

IBM SPSS Collaboration and Deployment Services
Version 8 Release 1

Scoring Service Developer's Guide

IBM

Note

Before using this information and the product it supports, read the information in "Notices" on page 87.

Product Information

This edition applies to version 8, release 1, modification 0 of IBM SPSS Collaboration and Deployment Services and to all subsequent releases and modifications until otherwise indicated in new editions.

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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.

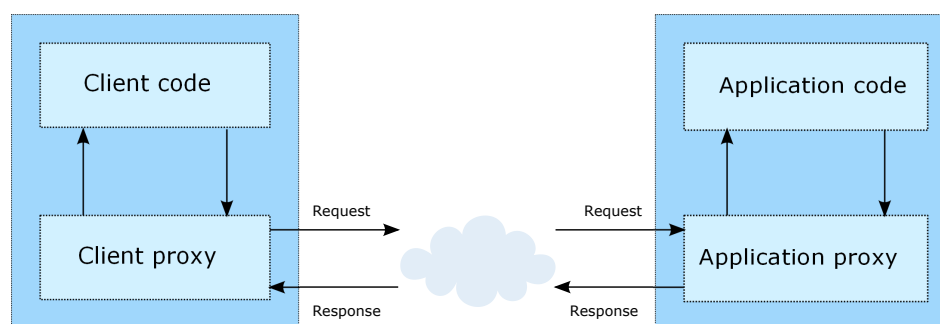


Figure 1. Web service architecture

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.

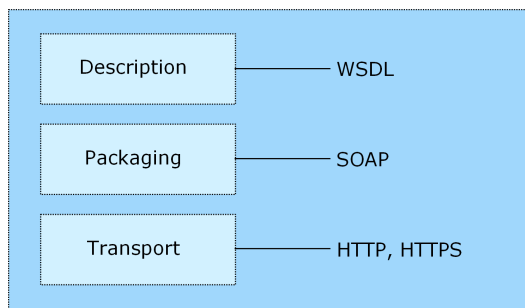


Figure 2. Web service protocol stack

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

```



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

In this case, the transport attribute of the `wsdl:soap: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">
    <wsdl:soap: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. Scoring Service overview

The Scoring Service allows client applications to employ real-time scores derived from predictive models developed in IBM® SPSS® Modeler, IBM SPSS Statistics, or third party tools. The service fetches a specified model, loads it, invokes the correct scoring implementation, and returns the result to the client. Supported models include regression (linear and logistic), decision trees, decision lists, neural networks, and naïve Bayes defined in IBM SPSS Modeler streams or in PMML from IBM SPSS Statistics.

Scoring can be either synchronous or asynchronous, depending on whether the client needs to wait for a score before proceeding or not. The service can load multiple models simultaneously for scoring and can be virtualized across multiple servers in a cluster configuration to handle large processing loads. The service logs all scoring activity for regulatory audit purposes. Configuring models for scoring and monitoring the service performance can be done using the IBM SPSS Deployment Manager.

The Scoring Service is often used in conjunction with the Data Services Service to access the data for scoring configurations. For more information, see Data Services Service documentation.

Accessing the Scoring Service

To access the functionality offered by the Scoring 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>/scoring/services/Scoring.HttpV2
```

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/scoring/services/Scoring.HttpV2?wsdl
```

Note that previous versions of this service used a different endpoint. Although that endpoint is still functional, it is deprecated and does not include new features introduced in this release. If possible, you should update any references in existing clients to use the new endpoint. New clients should use the endpoint above to take advantage of the latest functionality.

Calling Scoring 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 = "/scoring/services/Scoring.HttpV2";
URL url = new URL("http", "cads_server", 80, context);
ScoringService service = new ScoringServiceLocator();
stub = service.getStatus(url);
```

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

```
stub.getServiceDetails();
```

Chapter 3. Scoring concepts

Score providers

Score providers provide the Scoring Service with the internal processing instructions necessary for specific model types. For the service to be able to create a scoring configuration for a model, a score provider for that type of model must be available. The provider registers itself with the service, indicating which MIME types it supports. Each provider has a unique name and identifier to distinguish it from other providers, and each is versioned separately. Providers available to the scoring service include:

- *SmartScore Score Provider*, for processing PMML files
- *Modeler Score Provider*, for processing IBM SPSS Modeler streams

The Scoring Service includes the `getServiceDetails` operation for determining which providers are available in the system.

Note: The current IBM SPSS Collaboration and Deployment Services SmartScore Score Provider (used for processing PMML files) provides different scoring results (when compared to previous versions) for streams that contain C&RT, CHAID, and C5.0 models. The scoring discrepancies are the result of the updated scoring provider that uses the PMML confidence or probability. The PMML confidence or probability values are correct and should always be used (previous IBM SPSS Collaboration and Deployment Services version did not use the values).

Scoring configurations

Before a model can be used for scoring, supplemental information must be defined. Such information constitutes a **scoring configuration** for the model, and defines scoring parameters such as the following:

- Identification information for the configuration itself
- Identification information for the model used for scoring
- The data provider for the input
- Settings for logging
- The order of the input attributes
- Cache size used for scoring models

A single model may be used in a variety of scoring situations that require different scoring parameters. For example, scores may be based on a test data provider for internal purposes and on a different data provider for production usage. Alternatively, the information being logged as result of scoring may depend on the scoring situation. To allow a model to be used in differing scoring circumstances, any model may be associated with multiple scoring configurations.

Scoring configurations can be suspended to temporarily prevent the processing of score requests. A suspended configuration must be reactivated before it can be used to generate scores.

The Scoring Service includes operations for defining, retrieving, updating, suspending, and deleting configurations, as well as for loading a scoring model associated with a configuration.

Scores

Applying a predictive model to a set of data can produce a variety of scores, such as predicted values, predicted probabilities, and other values based on that model. The type of score produced is referred to as the **scoring function**. The following scoring functions are available:

Scoring function	Description
PREDICT	Returns the predicted value of the target variable.
STDDEV	Standard deviation.
PROBABILITY	Probability associated with a particular category of a target variable. Applies only to categorical variables. In the absence of the optional third parameter, <i>category</i> , this is the probability that the predicted category is the correct one for the target variable. If a particular category is specified, then this is the probability that the specified category is the correct one for the target variable.
CONFIDENCE	A probability measure associated with the predicted value of a categorical target variable. Applies only to categorical variables.
NODEID	The terminal node number. Applies only to tree models.
CUMHAZARD	Cumulative hazard value. Applies only to Cox regression models.
NEIGHBOR	The ID of the <i>k</i> th nearest neighbor. Applies only to nearest neighbor models. In the absence of the optional third parameter, <i>k</i> , this is the ID of the nearest neighbor. The ID is the value of the case labels variable, if supplied, and otherwise the case number.
DISTANCE	The distance to the <i>k</i> th nearest neighbor. Applies only to nearest neighbor models. In the absence of the optional third parameter, <i>k</i> , this is the distance to the nearest neighbor. Depending on the model, either Euclidean or City Block distance will be used.

The following table lists the set of scoring functions available for each type of model that supports scoring. The function type denoted as PROBABILITY (category) refers to specification of a particular category (the optional third parameter) for the PROBABILITY function.

Table 1. Supported functions by model type.

Model type	Supported functions
Tree (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE, NODEID
Tree (scale target)	PREDICT, NODEID, STDDEV
Boosted Tree (C5.0)	PREDICT, CONFIDENCE
Linear Regression	PREDICT, STDDEV
Automatic Linear Models	PREDICT
Binary Logistic Regression	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Conditional Logistic Regression	PREDICT
Multinomial Logistic Regression	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
General Linear Model	PREDICT, STDDEV

Table 1. Supported functions by model type (continued).

