Oracle® Fusion Middleware

Developing Extensible Applications for Oracle Web Services Manager

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Oracle Fusion Middleware Developing Extensible Applications for Oracle Web Services Manager, 12*c* (12.2.1.3.0)

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Preface

This preface describes the document accessibility features and conventions used in this guide.

Intended Audience

This manual is intended for software developers who are interested in creating custom assertions for web services.

How to Use This Guide

This document describes the following:

About Policies and Assertions

- Learn about predefined policies and assertions

  For more information, see About Predefined Policies and Assertions and Understanding Custom Assertions.
- Learn about parts and types of custom assertions

  For more information, see About Policy Combinations and Understanding the Types of Custom Assertions.
- Review the rules and restrictions about categories and bindings

  For more information, see Supported Custom Assertion Categories and About the Rules for Binding Custom Assertions.
- Review the lifecycle of a custom assertion

  For more information, see About the Life Cycle of a Custom Assertion.
- Understand the types of custom assertions

  For more information, see Understanding the Types of Custom Assertions.

Creation of Custom Assertions

- Review the naming conventions for policies and assertions

  For more information, see About Policy Name.
- Create the custom assertions

  For more information, see Developing Custom Assertions for Web Service.
- Test the custom assertion

  For more information, see Testing the Web Service.

Code Examples

- Validating IP Address in Custom Assertion
- Encrypting and Decrypting Data in Custom Assertion
- Authenticating a User in Custom Assertion

Advanced Topics

- Implement advanced features:
  - input parameters to the assertion
  - access OWSM context properties
  - access request, response, and fault message objects
  - access specific parts of a message based on XPath
  - access certificate used by container for SSL
  - access transport properties such as HTTP requests and responses
  - access CSF keys

  For more information, see Implementing Advanced Features in Custom Assertions.
- Handling exceptions

  For more information, see Handling Exceptions in Custom Assertions.

References

- XML schema for creating custom assertions

  For more information, see Custom Assertions Schema Reference.
- Java API reference for OWSM

  For more information, see Java API Reference for Oracle Web Services Manager.

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at `http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc`.

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Related Documents

For more information, see the following manuals:

- "Web Services" in *Release Notes for Oracle Fusion Middleware Infrastructure*
- *Administering Web Services*
- Oracle Fusion Middleware Library

Conventions

The following text conventions are used in this document:

Convention	Meaning
boldface	Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.
italic	Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.
`monospace`	Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

What's New in This Guide

This chapter lists the new and changed features of Oracle Web Services Manager (OWSM) extensibility.

This document is the new edition of the formerly titled *Extensibility Guide for Oracle Web Services Manager*.

New and Changed Features for 12c (12.2.1.3.0)

This topic contains the New and Changed Features for 12*c* (12.2.1.3.0).

Minor updates, such as fixes or corrections, were made to this document.

New and Changed Features for 12c (12.2.1.2.0)

You can secure the SOAP web service endpoint by updating the `provides` attribute and adding it to the `orasp:Assertion` element in the custom policy file.

For more information, see orasp:Assertion.

New and Changed Features for 12c (12.2.1.1.0)

This topic contains the New and Changed Features for 12*c* (12.2.1.1.0).

Minor updates, such as fixes or corrections, were made to this document.

1

Understanding Policies and Assertions in Oracle Web Services Manager

Oracle Web Services Manager (OWSM) delivers set of predefined policies and assertion templates that are automatically available when you install Oracle Fusion Middleware. OWSM also enables you to develop custom assertions when specific functionality is not provided with the predefined policies. For example, if an application requires the use of an authentication type that is not available in OWSM, then you can create a custom authentication assertion.
This chapter includes the following sections:

- About Predefined Policies and Assertions
- About Web Service Policies Creation
- Understanding Custom Assertions

For definitions of unfamiliar terms found in this and other books, see the Glossary.

1.1 About Predefined Policies and Assertions

OWSM provides read-only predefined policies with Oracle Fusion Middleware.

For information about the OWSM policies and their use, see *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

Each policy consists of one or more assertions, defined at the domain-level, that define the security requirements. OWSM also provides a set of predefined assertion templates. For information about these predefined assertions and their use, see,

- "Predefined Assertion Templates" in *Securing Web Services and Managing Policies with Oracle Web Services Manager*
- "Managing Policy Assertion Templates" in *Securing Web Services and Managing Policies with Oracle Web Services Manager*

In addition to using the existing assertions, you can develop your own custom assertions using the APIs for OWSM. For more information, see the *Java API Reference for Oracle Web Services Manager*.

1.2 About Web Service Policies Creation

Policies describe the capabilities and requirements of a Web service. You can create web service policies using existing assertion templates, custom assertions, and from existing policies. You can also import a policy from zip archive.

You can use any of the following methods to create a web service policy:

- Create a new policy using existing assertion templates
- Create a new policy from an existing policy

- Import a policy from a zip archive
- Create policies from custom assertions

The first three methods are described in "Managing Web Service Policies" in *Administering Web Services*.

This guide describes how to create policies using custom assertions that you develop.

1.3 Understanding Custom Assertions

You can develop custom assertions to fulfill the requirement of specific functionality that is not available with the predefined policies or assertions provided by OWSM.

The following topics provide information to help you understand custom assertions:

- About Policies, Assertions, Expressions, and Operators
- About Policy Combinations
- Supported Custom Assertion Categories
- About the Rules for Binding Custom Assertions
- About the Life Cycle of a Custom Assertion
- Understanding the Types of Custom Assertions

1.3.1 About Policies, Assertions, Expressions, and Operators

Web services use policies to describe their capabilities and requirements. Policies define how a message must be secured and delivered reliably, whether a message must flow a transaction, and so on. A policy is a set of assertions (rules, requirements, obligations) that express specific policy requirements or properties of a web service.

A policy assertion is a basic unit representing an individual requirement, capability or property in a policy. Assertions use domain-specific semantics to enable interoperability.

A policy expression is an XML representation of a policy. The policy expression consists of various logical combinations of the basic policy assertions that form the content of the wsp:Policy element. The logical combinations are created using policy operators (wsp:Policy, wsp:All, and wsp:ExactlyOne elements).

1.3.2 About Policy Combinations

You can combine policy with either assertions or operators.

The following topics explain this in detail:

- Combining a Policy with an Assertion
- Combining a Policy with Two Assertions and wsp:All Operator
- Combining a Policy with Many Assertions and wsp:ExactlyOne Operator

1.3.2.1 Combining a Policy with an Assertion

You can combine a policy that is defined by the wsp:Policy element with one assertion (orasp:AssertionOne). This is explained with an example below.

The following is the example. For more information about the elements and Oracle extensions of their attributes, see Custom Assertions Schema Reference.

```
<wsp:Policy
    xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
    xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy" >

           <orasp:AssertionOne orawsp:Silent="true" orawsp:Enforced="true"
           orawsp:name="Validator"
           orawsp:category="security/authentication">
           ...
          </orasp:AssertionOne>
</wsp:Policy>
```

1.3.2.2 Combining a Policy with Two Assertions and wsp:All Operator

You can combine a policy with two assertions. The following example shows a list of policy assertions wrapped by the policy operator wsp:All element (all of the policy assertions in the list must evaluate to true).

The wsp:Policy element is semantically equivalent to wsp:All.

```
<wsp:Policy
    xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
    xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy" >

          <wsp:All>
           <orasp:AssertionOne orawsp:Silent="true" orawsp:Enforced="true"
           orawsp:name="SAMLValidator"
           orawsp:category="security/authentication">
           ...
          </orasp:AssertionOne>
          <orasp:AssertionTwo orawsp:Silent="true" orawsp:Enforced="true"
           orawsp:name="UserNameValidator"
           orawsp:category="security/authentication">
           ...
           </orasp:AssertionTwo>
         </wsp:All>

</wsp:Policy>
```

1.3.2.3 Combining a Policy with Many Assertions and wsp:ExactlyOne Operator

You can combine a policy with many assertions and wsp:ExactlyOne operator. This is explained in the example given below.

In the following example, each line within the operators <wsp:All>...</wsp:All> represents a valid policy alternative. The policy is satisfied if one set of the policy alternatives is true.

```
<wsp:Policy
    xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
```

```
    xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy" >

       <wsp:ExactlyOne>
          <wsp:All>
           <orasp:SAML orawsp:Silent="true" orawsp:Enforced="true"
           orawsp:name="SAML"
           orawsp:category="security/authentication">
           ...
          </orasp:SAML>
          </wsp:All>
          <wsp:All>
          <orasp:Username orawsp:Silent="true" orawsp:Enforced="true"
           orawsp:name="Username"
           orawsp:category="security/authentication">
           ...
           </orasp:Username>
         </wsp:All>

    </wsp:ExactlyOne>
</wsp:Policy>
```

Using the operators and combinations of policy assertions, you can create complex policy alternatives.

1.3.3 Supported Custom Assertion Categories

The supported custom assertion categories based on the web service specification they conform to and their significance are tabulated below. You specify the category using `orawsp:category`, an attribute of the orasp:Assertion element.

Table 1-1 describes this. Managing Sample Custom Assertions provides samples for various categories of security custom assertions.

Table 1-1 Supported Custom Assertion Categories

Category	Description	Valid Values for orawsp:category
Security	Policies that implement the WS-Security 1.0 and 1.1 standards, which allow the communication of various security token formats, such as SAML, Kerberos, and X.509. They enforce authentication and authorization of users, identity propagation, and message protection.	security/authentication, security/msg-protection, security/authorization, security/logging
Management	Policies used to store request, response, and fault messages to a message log.	management

You can use Enterprise Manager Fusion Middlware Control to view, edit, and manage policies of different categories. Note that policies of a category can be attached to specific endpoints. See About the Rules for Binding Custom Assertions for rules for binding custom assertions.

1.3.4 About the Rules for Binding Custom Assertions

The <orawsp:bindings> element is used to define the bindings in an assertion.

For a description of the <orawsp:bindings> element used to define the bindings in the assertion, and all its subelements, see orawsp:bindings in *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

1.3.5 About the Life Cycle of a Custom Assertion

The OWSM runtime manages the life cycle of a custom assertion, which consists of four phases; initialization, execution, post-execution, and termination. For each phase, the OWSM runtime invokes a method of custom assertion executor.

The following methods must be implemented inside the custom assertion executor of the custom policy:

- void init(IAssertion ia, IExecutionContext context, IContext msgContext): This method is called after the AssertionExecutor is created or after one of the properties has been changed.
- IResult execute(IContext mcontext): This method is invoked at stages such as request, response, and in the event of a fault. This method must always return a non-null IResult object. To find the stage of policy execution, see Accessing OWSM Custom Security Assertion.
- IResult postExecute(IContext messageContext): Executes any task required after policy execution.
- void destroy(): The destroy method is invoked by OWSM runtime when application is shutting down. Its invoked for a cleaner ending of the assertion lifecycle.

1.3.6 Understanding the Types of Custom Assertions

The policy object model defines two types of assertions: Simple Assertions and Multi-Element Simple Assertions.

The following topics explain this further:

- Understanding Simple Assertions
- Understanding Multi-Element Simple Assertions

1.3.6.1 Understanding Simple Assertions

A Simple Assertion contains only one assertion (defining a single behavior) and cannot contain other assertions. A Simple Assertion maps to an org.w3c.dom.Element that does not have any nested elements except for extensions defined by Oracle. The class for the Simple Assertion extends the class oracle.wsm.policy.model.ISimpleAssertion. ISimpleOracleAssertion provides the extensions defined by Oracle for a WS-Policy Assertion.

This section contains the following topics:

- Rules for Using Simple Assertions
- Defining a Pseudo-schema for Simple Assertions

1.3.6.1.1 Rules for Using Simple Assertions

This topic lists the rules for using Simple Assertions.

When using Simple Assertions, be aware of the following usage rules:

- Cannot contain nested elements other than Oracle extension element <orawsp:bindings>
- Cannot contain other assertions
- Use the default Serializer and De-Serializer
- Use the default Implementation class
- Must extend the base class SimpleAssertion. The method getAssertionType must return the appropriate value if you introduce a new Class.
- Do not need Serializer and De-Serializer if you introduce a new Class.

1.3.6.1.2 Defining a Pseudo-schema for Simple Assertions

This topic shows a pseudo-schema for Simple Assertions with only binding elements.

The following is the pseudo-schema:

```
<Assertion>
[ wsp:Optional="xsd:boolean" ]?
[ orawsp:Silent="xsd:boolean" ]?
[ orawsp:Enforced="xsd:boolean" ]?
[ orawsp:description="xsd:string" ]?
[ orawsp:category="xsd:string" ]?...>
<orawsp:bindings>?
</Assertion>
```

1.3.6.2 Understanding Multi-Element Simple Assertions

A Multi-element Simple Assertion cannot contain other assertions; however, it may contain nested XML elements. A Multi-element Simple Assertion maps to an org.w3c.dom.Element which has nested XML elements and extension elements defined by Oracle. The class for the Multi-element Simple Assertion extends the class oracle.wsm.policy.model.IMultiElementSimpleAssertion.

This section contains the following topics:

- Rules for Using Multi-element Simple Assertions
- Defining a Pseudo-schema for Multi-element Simple Assertions

1.3.6.2.1 Rules for Using Multi-element Simple Assertions

This topic lists the usage rules for using Multi-element Simple Assertions.

When using Multi-element Simple Assertions, be aware of the following usage rules:

- May contain nested XML elements other than Oracle extension element <orawsp:bindings>
- Cannot contain other assertions and are defined in domain-specific specifications. Nested XML elements participate in policy intersections only if domain-specific intersection semantics are defined.

1.3.6.2.2 Defining a Pseudo-schema for Multi-element Simple Assertions

This topic shows a psuedo-schema for Multi-element Simple Assertions that may contain elements other than the bindings.

The following is the psuedo-schema:

```
<Assertion>
[ wsp:Optional="xsd:boolean" ]?
[ orawsp:Silent="xsd:boolean" ]?
[ orawsp:Enforced="xsd:boolean" ]?
[ orawsp:description="xsd:string" ]?
[ orawsp:category="xsd:string" ]?...>
<other-xml-elements>+
<orawsp:bindings>?
</Assertion>
```

2
Creating Custom Assertions

You can develop custom assertions when specific functionality is not provided with the standard policies that come with Oracle Web Services Manager.
Topics:

2.1 About Policy Name

The policy name is specified by the name attribute of the policy content. The policy name must not already exist in the OWSM Repository. Once you import the policy to the repository, you cannot edit the name of a policy. To change the policy name, you must copy the policy and assign it a different name.

