Oracle® Service Architecture Leveraging Tuxedo (SALT)

Configuration Guide

Release 22c

G11153-02

November 2024

Oracle Service Architecture Leveraging Tuxedo (SALT) Configuration Guide, Release 22c

G11153-02

Primary Authors: Priya Pathak, Tulika Das

Contributors: Maggie Li

Contents

1

Configuring a SALT Application

This chapter contains the following topics:

1.1 Configuring Oracle Tuxedo Web Services

This section contains the following topics:

1.1.1 Using Oracle Tuxedo Service Metadata Repository for SALT

SALT leverages the Oracle Tuxedo Service Metadata Repository to define service contract information for both existing Oracle Tuxedo services and SALT proxy services. Service contract information for all listed Oracle Tuxedo services is obtained by accessing the Oracle Tuxedo Service Metadata Repository system service provided by the local Oracle Tuxedo domain. Typically, SALT calls the TMMETADATA system as follows:

- During `GWWS` server run-time.
  SALT calls the Oracle Tuxedo Service Metadata Repository to retrieve necessary Oracle Tuxedo service definitions at the appropriate time.
- When tmwsdlgen generates a WSDL file.
  SALT calls the Oracle Tuxedo Service Metadata Repository to retrieve necessary Oracle Tuxedo service definitions and converts them to the WSDL description.

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

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

1.1.1.1 Defining Service-Level Keywords for SALT

The following table lists Oracle 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 SALT and are ignored when SALT components load the Oracle Tuxedo Service Metadata Repository.

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

Service-Level Keyword	SALT Usage
`service`	The unique key value of the service. This value is referenced in the SALT WSDF file. For native Oracle Tuxedo services, this value can be the same as the Oracle Tuxedo advertised service name, or an alias name different from the actual Oracle 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 Oracle Tuxedo service or SALT proxy service). The valid values are: • `tuxedo` Represents a native Oracle Tuxedo service • `webservice` Represents aSALT proxy service (i.e., a service definition converted from a wsdl:operation). Do not use “`webservice`” to define a native Oracle Tuxedo service. This value is always used to define services converted from external Web services.
`tuxservice`	The actual Oracle Tuxedo advertised service name. If no value is specified, then the value is the same as the value in the `service` keyword. For native Oracle Tuxedo services, SALT invokes the Oracle Tuxedo services defined using this keyword. For SALT proxy service, GWWS server advertises the service name using this keyword value.

Table 1-1 (Cont.) SALT Usage of Service-Level Keywords in Oracle Tuxedo Service Metadata Repository

Service-Level Keyword	SALT Usage
`servicetype`	Determines the service message exchange pattern for the specified Oracle Tuxedo service. The following values specify mapping rules between the Oracle Tuxedo service types and the Web Service message exchange pattern (MEP): • `service` Corresponds to request-response MEP. • `oneway` Corresponds to oneway request MEP. • `queue` Corresponds to request-response MEP.
`inbuf`	Specifies the input buffer (request buffer), type for the service. For native Oracle Tuxedo services, the value can be any Oracle Tuxedo typed buffers. The following values are Oracle 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 buffertype other than the above mentioned buffer types, the buffer is treated as a custom buffer type. For SALT proxy services, the value is always `FML32`.

Table 1-1 (Cont.) SALT Usage of Service-Level Keywords in Oracle Tuxedo Service Metadata Repository

Service-Level Keyword	SALT Usage
`outbuf`	Specifies the output buffer (response buffer with `TPSUCCESS`), type for the service. For native Oracle Tuxedo services, the value can be any Oracle Tuxedo typed buffer. The following values are Oracle 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 buffer type other than the above mentioned 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 type(response buffer with `TPFAIL`),for the service. For native Oracle Tuxedo services, the value can be any Oracle Tuxedo typed buffer. The following values are Oracle 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 buffer type other than the above mentioned buffer types, the buffer is treated as a custom buffer type. For SALT proxy services, the value is always `FML32`.

Table 1-1 (Cont.) SALT Usage of Service-Level Keywords in Oracle Tuxedo Service Metadata Repository

Service-Level Keyword	SALT Usage
`inview`	Specifies the view name used by the service for the following input buffer types: `VIEW, VIEW32, X_C_TYPE, X_COMMON` SALT requires that you specify the view name rather than accept the default `inview` setting. **Note:** This keyword is for native Oracle 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` SALT requires that you specify the view name rather than accept the default `outview` setting. **Note:** This keyword is for native Oracle 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` SALT requires that you specify the view name rather than accept the default `errview` setting. **Note:** This keyword is for native Oracle Tuxedo services only.

Table 1-1 (Cont.) SALT Usage of Service-Level Keywords in Oracle Tuxedo Service Metadata Repository

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

Table 1-1 (Cont.) SALT Usage of Service-Level Keywords in Oracle Tuxedo Service Metadata Repository

Service-Level Keyword	SALT Usage
`RECORD`	Oracle Tuxedo RECORD typed buffers can describe COBOL copybook information. Generated COBOL types: • `RECORD` • `COMP-2` • `S9(18)` • `9(18)` • `S9(9)` • `9(9)` • `S9(4)` • `S9(10)V9(10)` • `X(1024)` • `@binary=true`
`inrecord`	Specifies the record name used by the service for the following input buffer types: RECORD. Oracle SALT requires that you specify the record name rather than accept the default in record setting. This keyword is for native Tuxedo services only.
`outrecord`	Specifies the record name used by the service for the following output buffer types: RECORD. Oracle SALT requires that you specify the record name rather than accept the default outrecord setting. This keyword is for native Tuxedo services only.
`errrecord`	Specifies the record name used by the service for the following error buffer types: RECORD. Oracle SALT requires that you specify the record name rather than accept the default errrecord setting. This keyword is for native Tuxedo services only.

1.1.1.2 Defining Service Parameters for SALT

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

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 buffer parameter should represent an `FML/FML32` field element that may be present in the buffer.
- `STRING`, `CARRAY`, `XML`, `MBSTRING`, and `X_OCTET` typed buffers
  Oracle Tuxedo treats these buffers uniformly. At most, one parameter is permitted for the buffer to define restrictions (such as buffer size threshold).
- Custom typed buffers
  Parameters that facilitate describing details about the buffer type.
- `FML32` typed buffersthat support embedded `VIEW32` and `FML32` buffers
  Embedded parameters provide support.
- `View32` typed buffers that support embedded `VIEW32` buffers
  Embedded parameters provide support.

The following table lists the Oracle 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 SALT and are ignored when SALT components load the Oracle Tuxedo Service Metadata Repository.

Table 1-2 SALT Usage of Parameter-Level Keyword in Oracle Tuxedo Service Metadata Repository

Parameter-level Keyword	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` SALT ignores the parameter definitions.
`type`	Specifies the data type of the parameter. **Note:** SALT does not support `dec_t` and `ptr` data types.

Table 1-2 (Cont.) SALT Usage of Parameter-Level Keyword in Oracle Tuxedo Service Metadata Repository

Parameter-level Keyword	SALT Usage
`subtype`	Specifies the view structure name if the parameter type is `view32`. For any other typed parameter, SALT ignores this value. **Note:** SALT requires this value if the parameter type is `view32` This keyword is for native Oracle Tuxedo service only.
`access`	The general definition applies for this parameter. To support an Oracle 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 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 SALT, the value for the `count` parameter must be greater than or equal to `requiredcount`.
`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 the SALT WSDL converter. This keyword is for SALT proxy service only. Do not specify this keyword for native Oracle 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 Oracle Tuxedo services.

Table 1-2 (Cont.) SALT Usage of Parameter-Level Keyword in Oracle Tuxedo Service Metadata Repository

Parameter-level Keyword	SALT Usage
`RECORD`	Oracle Tuxedo RECORD typed buffers can describe COBOL copybook information. Generated COBOL types: • `RECORD` • `COMP-1` • `COMP-2` • `S9(18)` • `9(18)` • `S9(9)` • `9(9)` • `S9(4)` • `S9(10)V9(10)` • `X(1024)` • `@binary=true`
`inheader`	Retrieved from the SOAP header portion of the SOAP envelope message received. Message can be a request (native Tuxedo service) or reply (external web service call).
`outheader`	Added to the SOAP header portion of the SOAP envelope message sent. Message can be a reply (native Tuxedo service) or request (external web service call).
`inoutheader`	Combination of `inheader` and `outheader`.This parameter is both added to and retrieved from the SOAP header portion of the SOAP message.

1.1.2 Configuring Native Oracle Tuxedo Services

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

- Creating a Native WSDF
- Using WS-Policy Files
- Generating a WSDL File from a Native WSDF
- Using Oracle Tuxedo Version-Based Routing (Inbound)

1.1.2.1 Creating a Native WSDF

To expose a set of Oracle 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 Oracle Tuxedo service list to be exposed as web service operations, and so on).

This section contains the following topics:

- Defining the SOAP Header

- Configuration Mode
- Defining WSBinding Object
- Defining Service Object
- Configuring Message Conversion Handler

1.1.2.1.1 Defining the SOAP Header

The `mapsoapheader` attribute is used to configure SOAP headers. It defines an FML32 field that represents the SOAP header. It is `TA_WS_SOAP_HEADER` STRING type.

> **Note:**
>
> The `mapsoapheader` attribute It is defined in `wssoapflds.h` file shipped with SALT.

Following is an example of SOAP header definition:

Example 1-1 SOAP Header Definition

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

The `mapsoapheader` attribute default value is "`false`" which indicates the GWWS does not execute mapping between the SOAP header and FML fields.

If `mapsoapheader` is set to `true`, the mapping behavior is as follows for inbound and outbound services:

- Inbound
  For inbound services, the GWWS translates the SOAP header as shown in the example below:

Example 1-2 GWWS Soap Header Translation

```
<cup:SoapHeader xmlns:cup='http://www.xxx.com/soa/esb/message/1_0'>
<cup:Head>
<cup:Name>xxx</cup:Name>
<cup:Value>xxx</cup:Value>
</cup:Head>
</cup:SoapHeader>
```

The string buffer is assigned to the `TA_WS_SOAP_HEADER` field and injects the target FML32 buffer. If the target buffer type is not FML32, the translation will not take effect.

- Out Bound

For outbound services, the GWWS receives the `TA_WS_SOAP_HEADER` from the request buffer and places it in the SOAP header when the SOAP package is composed.

1.1.2.1.2 Configuration Mode

This mode requires the property `headerMapping` be set to `true` in the WSDF entry, at the service level as shown in in the example below:

Example 1-3 Configuration Mode

```
<?xml version="1.0" encoding="UTF-8"?>
<wsdf:Definition xmlns:wsdf="http://www.bea.com/Tuxedo/WSDF/2007"
name="TuxAll" wsdlNamespace="urn:TuxAll.wsdl">
<wsdf:WSBinding id="TuxAll_Binding">
<wsdf:Servicegroup id="TuxAll_PortType">
<wsdf:Service name="strmap_val003"/>
<Property name="headerMapping" value="true"/>
</wsdf:Service>
</wsdf:Servicegroup>
<wsdf:SOAP>
<wsdf:AccessingPoints>
<wsdf:Endpoint address="http://localhost:12438/TuxAll"
id="TuxAll_TuxAll_HTTPPort"></wsdf:Endpoint>
<wsdf:Endpoint address="https://localhost:12448/TuxAll"
id="TuxAll_TuxAll_HTTPSPort"></wsdf:Endpoint>
</wsdf:AccessingPoints>
</wsdf:SOAP>
</wsdf:WSBinding>
</wsdf:Definition>
```

1.1.2.1.3 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.

The example below shows how SOAP protocol details are redefined using the <`SOAP`> sub-element.

Example 1-4 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 Oracle Tuxedo services using the <`Servicegroup`> sub-element. Each <`Service`> element under <`Servicegroup`> represents an Oracle Tuxedo service that can be accessed from a Web service client.

