wsdl:output	`outbuf=FML32`	
/wsdl:definitions /wsdl:portType /wsdl:operation /wsdl:fault	`errbuf=FML32`	

WSDL-to-WSDF Mapping

Table 2-5 lists WSDL Element-to-WSDF Element mapping rules.

Table 2-5 WSDL Element-to-WSDF Element Mapping

WSDL Element	WSDF Element	Note
/wsdl:definitions @targetNamespace	/Definition @wsdlNamespace	Each wsdl:definition maps to a WSDF Definition.
/wsdl:definitions /wsdl:binding	/Definition /WSBinding	Each wsdl:binding object maps to a WSDF WSBinding element.
/wsdl:definitions /wsdl:binding @type	/Definition /WSBinding /Servicegroup	Each wsdl:binding referenced wsdl:portType object maps to the Servicegroup element of the corresponding WSBinding element.
/wsdl:definitions /wsdl:binding /soap:binding	/Definition /WSBinding /SOAP @version	If namespace prefix "`soap`" refers to URI "`http://schemas.xmlsoap.org/wsdl/soap/`", the SOAP version attribute value is "`1.1`"; If namespace prefix "`soap`" refers to URI "`http://schemas.xmlsoap.org/wsdl/soap12/`", the SOAP version attribute value is "`1.2`".
/wsdl:definitions /wsdl:binding /soap:binding @style	/Definition /WSBinding /SOAP @style	The WSDF WSBinding SOAP message style setting equals to the corresponding WSDL soap binding message style setting ("`rpc`" or "`document`").
/wsdl:definitions /wsdl:binding /wsdl:operation	/Definition /WSBinding /Servicegroup /Service	Each wsdl:operation object maps to a Service element of the corresponding WSBinding element.
/wsdl:definitions /wsdl:port /soap:address	/Definition /WSBinding /SOAP /AccessingPoints /Endpoint	Each soap:address endpoint defined for a wsdl:binding object maps to a Endpoint element of the corresponding WSBinding element.

Post Conversion Tasks

The following post conversion tasks need to be performed for configuring outbound Web service applications:

- Resolving Naming Conflict For the Generated SALT Proxy Service Definitions
- Loading the Generated SALT Proxy Service Metadata Definitions
- Setting Environment Variables for GWWS Runtime

Resolving Naming Conflict For the Generated SALT Proxy Service Definitions

When converting a WSDL file, unexpected naming conflicts may be found due to truncation or lost context information. Before using the generated Service Metadata Definitions and FML32 field table files, the following potential naming conflicts must be eliminated first.

- Eliminating the duplicated service metadata keyword "`tuxservice`" definitions

  The keyword `tuxservice` in the SALT proxy service metadata definition is the truncated value of the original Web Service operation local name if the operation name is more than 15 characters. The truncated `tuxservice` value may be duplicated for multiple SALT proxy service entries. Since GWWS server uses `tuxservice` values as the advertised service names, so you must manually resolve the naming conflict among multiple SALT proxy services to avoid uncertain service request delivery. To resolve the naming conflict, you should assign a unique and meaningful name to `tuxservice`.

- Eliminating the duplicated FML32 field definitions

  When converting a external WSDL file into Tuxedo definitions, each wsdl:message is parsed and mapped as an FML32 buffer format which containing a set of FML32 fields to represent the basic XML snippets of the wsdl:message. By default, The generated FML32 fields are named using the corresponding XML element local names.

  The FML32 field definitions in the generated field table file are sorted by field name so that duplicated names can be found easily. In order to achieve a certain SOAP/FML32 mapping, the field name conflicts must be resolved. You should modify the genenated duplicated field name with other unique and meaningful FML32 field name values. The corresponding Service Metadata Keyword `param` values in the generated SALT proxy service definition must be modified accordingly. The generated comments of the FML32 fields and Service Metadata Keyword "`param`" definitions are helpful in locating the corresponding `name` and `param`.

Loading the Generated SALT Proxy Service Metadata Definitions

After potential naming conflicts are resolved, you should load the SALT proxy service metadata definitions into the Tuxedo Service Metadata Repository through `tmloadrepos` utility. For more information about `tmloadrepos`, see BEA Tuxedo Service Metadata Repository Documentation.

Setting Environment Variables for GWWS Runtime

Before booting GWWS servers for outbound web services, the following environment variable settings must be performed.

- Update environment variable *FLDTBLDIR32* and *FIELDTBLS32* to add the generated FML32 field table files.
- Place all excerpted XML Schema files into one directory, and set environment variable *XSDDIR* and *XSDFILES* accordingly.
  - Environment variable *XSDDIR* and *XSDFILES* are introduced in SALT 2.0 release. They are used by the GWWS server to load all external XML Schema files at run time. Multiple XML Schema file names should be delimited with comma ‘,’. For instance, if you placed XML Schema files: a.xsd, b.xsd and c.xsd in directory /home/user/myxsd, you must set environment variable *XSDDIR* and *XSDFILES* as follows before booting the GWWS server:

```
XSDDIR=/home/user/myxsd
XSDFILES=a.xsd,b.xsd,c.xsd
```

Creating the SALT Deployment File

The SALT Deployment file (SALTDEPLOY) defines a SALT Web service application. The SALTDEPLOY file is the major input for Web service application in the binary SALTCONFIG file.

To create a SALTDEPLOY file, do the following steps:

1. Importing the WSDF Files
2. Configuring the GWWS Servers
3. Configuring System Level Resources

For more information, see SALT Deployment File Reference in the BEA SALT Reference Guide.

Importing the WSDF Files

You should import all your required WSDF files to the SALT deployment file. Each imported WSDF file must have a unique WSDF name which is used by the GWWS servers to make deployment associations. Each imported WSDF file must be accessible through the location specified in the SALTDEPLOY file.

Listing 2-5 shows how to import WSDF files in the SALTDEPLOY file.

Listing 2-5 Importing WSDF Files in the SALTDEPLOY File

```
<Deployment ..>
  <WSDF>
    <Import location="/home/user/simpapp_wsdf.xml" />
    <Import location="/home/user/rmapp_wsdf.xml" />
    <Import location="/home/user/google_search.wsdf" />
  </WSDF>
  ...
</Deployment>
```

Configuring the GWWS Servers

Each `GWWS` server can be deployed with a group of inbound WSBinding objects and a group of outbound WSBinding objects defined in the imported WSDF files. Each WSBinding object is referenced using attribute "`ref=<wsdf_name>:<WSBinding id>`". For inbound WSBinding objects, each `GWWS` server must specify at least one access endpoint as an inbound endpoint from the endpoint list in the WSBinding object. For outbound WSBinding objects, each GWWS server can specify zero or more access endpoints as outbound endpoints from the endpoint list in the WSBinding object.

Listing 2-6 shows how to configure GWWS servers with both inbound and outbound endpoints.