Oracle recommends that you follow the policy naming conventions described in "Recommended Naming Conventions for Policies" in *Understanding Oracle Web Services Manager.* The same conventions are used to name assertions.

2.2 Developing Custom Assertions for Web Service

To develop a custom assertion, you import a custom policy file and attach it to your web service or client.

The following topics explain this further.

2.2.1 Creating the Custom Assertion Executor

Create the custom assertion executor to execute and validate the logic of your policy assertion. The custom assertion executor must extend `oracle.wsm.policyengine.impl.AssertionExecutor`.

When building the custom assertion executor, ensure that the following JAR files are in your `CLASSPATH`:

- wsm-policy-core.jar
- wsm-agent-core.jar
- oracle.logging-utils_11.1.1.jar (located at oracle_common/modules/oracle.wsm.common_12.1.2, oracle_common/modules/oracle.wsm.common_12.1.2, and oracle_common/modules respectively)

If necessary, add these files to your CLASSPATH.

The following example shows a custom assertion executor that you can use to validate the IP address of the request to the web service. If the IP address of the request is invalid, a FAULT_FAILED_CHECK exception is thrown.

```
package sampleassertion;


import oracle.wsm.common.sdk.IContext;
import oracle.wsm.common.sdk.IMessageContext;
import oracle.wsm.common.sdk.IResult;
import oracle.wsm.common.sdk.Result;
import oracle.wsm.common.sdk.WSMException;
import oracle.wsm.policy.model.IAssertionBindings;
import oracle.wsm.policy.model.IConfig;
import oracle.wsm.policy.model.IPropertySet;
import oracle.wsm.policy.model.ISimpleOracleAssertion;
import oracle.wsm.policy.model.impl.SimpleAssertion;
import oracle.wsm.policyengine.impl.AssertionExecutor;


public class IpAssertionExecutor extends AssertionExecutor {
    public IpAssertionExecutor() {
    }
    public void destroy() {
    }


    public void init(oracle.wsm.policy.model.IAssertion assertion,
                     oracle.wsm.policyengine.IExecutionContext econtext,
                     oracle.wsm.common.sdk.IContext context) {
        this.assertion = assertion;
        this.econtext = econtext;
    }
    public oracle.wsm.policyengine.IExecutionContext getExecutionContext() {
        return this.econtext;
    }
    public boolean isAssertionEnabled() {
        return ((ISimpleOracleAssertion)this.assertion).isEnforced();
    }
    public String getAssertionName() {
        return this.assertion.getQName().toString();
    }


    /**
     * @param context
     * @return
     */
    public IResult execute(IContext context) throws WSMException {
        try {
            IAssertionBindings bindings =
                ((SimpleAssertion)(this.assertion)).getBindings();
            IConfig config = bindings.getConfigs().get(0);
            IPropertySet propertyset = config.getPropertySets().get(0);
            String valid_ips =
                propertyset.getPropertyByName("valid_ips").getValue();
            String ipAddr = ((IMessageContext)context).getRemoteAddr();
```

```
            IResult result = new Result();
            if (valid_ips != null && valid_ips.trim().length() > 0) {
                String[] valid_ips_array = valid_ips.split(",");
                boolean isPresent = false;
                for (String valid_ip : valid_ips_array) {
                    if (ipAddr.equals(valid_ip.trim())) {
                        isPresent = true;
                    }
                }
                if (isPresent) {
                    result.setStatus(IResult.SUCCEEDED);
                } else {
                  result.setStatus(IResult.FAILED);
                  result.setFault(new WSMException(WSMException.FAULT_FAILED_CHECK));
                }
            } else {
                result.setStatus(IResult.SUCCEEDED);
            }
            return result;
        } catch (Exception e) {
            throw new WSMException(WSMException.FAULT_FAILED_CHECK, e);
        }
    }

    public oracle.wsm.common.sdk.IResult postExecute(oracle.wsm.common.sdk.IContext p1) {
        IResult result = new Result();
        result.setStatus(IResult.SUCCEEDED);
        return result;
    }
}
```

You can run the following sample code, to determine client or service inside custom assertion executor.

```
String function = (String) getExecutionContext().getProperty("agent.function"); //
WSMExecutionConstants.AGENT_FUNCTION
if (function != null)
isService = function.equals("agent.function.service") //
WSMExecutionConstants.AGENT_FUNCTION_VAL_SERVICE
```

For more information about the APIs that are available to you for developing your own custom assertion executor, see the *Java API Reference for Oracle Web Services Manager*.

2.2.2 Creating the Custom Policy File

Create the custom policy file to define the bindings and configure the custom assertion.

Custom Assertions Schema Reference describes the schema that you can use to construct your custom policy file and custom assertion.

The following example defines the `oracle/ip_assertion_policy` custom policy file. The assertion defines a comma-separated list of IP addresses that are valid for a request.

```
<?xml version = '1.0' encoding = 'UTF-8'?>

<wsp:Policy xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
   xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy"
   orawsp:status="enabled"
   xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-
utility-1.0.xsd"
   xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" orawsp:category="security"
   orawsp:attachTo="binding.server" wsu:Id="ip_assertion_policy"
   xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
```

```
   xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
   wsp:Name="oracle/ip_assertion_policy">
      <orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
         orawsp:name="WSSecurity IpAssertion Validator" orawsp:category="security/
authentication">
            <orawsp:bindings>
                  <orawsp:Config orawsp:name="ipassertion" orawsp:configType="declarative">
                        <orawsp:PropertySet orawsp:name="valid_ips">
                              <orawsp:Property orawsp:name="valid_ips" orawsp:type="string"
                               orawsp:contentType="constant">
                                    <orawsp:Value>127.0.0.1,192.168.1.1</orawsp:Value>
                              </orawsp:Property>
                        </orawsp:PropertySet>
                   </orawsp:Config>
             </orawsp:bindings>
      </orasp:ipAssertion>
</wsp:Policy>
```

To use this custom policy file with a RESTful web service and client endpoints, you must add the `provides` attribute to the `orasp:ipAssertion` element, as follows:

```
<orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
    orawsp:name="WSSecurity IpAssertion Validator"
    orawsp:category="security/authentication"
    orawsp:provides="{http://schemas.oracle.com/ws/2006/01/policy}REST_HTTP">
</orasp:ipAssertion>
```

> **Note:**
>
> To secure the SOAP web service endpoints, you must specify the intents in the `provides` attribute and add it to the `orasp:Assertion` element in the custom policy file, as described in orasp:Assertion.

2.2.3 Specifying the Custom Assertion Executor

Specify the custom assertion executor in the Custom policy file or in the `policy-config.xml` file.

The following topics explain this further:

- Specifying the Custom Assertion Executor in the Custom Policy File
- Specifying the Custom Assertion Executor in the policy-config.xml File

2.2.3.1 Specifying the Custom Assertion Executor in the Custom Policy File

You can update the custom policy to specify the custom executor information in the orawsp:Implementation element. This is shown in the example below.

The following is the example:

```
 <?xml version = '1.0' encoding = 'UTF-8'?><wsp:Policy
 xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
 xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy"
orawsp:status="enabled"
xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" orawsp:category="security"
 orawsp:attachTo="binding.server" wsu:Id="ip_assertion_policy"
xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
 xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
wsp:Name="oracle/ip_assertion_policy">
```

```
          <orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
 orawsp:name="WSSecurity IpAsertion validator" orawsp:category="security/authentication">
              <orawsp:bindings>
                 <orawsp:Implementation>sampleassertion.IpAssertionExecutor</
orawsp:Implementation>
                   <orawsp:Config orawsp:name="ipassertion" orawsp:configType="declarative">
                        <orawsp:PropertySet orawsp:name="valid_ips">
                              <orawsp:Property orawsp:name="valid_ips" orawsp:type="string"
 orawsp:contentType="constant">
                                    <orawsp:Value>140.87.6.143,10.178.93.107</orawsp:Value>
                                </orawsp:Property>
                        </orawsp:PropertySet>
                    </orawsp:Config>
              </orawsp:bindings>
            </orasp:ipAssertion>
</wsp:Policy>
```

2.2.3.2 Specifying the Custom Assertion Executor in the policy-config.xml File

Create a `policy-config.xml` file that defines an entry for the new assertion and associates it with its custom assertion executor. You can also specify the custom assertion executor class in the configuration file.

This section includes the following topics:

- About the Policy Configuration File
- Defining the Policy Configuration File

2.2.3.2.1 About the Policy Configuration File

This topic explains the format of the policy-config.xml file and the attributes for the Key element.

The format for the `policy-config.xml` file is shown in the following example:

```
<?xml version="1.0" encoding="UTF-8"?>
<policy-config>
    <policy-model-config>
        <entry>
           <key namespace="namespace" element-name="elementname"/>
           <executor-classname>assertionclass</executor-classname>
        </entry>
    </policy-model-config>
</policy-config>
```

Table 2-1 describes the attributes for the key element.

Table 2-1 Attributes for Key Element

Attribute	Description
namespace	Namespace of the policy. This value must match the namespace defined in the custom policy file (in Step 1). In the custom policy file example in Creating the Custom Policy File, the namespace is defined as part of the <wsp:Policy> tag as follows: `xmlns:orasp="`**`http://schemas.oracle.com/ws/2006/01/securitypolicy`**`"`

Table 2-1 (Cont.) Attributes for Key Element

Attribute	Description
element-name	Name of the element. This value must match the assertion name defined in the custom policy file (in Step 1). In the custom policy file example in Creating the Custom Policy File, the element name ipAssertion is defined in the following tag: `<orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true" orawsp:name="WSSecurity IpAssertion Validator" orawsp:category="security/ authentication">`

2.2.3.2.2 Defining the Policy Configuration File

This topic shows an example of `policy-config.xml` file with an entry for the ipAssertion policy.

The following is the example:

```
<?xml version="1.0" encoding="UTF-8"?>
<policy-config>
    <policy-model-config>
        <entry>
            <key namespace="http://schemas.oracle.com/ws/2006/01/securitypolicy"
 element-name="ipAssertion"/>
            <executor-classname>sampleassertion.IpAssertionExecutor</executor-
classname>
        </entry>
    </policy-model-config>
</policy-config>
```

> **Note:**
>
> The `policy-config.xml` file must be in the `CLASSPATH` of the server. Add this file to the custom executor jar file as mentioned in Creating the Custom Assertion JAR File.

2.2.4 Creating the Custom Assertion JAR File

Create a custom assertion JAR file that includes the custom assertion executor and the `policy-config.xml` file.

You can use Oracle JDeveloper, other IDE, or the jar tool to generate the JAR file.

2.2.5 Adding the Custom Policy to the Policy Store

You can add the custom policy to the policy store using Fusion Middleware Control or WLST.

The following topics explain this further:

- Adding a Custom Policy to the Policy Store Using Fusion Middleware Control
- Adding a Custom Policy to the Policy Store Using WLST

2.2.5.1 Adding a Custom Policy to the Policy Store Using Fusion Middleware Control

You can add a Custom Policy to the Policy Store by using Fusion Middleware Control.

Before you can attach the custom policy to a web service, you must import it using the procedure described in "Importing Web Service Policies" in *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

2.2.5.2 Adding a Custom Policy to the Policy Store Using WLST

You can import the Custom Policy to the Policy Store by using WebLogic Scripting Tool (WLST) commands.

For information, see "Importing and Exporting Documents in the Repository" in *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

2.2.6 Deploying the Custom Assertion

You can add the custom assertion JAR to your `CLASSPATH` using the WLST command or by following manual process.

Perform the following steps to deploy custom assertion using the WLST command:

1. Invoke the WLST command located at `ORACLE_HOME/oracle_common/common/bin/wlst.sh` (UNIX) or `ORACLE_HOME\oracle_common\common\bin\wlst.cmd` (Windows).
2. Run the `appendToExtensionLoader` command to add the custom assertion jar to servers specified by target list:

   ```
   appendToExtensionLoader('path to custom-assertion.jar', 'comma separated targets')
   ```

   For example:

   ```
   connect('demouser', 'demopassword', 't3://localhost:7001')
   appendToExtensionLoader('/user/home/customAssertion.jar',
   'server1,server2,server3')
   ```

You can also add the custom assertion JAR manually to your `CLASSPATH` by performing the following steps:

1. Stop WebLogic Server.
2. Copy the custom assertion JAR file you have created as described in Creating the Custom Assertion JAR File to the following directory: `$DOMAIN_HOME/lib`.
3. Restart WebLogic Server.

For information about starting and stopping WebLogic Server, see "Starting and Stopping Oracle WebLogic Server Instances" in *Administering Oracle Fusion Middleware*.

2.2.7 Attaching the Custom Policy to a Web Service

Before attaching the custom policy to a web service, you need to first create a web service and then attach the custom policy to it using Fusion Middleware Control, using WLST or at design time.

Create a web service using the information described in "Roadmap for Implementing WebLogic Web Services" in *Understanding WebLogic Web Services for Oracle WebLogic Server*.

Attach the custom policy to the web service, as described in "Attaching Policies" in *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

2.3 Testing the Web Service

Use the Fusion Middleware Control Test Web Service page to test the operations and view results of the web service without deploying the web service.

For more information, see "Testing Web Services" in *Administering Web Services*.

You can also test your web service by creating a client proxy for the web service using clientgen. For more information, see "Using the clientgen Ant Task to Generate Client Artifacts" in *Developing JAX-WS Web Services for Oracle WebLogic Server*.

3
Managing Sample Custom Assertions

Managing custom assertions include activities such as validating IP address, encrypting and decrypting data, and authenticating a user in a custom assertion.
Topics:

- Validating IP Address in Custom Assertion
- Performing IP Address Validation in Custom Assertion
- Encrypting and Decrypting Data in Custom Assertion
- Performing Data Encryption and Decryption in Custom Assertion
- Authenticating a User in Custom Assertion
- Performing User Authentication in Custom Assertion

> **See Also:**
>
> Creating Custom Assertions

3.1 Validating IP Address in Custom Assertion

The IP Address Validation Custom Assertion sample validates whether a request that is made to the web service is from a set of valid IP addresses. In the custom policy assertion you can include the valid IP addresses as a comma-separated list of values. Any request coming from any other IP address results in a `FAILED_CHECK` response.

This section includes the following topics:

- Validating IP Address Using Custom Assertion Executor
- Validating IP Address Using Policy File
- Validating IP Address Using policy-config.xml File
- Validating IP Address Using Web Service
- Validating IP Address Using JSE Client

3.1.1 Validating IP Address Using Custom Assertion Executor

Follow this sample to validate an IP address using the custom assertion executor.