1.1.2.1.4 Defining Service Object

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

The following example shows how a group of services are defined for WSBinding:

Example 1-5 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>
```

1.1.2.1.5 Configuring Message Conversion Handler

You can create your own plug-in functions to customize SOAP XML payloads and Oracle Tuxedo typed buffer conversion routines. For more information, see Using SALT Plug-ins in SALT Programming Web Services and Configuring Plug-in Libraries

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.

The following example shows a service that uses the `MBCONV` custom plug-in to convert input and `XMLCONV` custom plug-in to convert output.

Example 1-6 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>
```

1.1.2.2 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 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. The location attribute is used to specify the policy file path; both abstract and relative file path are allowed. The use attribute 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 (for example, Reliable Messaging Assertion), the WS-Policy file applies to all endpoints serving the <Servicegroup> element
  - If a WS-Policy file consists of Web Service Operation-level Assertions (for example, Security Identity Assertion), the WS-Policy file applies to all services listed in the <Servicegroup> element.
  - If a WS-Policy file consists of Web Service Message level Assertions (for example, Security SignedParts Assertion), the WS-Policy file applies to input, output and/or fault messages of all services listed in the <Servicegroup> element.

    Note:

    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 (for example, Security Identity Assertion), the WS-Policy file applies to this particular service.
  - If a WS-Policy file consists of Web Service Message-level Assertions, (for example, Security SignedParts Assertion), the WS-Policy file applies to input, output and/or fault messages of this particular service.

Note:

SALT only supports request message-level assertions for the current release. You must specify use=”input” for message-level assertion policy files.

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>”`

Following is an example of a sample of using WS-Policy Files in the native `WSDF` file.

Example 1-7 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-Security Policy Files

1.1.2.3 Generating a WSDL File from a Native WSDF

Once an Oracle 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 Oracle 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 Oracle 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 Message Conversion in SALT Programming Web Services and tmwsdlgen in the SALT Reference Guide.

1.1.2.4 Using Oracle Tuxedo Version-Based Routing (Inbound)

Using Oracle Tuxedo version-based routing with Oracle Tuxedo services exposed as Web services involves the following:

- GWWS gets `REQUEST_VERSION` and `VERSION_RANGE` from the `UBBCONFIG` file.
- Calling service with request version
- If different settings are needed (such as specific traffic from specific gateway to be routed to specific services), another gateway instance can be configured in a group with different `REQUEST_VERSION` value and started for this.

Following is an example where GWWS inherits a request version "`1`" from its `UBBCONFIG` settings, and therefore exposes services that are advertised by Oracle Tuxedo application servers which include "`1`" in their `VERSION_RANGE` settings (such as `GROUP1` here). If a service exposed by GWWS is actually performed by a server in `GROUP2`, the result is a `TPENOENT` error forwarded to the remote Web Services client.

Example 1-8 Using Tuxedo Version Based Routing with Tuxedo Services Exposed as Web Services

```
...
GROUP1
LMID=L1 GRPNO=2 VERSION_RANGE="1-2"
GROUP2
LMID=L1 GRPNO=2 VERSION_RANGE="3-4"
GWWS_GRP
LMID=L1 GRPNO=3 REQUEST_VERSION=1
...
|mySERVER SRVGRP=GROUP2 SRVID=30
...
GWWS SRVGRP=GWWS_GRP SRVID=30
...
```

1.1.3 Configuring External Web Services

You can configure external web service via SALT web console or manually.

This section contains the following topics:

- Web Console SALT Configuration
- Manual SALT Configuration
- Using Oracle Tuxedo Version-Based Routing (Outbound)

1.1.3.1 Web Console SALT Configuration

A web console is a GUI based SALT configuration tool. One of its features is to import external web services by providing a WSDL file.

The WSDL file is provided as input to the "Import External Web Services" in the SALT web console main web page. The input file can exists locally from where the web console is launched or on the server (remote) where the GWWS server is actively running.

The GWWS Server upon receiving the WSDL file uses the wsdlcvt tool to generate the following files corresponding to their extensions in the `APPDIR` directory:

```
wsdlcvt -y -f -i <input_WSDL_file> -o <base_name>
```

`XSD` - XML schema file.

`MIF` - Metadata repository file.

`FML32` - FML32 field table file.

`WSDF` - Non-native WSDF file.

Note:

Please note that the user has to just input the WSDL file the above files are generated internally by the GWWS server without the intervention of the user.

After the files are successful generated, the user has to then set the following environment variables in the `APPDIR` directory

`FLDTBLDIR32`

`FIELDTBLS32`

`XSDDIR`

`XSDFILES`

The GWWS server reloads the Service Metadata Repository and the SALT configuration file (`SALTCONFIG`) with the new services/operations and Bindings that were imported from the WSDL file.

The web services that were imported are displayed in the SALT web console main page under the "Imported Web Services" section. For more information, see.

1.1.3.2 Manual SALT Configuration

This section contains the following topics:

- Converting a WSDL File into Oracle Tuxedo Definitions
- WSDL-to-Tuxedo Service Metadata Keyword Mapping
- WSDL-to-WSDF Mapping
- Post Conversion Tasks

1.1.3.2.1 Converting a WSDL File into Oracle Tuxedo Definitions

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

The SALT WSDL converter is composed of two parts:

- The xsl files, which process the WSDL file.

- The command utility, wsdlcvt<WSDF>, 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 Oracle Tuxedo definition files.

```
wsdlcvt -i GoogleSearch.wsdl -o GSearch
```

The following table lists the Oracle Tuxedo definition files generated by SALT WSDL Converter.

Table 1-3 Tuxedo Definition Files generated by SALT WSDL Converter

Generated File	Description
Oracle Tuxedo Service Metadata Repository input file	SALT WSDL Converter converts each `wsdl:operation` to a Oracle Tuxedo service metadata syntax compliant service called SALT proxy service. SALT proxy services are advertised by `GWWS` servers to accept ATMI calls from Oracle Tuxedo applications.
FML32 field table definition file	SALT maps each `wsdl:message` to an Oracle Tuxedo FML32 typed buffer. The 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 an SALT proxy service, Oracle 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 Oracle 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 Oracle Tuxedo Service Metadata Definition input file and FML32 field table definition file must be changed accordingly. For more information, see Resolving Naming Conflict For the Generated SALT Proxy Service Definitions

Table 1-3 (Cont.) Tuxedo Definition Files generated by SALT WSDL Converter

Generated File	Description
Non-native WSDF file	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 anon-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.

1.1.3.2.2 WSDL-to-Tuxedo Service Metadata Keyword Mapping

The following table lists WSDL Element-to-Tuxedo Service Metadata Definition Keyword mapping rules.

Table 1-4 WSDL Element-to-Tuxedo Service Metadata Definition Mapping

WSDL Element	Corresponding Oracle 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 Oracle Tuxedo system. If the wsdl operation local name is less than 15 characters, the 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 Oracle Tuxedo FML32 buffer types. 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 Oracle SALT Programming Web Services.
`/wsdl:definitions /wsdl:portType /wsdl:operation /wsdl:output`	`outbuf=FML32`	
`/wsdl:definitions /wsdl:portType /wsdl:operation /wsdl:fault`	`errbuf=FML32`	

1.1.3.2.3 WSDL-to-WSDF Mapping

The following table lists WSDL Element-to-WSDF Element mapping rules.

Table 1-5 WSDL Element-to-WSDF Element Mapping

WSDL Element	WSDF Element	Note
`/wsdl:definitions @targetNamespace`	`/Definition @wsdlNamespace`	Each wsdl:definition maps to a WSDF Definition.

Table 1-5 (Cont.) WSDL Element-to-WSDF Element Mapping

WSDL Element	WSDF Element	Note
`/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 is equal 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.

1.1.3.2.4 Post Conversion Tasks

The following post conversion tasks must 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

1.1.3.2.4.1 Resolving Naming Conflict For the Generated SALT Proxy Service Definitions

When converting a WSDL file, unexpected naming conflicts may arise 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, 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 an external WSDL file into Oracle Tuxedo definitions, each `wsdl:message` is parsed and mapped as an FML32 buffer format which contains 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 generated 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`.

1.1.3.2.4.2 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 Oracle Tuxedo Service Metadata Repository through tmloadrepos utility. For more information, see tmloadrepos, in the Oracle Tuxedo Command Reference Guide.

1.1.3.2.4.3 Setting Environment Variables for GWWS Runtime

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

- Update *`FLDTBLDIR32`* and *`FIELDTBLS32`*environment variables to add the generated FML32 field table files.
- Place all excerpted XML Schema files into one directory. and set the *`XSDDIR`* and *`XSDFILES`* environment variables accordingly.
  - The *`XSDDIR`* and *`XSDFILES`* environment variables, are introduced in the 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
    ```

1.1.3.3 Using Oracle Tuxedo Version-Based Routing (Outbound)

When using Oracle Tuxedo version-based routing with External Web services imported into Tuxedo using SALT, please note:

- Since one GWWS instance cannot advertise more than one service with same name, that same service has to be in a different instance.
- Based on the above, the existing mechanism can simply be used; configure multiple GWWS instances with `VERSION_RANGE` in its `*GROUP`settings accordingly.

Following is an example where Oracle Tuxedo programs (client or server) call an external Web service exposed by both GWWS in groups `GROUP2` and `GROUP3`. Programs using version `1` or `2` are routed to the service exposed by GWWS in `GROUP2` which may connect to endpoint `1`, and programs using version `3` or `4` are routed to the service exposed by GWWS in `GROUP3` which may connect to a different endpoint than GWWS in `GROUP2`.

Example 1-9 Oracle Tuxedo Version-Based Routing with External Web Services

```
...
GROUP2
LMID=L1 GRPNO=2 VERSION_RANGE="1-2"
GROUP3
LMID=L1 GRPNO=3 REQUEST_VERSION=1 VERSION_RANGE="3-4"
...
GWWS SRVGRP=GROUP2 SRVID=30
...
GWWS SRVGRP=GROUP3 SRVID=30
...
```

1.1.4 Configuring Multiple Bindings

This section contains the following topics:

- SALT Inbound Services
- SALT Outbound Services

1.1.4.1 SALT Inbound Services

The users are allowed to create multiple bindings for the same service group and service operation. However, it does not allow creating multiple bindings for different service groups and operation.

Multiple Bindings can be created for inbound services for the following:

- The users can add endpoint addresses for each of the binding created. This is useful when there is "http" and "https" needed per service.
- The users can add more than one SOAP attribute values.
  - To specify different SOAP versions. For example: SOAP version 1.1, or 1.2.
  - To specify Encoding styles. For example: RPC/encoded or Doc/Literal.

You must use the web console to add multiple bindings.

1.1.4.2 SALT Outbound Services

The web services that are imported using the WSDL file are outbound services, where a Tuxedo client can send a request and receive response from the external web service.

The users for the imported web service can change the value of the end point address via web console and the Policy files. However, the users are not allowed to add any multiple bindings or add SOAP attributes.

1.1.5 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.

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

To create a `SALTDEPLOY` file, follow the steps below:

- Importing the WSDF Files
- Configuring the GWWS Servers
- Configuring System-Level Resources

1.1.5.1 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.

The following example shows how to import WSDF files in the `SALTDEPLOY` file:

Example 1-10 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>
```

1.1.5.2 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.

The following example shows how to configure GWWS servers with both inbound and outbound endpoints.

Example 1-11 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=" simpapp_GWWS1_HTTPPort" />
          <Endpoint use=" simpapp_GWWS1_HTTPSPort" />
        </Binding>
        <Binding ref="app3:app3_binding" />
      </Outbound>
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

- Configuring GWWS Server-Level Properties
- Configuring Multiple Encoding Support

1.1.5.2.1 Configuring GWWS Server-Level Properties

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

The following table lists GWWS server-level properties:

Table 1-6 GWWS Server-Level Properties

Property Name	Description	Value Range	Default
`enableMultiEncoding`	Switch on/off the SOAP message multiple encoding support on/off.	`“true”|“false”`	“false”
`max_backlog`	Specifies socket backlog control value.	`[1, 255]`	20
`max_content_length`	Specifies the maximum allowed incoming HTTP message content length.	`[0,1G](byte) (Can set suffix ‘M’,’G’, eample.1.5M, 0.2G)`	0(means no limit)

Table 1-6 (Cont.) GWWS Server-Level Properties

Property Name	Description	Value Range	Default
`thread_pool_size`	Specifies the GWWS server thread pool size.	`[1,1024]`	16
`timeout`	Specifies the network timeout in seconds.	`[1,65535] (unit:sec)`	300
`wsrm_acktime`	Specifies 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 Oracle Tuxedo service returns the response message.	`"NETRECV" | "RPLYRECV"`	"NETRECV"

Note:

For more information, see Configuring Multiple Encoding Support

For more information, see Tuning the GWWS Server" in Administering SALT at Runtime.

Example 1-12 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>
```

1.1.5.2.2 Configuring Multiple Encoding Support

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

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 “enableMultiEncoding” property should be set to “true” as shown in the example below:

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.