Model type	Supported functions
Discriminant	PREDICT, PROBABILITY, PROBABILITY (category)
TwoStep Cluster	PREDICT
K-Means Cluster	PREDICT
Kohonen	PREDICT
Neural Net (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Neural Net (scale target)	PREDICT
Naive Bayes	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Anomaly Detection	PREDICT
Ruleset	PREDICT, CONFIDENCE
Generalized Linear Model (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Generalized Linear Model (scale target)	PREDICT, STDDEV
Generalized Linear Mixed Model (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Generalized Linear Mixed Model (scale target)	PREDICT
Ordinal Multinomial Regression	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Cox Regression	PREDICT, CUMHAZARD
Nearest Neighbor (scale target)	PREDICT, NEIGHBOR, NEIGHBOR(K), DISTANCE, DISTANCE(K)
Nearest Neighbor (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE, NEIGHBOR, NEIGHBOR(K), DISTANCE, DISTANCE(K)
Bayesian Network	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Support Vector Machine (categorical target)	PREDICT, PROBABILITY, PROBABILITY (category), CONFIDENCE
Support Vector Machine (scale target)	PREDICT, STDDEV

- For the Binary Logistic Regression, Multinomial Logistic Regression, and Naive Bayes models, the value returned by the CONFIDENCE function is identical to that returned by the PROBABILITY function.
- For the K-Means model, the value returned by the CONFIDENCE function is the least distance.
- For tree and ruleset models, the confidence can be interpreted as an adjusted probability of the predicted category and is always less than the value given by PROBABILITY. For these models, the confidence value is more reliable than the value given by PROBABILITY.

- For neural network models, the confidence provides a measure of whether the predicted category is much more likely than the second-best predicted category.
- For Ordinal Multinomial Regression and Generalized Linear Model, the PROBABILITY function is supported when the target variable is binary.
- For nearest neighbor models without a target variable, the available functions are NEIGHBOR and DISTANCE.

Scoring metrics

Scoring metrics are measurements that reflect the performance of a scoring configuration or the service itself. Available metric items include the following:

- **Service Scores.** Total number of scores produced by the service.
- **Service Uptime.** Amount of time, measured in seconds, that the service has been running.
- **Average Latency.** Average amount of time, measured in milliseconds, between the request for a score and the generation of the score.
- **Minimum Latency.** Smallest amount of time, measured in milliseconds, between the request for a score and the generation of the score.
- **Maximum Latency.** Largest amount of time, measured in milliseconds, between the request for a score and the generation of the score.
- **Score Data Initialization Time.** Amount of time, measured in milliseconds, that the data service takes to be initialized for a score request.
- **Average Data Initialization Time.** Average amount of time, measured in milliseconds, that the data service takes to be initialized for a score request.
- **Minimum Data Initialization Time.** Smallest amount of time, measured in milliseconds, that the data service takes to be initialized for a score request.
- **Maximum Data Initialization Time.** Largest amount of time, measured in milliseconds, that the data service takes to be initialized for a score request.
- **Score Data Access Time.** Amount of time, measured in milliseconds, that the data service takes to access the data.
- **Average Data Access Time.** Average amount of time, measured in milliseconds, that the data service takes to access the data.
- **Minimum Data Access Time.** Smallest amount of time, measured in milliseconds, that the data service takes to access the data.
- **Maximum Data Access Time.** Largest amount of time, measured in milliseconds, that the data service takes to access the data.
- **Score Computation Wait Time.** Amount of time, measured in milliseconds, that the score provider worker spends waiting for the data service.
- **Average Computation Wait Time.** Average amount of time, measured in milliseconds, that the score provider worker spends waiting for the data service.
- **Minimum Computation Wait Time.** Smallest amount of time, measured in milliseconds, that the score provider worker spends waiting for the data service.
- **Maximum Computation Wait Time.** Largest amount of time, measured in milliseconds, that the score provider worker spends waiting for the data service.
- **Score Computation Time.** Amount of time, measured in milliseconds, that the score provider worker spends computing the score.
- **Average Computation Time.** Average amount of time, measured in milliseconds, that the score provider worker spends computing the score.
- **Minimum Computation Time.** Smallest amount of time, measured in milliseconds, that the score provider worker spends computing the score.

- **Maximum Computation Time.** Largest amount of time, measured in milliseconds, that the score provider worker spends computing the score.
- **Average Log Serialization Time.** Average amount of time, measured in milliseconds, to create a log entry in XML format.
- **Minimum Log Serialization Time.** Smallest amount of time, measured in milliseconds, to create a log entry in XML format.
- **Maximum Log Serialization Time.** Largest amount of time, measured in milliseconds, to create a log entry in XML format.
- **Average Log Queue Time.** Average amount of time, measured in milliseconds, to place the XML log data on to the JMS queue.
- **Minimum Log Queue Time.** Smallest amount of time, measured in milliseconds, to place the XML log data on to the JMS queue.
- **Maximum Log Queue Time.** Largest amount of time, measured in milliseconds, to place the XML log data on to the JMS queue.
- **Configuration Scores.** Total number of scores produced by a specific scoring configuration.
- **Score Elapsed Time.** Amount of time, measured in milliseconds, since the previous score generation.
- **Configuration Uptime.** Amount of time, measured in seconds, that the scoring configuration has been available for scoring.
- **Cache Hits.** Number of successful attempts to retrieve data from the memory cache for a scoring configuration.
- **Cache Misses.** Number of failed attempts to retrieve data from the memory cache for a scoring configuration. Each failed attempt results in a new service call to retrieve the necessary data.

The scale for a particular metric item determines the number of decimal points included in the measurement.

The Scoring Service includes operations for retrieving the list of metric items and the value for a specific metric item for a configured model.

Chapter 4. Operation reference

The buildConfigurationDetails operation

Creates a new, default scoring configuration for a specified model. The score provider associated with the model type generates the appropriate configuration parameters for the model. This operation returns the configuration for modification. A subsequent call to the setConfigurationDetails operation stores the configuration in the system.

Input fields

The following table lists the input fields for the buildConfigurationDetails operation.

Table 2. Fields for buildConfigurationDetails.

Field	Type/Valid Values	Description
modelReference	modelReference	This element provides all the fields necessary to locate a specific version of a model file.

Return information

The following table identifies the information returned by the buildConfigurationDetails operation.

Table 3. Return Value.

Type	Description
configurationDetails	This element contains the information that's exchanged to view or adjust the configuration settings.

Java example

To create a default scoring configuration:

1. Create a ModelReference object.
2. Provide the setId method with a string corresponding to the identifier for the model.
3. Supply the setResourcePath method with a string denoting the repository path to the model.
4. Provide the setLabel method with a string identifying the label associated with the version of the model to use for scoring.
5. Supply the buildConfigurationDetails operation with the model reference object.

The following sample builds a default scoring configuration for the latest version of the model defined by the *naivebayes.xml* PMML file.

```
ModelReference model = new ModelReference();
modelRef.setId("0a010a07d3dc251c0000011eac84bfd18771");
modelRef.setResourcePath("/PMML/naivebayes.xml");
modelRef.setLabel("LATEST");
ConfigurationDetails details = stub.buildConfigurationDetails(model);
ModelReference modelRef = details.getModelReference();
System.out.println("Associated model: " + modelRef.getResourcePath());
System.out.println("Version label of model: " + modelRef.getLabel());
ModelInputMetadata inputMetadata = details.getModelInputMetadata();
ModelInputMetadataField[] inputMetadataField = inputMetadata.getModelInputMetadataField();
System.out.println("Inputs:\n");
System.out.println("NAME\tTYPE\tDESCRIPTION\tRETURNED\n");
for (int i = 0; i < inputMetadataField.length; i++) {
    System.out.println(inputMetadataField[i].getName() + "\t" +
```

```

        inputMetadataField[i].getType() + "\t" +
        inputMetadataField[i].getDescription() + "\t" +
        inputMetadataField[i].getIsReturned());
    }
    LogSettings lSettings = details.getLogSettings();
    System.out.println("Log Destination: " + lSettings.getLogDestination());
    LoggableItemGroup[] lgroups = lSettings.getLoggableItemGroup();
    for (int i = 0; i < lgroups.length; i++) {
        System.out.println(lgroups[i].getName() + " (" + lgroups[i].getId() + ")");
        LoggableItem[] logItem = lgroups[i].getLoggableItem();
        if (logItem.length > 0) {
            System.out.println("NAME\tID\tENABLED\n");
            for (int j = 0; j < logItem.length; j++) {
                System.out.println(logItem[j].getName() + "\t" +
                    logItem[j].getId() + "\t" +
                    logItem[j].getIsEnabled());
            }
        }
    }
    InputAttributeOrder inputOrder = details.getInputAttributeOrder();
    String[] inputAttributes = inputOrder.getAttributes();
    System.out.println("The order of the input attributes is:\n");
    for (int i = 0; i < inputAttributes.length; i++) {
        System.out.println(inputAttributes[i]);
    }
    ConfigurationItem[] configItem = details.getConfigurationItem();
    for (int i = 0; i < configItem.length; i++) {
        System.out.println("Configuration item for this configuration is:\n" +
            configItem[i].getXML());
    }
}