The following is the sample custom assertion executor:

```
package sampleassertion;

import oracle.wsm.common.sdk.IContext;
import oracle.wsm.common.sdk.IMessageContext;
import oracle.wsm.common.sdk.IResult;
import oracle.wsm.common.sdk.Result;
```

```
import oracle.wsm.common.sdk.WSMException;
import oracle.wsm.policy.model.IAssertionBindings;
import oracle.wsm.policy.model.IConfig;
import oracle.wsm.policy.model.IPropertySet;
import oracle.wsm.policy.model.ISimpleOracleAssertion;
import oracle.wsm.policy.model.impl.SimpleAssertion;
import oracle.wsm.policyengine.impl.AssertionExecutor;

public class IpAssertionExecutor extends AssertionExecutor {

    public IpAssertionExecutor() {
    }

    public void destroy() {
    }

    public void init(oracle.wsm.policy.model.IAssertion assertion,
                     oracle.wsm.policyengine.IExecutionContext econtext,
                     oracle.wsm.common.sdk.IContext context) {
        this.assertion = assertion;
        this.econtext = econtext;
    }

    public oracle.wsm.policyengine.IExecutionContext getExecutionContext() {
        return this.econtext;
    }

    public boolean isAssertionEnabled() {
        return ((ISimpleOracleAssertion)this.assertion).isEnforced();
    }

    public String getAssertionName() {
        return this.assertion.getQName().toString();
    }

    /**
     * @param context
     * @return
     */
    public IResult execute(IContext context) throws WSMException {
        try {
         oracle.wsm.common.sdk.IMessageContext.STAGE stage =
 ((oracle.wsm.common.sdk.IMessageContext)context).getStage();

            if (stage  == IMessageContext.STAGE.request)  {


                IAssertionBindings bindings =
 ((SimpleAssertion)(this.assertion)).getBindings();
                IConfig config = bindings.getConfigs().get(0);
                IPropertySet propertyset = config.getPropertySets().get(0);
                String valid_ips = propertyset.getPropertyByName("valid_
ips").getValue();
                String ipAddr = ((IMessageContext)context).getRemoteAddr();
                IResult result = new Result();

                if (valid_ips != null && valid_ips.trim().length() > 0) {
                     String[] valid_ips_array = valid_ips.split(",");
                     boolean isPresent = false;
                     for (String valid_ip : valid_ips_array) {
                       if (ipAddr.equals(valid_ip.trim())) {
```

```
                        isPresent = true;
                    }
                  }
                  if (isPresent) {
                     result.setStatus(IResult.SUCCEEDED);
                  } else {
                     result.setStatus(IResult.FAILED);
                     result.setFault(new WSMException(WSMException.FAULT_FAILED
_CHECK));
                  }
               } else {
                result.setStatus(IResult.SUCCEEDED);
               }
               return result;
            }
         } catch (Exception e) {
             throw new WSMException(WSMException.FAULT_FAILED_CHECK, e);
         }
    }

    public oracle.wsm.common.sdk.IResult
 postExecute(oracle.wsm.common.sdk.IContext p1) {
         IResult result = new Result();
         result.setStatus(IResult.SUCCEEDED);
         return result;
    }
}
```

3.1.2 Validating IP Address Using Policy File

Follow this sample to validate the IP address using Policy File.

The following is the sample policy file:

```
<?xml version = '1.0' encoding = 'UTF-8'?>
<wsp:Policy xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
 xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy"
orawsp:status="enabled"
xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-uti
lity-1.0.xsd"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" orawsp:category="security"
 orawsp:attachTo="binding.server" wsu:Id="ip_assertion_policy"
xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
 xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
wsp:Name="oracle/ip_assertion_policy">
           <orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
 orawsp:name="WSSecurity IpAsertion validator"
 orawsp:category="security/authentication">
               <orawsp:bindings>
                    <orawsp:Config orawsp:name="ipassertion"
 orawsp:configType="declarative">
                         <orawsp:PropertySet orawsp:name="valid_ips">
                               <orawsp:Property orawsp:name="valid_ips"
 orawsp:type="string" orawsp:contentType="constant">
                                    <orawsp:Value>140.87.6.143,10.178.93.107</
orawsp:Value>
                               </orawsp:Property>
                         </orawsp:PropertySet>
                    </orawsp:Config>
               </orawsp:bindings>
```

```
            </orasp:ipAssertion>
</wsp:Policy>
```

3.1.3 Validating IP Address Using policy-config.xml File

Follow the sample to use the `policy-config.xml` file to specify the custom assertion executor.

You can also use the custom policy to specify the custom policy executor, as described in Specifying the Custom Assertion Executor.

```
<?xml version="1.0" encoding="UTF-8"?>
<policy-config>
    <policy-model-config>
      <entry>
        <key namespace="http://schemas.oracle.com/ws/2006/01/securitypolicy"
 element-name="ipAssertion"/>
        <executor-classname>sampleassertion.IpAssertionExecutor</executor-classname>
      </entry>
    </policy-model-config>
</policy-config>
```

3.1.4 Validating IP Address Using Web Service

Follow the sample to validate the IP address using web service.

You can attach the custom assertion to a web service as described in Attaching the Custom Policy to a Web Service.

```
package project1;
import javax.jws.WebService;
import weblogic.wsee.jws.jaxws.owsm.SecurityPolicies;
@WebService
@SecurityPolicy(uri="policy:oracle/ip_assertion_policy")
public class Class1 {
    public Class1() {
        super();
    }

    public String echo1() {
        return "one";
    }
}
```

3.1.5 Validating IP Address Using JSE Client

Follow the sample to validate IP Address using JSE client generated from the web service.

The following sample shows a JSE client generated from the web service shown in Validating IP Address Using Web Service.

```
package project1;
import javax.xml.ws.WebServiceRef;

public class Class1PortClient
{
  @WebServiceRef
  private static Class1Service class1Service;
```

```
  public static void main(String [] args)
  {
    class1Service = new Class1Service();
    Class1 port = class1Service.getClass1Port();
    // Add your code to call the desired methods.

    System.out.println(port.echo1());
  }
}
```

3.2 Performing IP Address Validation in Custom Assertion

You can perform IP address validation in custom assertion by creating the custom assertion and the JAR file, adding the custom policy to the custom store, updating the `CLASSPATH`, attaching the custom policy to the web service, and finally testing the web service.

To perform IP address validation in custom assertion:

1. Create the custom assertion and custom assertion executor with the sample codes as described in Validating IP Address Using Custom Assertion Executor. These samples demonstrate the following key features:
   - Specify the valid values of IP addresses in the custom assertion:

     ```
     <orawsp:PropertySet orawsp:name="valid_ips">
       <orawsp:Property orawsp:name="valid_ips" orawsp:type="string"
      orawsp:contentType="constant">
       <orawsp:Value>140.87.6.143,10.178.93.107</orawsp:Value>
       </orawsp:Property>
     </orawsp:PropertySet>
     ```

     For more information, see Supplying Parameters for Custom Assertions.
   - View the execution stage in the custom assertion executor:

     ```
     oracle.wsm.common.sdk.IMessageContext.STAGE stage =
      ((oracle.wsm.common.sdk.IMessageContext)context).getStage()
     ```

     For more information, see Accessing OWSM Custom Security Assertion.
   - Access the IP address from the custom assertion executor:

     ```
     IConfig config = bindings.getConfigs().get(0);
     IPropertySet propertyset = config.getPropertySets().get(0);
     String valid_ips = propertyset.getPropertyByName("valid_ips").getValue();
     ```

     For more information, see Supplying Parameters for Custom Assertions.
   - Access the context property remote address:

     ```
     String ipAddr = ((IMessageContext)context).getRemoteAddr();
     ```

     For more information, see Examining OWSM Context Properties.
   - In the event of failure, set the fault that caused the request execution to fail:

     ```
     result.setFault(new WSMException(WSMException.FAULT_FAILED_CHECK));
     ```

     For more information, see Handling Exceptions in Custom Assertions.
2. Create the JAR file as described in Creating the Custom Assertion JAR File.

3. Add the custom policy to the policy store as described in Adding the Custom Policy to the Policy Store.
4. Update the `CLASSPATH` as described in Deploying the Custom Assertion.
5. Attach the custom policy to the web service by any one of the methods described in Attaching the Custom Policy to a Web Service.
6. Test the web service by creating a JSE client as shown in Validating IP Address Using JSE Client.

3.3 Encrypting and Decrypting Data in Custom Assertion

The Encryption and Decryption Custom Assertion sample uses a set of custom assertions to encrypt data from an inbound message, which makes it unreadable from consoles, audit trails, or logs. The encrypted data is decrypted for outbound messages for downstream services that require access to the data.

This section includes the following topics:

- Encrypting and Decrypting Data Using Custom Assertion Executor
- Encrypting Elements of an Inbound Message Using Custom Assertion Executor
- Decrypting Elements of an Outbound Message Using Custom Assertion Executor
- Encrypting Data Using Custom Assertion Executor
- Decrypting Data Using Custom Assertion Executor
- Receiving the Encrypted Message Using Composite Application
- Receiving the Decrypted Message Using Composite Application

3.3.1 Encrypting and Decrypting Data Using Custom Assertion Executor

Follow the sample custom assertion executor for encryption and decryption of data.

The following is the sample custom assertion executor. For more information on the implementation, see Performing Data Encryption and Decryption in Custom Assertion.

```
package owsm.custom.soa;

import java.util.HashMap;
import java.util.Iterator;

import javax.xml.namespace.NamespaceContext;
import javax.xml.xpath.XPath;
import javax.xml.xpath.XPathConstants;
import javax.xml.xpath.XPathExpressionException;
import javax.xml.xpath.XPathFactory;

import oracle.wsm.common.sdk.IContext;
import oracle.wsm.policy.model.IAssertion;
import oracle.wsm.policyengine.IExecutionContext;
import oracle.wsm.policyengine.impl.AssertionExecutor;

import org.w3c.dom.Element;
import org.w3c.dom.Node;
```

```
/**
 * A base class for OWSM custom assertions that specific classes can extend. It
 * contains common code and variables used accross all custom assertions.
 *
 * All custom assertions must extend the AssertionExecutor class.
 */
public abstract class CustomAssertion
  extends AssertionExecutor
{


  protected final static String PROP_DEBUG = "debugFlag";

  protected final static String DEBUG_START =
 "============================================================>>>";
  protected final static String DEBUG_END =
 "<<<============================================================";

  protected IAssertion mAssertion = null;
  protected IExecutionContext mEcontext = null;
  protected oracle.wsm.common.sdk.IContext mIcontext = null;

  /**
   * A tag or text to display when printing debug information to identify the
   * content.
   */
  protected String mTag;

  /**
   * Constructor
   */
  public CustomAssertion(String tag)
  {
    super();
    mTag = tag;
  } // CustomAssertion()

  /**
   * Implemented from parent class
   */
  public void init(IAssertion iAssertion,
                   IExecutionContext iExecutionContext,
                   IContext iContext)
  {
    mAssertion = iAssertion;
    mEcontext = iExecutionContext;
    mIcontext = iContext;
    //IAssertionBindings bindings = ((SimpleAssertion)

 (mAssertion)).getBindings();
  } // init()
  /**
   * Implemented from parent class
   */
  public void destroy()
  {
    // Nothing to do.
  } // destroy()

  /**
   * A utility method for extracting the node specified by <code>xpathStr</code>
```

```
  * (with namespaces defined by <code>namespaces</code>) from
*<code>payload</code>
  *
  * This method will print an stack trace if their is an exception. If you want
*to
  * return the exception instead then modify the method appropriately.
  *
  * @param payload the payload
  * @param namespaces the namespaces referenced by <code>xpathStr</code>
  * @param xpathStr an XPath query defining how to extract a node from
*<code>payload</code>
  * @return
  */
 public static Node getDataNode(Element payload, final HashMap<String, String>

namespaces, String xpathStr)
 {
   Node node = null;

   try
   {
     // Create a namespace context based on the namespaces passed in.
     //
     NamespaceContext ctx = new NamespaceContext()
     {
       public String getNamespaceURI(String prefix)
       {
         return namespaces.get(prefix);
       }
       // Dummy implementation - not used
       public Iterator getPrefixes(String val)
       {
         return null;
       }
       // Dummy implemenation - not used
       public String getPrefix(String uri)
       {
         return null;
       }
     };
     XPathFactory xpathFact = XPathFactory.newInstance();
     XPath xpath = xpathFact.newXPath();
     xpath.setNamespaceContext(ctx);
           node = (Node)xpath.evaluate(xpathStr, payload, XPathConstants.NODE);
   }
   catch (XPathExpressionException ex)
   {
     ex.printStackTrace();
     return null;
   }

   return node;
 } // getDataNode()

}
```

3.3.2 Encrypting Elements of an Inbound Message Using Custom Assertion Executor

Follow the sample custom assertion executor for encrypting an element of an inbound message.