Listing 2-6 GWWS Server Defined In the SALTDEPLOY File

```
<Deployment ..>
  ...
  <WSGateway>
    <GWInstance id="GWWS1">
      <Inbound>
        <Binding ref="app1:app1_binding">
          <Endpoint use="simpapp_GWWS1_HTTPPort" />
          <Endpoint use="simpapp_GWWS1_HTTPSPort" />
        </Binding>
```

```
      </Inbound>
      <Outbound>
        <Binding ref="app2:app2_binding">
          <Endpoint use=" extServer1_HTTPPort" />
          <Endpoint use=" extServer1_HTTPSPort" />
        </Binding>
        <Binding ref="app3:app3_binding" />
      </Outbound>
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

Configuring GWWS Server Level Properties

The GWWS server can be configured with properties that switch feature on/off or set argument to tune the server's performance.

Properties are configured in the `<GWInstance>` child element `<Properties>`. Each individual property is defined by using the `<Property>` element which contains a "name" attribute and a "value" attribute). Different "name" attributes represent different property elements that contain a value. Table 2-6 lists GWWS server level properties.

Table 2-6 GWWS Server Level Properties

Property Name	Description	Value Range	Default
`enableMultiEncoding`	Switch on/off the SOAP message multiple encoding support	`"true"|"false"`	`"false"`
`max_backlog`	Specify socket backlog control value	`[1, 255]`	`20`
`max_content_length`	Specify the maximum allowed incoming HTTP message content length.	`[0, 1G](byte)` (Can set suffix 'M','G', e.g. 1.5M, 0.2G)	`0` (means no limit)
`thread_pool_size`	Specify the GWWS server thread pool size.	`[1, 1024]`	`16`

Table 2-6 GWWS Server Level Properties

Property Name	Description	Value Range	Default
`timeout`	Specify the network timeout in seconds.	`[1, 65535]` `(unit:sec)`	`300`
`wsrm_acktime`	Specify the Reliable Messaging Acknowledgement message reply policy. GWWS servers support replying acknowledgement messages either after receiving the SOAP request from network immediately or after the Tuxedo service returns the response message.	`“NETRECV” | “RPLYRECV”`	`“NETRECV”`

Note: For more information about GWWS multiple encoding support, see “Configuring Multiple Encoding Support” on page 2-23.

For more information abouth Performance tuning properties, see “Tuning the GWWS Server” on page 3-3.

Listing 2-7 shows an example of how GWWS properties are configured.

Listing 2-7 Configuring GWWS Server Properties

```
<Deployment ..>
  ...
  <WSGateway>
    <GWInstance id="GWWS1">
      .......
      <Properties>
        <Property name="thread_pool_size" value="20"/>
        <Property name="enableMultiEncoding" value="true"/>
        <Property name="timeout" value="600"/>
      </Properties>
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

Configuring Multiple Encoding Support

SALT supports multiple encoding SOAP messages and the encoding mappings between SOAP message and Tuxedo buffer. SALT supports the following character encodings:

```
ASCII, BIG5, CP1250, CP1251, CP1252, CP1253, CP1254, CP1255, CP1256,
CP1257, CP1258, CP850, CP862, CP866, CP874, EUC-CN, EUC-JP, EUC-KR,
GB18030, GB2312, GBK, ISO-2022-JP, ISO-8859-1, ISO-8859-13,
ISO-8859-15, ISO-8859-2, ISO-8859-3, ISO-8859-4, ISO-8859-5,
ISO-8859-6, ISO-8859-7, ISO-8859-8, ISO-8859-9, JOHAB, KOI8-R,
SHIFT_JIS, TIS-620, UTF-16, UTF-16BE, UTF-16LE, UTF-32, UTF-32BE,
UTF-32LE, UTF-7, UTF-8
```

To enable the GWWS multiple encoding support, GWWS server level property "`enableMultiEncoding`" should be set to "`true`".

Note: GWWS internally converts non UTF-8 external messages into UTF-8. However, encoding conversion hurts server performance. By default, encoding conversion is turned off and messages that are not UTF-8 encoded are rejected.

Listing 2-8 Configuring GWWS Server Multiple Encoding Property

```
<Deployment ..>
  ...
  <WSGateway>
    <GWInstance id="GWWS1">
      .......
      <Properties>
        <Property name="enableMultiEncoding" value="true"/>
      </Properties>
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

Table 2-7 explains the detailed SOAP message and Tuxedo buffer encoding mapping rules if the GWWS server level multiple encoding switch is turned on.

Table 2-7 SALT Message Encoding Mapping Rules

Mapping from ...	Mapping to ...	Encoding Mapping Rule
SOAP/XML	Tuxedo Typed Buffer	`string/mbstring/xml` buffer or field characters' encoding equals to SOAP xml encoding.
STRING Typed Buffer	SOAP/XML	GWWS sets the target SOAP message in `UTF-8` encoding, and assumes the original `STRING` buffer containing only `UTF-8` encoding characters. **Note:** Tuxedo Developers must ensure the STRING characters are in `UTF-8` encoding.
MBSTRING/XML Typed Buffer	SOAP/XML	SOAP xml encoding equals to MBSTRING/XML encoding.
FML/32, VIEW/32 Typed Buffer that containing the same encoding setting for multiple `FLD_MBSTRING` fields	SOAP/XML	SOAP xml encoding is set to `FLD_MBSTRING` encoding, the original Typed buffer field characters are not changed in the SOAP message. **Note:** Tuxedo Developers must ensure the `FLD_STRING` characters in the same buffer are in consistent encoding.
FML/32, VIEW/32 Typed Buffer that containing the different encodings for multiple `FLD_MBSTRING` fields	SOAP/XML	SOAP xml encoding is set to `UTF-8`, the original Typed buffer `FLD_MBSTRING` field characters in other encodings are converted into `UTF-8` in the SOAP message. **Note:** Tuxedo Developers must ensure the `FLD_STRING` characters in the same buffer are in `UTF-8` encoding.

Configuring System Level Resources

BEA SALT defines a set of global resources shared by all `GWWS` servers in the SALTDEPLOY file. The following system level resources can be configured in the SALTDEPLOY file:

- Certificates

- Plug-in load libraries

Configuring Certificates

Certificate information must be configured in order for the GWWS server to create an SSL listen endpoint, or to use X.509 certificates for authentication and/or message signature. All GWWS servers defined in the same deployment file shares the same certificate settings, including the private key file, trusted certificate directory, and so on.

The private key file is configured using the <Certificate>/<PrivateKey> sub-element. The private key file must be in PEM file format and stored locally.

SSL clients can optionally be verified if the <Certificate>/<VerifyClient> sub-element is set to true. By default, the GWWS server does not verify SSL clients.

If SSL clients are to be verified, and/or the X.509 certificate authentication feature is enabled, a set of trusted certificates must be stored locally and located by the GWWS server. There are two ways to define GWWS server trusted certificates:

1. Include all certificates in one PEM format file and define the file path using the <<Certificate>/<TrustedCert> sub-element.
2. Saving separate certificate PEM format files in one directory and define the directory path using the <<Certificate>/<CertPath> sub-element.

Listing 2-9 shows a SALTDEPLOY file segment configuring GWWS server certificates.

Listing 2-9 Configuring Certificates In the SALTDEPLOY File