Example 1-13 Configuring GWWS Server Multiple Encoding Property

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

The following table explains the detailed SOAP message and Oracle Tuxedo buffer encoding mapping rules if the GWWS server level multiple encoding switch is turned on.

Table 1-7 SALT Message Encoding Mapping Rules

Mapping from	Mapping to	Encoding Mapping Rule
SOAP/XML	Oracle Tuxedo Typed Buffer	`string/mbstring/xml` buffer or field character 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 contains only `UTF-8` encoding characters. **Note:** Oracle Tuxedo Developers must ensure the STRING characters are `UTF-8` encoded.
MBSTRING/XML Typed Buffer	SOAP/XML	SOAP xml encoding equals to MBSTRING/XML encoding.

Table 1-7 (Cont.) SALT Message Encoding Mapping Rules

Mapping from	Mapping to	Encoding Mapping Rule
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:** Oracle Tuxedo Developers must ensure the `FLD_STRING` characters in the same buffer are consistent.
FML/32, VIEW/32 Typed Buffer that containing the different encoding 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 encoding are converted into `UTF-8` in the SOAP message. **Note:** Oracle Tuxedo Developers must ensure the `FLD_STRING` characters in the same buffer are `UTF-8` encoded.

1.1.5.3 Configuring System-Level Resources

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:

- Configuring Certificates
- Configuring Plug-in Libraries

1.1.5.3.1 Configuring Certificates

Certificate information must be configured in order for the `GWWS` server to create an TLS 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. TLS clients can optionally be verified if the `<Certificate>/<VerifyClient>` sub-element is set to `true`.

Note:

By default, the `GWWS` server does not verify TLS clients.

If TLS 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. Save separate certificate PEM format files in one directory and define the directory path using the <`<Certificate>/<CertPath>` sub-element.

> **Note:**
>
> The "`cn`" attribute of a distinguished name is used as a key for certificate lookup. Wildcards used in a name are not supported. Empty subject fields are not allowed. This limitation is also found in Oracle Tuxedo.

The following example shows a `SALTDEPLOY` file segment configuring `GWWS` server certificates.

Example 1-14 Configuring Certificates In the SALTDEPLOY File

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

1.1.5.3.2 Configuring Plug-in Libraries

A plug-in is a set of functions that are called when the `GWWS` server is running. 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.

The following example shows a `SALTDEPLOY` file segment configuring multiple customized plug-in libraries to be loaded by the `GWWS` servers.

Example 1-15 Configuring Plug-in Libraries 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
```

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 plug-in interfaces. For more information, see Using SALT Plug-Ins in Oracle SALT Programming with Web Services.

1.1.6 Configuring Advanced Web Service Messaging Features

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.
- Message Transmission Optimization Mechanism (MTOM)
  Supports binary attachment in native and external web services.

  This section contains the following topics:

- Web Service Addressing
- Web Service Reliable Messaging
- Message Transmission Optimization Mechanism (MTOM)

1.1.6.1 Web Service Addressing

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

1.1.6.1.1 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.

The following example shows a `SALTDEPLOY` file segment enabling WS-Addressing for a referenced outbound Web service binding.

Example 1-16 WS-Addressing Endpoint Defined for Outbound Web Service Binding

```
<Deployment ..>
  ...
  <WSGateway>
    <GWInstance id="GWWS1">
      ...
      <Outbound>
        <Binding ref="app1:app1_binding">
          <WSAddressing>
            <Endpoint address=”https://myhost:8801/app1_async_point”
tlsversion=TLSv1.2>
          </WSAddressing>
          <Endpoint use=" simpapp_GWWS1_HTTPPort" />
          <Endpoint use=" simpapp_GWWS1_HTTPSPort" />
        </Binding>
        <Binding ref="app2:app2_binding">
          <WSAddressing>
            <Endpoint address=”https://myhost:8802/app2_async_point”
tlsversion=TLSv1.2>
          </WSAddressing>
          <Endpoint use=" simpapp_GWWS1_HTTPPort" />
          <Endpoint use=" simpapp_GWWS1_HTTPSPort" />
        </Binding>
      </Outbound>
    ...
    </GWInstance>
  </WSGateway>
  ...
</ Deployment>
```

Note:

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.

The attribute `tlsversion` specifies the TLS version used in an TLS network connection. If the `tlsversion` attribute is not specified, GWWS endpoint uses TLS version 1.2 in release 22.1.0.0.0 and TLS version 1.3 or 1.2 in release 22.1.1.0.0. In the release 22.1.0.0.0, the `tlsversion` attribute supports TLS version 1.2 (`TLSv1.2`), TLS version 1.1 (`TLSv1.1`), and TLS version 1.0 (`TLSv1.0`). In the release 22.1.1.0.0, it supports TLS version 1.3 (`TLSv1.3`) and TLS version 1.2 (`TLSv1.2`).

1.1.6.1.2 Disabling WS-Addressing

If you create a WS-Addressing endpoint in the `SALTDEPLOY` file or not, 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 on any inbound services.

The following example shows WSDF file segment disabling Addressing capability.

Example 1-17 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>
```

1.1.6.2 Web Service Reliable Messaging

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
- Specifying the Reliable Messaging Policy File in the WSDF File

1.1.6.2.1 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, see the SALT WS-ReliableMessaging Policy Assertion Reference in the SALT Reference Guide.

Following is an example of Reliable Messaging Policy File:

Example 1-18 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>
```

1.1.6.2.2 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 example shows how to reference the WS-ReliableMessaging policy file:

Example 1-19 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 SALT does not support process/system failure scenarios, which means SALT does not store the message in a persistent storage area. SALT works in a *direct mode* with the SOAP client. Usually, system failure recovery requires business logic synchronization between the client and server.

1.1.6.3 Message Transmission Optimization Mechanism (MTOM)

SALT supports binary attachments for CARRAY typed buffers or CARRAY fields in fielded buffers (VIEW, VIEW32, FML or FML32). By default binary buffers/fields are base64 encoded. As shown in the example below, in order to enable MTOM the configuration must be added to a service or service group in a WSDF file.

Example 1-20 <Policy location="salt:ws-mtom.xml"/>

```
<Definition ...>
 <WSBinding id="simpapp_binding">
  <Servicegroup id="simpapp">
   <Service name="toupper">
     <Policy location="salt:ws-mtom.xml"/>
   </Service>
   <Service name="tolower" />
  </Servicegroup>
  ....
 </WSBinding>
</Definition>
```

1.1.7 Configuring Security Features

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

Note:

Starting Oracle Tuxedo (22.1.1.0.0) introduces support for TLS version 1.3.

- Configuring Transport-Level Security
- Configuring Message-Level Web Service Security
- Configuring SAML Single Sign-On
- Configuring X.509-Based Authentication

1.1.7.1 Configuring Transport-Level Security

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

This section contains the following topics:

- Setting Up TLS Link-Level Security
- Configuring Inbound HTTP Basic Authentication
- Configuring Outbound HTTP Basic Authentication

1.1.7.1.1 Setting Up TLS Link-Level Security

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

The GWWS server automatically creates TLS secured connection to outbound endpoints that are published with URLs that having prefix “https://”.

1.1.7.1.2 Configuring Inbound HTTP Basic Authentication

SALT depends on the Oracle Tuxedo security framework for Web Service client authentication. There is no special SALT configuration required to enable inbound HTTP Basic Authentication. If the Oracle Tuxedo system requires user credentials, HTTP Basic Authentication is an alternative for Web Service client programs to carry user credentials.

The `GWWS` gateway supports Oracle 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 Oracle 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 Oracle Tuxedo username “`Aladdin`” and the password “`open sesame`”, and uses this paired value for Oracle Tuxedo authentication.

- Using Application Password (`APP_PW`)
  If Oracle Tuxedo uses `APP_PW`, then the HTTP username value is ignored and the `GWWS` server only uses the password string as the Oracle Tuxedo application password to check the authentication.
- Using User-level Authentication (`USER_AUTH`)
  If Oracle Tuxedo uses `USER_AUTH`, then both the HTTP username and password value are used. In this case, the `GWWS` server does not check the Oracle Tuxedo application password.

1.1.7.1.3 Configuring Outbound HTTP Basic Authentication

SALT supports authentication plug-in development to prepare user credentials for outbound HTTP Basic Authentication. Outbound HTTP Basic Authentication is configured at Endpoint-level. If an outbound Endpoint requires a user profile in the HTTP message, you must specify the HTTP Realm for the HTTP endpoint in the WSDF file. The `GWWS` server invokes the authentication plug-in library to prepare usernames and passwords, and sends them using HTTP Basic Authentication mechanism in the request message.

The following example shows how to enable HTTP Basic Authentication for the outbound endpoints:

Example 1-21 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 sent to an outbound endpoint using <`Realm`> element, the `GWWS` server passes the Oracle 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 Oracle Tuxedo client information. To obtain Oracle Tuxedo client `uid / gid` for HTTP basic authentication `username/password` mapping, Oracle Tuxedo security level may also need to be configured in the `UBBCONFIG` file.

For more information, see Configuring Oracle Tuxedo Security Level for Outbound HTTP Basic Authentication and Programming Outbound Authentication Plug-Ins in the SALT Programming Web Services.

1.1.7.2 Configuring Message-Level Web Service Security

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

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

This section contains the following topics:

- Main Use Cases of Web Service Security
- Using WS-Security Policy Files

1.1.7.2.1 Main Use Cases of Web Service Security

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.

1.1.7.2.2 Using WS-Security Policy Files

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 SALT.

Following example lists WS-Security Policy files bundled by SALT:

Table 1-8 WS-Security Policy Files Provided By SALT

File Name	Purpose
`wssp1.0-username-auth.xml`	WS-Security Policy 1.0. Plain Text Username Token for Service Authentication

Table 1-8 (Cont.) WS-Security Policy Files Provided By SALT

File Name	Purpose
`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-UsernameToken-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 (with the exception of the WS-Security Policy 1.2 `UserToken` file), can be referenced using`<Servicegroup>` or `<Service>` elements in the native `WSDF` file. The WSSP 1.2 `UserToken` file can only be referenced using `<Servicegroup>`

The following is an example of policy assignment making that the service "`TOUPPER`" requires client send a `UsernameToken` (in plain text format) and an X509v3Token in request, and also requires the `SOAP:Body` part of message to be signed with the X.509 token. The sample "`wsseapp`" shows how to clip the WSSP 1.2 `UserToken` file used in the `<Service>` element .

Example 1-22 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 using the "`location`" attribute of the `<Policy>` element. A prefix "salt:" means an SALT default bundled policy file is used. User-defined policy file can be used by directly specifying the file path.

Note:

If a policy is referred at the `<Servicegroup>` level, it applies 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 the `SOAP:Body` of the output message is not signed.

1.1.7.3 Configuring SAML Single Sign-On

SALT supports SAML 1.1 and SAML 2.0 Single Sign-On (SSO). You can use Single Sign-On to process a secure incoming request by performing authentication on behalf of the end user, without having to request their credentials.

The SALT implementation of SAML SSO supports the sender-vouches confirmation method. With this method, SALT represents a back-end system, and a Web Service intermediary sits between the back-end and the end user. In this case, the Web Service intermediary "vouches" for the end user using SAML token mechanisms.

Note:

In order to use SAML SSO, make sure you have correctly configured the `<Certificates>` element in the `SALTDEPLOY` file.

- Transport Protection
- SAML Key File

1.1.7.3.1 Transport Protection

Although it is not required to use TLS as a transport to carry an SAML security token to access Oracle Tuxedo through GWWS, it is recommended that the Web Service intermediary use TLS to access Oracle Tuxedo through GWWS using an SAML security token. The use of TLS ensures the SOAP message content from being disclosed or modified without detection This is particularly important when accessing Oracle Tuxedo services through a wide area network outside of a fire wall.

1.1.7.3.2 SAML Key File

The public key certificate of trusted SAML assertion issuers must be located in the $APPDIR directory. These certificates must be in PEM format. The name of the certificate must reflect the issuer name. For instance, if the issuer id is "`ws_1`" then the certificate name should be `ws_1.pem`.

However, for long issuer names the key file provides the ability to correlate between the real issue name and its local reference name so that the `PEM` file name can be much more concise but still remain useful to the administrator.

For example, if the assertion issuer name is `web.abc.com/saml/authenticator`, then the `PEM` file name for its public key certificate can be called "`abc.pem`" instead of "`www.abc.com/saml/authenticator.pem`".

This is especially useful when in a UNIX environment where the "/" symbol also works as a path separator. This translation is required when confusion like this may arise.

The key file name is fixed to"`saml_key.meta`". It should be located in the same file folder specified by "`CertPath`". This file should be protected by the file system and is in XML format.

This section contains the following topics:

- Key File Format
- File Information
- GWWS Key
- Assertion Issuer Information
- Key File Generation
- Procedure to Manage Key File
- WS-Policy Files
- Mapping SAML Elements with Oracle Tuxedo Security

1.1.7.3.2.1 Key File Format

The key file is an XML file. There are three types of information stored in this file:

file information, GWWS key, and issuer information.

> **Note:**
>
> You should not modify this file manually since this will cause the file to fail integrity checking.

1.1.7.3.2.2 File Information

The file information section contains the version number of the tool generated this file, a random key, administrative password, and digital signature.

1.1.7.3.2.3 GWWS Key

This GWWS key section contains one GWWS symmetric key. There can be only one symmetric configured for GWWS to simplify the validation task. This key is encrypted with obfuscated key. This section is optional and is missing if no GWWS symmetric key is configured.

In MP configuration with multiple GWWS on different machine nodes, this file needs to be replicated on each node; however, if a different GWWS key is desired, then a similar key file but with a different GWWS key record can be copied to a different node.

1.1.7.3.2.4 Assertion Issuer Information

This section contains multiple records, one for each trusted assertion issuer. It contains issuer identifier, local issuer identifier, symmetric key, and whether a public key certificate also exists or not.

The issuer identifier is the value presented in the "`issuer`" attribute of "`<saml:Assertion>`" element in the WSSE security header.

The local issuer identifier is the abbreviated name for the issuer. The purpose is to make any long issuer identifier become shorter and easier to memorize, but still remain locally unique. This data is optional; if it exists and a certificate also exists, then the certificate must take the name of this local issuer identifier with `'pem"` as file extension.

The symmetric key is the shared secret that issuer used to sign the assertion. This data is optional. The length of the key also dictates which algorithm can be used for signing.

The public key certificate exists field tells whether a public key certificate exists. If it exists, the certificate should be located in the folder specified by the `"CertPath"` element. This field can be true while the symmetric key field also exists. At runtime, GWWS detects which key to use to validate the signature.

1.1.7.3.2.5 Key File Generation

A new command is added to `wsadmin` to manage the key file. This new command is used to generate new key file, add new record, delete existing record, and modify record. The name of the file it managed is "`saml_key.meta`" in the current working directory.

To create the key file issues the following `wsadmin` command:

```
saml create -p password
```

Where the "`-p password`" is for the administrative password to access the newly created key file. A key file with name "`saml_key.meta`" is created in the current working directory.

To add a trusted issuer, input the following command:

```
saml add -i -n authority.abc.com -l abc -c -p password
```

Where "`-i`" tells it to add an issuer with name `"authority.abc.com"` with short local reference name `"abc"` and the access password to access the key file. The key file `saml_key.meta`" must exist in current working directory. Since `"-c"` option is given, a public key certificate named `"abc.pem"` must exist in the `"CertPath"`.

For more information, see wsadmin topic in the the SALT Command Reference guide.

1.1.7.3.2.6 Procedure to Manage Key File

The following procedure describes a SALT administrator setting up GWWS to be able to handle SAML assertion for the first time.

1. Change directory to `$APPDIR` and start `wsadmin`.
2. Use "`saml create`" command to create the key file.
3. Use "`saml add -g`" command to add GWWS record.
4. Use "`saml add -i`" command to add trusted assertion issuer record for every trusted assertion issuer.
5. Copy the file `"saml_key.meta"` to the directory described in the SALT deployment descriptor file `"CertPath"` element under "Certificate".
6. Change directory to Oracle Tuxedo application domain, and use `"tmboot -y"` to boot the Oracle Tuxedo application domain.

In MP mode configuration, it is possible to have a different GWWS record in the key file for a different GWWS instance. The following procedure creates the key file for a GWWS instance on a different node.

1. Copy the original key file to different directory or machine.

2. Use "`saml delete -g`" to delete existing GWWS record.
3. Use "`saml add -g`" to add a different GWWS record.
4. Boot Oracle Tuxedo.

1.1.7.3.2.7 WS-Policy Files

SALT includes a number of WS-Policy files that you can use for configuring services for SAML SSO as listed in Table below:

Table 1-9 SAML SSO Policy Files

File Name	Purpose
Wssp1.2-2007-Saml1.1-SenderVouches-Https.xml	SAML 1.1 support (with TLS)
Wssp1.2-2007-Saml2.0-SenderVouches-Https.xml	SAML 2.0 support (with TLS)
Wssp1.2-2007-Saml1.1-SenderVouches.xml	SAML 1.1 support (without TLS)
Wssp1.2-2007-Saml2.0-SenderVouches.xml	SAML 2.0 support (without TLS)

The above files can be referenced at the `<ServiceGroup>` or `<Service>` level in the native WSDF file.

This policy may be combined with other WS-Security policies (such as inbound body signature). For more information, see Configuring Message-Level Web Service Security

Following is an example of the SAML 1.1 policy file with supported capabilities outlined.

Example 1-23 SAML 1.1 Policy File

```
<?xml version="1.0"?>

<wsp:Policy xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
xmlns:sp="http://docs.oasis-open.org/ws-sx/ws-securitypolicy/200702">

     <sp:AsymmetricBinding>
        <wsp:Policy>
          <sp:InitiatorToken>
            <wsp:Policy>
              <sp:X509Tokensp:IncludeToken="http://docs.oasis-open.org/ws-
sx/ws-securitypolicy/200512/IncludeToken/Always">
            <wsp:Policy>
              <sp:WssX509V3Token10/>
               </wsp:Policy>
          </sp:X509Token>
        </wsp:Policy>
      </sp:InitiatorToken>
      <sp:RecipientToken>
        <wsp:Policy>
          <sp:X509Token sp:IncludeToken="http://docs.oasis-open.org/ws-sx/ws-
securitypolicy/200512/IncludeToken/Never">
           <wsp:Policy>
             <sp:WssX509V3Token10/>
           </wsp:Policy>
         </sp:X509Token>
       </wsp:Policy>
      </sp:RecipientToken>
      <sp:AlgorithmSuite>
        <wsp:Policy>
          <sp:Basic256/>
        </wsp:Policy>
      </sp:AlgorithmSuite>
      <sp:Layout>
        <wsp:Policy>
          <sp:Lax/>
        </wsp:Policy>
      </sp:Layout>
      <sp:IncludeTimestamp/>
      <sp:ProtectTokens/>
    </wsp:Policy>
  </sp:AsymmetricBinding>
  <sp:SignedSupportingTokens>
    <wsp:Policy>
      <sp:SamlToken
sp:IncludeToken="http://docs.oasis-open.org/ws-sx/ws-securitypolicy/200702/
IncludeToken/AlwaysToRecipient">
        <wsp:Policy>
          <sp:WssSamlV11Token10/>
        </wsp:Policy>
      </sp:SamlToken>
    </wsp:Policy>
  </sp:SignedSupportingTokens>
</wsp:Policy>
```

1.1.7.3.2.8 Mapping SAML Elements with Oracle Tuxedo Security

The following table lists what optional SAML assertion elements must present.

Table 1-10 Optional SAML Assertion Elements

Oracle Tuxedo Security and SAML Assertion Correspondence		
Oracle Tuxedo SECURITY Level	**Additional SAML Assertion Elements Required**	**Access Principal**
`NONE`	None	Anonymous, Subject/NameID
`APP_PW`	None	Anonymous, Subject/NameID
`USER_PW`	Subject	Subject/NameID
`ACL`	Subject	Subject/NameID
`MANDATORY_ACL`	Subject	Subject/NameID

In `NONE` and `APP_PW` cases, if the optional element "`Subject`"exists, then "`NameID`"is used to access Oracle Tuxedo. If the optional element "`Subject`"does not exist, then the client assumes anonymous user identity to access Oracle Tuxedo. If the anonymous access is not allowed (i.e. no credential mapping for anonymous), then the request fails.

If the `SAML` assertion does not contain a "`Subject`" element and Tuxedo `SECURITY` level is configured at `USER_PW`, `ACL`, or `MANDATORY_ACL`, then the request is rejected.

1.1.7.4 Configuring X.509-Based Authentication

A X.509 V3 public key certificate is required for X.509 based authentication for an outbound GWWS SOAP message. The public key certificate used for this purpose can be configured as either one certificate for all the requests targeted for the same Web Service or per request invocation if Tuxedo SECURITY is set at USER_AUTH or higher. In the later case, the certificate must have the same name as the Tuxedo user identification or the mapped remote user name if identity mapping plug-in is installed.

The configured X.509 public key certificate will be used for:

1. Mutual Authentication for Transport Layer security (that is,TLS).
2. Message signing.
3. Part of the SOAP message that can be used to authenticate user at message-level (as oppose to transport layer).

Whether all 3 tasks will be performed or only partial of the 3 tasks depends on the WS policy used by the Web Service.

Since message encryption will not be supported as it is not required it is recommended to use TLS as the preferred transport mechanism to protect the integrity and privacy of the message. The X.509 Public Key certificate used for TLS can be different from the one used for signing depends on how user configure it.

When GWWS received a request from client it will process the message, optionally it will sign the message and attach the certificate as the binary security token to the SOAP request message if WS policy requires it; and then send the request to remote Web Service through TLS. Depends on the WS policy this TLS connection can be either one-way or two-way TLS.

During the TLS connection establishing process the application server will validate the client certificate if the connection is two-way TLS; and forward the request to Web Service.

When Web Service received the request it will validate the certificate, verify the signature if Web Service requires it. If the request is good it will send reply back. The reply send back by Web Service may be also signed depends on WS policy.

When GWWS received the reply it will forward reply back to actual SALT client. In the case that reply is signed GWWS will validate the certificate and verify the signature before forwarding the reply back to SALT client.

Example 1-24 SOAP message based on X.509 Authentication

```
<S11:Envelope xmlns:S11="…" >
<S11:Header>
<wsse:Security xmlns:wsse="…" xmlns:wsu="…">
<wsse:BinarySecurityToken
wsu:id="binarytoken"
ValueType="wsse:X590v3"
EncodingType="wsse:Base64Binary">
MIIEzzCCA9CgAwIBAgIQEmtJZc0…
</wsse:BinarySecurityToken>
<ds:Signature xmlns:ds="http://www.w3.org/2000/09/xmldsig#">
<ds:SignedInfo>
<ds:Reference URI="#body">…</ds:Reference>
<ds:Reference URI="#binarytoken">…</ds:Reference>
</ds:SignedInfo>
…
```