The following is the sample custom assertion executor:

```
package owsm.custom.soa;

import java.util.HashMap;

import javax.xml.soap.SOAPBody;

import oracle.wsm.common.sdk.IContext;
import oracle.wsm.common.sdk.IMessageContext;
import oracle.wsm.common.sdk.IResult;
import oracle.wsm.common.sdk.Result;
import oracle.wsm.common.sdk.SOAPBindingMessageContext;
import oracle.wsm.common.sdk.WSMException;
import oracle.wsm.policy.model.IAssertionBindings;
import oracle.wsm.policy.model.IConfig;
import oracle.wsm.policy.model.IProperty;
import oracle.wsm.policy.model.IPropertySet;
import oracle.wsm.policy.model.impl.SimpleAssertion;

import oracle.xml.parser.v2.XMLElement;

import org.w3c.dom.Node;


/**
 * A custom assertion class for encrypting an element of an inbound message.
 */
public class InboundEncryptor
  extends CustomAssertion
{
  /**
   * Constructor
   */
  public InboundEncryptor()
  {
    super("[InboundEncryptor] ");
  } // InboundEncryptor()



  /**
   * Process an inbound message for the given invocation context
   *
   * @param iContext the invocation context for a specific message
   * @return the result of any actions taken. It can return a success message or
   *         a fault with an exception message
   */
  public IResult execute(IContext iContext)
  {
    // Create the result that's going be populate with success or failure
    // depending on what happens.
    //
```

```
    IResult result = new Result();

    // Specify whether we are in debug mode or not. If true then debug statements
    // will be printed to the log file.
    // This can be set to true in the OWSM policy assertion.
    //
    boolean debug = false;

    try
    {
      // Get the property set which contains properties defined in the OWSM
      // policy assertion.
      //
      IAssertionBindings bindings = ((SimpleAssertion)
(mAssertion)).getBindings();
      IConfig config = bindings.getConfigs().get(0);
      IPropertySet propertyset = config.getPropertySets().get(0);

      // Now that we have the property set, let's check it for the specific
      // properties we care about.
      //

      // Check for the debug flag property.
      //
      IProperty debugProp = propertyset.getPropertyByName(PROP_DEBUG);
      if (debugProp != null)
      {
        String debugStr = debugProp.getValue();
        debug = Boolean.valueOf(debugStr).booleanValue();
      }
      if (debug)
      {
        System.out.println(mTag+DEBUG_START);
        System.out.println(mTag+this.getClass().getSimpleName()+".execute()
Starting...");
        System.out.println(mTag+"In debug mode");
      }

      // Check for the stage. We only care about the request stage for this
      // implementation.
      //
      IMessageContext.STAGE stage = ((IMessageContext) iContext).getStage();
      if (debug) System.out.println(mTag+"stage="+stage);
      if (stage != IMessageContext.STAGE.request)
      {
        result.setStatus(IResult.SUCCEEDED);
        if (debug)
        {
          System.out.println(mTag+"Nothing to process in this stage. Returning");
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }
      // Get the encryption key, which is a property on the assertion.
      //
      String key = propertyset.getPropertyByName("encryption_key").getValue();
      if (debug) System.out.println(mTag+"key=[" + key + "]");
      if (key == null || key.trim().length() == 0)
      {
        result.setStatus(IResult.FAILED);
        result.setFault(new WSMException("Invalid key"));
```

```
        if (debug)
        {
          System.out.println(mTag+"Invalid key");
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }
      // As as point of interest, you can get the service URL. This could be used
      // by this class to know which service this message is bound for, and
 //therefore
      // which XPath expression to use.
      // In this example no such logic is needed as we only have one servcie
      // to worry about.
      //
      if (debug)
      {
        String serviceURL = ((IMessageContext) iContext).getServiceURL();
        System.out.println(mTag+"serviceURL=[" + serviceURL+"]");
      }
      // Get the message.
      //
      SOAPBindingMessageContext soapbindingmessagecontext =
 (SOAPBindingMessageContext) iContext;
      javax.xml.soap.SOAPMessage soapMessage =
 soapbindingmessagecontext.getRequestMessage();
      SOAPBody soapElem = soapMessage.getSOAPBody();
      if (debug)
      {
        System.out.println(mTag+"----- Start ORIGINAL inbound message -----");
        ((XMLElement) soapElem).print(System.out);
        System.out.println(mTag+"-----  End ORIGINAL inbound message  -----");
      }
      // Create the XPath to reference the element which is to be encrypted.
      //
      String xpathStr =
 "/soap:Envelope/soap:Body/ns1:process/ns1:order/ns1:ccNum";
      // Build up a namespace list for any namespaces referenced by the
      // XPath expression. This will be the basis for a namespace context
      // created later.
      //
      final HashMap<String, String> namespaces = new HashMap<String, String>();
      namespaces.put("soap", "http://schemas.xmlsoap.org/soap/envelope/");
      namespaces.put("ns1", "http://xmlns.oracle.com/CustomEncryption
 _jws/CustomEncryptionComposite/ProcessCustomer");

      // Extract the node that should be encrypted.
      //
      Node inputNode = getDataNode(soapElem, namespaces, xpathStr);
      if (inputNode == null)
      {
        // Something went wrong, but getDataNode() would've printed out a
 //stacktrace
        // so print out a debug statement and exit.
        //
        result.setStatus(IResult.FAILED);
        result.setFault(new WSMException("Cannot find node with XPath expression:
 "+xpathStr));
        if (debug)
        {
          System.out.println(mTag+"Cannot find node with XPath expression:
 "+xpathStr);
```

```
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }

      // Extract the string value of the element to be encrypted.
      //
      String inputValue = inputNode.getTextContent();

      // Get an instance of EncDec and perform the actual encryption.
      //
      EncDec ed = EncDec.getInstance();
      String encryptedInput = ed.encryptStrToStr(inputValue, key);
      if (debug) System.out.println(mTag+"result of encryption=[" + encryptedInput
+ "]");
      // Replace the value of the node with the encrypted value.
      //
      try
      {
        inputNode.setTextContent(encryptedInput);
      }
      catch (Exception ex)
      {
        ex.printStackTrace();
      }
      if (debug)
      {
        System.out.println(mTag+"----- Start MODIFIED inbound message -----");
        ((XMLElement) soapElem).print(System.out);
        System.out.println(mTag+"-----  End MODIFIED inbound message  -----");
      }
      // Set a happy result.
      //
      result.setStatus(IResult.SUCCEEDED);
    }
    catch (Exception e)
    {
      // This is a general or catchall handler.
      //
      result.setStatus(IResult.FAILED);
      result.setFault(new WSMException(WSMException.FAULTCODE_QNAME_FAILED_CHECK,
e));
      if (debug) System.out.println(this.getClass().getName()+": ERROR: Got an
exception somewhere...");
    }

    if (debug) System.out.println(mTag+DEBUG_END);
    return result;

  } // execute()

} // InboundEncryptor
```

3.3.3 Decrypting Elements of an Outbound Message Using Custom Assertion Executor

Follow the sample custom assertion executor for decrypting an element of an outbound message.

The following is the sample custom assertion executor:

```
package owsm.custom.soa;

import java.util.HashMap;

import javax.xml.soap.SOAPBody;

import oracle.wsm.common.sdk.IContext;
import oracle.wsm.common.sdk.IMessageContext;
import oracle.wsm.common.sdk.IResult;
import oracle.wsm.common.sdk.Result;
import oracle.wsm.common.sdk.SOAPBindingMessageContext;
import oracle.wsm.common.sdk.WSMException;
import oracle.wsm.policy.model.IAssertionBindings;
import oracle.wsm.policy.model.IConfig;
import oracle.wsm.policy.model.IProperty;
import oracle.wsm.policy.model.IPropertySet;
import oracle.wsm.policy.model.impl.SimpleAssertion;

import oracle.xml.parser.v2.XMLElement;

import org.w3c.dom.Node;


/**
 * A custom assertion class for decrypting an element of an outbound message.
 */
public class OutboundDecryptor
  extends CustomAssertion
{

  /**
   * Constructor
   */
  public OutboundDecryptor()
  {
    super("[OutboundDecryptor] ");
  } // OutboundDecryptor()

  ////////////////////////////////////////////////////////////////////////////

  /**
   * Process an outbound message for the given invocation context
   *
   * @param iContext the invocation context for a specific message
   * @return the result of any actions taken. It can return a success message or
   *         a fault with an exception message
   */
  public IResult execute(IContext iContext)
  {
    // Create the result that's going be populate with success or failure
    // depending on what happens.
```

```
    //
    IResult result = new Result();

    // Specify whether we are in debug mode or not. If true then debug statements
    // will be printed to the log file.
    // This can be set to true in the OWSM policy assertion.
    //
    boolean debug = false;

    try
    {
      // Get the property set which contains properties defined in the OWSM
      // policy assertion.
      //
      IAssertionBindings bindings = ((SimpleAssertion)
(mAssertion)).getBindings();
      IConfig config = bindings.getConfigs().get(0);
      IPropertySet propertyset = config.getPropertySets().get(0);

      // Now that we have the property set, let's check it for the specific
      // properties we care about.
      //

      // Check for the debug flag property.
      //
      IProperty debugProp = propertyset.getPropertyByName(PROP_DEBUG);
      if (debugProp != null)
      {
        String debugStr = debugProp.getValue();
        debug = Boolean.valueOf(debugStr).booleanValue();
      }
      if (debug)
      {
        System.out.println(mTag+DEBUG_START);
        System.out.println(mTag+this.getClass().getSimpleName()+".execute()
Starting...");
        System.out.println(mTag+"In debug mode");
      }

      // Check for the stage. We only care about the request stage for this
      // implementation.
      //
      IMessageContext.STAGE stage = ((IMessageContext) iContext).getStage();
      if (debug) System.out.println(mTag+"stage="+stage);
      if (stage != IMessageContext.STAGE.request)
      {
        result.setStatus(IResult.SUCCEEDED);
        if (debug)
        {
          System.out.println(mTag+"Nothing to process in this stage. Returning");
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }
      // Get the encryption key, which is a property on the assertion.
      //
      String key = propertyset.getPropertyByName("decryption_key").getValue();
      if (debug) System.out.println(mTag+"key=[" + key + "]");
      if (key == null || key.trim().length() == 0)
      {
        result.setStatus(IResult.FAILED);
```

```
        result.setFault(new WSMException("Invalid key"));
        if (debug)
        {
          System.out.println(mTag+"Invalid key");
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }
      String serviceURL = ((IMessageContext) iContext).getServiceURL();
      if (debug) System.out.println(mTag+"serviceURL=[" + serviceURL+"]");
      // Get the message.
      //
      SOAPBindingMessageContext soapbindingmessagecontext =

 (SOAPBindingMessageContext) iContext;
      javax.xml.soap.SOAPMessage soapMessage =
 soapbindingmessagecontext.getRequestMessage();
      SOAPBody soapElem = soapMessage.getSOAPBody();

      // As as point of interest, you can get the service URL. This could be used
      // by this class to know which service this message is bound for, and
 //therefore
      // which XPath expression to use.
      // In this example no such logic is needed as we only have one servcie
      // to worry about.
      //
      if (debug)
      {
        System.out.println(mTag+"----- Start ORIGINAL inbound message -----");
        ((XMLElement) soapElem).print(System.out);
        System.out.println(mTag+"-----  End ORIGINAL inbound message  -----");
      }
      // Create the XPath to reference the element which is to be encrypted.
      //
      String xpathStr = "/soap:Envelope/soap:Body/ns1:process/ns1:ccNum";

      // Build up a namespace list for any namespaces referenced by the
      // XPath expression. This will be the basis for a namespace context
      // created later.
      //
      final HashMap<String, String> namespaces = new HashMap<String, String>();
      namespaces.put("soap", "http://schemas.xmlsoap.org/soap/envelope/");
      namespaces.put("ns1", "http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionExternalService/ExternalServiceBpel");

      // Extract the node that should be encrypted.
      //
      Node inputNode = getDataNode(soapElem, namespaces, xpathStr);
      if (inputNode == null)
      {
        // Something went wrong, but getDataNode() would've printed out a
 //stacktrace
        // so print out a debug statement and exit.
        //
        result.setStatus(IResult.FAILED);
        result.setFault(new WSMException("Cannot find node with XPath expression:
 "+xpathStr));
        if (debug)
        {
          System.out.println(mTag+"Cannot find node with XPath expression:
 "+xpathStr);
```

```
          System.out.println(mTag+DEBUG_END);
        }
        return result;
      }

      // Set a happy result.
      //
      result.setStatus(IResult.SUCCEEDED);
    }
    catch (Exception e)
    {
      // This is a general or catchall handler.
      //
      result.setStatus(IResult.FAILED);
      result.setFault(new WSMException(WSMException.FAULTCODE_QNAME_FAILED_CHECK,
 e));
      if (debug) System.out.println(this.getClass().getName()+": ERROR: Got an
 exception somewhere...");
    }

    if (debug) System.out.println(mTag+DEBUG_END);
    return result;

  } // execute()

} // OutboundDecryptor
```

3.3.4 Encrypting Data Using Custom Assertion Executor

Follow the sample custom assertion executor for encryption.

The following is the sample custom assertion executor:

```
<orasp:Assertion xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
                         orawsp:Id="soa_encryption_template"
                         orawsp:attachTo="generic" orawsp:category="security"
                         orawsp:description="Custom Encryption of payload"
                         orawsp:displayName="Custom Encryption"
                         orawsp:name="custom/soa_encryption"
                         xmlns:custom="http://schemas.oracle.com/ws/soa/custom">
  <custom:custom-executor orawsp:Enforced="true" orawsp:Silent="false"
                  orawsp:category="security/custom"
                  orawsp:name="WSSecurity_Custom_Assertion">
    <orawsp:bindings>
      <orawsp:Implementation>owsm.custom.soa.InboundEncryptor</orawsp:Implementation>
      <orawsp:Config orawsp:configType="declarative" orawsp:name="encrypt_soa">
        <orawsp:PropertySet orawsp:name="encrypt">
          <orawsp:Property orawsp:contentType="constant"
                           orawsp:name="encryption_key" orawsp:type="string">
            <orawsp:Value>MySecretKey</orawsp:Value>
          </orawsp:Property>
          <orawsp:Property orawsp:contentType="constant"
                           orawsp:name="debugFlag" orawsp:type="string">
            <orawsp:Value>true</orawsp:Value>
          </orawsp:Property>
        </orawsp:PropertySet>
      </orawsp:Config>
    </orawsp:bindings>
  </custom:custom-executor>
</orasp:Assertion>
```

3.3.5 Decrypting Data Using Custom Assertion Executor

Follow the sample custom assertion executor to decrypt data.

The following is a sample custom assertion for decryption.

```
<orasp:Assertion xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
                         orawsp:Id="soa_decryption_template"
                         orawsp:attachTo="binding.client"
 orawsp:category="security"
                         orawsp:description="Custom Decryption of payload"
                         orawsp:displayName="Custom Decryption"
                         orawsp:name="custom/soa_decryption"
                         xmlns:custom="http://schemas.oracle.com/ws/soa/custom">
  <custom:custom-executor orawsp:Enforced="true" orawsp:Silent="false"
                  orawsp:category="security/custom"
                  orawsp:name="WSSecurity Custom Assertion">
    <orawsp:bindings>
      <orawsp:Implementation>owsm.custom.soa.OutboundDecryptor</
orawsp:Implementation>
      <orawsp:Config orawsp:configType="declarative" orawsp:name="encrypt_soa">
        <orawsp:PropertySet orawsp:name="decrypt">
          <orawsp:Property orawsp:contentType="constant"
                           orawsp:name="decryption_key" orawsp:type="string">
            <orawsp:Value>MySecretKey</orawsp:Value>
          </orawsp:Property>
          <orawsp:Property orawsp:contentType="constant"
                           orawsp:name="debugFlag" orawsp:type="string">
            <orawsp:Value>true</orawsp:Value>
          </orawsp:Property>
        </orawsp:PropertySet>
      </orawsp:Config>
    </orawsp:bindings>
  </custom:custom-executor>
</orasp:Assertion>
```

3.3.6 Receiving the Encrypted Message Using Composite Application

Follow the sample composite application with a BPEL process to demonstrate that it received the encrypted value.

