IBM SPSS Collaboration and Deployment Services
Version 7 Release 0

Capability Information Service Developer's Guide

Note
Before using this information and the product it supports, read the information in "Notices" on page 31.

Product Information

This edition applies to version 7, release 0, modification 0 of IBM SPSS Collaboration and Deployment Services and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

Chapter 1. Introduction to web services

What are web services?

At a high level, a web service is a set of functionality distributed across a network (LAN or the Internet) using a common communication protocol. The web service serves as an intermediary between an application and its clients, providing both a standardized information structure and a standardized communication protocol for interaction between the two.

Where other methods of distributed application architecture rely on a single programming language being used on both the application and its clients, a web service allows the use of loosely coupled services between non-homogenous platforms and languages. This provides a non-architecture-specific approach allowing, for example, Java services to communicate with C# clients, or vice versa.

Advantages to implementing application functionality as web services include the following:

- Software written in different languages (Java or C#) running on different platforms (UNIX or Windows) can exchange services and data
- Application functionality can be accessed by a variety of clients. For example, both a thin-client interface and a rich-client interface can take advantage of the web service operations.
- Updates to the service are immediately available to all service clients

Web service system architecture

Web services are deployed and made publicly available using an application server, such as WebSphere®, JBoss Application Server, or Oracle WebLogic Server. The published web services are hosted by this application server to handle application requests, access permissions, and process load. A high-level architecture of how web services are implemented is displayed in the following diagram.

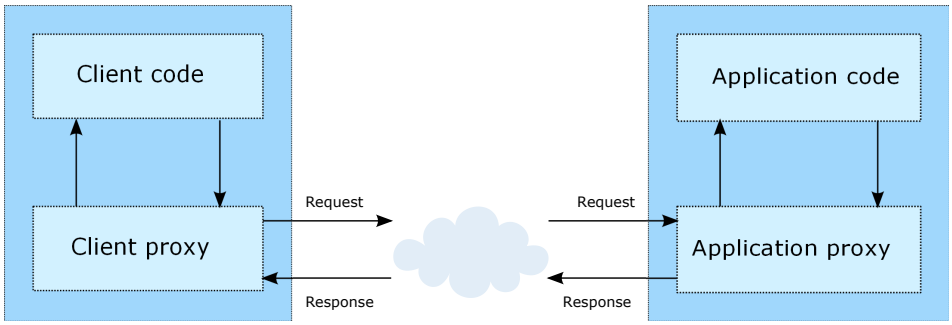

Figure 1. Web service architecture

The client code supplies input to an operation offered by a proxy class. The proxy class generates a request containing a standardized representation of the input and sends it across the network to the application. A proxy class on the server receives the request and unmarshals the contents into objects for processing by the application. Upon completing the operation, the application supplies a proxy with the output. The proxy creates a standardized representation of that output and sends the response back to the client. The client proxy unmarshals the response into native objects for subsequent processing by the client code.

Standardizing the format of the information passing between the client and the application allows a client written in one programming language to communicate with an application written in another. The proxy

classes, which are automatically generated from a web service description by a variety of toolkits, handle the translation between native programming objects and the standardized representation. See the topic "Proxies" on page 5 for more information.

Web service protocol stack

A web service implementation depends on technologies often organized in a layered stack. The implementation itself defines a standard protocol for each technology layer, with each layer depending on the layers appearing below it in the stack.

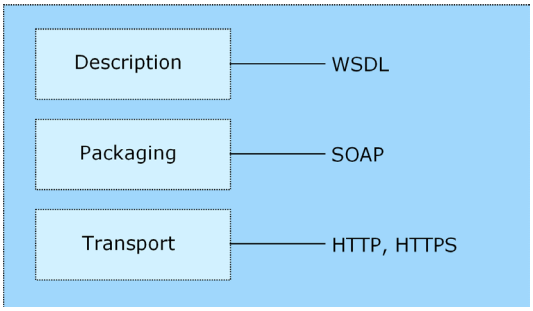

Figure 2. Web service protocol stack

Beginning at the bottom of the stack, the Transport layer defines the technology standards for communication, allowing information to move across the network. HTTP or HTTPS are often used as the standard for the transport layer.

The Packaging layer rests on top of Transport and defines the standard for structuring information for transport across the network. The SOAP format is commonly used, which offers an XML structure for packaging the data. See the topic "Simple Object Access Protocol" for more information.

The topmost layer is Description and identifies the standards used by the layers below it in the stack, as well as providing the definition of the interface available for client use. The most common means of conveying this information is through the use of a WSDL file. See the topic "Web Service Description Language" on page 3 for more information.

Simple Object Access Protocol

The Simple Object Access Protocol (SOAP) is a way to pass information between applications in an XML format.

SOAP messages are transmitted from the sending application to the receiving application, typically over an HTTP session. The actual SOAP message is made up of the Envelope element, which contains a Body element and an optional Header element.

- **Envelope.** This mandatory element is the root of the SOAP message, identifying the transmitted XML as being a SOAP packet. An envelope contains a body section and an optional header section.
- **Header.** This optional element provides an extension mechanism indicating processing information for the message. For example, if the operation using the message requires security credentials, those credentials should be part of the envelope header.
- **Body.** This element contains the message payload, the raw data being transmitted between the sending and receiving applications. The body itself may consist of multiple child elements, with an XML schema typically defining the structure of this data.

A SOAP packet and the corresponding XML is structured in the following way:

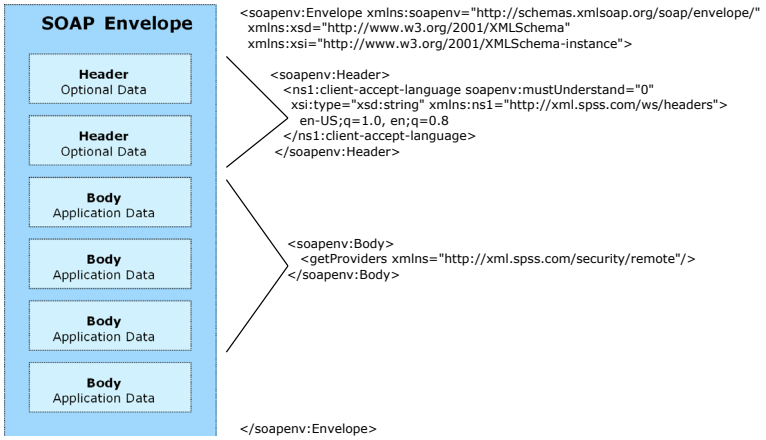

Figure 3. An example SOAP packet

Web Service Description Language

A Web Service Description Language (WSDL) file provides an XML-based map of what functionality the published web service allows, separating the implementation in the service from the interface. The WSDL defines the following:

- The access location of the web service
- Operations the web service exposes
- Parameters the exposed operations accept
- Any request or response messages associated with the operations

The WSDL provides the information necessary to generate a client-side proxy in the target programming language.

In accordance with the WSDL specification adopted by the World Wide Web Consortium, information in the WSDL is organized into the following sections:

- **Types.** Content definitions for web service operation input and output. See the topic "Types" for more information.
- **Messages.** Input and output definitions for the web service operations. See the topic "Messages" on page 4 for more information.
- **PortTypes.** Groups of operations offered by the web service. See the topic "Port types" on page 4 for more information.
- **Bindings.** Protocols and formats for the web service operations. See the topic "Bindings" on page 4 for more information.
- **Services.** Endpoints at which the web service functionality can be accessed. See the topic "Services" on page 5 for more information.