```
<Deployment ..>
  ...
  <System>
    <Certificates>
      <PrivateKey>/home/user/gwws_cert.pem</PrivateKey>
      <VerifyClient>true</VerifyClient>
      <CertPath>/home/user/trusted_cert</CertPath>
    </Certificates>
  </System>
</Deployment
```

Configuring Plug-in Libraries

A plug-in is a set of functions that are called when the GWWS server is running. BEA SALT provides a plug-in framework as a common interface for defining and implementing plug-ins. Plug-in implementation is carried out through a dynamic library that contains the actual function code. The implementation library can be loaded dynamically during GWWS server start up. The functions are registered as the implementation of the plug-in interface.

In order for the GWWS server to load the library, the library must be specified using the <Plugin>/<Interface> element in the SALTDEPLOY file.

Listing 2-10 shows a SALTDEPLOY file segment configuring multiple customized plug-in libraries to be loaded by the GWWS servers.

Listing 2-10 Configuring Plug-in Libraries In the SALTDEPLOY File

```
<Deployment ..>
  ...
  <System>
    <Plugin>
      <Interface lib="plugin_1.so" />
      <Interface lib="plugin_2.so" />
    </Plugin>
  </System>
</Deployment
```

Note: If the plug-in library is developed using the SALT 2.0 plug-in interface, the "id" and "name"attributes for the interface do not need to be specified. These values can be obtained through plugin interfaces.

For more information, see Using Plug-ins with BEA SALT in BEA SALT Programming with Web Services.

Configuring Advanced Web Service Messaging Features

BEA SALT currently supports the following advanced Web Service Messaging features:

- Web Service Addressing

Supports both inbound and outbound asynchronous Web service messaging.

- Web Service Reliable Messaging

  Supports inbound Web Service reliable message delivery.

Web Service Addressing

BEA SALT supports Web service addressing for both inbound and outbound services. The Web service addressing (WS-Addressing) messages used by the `GWWS` server must comply with the Web Service Addressing standard (W3C Member Submission 10 August 2004).

Inbound services do not require specific Web service addressing configuration. The `GWWS` server accepts and responds accordingly to both WS-Addressing request messages and non WS-Addressing request messages.

Outbound services require Web service addressing configuration as described in the following sections:

- Configuring the Addressing Endpoint for Outbound Services
- Disabling WS-Addressing

Configuring the Addressing Endpoint for Outbound Services

For outbound services, Web service addressing is configured at the Web service binding level. In the SALTDEPLOY file, each `GWWS` server can specify a WS-Addressing endpoint by using the `<WSAddressing>` element for any referenced outbound WSBinding object to enable WS-Addressing.

Once the WS-Addressing endpoint is configured, the `GWWS` server creates a listen endpoint at start up. All services defined in the outbound WSBinding are invoked with WS-Addressing messages.

Listing 2-11 shows a `SALTDEPLOY` file segment enabling WS-Addressing for a referenced outbound Web service binding.

Listing 2-11 WS-Addressing Endpoint Defined for Outbound Web Service Binding

```
<Deployment ..>
  ...
  <WSGateway>
    <GWInstance id="GWWS1">
      ...
```

```
      <Outbound>
        <Binding ref="app1:app1_binding">
          <WSAddressing>
            <Endpoint address=”https://GWWS_host:8801/app1_async_point”>
          </WSAddressing>
          <Endpoint use=" extServer1_HTTPPort" />
          <Endpoint use=" extServer1_HTTPSPort" />
        </Binding>
        <Binding ref="app2:app2_binding">
          <WSAddressing>
            <Endpoint address=”https://GWWS_host:8802/app2_async_point”>
          </WSAddressing>
          <Endpoint use=" extServer2_HTTPPort" />
          <Endpoint use=" extServer2_HTTPSPort" />
        </Binding>
      </Outbound>
    ...
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

Notes: In a GWWS server, each outbound Web Service binding can be associated with a particular WS-Addressing endpoint address. These endpoints can be defined with the same hostname and port number, but the context path portion of the endpoint addresses must be different.

If the external Web service binding does not support WS-Addressing messages, configuring Addressing endpoints may result in run time failure.

Disabling WS-Addressing

No matter you create a WS-Addressing endpoint or not in the SALTDEPLOY file, you can explicitly disable the Addressing capability for particular outbound services in the WSDF. To disable the Addressing capability for a particular outbound service, you should use the property name “disableWSAddressing” with a value set to “true” in the corresponding <Service> definition in the WSDF file. This property has no impact to any inbound services.

Listing 2-12 shows WSDF file segment disabling Addressing capability.

Listing 2-12 Disabling Service Level WS-Addressing

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
      <Service name="toupper">
        <Property name="disableWSAddressing" value=”true” />
      </Service>
      <Service name="tolower" />
    </Servicegroup>
    ....
  </WSBinding>
</Definition>
```

Web Service Reliable Messaging

BEA SALT currently supports Reliable Messaging for inbound services only. To enable Reliable Messaging functionality, you must create a Web Service Reliable Messaging policy file and include the policy file in the WSDF. The policy file must comply with the WS-ReliableMessaging Policy Assertion Specification (February 2005).

Note: A WSDF containing a Reliable Messaging policy definition should be used by the `GWWS` server for inbound direction only.

Creating the Reliable Messaging Policy File

A Reliable Messaging Policy file is a general WS-Policy file containing WS-ReliableMessaging Assertions. The WS-ReliableMessaging Assertion is an XML segment that describes features such as the version of the supported WS-ReliableMessage specification, the source endpoint’s retransmission interval, the destination endpoint’s acknowledge interval, and so on.

For more information about the WS-ReliableMessaging policy file format, see the BEA SALT WS-ReliableMessaging Policy Assertion Reference in the *BEA SALT Reference Guide*.

Listing 2-13 shows a Reliable Messaging policy file example.

Listing 2-13 Reliable Messaging Policy File Example

```
<?xml version="1.0"?>
<wsp:Policy wsp:Name="ReliableSomeServicePolicy"
  xmlns:wsrm="http://schemas.xmlsoap.org/ws/2005/02/rm/policy"
  xmlns:wsp=”http://schemas.xmlsoap.org/ws/2004/09/policy”
  xmlns:beapolicy="http://www.bea.com/wsrm/policy">
  <wsrm:RMAssertion>
    <wsrm:InactivityTimeout Milliseconds="600000" />
    <wsrm:AcknowledgementInterval Milliseconds="2000" />
    <wsrm:BaseRetransmissionInterval Milliseconds="500"/>
    <wsrm:ExponentialBackoff />
    <beapolicy:Expires Expires="P1D" />
    <beapolicy:QOS QOS=”ExactlyOnce InOrder" />
  </wsrm:RMAssertion>
</wsp:Policy>
```

Specifying the Reliable Messaging Policy File in the WSDF File

You must reference the WS-ReliableMessaging policy file at the <Servicegroup> level in the native WSDF file. The following segment of the WSDF file shows how to reference the WS-ReliableMessaging policy file.

Listing 2-14 Reference the WS-ReliableMessaging Policy At the Endpoint Level