The following is the sample composite application:

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- Generated by Oracle SOA Modeler version 1.0 at [5/10/10 9:33 AM]. -->
<composite name="CustomEncryptionComposite"
           revision="1.0"
           label="2010-05-10_09-33-01_807"
           mode="active"
           state="on"
           xmlns="http://xmlns.oracle.com/sca/1.0"
           xmlns:xs="http://www.w3.org/2001/XMLSchema"
           xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
           xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
           xmlns:ui="http://xmlns.oracle.com/soa/designer/">
  <import namespace="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionComposite/ProcessCustomer"
          location="ProcessCustomer.wsdl" importType="wsdl"/>
  <import namespace="http://xmlns.oracle.com/CustomEncryption
```

```
_jws/CustomEncryptionExternalService/ExternalServiceBpel"
          location="ExternalServiceBpel.wsdl" importType="wsdl"/>
  <service name="processcustomer_client_ep"
           ui:wsdlLocation="ProcessCustomer.wsdl">
    <interface.wsdl interface="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionComposite/ProcessCustomer#wsdl.interface(ProcessCustomer)"/>
    <binding.ws port="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionComposite/ProcessCustomer#wsdl.endpoint(processcustomer
_client_ep/ProcessCustomer_pt)">
      <wsp:PolicyReference URI="SOA/CustomEncryption" orawsp:category="security"
                           orawsp:status="enabled"/>
    </binding.ws>
  </service>
  <component name="ProcessCustomer">
    <implementation.bpel src="ProcessCustomer.bpel"/>
  </component>
  <reference name="ExternalSvc" ui:wsdlLocation="ExternalServiceBpel.wsdl">
    <interface.wsdl interface="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionExternalService/ExternalServiceBpel#wsdl.interface(ExternalSe
rviceBpel)"/>
    <binding.ws port="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionExternalService/ExternalServiceBpel#wsdl.endpoint(externalser
vicebpel_client_ep/ExternalServiceBpel_pt)"
                location="externalservicebpel_client_ep.wsdl"
                soapVersion="1.1">
      <wsp:PolicyReference URI="SOA/CustomDecryption" orawsp:category="security"
                           orawsp:status="enabled"/>
      <property name="weblogic.wsee.wsat.transaction.flowOption"
                type="xs:string" many="false">WSDLDriven</property>
    </binding.ws>
  </reference>
  <wire>
    <source.uri>processcustomer_client_ep</source.uri>
    <target.uri>ProcessCustomer/processcustomer_client</target.uri>
  </wire>
  <wire>
    <source.uri>ProcessCustomer/ExternalSvc</source.uri>
    <target.uri>ExternalSvc</target.uri>
  </wire>
</composite>
```

3.3.7 Receiving the Decrypted Message Using Composite Application

Follow the sample composite application to represent an external service being called and show that it received the decrypted value.

The following is the sample composite application:

```
<?xml version="1.0" encoding="UTF-8" ?>
<!-- Generated by Oracle SOA Modeler version 1.0 at [5/10/10 9:41 AM]. -->
<composite name="CustomEncryptionExternalService"
           revision="1.0"
           label="2010-05-10_09-41-00_810"
           mode="active"
           state="on"
           xmlns="http://xmlns.oracle.com/sca/1.0"
           xmlns:xs="http://www.w3.org/2001/XMLSchema"
           xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
           xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
           xmlns:ui="http://xmlns.oracle.com/soa/designer/">
  <import namespace="http://xmlns.oracle.com/CustomEncryption
```

```
_jws/CustomEncryptionExternalService/ExternalServiceBpel"
          location="ExternalServiceBpel.wsdl" importType="wsdl"/>
  <service name="externalservicebpel_client_ep"
           ui:wsdlLocation="ExternalServiceBpel.wsdl">
    <interface.wsdl interface="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionExternalService/ExternalServiceBpel#wsdl.interface(ExternalSe
rviceBpel)"/>
    <binding.ws port="http://xmlns.oracle.com/CustomEncryption
_jws/CustomEncryptionExternalService/ExternalServiceBpel#wsdl.endpoint(externalser
vicebpel_client_ep/ExternalServiceBpel_pt)"/>
  </service>
  <component name="ExternalServiceBpel">
    <implementation.bpel src="ExternalServiceBpel.bpel"/>
  </component>
  <wire>
    <source.uri>externalservicebpel_client_ep</source.uri>
    <target.uri>ExternalServiceBpel/externalservicebpel_client</target.uri>
  </wire>
</composite>
```

3.4 Performing Data Encryption and Decryption in Custom Assertion

You can perform data encryption and decryption in custom assertion by creating custom assertion policy file and JAR file, adding the custom policy to the policy store, updating the `CLASSPATH` and finally attaching the custom policy to the web service.

To perform data encryption and decryption in custom assertion:

1. Create the custom assertion policy file and custom assertion executor with the sample codes as described in Encrypting and Decrypting Data in Custom Assertion. These samples demonstrate the following key features:

   - Specify the properties encryption_key and debugFlag in the encrypt property set for the encryption custom assertion:

     ```
     <orawsp:PropertySet orawsp:name="encrypt">
       <orawsp:Property orawsp:contentType="constant"
                        orawsp:name="encryption_key"
orawsp:type="string">
         <orawsp:Value>MySecretKey</orawsp:Value>
       </orawsp:Property>
       <orawsp:Property orawsp:contentType="constant"
                        orawsp:name="debugFlag" orawsp:type="string">
         <orawsp:Value>true</orawsp:Value>
       </orawsp:Property>
     </orawsp:PropertySet>
     ```

     For more information, see Supplying Parameters for Custom Assertions.

   - Set the properties decryption_key and debugFlag in the property set decrypt for decryption custom assertion:

     ```
     <orawsp:PropertySet orawsp:name="decrypt">
       <orawsp:Property orawsp:contentType="constant"
                        orawsp:name="decryption_key"
 orawsp:type="string">
         <orawsp:Value>MySecretKey</orawsp:Value>
     ```

```
        </orawsp:Property>
        <orawsp:Property orawsp:contentType="constant"
                         orawsp:name="debugFlag" orawsp:type="string">
          <orawsp:Value>true</orawsp:Value>
        </orawsp:Property>
      </orawsp:PropertySet>
```

For more information, see Supplying Parameters for Custom Assertions.

- Extract the node specified by XPath expressions with defined namespaces from the custom assertion class:

```
NamespaceContext ctx = new NamespaceContext()
      {
        public String getNamespaceURI(String prefix)
        {
          return namespaces.get(prefix);
        }
        // Dummy implementation - not used
        public Iterator getPrefixes(String val)
        {
          return null;
        }
        // Dummy implemenation - not used
        public String getPrefix(String uri)
        {
          return null;
        }
      };
      XPathFactory xpathFact = XPathFactory.newInstance();
      XPath xpath = xpathFact.newXPath();
      xpath.setNamespaceContext(ctx);

      node = (Node)xpath.evaluate(xpathStr, payload, XPathConstants.NODE);
    }
```

For more information, see Accessing Parts of a Message Using XPath.

2. Create the JAR file as described in Creating the Custom Assertion JAR File.
3. Add the custom policy to the policy store as described in Adding the Custom Policy to the Policy Store.
4. Update the `CLASSPATH` as described in Deploying the Custom Assertion.
5. Attach the custom policy to the web service by any one of the methods described in Attaching the Custom Policy to a Web Service.

3.5 Authenticating a User in Custom Assertion

The authentication custom assertion sample is used to authenticate a user using WebLogic authentication providers. The credentials (user name and password) are read from incoming SOAP message and are authenticated against WebLogic authentication provider using a custom login module.

This section includes the following topics:

- Authenticating Using Custom Assertion Executor
- Authenticating Using Policy File

- Implementing User Authentication Using Files

3.5.1 Authenticating Using Custom Assertion Executor

Follow the sample executor to understand how it invokes the custom login module to perform the authentication.

The following example describes it.

```
package sampleAssertion;
/**
 * <Description>
 * <p>
 * CustomAuthExecutor class. This class is invoked for custom_auth_policy
 * This class expects that wss_username_token_client_policy is attached to the
* calling client
 * This class fetches credentials from incoming SOAP message and performs
 * authentication against a configured login module as specified by the Login
* Config file.
 * </p>
 * </Description>
 *
 */
import java.util.Iterator;

import javax.security.auth.Subject;
import javax.security.auth.login.LoginContext;
import javax.security.auth.login.LoginException;
import javax.xml.soap.SOAPException;
import javax.xml.soap.SOAPHeader;
import javax.xml.soap.SOAPHeaderElement;
import javax.xml.soap.SOAPMessage;

import oracle.wsm.common.sdk.IContext;
import oracle.wsm.common.sdk.IMessageContext;
import oracle.wsm.common.sdk.IResult;
import oracle.wsm.common.sdk.Result;
import oracle.wsm.common.sdk.SOAPBindingMessageContext;
import oracle.wsm.common.sdk.WSMException;
import oracle.wsm.policy.model.IAssertion;
import oracle.wsm.policy.model.ISimpleOracleAssertion;
import oracle.wsm.policyengine.impl.AssertionExecutor;

import org.w3c.dom.Node;
import org.w3c.dom.NodeList;

public class CustomAuthExecutor extends AssertionExecutor {

    public void init(IAssertion assertion,
        oracle.wsm.policyengine.IExecutionContext econtext,
        oracle.wsm.common.sdk.IContext context) {
        this.assertion = assertion;
        this.econtext = econtext;
    }

    public oracle.wsm.policyengine.IExecutionContext getExecutionContext() {
        return this.econtext;
    }

    public boolean isAssertionEnabled() {
```

```
        return ((ISimpleOracleAssertion) this.assertion).isEnforced();
    }

    public String getAssertionName() {
        return this.assertion.getQName().toString();
    }


    /**
     * <p>
     * This method is invoked for each request/response.
     * This method retrieves credentials from incoming soap message and
     * authenticates
     * them against a configured login module
     * </p>
     * @param context
     * @return IResult
     * @exception WSMException
     */
    @Override
    public IResult execute(IContext context) throws WSMException {
        oracle.wsm.common.sdk.IMessageContext.STAGE stage =
((oracle.wsm.common.sdk.IMessageContext) context)
            .getStage();
        IResult result = new Result();

        if (stage == IMessageContext.STAGE.request) {
            try {
                SOAPBindingMessageContext soapMsgCtxt= (SOAPBindingMessageContext)
                context;
                //Intercepts the incoming SOAP message
                SOAPMessage soapMessage = soapMsgCtxt.getRequestMessage();

                MyCallbackHandler callbackhandler = new MyCallbackHandler();

                //initialize CallbackHandler instance which is passed to
                //LoginModule implementation
                initializeCallbackHandler(callbackhandler, soapMessage);


               //In order to authenticate a user, you first need a
               //javax.security.auth.login.LoginContext.
               /**

               * Following parameters are passed to LoginContext
               * 1. name - LoginContext uses the name as the index into the JAAS
               * login configuration file to determine which LoginModules should
               * be used. Such an entry specifies the class(es) that
               * implement the desired underlying authentication
               * technology(ies). The class(es) must implement
               *  the LoginModule interface, which is in the
               * javax.security.auth.spi package.
               * In our case CustomLoginModule refers to
               * sampleAssertion.loginmodule.CustomLoginModule
               *
               * 2. Subject - the subject (javax.security.auth.Subject) to
               * authenticate. LoginContext passes the Subject
               * object to configured LoginModules so they may perform
               * additional authentication and update the Subject.
               *
               * 3. CallbackHandler instance -
```

```
                * javax.security.auth.callback.CallbackHandler  object is used by
                * LoginModules to
                * communicate with the user. LoginContext passes the
                * CallbackHandler object to configured LoginModules
                *  so they may communicate with the user. An application
                * typically provides its own CallbackHandler implementation.
                *
                **/


                 // Obtain a LoginContext, needed for authentication.
                 // Tell it to use the LoginModule implementation
                // specified by the entry named "CustomLoginModule" in the
                // JAAS login configuration file and to also use the
                // specified CallbackHandler.
                 Subject subject = new Subject();
                LoginContext lc = new LoginContext("CustomLoginModule", subject,
                callbackhandler);

                /**Once the caller has instantiated a LoginContext, it invokes the
                * login method to authenticate a Subject
                * The LoginContext instantiates a new empty
                * javax.security.auth.Subject object (which represents the user or
                * service being
                * authenticated).
                * The LoginContext constructs the configured LoginModule (in our
                * case CustomLoginModule) and initializes it with this new Subject
                * and
                * MyCallbackHandler.
                * The SampleLoginModule will utilize the MyCallbackHandler to
                * obtain the user name and password.
                * If authentication is successful, the CustomLoginModule
                * populates the Subject with a Principal representing the user.
                *
                 **/
                lc.login();

                //authenticated Subject can be retrieved by calling the
                // LoginContext's getSubject
                 //method
                  subject = lc.getSubject();

 System.out.println("Authentication succeeded");


context.setProperty(oracle.wsm.common.sdk.IMessageContext.SECURITY_SUBJECT,sub);

                 //sets result to succeeded if authentication succeeds
  result.setStatus(IResult.SUCCEEDED);
  } catch (LoginException e) {
                //in case there is a failure in authentication sets result to
                // failed state and
                // throw Failed authentication exception
                 result.setStatus(IResult.FAILED);
                 throw new WSMException(
                     WSMException.FAULTCODE_QNAME_FAILED_AUTHENTICATION, e);
            }
        }

        return result;
    }
```

```
                    /**
                     * Retrieves credentials from incoming SOAP message and
                     * sets them into call back handler, which is than passed to
                     * Login module
                     * class
                     * via initialize(Subject, Callbackhandler,..) method of
                     *  LoginModule
                     * @param SOAPMessage
                     * @param callbackhandler
                     *
                     */
   private void initializeCallbackHandler(MyCallbackHandler callbackhandler,
SOAPMessage soapElement) {
       try {
           SOAPHeader header = soapElement.getSOAPPart().getEnvelope()
               .getHeader();
           SOAPHeaderElement hdrElem = null;
           Iterator iter = header.examineAllHeaderElements();

           while (iter.hasNext()) {
               hdrElem = (SOAPHeaderElement) iter.next();
               String localName = hdrElem.getLocalName();
               NodeList headerNodeList = hdrElem.getChildNodes();

               for (int i = 0; i < headerNodeList.getLength(); i++) {
                   Node kid = headerNodeList.item(i);
                   String kidName = kid.getLocalName();

                   if (kidName.equals("UsernameToken")) {
                       NodeList nodeList = kid.getChildNodes();

                  /**check if incoming SOAP message contains UsernameToken
                   *and retrieve credentials from it
                  * The user name and password are set into callbackhandler
                  * which are passed to Login module
                   * for authentication
                   **/
                           for (int j = 0; j < nodeList.getLength(); j++) {
                               String nodeName = nodeList.item(j).getLocalName();
                               String nodeValue = nodeList.item(j).getTextContent();

                               if (nodeName.equals("Username")) {
                                   callbackhandler.setUserName(nodeValue);
                               }

                               if (nodeName.equals("Password")) {
                                   callbackhandler.setPassword(nodeValue);
                               }
                           }

                   }
               }
           }

       } catch (SOAPException se) {
           System.out.println("caught SOAPException: " + se.getMessage());
       }

   }
```

```
    /**
     *Executes any task required after policy execution.
     *
     */
    @Override
    public oracle.wsm.common.sdk.IResult postExecute(
        oracle.wsm.common.sdk.IContext context) {
        IResult result = new Result();
        result.setStatus(IResult.SUCCEEDED);
        return result;
    }       @Override
    public void destroy() {
    }
   }
```

3.5.2 Authenticating Using Policy File

Follow the sample custom assertion that invokes the executor which is used to authenticate users against WebLogic authentication provider.

The following sample is a custom assertion that invokes the executor described in Authenticating Using Custom Assertion Executor, which is used to authenticate users against WebLogic authentication provider.