Types

The types element of a WSDL file contains the data type definitions employed by messages processed by the web service. These definitions use XML to organize the information relevant to the type element being defined. Consider the following example type definitions:

```
<wsdl:types>
  <schema targetNamespace="http://xml.spss.com/security/remote"
    xmlns="http://www.w3.org/2001/XMLSchema">
    <element name="getProviders">
      <complexType />
    </element>
    <element name="getProvidersResponse">
      <complexType>
```

```
        <sequence>
          <element name="providerInfo[unbounded]" type="tns1:providerInfo" />
        </sequence>
      </complexType>
    </element>
  </schema>
</wsdl:types>
```

This section defines two elements, *getProviders* and *getProvidersResponse*. The former is an empty element. The latter contains a sequence of *providerInfo* child elements. These children are all of the *providerInfo* type, which is defined elsewhere.

In practice, the WSDL file typically references type element definitions found in an external XML schema. For instance, the following definition uses `security-remote.xsd` to define type elements.

```
<wsdl:types>
  <xs:schema>
    <xs:import namespace="http://xml.spss.com/security/remote"
      schemaLocation="security-remote.xsd"/>
  </xs:schema>
</wsdl:types>
```

Messages

The message elements of a WSDL file defines the input or output parameters for operations available in the web service. Each message can consist of one or more parts, with the parts similar to the parameters of a function call in a traditional programming language. Consider the following two example message definitions:

```
<wsdl:message name="getProvidersResponse">
  <wsdl:part element="tns2:getProvidersResponse" name="parameters" />
</wsdl:message>
<wsdl:message name="getProvidersRequest">
  <wsdl:part element="tns2:getProviders" name="parameters" />
</wsdl:message>
```

The *getProvidersResponse* message contains a single part, corresponding to the *getProvidersResponse* element defined in the types section of the WSDL file. Similarly, the *getProvidersRequest* message also contains a single part, as defined by the *getProviders* element in the types section. See the topic "Types" on page 3 for more information.

Port types

The portType element of a WSDL file defines the actual interface to the web service. A port type is simply a group of related operations and is comparable to a function library, module, or class in a traditional programming language. The definition specifies the parameters for the operations, as well as any values returned. The parameters and return values correspond to messages defined elsewhere in the WSDL file. Consider the following example port type definition:

```
<wsdl:portType name="ProviderInformation">
  <wsdl:operation name="getProviders">
    <wsdl:input message="impl:getProvidersRequest" name="getProvidersRequest" />
    <wsdl:output message="impl:getProvidersResponse" name="getProvidersResponse" />
  </wsdl:operation>
</wsdl:portType>
```

The *ProviderInformation* port type consists of a single operation, *getProviders*. Input to this operation corresponds to the *getProvidersRequest* message. The operation returns information in the structure defined by the *getProvidersResponse* message. See the topic "Messages" for more information.

Bindings

The binding element of a WSDL file binds the interface defined by the port type to transport and messaging protocols. Consider the following example binding definition:

```
<wsdl:binding name="ProviderInformationSoapBinding" type="impl:ProviderInformation">
  <wsdlsoap:binding style="document" transport="http://schemas.xmlsoap.org/soap/http" />
  <wsdl:operation name="getProviders">
    <wsdlsoap:operation soapAction="" />
    <wsdl:input name="getProvidersRequest">
      <wsdlsoap:body namespace="http://xml.spss.com/security/remote" use="literal" />
    </wsdl:input>
    <wsdl:output name="getProvidersResponse">
```

```
      <wsdlsoap:body namespace="http://xml.spss.com/security" use="literal" />
    </wsdl:output>
  </wsdl:operation>
</wsdl:binding>
```

In this case, the transport attribute of the `wsdlsoap:binding` element defines HTTP as the transport protocol. The `getProviders` operation in the interface is bound to the SOAP messaging protocol.

Services

The service element of a WSDL file identifies the network location at which the service interface can be accessed. Consider the following example service definition:

```
<wsdl:service name="ProviderInformationService">
  <wsdl:port binding="impl:ProviderInformationSoapBinding" name="ProviderInformation">
    <wsdlsoap:address location="http://pes_server:8080/security-ws/services/ProviderInformation" />
  </wsdl:port>
</wsdl:service>
```

In this example, the operations comprising the *ProviderInformation* port type can be accessed at:

```
http://pes_server:8080/security-ws/services/ProviderInformation
```

Proxies

Proxies serve as bridges between the client and the web service. A client-side proxy marshals the input objects into a standardized representation which is sent to the web service. A server-side proxy unmarshals the information into input objects for the service operations. The results of the operation are marshalled into standard representations and returned to the client. The client proxy unmarshals the response information into objects for any additional processing by the client.

Creating a proxy is the first step when developing a web service client; the proxy is the translation-unit between your application and the web service the application is using. Fortunately, many development environments include tools for automatically generating the client proxy from the web service WSDL file, allowing the client developer to focus on the client application code instead of transport and packaging protocols.

The proxy classes generated from a WSDL file depend on the tool used. For Java, the `wsdl2java` tool, which is part of the Apache Axis project, can be used. This tool produces a Java class for each type in the WSDL. Each port type results in a Java interface. A binding creates a stub class, and a WSDL service yields a service interface with a locator implementation. These generated classes and interfaces can be called directly from a client application written in Java to access the web service functionality.

An alternative Java proxy tool is `wsimport`, which is part of JAX-WS. The general structure of the generated classes is similar to that created by the Axis tool, but there are some differences. For example, instead of using arrays for input fields and returned items, the code generated from the `wsimport` tool uses `List` collections. In addition, if an input type matches an output type for a method, the `wsimport` tool uses a `Holder` class for the parameter.

In contrast, on the .NET platform, the `wsdl.exe` tool is often used to generate a web service proxy. This tool creates a single source file in a specified language containing the proxy class. This class includes both synchronous and asynchronous methods for each operation defined in the WSDL. For example, the web service operation `getProviders` results in the methods `getProviders`, `getProvidersBegin`, and `getProvidersEnd`. The latter two can be used for asynchronous processing.

A variety of other tools exist for other programming languages. For details, consult the documentation for those tools. In each case, the tool creates native programming constructs that permit leveraging a web service regardless of the service implementation language.

Chapter 2. Capability Information Service overview

The Capability Information Service allows a client to obtain detailed information about the IBM® SPSS® Collaboration and Deployment Services server. The information returned in the capabilities message includes the following:

- User details
- The service version and instance
- Actions the user can perform, as controlled by the authorization mechanism
- Web services available on the server
- Settings for the web services that can be configured by the user

The Capability Information Service is primarily designed to allow clients to collect a variety of information when first connecting to a IBM SPSS Collaboration and Deployment Services server. The capabilities information has ramifications for how a particular user interacts with the server. Consequently, a request for capabilities data should be included as part of the action of logging in to the server.

Workflow

The request for capabilities information should be made part of the act of logging in to the server. The initial exchange between a client and the server would be:

1. Use the Provider Information Service to determine which providers the user can choose from.
2. Log in using the Capability Information Service.
3. Get the root of the repository using the Content Repository Service.

Of course, the first two services must be hardcoded in the client. However, all other web service endpoints should be obtained from the capabilities data. See the topic "Services" on page 10 for more information.

Accessing the Capability Information Service

To access the functionality offered by the Capability Information Service, create a client application using the proxy classes generated by your preferred web service tool. The endpoint for the service is:

```
http://<host-name>:<port-number>/<context-root>/security-ws/services/CapabilityInformation
```

The value of *<host-name>* corresponds to the name or IP address of the machine on which IBM SPSS Collaboration and Deployment Services Repository is installed.

Note: An IPv6 address must be enclosed in square brackets, such as `[3ffe:2a00:100:7031::1]`.
The value of *<port-number>* indicates the port number on which the repository server is running. The *<context-root>* value specifies the custom context root, if any, configured for your repository server. If your system does not use a context root, omit this portion of the endpoint. To access the WSDL file for the service, append *?wsdl* to the service endpoint.