```
<Definition ...>
  <WSBinding ...>
    <Servicegroup ...>
      <Policy location=”RMPolicy.xml” />
      <Service ... />
      <Service ... />
      ...
    </Servicegroup ...>
  </WSBinding>
</Definition>
```

Note: Reliable Messaging in BEA SALT does not support process/system failure scenarios, which means SALT does not store the message in a persistent storage area. BEA SALT works in a *direct mode* with the SOAP client. Usually, system failure recovery requires business logic synchronization between the client and server.

Configuring Security Features

BEA SALT provides security support at both transport level and SOAP message level. The following topics explains how to configure security features for each level:

- Configuring Transport Level Security
- Configuring Message Level Web Service Security

Configuring Transport Level Security

BEA SALT provides point-to-point security using SSL link-level security and supports HTTP basic authentication mechanism for both inbound and outbound service authentication.

Setting Up SSL Link-Level Security

To set up link-level security using SSL at inbound endpoints, you can simply specify the endpoint address with prefix "`https://`". The `GWWS` server who uses this inbound endpoint creates SSL listen port and make SSL secured connections with Web Service Clients. SSL features need to specify certificates settings. For more information about certificate settings, see "Configuring Certificates".

GWWS server automatically creates SSL secured connection to outbound endpoints that are published with URLs that having prefix "`https://`".

Configuring Inbound HTTP Basic Authentication

BEA SALT depends on the Tuxedo security framework for Web Service client authentication. There is no special configuration at BEA SALT side to enable inbound HTTP Basic Authentication. If Tuxedo system requires user credential, HTTP Basic Authentication is simply an alternative for Web Service client program to carry the user credential.

The `GWWS` gateway supports Tuxedo domain security configuration for the following two authentication patterns:

- Application password (APP_PW)
- User-level authentication (USER_AUTH)

The GWWS server passes the following string from the HTTP header of the client SOAP request for Tuxedo authentication.

```
Authorization: Basic <base64Binary of username:password>
```

The following is an example of a string from the HTTP header:

```
Authorization: Basic QWxhZGRpbjpvcGVuIHNlc2FtZQ==
```

In this example, the client sends the Tuxedo username "Aladdin" and the password "open sesame", and uses this paired value for Tuxedo authentication.

- Using Application Password (APP_PW)

  If Tuxedo uses APP_PW, then the HTTP username value is ignored and the GWWS server only uses the password string as the Tuxedo application password to check the authentication.

- Using User-level Authentication (USER_AUTH)

  If Tuxedo uses USER_AUTH, then both the HTTP username and password value are used. In this case, the GWWS server does not check the Tuxedo application password.

  Note: ACL and MANDATORY_ACL are not supported for Web service clients, which means the Tuxedo system ignores any ACL-related configuration specifications. BEA SALT does not make group information available for Web service clients.

Configuring Outbound HTTP Basic Authentication

BEA SALT supports customers to develop authentication plug-in to prepare the user credential for the outbound HTTP Basic Authentication. Outbound HTTP Basic Authentication is configured at Endpoint level. If an outbound Endpoint requires user profile in the HTTP message, you must specify the HTTP Realm for the HTTP endpoint in the WSDF file. The GWWS server invokes authentication plug-in library to prepare the username and password, and send them using HTTP Basic Authentication mechanism in the request message.

Listing 2-15 shows how to enable HTTP Basic Authentication for the outbound endpoints.

Listing 2-15 Enabling HTTP Basic Authentication For the Outbound Endpoint

```
<Definition ...>
  <WSBinding id="simpapp_binding">
    <SOAP>
      <AccessingPoints>
```

```
        <Endpoint id="..." address="...">
          <Realm>SIMP_REALM</Realm>
        </Endpoint>
      </AccessingPoints>
    </SOAP>
    <Servicegroup id="simpapp">
    ....
    </Servicegroup>
    ....
  </WSBinding>
  ......
</Definition>
```

Once a service request is sending to an outbound endpoint specified with <Realm> setting, the GWWS server passes the Tuxedo client uid and gid to the authentication plug-in function, so that the plug-in can determine HTTP Basic Authentication username/password according to the Tuxedo client information. To obtain Tuxedo client uid / gid for HTTP basic authentication username/password mapping, Tuxedo security level may also need to be configured in the UBBCONFIG file. For more information, see "Configuring Tuxedo Security Level for Outbound HTTP Basic Authentication".

For more information about how to develop an outbound authentication plug-in, see Programming Outbound Authentication Plug-ins in the *BEA SALT Programming Web Services*.

Configuring Message Level Web Service Security

BEAL SALT supports Web Service Security 1.0 and 1.1 specification for message level security. You can use message-level security in BEA SALT to assure:

- Authentication, by requiring username or X.509 tokens
- Inbound request message integrity, by requiring the soap body signature

Main Use Cases of Web Service Security

BEA SALT implementation of the *Web Service Security: SOAP Message Security specification* supports the following use cases:

- Include a token (username, or X.509) in the SOAP message for authentication.

- Include a token (X.509) and the soap body signature in the SOAP message for integrity.

Using WS-SecurityPolicy Files

BEA SALT includes a number of WS-Security Policy 1.0 and 1.2 files you can use for message level security use cases.

The WS-Policy files can be found at `$TUXDIR/udataobj/salt/policy` once you have successfully installed BEA SALT.

The following table lists the default WS-Security Policy files bundled by BEA SALT.

Table 2-8 WS-Security Policy Files Provided By BEA SALT

File Name	Purpose
wssp1.0-username-auth.xml	WS-Security Policy 1.0. Plain Text Username Token for Service Authentication
wssp1.0-x509v3-auth.xml	WS-Security Policy 1.0. X.509 V3 Certificate Token for Service Authentication
wssp1.0-signbody.xml	WS-Security Policy 1.0. Signature on SOAP:Body for verification of X.509 Certificate Token
wssp1.2-Wss1.0-Username Token-plain-auth.xml	WS-Security Policy 1.2. Plain Text Username Token for Service Authentication
wssp1.2-Wss1.1-X509V3-auth.xml	WS-Security Policy 1.2. X.509 V3 Certificate Token for Service Authentication
wssp1.2-signbody.xml	WS-Security Policy 1.2. Signature on SOAP:Body for verification of X.509 Certificate Token

The above policy files except WS-Security Policy 1.2 UserToken file can be referenced at <Servicegroup> or <Service> level in the native `WSDF` file. The WSSP 1.2 UserToken file can only be referenced at <Servicegroup> level. The sample “wsseapp” shows how to clip the WSSP 1.2 UserToken file to be used in <Service> level.

Listing 2-16 shows a combination of policy assignment making that the service “TOUPPER” requires client send a UsernameToken (in PlainText format) and an X509v3Token in request, and also require the SOAP:Body part of message is signed with the X.509 token.

Listing 2-16 WS-Security Policy Usage