```
<?xml version = '1.0'?>
<wsp:Policy xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
 xmlns:oralgp="http://schemas.oracle.com/ws/2006/01/loggingpolicy"
 xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
orawsp:provides="{http://docs.oasis-open.org/ns/opencsa/sca/200903}authentication,
 {http://docs.oasis-open.org/ns/opencsa/sca/200903}clientAuthentication,
 {http://docs.oasis-open.org/ns/opencsa/sca/200903}clientAuthentication.message,
 {http://schemas.oracle.com/ws/2006/01/policy}token.usernamePassword"
 orawsp:status="enabled" xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-uti
lity-1.0.xsd" wsu:Id="custom_auth_policy"
orawsp:displayName="i18n:oracle.wsm.resources.policydescription.PolicyDescription
Bundle_oracle/custom_auth_policy_PolyDispNameKey"
 xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy"
orawsp:description="i18n:oracle.wsm.resources.policydescription.PolicyDescription
Bundle_oracle/custom_auth_policy_PolyDescKey" orawsp:attachTo="binding.server"
 Name="oracle/custom_auth_policy"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" orawsp:category="security"
 orawsp:local-optimization="off">
   <orasp:custom-auth-assertion orawsp:Silent="false" orawsp:name="Custom auth"
 orawsp:Enforced="true" orawsp:category="security/authentication">
      <orawsp:bindings>
       <orawsp:Implementation>sampleAssertion.CustomAuthExecutor</
orawsp:Implementation>
      </orawsp:bindings>
     </orasp:custom-auth-assertion>
</wsp:Policy>
```

3.5.3 Implementing User Authentication Using Files

You can authenticate a user using the login configuration file and the implement various classes as specified in the file.

It contains the following topics:

- Authenticating Using Login Configuration File

- Implementing a Custom Login Module Class
- Implementing a Simple Login Module Class
- Implementing a Callback Handler Class

3.5.3.1 Authenticating Using Login Configuration File

The following sample describes a Login configuration file that contains an entry specifying the Login Module that is to be used to do the user authentication.

```
/** Login Configuration for the Sample Application
JAAS authentication is performed in a pluggable fashion, so Java applications can
 remain independent from
underlying authentication technologies. Users can plugin there custom loginmodule
 implementations which
can integrate with corresponding authentication provider.

The name for an entry in a login configuration file is the name that applications
 use to refer to the entry when
they instantiate a LoginContext. The specified LoginModules (described below) are
 used to control the authentication process.

As part of this sample we are using CustomLoginModule and SimpleLoginModule
1. CustomLoginModule - integrates with weblogic authentication provider
2. SimpleLoginModule - simply returns

You can also provide implementation of javax.security.auth.login.Configuration
 interface
Refer http://download.oracle.com/javase/1.4.2/docs/api/javax/security/auth/login/
Config
uration.html and
http://download.oracle.com/javase/1.4.2/docs/guide/security/jaas/tutorials/LoginC
onfigFile.html for more details.

**/

CustomLoginModule {
   sampleAssertion.loginmodule.CustomLoginModule required debug=true;
};

SimpleLoginModule {
  sampleAssertion.loginmodule.SimpleLoginModule required debug=true;
};
```

3.5.3.2 Implementing a Custom Login Module Class

Follow the sample CustomLoginModule class that provides an implementation of javax.security.auth.spi.LoginModule and authenticates a user against WebLogic authentication provider.

The following is a sample CustomLoginModule class that is specified by the LoginConfig file in Authenticating Using Login Configuration File.

```
package sampleAssertion.loginmodule;
/**
 * <Description>
 * <p>
 * CustomLoginModule class implements the javax.security.auth.spi.LoginModule
 * interface. CustomLoginModule class is specified
 * by the login configuration file i.e Login.config file.
```

```
 * This class authenticates user against weblogic authentication provider.
 * If authentication is successful, the CustomLoginModule associate Principals and
 * Credentials with the authenticated Subject
 *
 * Users can create there own custom login modules
 * by implementing <code>javax.security.auth.spi.LoginModule</code> interface
 * </p>
 * </Description>
 *
 */
import java.security.AccessController;
import java.security.PrivilegedAction;
import java.util.Map;

import javax.security.auth.Subject;
import javax.security.auth.callback.CallbackHandler;
import javax.security.auth.login.LoginException;
import javax.security.auth.spi.LoginModule;

import weblogic.security.services.Authentication;

public class CustomLoginModule implements LoginModule
{
    private Subject authenticatorSubject;
    private CallbackHandler callbackHandler;
    private boolean loginSucceeded;

    /**
     * Initialize this LoginModule.
     *
     * <p> This method is called by the <code>LoginContext</code> to initialize
     * the <code>LoginModule</code> with the relevant information.
     * <p>
     *
     * @param subject the - <code>javax.security.auth.Subject</code> to be
     * authenticated.
     *
     * @param callbackHandler - instance of
     * <code>javax.security.auth.callback.CallbackHandler</code>
     *   the CallbackHandler object is used by LoginModules to retrieve the
     * information set by the user
     *   e.g user name / password.
     *
     * @param sharedState state shared with other configured LoginModules. <p>
     *
     * @param options options specified in the login Configuration for this
     *  particular LoginModule.
     *
     **/
    @Override
    public void initialize(Subject subject, CallbackHandler callbackHandler,
 Map<String, ?> sharedState, Map<String, ?> options)
    {
        this.authenticatorSubject = subject;
        this.callbackHandler = callbackHandler;
    }


    @Override
    /**
     * Method to authenticate a <code>Subject</code>.
```

```
 *
 * <p> The implementation of this method authenticates
 * a <code>Subject</code> using weblogic authentication provider
 * <p>
 *
 * @exception LoginException if the authentication fails
 *
 * @return true if the authentication succeeded
 */
public boolean login() throws LoginException
{
    /**authenticates user against weblogic authentication provider and sets
     * loginSucceeded
     * flag to true in case of successful authentication
     */
    this.authenticatorSubject = authenticate(this.callbackHandler);
    loginSucceeded = true;
    return loginSucceeded;
}

/**
 * authenticates using weblogic authentication provider
 * @param CallbackHandler
 * @return authenticated Subject
 * @throws LoginException
 */
private Subject authenticate(CallbackHandler cbh) throws LoginException {
    try {
        return Authentication.login(cbh);
    } catch (LoginException e) {
        throw new LoginException("Authentication Failed"+e.getMessage());
    }
}

@Override
/**
 * Method to commit the authentication process.
 *
 * <p> This method is called if the LoginContext's
 * overall authentication succeeded
 * <p>
 *
 * @exception LoginException if the commit fails
 *
 * @return true if this method succeeded, or false if this
 *          <code>LoginModule</code> should be ignored.
 */
public boolean commit() throws LoginException {
    if (this.authenticatorSubject != null) {
        addToSubject(this.authenticatorSubject);
        return true;
    } else {
        return false;
    }
}
/**
 * Method to abort the authentication process.
 *
 * <p> This method is called if the LoginContext's
 * overall authentication failed.
 * <p>
```

```
     *
     * @exception LoginException if the abort fails
     *
     * @return true if this method succeeded, or false if this
     *          <code>LoginModule</code> should be ignored.
     */
    public boolean abort() throws LoginException {
        return this.loginSucceeded && logout();
    }


    /**
     * Method which logs out a <code>Subject</code>.
     *
     * <p>An implementation of this method might remove/destroy a Subject's
     * Principals and Credentials.
     * <p>
     *
     * @exception LoginException if the logout fails
     *
     * @return true if this method succeeded, or false if this
     *          <code>LoginModule</code> should be ignored.
     */
    public boolean logout() throws LoginException
    {
        if (this.authenticatorSubject != null) {
            removeFromSubject(this.authenticatorSubject);
        }
        this.loginSucceeded = false;
        return true;
    }

    /**
     * associates relevant Principals and Credentials with the Subject located in
     * the LoginModule
     * @param Subject
     */
    protected void addToSubject(final Subject sub) {
        if (sub != null) {
            AccessController.doPrivileged(new PrivilegedAction<Object>() {
             public Object run() {

              authenticatorSubject.getPrincipals().addAll(sub.getPrincipals());
 authenticatorSubject.getPrivateCredentials().addAll(sub.getPrivateCredentials());
authenticatorSubject.getPublicCredentials().addAll(sub.getPublicCredentials());
                        return null;
                    }
                });
        }
    }

    /**
     * removes Principals and Credentials from the subject
     * @param Subject
     */
    private void removeFromSubject(final Subject sub) {
        if (sub != null) {
            AccessController.doPrivileged(new PrivilegedAction<Object>() {
             public Object run() {
 authenticatorSubject.getPrincipals().removeAll(sub.getPrincipals());
 authenticatorSubject.getPrivateCredentials().removeAll(sub.getPrivateCredentials(
```

```
));
authenticatorSubject.getPublicCredentials().removeAll(sub.getPublicCredentials());
                        return null;
                    }
                });
        }
    }
}
```

3.5.3.3 Implementing a Simple Login Module Class

Follow the sample SimpleLoginModule class that provides an implementation of javax.security.auth.spi.LoginModule.

The following is the sample SimpleLoginModule class:

```
/**
 * <Description>
 * <p>
 * SimpleLoginModule class implements the LoginModule interface. SimpleLoginModule
 * class is specified
 * by the login configuration file i.e Loginconfig file.
 * This class simply returns true resulting in successful authentication.
 *
 * This class is shown for illustration purpose only, users can integrate it with
 * there custom authentication provider
 * </p>
 * </Description>
 *
 */
package sampleAssertion.loginmodule;

import java.util.Map;

import javax.security.auth.Subject;
import javax.security.auth.callback.CallbackHandler;
import javax.security.auth.login.LoginException;
import javax.security.auth.spi.LoginModule;

public class SimpleLoginModule implements LoginModule {

    @Override
    public boolean abort() throws LoginException {
        return false;
    }

    @Override
    public boolean commit() throws LoginException {
        return true;
    }

    @Override
    public void initialize(Subject subject, CallbackHandler callbackHandler,
        Map<String, ?> sharedState, Map<String, ?> options) {

    }

    @Override
    /**
```

```
     * This method simply returns true and results in successful authentication
     * Users can integrate it using there custom authentication provider
     */
    public boolean login() throws LoginException {
        System.out.println("Inside SimpleLoginModule");
        return true;
    }

    @Override
    public boolean logout() throws LoginException {
        return false;
    }


}
```

3.5.3.4 Implementing a Callback Handler Class

Follow the sample CallbackHandler class that provides an implementation of javax.security.auth.callback.Callback interface.

The following is the sample CallbackHandler class:

```
package sampleAssertion;
/**
 * <Description>
 * <p>
 * MyCallbackHandler class implements the
 *  <code>javax.security.auth.callback.CallbackHandler </code> interface.
 * An application implements its owm implementation of CallbackHandler.
 * An instance of CallbackHandler is passed as an argument to the LoginContext
 * instantiation.
 * The LoginContext forwards the CallbackHandler directly to the underlying
 * LoginModules
 * so that they may interact with the application to retrieve specific
 * authentication data,
 * such as usernames and passwords.
 * </p>
 * </Description>
 *
 */
import java.io.IOException;

import javax.security.auth.callback.Callback;
import javax.security.auth.callback.CallbackHandler;
import javax.security.auth.callback.NameCallback;
import javax.security.auth.callback.PasswordCallback;
import javax.security.auth.callback.UnsupportedCallbackException;

public class MyCallbackHandler implements CallbackHandler {

    private String userName = null;

    private String password = null;

    public void setUserName(String userName) {
        this.userName = userName;
    }

    public void setPassword(String password) {
        this.password = password;
```

```
    }

    @Override
    /**
     * sets user name and password into callback
     */
    public void handle(Callback[] callbacks) throws IOException,
        UnsupportedCallbackException {

        for (int i = 0; i < callbacks.length; i++) {
            Callback c = callbacks[i];
            if (c instanceof NameCallback) {
                ((NameCallback) c).setName(this.userName);
            } else if (c instanceof PasswordCallback) {
                char[] password = this.password.toCharArray();
                ((PasswordCallback) c).setPassword(password);
            } else {
                throw new UnsupportedCallbackException(callbacks[i],
                    "Unrecognized Callback");
            }
        }