For example, if IBM SPSS Collaboration and Deployment Services Repository is running on port 80 of the machine *cads_server* without a context root, the WSDL file can be accessed using the path:

```
http://cads_server:80/security-ws/services/CapabilityInformation?wsdl
```

Calling Capability Information Service operations

Clients access the operations offered by the web service using a stub for the service. The following is an example of how to acquire a stub in Java through Axis defined methods:

```
String context = "/security-ws/services/CapabilityInformation";
URL url = new URL("http", "cads_server", 80, context);
CapabilityInformationService service = new CapabilityInformationServiceLocator();
stub = service.getCapabilityInformation(url);
```

The service operations can be called directly from the stub, such as:

```
stub.getCapabilities();
```

Chapter 3. Capability Information Service concepts

The information returned by Capability Information Service can be classified into three primary categories, as follows:

- Actions available to the user
- Services available on the server
- Configuration settings for the server

Actions

An action is something the user can do. The ability to perform an action is controlled by the IBM SPSS Collaboration and Deployment Services access control mechanism. Access control can be applied to objects in the repository or to actions. Think of repository objects as nouns and actions as verbs. Both can have access control lists. Users, groups, or roles can be authorized to deal with these nouns for verbs.

The list of actions in the capabilities information are those that a specified user can actually use. If the user has administrative rights, then the list will contain all the actions defined in the installation. A non-administrative user will have a subset of actions and may have none. Typical available actions include the following:

- **Access Contents and Folders.** Access the IBM SPSS Collaboration and Deployment Services Repository.
- **Access Syndicated Feeds.** Access syndicated feeds such as RSS (Really Simple Syndication) feeds.
- **Configuration.** Modify repository settings.
- **Configure Model.** Configure models for scoring.
- **Create Subscriptions.** Create individual subscribtions to repository objects, such as folders, files, jobs, etc. The subscribers receive e-mail messages when changes are made to the corresponding objects.
- **Define and Manage Notifications.** Define and manage notifications for multiple individuals for events such as job success or failure.
- **Define Credentials.** Create, view, and modify security credentials for execution servers.
- **Define Custom Properties.** Define and modify custom properties for objects within the repository.
- **Define Datasources.** Define and modify data sources.
- **Define Message Domains.** Define and modify domains for JMS messaging.
- **Define Promotion Policies.** Define and modify policies (sets of rules) for promoting repository objects.
- **Define Server Clusters.** Define and modify execution server clusters.
- **Define Servers.** Define and modify execution servers.
- **Define Topics.** Define and modify topic hierarchy for the repository.
- **Job Edit.** Create and modify jobs. Note that job visibility to a user is determined by permissions.
- **Job Run.** Execute jobs. Note that job visibility to a user is determined by permissions.
- **Manage Locks** Manage locks that users create on repository resources, for example, unlock resources locked by others.
- **Manage IBM SPSS Collaboration and Deployment Services Enterprise View.** Create, modify, and delete Enterprise Views, Application Views, and Data Provider Definitions.
- **Manage Subscriptions.** Manage other users' subscriptions, and delete subscriptions.
- **MIME Types.** Manage MIME type mappings for the repository.
- **Promote Objects.** Promote repository objects.
- **Repository Index.** Reindex the contents of the repository.
- **Run Custom Dialogs** Run IBM SPSS Statistics custom dialogs.

- **Run Report Dynamically.** Run dynamic reports, such as Business Intelligence Reporting Tools (BIRT) reports, in IBM SPSS Collaboration and Deployment Services Deployment Portal.
- **Schedules.** Manage job schedules.
- **Score Model.** Score models.
- **Show All Versions.** View all versions of objects (labeled and unlabeled) in IBM SPSS Collaboration and Deployment Services Deployment Portal. By default, users are able to see only labeled versions in IBM SPSS Collaboration and Deployment Services Deployment Portal.
- **Show latest.** View only the latest version of objects.
- **Submit Work** Submit work (for example, reports) for processing by IBM SPSS Collaboration and Deployment Services.
- **User Preference Administration.** Manage the preferences of other users. Note that IBM SPSS Collaboration and Deployment Services products do not provide any user interfaces for modifying the preferences of other users. This setting only applies if calling the User Preference Web Service directly.
- **View Expired Files.** View expired content, such as files and jobs.
- **View Model Management Dashboard.** View model management dashboards in IBM SPSS Collaboration and Deployment Services Deployment Manager and IBM SPSS Collaboration and Deployment Services Deployment Portal.

Note: *Show latest* action is a subset of *Show All Versions* and if a user has both actions, *Show All Versions* supersedes *Show latest*.

The most important piece of information about an action is its resource ID. This is a non-localized internal identifier of the action. Much of the time the client is only interested in whether the user has access to the action or not. In such cases, the client should examine the list of actions for the user and see if the resource ID exists. If it does, the user can do something with the action. That information can be used to modify the client interface accordingly. For example, if the resource ID for `Export Content` is present in the capabilities information, a menu item for exporting can be enabled for a user.

Services

IBM SPSS Collaboration and Deployment Services includes a variety of web services. Service information includes a list of all services available using a resource ID to identify each. A client can use the resource IDs to access the services without a need to hard-code the URL path of each service.

For example, if the repository is running on port *80* of *cds_server*, the Provider Information Service has a resource ID of *security/providers* with a URL of:

```
http://cds_server:80/security-ws/services/ProviderInformation
```

A client should use the service information to build a map of resource ID to service URLs. The URLs are suitable for being passed to a service locator, usually generated by a proxy code generator.

Configuration

Configuration information identifies modifiable properties of the repository. Services may offer these configurable items to allow control over settings used. The items can be presented to a client user to be customized as needed. Configuration items are characterized by the following properties:

- A *configkey* used to internally access the item
- A *name* used to identify the item
- A *group* identifier used to classify similar items together

For example, the configuration item for allowing a guest user has a name of *Allow guest user* with a configkey of *com.spss.security/enableGuest*. The item belongs to the group *Security*, allowing it be grouped with other security-related items in client interfaces. The default value is *0*.

All values for configuration items are stored as strings, with boolean values stored as "0" and "1." Some items can have a collection of values, but most only have one. In addition, items without values are possible.

Chapter 4. Operation reference

The getCapabilities operation

Returns information about the actions, services, and configuration of the IBM SPSS Collaboration and Deployment Services server. This information is useful in the determination of how a client interacts with the server.

Return information

The following table identifies the information returned by the `getCapabilities` operation.

Table 1. Return Value.

Type	Description
capabilities	The capabilities of the server and how they are available for the user. A client should usually ask for this as a part of a user login operation.

Java example

The following sample returns the capabilities for a specified user. To optimize performance, check the cache for the capabilities information before issuing a request to the server. If the user isn't in the cache, get the user's capabilities from the server and put them in the cache for future use.

```
public Capabilities getCapabilities(String user)
   throws RemoteException, IOException, ServiceException {
   Capabilities capabilities = null;
   capabilities = (i_cache.containsKey(user))
      ? (Capabilities) i_cache.get(user)
      : null;
   if (capabilities == null) {
      capabilities = getCapabilitiesInformation().getCapabilities();
      i_cache.put(user, capabilities);
   }
   return capabilities;
}
```

SOAP request example

Client invocation of the `getCapabilities` operation generates a SOAP request message that is sent to the server for processing. An example of such a message follows.