```

For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
List<ModelInputMetadataField> inputMetadataFieldList = inputMetadata.getModelInputMetadataField();
```

For information on working with ConfigurationDetails objects, see the Java sample for the getConfigurationDetails operation.

SOAP request example

Client invocation of the buildConfigurationDetails 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <buildConfigurationDetails xmlns="http://xml.spss.com/scoring-v2/remote">
      <modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
        id="0a010a07d3dc251c0000011eac84bfd18771" xmlns="http://xml.spss.com/scoring-v2"/>
    </buildConfigurationDetails>
  </soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `buildConfigurationDetails` 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>
    <d:buildConfigurationDetailsResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:configurationDetails cfgSerial="21c881e0-ddc4-11dd-aca9-dcb0b853b9a7" id="">
        <c:modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
          id="0a010a07d3dc251c0000011eac84bfd18771"/>
        <c:modelInputMetadata isReturnEnabled="false">
          <c:modelInputMetadataField name="age" type="double"
            description="Age of Respondent" isReturned="false"/>
          <c:modelInputMetadataField name="educ" type="double"
            description="Highest Year of School Completed" isReturned="false"/>
          <c:modelInputMetadataField name="prestg80" type="double"
            description="R's Occupational Prestige Score (1980)" isReturned="false"/>
          <c:modelInputMetadataField name="speduc" type="double"
            description="Highest Year School Completed, Spouse" isReturned="false"/>
        </c:modelInputMetadata>
        <c:logSettings isEnabled="false" logDestination="queue/PASWLog">
          <c:loggableItemGroup name="Context Data" id="INPUT_CONTEXT"/>
          <c:loggableItemGroup name="Model Inputs" id="INPUT_MODEL">
            <c:loggableItem isEnabled="false" name="age" id="age"/>
            <c:loggableItem isEnabled="false" name="educ" id="educ"/>
            <c:loggableItem isEnabled="false" name="prestg80" id="prestg80"/>
            <c:loggableItem isEnabled="false" name="speduc" id="speduc"/>
          </c:loggableItemGroup>
          <c:loggableItemGroup name="Model Outputs" id="OUTPUT">
            <c:loggableItem isEnabled="false" name="Prediction" id="Prediction"/>
            <c:loggableItem isEnabled="false" name="Prob" id="Prob"/>
            <c:loggableItem isEnabled="false" name="Prob-1.0" id="Prob-1.0"/>
            <c:loggableItem isEnabled="false" name="Prob-2.0" id="Prob-2.0"/>
            <c:loggableItem isEnabled="false" name="Confidence" id="Confidence"/>
          </c:loggableItemGroup>
          <c:loggableItemGroup name="Scoring Engine Properties" id="ENGINE_PROPERTY">
            <c:loggableItem isEnabled="false" name="Model Path" id="MODEL_PATH"/>
            <c:loggableItem isEnabled="false" name="Scoring Configuration Name"
              id="CONFIGURATION_NAME"/>
            <c:loggableItem isEnabled="false" name="Model Version Label" id="MODEL_LABEL"/>
            <c:loggableItem isEnabled="false" name="Model MIME type" id="MODEL_MIME_TYPE"/>
            <c:loggableItem isEnabled="false" name="Model Version Marker"
              id="MODEL_MARKER"/>
            <c:loggableItem isEnabled="false" name="Scoring Configuration Serial"
              id="CONFIGURATION_SERIAL"/>
            <c:loggableItem isEnabled="false" name="Model ID" id="MODEL_ID"/>
          </c:loggableItemGroup>
          <c:loggableItemGroup name="Score Provider Properties" id="PROVIDER_PROPERTY"/>
        </c:logSettings>
        <c:inputAttributeOrder>
          <c:attributes>age</c:attributes>
          <c:attributes>educ</c:attributes>
          <c:attributes>prestg80</c:attributes>
          <c:attributes>speduc</c:attributes>
        </c:inputAttributeOrder>
        <c:cacheSize value="1" min="1" max="100"/>
        <c:batchEnabledFlag>false</c:batchEnabledFlag>
        <c:configurationItem>
          <c:xml>&lt;?xml version="1.0" encoding="UTF-8" &gt; &lt;node
            name="Model Specific" objectType="Model Specific" &gt;&lt;boolean
              objectType="PredictionOnly" name="A flag for prediction only"
              required="true" value="false" &gt;&lt;choice
                objectType="MissingValuePolicy" name="Missing value handling policy for this model"
                required="true" &gt;&lt;item
                  value="Substitute: Different model has different substitute policy" &gt;&lt;item
                    value="Score as SYSMIS: Score result would be SYSMIS" &gt;&lt;item
                      value="Throw exception: A SCMissingPredictorException is thrown" &gt;&lt;/choice&gt;&lt;/node&gt;</c:xml>
        </c:configurationItem>
      </c:configurationDetails>
    </d:buildConfigurationDetailsResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

```

        </c:configurationDetails>
    </d:buildConfigurationDetailsResponse>
</soapenv:Body>
</soapenv:Envelope>

```

The changeConfigurationRunningState operation

Changes the running state of a scoring configuration to a specified value. Use this operation to temporarily suspend a configuration from processing requests or to reactivate a previously suspended configuration. Valid values for the running state include:

- ACTIVE. The configuration is consuming resources and can process score requests (if the configuration status code does not indicate an error).
- SUSPENDED. The configuration is not consuming resources and cannot process score requests.

The running state of a configuration is preserved when restarting the IBM SPSS Collaboration and Deployment Services Repository server. Configurations that are suspended cannot be activated by a server restart. However, a suspended configuration can be modified as needed.

Input fields

The following table lists the input fields for the changeConfigurationRunningState operation.

Table 4. Fields for changeConfigurationRunningState.

Field	Type/Valid Values	Description
configurationRunningState	configurationRunningState	This element indicates the state that the configuration should be set to

Java example

To modify the running state of a scoring configuration:

1. Create a ConfigurationRunningState object.
2. Provide the setId method with a string corresponding to the identifier for the configuration.
3. Supply the setState method with a RunningState constant corresponding to the state.
4. Supply the changeConfigurationRunningState operation with the ConfigurationRunningState object.

The following sample changes the running state for the nb-config configuration to suspended.

```

ConfigurationRunningState cfgState = new ConfigurationRunningState();
cfgState.setId("nb-config");
cfgState.setState(RunningState.SUSPENDED);
stub.changeConfigurationRunningState(cfgState);

```

SOAP request example

Client invocation of the changeConfigurationRunningState 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created

```

```

        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
        >2009-01-08T20:36:10Z</wsu:Created>
    </wsse:UsernameToken>
</wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
        soapenv:mustUnderstand="0" 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>
    <changeConfigurationRunningState xmlns="http://xml.spss.com/scoring-v2/remote">
        <configurationRunningState xmlns="http://xml.spss.com/scoring-v2" state="SUSPENDED" id="nb-config"/>
    </changeConfigurationRunningState>
</soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `changeConfigurationRunningState` 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>
        <d:changeConfigurationRunningStateResponse xmlns:a="http://xml.spss.com/data"
            xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
            xmlns:d="http://xml.spss.com/scoring-v2/remote"
            xmlns:e="http://xml.spss.com/scoring/exception">
        </soapenv:Body>
    </soapenv:Envelope>

```

The `getConfigurationDetails` operation

Retrieves the parameter settings for a specified scoring configuration.

Input fields

The following table lists the input fields for the `getConfigurationDetails` operation.

Table 5. Fields for getConfigurationDetails.

Field	Type/Valid Values	Description
id	string	Non-localized ID for the element. This should match the <code>spss_ss:idAttributeGroup</code> type.

Return information

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

Table 6. Return Value.

Type	Description
<code>configurationDetails</code>	This element contains the information that's exchanged to view or adjust the configuration settings.