```
</ds:Signature>
</wsse:Security>
</S11:Header>
<S11:Body wsu:Id="body" xmlns:wsu="…">
…
</S11:Body>
</S11:Envelope>
```

For user to successfully access Web Service through GWWS user must configure a valid client certificate and private key that is accessible to GWWS at runtime. This certificate and private key can be used by transport level security or message level security, or even both depend on Web Service' requirement.

Currently Tuxedo SALT only support single certificate which is configured through the "System" element in the deployment descriptor, with this limitation all the requests going through different instances of GWWS gateway 1 will use same certificate to establish TLS connection. Invariably, in the eyes of the Web Service they all come from the same user; thus same access privilege. This new feature will remove this constraint and make it possible to use different certificate to represent different client or gateway.

SALT configuration consists of a deployment descriptor (DEP) and multiple web service definition files (WSDF). This new feature will use "Property" to configure default user identity to be used for this purpose, or to instruct GWWS to how to use filters/mappers to map Tuxedo user identity to a X.509 certificate. The "Property" which is used for configuration is an XML element that is available as configurable child element to both "GWInstance" and "Service". "GWInstance" is configured in SALT deployment descriptor while "Service" is configured in SALT web service definition file.

When a Web Service' WS-Security policy requires message level security, GWWS will use the private key to perform message signing, and attach the certificate to the SOAP message as Binary Security Token to be used by target Web Service to validate the message and authenticate the user. Otherwise, it will only use the certificate and private key to create a secured transport layer connection, i.e. TLS.

Whether a service request will use "X.509" security token for user identity is determined by the WS Security Policy associated with the Web Service.

Note:

This feature only supports X.509 V3 Public Key Certificate; other versions are not supported.

- Certificate Sources
- Properties

1.1.7.4.1 Certificate Sources

The X.509 V3 Public Key Certificate used for message level security can come from one of the following sources:

1. The X.509 Certificate configured for the transport security.

2. The X.509 Certificate associates with a particular instance of GWWS gateway.

3. The X.509 Certificate associates with the preset principal of the Web Service.

4. The X.509 Certificates associate with SALT clients.

1.1.7.4.2 Properties

There are three new properties added to the configuration to aid different security configurations. All 3 properties are available in "GWInstance" and "Service". The "Service" element is available in WSDF, and the "GWInstance" is available in SALT deployment descriptor.

- defaultClientIdentification
- useSingleClientIdentification
- allowAnonymousAccess

1.1.7.4.2.1 defaultClientIdentification

This property defines the default client name to be used for X.509 certificate lookup. The one configured in the "Service" has precedence over the one configured in "GWInstance".

The following example shows the effective default client name will be "catalina" for service "GetData".

Example 1-25 defaultClientIdentification

```
<?xml version="1.0" encoding="UTF-8" ?>
<!- Sample.wsdf
-->
<Definition …>
<WSBinding id="sample_Binding">
<SOAP>
<AccessingPoiints>
…
</AccessingPoint>
</SOAP>
<ServiceGroup id="SampleSrvGrp">
<Service name="GetData">
<Property name="defaultClientIdentification" value="catalina"/>
</Service>
</ServiceGroup>
</WSBinding>
</Definition>
```

Example 1-26 defaultClientIdentification

```
<?xml version="1.0" encoding="UTF-8"?>
<!- sample.dep
-->
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
<Import location="c:/salt/x.509/Sample.wsdf"></Import>
</WSDF>
<WSGateway>
<GWInstance id="INSTANCE1">
<Outbound>
…
</Outbound>
```

```
<Properties>
<Property name="defaultClientIdentification" value="melbourne"/>
</Properties>
</GWInstance>
</WSGateway>
<System>
<Certificate>
…
</Certificate>
</System>
</Deployment>
```

For all other services provided by GWWS instance "INSTANCE1" without their own "defaultClientId" configured then they will use the default client id of the GWWS and in this case it will be "melbourne".

1.1.7.4.2.2 useSingleClientIdentification

"useSingleClientIdentification" tells whether it is desirable for any Web Service use the same client X.509 certificate. When the decision is to enable this filter then all the SALT client request will use the identity configured in "defaultClientIdentification", if "defaultCleintIdentification" is not configured then it is a configuration error and "wsloadcf" will issue an error. By default it is disabled.

This filter only affects the runtime client X.509 certificate selection when Tuxedo "SECURITY" is configured at least at "USER_AUTH" level. If Tuxedo SECURITY is configured as "NONE" or "APP_PW" then this filter will not be used for client certificate selection. The error condition described in previous paragraph will still be true even if this attribute is disabled at runtime.

The following table is a matrix table for decision to enable this single client identification filter:

Table 1-11 Single Client Identification Filter Matrix

Service	GWInstance	Decision
Unconfigured	Unconfigured	Disable
Unconfigured	Configured TRUE	Enabled
Unconfigured	Configured FALSE	Disabled
Configure TRUE	Unconfigured	Enabled
Configure TRUE	Configured TRUE	Enabled
Configure TRUE	Configured FALSE	Enabled
Configure FALSE	Unconfigured	Disable
Configure FALSE	Configured TRUE	Disable
Configure FALSE	Configured FALSE	Disable

The example in the previous section has this filter "disabled" since both places omitted this property.

The following example will have this filter "enabled".

Example 1-27 Filter Enabled

```
<?xml version="1.0" encoding="UTF-8" ?>
<!- Sample.wsdf
-->
```

```
<Definition …>
<WSBinding id="sample_Binding">
<SOAP>
<AccessingPoints>
…
</AccessingPoints>
</SOAP>
<ServiceGroup id="SampleSrvGrp">
<Service name="GetData">
<Property name="defaultClientIdentification" value="catalina"/>
<Property name="useSingleClientIdentification" value="true" />
</Service>
</ServiceGroup>
</WSBinding>
</Definition>
```

Example 1-28   Filter Enabled

```
<?xml version="1.0" encoding="UTF-8"?>
<!- sample.dep
-->
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
<Import location="c:/salt/x.509/Sample.wsdf"></Import>
</WSDF>
<WSGateway>
<GWInstance id="INSTANCE1">
<Outbound>
…
</Outbound>
<Properties>
<Property name="defaultClientIdentification" value="melbourne"/>
</Properties>
</GWInstance>
</WSGateway>
<System>
<Certificate>
…
</Certificate>
</System>
</Deployment>
```

1.1.7.4.2.3 allowAnonymousAccess

This property only affects the X.509 certificate selection when Tuxedo SECURITY is configured at least at "USER_AUTH" level. This property allows users without their own X.509 certificate to use a default client identification when access a Web Service. By default it is disabled.

The following is the matrix table for decision to enable this anonymous client access filter:

Table 1-12   Anonymous Client Access Filter Matrix

Service	GWInstance	Decision
Unconfigured	Unconfigured	Disabled

Table 1-12 (Cont.) Anonymous Client Access Filter Matrix

Service	GWInstance	Decision
Unconfigured	Configured TRUE	Enabled
Unconfigured	Configured FALSE	Disabled
Configure TRUE	Unconfigured	Enabled
Configure TRUE	Configured TRUE	Enabled
Configure TRUE	Configured FALSE	Enabled
Configure FALSE	Unconfigured	Disabled
Configure FALSE	Configured TRUE	Disabled
Configure FALSE	Configured FALSE	Disabled

If the decision is to enable this filter then "defaultClientIdentification" must be configured; if "defaultClientIdentification" is not configured then "wsloadcf" will fail and return an error.

The following is the sample configuration.

Example 1-29 defaultClientIdentification Configured

```
<?xml version="1.0" encoding="UTF-8" ?>
<!- Sample.wsdf
-->
<Definition …>
<WSBinding id="sample_Binding">
<SOAP>
<AccessingPoints>
…
</AccessingPoints>
</SOAP>
<Servicegroup id="SampleSrvGrp">
<Service name="GetData">
<Property name="defaultClientIdentification" value="catalina"/>
<Property name="allowAnonymousAccess" value="true" />
</Service>
</Servicegroup>
</WSBinding>
</Definition>
```

Example 1-30 defaultClientIdentification not configured

```
<?xml version="1.0" encoding="UTF-8"?>
<!- sample.dep
-->
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
<Import location="c:/salt/x.509/Sample.wsdf"></Import>
</WSDF>
<WSGateway>
<GWInstance id="INSTANCE1">
<Outbound>
…
</Outbound>
```

```
<Properties>
<Property name="defaultClientIdentification" value="melbourne"/>
<Property name="allowAnonymousAccess" value="false" />
</Properties>
</GWInstance>
</WSGateway>
<System>
<Certificate>
…
</Certificate>
</System>
</Deployment>
```

1.1.8 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 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, see wsloadcf reference in the SALT Reference Guide

1.1.9 Configuring the UBBCONFIG File for SALT

After configuring and compiling the SALT configuration, the Oracle Tuxedo UBBCONFIG file needs to be updated to apply SALT components in the Oracle Tuxedo application. The following table lists the UBBCONFIG file configuration tasks for SALT.

Table 1-13 UBBCONFIG File Configuration Tasks for 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 Oracle Tuxedo Authentication for Web Service Clients	-	X

Table 1-13 (Cont.) UBBCONFIG File Configuration Tasks for SALT

Configuration Tasks	Required	Optional
Configuring Oracle Tuxedo Security Level for Outbound HTTP Basic Authentication	-	X

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

1.1.9.1 Configuring the TMMETADATA Server in the *SERVERS Section

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 Oracle Tuxedo service definitions.

The following is an example of a segment of the `UBBCONFIG` file that shows how to define `TMMETADATA` servers in an Oracle Tuxedo application.

Example 1-31 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 entire Oracle Tuxedo domain is highly recommended. To ensure this, multiple `TMMETADATA`servers running in the Oracle Tuxedo domain must point to the same repository file.
For more information, see Managing the Oracle Tuxedo Service Metadata Repository in the Oracle Tuxedo documentation.

1.1.9.2 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 Oracle Tuxedo domain. The instance id must be present in the XML version `SALTDEPLOY` file and the generated binary version SALTCONFIG file.

The following is an example of a segment of the UBBCONFIG file that shows how to define GWWS servers in an Oracle Tuxedo application:

Example 1-32   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 Oracle 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.

SALT configuration information is pre-compiled with `wsloadcf` to generate the`SALTCONFIG` file binary. `GWWS` server reads the `SALTCONFIG` file at start up.The *`SALTCONFIG`*environment variable must be set correctly with the `SALTCONFIG` file entity before booting `GWWS` servers.

Option “`-c`” is deprecated in the current version 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.

1.1.9.3 Updating System Limitations in the UBBCONFIG File

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

Tip:

- **Define an adequate MAXSERVERS number in the *RESOURCES section**
  SALT requires the following system servers to be started in an Oracle Tuxedo domain: `TMMETADATA` and GWWS. The number of `TMMETADATA` and GWWS server must be accounted for in the MAXSERVERS value.
- **Define an adequate `MAXSERVICES` number in the *`RESOURCES` section**
  When the GWWS server working in the outbound direction, external wsdl operations are mapped with Oracle 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.
- **Define an adequate `MAXACCESSERS` number in the *`RESOURCES` section**
  The `MAXACCESSERS` value is used to specify the default maximum number of clients and servers that can be simultaneously connected to the Oracle 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.
- **Define an adequate MAXWSCLIENTS number in the *MACHINES section**
  When the GWWS server operating in the inbound direction, each Web Service client is deemed a workstation client in the Oracle Tuxedo system; therefore, `MAXWSCLIENTS` must be configured with a valid number in the `UBBCONFIG` file for the machine where the GWWS server is deployed. The number is shared.

1.1.9.4 Configuring Certificate Password Phrase For the GWWS Servers

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

When `GWWS` servers are specified with certificate-related features, they are required to read the private key file and decrypt it using the password phrase. To configure a password phrase for each `GWWS` server, the keywords *`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.

The example shows a segment of the `UBBCONFIG` file that defines a security password phrase for the `GWWS` servers.

Example 1-33 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 Oracle Tuxedo documentation

1.1.9.5 Configuring Oracle Tuxedo Authentication for Web Service Clients

SALT `GWWS` servers rely on Oracle Tuxedo authentication framework to check the validity of the Web Service clients. If your existing Oracle Tuxedo application is already applied, Web Service clients must send user credentials using one of the following:

- 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 SALT, you must configure Oracle Tuxedo authentication in the Oracle Tuxedo domain.

For more information, see administering_authentication in the Oracle Tuxedo 22c Documentation

1.1.9.6 Configuring Oracle Tuxedo Security Level for Outbound HTTP Basic Authentication

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

The following example shows a segment of the `UBBCONFIG` file that defines security-level ACL in the `UBBCONFIG` file.

Example 1-34 Security-Level ACL Defined in the UBBCONFIG File For Outbound HTTP Basic Authentication

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

1.1.10 Configuring SALT In Oracle Tuxedo MP Mode

To set up `GWWS` servers running on multiple machines within an MP mode Oracle Tuxedo domain, each Oracle 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 Oracle Tuxedo Services consume FML32 typed buffers
- XML Schema files excerpted by `wsdlcvt`

1.1.11 Migrating from 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

1.1.11.1 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. This is supported in SALT 2.0.

The SALT configuration compiler utility, `wsloadcf`, supports loading 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 must perform the following steps:

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

Note:

If you have more than one SALT 1.1 configuration files defined in an Oracle Tuxedo domain, you must follow steps 1 - 3 to generate more binary `SALTCONFIG` files and boot corresponding `GWWS` servers.

1.1.11.2 Adopting SALT 2.0 Configuration Style by Converting SALT 1.1 Configuration File

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

It is highly recommended to start using the SALT 2.0 styled configuration once you get the converted files from SALT 1.1 configuration. If you want to incorporate more than one SALT 1.1 configuration file into one SALT 2.0 deployment, you must manually edit the `SATLDEPLOY` file for importing the other WSDF files.

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

Example 1-35 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 shown in the following examples:

Example 1-36 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 tlsversion=TLSv1.2/>
      </AccessingPoints>
    </SOAP>
  </WSBinding>
</Definition>
```