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Header>
    <wsse:Security soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken>
        <wsse:Username xsi:type="xsd:string">validUser</wsse:Username>
        <wsse:Password xsi:type="xsd:string">password</wsse:Password>
      </wsse:UsernameToken>
    </wsse:Security>
    <ns1:client-accept-language soapenv:mustUnderstand="0" xsi:type="xsd:string"
      xmlns:ns1="http://xml.spss.com/ws/headers">en-US;q=1.0, en;q=0.8</ns1:client-accept-language>
  </soapenv:Header>
  <soapenv:Body>
    <getCapabilities xmlns="http://xml.spss.com/security/remote"/>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP response example

The server responds to a `getCapabilities` operation call by sending a SOAP response message containing the results. An example of such a message follows.

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <getCapabilitiesResponse xmlns="http://xml.spss.com/security/remote">
      <ns1:capabilities platformVersion="2.5 (2.50.000.335) at 04/04/2007 22:13:59:921 CDT)"
        stamp="2007-04-06T10:25:20.617-05:00" host="http://pes_server.spss.com:80"
        userID="validUser" primaryPrincipalID="//uNative//validuser"
        xmlns:ns1="http://xml.spss.com/security">
        <ns1:actions>
          <ns1:action name="Repository Index" description="Reindex the repository contents."
            resourceID="contentRepository/index" url="/cr/index">
            <ns1:navItems>
              <ns1:navItem locus="bookkeeper" name="Repository Index" order="0"/>
            </ns1:navItems>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Manage Subscriptions"
            description="Manage other users' subscriptions, for example, delete subscriptions"
            resourceID="notification/manageIndividualSubscriptions">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Birt Installer" description="Birt Designer Installer"
            resourceID="peaInstall/birtDesignerInstall" url="/birtdesignerinstall">
            <ns1:navItems>
              <ns1:navItem locus="bookkeeper" name="Birt Installer" order="0"/>
            </ns1:navItems>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Define and Manage Notifications"
            description="Define notifications of job processing events and content changes for multiple recipients"
            resourceID="notification/multicastSubscriptions">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Define Custom Properties"
            description="Define and modify custom properties for repository objects"
            resourceID="contentRepository/customProperties">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Run Report Dynamically"
            description="Permission to Run Report dynamically" resourceID="erExtension/RunReport"
            url="/erExtension/RunReport">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Define Datasources"
            description="Create and modify data source definitions"
            resourceID="contentRepository/datasources">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Manage Enterprise View"
            description="Allows user to create, edit, and delete Enterprise Views, Application Views,
              and Data Provider Definitions."
            resourceID="pev/managePevId">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Access Contents and Folders" description="Access the repository"
            resourceID="contentRepository/folders">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Define Servers" description="Create and modify execution servers"
            resourceID="contentRepository/servers">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
          <ns1:action name="Submit Work"
            description="Allow work (e.g. reports) to be submitted to the Process Management System"
            resourceID="prms/submitwork">
            <ns1:navItems/>
            <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
          </ns1:action>
```

```
  <ns1:action name="Export Content" description="Export repository folder content"
    resourceID="contentRepository/export">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="User Preference Administration"
    description="Manage the preferences of other users" resourceID="userPref/Admin">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Import Content"
    description="Import folders that have been exported from the repository"
    resourceID="contentRepository/import">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="MIME Types" description="Manage MIME types and icons."
    resourceID="configuration/MimeManager" url="/config/mimeManager">
    <ns1:navItems>
      <ns1:navItem locus="bookkeeper" name="MIME Types" order="0"/>
    </ns1:navItems>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Configuration" description="Modify system-wide settings"
    resourceID="configuration/Editor" url="/config/config">
    <ns1:navItems>
      <ns1:navItem locus="bookkeeper" name="Configuration" order="0"/>
    </ns1:navItems>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="View Expired Files" description="View expired content"
    resourceID="contentRepository/showExpired">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Define Topics"
    description="Define and modify the repository topic hierarchy"
    resourceID="contentRepository/topics">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Schedules" description="Create and modify schedules for jobs"
    resourceID="prms/schedules">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Jobs"
    description="Create and modify jobs.
      Note: Use appropriate object security/permissions to restrict visibility to jobs."
    resourceID="prms/jobs">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Define Credentials"
    description="Create and modify security credentials for execution servers"
    resourceID="contentRepository/credentials">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Show All Versions"
    description="View all versions (labelled and unlabelled) of files in Deployment Portal"
    resourceID="consumerUI/ShowAllVersions" url="consumerUI/ShowAllVersions">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
  <ns1:action name="Create Subscriptions"
    description="Subscribe to repository objects to get notified of changes to the objects (individual users only)"
    resourceID="notification/individualSubscriptions">
    <ns1:navItems/>
    <ns1:permissions><ns1:permission>/perform</ns1:permission></ns1:permissions>
  </ns1:action>
</ns1:actions>
<ns1:services>
  <ns1:service resourceID="capabilities" name="security/wsCapabilities"
    url="http://pes_server.spss.com:80/security-ws/services/CapabilityInformation"
    >security/wsCapabilitiesDesc</ns1:service>
  <ns1:service resourceID="notification/EventCollector" name="Event Collector Endpoint"
    url="http://pes_server.spss.com:80/notification/services/EventCollector"/>
  <ns1:service resourceID="notification/SubscriptionManager"
    name="Subscription Manager Endpoint"
    url="http://pes_server.spss.com:80/notification/services/SubscriptionManager"/>
  <ns1:service resourceID="notification/SubscriptionRepository"
    name="Subscription Repository Endpoint"
    url="http://pes_server.spss.com:80/notification/services/SubscriptionRepository"/>
```

```
  <ns1:service resourceID="pemupdate" name="PEM Update"
    url="http://pes_server.spss.com:80/pem/update">This is not a SOAP web service, it's
    just a web site in Eclipse update format.</ns1:service>
  <ns1:service resourceID="prms/ProcessManagement"
    name="Endpoint address of the Process Management web service."
    url="http://pes_server.spss.com:80/process/services/ProcessManagement"/>
  <ns1:service resourceID="prms/SchedulingServer"
    name="Endpoint address of the Process Management Scheduling Server web service."
    url="http://pes_server.spss.com:80/process/services/SchedulingServer"/>
  <ns1:service resourceID="reportservice/reportservice" name="SPSS Reporting Service"
    url="http://pes_server.spss.com:80/reporting-ws/services/Reporting">Report Services</ns1:service>
  <ns1:service resourceID="repository/ContentRepository"
    name="Repository"
    url="http://pes_server.spss.com:80/cr-ws/services/ContentRepository"/>
  <ns1:service resourceID="repository/ContentRepositoryURI"
    name="Repository URI"
    url="http://pes_server.spss.com:80/cr-ws/services/ContentRepositoryURI"/>
  <ns1:service resourceID="search/search" name="SearchService "
    url="http://pes_server.spss.com:80/search-ws/services/Search">Searches the index</ns1:service>
  <ns1:service resourceID="search/values" name="SearchValuesService "
    url="http://pes_server.spss.com:80/search-ws/services/Values">Search values endpoint</ns1:service>
  <ns1:service resourceID="security/authentication" name="security/wsAuthentication"
    url="http://pes_server.spss.com:80/security-ws/services/Authentication"
    >security/wsAuthenticationDesc</ns1:service>
  <ns1:service resourceID="security/directoryManagement"
    name="security/wsDirectoryManagement"
    url="http://pes_server.spss.com:80/security-ws/services/DirectoryManagement"
    >security/wsDirectoryManagementDesc</ns1:service>
  <ns1:service resourceID="security/providers" name="security/wsProviderInformation"
    url="http://pes_server.spss.com:80/security-ws/services/ProviderInformation"
    >security/wsProviderInformationDesc</ns1:service>
  <ns1:service resourceID="security/userDirectories" name="security/wsDirectoryInformation"
    url="http://pes_server.spss.com:80/security-ws/services/DirectoryInformation"
    >security/wsDirectoryInformationDesc</ns1:service>
  <ns1:service resourceID="userpref/client" name="User Preference Client"
    url="http://pes_server.spss.com:80/userpref-ws/services/Client">Client User
    Preference services.</ns1:service>
  <ns1:service resourceID="userpref/manager" name="User Preference Manager"
    url="http://pes_server.spss.com:80/userpref-ws/services/Manager">Manager User
    Preference services.</ns1:service>
</ns1:services>
<ns1:configuration>
  <ns1:configItem configKey="com.spss.search/fieldFold" name="Field Count" group="Search ">
    <ns1:value>5</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.repository.ContentRepository/defaultCharset"
    name="Default charset" group="Repository">
    <ns1:value>UTF-8</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="mail.smtp.from" name="SMTP from e-mail address"
    group="Notification">
    <ns1:value>bmcgee18594@yahoo.com</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.search/Normalizer/Mode"
    name="Unicode Normalizer Mode " group="Search ">
    <ns1:value>1</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.security/enableGuest" name="Allow guest user"
    group="Security">
    <ns1:value>0</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="URLPrefix" name="URL Prefix" group="Setup">
    <ns1:value>http://pes_server.spss.com:80</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.search/fieldList" name="Field Order" group="Search ">
    <ns1:value>Title</ns1:value>
    <ns1:value>Description</ns1:value>
    <ns1:value>Keyword</ns1:value>
    <ns1:value>Author</ns1:value>
    <ns1:value>Version Creation By</ns1:value>
    <ns1:value>Label</ns1:value>
    <ns1:value>Version Creation Date</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.security/LoginInfo" name="Message" group="Security">
    <ns1:value>PES 3.0</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.search/pageSize" name="Default Page Size "
    group="Search ">
    <ns1:value>25</ns1:value>
  </ns1:configItem>
  <ns1:configItem configKey="com.spss.configsys/clientProtocolTimeout"
    name="Protocol Timeout" group="Deployment Manager">
    <ns1:value>180</ns1:value>
  </ns1:configItem>
```