```
<Definition ...>
  <WSBinding id="simpapp_binding">

    <Servicegroup id="simpapp">
      <Policy location="salt:wssp1.2-Wss1.1-X509V3-auth.xml"/>
      <Service name="TOUPPER" >
        <Policy location="D:/wsseapp/wssp1.2-UsernameToken-Plain.xml"/>
        <Policy location="salt:wssp1.2-signbody.xml" use="input"/>
      </Service>
    </Servicegroup>
    ....
  </WSBinding>
  ......
</Definition>
```

Policy is referred with “location” attribute of the <Policy> element. A prefix “`salt:`” means a SALT default bundled policy file is used. User-defined policy file can be used by directly specifying the file path.

Notes: If a policy is referred at <Servicegroup> level, it will apply to all services in this service group.

The “signbody” policy must be used with the attribute “`use`” set as “`input`”, which specifies the policy applied only for input message. This is necessary because we do not sign the SOAP:Body of output message.

Compiling SALT Configuration

Compiling a SALT configuration file means generating a binary version of the file (`SALTCONFIG`) from the XML version `SALTDEPLOY` file. To compile a configuration file, run the `wsloadcf` command. `wsloadcf` parses a deployment file and loads the binary file.

`wsloadcf` reads a deployment file and all imported WSDF files and WS-Policy files referenced in the deployment file, checks the syntax according to the XML schema of each file format, and optionally loads a binary configuration file called `SALTCONFIG`. The `SALTCONFIG` and

(optionally) SALTOFFSET environment variables point to the SALTCONFIG file and (optional) offset where the information should be stored.

wsloadcf validates the given SALT configuration files according to the predefined XML Schema files. XML Schema files needed by BEA SALT can be found at directory: $TUXDIR/udataobj/salt.

wsloadcf can execute for validating purpose only without generating the binary version SALTCONFIG once option "-n" is specified.

For more information about wsloadcf, see wsloadcf reference in the *BEA SALT Reference Guide*.

Configuring the UBBCONFIG File for BEA SALT

After configuring and compiling SALT configuration, Tuxedo UBBCONFIG file needs to be updated to apply SALT components in the Tuxedo application. Table 2-9 lists the UBBCONFIG file configuration tasks for BEA SALT.

Table 2-9 UBBCONFIG File Configuration Tasks for BEA SALT

Configuration Tasks	Required	Optional
Configuring the TMMETADATA Server in the *SERVERS Section	X	
Configuring the GWWS Servers in the *SERVERS Section	X	
Updating System Limitations in the UBBCONFIG File	X	
Configuring Certificate Password Phrase For the GWWS Servers		X
Configuring Tuxedo Authentication for Web Service Clients		X
Configuring Tuxedo Security Level for Outbound HTTP Basic Authentication		X

Configuring the TMMETADATA Server in the *SERVERS Section

BEA SALT requires at least one TMMETADATA server defined in the UBBCONFIG file. Multiple TMMETADATA servers are also allowed to increase the throughput of accessing the Tuxedo service definitions.

Listing 2-17 lists a segment of the UBBCONFIG file that shows how to define TMMETADATA servers in a Tuxedo application.

Listing 2-17 TMMETADATA Servers Defined In the UBBCONFIG File *SERVERS Section

```
......
*SERVERS
TMMETADATA SRVGRP=GROUP1 SRVID=1
           CLOPT="-A -- –f domain_repository_file -r"
TMMETADATA SRVGRP=GROUP1 SRVID=2
           CLOPT="-A -- –f domain_repository_file"
......
```

Note: Maintaining only one Service Metadata Repository file for the whole Tuxedo domain is highly recommended. To ensure this, multiple TMMETADATA servers running in the Tuxedo domain must point to the same repository file.

For more information, see "Managing The Tuxedo Service Metadata Repository" in the *Tuxedo 9.1 documentation*.

Configuring the GWWS Servers in the *SERVERS Section

To boot GWWS instances defined in the SALTDEPLOY file, the GWWS servers must be defined in the *SERVERS section of the UBBCONFIG file. You can define one or more GWWS server instances concurrently in the UBBCONFIG file. Each GWWS server must be assigned with a unique instance id with the option "-i" within the Tuxedo domain. The instance id must be present in the XML version SALTDEPLOY file and the generated binary version SALTCONFIG file.

Listing 2-18 lists a segment of the UBBCONFIG file that shows how to define GWWS servers in a Tuxedo application.

Listing 2-18 GWWS Servers Defined In the UBBCONFIG File *SERVERS Section

```
......
*SERVERS
GWWS SRVGRP=GROUP1 SRVID=10
     CLOPT="-A -- –i GW1"
```

```
GWWS SRVGRP=GROUP1 SRVID=11
     CLOPT="-A -- –i GW2"
GWWS SRVGRP=GROUP2 SRVID=20
     CLOPT="-A -- -c saltconf_2.xml –i GW3"
......
```

For more information, see "GWWS" in the BEA SALT Reference Guide.

Note: Be sure that the TMMETADATA system server is set up in the UBBCONFIG file to start before the GWWS server boots. Because the GWWS server calls services provided by TMMETADATA, it must boot after TMMETADATA.

To ensure TMMETADATA is started prior to being called by the GWWS server, put TMMETADATA before GWWS in the UBBCONFIG file or use SEQUENCE parameters in *SERVERS definition in the UBBCONFIG file.

Note: SALT configuration information is pre-compiled with wsloadcf to generated a binary version SALTCONFIG file. GWWS server reads SALTCONFIG file at start up. Environment variable *SALTCONFIG* must be set correctly with the binary version SALTCONFIG file entity before booting GWWS servers.

Note: Option "-c" is deprecated in the current version BEA SALT. In SALT 1.1 release, option "-c" is used to specify SALT 1.1 configuration file for the GWWS server. In SALT 2.0, GWWS server reads SALTCONFIG file at start up. GWWS server specified with this option can be booted with a warning message to indicate this deprecation. The specified file can be arbitrary and is not read by the GWWS server.

Updating System Limitations in the UBBCONFIG File

When configuring the Tuxedo domain with SALT GWWS servers, you need to plan and update Tuxedo system limitations defined in the UBBCONFIG file according to your SALT application requirements.

Tip: Defining enough MAXSERVERS number in the *RESOURCES section

BEA SALT requires the following system servers to be started in a Tuxedo domain: TMMETADATA and GWWS. The number of TMMETADATA and GWWS server must be accounted for in the MAXSERVERS value.

Tip: Defining enough MAXSERVICES number in the *RESOURCES section

When the GWWS server working in the outbound direction, external wsdl:operations are mapped with Tuxedo services and advertised via the GWWS servers. The number of the advertised services by all GWWS servers must be accounted for in the MAXSERVICES value.

Tip: Defining enough MAXACCESSERS number in the *RESOURCES section

MAXACCESSERS value is used to specify the default maximum number of clients and servers that can be simultaneously connected to the Tuxedo bulletin board on any particular machine in this application. The number of TMMETADATA and GWWS server, maximum concurrent Web Service client requests must be accounted for in the MAXACCESSERS value.

Tip: Defining enough MAXWSCLIENTS number in the *MACHINES section

When the GWWS server working in the inbound direction, each Web Service client is deemed a workstation client in Tuxedo system; therefore, MAXWSCLIENTS must be configured with a valid number in UBBCONFIG for the machine where the GWWS server is deployed. The number shares.

Configuring Certificate Password Phrase For the GWWS Servers

Configuring security password phrase is required when setting up certificates for BEA SALT. Certificates setting is desired when the GWWS servers enabling SSL link-level encryption and/or Web Service Security X.509 Token and signature features. The certificate private key file needs to be created and encrypted with a password phrase.

When the GWWS servers are specified with certificate related features, they are required to read the private key file and decrypt them using the password phrase. To configure password phrase for each GWWS server, keyword *SEC_PRINCIPAL_NAME* and *SEC_PRINCIPAL_PASSVAR* must be specified under each desired GWWS server entry in the *SERVERS section. During compiling the UBBCONFIG file with tmloadcf, the administrator must type the password phrase, which can be used to decrypt the private key file correctly.

Note: Only one private key file can be specified in the SALT deployment file. All the GWWS servers defined in the SALT deployment file must be provided the same password phrase for the private key file decryption.

Listing 2-19 lists a segment of the UBBCONFIG file that shows how to define security password phrase for the GWWS servers.

Listing 2-19 Security Password Phrase Defined in the UBBCONFIG File For the GWWS Servers