Java example

To retrieve information about a scoring configuration, supply the `getConfigurationDetails` operation with a string corresponding to the identifier for the configuration.

```

String configId = "nb-config";
ConfigurationDetails details = stub.getConfigurationDetails(configId);

```

The `getModelReference` method returns a `ModelReference` object containing information about the model associated with the configuration. Use the `getResourcePath` and `getLabel` methods to access the repository path and version label for the model.

```
ModelReference modelRef = details.getModelReference();
System.out.println("Associated model: " + modelRef.getResourcePath());
System.out.println("Version label of model: " + modelRef.getLabel());
```

The `getModelInputMetadata` method returns a `ModelInputMetadata` object containing information about the input fields for the model. Use the `getModelInputMetadataField` method to create an array containing an entry for each field. The `getName` and `getType` methods return the name and type for a field. The `getDescription` method returns the description of the field. Use the `getIsReturned` method to access a boolean indicating whether the model requires a value for the field or not.

```
ModelInputMetadata inputMetadata = details.getModelInputMetadata();
ModelInputMetadataField[] inputMetadataField = inputMetadata.getModelInputMetadataField();
System.out.println("Inputs:\n");
System.out.println("NAME\tTYPE\tDESCRIPTION\tRETURNED\n");
for (int i = 0; i < inputMetadataField.length; i++) {
    System.out.println(inputMetadataField[i].getName() + "\t" +
        inputMetadataField[i].getType() + "\t" +
        inputMetadataField[i].getDescription() + "\t" +
        inputMetadataField[i].getIsReturned());
}
```

The `getLogSettings` method returns a `LogSettings` object containing information about the settings for logging. Use the `getLogDestination` method to access the JMS destination of the information logged by the service.

The actual items being logged are organized into groups. Use the `getLoggableItemGroup` method to create an array containing an entry for each group. For each group, the `getLoggableItem` method returns an array containing the log items. The `getName`, `getId`, and `getIsEnabled` methods return details about a specific item.

```
LogSettings lSettings = details.getLogSettings();
System.out.println("Log Destination: " + lSettings.getLogDestination());
LoggableItemGroup[] lgroups = lSettings.getLoggableItemGroup();
for (int i = 0; i < lgroups.length; i++) {
    System.out.println(lgroups[i].getName() + " (" + lgroups[i].getId() + ")");
    LoggableItem[] logItem = lgroups[i].getLoggableItem();
    if (logItem.length > 0) {
        System.out.println("NAME\tID\tENABLED\n");
        for (int j = 0; j < logItem.length; j++) {
            System.out.println(logItem[j].getName() + "\t" +
                logItem[j].getId() + "\t" +
                logItem[j].getIsEnabled());
        }
    }
}
```

The `getInputAttributeOrder` method returns an `InputAttributeOrder` object containing information about the order of the input fields for the model. Use the `getAttributes` method to create an array containing an entry for each field.

```
InputAttributeOrder inputOrder = details.getInputAttributeOrder();
String[] inputAttributes = inputOrder.getAttributes();
System.out.println("The order of the input attributes is:\n");
for (int i = 0; i < inputAttributes.length; i++) {
    System.out.println(inputAttributes[i]);
}
```

The `getConfigurationItem` method returns an array of `ConfigurationItem` objects containing information about model-specific configuration settings. The settings are defined using XML having a structure defined by the `schedParams.xsd` schema. Use the `getXML` method to access the XML definition for an item.

```
ConfigurationItem[] configItem = details.getConfigurationItem();
for (int i = 0; i < configItem.length; i++) {
    System.out.println("Configuration item for this configuration is:\n" +
        configItem[i].getXML());
}
```


For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
List<ModelInputMetadataField> inputMetadataFieldList = inputMetadata.getModelInputMetadataField();
```

SOAP request example

Client invocation of the `getConfigurationDetails` 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <getConfigurationDetails xmlns="http://xml.spss.com/scoring-v2/remote">
      <ns2:id xmlns:ns2="http://xml.spss.com/scoring-v2">nb-config</ns2:id>
    </getConfigurationDetails>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP response example

The server responds to a `getConfigurationDetails` 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>
    <d:getConfigurationDetailsResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:configurationDetails cfgSerial="0a010a07d3dc251c0000011eac84bfd18803" id="nb-config">
        <c:configurationReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
          id="0a010a07d3dc251c0000011eac84bfd18771"/>
        <c:modelInputMetadata isReturnEnabled="false">
          <c:modelInputMetadataField name="age" type="double"
            description="Age of Respondent" isReturned="false"/>
          <c:modelInputMetadataField name="educ" type="double"
            description="Highest Year of School Completed" isReturned="false"/>
          <c:modelInputMetadataField name="prestg80" type="double"
            description="R's Occupational Prestige Score (1980)" isReturned="false"/>
          <c:modelInputMetadataField name="speduc" type="double"
            description="Highest Year School Completed, Spouse" isReturned="false"/>
        </c:modelInputMetadata>
        <c:logSettings isEnabled="false" logDestination="queue/PASWLog">
          <c:loggableItemGroup name="Context Data" id="INPUT_CONTEXT"/>
          <c:loggableItemGroup name="Model Inputs" id="INPUT_MODEL">
            <c:loggableItem isEnabled="false" name="age" id="age"/>
            <c:loggableItem isEnabled="false" name="educ" id="educ"/>
            <c:loggableItem isEnabled="false" name="prestg80" id="prestg80"/>
            <c:loggableItem isEnabled="false" name="speduc" id="speduc"/>
          </c:loggableItemGroup>
          <c:loggableItemGroup name="Model Outputs" id="OUTPUT">
            <c:loggableItem isEnabled="false" name="Prediction" id="Prediction"/>
            <c:loggableItem isEnabled="false" name="Prob" id="Prob"/>
            <c:loggableItem isEnabled="false" name="Prob-1.0" id="Prob-1.0"/>
            <c:loggableItem isEnabled="false" name="Prob-2.0" id="Prob-2.0"/>
          </c:loggableItemGroup>
        </c:configurationDetails>
    </d:getConfigurationDetailsResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

```

        <c:loggableItem isEnabled="false" name="Confidence" id="Confidence"/>
    </c:loggableItemGroup>
    <c:loggableItemGroup name="Scoring Engine Properties" id="ENGINE_PROPERTY">
        <c:loggableItem isEnabled="false" name="Model Path" id="MODEL_PATH"/>
        <c:loggableItem isEnabled="false" name="Scoring Configuration Name"
            id="CONFIGURATION_NAME"/>
        <c:loggableItem isEnabled="false" name="Model Version Label" id="MODEL_LABEL"/>
        <c:loggableItem isEnabled="false" name="Model MIME type" id="MODEL_MIME_TYPE"/>
        <c:loggableItem isEnabled="false" name="Model Version Marker"
            id="MODEL_MARKER"/>
        <c:loggableItem isEnabled="false" name="Scoring Configuration Serial"
            id="CONFIGURATION_SERIAL"/>
        <c:loggableItem isEnabled="false" name="Model ID" id="MODEL_ID"/>
    </c:loggableItemGroup>
    <c:loggableItemGroup name="Score Provider Properties" id="PROVIDER_PROPERTY"/>
</c:logSettings>
<c:inputAttributeOrder>
    <c:attributes>age</attributes>
    <c:attributes>educ</attributes>
    <c:attributes>prestg80</attributes>
    <c:attributes>speduc</attributes>
</c:inputAttributeOrder>
<c:cacheSize value="1" min="1" max="100"/>
<c:batchEnabledFlag>false</c:batchEnabledFlag>
<c:configurationItem>
    <c:xml>&lt;?xml version="1.0" encoding="UTF-8" ?&gt; &lt;node
        name="Model Specific" objectType="Model
        Specific" &gt;&lt;boolean
        objectType="PredictionOnly" name="A flag for
        prediction only" required="true"
        value="false" /&gt;&lt;choice
        objectType="MissingValuePolicy" name="Missing
        value handling policy for this model"
        required="true" &gt;&lt;item
        value="Substitute: Different model has different substitute
        policy" /&gt;&lt;item value="Score as SYSMIS: Score
        result would be SYSMIS" /&gt;&lt;item value="Throw
        exception: A SCSMissingPredictorException is
        thrown" /&gt;&lt;value"Score as SYSMIS: Score result
        would be
        SYSMIS" /&gt;&lt;/choice" /&gt;&lt;/node" /></c:xml>
    </c:configurationItem>
</c:configurationDetails>
</d:getConfigurationDetailsResponse>
</soapenv:Body>
</soapenv:Envelope>

```

The getConfigurations operation

Returns information about all scoring configurations in the system. For each configuration, the operation reports the following:

- Configuration identifier
- Path, identifier, and label for the model associated with the configuration
- Current status of the configuration

Return information

The following table identifies the information returned by the getConfigurations operation.

Table 7. Return Value.

Type	Description
configurationReference[]	This element defines the format of the array element that is returned by the getConfigurations service call. It contains a reference to the model which this configuration is based upon, and the identifier of the scoring configuration itself.

Java example

Each entry of the array of `ConfigurationReference` objects returned by the `getConfigurations` operation corresponds to a scoring configuration in the system. Use the `getId` method to return the identifier for the configuration.

Information about the model associated with the scoring configuration can be obtained from the `ModelReference` object returned by the `getModelReference` method. The `getResourcePath` method returns the repository path to the model. The `getLabel` method returns the label identifying the model version being used.