Example 1-37 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>
```

1.2 Configuring Service Contract Discovery

When discovery is activated for a service, the server that provides the service collects service contract information and sends the information to an internal service implemented by TMMETADATA(5). The same service contract is only sent once to reduce communication overhead.

The `TMMETADATA` server summarizes the collected data and generates a service contract. The contract information can either can be stored in the metadata repository, or output to a text file (which is then loaded to the metadata repository using `tmloadrepos)`. SALT uses the `tmscd` command to control the service contract runtime collection. For more information, see tmscd in the SALT Command Reference Guide

Generated service contract information contains the service name, request buffer information, response buffer information, and error buffer information if there is a failure. The collected service contract information is discarded if it fails to send information to the `TMMETADATA` server. The buffer information includes buffer type and subtype, and field information for FML/FML32 (`name,type,subtype`).

Discovery is supported for any embedded buffer in FML32 buffer. For FML/FML32 field occurrences, the discovery automatically updates the pattern for the `count`/`requiredcount` in metadata repository. Field occurrence does not impact the pattern, but the minimum occurrence is the "`requiredcount`".The maximum occurrence is the "`count`" of the entire contract discovery period.

For VIEW/VIEW32/X_C_TYPE/X_COMMON, only the view name is discovered. SALT can generate a detailed description by view name when using metadata repository.

Note:

Patterns flagged with `autodiscovery` (see Table 1-14) are compared.
If the same `autodiscovery` pattern already exists in the metatdata repository, then the newer pattern is ignored.

Only application ATMI services (local, or imported via /TDOMAIN gateway) are supported. Service contract discovery *does not* support the following services:

- system services (name starts with '.' or '..')
- conversational services
- CORBA services
- /Q and SALT proxy services

Note:

Services without a reply are mapped as "oneway" services in the metadata repository.

- tpforward Support
- Service Contract Text File Output

1.2.1 tpforward Support

If a service issues `tpforward()` instead of `tpreturn()`, its reply buffer information is the same as the reply buffer of the service which it forwards to. For example:

- client calls SVCA with a STRING typed buffer
- SVCA processes the request, and then creates a new FML32 typed buffer as the request is forwarded to SVCB
- SVCB handles the request and returns a STRING buffer to the client. The SVCA contract is `STRING+STRING`. The SVCB contract is `FML32+STRING`

1.2.2 Service Contract Text File Output

If you want collected service contract discovery information logged to a file instead of directly to the metadata repository, you must use the TMMETADATA(5) `-o<filename>` option and then use `tmloadrepos` to manually load the file to the metadata repository. For more information, see tmloadrepos in the Oracle Tuxedo Command Reference Guide.

The output complies with the format imposed by `tmloadrepos` if a file is used as storage instead of the metadata repository. The file contains a service header section and a parameter section for each parameter. Service header contains items listed in the table below:

The "`service`" field format is `<TuxedoServiceName>+'_'+<SequenceNo>`. The suffix `<SequenceNo>` is used to avoid name conflict when multiple patterns are recognized for an Oracle Tuxedo service.

Note:

`<SequenceNo>` starts from the last `<SequenceNo>` number already stored in the metadata repository.

Service parameter contains information is listed in the following table:

Table 1-14 Service Level Attributes

Keyword (abbreviation)	Sample Value	Description
`service(sv)`	`TOUPPER_1`	`<RealServiceName>_<SequenceNo>.`
`tuxservice(tsv)`	`TOUPPER`	The service name.
`servicetype(st)`	`service|oneway`	one way if `TPNOREPLY` is set.
`inbuf(bt)`	`STRING`	FML, FML32, VIEW, VIEW32, STRING, CARRAY, XML, X_OCTET, X_COMMON, X_C_TYPE, MBSTRING or other arbitrary string representing an application defined custom buffer type.
`outbuf(BT)`	`FML32`	set to "NULL" if it is an error reply.
`errbuf(ebt)`	STRING	present only when it is an error reply.
`inview`	-	View name. Present only when inbuf is of type VEW or VIEW32.
`outview`	-	View name. Present only when outbuf is of type VIEW or VIEW32.
`errview`	-	View name. Present only when errbuf is of type VIEW or VIEW32.
`autodiscovery`	`true`	Set to "true".

Table 1-15 Parameter Level Attributes

Keyword (abbreviation)	Sample	Description
`param(pn)`	`USER_INFO`	-
`paramdescription(pd)`	`service parameter`	-
`access(pa)`	`in`	A combination of {in}{out}{err}.

Table 1-15 (Cont.) Parameter Level Attributes

Keyword (abbreviation)	Sample	Description
`type(pt)`	`fml32`	byte, short, integer, float, double, string, carray, dec_t, xml, ptr, fml32, view32, mbstring.
`subtype(pst)`	-	A view name for a view or view32 typed parameter.
`count`	100	The maximum occurrence of FML/FML32 field watched during the collection period
`requiredcount`	1	The minimum occurrence of FML/FML32 field watched during the collection period.

- Examples

1.2.2.1 Examples

Example 1:

Input: `service=SVC, request=STRING, reply = TPSUCCESS + STRING`

Output Pattern:
`service=SVC_1,tuxservice=SVC,inbuf=STRING,outbuf=STRINGservice=SVC_1,tuxservice=SVC,inbuf=STRING,outbuf=STRING`

Example 2:

Input: `SVC, request=STRING, reply = TPFAIL+ STRING`

Output Pattern (partial): `Service=SVC_1, tuxservice=SVC,inbuf=STRING,outbuf=NULL,errbuf=STRING`

Example 3:

Input:

```
service=SVC, request=STRING, reply = TPSUCCESS + STRING
```

```
service=SVC, request=STRING, reply = TPFAIL+ STRING
```

Output Pattern:

```
service=SVC_1,tuxservice=SVC,inbuf=STRING,outbuf=STRING
```

```
Service=SVC_2, tuxservice=SVC,inbuf=STRING,outbuf=NULL,errbuf=STRING
```

Example 4:

Input:

```
service=FMLS,request=FML32(name,pwd),reply=TPSUCCESS+FML32(id)
```

Output Pattern:

```
service=FMLS_1,tuxservice=FMLS,inbuf=FML32,outbuf=FML32
```

```
param: input(name, pwd), output(id)
```

Example 5:

Input:

```
service=FMLS,request=FML32(name,pwd),reply=TPSUCCESS+FML32(id)

service=FMLS,request=FML32(name,pwd,token),reply=TPSUCCESS+FML32(id)
```

Output Pattern:

```
service=FMLS_1,tuxservice=FMLS,inbuf=FML32,outbuf=FML32

param: input(name, pwd), output(id)

service=FMLS_2,tuxservice=FMLS,inbuf=FML32,outbuf=FML32

param: input(name, pwd,token), output(id)
```

1.3 Configuring SALT WS-TX Support

> **Note:**
>
> These configuration changes are summarized in the `SALTDEPLOY` additions pseudo-schema and WSDF additions pseudo-schema Appendix.

For additional information, see the SALT Interoperability Guide

This section contains the following topics:

- Configuring Transaction Log Device
- Registration Protocol
- Configuring WS-TX Transactions
- Configuring Maximum Number of Transactions
- Configuring Policy Assertions
- WSDL Generation
- WSDL Conversion

1.3.1 Configuring Transaction Log Device

The GWWS system server must be configured using the transaction log (TLogDevice) element (similar to the Oracle Tuxedo or /Domains TLog files). The `TLOGDevice` element is added to the `SALTCONFIG` source file (`SALTDEPLOY`) as shown in the example below:

A `TLOGName` element is also added to allow sharing the same TLog device across GWWS instances.

Only one TLog device per Web services Gateway instance is permitted (that is, the transaction log element is a child element of /Deployment/WSGateway/GWInstance).

Example 1-38 TLOG Element Added to SALTDEPLOY File