```
          <ns1:configItem configKey="com.spss.repository.ContentRepository/notificationEnabled"
            name="Repository Notification Enabled" group="Repository">
            <ns1:value>1</ns1:value>
          </ns1:configItem>
          <ns1:configItem configKey="securityP/passwordAnnotation" name="security/cfgNameAnno"
            group="security/cfgPseudoGroup"/>
          <ns1:configItem configKey="securityP/supportPasswordChange"
            name="security/cfgNameAllowPwdChange" group="security/cfgPseudoGroup">
            <ns1:value>true</ns1:value>
          </ns1:configItem>
        </ns1:configuration>
      </ns1:capabilities>
    </getCapabilitiesResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

The getVersion operation

Returns the version number of the service.

Return information

The following table identifies the information returned by the `getVersion` operation.

Table 2. Return Value.

Type	Description
string	The version of the web service.

Java example

The following code uses the `WSConnections` class to return stubs for the services. The `getVersion` operation returns the version number of each returned service to the standard output.

```
String host = "localhost";
        int port = 80;
        boolean useSSL = false;
        String username = "admin";
        String password = "spss";
        String acceptLanguage = "en_us";

        // create an instance of the WebServiceConnections, passing in all the
        // relevant connection information.
        WebServiceConnections wsConnections = new WebServiceConnections(host,
                port, useSSL, username, password, acceptLanguage);
CapabilityInformation capabilityInformation = wsConnections.getCapabilityInformation();
            System.out.println("CapabilityInformation version = " + capabilityInformation.getVersion());
DirectoryManagement directoryManagement = wsConnections.getDirectoryManagement();
            System.out.println("Directory Management version = " + directoryManagement.getVersion());
ProviderInformation providerInformation = wsConnections.getProviderInformation();
            System.out.println("ProviderInformation version = " + providerInformation.getVersion());
DirectoryInformation directoryInformation = wsConnections.getDirectoryInformation();
            System.out.println("DirectoryInformation version = " + directoryInformation.getVersion());
Authentication authentication = wsConnections.getAuthentication();
            System.out.println("Authentication version = " + authentication.getVersion());
SSODirectoryManagement ssoDirectoryManagement = wsConnections.getSSODirectoryManagement();
            System.out.println("SSODirectoryManagement version = " + ssoDirectoryManagement.getVersion());
```

SOAP request example

Client invocation of the `getVersion` operation generates a SOAP request message that is sent to the server for processing. An example of such a message follows.

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <getVersion xmlns="http://xml.spss.com/security/remote"/>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP response example

The server responds to a `getVersion` operation call by sending a SOAP response message containing the results. An example of such a message follows.

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance">
  <soapenv:Body>
    <getVersionResponse xmlns="http://xml.spss.com/security/remote">
      <version>4.20.000</version>
    </getVersionResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

Chapter 5. JAX-WS clients

Java developers can create custom web service clients by using JAX-WS.

The discussion here assumes the use of Java 6. In general, the process for accessing IBM SPSS Collaboration and Deployment Services web services involves the following steps:

1. Generate a web service client using wsimport
2. Package the client
3. Programmatically configure the client
4. Exercise the web service

Generating a JAX-WS client

To generate a JAX-WS client, open a command prompt and execute the Java 6 `wsimport` command.

The `wsimport` command creates JAX-WS service classes and JAXB classes that represent the WSDL schema. For example, the following command executes wsimport for the Scoring.HttpV2 service, storing the output in the current directory:

```
"c:\Program Files\IBM\Java60\bin\wsimport.exe" http://localhost:7001/scoring/services/Scoring.HttpV2?wsdl
```

In this example, the command obtained the WSDL from the server by using the endpoint name followed by `?wsdl`. The `wsimport` command requires access to the WSDL in order to generate the files. JAX-WS also requires access to the WSDL file during runtime, so this example hard codes the value provided to `wsimport` in the Java code. The generated client fetches the WSDL from that same location unless otherwise specified. An alternative is to store the WSDL locally and refer to the local copy rather than downloading the WSDL from the server.

Packaging a JAX-WS client

A JAX-WS client must be packaged as a jar file.

The following example command creates a jar file named `scoring.jar`:

```
"c:\Program Files\IBM\Java60\bin\jar.exe" -cvf scoring.jar *
```

This command assumes the command prompt is in the same location in which the client was generated.

If you store the WSDL locally, include the WSDL and XSD files in the jar file. Place the files in the `\META-INF\wsdl` directory within the file. Refer to that directory programmatically when configuring the client.

Configuring a JAX-WS client

JAX-WS clients can obtain the WSDL file remotely from the server or locally from within the jar file.

The following example demonstrates obtaining the WSDL from the server:

```
com.spss.scoring.ws.jaxws.ScoringServices service =
  new com.spss.scoring.ws.jaxws.ScoringServices(
    new URL("http://localhost:7001/scoring/services/Scoring.HttpV2?wsdl"),
    new QName("http://xml.spss.com/scoring/wsdl", "ScoringServices"));
```

The URL includes the host and port for your server.