```
ConfigurationReference[] configRef = stub.getConfigurations();
for (int i = 0; i < configRef.length; i++) {
    System.out.println("Configuration ID: " + configRef[i].getId());

    ModelReference modelRef = configRef[i].getModelReference();
    System.out.println("Associated model: " + modelRef.getResourcePath());
    System.out.println("Version label of model: " + modelRef.getLabel());

    ConfigurationStatus configStat = configRef[i].getConfigurationStatus();
    System.out.println("Status: (" + configStat.getStatusCode().toString() +
        ") " + configStat.getMessage());
}
```

The `getConfigurationStatus` method returns a `ConfigurationStatus` object containing information about the current status for the configuration. This information consists of a status code and a status message. The code indicates whether the message represents an error, a warning, or informational text.

For web service clients based on JAX-WS, replace the arrays in the sample with `List` collections and update the array processing accordingly. For example:

```
List<ConfigurationReference> configRefList = stub.getConfigurations();
for (ConfigurationReference configRef : configRefList)
{
    System.out.println("Configuration ID: " + configRef.getId());
    ModelReference modelRef = configRef.getModelReference();
    System.out.println("Associated model: " + modelRef.getResourcePath());
    System.out.println("Version label of model: " + modelRef.getLabel());
    ConfigurationStatus configStat = configRef.getConfigurationStatus();
    System.out.println("Status: (" + configStat.getStatusCode().toString() +
        ") " + configStat.getMessage());
}
```

SOAP request example

Client invocation of the `getConfigurations` 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
      <getConfigurations xmlns="http://xml.spss.com/scoring-v2/remote"/>
    </soapenv:Body>
  </soapenv:Envelope>

```

SOAP response example

The server responds to a getConfigurations 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>
    <d:getConfigurationsResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:configurationReference id="nb-config">
        <c:modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
          id="0a010a07d3dc251c0000011eac84bfd18771"/>
        <c:configurationStatus statusCode="INFORMATION" message="Started"/>
      </c:configurationReference>
      <c:configurationReference id="test">
        <c:modelReference label="LATEST" resourcePath="/CSGLM_model.xml"
          id="0a010a0774bd18050000011ea8b211d98040"/>
        <c:configurationStatus statusCode="INFORMATION" message="Started"/>
      </c:configurationReference>
    </d:getConfigurationsResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The getMetadata operation

Retrieves information about the input and output fields for a specified scoring configuration. For each field, this information includes the following:

- Name
- Data type for the field
- An optional description

For input fields, an optional indicator of whether or not a value of the field is required for scoring may be included. In addition, for categorical fields, the metadata may include a list of valid values.

This operation is often used to provide information for interfaces that prompt a user for model input values on which scoring will be based.

Input fields

The following table lists the input fields for the getMetadata operation.

Table 8. Fields for getMetadata.

Field	Type/Valid Values	Description
id	string	Non-localized ID for the element. This should match the spss_ss:idAttributeGroup type.

Return information

The following table identifies the information returned by the getMetadata operation.

Table 9. Return Value.

Type	Description
metadataResult	This element combines the metadata input and output data into one element, which is used by the getMetadata service call.

Java example

Supply the getMetadata operation with a string denoting the identifier for the scoring configuration. The resulting MetadataResult object contains two types of objects, MetadataInputField and MetadataOutputField. Use the getMetadataInputField method to return an array of the input objects. The getMetadataOutputField method returns an array of the output objects, which represent the scoring functions used for the model.

For both input and output objects, use the getName, getType, and getDescription methods to obtain information about the fields. In addition, for input objects only, the getIsRequired method returns a boolean indicating whether or not a value for the field is required.

```
String configId = "config-glm";
MetadataResult result = stub.getMetadata(configId);

MetadataInputField[] inputs = result.getMetadataInputField();
System.out.println("Inputs:\n");
System.out.println("NAME\tTYPE\tDESCRIPTION\tREQUIRED\n");
for (int i = 0; i < inputs.length; i++) {
    System.out.println(inputs[i].getName() + "\t" + inputs[i].getType() +
        "\t" + inputs[i].getDescription() + "\t" + inputs[i].getIsRequired());
}

MetadataOutputField[] outputs = result.getMetadataOutputField();
System.out.println("Outputs:\n");
System.out.println("NAME\tTYPE\tDESCRIPTION\n");
for (int i = 0; i < outputs.length; i++) {
    System.out.println(outputs[i].getName() + "\t" + outputs[i].getType() +
        "\t" + outputs[i].getDescription());
}
```

For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
List<MetadataInputField> inputsList = result.getMetadataInputField();
```

SOAP request example

Client invocation of the getMetadata 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
  </soapenv:Header>
  <soapenv:Body>
    <getMetadataRequest>
      <configId>config-glm</configId>
    </getMetadataRequest>
  </soapenv:Body>
</soapenv:Envelope>
```

```

    </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <getMetadata xmlns="http://xml.spss.com/scoring-v2/remote">
      <ns2:id xmlns:ns2="http://xml.spss.com/scoring-v2">config-glm</ns2:id>
    </getMetadata>
  </soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `getMetadata` 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>
    <d:getMetadataResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:metadataResult>
        <c:metadataInputField name="happy" type="double" description="General Happiness"
          isRequired="true"/>
        <c:metadataInputField name="prestg80" type="double"
          description="R's Occupational Prestige Score (1980)" isRequired="true"/>
        <c:metadataInputField name="tax" type="double" description="R's Federal Income Tax"
          isRequired="true"/>
        <c:metadataOutputField name="Prediction" type="double" description=""/>
        <c:metadataOutputField name="StdDev" type="double" description=""/>
      </c:metadataResult>
    </d:getMetadataResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The `getMetricItems` operation

Returns all metric items available for a specified configuration. To retrieve the value for a particular metric, use the `getMetricValue` operation.

Input fields

The following table lists the input fields for the `getMetricItems` operation.

Table 10. Fields for `getMetricItems`.

Field	Type/Valid Values	Description
id	string	Non-localized ID for the element. This should match the <code>spss_ss:idAttributeGroup</code> type.

Return information

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

Table 11. Return Value.

Type	Description
<code>metricItem[]</code>	This element describes a single metric entry (such as score performance).

Java example

To access the metric items, supply the `getMetricItems` operation with a string corresponding to the identifier for the scoring configuration. The name, identifier, unit, and scale for any metric item in the returned array can be obtained using the `getName`, `getId`, `getUnit`, and `getScale` methods.