```
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
...
</WSDF>
<WSGateway>
<GWInstance id="GW1">
<TLogDevice location="/app/GWTLOG"/>
<TLogName id="GW1TLOG"/>
...
</GWInstance>
</WSGateway>
...
</Deployment>
```

1.3.2 Registration Protocol

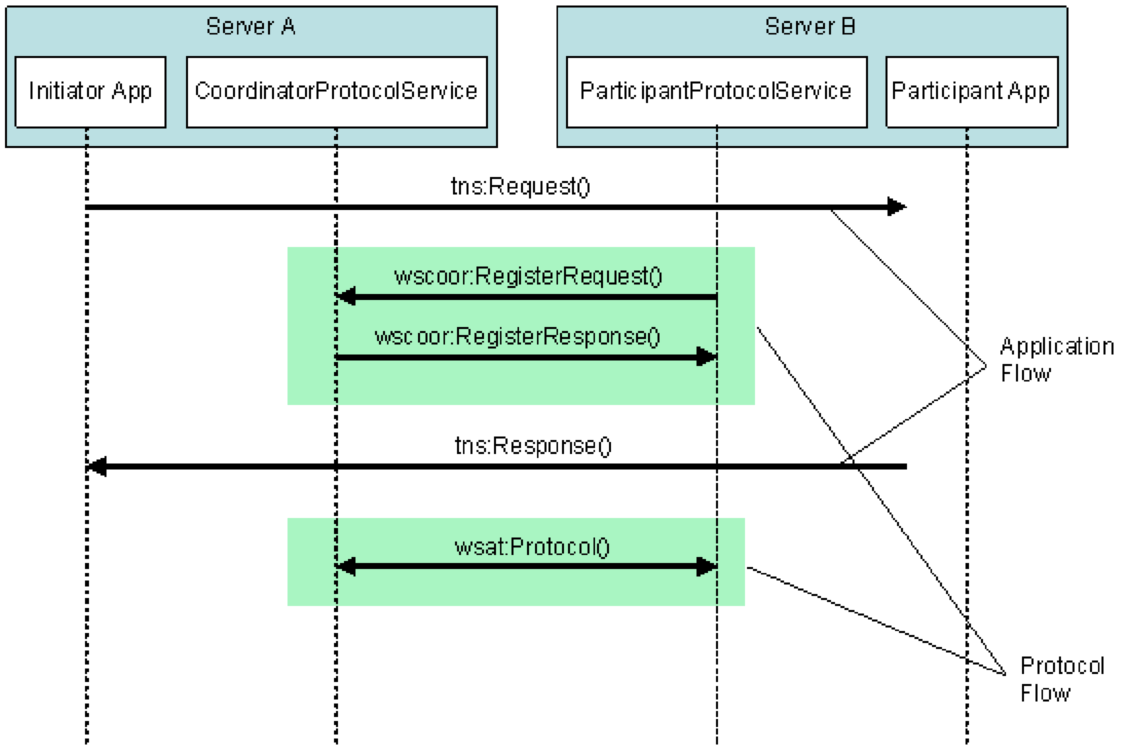
Oracle Tuxedo-based services are registered with a Durable 2PC protocol with coordinators.

When Oracle Tuxedo is the coordinator (outbound direction), the GWWS system server allows either Volatile 2PC or Durable 2PC registration requests and handles them accordingly.

1.3.3 Configuring WS-TX Transactions

The following figure illustrates the application and protocol flows of a typical WS-AT context service invocation.

Figure 1-1 WS-AT Service Invocation



The configuration steps and runtime behavior of the SALT GWWS gateway are outlined in the following sections (depending on the role of the Oracle Tuxedo domain as shown in figure above:

- Configuring Incoming Transactions
- Configuring Outbound Transactions

1.3.3.1 Configuring Incoming Transactions

Oracle Tuxedo services exposed as Web services do not require any specific configuration other than creating a transaction log file and adding it to the GWWS deploy configuration file in order to initiate a local transaction associated with an incoming WS-AT transaction request.

To ensure a transaction can be propagated into an Oracle Tuxedo domain, do the following steps:

1. Ensure that the Oracle Tuxedo service called supports transactions
2. Configure a transaction log g file in the GWWS deployment file. For more information, see Configuring Transaction Log Device
3. Configure a policy file containing a WS-AT Assertion corresponding to the desired behavior with respect to the external Web Service called. For more information, see Configuring Policy Assertions
4. Incoming calls containing a `CoordinationContext` element creates an Oracle Tuxedo global transaction.

- Error Conditions

1.3.3.1.1 Error Conditions

Error conditions are handled as follows:

- No log file is configured for the gateway. A `wscoor:InvalidState` fault is sent back to the caller. The `Detail` field contains a corresponding message.
- The target Oracle Tuxedo service does not support transactions. An application fault with a `TPETRAN` error code is returned to the caller.
- For all other applications, configuration (such as `TPENOENT`) or system errors are handled the same way that normal (non-transactional) requests are handled.

1.3.3.2 Configuring Outbound Transactions

In order for Oracle Tuxedo clients to propagate an Oracle Tuxedo global transaction to external Web services, do the following steps:

1. Configure a transaction log g file in the GWWS deployment file. For more information, see Configuring Transaction Log Device
2. Configure a policy file containing a WS-AT Assertion corresponding to the desired behavior with respect to the external Web Service called. For more information, see Configuring Policy Assertions
3. Depending on the assertion setting and presence of an Oracle Tuxedo transaction context, a `CoordinationContext` element is created and sent in the SOAP header along with the application request.
4. An endpoint reference is automatically generated and sent along with the `CoordinationContext` element for the remote `RegistrationService` element to enlist in

the transaction. This step, along with the protocol exchanges (Prepare/Commit or Rollback etc.) is transparent on both sides

- Error Conditions

1.3.3.2.1 Error Conditions

Error conditions are handled as follows:

- If the remote system does not support transactions and the WS-AT Assertion/transaction context call has *must* create transaction semantics, a `TPESYSTEM` error is returned to the client.
- Errors generated remotely are returned to the Oracle Tuxedo client in the same manner as regular, non-transactional calls. The fault `Reason` and `Detail` fields returned describe the nature of the failure (which is environment dependent).

1.3.4 Configuring Maximum Number of Transactions

The `MaxTran` element allows you to configure the size of the internal transaction table as shown in the example below. The default is `MAXGTT`.

> **Note:**
>
> The `MaxTran` value is optional. If the configured value is greater than `MAXGTT`, it is ignored and `MAXGTT` is used instead

Example 1-39 MAxTran Element

```
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
...
</WSDF>
<WSGateway>
<GWInstance id="GW1">
...
<MaxTran value="500"/>
...
</GWInstance>
</WSGateway>
...
</Deployment>
```

1.3.5 Configuring Policy Assertions

WS-AT defines a policy assertion that allows requests to indicate whether an operation call *must* or *may* be made as part of an Atomic Transaction.

- Policy.xml File

1.3.5.1 Policy.xml File

The `policy.xml` file includes WS-AT policy elements. WS-AT defines the `ATAssertion` element, with an `Optional` attribute, as follows: `/wsat:ATAssertion/@wsp:Optional="true"` as shown in the example below:

Example 1-40 Policy.XML ATAssertion Element

```
<?xml version="1.0"?>
<wsp:Policy wsp:Name="TransactionalServicePolicy"
xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
xmlns:wsat="http://docs.oasis-open.org/ws-tx/wsat/2006/06">
<wsat:ATAssertion wsp:Optional="true"/>
</wsp:Policy>
```

Note:

In order to correctly import external WSDL files, the `wsdlcvt` command is modified to generate a `policy.xml` file containing the `ATAssertion`element when one is present in the WSDL. For outbound requests, a `policy.xml` file containing an `ATAssertion` element must be created and properly pointed to in the `SALTDEPLOY` source.

- Inbound Transactions
- Outbound Transactions

1.3.5.1.1 Inbound Transactions

For inbound transactions, no particular behavior change takes place at runtime. The client consuming the WSDL takes the decision based on the configured value and runtime behavior is the same for the normal cases.

1.3.5.1.2 Outbound Transactions

- When an `ATAssertion` with no `"Optional=true"` is configured, the call must be made in a transaction. If no corresponding XA transaction exists, the WS-TX transaction is initiated but not associated with any Oracle Tuxedo XA transaction. If an XA transaction exists, there is no change in behavior.
- When an `ATAssertion` with `"Optional=true"` is configured, an outbound transaction context is requested only if a corresponding Oracle Tuxedo XA transaction exists in the context of the call.
- When no `ATAssertion` is configured for this service, the corresponding service call is made outside of any transaction. If a call is made to an external Web service in the context of an Oracle Tuxedo XA transaction, the Web service call will not propagate the transaction. This allows excluding certain Web service calls from a global transaction, and represents the default for *most* existing Web services calls (that do not support WS-TX).

1.3.6 WSDL Generation

WSDL generation is enhanced to generate an `ATAssertion` element corresponding to the assertion configured in the policy file for the corresponding service.

1.3.7 WSDL Conversion

For outbound requests, the WSDL conversion tool, `wsdlcvt`, generates a `policy.xml` file containing the `ATAssertion` element when one is present in the processed WSDL. You must properly configure the location of the `policy.xml` file in the `SALTDEPLOY` source.

1.4 Viewing and Modifying SALT Configuration

You can use Oracle Tuxedo Services Console to view and modify your configuration.

For more information, see Using Oracle Tuxedo Services Console

> **Note:**
>
> The original SALT configuration tool is deprecated.

1.5 SALT Mainframe Transaction Publisher

This section contains the following topics:

- Overview
- Configuration
- SOAP Inbound (Mainframe Transactions Exposed As A Web Service)
- REST Inbound
- SOAP Outbound (Mainframe Invoking An External Web Service)
- REST Outbound

1.5.1 Overview

This feature will provide support for generation of SALT configuration artifacts based on COBOL copybook in the inbound direction, and generate configuration artifacts and COBOL copybook in the outbound direction. A new command-line tool (`wscobolcvt`) is provided to convert COBOL copybook into SALT artifacts. In addition to runtime support, the configuration tool is enhanced as follows:

- Provides the same level of functionality as command-line tools with a graphical users interface.
- Allows you to restrict input/output fields so these are not part of the interface. Defaulting rules apply in this case as you are not permitted to set/retrieve the values.

1.5.2 Configuration

This section contains the following topics:

- Command-Line

1.5.2.1 Command-Line

wscobolcvt

A new command-line tool that converts COBOL copybook into SALT artifacts.

wsdlcvt

The `wsdlcvt` command adds the capability of generating a COBOL copybook based on the structure of the schema contained in the imported WSDL.

In this mode, `wsdlcvt` also generate `servicetype=sna` (as opposed to webservice), so that the corresponding Tuxedo service can be invoked by GWSNAX. The service maps to an external web service and functions the same as `servicetype=webservice`.

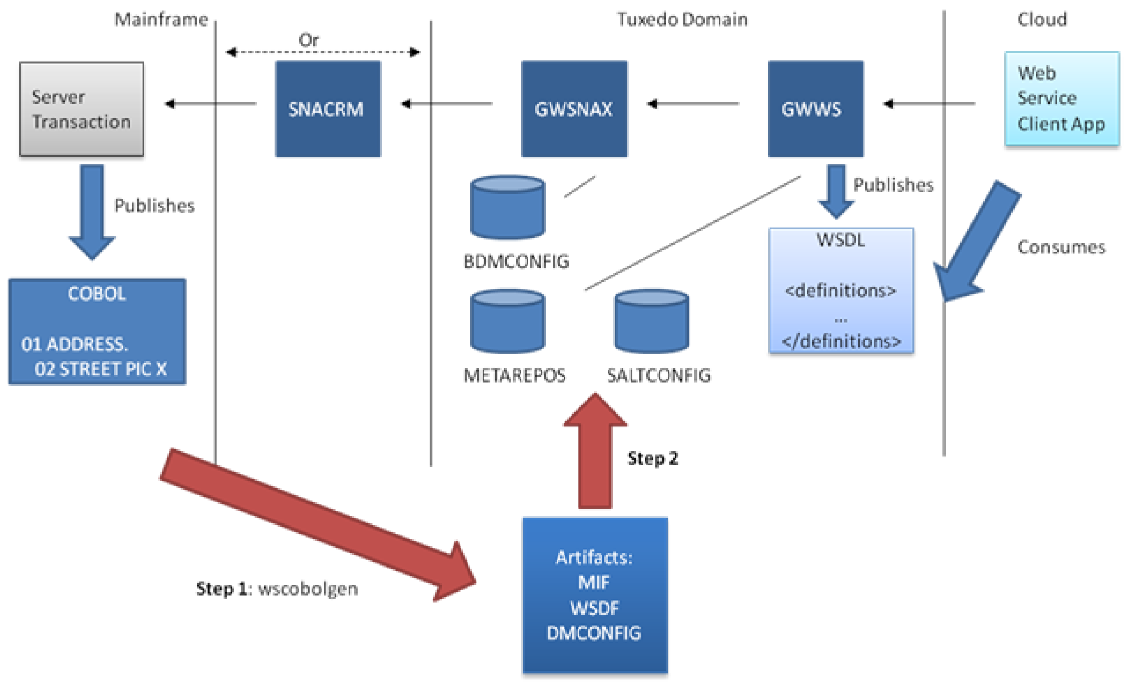
You can automate the COBOL copybook import process, generate a web service based on it, and import an external Web Service by Tuxedo Services Console

1.5.3 SOAP Inbound (Mainframe Transactions Exposed As A Web Service)

The `wscobolcvt` command converts COBOL copybook to service metadata (MIF) with record type buffers. It parses COBOL and generates service metadata in the MIF format as shown in figure below:

For more information, see Using Oracle Tuxedo Service Metadata Repository for SALT, and Tuxedo-to-XML Data Type Mapping for Oracle Tuxedo Services

Figure 1-2 SOAP Inbound (Mainframe Transactions Exposed As A Web Service)



Step 1: run wscobolgen on server transaction COBOL copybioook (interface)

Step 2: generated configuration artifacts are used to expose M/F service as follows

Step 2.1: tmloadrepos on service metadata input (MIF)
Step 2.2: WSDF added to SALTDEP, then **wsloadcf** used to compile SALTCONFIG
Step 2.3: dmconfig bits added to dmconfig, then **dmloadcf** used to compile BDMCONFIG
Step 2.4: Optional: metadata input (MIF) can be edited to "hide" fields: those will not be published in WSDL but will be defaulted in payload

The following steps are performed:

1. `wscobolcvt` takes the COBOL source and the following additional information as arguments:
   - service name advertised by TMA corresponding to the mainframe transaction.
   - service metadata repository where the MIF definition is added.
   - wscobolcvt support targeting the same MIF service in order to expose multiple transactions in the same WSDL service.
2. `wscobolcvt` generates service metadata and `WSDF` file.
3. Optionally, `wscobolcvt` automatically configures `DMCONFIG` file entries with domain IDs and CRM address as shown in the example below:
4. You can add generated files and references to the configuration and deploy them.

Example 1-41 DMCONFIG File Entries With Domain IDs and CRM Address