The following example demonstrates obtaining the WSDL from the within the jar file:

```
com.spss.scoring.ws.jaxws.ScoringServices service =
  new com.spss.scoring.ws.jaxws.ScoringServices(
    DemoClass.class.getResource("/META-INF/wsdl/scoring.wsdl"),
    new QName("http://xml.spss.com/scoring/wsdl", "ScoringServices"));
```

In order to include the required SOAP security headers, create an object that implements `SOAPHandler<SOAPMessageContext>`. See "SOAPHandler example" for an example handler object. The following example shows how this object is used:

```
service.setHandlerResolver(new HandlerResolver()
{
  @Override
    public List<Handler> getHandlerChain(PortInfo portInfo)
    {
      List<Handler> handlerChain = new ArrayList<Handler>();
      handlerChain.add(new SecurityHandler("user", "password", "en-US;q=1.0, en;q=0.8"));
      return handlerChain;
    }
});
```

Next, access the service endpoint:

```
ScoringV2 serviceEndpoint = service.getHttpV2();
```

After obtaining the service endpoint, set the JAX-WS standard endpoint address property, which specifies the URL at which to access the endpoint.

```
Map<String, Object> requestContext = ((BindingProvider)serviceEndpoint).getRequestContext();
requestContext.put(BindingProvider.ENDPOINT_ADDRESS_PROPERTY,
   "http://localhost:7001/scoring/services/Scoring.HttpV2");
```

SOAPHandler example

JAX-WS clients must include an object that implements `SOAPHandler<SOAPMessageContext>`.

The following code provides an example of this object.

```
/*************************************************************
** Licensed Materials - Property of IBM
** IBM SPSS Products: Collaboration and Deployment Services
** © Copyright IBM Corp. 2000, 2013
** US Government Users Restricted Rights - Use, duplication or
** disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
**
*************************************************************/

import java.util.Collections;
import java.util.Set;

import javax.xml.namespace.QName;
import javax.xml.soap.SOAPElement;
import javax.xml.soap.SOAPEnvelope;
import javax.xml.soap.SOAPFactory;
import javax.xml.soap.SOAPHeader;
import javax.xml.soap.SOAPMessage;
import javax.xml.ws.handler.MessageContext;
import javax.xml.ws.handler.soap.SOAPHandler;
import javax.xml.ws.handler.soap.SOAPMessageContext;

/**
 * This is a SOAP handler that applies a security header and a language header to a SOAP message.
 */
public class SecurityHandler implements SOAPHandler<SOAPMessageContext>
{
    // WS-Security header values
    public static final String SECURITY = "Security";
    public static final String USERNAME_TOKEN = "UsernameToken";
    public static final String USERNAME = "Username";
    public static final String PASSWORD = "Password";
    public static final String WS_SECURITY_NAMESPACE =
       "http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd";

    // prefixes
```

```
public static final String WSSE_PREFIX = "wsse"; // ws service security
public static final String SPSS_PREFIX = "spss"; // spss prefix

// SPSS custom language header values
public static final String SPSS_HEADER_NAMESPACE = "http://xml.spss.com/ws/headers";
public static final String CLIENT_ACCEPT_LANGUAGE_HEADER = "client-accept-language";

private String i_username;
private String i_password;
private String i_acceptLanguage;

/**
 * Creates a security and language handler
 * @param username A user name to access the web service. Cannot be null.
 * @param password A password to access the web service. Cannot be null.
 * @param acceptLanguage The language that should be used by the web service.
 * This value should be formatted according to the HTTP specification regarding
 * the Accept-Language HTTP header (e.g. en-US;q=1.0, en;q=0.8)
 * If the value is null, the language header will not be added.
 */
public SecurityHandler(String username, String password, String acceptLanguage)
{
    i_username = username;
    i_password = password;
    i_acceptLanguage = acceptLanguage;
}

@Override
public boolean handleMessage(SOAPMessageContext context)
{
    // Apply this handler to only outbound traffic
    if((Boolean)context.get(SOAPMessageContext.MESSAGE_OUTBOUND_PROPERTY))
    {
        // get the message
        SOAPMessage message = context.getMessage();
        try
        {
            // get the message header
            SOAPEnvelope envelope = message.getSOAPPart().getEnvelope();
            SOAPHeader header = envelope.getHeader();
            if (header == null)
            {
                header = envelope.addHeader();
            }

            // add the UsernameToken header
            header.addChildElement(createUsernameTokenSecurityHeader());
            // assuming the language was provided, apply the custom language header
            if(i_acceptLanguage != null)
            {
                header.addChildElement(createLanguageHeader());
            }
        }
        catch (Exception e)
        {
            e.printStackTrace();
        }
    }
    // allow any other handler to execute
    return true;
}

/**
 * This method creates a custom language header, which allows the scoring service
 * to use the given language if possible.
 * @return A custom language header
 * @throws Exception
 */
private SOAPElement createLanguageHeader() throws Exception
{
    SOAPFactory factory = SOAPFactory.newInstance();

    // create a custom language header
    SOAPElement languageHeader =
       factory.createElement(CLIENT_ACCEPT_LANGUAGE_HEADER,SPSS_PREFIX,SPSS_HEADER_NAMESPACE);

    // include the language text
    languageHeader.addTextNode(i_acceptLanguage);

    return languageHeader;
}

/**
 * Creates the WS-Security SOAP header for UsernameToken as SOAPElement.
```

```
     *
     * @return the WS-Security SOAP header for UsernameToken
     * @throws Exception as appropriate
     */
    private SOAPElement createUsernameTokenSecurityHeader() throws Exception
    {
        SOAPFactory factory = SOAPFactory.newInstance();

        // create a UsernameToken element
        SOAPElement usernameToken =
          factory.createElement(USERNAME_TOKEN, WSSE_PREFIX, WS_SECURITY_NAMESPACE);

        // add the username element
        SOAPElement usernameElement =
          factory.createElement(USERNAME, WSSE_PREFIX, WS_SECURITY_NAMESPACE);
        usernameElement.addTextNode(i_username);
        usernameToken.addChildElement(usernameElement);

        // add the password element
        SOAPElement passwordElement =
          factory.createElement(PASSWORD, WSSE_PREFIX, WS_SECURITY_NAMESPACE);
        passwordElement.addTextNode(i_password);
        usernameToken.addChildElement(passwordElement);

        // create the Security Header
        SOAPElement securityHeader =
          factory.createElement(SECURITY, WSSE_PREFIX, WS_SECURITY_NAMESPACE);
        securityHeader.addChildElement(usernameToken);

        return securityHeader;
    }

    @Override
    public boolean handleFault(SOAPMessageContext context)
    {
        // allow any other handler to execute
        return true;
    }

    @Override
    public void close(MessageContext context)
    {
        // do nothing
    }

    @Override
    public Set<QName> getHeaders()
    {
        return Collections.emptySet();
    }

}
```

Exercising web services from JAX-WS clients

Once properly configured, a JAX-WS client can make calls to IBM SPSS Collaboration and Deployment Services web services.

For example, the following code calls the `getConfigurations` operation of the Scoring Service:

```
serviceEndpoint.getConfigurations();
```

Chapter 6. Microsoft® .NET Framework-based clients

In order to use the web services from a Microsoft Windows Communication Foundation (WCF) client, you will need Visual Studio 2008 or later. The discussion here assumes the use of Visual Studio 2008. In general, the process for accessing IBM SPSS Collaboration and Deployment Services web services involves the following steps:

1. Add a Service Reference. See the topic "Adding a service reference" for more information.
2. Configure the web service endpoint. See the topic "Configuring the web service endpoint" on page 24 for more information.
3. Programmatically configure the necessary endpoint behaviors. See the topic "Configuring endpoint behaviors" on page 25 for more information.
4. Exercise the web service. See the topic "Exercising the service" on page 25 for more information.

Adding a service reference

The first step in using a WCF client to access IBM SPSS Collaboration and Deployment Services web services is to make the service available to the Visual Studio project by adding it as a Service Reference.

1. In Visual Studio, right-click the folder's *References* folder and select **Add Service Reference**.
2. Type the URL of the service WSDL location in the **Address** field, and click **Go**. The value corresponds to the service endpoint appended with `?wsdl`.
3. Specify the namespace in the **Namespace** field.
4. Click **OK**.