```
String configId = "test";
MetricItem[] item = stub.getMetricItems(configId);
System.out.println("NAME\tID\tUNIT\tSCALE");
for (int i = 0; i < item.length; i++) {
    System.out.println(item[i].getName() + "\t" + item[i].getId() +
        "\t" + item[i].getUnit() + "\t" + item[i].getScale());
}
```

For web service clients based on JAX-WS, replace the arrays in the sample with `List` collections and update the array processing accordingly. For example:

```
String configId = "test";
List<MetricItem> itemList = stub.getMetricItems(configId);
System.out.println("NAME\tID\tUNIT\tSCALE");
for (MetricItem item : itemList)
{
    System.out.println(item.getName() + "\t" + item.getId() +
        "\t" + item.getUnit() + "\t" + item.getScale());
}
```

SOAP request example

Client invocation of the `getMetricItems` 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <getMetricItems xmlns="http://xml.spss.com/scoring-v2/remote">
      <ns2:id xmlns:ns2="http://xml.spss.com/scoring-v2">test</ns2:id>
    </getMetricItems>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP response example

The server responds to a `getMetricItems` 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>
    <d:getMetricItemsResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:metricItem scale="3" unit="milliseconds" name="Minimum Computation Wait Time"
        id="CONFIGURATION_COMPUTATION_WAIT_TIME_MINIMUM"/>
      <c:metricItem scale="0" unit="hits" name="Cache Hits" id="CONFIGURATION_CACHE_HITS"/>
    </d:getMetricItemsResponse>
  </soapenv:Body>
</soapenv:Envelope>
```

```

<c:metricItem scale="0" unit="scores" name="Service Scores" id="SERVICE_TOTAL_SCORES"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Data Initialization Time"
  id="CONFIGURATION_DATA_INIT_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Log Queue Time"
  id="CONFIGURATION_LOG_QUEUE_TIME_MINIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Data Initialization Time"
  id="CONFIGURATION_DATA_INIT_TIME_MAXIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Latency"
  id="CONFIGURATION_RESPONSE_TIME_MINIMUM"/>
<c:metricItem scale="0" unit="seconds" name="Service Uptime" id="SERVICE_UPTIME"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Computation Wait Time"
  id="CONFIGURATION_COMPUTATION_WAIT_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Computation Wait Time"
  id="CONFIGURATION_COMPUTATION_WAIT_TIME_MAXIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Log Queue Time"
  id="CONFIGURATION_LOG_QUEUE_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Computation Time"
  id="CONFIGURATION_COMPUTATION_TIME_MINIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Log Serialization Time"
  id="CONFIGURATION_LOG_SERIALIZE_TIME_MINIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Latency"
  id="CONFIGURATION_RESPONSE_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Log Queue Time"
  id="CONFIGURATION_LOG_QUEUE_TIME_MAXIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Latency"
  id="CONFIGURATION_RESPONSE_TIME_MAXIMUM"/>
<c:metricItem scale="0" unit="scores" name="Configuration Scores"
  id="CONFIGURATION_TOTAL_SCORES"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Data Access Time"
  id="CONFIGURATION_DATA_ACCESS_TIME_MINIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Computation Time"
  id="CONFIGURATION_COMPUTATION_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Log Serialization Time"
  id="CONFIGURATION_LOG_SERIALIZE_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Computation Time"
  id="CONFIGURATION_COMPUTATION_TIME_MAXIMUM"/>
<c:metricItem scale="0" unit="misses" name="Cache Misses"
  id="CONFIGURATION_CACHE_MISSES"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Log Serialization Time"
  id="CONFIGURATION_LOG_SERIALIZE_TIME_MAXIMUM"/>
<c:metricItem scale="0" unit="seconds" name="Configuration Uptime"
  id="CONFIGURATION_UPTIME"/>
<c:metricItem scale="3" unit="milliseconds" name="Average Data Access Time"
  id="CONFIGURATION_DATA_ACCESS_TIME_AVERAGE"/>
<c:metricItem scale="3" unit="milliseconds" name="Maximum Data Access Time"
  id="CONFIGURATION_DATA_ACCESS_TIME_MAXIMUM"/>
<c:metricItem scale="3" unit="milliseconds" name="Minimum Data Initialization Time"
  id="CONFIGURATION_DATA_INIT_TIME_MINIMUM"/>
</d:getMetricItemsResponse>
</soapenv:Body>
</soapenv:Envelope>

```

The getMetricValue operation

Returns the value for a specified metric of a scoring configuration. The list of metric items available for a configuration can be retrieved using the getMetricItems operation. Valid metric identifiers include:

- SERVICE_TOTAL_SCORES
- SERVICE_UPTIME
- CONFIGURATION_RESPONSE_TIME_AVERAGE
- CONFIGURATION_RESPONSE_TIME_MINIMUM
- CONFIGURATION_RESPONSE_TIME_MAXIMUM
- CONFIGURATION_DATA_INIT_TIME_AVERAGE
- CONFIGURATION_DATA_INIT_TIME_MINIMUM
- CONFIGURATION_DATA_INIT_TIME_MAXIMUM
- CONFIGURATION_DATA_ACCESS_TIME_AVERAGE
- CONFIGURATION_DATA_ACCESS_TIME_MINIMUM
- CONFIGURATION_DATA_ACCESS_TIME_MAXIMUM
- CONFIGURATION_COMPUTATION_WAIT_TIME_AVERAGE
- CONFIGURATION_COMPUTATION_WAIT_TIME_MINIMUM

- CONFIGURATION_COMPUTATION_WAIT_TIME_MAXIMUM
- CONFIGURATION_COMPUTATION_TIME_AVERAGE
- CONFIGURATION_COMPUTATION_TIME_MINIMUM
- CONFIGURATION_COMPUTATION_TIME_MAXIMUM
- CONFIGURATION_LOG_SERIALIZE_TIME_AVERAGE
- CONFIGURATION_LOG_SERIALIZE_TIME_MINIMUM
- CONFIGURATION_LOG_SERIALIZE_TIME_MAXIMUM
- CONFIGURATION_LOG_QUEUE_TIME_AVERAGE
- CONFIGURATION_LOG_QUEUE_TIME_MINIMUM
- CONFIGURATION_LOG_QUEUE_TIME_MAXIMUM
- CONFIGURATION_TOTAL_SCORES
- CONFIGURATION_UPTIME
- CONFIGURATION_CACHE_HITS
- CONFIGURATION_CACHE_MISSES

Input fields

The following table lists the input fields for the `getMetricValue` operation.

Table 12. Fields for `getMetricValue`.

Field	Type/Valid Values	Description
id	string	Non-localized ID for the element. This should match the <code>spss_ss:idAttributeGroup</code> type.
metricId	string	Metric item ID

Return information

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

Table 13. Return Value.

Type	Description
metricValue	This element contains a single metric value.

Java example

To obtain a value of a metric item for a configuration, supply the `getMetricValue` operation with strings denoting the configuration and metric identifiers. Use the `getValue` method of the returned `MetricValue` object to access the value.

The following sample reports the uptime for the `test` configuration.

```
String configId = "test";
String metricId = "CONFIGURATION_UPTIME";
MetricValue val = stub.getMetricValue(configId, metricId);
System.out.format("%s Configuration\n%s = %f", configId, metricId, val.getValue());
```

SOAP request example

Client invocation of the `getMetricValue` 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <getMetricValue xmlns="http://xml.spss.com/scoring-v2/remote">
      <ns2:id xmlns:ns2="http://xml.spss.com/scoring-v2">test</ns2:id>
      <metricId>CONFIGURATION_UPTIME</metricId>
    </getMetricValue>
  </soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `getMetricValue` 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>
    <d:getMetricValueResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:metricValue value="0.0"/>
    </d:getMetricValueResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The `getScore` operation

Generates scores based on supplied inputs for a specified scoring configuration. The types of scores returned depend on the model being used for scoring.

If the configuration being used for scoring does not specify a data provider, the `getScore` call must provide all required input data in the scoring request. This data can be specified as a set of name-value pairs for the input fields used by the model or as tabular context data in which the columns correspond to the input fields and the row entries identify the input values. The format for input values must match the data type, as specified in the configuration details and metadata. For non-numeric data types, the format must be as follows:

- Boolean = `true` (not case sensitive) or `1`, or `false` (not case sensitive) or `0`
- Date = `yyyy-MM-dd`
- Daytime = `HH:mm:ss`
- Timestamp = `yyyy-MM-dd'T'HH:mm:ss`

The results returned by the operation include the following information:

- Input values on which the scores are based
- A tabular structure in which the columns correspond to the scoring functions returned with the row entries indicating the value of the scoring functions

Input fields

The following table lists the input fields for the `getScore` operation.

Table 14. Fields for `getScore`.

Field	Type/Valid Values	Description
<code>scoreRequest</code>	<code>scoreRequest</code>	This element contains the input(s) of a <code>getScore</code> call. Note, due to the possible impact upon performance, this element is as lightweight as possible.