    }

}
```

3.6 Performing User Authentication in Custom Assertion

You can perform user authentication in custom assertion by creating the necessary files, specifying the login configuration file and by invoking the request from the client for authentication.

To perform user authentication in custom assertion:

1. Create the custom assertion and custom assertion executor with the sample codes as described in Authenticating a User in Custom Assertion. These samples demonstrate the following key features:
   - Define the custom assertion implementation class:

     ```
           <orawsp:bindings>
     <orawsp:Implementation>sampleAssertion.CustomAuthExecutor
     </orawsp:Implementation>
           </orawsp:bindings>
     ```

     For more information, see orawsp:Implementation
   - View the execution stage in the custom assertion executor:

     ```
     oracle.wsm.common.sdk.IMessageContext.STAGE stage =
      ((oracle.wsm.common.sdk.IMessageContext) context).getStage();
     ```

     For more information, see Accessing OWSM Custom Security Assertion.
   - In order to authenticate a user, you first need a javax.security.auth.login.LoginContext. Obtain a LoginContext. Use the LoginModule implementation specified by the entry named "CustomLoginModule" in the JAAS login configuration file and use the specified CallbackHandler as follows:

```
Subject subject = new Subject();
LoginContext lc = new LoginContext("CustomLoginModule", subject,
callbackhandler);
```

Once the caller has instantiated a LoginContext, it invokes the login method to authenticate a subject. If authentication is successful, the CustomLoginModule populates the Subject with a Principal representing the user.

For more information, see http://download.oracle.com/javase/1.5.0/docs/guide/security/jgss/tutorials/index.html.

initializerCallbackHandler (from Authenticating Using Custom Assertion Executor) is used to check if incoming SOAP message contains UsernameToken, retrieve credentials from the incoming SOAP message and pass them to Login module class

- In the event of success, set the result to success:

```
result.setStatus(IResult.SUCCEEDED);
```

- In the event of failure, set the fault that caused the request execution to fail:

```
result.setStatus(IResult.FAILED);
                throw new WSMException(
                    WSMException.FAULTCODE_QNAME_FAILED_AUTHENTICATION, e);
```

For more information, see Handling Exceptions in Custom Assertions.

2. Create the JAR file as described in Creating the Custom Assertion JAR File.
3. Add the custom policy to the policy store as described in Adding the Custom Policy to the Policy Store.
4. Update the `CLASSPATH` as described in Deploying the Custom Assertion.
5. Attach the custom policy to the web service by any one of the methods described in Attaching the Custom Policy to a Web Service.
6. Create a client for the web service. This sample custom policy uses wss_username_token_client_policy on the client side. Attach the wss_username_token_client_policy to the client.
7. Create a configuration file and the class files that implement authentication as described in Implementing a Custom Login Module Class. For more information on the configuration file, refer to the JAAS API at http://download.oracle.com/javase/1.5.0/docs/guide/security/jgss/tutorials/index.html.
8. Specify the Login configuration file created in Authenticating Using Login Configuration File. You can specify the file in any one of the following ways:
   - Edit the script you use to start WebLogic Server to add the following option after the java command and restart the server:

     `-Djava.security.auth.login.config==`*<path of LoginConfig file>*
   - The Java security properties file is located in the file named *<JAVA_HOME>*`/lib/security/java.security`, where *<JAVA_HOME>* refers to the directory where the JDK was installed. In this file, change the value of the "login.configuration.provider" security property to the fully qualified name of the Login configuration file.
9. Invoke request from the client. The user name and password set into client will be authenticated against configured login module which integrates with Weblogic authentication provider.

4

Implementing Advanced Features in Custom Assertions

You can use the Java API Reference for Oracle Web Services Manager, which specifies packages, interfaces, and methods to implement advanced features in custom assertions.
This chapter describes how to use the API to implement some common features and exception handling. This information is organized into the following sections:

- Supplying Parameters for Custom Assertions
- Examining OWSM Context Properties
- Accessing OWSM Custom Security Assertion
- Accessing Parts of a Message Using XPath
- Retrieving Certificates Used by Container for SSL
- Accessing Transport Properties
- Accessing Credential Store Framework Keys
- Handling Exceptions in Custom Assertions

4.1 Supplying Parameters for Custom Assertions

You can access the parameters inside the custom assertion executor using the various interfaces and methods, such as IAssertionBindings, IConfig, IPropertySet, getBindings, getConfigs, getPropertySets, getPropertyByName, and getValue.

For step-by-step instruction on how to supply parameters for custom assertions, see Inputting Parameters to Custom Assertions.

4.1.1 Inputting Parameters to Custom Assertions

You can input parameters to custom assertions by specifying and accessing the parameters inside the custom executor.

To input parameters to custom assertions:

1. Specify parameters as properties inside your custom assertion. In this example, the orawsp:PropertySet with the name valid_ips defines a group of properties. The orawsp:Property element defines a single property. orawsp:Value defines a list of valid values for the property.

```
<orawsp:PropertySet orawsp:name="valid_ips">
    <orawsp:Property orawsp:name="valid_ips" orawsp:type="string"
 orawsp:contentType="constant">
     <orawsp:Value>140.87.6.143,10.178.93.107</orawsp:Value>
     </orawsp:Property>
 </orawsp:PropertySet>
```

2. Access the parameters inside the custom executor for the corresponding policy. For example, the following code in the execute method of custom assertion's executor class accesses the property valid_ips:

```
IAssertionBindings bindings =
 ((SimpleAssertion)(this.assertion)).getBindings();
IConfig config = bindings.getConfigs().get(0);
IPropertySet propertyset = config.getPropertySets().get(0);
String valid_ips = propertyset.getPropertyByName("valid_ips").getValue();
```

4.2 Examining OWSM Context Properties

You can access OWSM context properties using the IMessageContext interface.

List of interfaces and methods:

- IMessageContext
- getServiceURL
- getProperty
- getAllProperty

For instructions on how to access the properties using the IMessageContext interface, see Accessing OWSM Context Properties.

4.2.1 Accessing OWSM Context Properties

You can access OWSM context properties in various ways using the IMessageContext interface.

To access OWSM context properties:

1. To access OWSM context properties inside the custom assertion executor, use the IMessageContext interface. For example:

```
IMessageContext messagecontext = (IMessageContext) context;
messagecontext.getServiceURL();
```

2. To access the value of a specific property inside the custom assertion executor, use the IMessageContext interface. For example:

```
messagecontext.getProperty("<property name>");
```

3. To access all the properties that are used during execution from inside the custom assertion executor, use the IMessageContext interface. For example:

```
msgContextProperties = messagecontext.getAllProperties();
```

4.3 Accessing OWSM Custom Security Assertion

You can access the stages and retrieve the request and response messages inside the custom assertion executor using the various interfaces.

The OWSM custom security assertion has three stages:

- **request:** The request stage occurs when a client has made a request and that request is in the process of being delivered to its destination.

- **response:** The response stage occurs after the destination has processed the message and is in the process of returning a response.
- **fault:** The fault stage occurs in the event of a fault.

The contextual information (such as stages and messages) is passed using context properties and can be obtained by the IMessageContext interface. You can use the following interfaces and methods to access context properties:

- IMessageContext
- getStage
- getRequestMessage
- getResponseMessage

For instructions on how to access custom security assertion stages and interfaces, see Accessing Request, Response, and Fault Message Objects.

4.3.1 Accessing Request, Response, and Fault Message Objects

To access request, response and fault messages objects:

1. To access the stage, use the following code within the custom assertion executor:

```
IMessageContext.STAGE stage = ((IMessageContext) iContext).getStage();
           if (stage == IMessageContext.STAGE.request) {
                    //handle request
            }

            if (stage == IMessageContext.STAGE.response) {
                   //handle response
            }

            if (stage == IMessageContext.STAGE.fault) {
                //handle fault conditions
            }
```

2. To retrieve the SOAP request message, use the same context oracle.wsm.common.sdk.IMessageContext, as shown in the following example:

```
oracle.wsm.common.sdk.SOAPBindingMessageContext soapMsgCtxt=
 (oracle.wsm.common.sdk.SOAPBindingMessageContext) context;
javax.xml.soap.SOAPMessage soapMessage = soapMsgCtxt.getRequestMessage();
```

3. To retrieve the SOAP response message, use the same context oracle.wsm.common.sdk.IMessageContext, as shown in the following example:

```
oracle.wsm.common.sdk.SOAPBindingMessageContext soapMsgCtxt=
 (oracle.wsm.common.sdk.SOAPBindingMessageContext) context;
javax.xml.soap.SOAPMessage soapMessage = soapMsgCtxt.getResponseMessage ();
```

4.4 Accessing Parts of a Message Using XPath

You can use XPath expression to access parts of a SOAP message inside the custom assertion executor.

The following topics explain this further:

- About XPath Expression
- Identifying the Value of a Node

- Adding a Namespace to Namespace Context
- Retrieving the Value of a Node

4.4.1 About XPath Expression

You can access parts of a SOAP message using XPath expression inside your custom policy executor.

In the following SOAP message example, the node arg0 has the value john:

```
<S:Envelope xmlns:S="http://schemas.xmlsoap.org/soap/envelope/">
  <S:Header/>
    <S:Body>
      <ns2:echo xmlns:ns2="http://project1/">
       <arg0>john</arg0>
      </ns2:echo>
    </S:Body>
</S:Envelope>
```

In XPath, there are seven types of nodes: element, attribute, text, namespace, processing-instruction, comment, and document nodes. XPath uses path expressions to select nodes in an XML document. Table 4-1 describes some examples of XPath expressions.

Table 4-1 Examples of XPath Expressions

Expression	Description
/S:Envelope	Selects from the root element S:Envelope.
/S:Envelope/S:Body	Selects all S:Body elements that are children of S:Envelope
//S:Body	Selects all S:Body elements no matter where they are in a document

4.4.2 Identifying the Value of a Node

Follow the example to identify the value of the node arg0 using the XPath expression.

The following is the example:

```
//xpath expression that will be used to identify the node arg0
     String xpathStr = "/S:Envelope/S:Body/ns2:echo/arg0";
```

4.4.3 Adding a Namespace to Namespace Context

You can define namespaces for any namespace referenced by the XPath expression and add them to the namespace context.

For example:

```
final DefaultNamespaceContext nsContext = new DefaultNamespaceContext();
nsContext.addEntry("S", "http://schemas.xmlsoap.org/soap/envelope/");
nsContext.addEntry("ns2", "http://project1/");

XPathFactory xpathFact = XPathFactory.newInstance();
```

```
XPath xpath = xpathFact.newXPath();
xpath.setNamespaceContext(nsContext);
```

4.4.4 Retrieving the Value of a Node

Follow the example to retrieve the value of a node using the evaluate method.

The following is the example:

```
     //This will return node arg0 from SOAP message, here soapElement is
// org.w3c.dom.Elemet  representation of SOAP message
     org.w3c.dom.Node inputNode = (Node)xpath.evaluate(xpathStr, soapElement,
 XPathConstants.NODE);
```

4.5 Retrieving Certificates Used by Container for SSL

You can retrieve certificates for SSL by using `oracle.wsm.common.sdk.IMessageContext` and then accessing the attributes of the certificate.

To retrieve certificates for SSL:

1. Retrieve SOAP response message using the same context oracle.wsm.common.sdk.IMessageContext, as shown in the following example:

   ```
   oracle.wsm.common.sdk.SOAPBindingMessageContext soapMsgCtxt=
    (oracle.wsm.common.sdk.SOAPBindingMessageContext) context;
   ```

2. Access the attributes of an X.509 certificate. For example:

   ```
   X509Certificate[] certificates = (X509Certificate[])
   soapMsgCtxt.getTransportContext().getAttribute(oracle.wsm.security.util.SecurityC
   onstants.SSL_PEER_CERTIFICATES);
   ```

4.6 Accessing Transport Properties

You can access the transport properties of HTTP requests and responses by using the same message context as given in the example below and by retrieving the `TransportContext` from the message context.

To access transport properties for HTTP requests and responses:

1. Retrieve SOAP response message using the same context `oracle.wsm.common.sdk.IMessageContext`, as shown in the following example:

   ```
   oracle.wsm.common.sdk.SOAPBindingMessageContext soapMsgCtxt=
   (oracle.wsm.common.sdk.SOAPBindingMessageContext) context;
   ```

2. Retrieve `TransportContext` from message context, as shown in following example:

   ```
   ITransportContext transCtx = invokerCtx.getTransportContext();
   ```

   See the `ITransportContext` and `HttpTransportContext` javadoc classes in *Oracle Fusion Middleware Java API Reference for Oracle Web Services Manager* to see how you can access various properties. Information about these classes is available inside the `oracle.wsm.common.sdk` package.

4.7 Accessing Credential Store Framework Keys

You can use credential store framework (CSF) to manage the credentials securely, and store, retrieve, and maintain credentials.

To configure and use CSF:

1. Configure CSF in jps-config.xml.

   For details on configuring credential store using WLST, see Configuring the Credential Store in *Securing Web Services and Managing Policies with Oracle Web Services Manager*.

2. You can add, update, or retrieve CSF keys from CSF inside your custom assertion executor.

   You can use the following sample to access CSF keys from credential store.