Visual Studio adds a new service reference to the Service Reference directory for the project. The name of the reference corresponds to the specified namespace.

Important: If you have a .NET client created by using a version of IBM SPSS Collaboration and Deployment Services before 6.0, you must regenerate your service references from the current WSDL files to allow successful communication between your application and the current server. If you do not regenerate your service references, you may experience a variety of errors that may include incorrect namespace assignments, NullPointerExceptions in the web services being invoked, and data type assignment errors.

Service reference modifications

Due to known compatibility issues between Microsoft tooling and some WSDL files, you need to manually modify some service references before they can be used successfully. For information about the specific issues, see articles 891386 and 326790 on the Microsoft Support site.

To modify a service reference:

1. In Visual Studio, select the project and click **Show All Files** from the Project menu.
2. Expand the service reference that needs to be modified.
3. Expand the **Reference.svcmap** node.
4. Open the `Reference.cs` file.
5. Make the required modifications.
6. Save the file.

For the Content Repository Service , Content Repository URI Service, and Process Management Service, you need to make the following changes to the `RowType` class:

- `private value[][] cellField` should be changed to `private value[] cellField`
- `public value[][] cell` should be changed to `public value[] cell`

For the Scoring Service, you need to make the following changes:

- in the `returnedDPDOutputTable` class, `private returnedDPDOutputValue[][] returnedDPDOutputrowField` should be changed to `private returnedDPDOutputValue[] returnedDPDOutputrowField`
- in the `returnedDPDOutputTable` class, `private returnedDPDOutputValue[][] returnedDPDOutputRow` should be changed to `private returnedDPDOutputValue[] returnedDPDOutputRow`
- in the `returnedRequestInputTable` class, `private returnedRequestInputValue[][] returnedRequestInputRow` should be changed to `private returnedRequestInputValue[] returnedRequestInputRow`
- in the `returnedRequestInputTable` class, `private returnedRequestInputValue[][] returnedRequestInputRowField` should be changed to `private returnedRequestInputValue[] returnedRequestInputRowField`
- in the `requestInputTable` class, `private input1[][] requestInputRowField` should be changed to `private input1[] requestInputRowField`
- in the `requestInputTable` class, `private input1[][] requestInputRow` should be changed to `private input1[] requestInputRow`

For the PevServices Service, you need to make the following changes:

- in the `avTableConflict` class, `private avColumnMeta[][] avColumnConflictField` should be changed to `private avColumnMeta[] avColumnConflictField`
- in the `avTableConflict` class, `private avColumnMeta[][] avColumnConflict` should be changed to `private avColumnMeta[] avColumnConflict`
- in the `evTableConflict` class, `private evColumnMeta[][] evColumnConflictField` should be changed to `private evColumnMeta[] evColumnConflictField`
- in the `evTableConflict` class, `private evColumnMeta[][] evColumnConflict` should be changed to `private evColumnMeta[] evColumnConflict`

Configuring the web service endpoint

In WCF, you can configure a service endpoint either declaratively using an *app.config* file, or programmatically using the WCF APIs. The following steps describe the creation of a basic configuration within an *app.config* file.

1. In Visual Studio, double-click the *app.config* file for the application (or *web.config* for a web-application).
2. Find the `system.serviceModel` element. Create it if it does not already exist.
3. Find the `client` element. Create it if it does not already exist.
4. Create a new `endpoint` element as a child of the `client` element.
5. Specify the appropriate service endpoint URL as the value of the *address* attribute.
6. Specify *basicHttpBinding* as the value of the *binding* attribute.
7. Specify the appropriate service contract as the value of the *contract* attribute. The service contract is the value of the service reference namespace appended with the service name.
8. Optionally specify a value for the *name* attribute that identifies a name for the endpoint configuration. If the *name* is blank, the configuration is used as the default for the service.

The resulting *app.config* file should be similar to the following example:

```
<system.serviceModel>
   <client>
      <endpoint
         address="http://cads_server:8080/cr-ws/services/ContentRepository"
```

```
        binding="basicHttpBinding"
        bindingConfiguration=""
        contract="IBM.SPSS.ContentRepository"
        name=""/>
   </client>
</system.serviceModel>
```

Configuring endpoint behaviors

The following two issues complicate the use of IBM SPSS Collaboration and Deployment Services web services by WCF clients:

- WCF does not allow the username and password to be transmitted over HTTP
- WCF does not correctly understand the SOAP Fault format returned by the services

To address these problems, a sample Visual Studio project is available that contains classes adding endpoint behaviors that resolve both issues. The IBM SPSS Collaboration and Deployment Services installation media includes this project.

To use these classes, ensure that the *IBM.SPSS.WCF.Utilities* project containing these classes has been compiled and added as a referenced DLL to the Visual Studio project that exercises the web services. When constructing a new service client instance, ensure that the behaviors are added as follows:

```
ContentRepositoryClient serviceClient = new ContentRepositoryClient();
serviceClient.Endpoint.Behaviors.Add(
    new ApplyClientInspectorsBehavior(
    new HeaderInjectionMessageInspector(
        new UsernameTokenSecurityHeader("admin", "Abcdefg1")
    ),
    new SOAPFaultFormatMessageInspector())
);
```

This adds two message inspectors to the behaviors for the endpoint. The first allows message headers to be injected, permitting a `UsernameToken` security header containing the username and password to be transmitted over HTTP. The second message inspector intercepts SOAP Faults, ensuring that they are formatted for proper WCF processing.

Exercising the service

After adding the service reference to the project, configuring the endpoint, and adding the necessary endpoint behaviors, the WCF-based web service client is ready. Add the .NET source code to the project to exercise the web service as needed.

There may be instances in which the .NET client proxies are generated incorrectly, leading to unexpected missing results at runtime. If a web service call returns no results when results are expected, the generated .NET types associated with the request and response should be examined. Specifically, members of the types may have two .NET attributes assigned. The first, `MessageBodyMemberAttribute`, will often include the proper namespace for the member type. The second, `XmlElementAttribute`, should have the same namespace as `MessageBodyMemberAttribute`. If this is not the case, add the namespace to `XmlElementAttribute`. Moreover, the addition of XML serialization attributes, such as `System.XML.Serialization.XmlElementAttribute`, may be necessary to correctly name the expected namespace or element. For example, the following generated client code would need to be modified:

```
public partial class getUsersResponse {
   System.ServiceModel.MessageBodyMemberAttribute(Namespace =
      "http://xml.spss.com/pes/userPref/remote", Order = 0)]
   public IBM.SPSS.ManagerUserPref.usersResponse usersResponse;
```

The corrected code is as follows:

```
public partial class getUsersResponse {
   [System.ServiceModel.MessageBodyMemberAttribute(Namespace =
      "http://xml.spss.com/pes/userPref/remote", Order = 0)]
   [System.Xml.Serialization.XmlElementAttribute(ElementName="usersRequestResponse")]
   public IBM.SPSS.ManagerUserPref.usersResponse usersResponse;
```

Single sign-on authentication

You can use single sign-on authentication for web service calls by obtaining a service ticket that you include in your SOAP requests.

The general process of using single sign-on authentication for WCF clients includes the following steps:

1. Obtain a ticket-grating ticket (TGT) using .NET or WCF code.
2. Send the TGT to the IBM SPSS Collaboration and Deployment Services Repository server using the SSO Authentication Service `getToken` operation to obtain a service ticket. This ensures that single sign-on authentication occurs on the repository server.
3. Send the service ticket in the SOAP header for all subsequent web services calls from your client application.

Chapter 7. Message header reference

The headers for the transport and packaging layers contain vital information for processing a web service call.

For IBM SPSS Collaboration and Deployment Services, the SOAP headers contain the security information under which the web service call is processed. In addition, the HTTP headers contain information about the client that initiated the web service request.