```
*DM_LOCAL_DOMAINS

CRMDOM
GWGRP=CRMGRP
TYPE=SNAX
DOMAINID="CRMDOM"
```

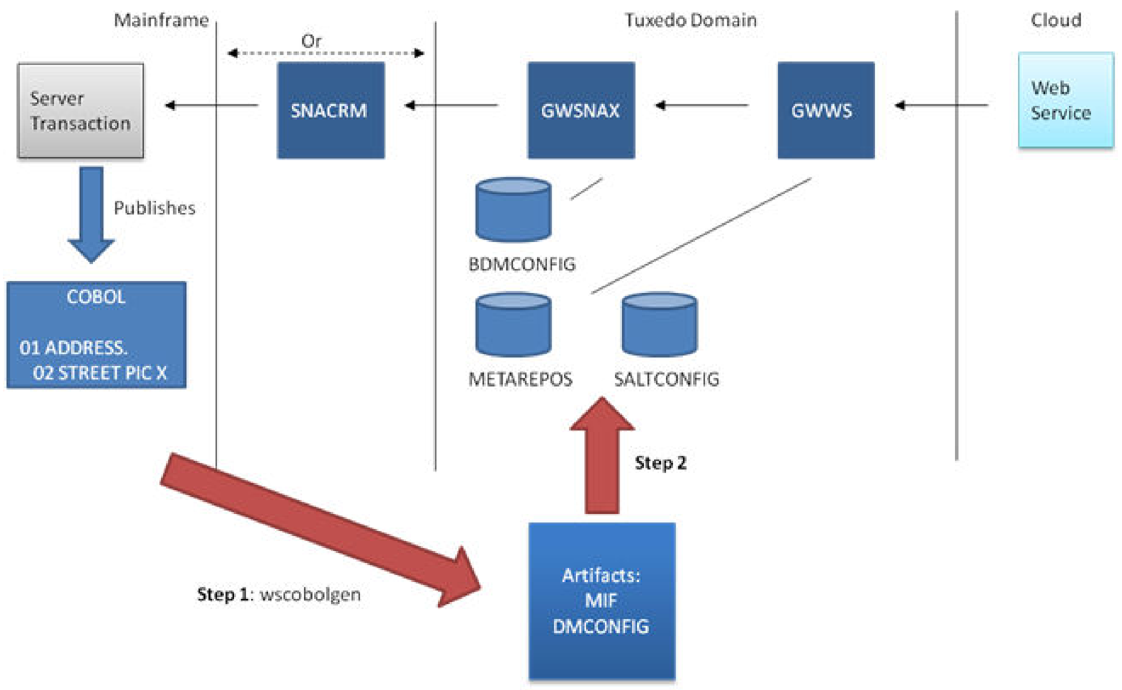
```
*DM_REMOTE_DOMAINS

CICSDOM
TYPE=SNAX
DOMAINID="CICSDOM"

*DM_SNACRM

CRMDOM
SNACRMADDR="//wasa:1234"
NWDEVICE="/dev/tcp"
LDOM="CRMDOM"
```

1.5.4 REST Inbound

The steps to expose a mainframe transaction as a REST inbound service are similar to SOAP (using `wscobolcvt`) as shown in Figure below. Note the following differences:

- the `wsdf` file is not required.
- services are only be added to `SALTDEP` as shown in the example below:

Figure 1-3 REST Inbound



Step 1: run wscobolgen on server transaction COBOL copyboook (interface)

Step 2: generated configuration artifacts are used to expose M/F service as follows

Step 2.1: tmloadrepos on service metadata input (MIF)
Step 2.2: HTTP/REST service is added to SALTDEP, then **wsloadcf** used to compile SALTCONFIG
Step 2.3: dmconfig bits added to dmconfig, then **dmloadcf** used to compile BDMCONFIG

Example 1-42 SALTDEP

```
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
<Import location="GWWS_conf.xml.wsdf"></Import>
</WSDF>
<WSGateway>
<GWInstance id="TuxAll">
<Inbound>
<Binding ref="TuxAll:TuxAll_Binding">
<Endpoint use="TuxAll_TuxAll_HTTPPort"></Endpoint>
</Binding>
<HTTP>
<Network http="localhost:2211" https=""/>
<Service name="MF_BANK">
<Method name="GET" reposservice="BALANCE" service="BALANCE"
inputbuffer="RECORD"/>
<Method name="POST" reposservice="DEPOSIT" service="DEPOSIT"
inputbuffer="RECORD"/>
</Service>
...
```

1.5.5 SOAP Outbound (Mainframe Invoking An External Web Service)

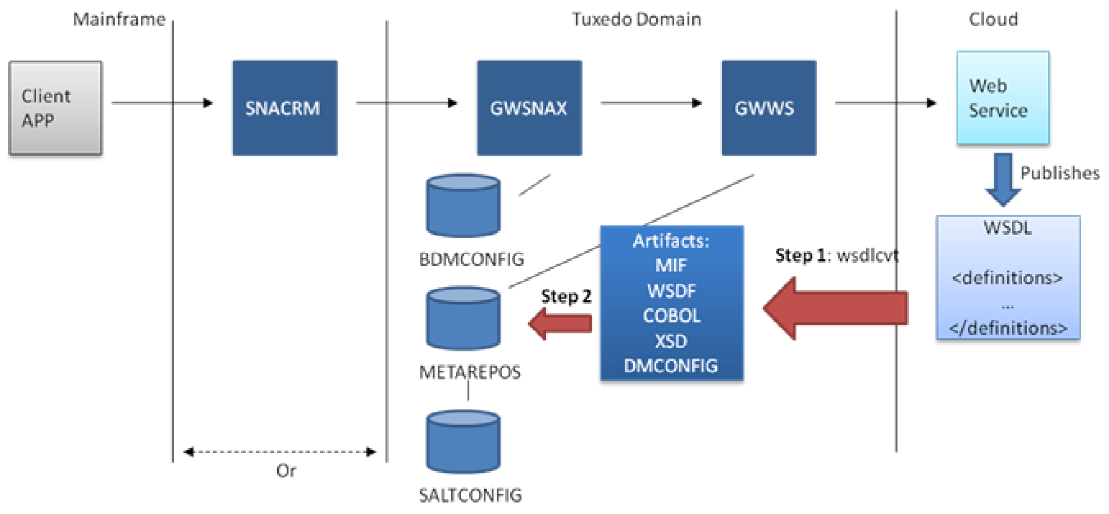
The `wsdlcvt` command is used to generate COBOL copybook from WSDL/schema. Outbound services are invoked using `RECORD` payloads and are automatically detected and converted using GWWS.

You can invoke `wsdlcvt` using the `-C` argument to generate MIF with `RECORD` type definitions, `WSDF`, `XSD`, `RECORD` files and COBOL copybook source files.

`wsdlcvt` has the `-D` option to specify a string length to use when `xsd:string` types are not constrained by size. Otherwise the default for strings is `256(PIC X(256))`.

The generated MIF entry `servicetype` is set to "`sna`".

Figure 1-4 SOAP Outbound (Mainframe Invoking An External Web Service)



Step 1: wsdlcvt is used to generate configuration artifacts

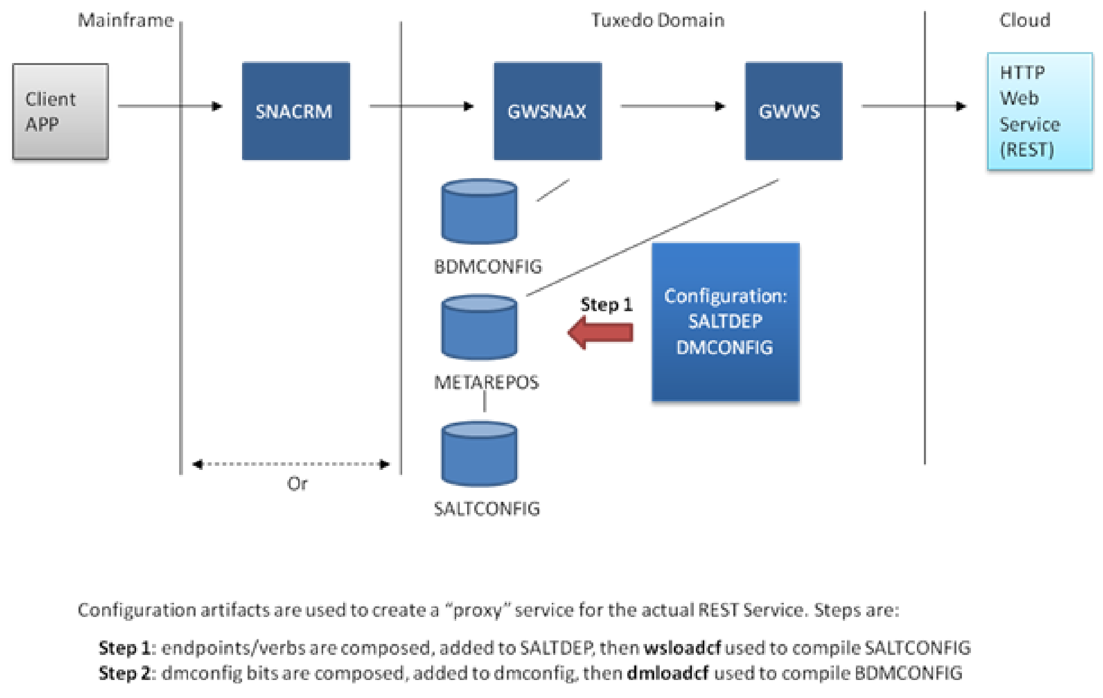
Step 2: configuration artifacts are used to create a "proxy" service for the actual Web Service. Secondary steps are:

Step 2.1: **tmloadrepos** on metadata input (MIF). 2 services generated: one for GWSNAX and one for GWWS
Step 2.2: WSDF added to SALTDEP, then **wsloadcf** used to compile SALTCONFIG
Step 2.3: dmconfig bits added to dmconfig, then **dmloadcf** used to compile BDMCONFIG
Step 2.4: Optional: generated COBOL copybook can be used by Mainframe client for integration, when client part done from scratch.

1.5.6 REST Outbound

REST outbound services do not have the equivalent of `wsdlcvt` as shown in Figure 6. You simply add service endpoints to be accessed in the /Outbound/HTTP section as shown in the example below:

Figure 1-5 REST Outbound



Configuration artifacts are used to create a "proxy" service for the actual REST Service. Steps are:

Step 1: endpoints/verbs are composed, added to SALTDEP, then **wsloadcf** used to compile SALTCONFIG
Step 2: dmconfig bits are composed, added to dmconfig, then **dmloadcf** used to compile BDMCONFIG

Example 1-43 /Outbound/HTTP Section

```
<Deployment xmlns="http://www.bea.com/Tuxedo/SALTDEPLOY/2007">
<WSDF>
...
</WSDF>
<WSGateway>
<GWInstance id="GW1">
...
<Outbound>
<Binding ref="bankapp:bankapp_binding">
<Endpoint use="http1"/>
<Endpoint use="https1" />
</Binding>
<HTTP>
<Service name="BANK_GET"
method="GET"
address="http://some.org/bankAccount"
content-type="JSON"
outputbuffer="RECORD"/>
```

See Also:

- tmadmin
- tmloadrepos
- ubbconfig
- WSDF documentation
- SALT Programming Guide
- SALT Command Reference
- SALT Interoperability Guide