```
......
*SERVERS
GWWS SRVGRP=GROUP1 SRVID=10
     SEC_PRINCIPAL_NAME="gwws_certkey"
     SEC_PRINCIPAL_VAR="gwws_certkey"
     CLOPT="-A -- –i GW1"
GWWS SRVGRP=GROUP1 SRVID=11
     SEC_PRINCIPAL_NAME="gwws_certkey"
     SEC_PRINCIPAL_PASSVAR="gwws_certkey"
     CLOPT="-A -- –i GW2"
......
```

For more information, see "UBBCONFIG(5)"in the *Tuxedo 9.1 documentation*.

Configuring Tuxedo Authentication for Web Service Clients

BEA SALT GWWS servers rely on Tuxedo authentication framework to check the validity of the Web Service clients. If your legacy Tuxedo application is already applied with, Web Service clients must send user credential using one of the following approaches:

- HTTP Basic Authentication in the HTTP message header
- Web Service Security Username Token in the SOAP message header

Contrarily, if you want to authenticate Web Service clients for BEA SALT, you must configure Tuxedo authentications in the Tuxedo domain.

For more information about Tuxedo authentication, see "Administering Authentication" in the *BEA Tuxedo 9.1 Documentation.*

Configuring Tuxedo Security Level for Outbound HTTP Basic Authentication

To obtain Tuxedo client `uid / gid` for outbound HTTP Basic Authentication `username /password` mapping, you need to configure Tuxedo Security level as `USER_AUTH`, `ACL` or `MANDATORY_ACL` in the `UBBCONFIG` file.

Listing 2-20 lists a segment of the `UBBCONFIG` file that shows how to define security level ACL in the `UBBCONFIG` file.

Listing 2-20 Security Level ACL Defined in the UBBCONFIG File For Outbound HTTP Basic Authentication

```
*RESOURCES
IPCKEY ...
......
SECURITY ACL
......
```

Configuring BEA SALT In Tuxedo MP Mode

To set up `GWWS` servers running on multiple machines within a MP mode Tuxedo domain, each Tuxedo machine must be defined with a separate `SALTDEPLOY` file and a set of separate other components.

You must propagate the following global resources across different machines:

- Certificates. Private key file and the trusted certificate files must be accessible from each machine according to the settings defined in the `SALTDEPLOY` file.
- Plug-in load libraries. Plug-in shared libraries must be compiled on each machine and must be accessible according to the settings defined in the `SALTDEPLOY` file.

You may define two `GWWS` servers running on different machine with the same functionality by associating the same WSDF files. But it requires manual propagation of the following artifacts:

- The WSDF files
- The WS-Policy files

- FML32 field table definition files if Tuxedo Services consume FML32 typed buffers
- XML Schema files excerpted by wsdlcvt.

Migrating from BEA SALT 1.1

This section describes the following two possible migrating approaches for SALT 1.1 customers who plan to upgrade to SALT 2.0 release:

- Running GWWS servers with SALT 1.1 Configuration File
- Adopting SALT 2.0 Configuration Style by Converting SALT 1.1 Configuration File

Running GWWS servers with SALT 1.1 Configuration File

After upgrading from SALT 1.1 to SALT 2.0 release, you may still want to run your existing SALT applications with the original SALT 1.1 configuration file. SALT 2.0 definitely supports that.

SALT configuration compiler utility, `wsloadcf`, supports to load the binary version `SALTCONFIG` from one SALT 1.1 format configuration file.

To run SALT 2.0 `GWWS` servers with SALT 1.1 Configuration file, you need to perform the following steps:

1. Load the binary version `SALTCONFIG` from the SALT 1.1 format configuration file via `wsloadcf`.
2. Set environment variable *`SALTCONFIG`* before booting the `GWWS` servers.
3. Boot the `GWWS` servers associated with this SALT 1.1 configuration file.

Note: If customers have more than one SALT 1.1 configuration files defined in a Tuxedo domain, customers need to follow step 1 to 3 to generate more binary version `SALTCONFIG` files and boot corresponding `GWWS` servers.

Adopting SALT 2.0 Configuration Style by Converting SALT 1.1 Configuration File

When `wsloadcf` loads a binary version `SALTCONFIG` from a SALT 1.1 configuration file, it also convert this SALT 1.1 configuration file into one `WSDF` file and one `SALTDEPLOY` file.

It's highly recommended to start using the SALT 2.0 styled configuration once you get the converted files from SALT 1.1 configuration.

Note: If customers want to incorporate more than one SALT 1.1 configuration files into one SALT 2.0 deployment, customers need to manually edit the `SATLDEPLOY` file for importing the other WSDF files.

The following sample lists the converted `SALTDEPLOY` file and `WSDF` file from a given SALT 1.1 configuration file.

Listing 2-21 A Sample of SALT 1.1 Configuration File (simpapp.xml)

```
<Configuration xmlns=" http://www.bea.com/Tuxedo/Salt/200606">
  <Servicelist id="simpapp">
    <Service name="toupper" />
    <Service name="tolower" />
  </Servicelist>
  <Policy />
  <System />
  <WSGateway>
    <GWInstance id="GWWS1">
      <HTTP address="//127.0.0.1:7805" />
      <HTTPS address="127.0.0.1:7806" />
      <Property name="timeout" value="300" />
    </GWInstance>
  </WSGateway>
</Configuration>
```

The converted SALT 2.0 WSDF file and deployment file are listed below.

Listing 2-22 Converted WSDF File for SALT 1.1 Configuration File (simpapp.xml.wsdf)

```
<Definition name="simpapp" wsdlNamespace="urn:simpapp.wsdl"
  xmlns=" http://www.bea.com/Tuxedo/WSDF/2007">
  <WSBinding id="simpapp_binding">
    <Servicegroup id="simpapp">
```

```
      <Service name="toupper" />
      <Service name="tolower" />
    </Servicegroup>
    <SOAP>
      <AccessingPoints>
        <Endpoint id="simpapp_GWWS1_HTTPPort"
                  address=http://127.0.0.1:7805/simpapp />
        <Endpoint id=" simpapp_GWWS1_HTTPSPort"
                  address=https://127.0.0.1:7806/simpapp />
      </AccessingPoints>
    </SOAP>
  </WSBinding>
</Definition>
```

Listing 2-23 Converted SALTDEPLOY File for SALT 1.1 Configuration File (simpapp.xml.dep)

```
<Deployment xmlns=" http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
  <WSDF>
    <Import location="/home/myapp/simpapp.wsdf" />
  </ WSDF>
  <WSGateway>
    <GWInstance id="GWWS1">
      <Inbound>
        <Binding ref="simpapp:simpapp_binding">
          <Endpoint use=" simpapp_GWWS1_HTTPPort" />
          <Endpoint use=" simpapp_GWWS1_HTTPSPort" />
        </Binding>
      </Inbound>
      <Properties>
        <Property name="timeout" value="300" />
      </Properties>
    </GWInstance>
  </WSGateway>
</ Deployment>
```

CHAPTER 3

Administering BEA SALT at Run Time

This section contains the following topics:

Browsing to the WSDL Document from the GWWS Server

Each `GWWS` server automatically generates a WSDL document for each deployed inbound native WSDF. The WSDL document can be downloaded from any of the HTTP/S listening endpoints via HTTP GET.

Use the following URL to browse the WSDL document:

```
“http(s)://<host>:<port>/wsdl[? [id=<wsdf_name>]
[&mappolicy=<pack|raw|mtom>] [&toolkit=<wls|axis>]]”
```

Table 3-1 lists all WSDL document download options.

Table 3-1 WSDL Download Options

Option	Value Description
`id`	Specifies the native WSDF name for the WSDL document. The specified native WSDF must be imported via inbound direction by the `GWWS` server. If the option is not specified, the first inbound native WSDF is used.
`mappolicy`	`{ pack | raw | mtom }` Specifies the data mapping policies for certain Tuxedo Typed buffers for the generated WSDL document. Currently, this option impacts CARRAY typed buffers only. If the option is not specified, `pack` is used as the default value.
`toolkit`	`{ wls | axis }` Use this option only if you have previously defined `mappolicy=raw`. Specify the client toolkit used so that the proper WSDL document description for a CARRAY typed buffer MIME attachment is generated. BEA SALT supports WebLogic Server and Axis for SOAP with Attachments. The default value is `wls`.

Note: The WSDL download URL supported by BEA SALT 2.0 is different from BEA SALT 1.1. In BEA SALT 1.1 release, one `GWWS` server adaptively supports both `RPC/encoded` and `document/literal` message style, both SOAP 1.1 and SOAP 1.2 version, from a given configuration file. In BEA SALT 2.0 release, each WSDF file associated with the `GWWS` server must be pre-combined with a certain SOAP version and a certain SOAP message style. So the following WSDL download options for SALT 1.1 `GWWS` server are deprecated in this release.

Table 3-2 Deprecated WSDL Download Options

Option	Value Description
`SOAPversion`	This deprecated option is used to specify the expected SOAP version defined in the generated WSDL document. Now this option is set in the WSDF file.
`encstyle`	This deprecated option is used to specify the expected SOAP message style defined in the generated WSDL document. Now this option is set in the WSDF file.

Tuning the GWWS Server

The GWWS server is a high performance gateway used between external Web Service application and the Tuxedo application. It uses a thread-pool working model to improve performance in a multi-processor server environment. The GWWS server also provides options to control runtime behavior by setting the <WSGateway> element property values in the BEA SALT configuration file. The following topics list deployment considerations based on different scenarios. For more information, see "Configuring the GWWS Servers" on page 2-20.

Thread Pool Size Tuning

Property: `thread_pool_size`

The default thread pool size is 16, but in some cases this may not be enough to handle high volume loads. It is recommended to conduct a typical usage analysis in order to better estimate the proper size requirement. Usually, if the concurrent client number is large (for example, more than 500), it is suggested that you deploy the GWWS gateway on a server with at least a 4-way processor and set the thread pool size to 64.

Network Timeout Control

Property: `timeout`

BEA SALT provides a network timeout tuning parameter in the configuration file. The default timeout value is 300 seconds.The value can be adjusted to reduce timeout errors.

Max Content Length Control

Property: `max_content_length`

BEA SALT administrators may want to limit the buffer size sent from a client. SALT supports this by using a property value that can be set for particular GWWS instances. By default there is no limit.

Backlog Control

Property: `max_backlog`

The default backlog socket listen value is 20. On some systems, such as Windows, 20 may not meet heavy load requirements. The client connection is rejected during TCP handshake.

The recommended value for Windows is based on the max concurrent TCP connections you may encounter. For example, if 80 is the peak point, you may configure the `max_backlog` property value to 60 in the SALT configuration file.

Note: The default backlog value is adequate for most systems. You do not need to tune it unless you experience client connection problems during heavy loads.

WARNING: A large backlog value may increase *syn-blood* attack risk.

Tuxedo BLOCKTIME

A network receive timeout property is provided in the SALT configuration file. Web service applications are also impacted by the Tuxedo BLOCKTIME parameter. Blocktime accounting begins when a message is transformed from XML to a typed buffer and delivered to the Tuxedo framework.

If no reply is received for a particular Web service client within the BLOCKTIME time frame, the GWWS server sends a SOAP fault message to the client and terminates the connection. If the GWWS server receives a delayed reply, it drops this message because the client has been disconnected.

BLOCKTIME is defined in the UBBCONFIG file `*RESOURCE` section.

Boost Performance Using Multiple GWWS instances

If one `GWWS` instance is bottlenecked due to network congestion, low CPU resources and so on, multiple `GWWS` instances can be deployed with the same Web Service binding on distributed Tuxedo nodes.

Note: Even though multiple `GWWS` instances can provide the same logic functionality, from a client perspective, they are different Web service endpoints with different HTTP/S listen ports and addresses.

Tracing the GWWS Server

The GWWS server supports Tuxedo `TMTRACE` functionality (used to dynamically trace messages). All trace points are logged in the ULOG file. Checking the ULOG file trace information helps to evaluate GWWS server SOAP message problems. GWWS server message tracing behavior is set using the `TMTRACE` environment variable, or by using the `tmadmin chtr` sub-command command.

The reserved trace category, `msg`, is used to trace BEA SALT messages. It can be used together with other general trace categories. For example, if trace category "`atmi+msg`" is specified, both BEA SALT and Tuxedo ATMI trace messages are logged.

Notes: Message tracing is recommended for diagnostic treatment only.

The following trigger specifications are not recommended for GWWS servers:

`abort, system, sleep`

In any of these trigger specifications are used, GWWS servers may be unexpectedly terminated.

For more `tmtrace` and trace specification information, see tmtrace(5) in the *File Formats, Data Descriptions, MIBs, and System Processes Reference*.

TMTRACE specification examples for BEA SALT message tracing are shown below:

- To trace SALT messages only
  `export TMTRACE=msg:ulog:`
- To trace both BEA SALT and Tuxedo ATMI messages
  `export TMTRACE=atmi+msg:ulog:`

Listing 3-1 shows a ULOG file example containing BEA SALT tracing messages.

Listing 3-1 TMTRACE Messages Logged By the GWWS Server

```
183632.BOX1!GWWS.4612.4540.0: TRACE:ms:A HTTP message is received, SCO
index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:A SOAP message is received, SCO
index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:Begin data transformation of
request message, buffer type = STRING, SCO index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:End of data transformation of
request message, buffer type = STRING, SCO index=1023

183632. BOX1!GWWS.4612.840.0: TRACE:ms:Delivering a message to Tuxedo,
service name =TOUPPER,  SCO index=1023
```

```
183632. BOX1!GWWS.4612.840.0: TRACE:ms:Got a message from Tuxedo, SCO
index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:Begin data transformation of reply
message, buffer type = STRING, SCO index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:End of data transformation of reply
message, buffer type = STRING, SCO index=1023

183632. BOX1!GWWS.4612.4540.0: TRACE:ms:Send a http message to net, SCO
index=1023
```

A more complex log is generated by `TMTRACE=msg:ulog`, used in WS-ReliableMessaging communication. All the application and infrastructure messages are sent to ULOG. Listing 3-2 shows a ULOG file example containing WS-ReliableMessaging TMTRACE messages.

Listing 3-2 WS-ReliableMessaging TMTRACE Messages

```
184706.BOX1!GWWS.3640.4772.0: TRACE:ms:A HTTP message is received, SCO
index=1023