Security headers

Most IBM SPSS Collaboration and Deployment Services web service calls require security information in the request message.

In general, the structure of this content follows the `WS-Security` extension to the SOAP 1.1 standard. This documentation provides details on the XML elements and attributes that are recognized by IBM SPSS Collaboration and Deployment Services. Some of the elements and attributes are required, some are optional, and some are ignored. Refer to the following official specifications for details, but IBM SPSS Collaboration and Deployment Services requires some special values not referenced in the official specifications.

- http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-SOAPMessageSecurity.pdf
- http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-UsernameTokenProfile.pdf
- http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-KerberosTokenProfile.pdf

The following table defines the values of namespaces that are used for the SOAP header elements.

Table 3. SOAP header namespaces

Namespace prefix	Namespace value
wsse	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd
soapenv	http://schemas.xmlsoap.org/soap/envelope/
spsssec	http://xml.spss.com/security

Security element

The `wsse:Security` element is the main security header element included in a `soapenv:Header` element.

Table 4. Attributes of `wsse:Security`

Attribute	Description	Example
`soapenv:actor`	Targets a given endpoint along the message path. This value is ignored.	http://schemas.xmlsoap.org/soap/actor/next
`soapenv:mustUnderstand`	Clients can specify if the server must process this element. This value is ignored.	0

UsernameToken element

Use the wsse:UsernameToken element when a traditional user and password combination is required.

Table 5. Attributes of wsse:UsernameToken

Attribute	Description
wsu:Id	An optional string label for the security token. This value is ignored.

Table 6. Child elements of wsse:UsernameToken

Attribute	Description	Example
wsse:Username	The xml value represents the identity of the user.	a_user
wsse:Password	The attribute Type specifies the type of password. PasswordText is currently the only supported type. The xml value can handle plain text passwords and encrypted data.	myPassword [{AES}KrY+KLlOYo4O6545tgGsYQ==]
wsse:Nonce	The xml value represents a cryptographically random nonce encoded as base64 data. This is currently ignored.	RUx1ugQo0o3g0Xyl+sUEsA==
wsu:Created	The xml value represents the creation time as a timestamp conforming to wsu:Timestamp. This is currently ignored.	2013-10-08T02:09:20Z

BinarySecurityToken and BinarySecuritySSOToken elements

Binary security tokens may be used when IBM SPSS Collaboration and Deployment Services communicates with itself or when single sign-on (SSO) is used. Customer usage of these token types is limited to SSO.

The wsse:BinarySecurityToken and wsse:BinarySecuritySSOToken elements have the same format, but only wsse:BinarySecurityToken is recognized in the official WS-Security standard. The element wsse:BinarySecuritySSOToken was added as a nonstandard element when used in SSO.

Of these two elements, you should use wsse:BinarySecurityToken and you must supply the correct attributes for proper handling. The most critical attribute is the wsu:Id value which is used during web service request processing to handle the security token correctly.

Table 7. Attributes of wsse:BinarySecurityToken

Attribute	Description	Example
ValueType	Indicates the type of the security token. IBM SPSS Collaboration and Deployment Services always writes these values when creating its own XML, but this value is currently ignored during processing. You should use spsssec:BinarySecuritySSOToken.	spsssec:BinarySecurityToken spsssec:BinarySecuritySSOToken

Table 7. Attributes of wsse:BinarySecurityToken (continued)

Attribute	Description	Example
EncodingType	Indicates the encoding type for the token. The only currently supported type is base64, so this value should always be wsse:Base64Binary. IBM SPSS Collaboration and Deployment Services always writes these values when creating its own XML, but this value is currently ignored during processing.	wsse:Base64Binary
wsu:Id	An identifier for the token. This value must be correctly provided. You should always provide spssSSOToken. The only valid case for using spssToken is for internal web service calls, which use an internal token format.	spssToken spssSSOToken
anyAttribute	An extension mechanism to allow any arbitrary attribute in other namespaces. These extensions are ignored.	

The XML value for wsse:BinarySecurityToken and wsse:BinarySecuritySSOToken is string data in base64 format.

The client-accept-language element

This element restricts the set of natural languages that are preferred as a response to the request.

This element is inserted into a soapenv:Header element and is not related to WS-Security in any way. This is the same value found in the HTTP header named Accept-Language as defined in RFC2068. The xml value for this element might look like the following:

```
en-US;q=1.0, en;q=0.8
```

The namespace for this element could be any allowed value, such as ns1, which has an associated value of http://xml.spss.com/ws/headers.

HTTP headers

In addition to SOAP headers, it is possible to apply HTTP headers as well. None of the HTTP headers is required.

Table 8. HTTP headers

HTTP header	Description
Accept-Language	The accept language header value, as defined in RFC2068 (e.g. en-US;q=1.0, en;q=0.8). If not supplied the server language setting is used as a default.
CLIENT_ADDR	The client IP address that ultimately initiated the request.
CLIENT_HOSTNAME	The client host name that ultimately initiated the request.
X-FORWARDED-FOR	The client IP address that ultimately initiated the request. This is standard for determining the originating IP address.

The CLIENT_ADDR, CLIENT_HOSTNAME, and X-FORWARDED-FOR values are useful when a client application makes a call through an HTTP proxy, load balancer, or when IBM SPSS Collaboration and Deployment Services components make internal calls. The CLIENT_ADDR and CLIENT_HOSTNAME entries are specific HTTP headers that can be set by IBM SPSS Collaboration and Deployment Services itself. The X-FORWARDED-FOR header is a standard that some load balancers understand. These headers are used to make a best-effort attempt in determining the originating client for a given call, allowing information to be used for auditing purposes. The headers may not work as intended, but IBM SPSS Collaboration and Deployment Services will fall back to reasonable defaults in those situations.

Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

Intellectual Property Licensing
Legal and Intellectual Property Law
IBM Japan Ltd.
1623-14, Shimotsuruma, Yamato-shi
Kanagawa 242-8502 Japan

The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law: INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who want to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Software Group
ATTN: Licensing
200 W. Madison St.
Chicago, IL; 60606
U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

If you are viewing this information softcopy, the photographs and color illustrations may not appear.

Privacy policy considerations

IBM Software products, including software as a service solutions, (“Software Offerings”) may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering’s use of cookies is set forth below.

This Software Offering does not use cookies or other technologies to collect personally identifiable information.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, See IBM’s Privacy Policy at http://www.ibm.com/privacy and IBM’s Online Privacy Statement at http://www.ibm.com/privacy/details the section entitled “Cookies, Web Beacons and Other Technologies” and the “IBM Software Products and Software-as-a-Service Privacy Statement” at http://www.ibm.com/software/info/product-privacy.

Trademarks

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corp., registered in many jurisdictions worldwide. Other product and service names might be trademarks of IBM or other companies. A current list of IBM trademarks is available on the Web at "Copyright and trademark information" at www.ibm.com/legal/copytrade.shtml.

Adobe, the Adobe logo, PostScript, and the PostScript logo are either registered trademarks or trademarks of Adobe Systems Incorporated in the United States, and/or other countries.

Intel, Intel logo, Intel Inside, Intel Inside logo, Intel Centrino, Intel Centrino logo, Celeron, Intel Xeon, Intel SpeedStep, Itanium, and Pentium are trademarks or registered trademarks of Intel Corporation or its subsidiaries in the United States and other countries.

Linux is a registered trademark of Linus Torvalds in the United States, other countries, or both.

Microsoft, Windows, Windows NT, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Oracle and/or its affiliates.

Other product and service names might be trademarks of IBM or other companies.

Glossary

Index

Special characters

A

B

C

G

H

J

L

M

N

P

S

T

U

V

W

X

Printed in USA