Return information

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

Table 15. Return Value.

Type	Description
<code>scoreResult</code>	This element contains the output(s) and details of a <code>getScore</code> call. Note, due to the possible impact upon performance, this element is as lightweight as possible.

Java example

To generate a score:

1. Create a `ScoreRequest` object.
2. Use the `setId` method to assign a string corresponding to the identifier of the scoring configuration to use for the score.
3. Create `Input` objects for the input values on which to base the score. Use the `setName` and `setValue` methods for each object to assign values to specific input fields. When complete, use the `setRequestInputTable` method to assign the input values to the request object.
4. If the scoring model uses context data, create a `TableType` object for the context data table. Use the `setName` and `setRowValues` methods to assign values to specific context fields. When complete, use the `setContext` method to assign the context table to the request object.
5. Provide the `getScore` operation with the request object.

The following sample provides the `config-glm` scoring configuration with a request input table consisting of two rows containing values for three input fields to generate a score.

```
ScoreRequest request = new ScoreRequest();
request.setId("config-glm");

Input[][] inputs = new Input[1][2][3];
inputs[0][0][0].setName("happy");
inputs[0][0][0].setValue("1");
inputs[0][0][1].setName("prestg80");
inputs[0][0][1].setValue("1");
inputs[0][0][2].setName("tax");
inputs[0][0][2].setValue("1");
inputs[0][1][0].setName("happy");
inputs[0][1][0].setValue("3");
inputs[0][1][1].setName("prestg80");
inputs[0][1][1].setValue("2");
inputs[0][1][2].setName("tax");
inputs[0][1][2].setValue("4");
request.setRequestInputTable(inputs);

ScoreResult result=stub.getScore(request);
```

For the `ScoreResult` object returned by the operation, the `getReturnedRequestInputValue` and `getReturnedDPDOutputValue` methods return arrays of `ReturnedRequestInputValue` and `ReturnedDPDOutputValue` objects, from which the values for the scoring inputs can be retrieved. Use the `getColumnNames` and `getRowValues` methods for the result object to access the scores.

```
ReturnedRequestInputValue[][][] inputValue = result.getReturnedRequestInputValue();
System.out.print("Request Inputs:\n");
for (int t=0; t < inputValue.length; t++) {
    System.out.println("Table " + t + "\n");
    for (int r=0; r < inputValue[t].length; r++) {
        for (int c=0; c < inputValue[t][r].length; c++) {
            System.out.print(inputValue[t][r][c].getValue() + "\t");
        }
        System.out.println("\n");
    }
    System.out.println("\n");
}

System.out.print("Outputs:\n");
String[] columns = result.getColumnNames();
RowValues[] rValues = result.getRowValues();
for (int r=0; r < rValues.length; r++) {
    Value[] val = rValues.getValue();
    for (int c=0; c < val.length; c++) {
        System.out.print(columns[c] + " = " + val[c].getValue() + "\n");
    }
    System.out.print("\n");
}
```

For web service clients based on JAX-WS, replace the arrays in the sample with `List` collections and update the array processing accordingly. For example:

```
ScoreRequest request = new ScoreRequest();
request.setId("config-g1m");

RequestInputTable rInputTable = new RequestInputTable();
rInputTable.setName("Table1");
RequestInputRow rInputRow = new RequestInputRow();

Input inputs = new Input();
inputs.setName("happy");
inputs.setValue("1");
rInputRow.getInput().add(inputs);
inputs.setName("prestg80");
inputs.setValue("1");
rInputRow.getInput().add(inputs);
inputs.setName("tax");
inputs.setValue("1");
rInputRow.getInput().add(inputs);

rInputTable.getRequestInputRow().add(rInputRow);
request.getRequestInputTable().add(rInputTable);

ScoreResult result=stub.getScore(request);
List<ReturnedRequestInputTable> rRequestInputTableList = result.getReturnedRequestInputTable();
System.out.print("Inputs:\n");
for (ReturnedRequestInputTable rRequestInputTable : rRequestInputTableList)
{
    List<ReturnedRequestInputRow> rRequestInputRowList = rRequestInputTable.getReturnedRequestInputRow();
    for (ReturnedRequestInputRow rRequestInputRow : rRequestInputRowList)
    {
        List<ReturnedRequestInputValue> rRequestInputValueList = rRequestInputRow.getReturnedRequestInputValue();
        for (ReturnedRequestInputValue rRequestInputValue : rRequestInputValueList)
        {
            System.out.print(rRequestInputValue.getName() + "=" + rRequestInputValue.getValue() + "\n");
        }
    }
}

System.out.print("Outputs:\n");
List<String> colNameList = result.getColumnNames().getName();
for (String colName : colNameList)
{
    System.out.print(colName + "\t");
}
System.out.print("\n");
List<RowValues> rowValuesList = result.getRowValues();
for (RowValues rowValues : rowValuesList)
{
    List<Value> valueList = rowValues.getValue();
    for (Value value : valueList)
```

```

    {
      System.out.print(value.getValue() +"\t");
    }
    System.out.print("\n");
}

```

SOAP request example

Client invocation of the `getScore` 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wss="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <getScore xmlns="http://xml.spss.com/scoring-v2/remote">
      <scoreRequest id="config-glm" xmlns="http://xml.spss.com/scoring-v2">
        <requestInputTable name="Table1">
          <requestInputRow>
            <input name="happy" value="1"></input>
            <input name="prestg80" value="1"></input>
            <input name="tax" value="1"></input>
          </requestInputRow>
        </requestInputTable>
      </scoreRequest>
    </getScore>
  </soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `getScore` 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>
    <d:getScoreResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <c:scoreResult id="4eddd000-e737-11dd-8971-94ff11922566">
        <c:columnNames>
          <c:name>Prediction</c:name>
          <c:name>StdDev</c:name>
        </c:columnNames>
        <c:rowValues>
          <c:value>44.5836</c:value>
          <c:value>2.89975</c:value>
        </c:rowValues>
        <c:modelInputValue name="prestg80" type="double">1.0</c:modelInputValue>
        <c:modelInputValue name="tax" type="double">1.0</c:modelInputValue>
        <c:modelInputValue name="happy" type="double">1.0</c:modelInputValue>
      </c:scoreResult>
    </d:getScoreResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The getServiceDetails operation

Returns information about each registered scoring provider available in the system. This information includes the following:

- Provider name
- Internal identifier for the provider
- Version of the provider
- MIME types of files that can be scored using the provider

Return information

The following table identifies the information returned by the getServiceDetails operation.

Table 16. Return Value.

Type	Description
scoringServiceDetails	This element is a collection of information that provides details about the scoring service.

Java example

After calling the getServiceDetails operation, use the getVersion method for the resulting ScoringServiceDetails object to return the version number for the Scoring Service.

The getScoreProviderDetails method returns an array of ScoreProviderDetails objects containing information about the scoring providers. Use the getName, getVersion, and getSupportedMimeTypes methods to access the name, version, and MIME types for each provider.

```
ScoringServiceDetails details = stub.getServiceDetails();
System.out.println("Service version: " + details.getVersion());
ScoreProviderDetails[] providerArray = details.getScoreProviderDetails();
for (int i = 0; i < providerArray.length; i++) {
    System.out.println("Provider: " + providerArray[i].getName() +
        " (version " + providerArray[i].getVersion() + ")");
    String[] mimeTypes = providerArray[i].getSupportedMimeTypes();
    System.out.println("Used for:");
    for (int j = 0; j < mimeTypes.length; j++) {
        System.out.println(mimeTypes[j]);
    }
}
```

For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
List<ScoreProviderDetails> providerList = details.getScoreProviderDetails();
```

SOAP request example

Client invocation of the getServiceDetails 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1ghcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
```

```

        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
        >2009-01-08T20:36:10Z</wsu:Created>
    </wsse:UsernameToken>
</wsse:Security>
<ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
    soapenv:mustUnderstand="0" 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>
    <getServiceDetails xmlns="http://xml.spss.com/scoring-v2/remote"/>
</soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `getServiceDetails` 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>
        <d:getServiceDetailsResponse xmlns:a="http://xml.spss.com/data"
            xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
            xmlns:d="http://xml.spss.com/scoring-v2/remote"
            xmlns:e="http://xml.spss.com/scoring/exception">
            <c:scoringServiceDetails>
                <c:version>4.00.000.133</c:version>
                <c:scoreProviderDetails name="Score Provider - SmartScore"
                    id="0a010a07d522b9690000011ea89ab3f08176">
                    <c:version>1.0</c:version>
                    <c:supportedMimeTypes>application/x-vnd.spss-pmm1</c:supportedMimeTypes>
                </c:scoreProviderDetails>
                <c:scoreProviderDetails name="Modeler Score Provider"
                    id="0a010a07d522b9690000011ea89ab3f08309">
                    <c:version>1.0</c:version>
                    <c:supportedMimeTypes>application/x-vnd.spss-clementine-stream</c:supportedMimeTypes>
                    <c:supportedMimeTypes>application/x-vnd.spss-scenario</c:supportedMimeTypes>
                </c:scoreProviderDetails>
            </c:scoringServiceDetails>
        </d:getServiceDetailsResponse>
    </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 17. Return Value.

Type	Description
string	The service version number.

Java example

To access the version number of the service, call the `getVersion` operation from the service stub.