```
   final String mapName = "oracle.wsm.security";
   final csfKey = "user.credentials";
   final oracle.security.jps.service.credstore.PasswordCredential userCreds =
 getCredentialsFromCSF(mapName, csfKey);

          if (userCreds != null) {
                System.out.println("name:"+ userCreds.getName());
                System.out.println("name:"+ new String(userCreds.getPassword()));
                                }
```

   This sample uses the getCredentialsFromCSF method:

```
private static oracle.security.jps.service.credstore.PasswordCredential
getCredentialsFromCSF(
        final String mapName, final String csfKey) {
        oracle.security.jps.service.credstore.PasswordCredential
        passwordCredential = null;
        try {
            if (csfKey != null) {
            final oracle.security.jps.service.credstore.CredentialStore credStore
            = getCredStore();
            if (credStore != null) {
            passwordCredential =
(oracle.security.jps.service.credstore.PasswordCredential)
java.security.AccessController
            .doPrivileged(new
java.security.PrivilegedExceptionAction<oracle.security.jps.service.credstore.
Credential>() {
             public
 oracle.security.jps.service.credstore.Credential run() throws Exception {
              return (credStore .getCredential(mapName, csfKey));
                          }
                   });
              } else {
                  // failure obtaining csf credentials
              }
            }
        } catch (final java.security.PrivilegedActionException ex) {
            //handle excpetion
        } catch (final oracle.security.jps.JpsException jpse) {
            //handle excpetion
```

```
        }
        return passwordCredential;
    }


    private static oracle.security.jps.service.credstore.CredentialStore
 getCredStore() throws oracle.security.jps.JpsException {
        oracle.security.jps.service.credstore.CredentialStore csfStore;
        oracle.security.jps.service.credstore.CredentialStore appCsfStore = null;
        oracle.security.jps.service.credstore.CredentialStore systemCsfStore =
 null;

        final oracle.security.jps.internal.api.runtime.ServerContextFactory
 factory = (oracle.security.jps.internal.api.runtime.ServerContextFactory)
 oracle.security.jps.JpsContextFactory
            .getContextFactory();

        final oracle.security.jps.JpsContext jpsCtxSystemDefault =

factory.getContext(oracle.security.jps.internal.api.runtime.ServerContextFactory.
S
cope.SYSTEM);

        final oracle.security.jps.JpsContext jpsCtxAppDefault = factory
            .getContext(oracle.security.jps.internal.api.runtime.ServerContextFac
tory.Scope.AP
PLICATION);

        appCsfStore = (jpsCtxAppDefault != null) ? jpsCtxAppDefault
            .getServiceInstance(oracle.security.jps.service.credstore.CredentialS
tore.class) :
 null;

        if (appCsfStore == null) {
            systemCsfStore = jpsCtxSystemDefault
                .getServiceInstance(oracle.security.jps.service.credstore.Credent
ialStore.class);
            csfStore = systemCsfStore;
        } else {
            //use Credential Store defined in app-level jps-config.xml
            csfStore = appCsfStore;
        }
        return csfStore;
    }
```

> **Note:**
>
> The following JAR files must be included in the `classpath`:
> `oracle.jps_12.1.2/jps-api.jar, oracle.jps_12.1.2/jps-unsupported-api.jar`.

You must provide the CredentialAccessPermission permission to the custom policy executor jar. For more information about granting permissions, see "Setting the Java Security Policy Permissions" in *Securing Applications with Oracle Platform Security Services*.

4.8 Handling Exceptions in Custom Assertions

You can handle exceptions in the custom assertion executor using the WSMException method.

For more information, see the following topics:

- About WSMException Method
- Processing Exceptions in WSMException

4.8.1 About WSMException Method

Any exceptions during the execution of custom assertions must be handled by the WSMException in the custom assertion executor.

```
IResult execute(IContext mcontext) throws WSMException
```

This method must always return a non-null IResult object. The status field indicates success or failure or other state. The IResult.getFault() method is used to return the detailed cause for failure and returns null in case of success.

4.8.2 Processing Exceptions in WSMException

The exceptions arising from within the execute method of custom assertion executor should first be wrapped in WSMException, the execution status should be set to IResult.FAILED, and the generateFault method throws the WSMException.

The following example shows this:

```
IResult execute(IContext mcontext) throws WSMException {
   IResult result = new Result();
   try {
      ....
      .....

   } catch (Exception e) {
      WSMException wsmException = new WSMException(e);
      result.setStatus(IResult.FAILED);
      generateFault(wsmException);
   }
}
```

A

Custom Assertions Schema Reference

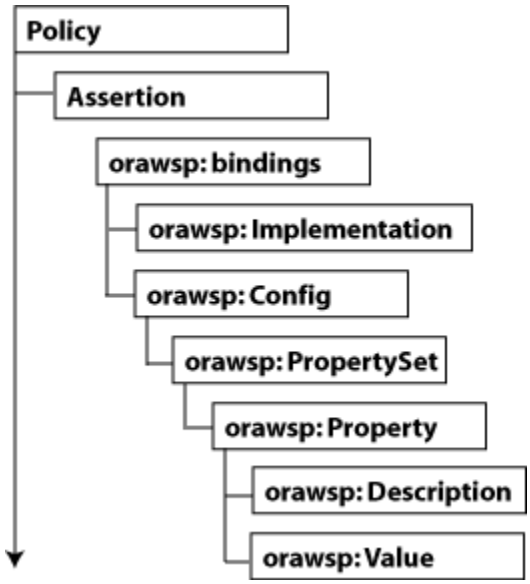
You can use the XML schema in this appendix as a reference when creating a WS-Policy file that contains custom web service assertions.
This appendix includes the following topics:

- Element Hierarchy of Custom Assertions in a WS-Policy File
- Custom Assertion Elements

A.1 Element Hierarchy of Custom Assertions in a WS-Policy File

The following figure illustrates the element hierarchy of the custom assertions in a WS-Policy file:

Figure A-1 Element Hierarchy of Custom Assertion



A.2 Custom Assertion Elements

A custom assertion contains the following elements:

- wsp:Policy
- orasp:Assertion
- orawsp:bindings

- orawsp:Implementation
- orawsp:Config
- orawsp:PropertySet
- orawsp:Property
- orawsp:Description
- orawsp:Value

A.2.1 wsp:Policy

Follow the table and the example given below to know about the <wsp:Policy> element and its attributes.

The <wsp:Policy> element groups nested policy assertions.

Attributes

The following table summarizes the Oracle extensions to the WS-Policy attributes.

Table A-1 Oracle Extensions to WS-Policy Attributes

Attribute	Description
attachTo	Policy subjects to which the policy can be attached. Valid values include:binding.client, binding.server, binding.any.
category	Category of the policy. Valid values include: security and management.
description	Description of the policy.
status	Status of the policy reference. Valid values include: enabled and disabled.

Example

The following example illustrates the <wsp:Policy> element:

```
<wsp:Policy xmlns="http://schemas.xmlsoap.org/ws/2004/09/policy"
  xmlns:orasp="http://schemas.oracle.com/ws/2006/01/securitypolicy"
  orawsp:status="enabled"
xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-util
ity-1.0.xsd"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  orawsp:category="security"
  orawsp:attachTo="binding.server"
  wsu:Id="ip_assertion_policy"
  xmlns:orawsp="http://schemas.oracle.com/ws/2006/01/policy"
  xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
  wsp:Name="oracle/ip_assertion_policy">
```

A.2.2 orasp:Assertion

Follow the tables and the example given below to know about the attributes of the <orasp:Assertion> element.

The <orasp:Assertion> element is the main element of the custom assertion.

Attributes

The following table summarizes the attributes of the <orasp:Assertion> element.

Table A-2 Attributes of <orasp:Assertion> Element

Attribute	Description
Optional	Flag that specifies whether the assertion is optional or required.
Silent	Flag that specifies whether the assertion is advertised. If set to true, the assertion is not advertised.
Enforced	Flag that specifies whether the assertion is currently enabled.
name	Name of the assertion.
description	Description of the assertion.
category	Category to which the assertion applies. Valid values include: security/authentication, security/msg-protection, security/authorization, security/logging and management.
provides	Web service endpoint type to which this policy can be attached. **Note:** This attribute is required for RESTful endpoints. For example, to specify RESTful web services: `orawsp:provides="{http://schemas.oracle.com/ws/2006/01/policy}REST_HTTP"`

Example

The following example illustrates the <orasp:Assertion> element:

```
<orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
orawsp:name="WSSecurity IpAssertion Validator"
orawsp:category="security/authentication"
orawsp:provides="{http://schemas.oracle.com/ws/2006/01/policy}REST_HTTP">
...
</orasp:ipAssertion>
```

Update the provides Attribute to Secure SOAP Web Service Endpoints

To secure a SOAP Web Service endpoints, you must add the intents to the `provides` attribute in the custom policy file.

Table A-3 Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
serverAuthentication	Security Policy	When specified, an SCA runtime ensures that the server is authenticated by the client.
clientAuthentication	Security Policy	When specified, an SCA runtime ensures that the client is authenticated by the server.

Table A-3 (Cont.) Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
authentication	Security Policy	This is a profile intent that requires only clientAuthentication. It is required for backwards compatibility.
mutualAuthentication	Security Policy	This is a profile intent that includes the serverAuthentication and the clientAuthentication intents.
confidentiality	Security Policy	This intent indicates that the message contents are accessible only to those authorized to have access (For example, the service client and the service provider). When the confidentiality intent is specified, an SCA runtime ensures that only authorized entities can view the contents of a message.

Table A-3 (Cont.) Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
integrity	Security Policy	This intent is used to ensure that the messages are not tampered with and altered between the sender and the receiver. This is done generally by digitally signing the message or other methods. When the integrity intent is specified, an SCA runtime ensures that the message contents are not altered. This intent can have the following qualifiers: • transport – the transport qualifier specifies that the qualified intent is realized at the transport or transfer layer of the communication protocol, such as HTTPS. When a serverAuthentication, clientAuthentication, confidentiality, or integrity intent is qualified by message, an SCA runtime delegates serverAuthentication, clientAuthentication, confidentiality and integrity, respectively to the message layer of the communication protocol. • message – the message qualifier specifies that the qualified intent is realized at the message level of the communication protocol. When a serverAuthentication, clientAuthentication, confidentiality, or integrity intent is qualified by message, an SCA runtime delegates serverAuthentication, clientAuthentication, confidentiality and integrity respectively to the message layer of the communication protocol.

Table A-3 (Cont.) Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
atLeastOnce	Reliability Policy Intents	The binding implementation ensures that a message that is successfully sent by a service consumer or service implementation is delivered to the destination (service implementation or service consumer). The message can be delivered multiple times to the service implementation or service consumer. When atLeastOnce intent is specified, an SCA Runtime ensures deliverering of message to the destination service implementation or service consumer.
atMostOnce	Reliability Policy Intents	The binding implementation ensures that a message that is successfully sent by a service consumer or service implementation is not delivered more than once to the service implementation or service consumer. The binding implementation does not ensure that the message is delivered to the service implementation or service consumer. When atMostOnce intent is specified, an SCA Runtime should not deliver duplicates of a message to the service implementation.

Table A-3 (Cont.) Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
ordered	Reliability Policy Intents	The binding implementation ensures that the messages sent by a service client via a single service reference are delivered to the target service implementation in the order in which they were sent by the service client. This intent does not ensure the messages that are sent by a service client are delivered to the service implementation and the ordering of messages sent via different service references by a single service client, even if the same service implementation is targeted by each of the service references. When ordered intent is specified, an SCA Runtime deliver messages sent by a single source to a single destination service implementation in the order that the messages were sent by that source. For service interfaces that involve messages being sent back from the service implementation to the service client (For example, a service with a callback interface), for the ordered intent, the binding implementation ensures that the messages sent by the service implementation over a given wire are delivered to the service client in the order in which they were sent by the service implementation. This intent does not ensure that messages that are sent by the service implementation are delivered to the service consumer.

Table A-3 (Cont.) Intents for provides Attribute to Secure the SOAP Web Service Endpoints

Intent	Type	Description
exactlyOnce	Reliability Policy Intents	The binding implementation ensures that a message sent by a service consumer is delivered to the service implementation and it also ensures that the message is not delivered more than once to the service implementation. When the exactlyOnce intent is specified, an SCA Runtime delivers a message to the destination service implementation and not deliver duplicates of a message to the service implementation.

Example

The following example illustrates the intents added to the `provides` attribute to secure a SOAP web service endpoint:

```
<orasp:ipAssertion orawsp:Silent="true" orawsp:Enforced="true"
    orawsp:name="WSSecurity IpAssertion Validator"
    orawsp:category="security/authentication"
    orawsp:provides="{http://schemas.oracle.com/ws/2006/01/policy}SOAP_HTTP,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}serverAuthentication,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}clientAuthentication,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}authentication,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}mutualAuthentication,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}confidentiality,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}integrity,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}atLeastOnce,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}atMostOnce,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}ordered,
    {http://docs.oasis-open.org/ns/opencsa/sca/200912}exactlyOnce">
</orasp:ipAssertion>
```

A.2.3 orawsp:bindings

Follow the example given below to know about the <oraswsp:bindings> element.

The <oraswsp:bindings> element defines the bindings in the custom assertion.

Example

The following example illustrates the <oraswsp:bindings> element:

```
<orawsp:bindings>
...
</orawsp:bindings>
```

A.2.4 orawsp:Implementation

Follow the example given below to know about the <oraswsp:Implementation> element.

The <oraswsp:Implementation> element defines the custom assertion implementation class.

Example

The following example illustrates the <oraswsp:Implementation> element:

```
<orawsp:Implementation>sampleassertion.IpAssertionExecutor</orawsp
:Implementation>
```

A.2.5 orawsp:Config

Follow the table and the example given below to know about the <oraswsp:Config> element and its attributes.

The <oraswsp:Config> element defines the configuration for the custom assertion.

Attributes

The following table summarizes the attributes of the <orawsp:Config> element.

Table A-4 Attributes of <orawsp:Config> Element

Attribute	Description
name	Name of the configuration.
type	Category to which the configuration applies.
configType	Configuration type. Valid values include: declarative and programmatic. • declarative—Use deployment descriptors and configuration files to describe authentication and authorization requirements. • programmatic—Embed security enforcement within the application.

Example

The following example illustrates the <oraswsp:Config> element:

```
<orawsp:Config orawsp:name="ipassertion" orawsp:configType="declarative">
```

A.2.6 orawsp:PropertySet

Follow the table and example given below to know about the <oraswsp:PropertySet> element and its attributes.

The <oraswsp:PropertySet> element groups nested properties.

Attributes

The following table summarizes the attributes of the <orawsp:PropertySet> element.

Table A-5 Attributes of <orawsp:PropertySet> Element

Attribute	Description
name	Name of the property set.

Example

The following example illustrates the <oraswsp:PropertySet> element:

```
<orawsp:PropertySet orawsp:name="valid_ips">
```

A.2.7 orawsp:Property

Follow the table and example given below to know about the <oraswsp:Property> element and its attributes.

The <oraswsp:Property> element defines a single property.

Attributes

The following table summarizes the attributes of the <orawsp:Property> element.

Table A-6 Attributes of <orawsp:Property> Element

Attribute	Description
name	Name of the property.
type	Type of the property. For example, string.
contentType	Specifies whether the property is required and can be overridden. Valid values include: • constant—Property is a constant value and cannot be overridden. • required—Property is required and can be overridden. • optional—Property is optional and can be overridden. For information about overriding policies, see "Overriding Policy Configuration Overrides" in *Administering Web Services*.

Example

The following example illustrates the <orawsp:Property> element:

```
<orawsp:Property orawsp:name="valid_ips" orawsp:type="string"
 orawsp:contentType="constant">
```

A.2.8 orawsp:Description

Follow the example given below to know about the <oraswsp:Description> element.

The <oraswsp:Description> element provides a description of the property.

Example

The following example illustrates the <oraswsp:Description> element:

```
<orawsp:Description>Valid IP Values</orawsp:Description>
```

A.2.9 orawsp:Value

Follow the example given below to know about the <oraswsp:Value> element.

The <oraswsp:Value> element provides a list of valid values for the property.

Example

The following example illustrates the <oraswsp:Value> element:

```
<orawsp:Value>140.87.6.143,10.178.93.107</orawsp:Value>
```