184706.BOX1!GWWS.3640.4772.0: TRACE:ms:A HTTP Get request is received, SCO
index=1023

184706.BOX1!GWWS.3640.4772.0: TRACE:ms:Send a http message to net, SCO
index=1023

184710.BOX1!GWWS.3640.4772.0: TRACE:ms:A HTTP message is received, SCO
index=1022

184710.BOX1!GWWS.3640.4772.0: TRACE:ms:A SOAP message is received, SCO
index=1022

184710.BOX1!GWWS.3640.4772.0: TRACE:ms:Create a new inbound sequence,
ID=uuid:4F1FEE40-72CB-118C-FFFFFFC0FFFFFFA8FFFFFFEB010000-1811
```

```
184710.BOX1!GWWS.3640.4772.0: TRACE:ms:Create a new outbound sequence,
ID=uuid:f7f76200-f612-11da-990d-9f37c3d14ba7

184710.BOX1!GWWS.3640.4772.0: TRACE:ms:Send CreateSequenceResponse message
for sequence uuid:4F1FEE40-72CB-118C-FFFFFFC0FFFFFFA8FFFFFFEB010000-1811

184710.BOX1!GWWS.3640.4772.0: TRACE:ms:Send a http message to net, SCO
index=1022

184712.BOX1!GWWS.3640.3260.0: TRACE:ms:A HTTP message is received, SCO
index=1022

184712.BOX1!GWWS.3640.3260.0: TRACE:ms:A SOAP message is received, SCO
index=1022

184712.BOX1!GWWS.3640.3260.0: TRACE:ms:Begin data transformation of request
message, buffer type = STRING, SCO index=1022

184712.BOX1!GWWS.3640.3260.0: TRACE:ms:End of data transformation of
request message, buffer type = STRING, SCO index=1022

184712.BOX1!GWWS.3640.3260.0: TRACE:ms:Received a request message in
sequence uuid:4F1FEE40-72CB-118C-FFFFFFC0FFFFFFA8FFFFFFEB010000-1811
```

Checking the ULOG tracing information helps to evaluate GWWS server SOAP message problem status.

Monitoring the GWWS Server

The GWWS server can be monitored with `wsadmin` utility, which is a command line tool. This tool can show the running status of GWWS.

An example is shown in Listing 3-3.

Listing 3-3 Use wsadmin to monitor GWWS

```
$wsadmin
wsadmin - Copyright (c) 2005-2006 BEA Systems, Inc.
Portions * Copyright 1986-1997 RSA Data Security, Inc.
All Rights Reserved.
Distributed under license by BEA Systems, Inc.
SALT is a registered trademark.

> gwstats -i abcd
GWWS Instance : abcd

Inbound Statistics :
---------------------------------
      Request Response Succ :     74
      Request Response Fail :     32
                Oneway Succ :      0
                Oneway Fail :      0

                 Total Succ :     74
                 Total Fail :     32

       Avg. Processing Time : 210.726 (ms)
Outbound Statistics :
---------------------------------
      Request Response Succ :      0
      Request Response Fail :      0
                Oneway Succ :      0
                Oneway Fail :      0

                 Total Succ :      0
                 Total Fail :      0

       Avg. Processing Time :  0.000 (ms)
---------------------------------
      Total request Pending :      0
   Outbound request Pending :      0
       Active Thread Number :      2
```

```
> gws -i out -s getTemp
GWWS Instance : out

Service : getTemp

Outboud Statistics :
---------------------------------
      Request Response Succ :    333
      Request Response Fail :    139
       Avg. Processing Time : 143.064 (ms)


>
```

Command `gwstats` (abbreviated as `gws`) can display the statistics data of `GWWS` server with specific instance ID or of certain service of the `GWWS` server. The data include the amount of successful and failed request, etc.

Before `wsadmin` is executed, both `TUXCONFIG` and `SALTCONFIG` environment variable must be set. wsadmin supports both active mode and in-active mode, which means wsadmin is able to launch with/without booting the Tuxedo domain.

The following table lists wsadmin sub-commands.

Table 3-3 wsadmin sub-commands

Sub-Command	Description
`gwstats(gws)`	Show statistics information of GWWS server
`configstats(cstat)`	Show configuration information
`default(d)`	Specify the default -i option
`echo(e)`	Switch on/off echo of input
`paginate(page)`	Switch on/off paging the output

Table 3-3 wsadmin sub-commands

`verbose(v)`	Switch on/off verbose output
`quit(q)`	Quit wsadmin

Troubleshooting BEA SALT

The following sections explain how to troubleshoot a BEA SALT run-time failure:

- GWWS Start Up Failure
- GWWS Rejects SOAP Request
- WSDL Document Generated Incorrectly or Rejected by SOAP Client Toolkit

GWWS Start Up Failure

If the GWWS server fails to start, check the following:

- Tuxedo service contract configuration

  Check the Tuxedo service contract definition is correct in the Tuxedo Service Metadata Repository and the Tuxedo Service Metadata Repository Server - `TMMETADATA` - is booted successfully.

- ~~GWWS server license~~

  ~~The GWWS server requires an extra license from BEA to enable the functionality. Check to make sure it has been installed properly.~~

- GWWS server HTTP listen port configuration.

  Check the GWWS server listen / WS-Addressing endpoints defined in the SALT configuration files. Avoid port conflicts with other applications.

- GWWS instance ID.

  Check the GWWS instance ID to make sure the two names defined in `UBBCONFIG` and `SALTDEPLOY` file are consistent.

- UBBCONFIG file `MAXWSCLIENTS` definition.

  Make sure that `MAXWSCLIENTS` is defined in the `*MACHINE` section of UBBCONFIG file on the computer where GWWS server is deployed.

- RESTART=Y and REPLYQ=Y parameters.

  If the GWWS server is set to RESTART=Y in the UBBCONFIG file, REPLYQ=Y also must be defined.

- SALTCONFIG file.

  Make sure the binary version SALTCONFIG file is compiled successfully and the environment variable SALTCONFIG is set correctly for the GWWS server.

GWWS Rejects SOAP Request

In some cases, the GWWS server may reject SOAP requests. The most common causes are:

- The WSDL document is outdated

  The WSDL document used by SOAP clients is out of date and some services may not be available.

- The GWWS server environment variables are not set correctly

  When exporting a Tuxedo service with FML/VIEW buffers to a Web service, make sure the related GWWS environment variables are set with valid values. The GWWS server needs this information for the data mapping conversion.

- Violated Tuxedo Service Metadata Repository restrictions

  Check the SOAP client data and make sure Tuxedo Service Metadata Repository restrictions are not violated.

- Unavailable Tuxedo service

  Make sure the Tuxedo service you want exported as a Web service is available.

WSDL Document Generated Incorrectly or Rejected by SOAP Client Toolkit

If the WSDL document is rejected by the Web Service client toolkit, do the following:

- Try to use the document/literal message style and SOAP 1.1 to define native Tuxedo WSDF file. This is also the default behavior.

- Use tmwsdlgen to generate the WSDL document manually and compare with the one downloaded by the GWWS server. If the TMMETADATA server is not started when the GWWS server booted, the GWWS server cannot obtain the correct service contract information. Therefore, the downloaded WSDL document does not contain the correct type definitions.