```
System.out.println("Service Version = " + stub.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/scoring-v2/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>
    <d:getVersionResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
      <d:version>5.0.0.000</d:version>
    </d:getVersionResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The ping operation

Verifies that the scoring service is available.

SOAP request example

Client invocation of the ping 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>
    <ping xmlns="http://xml.spss.com/scoring-v2/remote"/>
  </soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a ping 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>
    <d:pingResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
    </d:pingResponse>
  </soapenv:Body>
</soapenv:Envelope>

```

The removeConfiguration operation

Removes a specified scoring configuration from the system, allowing any in-process score requests to complete while preventing any score requests received after the delete request from initiating. The operation generates an entry in the service logging tables indicating the configuration was deleted.

Input fields

The following table lists the input fields for the removeConfiguration operation.

Table 18. Fields for removeConfiguration.

Field	Type/Valid Values	Description
id	string	Non-localized ID for the element. This should match the spss_ss:idAttributeGroup type.

Java example

To delete a scoring configuration, supply the removeConfiguration operation with a string corresponding to the identifier for the configuration to be deleted.

```
String configId = "nb-config";
stub.removeConfiguration(configId);
```

SOAP request example

Client invocation of the removeConfiguration 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native//admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <removeConfiguration xmlns="http://xml.spss.com/scoring-v2/remote">
      <ns2:id xmlns:ns2="http://xml.spss.com/scoring-v2">nb-config</ns2:id>
    </removeConfiguration>
  </soapenv:Body>
</soapenv:Envelope>
```

SOAP response example

The server responds to a removeConfiguration 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>
    <d:removeConfigurationResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
    </soapenv:Body>
</soapenv:Envelope>
```

The setConfigurationDetails operation

Assigns values to configuration settings for a scoring configuration. Scoring requests for an existing configuration are queued until the new settings are applied.

Input fields

The following table lists the input fields for the setConfigurationDetails operation.

Table 19. Fields for setConfigurationDetails.

Field	Type/Valid Values	Description
configurationDetails	configurationDetails	This element contains the information that's exchanged to view or adjust the configuration settings.

Java example

The following sample modifies the default ConfigurationDetails object created by the buildConfigurationDetails operation. The default configuration contains no identifier so use the setId operation to assign one. In addition, the input metadata fields are modified to be returned with any score results. The resulting configuration is then stored by calling the setConfigurationDetails operation.

```
ModelReference model = new ModelReference();
modelRef.setId("0a010a07d3dc251c0000011eac84bfd18771");
modelRef.setResourcePath("/PMML/naivebayes.xml");
modelRef.setLabel("LATEST");
ConfigurationDetails details = stub.buildConfigurationDetails(model);
details.setId("nb-config");

ModelInputMetadata inputMetadata = details.getModelInputMetadata();
inputMetadata.setIsReturnEnabled(true);
ModelInputMetadataField[] inputMetadataField = inputMetadata.getModelInputMetadataField();
for (int i = 0; i < inputMetadataField.length; i++) {
    inputMetadataField[i].setIsReturned(true);
}
inputMetadata.setModelInputMetadataField(inputMetadataField);
details.setModelInputMetadata(inputMetadata);

stub.setConfigurationDetails(details);
```

For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
ModelReference model = new ModelReference();
modelRef.setId("0a010a07d3dc251c0000011eac84bfd18771");
modelRef.setResourcePath("/PMML/naivebayes.xml");
modelRef.setLabel("LATEST");
ConfigurationDetails details = stub.buildConfigurationDetails(model);
details.setId("nb-config");
ModelInputMetadata inputMetadata = details.getModelInputMetadata();
inputMetadata.setIsReturnEnabled(true);
List<ModelInputMetadataField> inputMetadataFieldList = inputMetadata.getModelInputMetadataField();
for (ModelInputMetadataField inputMetadataField : inputMetadataFieldList)
{
    inputMetadataField.setIsReturned(true);
}
inputMetadata.setModelInputMetadataField(inputMetadataField);
details.setModelInputMetadata(inputMetadata);
stub.setConfigurationDetails(details);
```

SOAP request example

Client invocation of the setConfigurationDetails 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>
```

```

<wss:Security soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
  soapenv:mustUnderstand="0"
  xmlns:wss="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
  <wss:UsernameToken
    xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
    <wss:Username>Native/admin</wss:Username>
    <wss:Password
      wss:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
        #PasswordText">pass</wss:Password>
    <wss:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wss:Nonce>
    <wsu:Created
      xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
      >2009-01-08T20:36:10Z</wsu:Created>
    </wss:UsernameToken>
  </wss:Security>
</ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
  soapenv:mustUnderstand="0" 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>
<setConfigurationDetails xmlns="http://xml.spss.com/scoring-v2/remote">
  <configurationDetails cfgSerial="21c881e0-ddc4-11dd-aca9-dcb0b853b9a7" id="nb-config"
    xmlns="http://xml.spss.com/scoring-v2">
    <modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
      id="0a010a07d3dc251c0000011eac84bfd18771"/>
    <modelInputMetadata isReturnEnabled="true">
      <modelInputMetadataField name="age" type="double"
        description="Age of Respondent" isReturned="true"/>
      <modelInputMetadataField name="educ" type="double"
        description="Highest Year of School Completed" isReturned="true"/>
      <modelInputMetadataField name="prestg80" type="double"
        description="R's Occupational Prestige Score (1980)" isReturned="true"/>
      <modelInputMetadataField name="speduc" type="double"
        description="Highest Year School Completed, Spouse" isReturned="true"/>
    </modelInputMetadata>
    <logSettings isEnabled="false" logDestination="queue/PASWLog">
      <loggableItemGroup name="Context Data" id="INPUT_CONTEXT"/>
      <loggableItemGroup name="Model Inputs" id="INPUT_MODEL">
        <loggableItem isEnabled="false" name="age" id="age"/>
        <loggableItem isEnabled="false" name="educ" id="educ"/>
        <loggableItem isEnabled="false" name="prestg80" id="prestg80"/>
        <loggableItem isEnabled="false" name="speduc" id="speduc"/>
      </loggableItemGroup>
      <loggableItemGroup name="Model Outputs" id="OUTPUT">
        <loggableItem isEnabled="false" name="Prediction" id="Prediction"/>
        <loggableItem isEnabled="false" name="Prob" id="Prob"/>
        <loggableItem isEnabled="false" name="Prob-1.0" id="Prob-1.0"/>
        <loggableItem isEnabled="false" name="Prob-2.0" id="Prob-2.0"/>
        <loggableItem isEnabled="false" name="Confidence" id="Confidence"/>
      </loggableItemGroup>
      <loggableItemGroup name="Scoring Engine Properties" id="ENGINE_PROPERTY">
        <loggableItem isEnabled="false" name="Model Path" id="MODEL_PATH"/>
        <loggableItem isEnabled="false" name="Scoring Configuration Name"
          id="CONFIGURATION_NAME"/>
        <loggableItem isEnabled="false" name="Model Version Label" id="MODEL_LABEL"/>
        <loggableItem isEnabled="false" name="Model MIME type" id="MODEL_MIME_TYPE"/>
        <loggableItem isEnabled="false" name="Model Version Marker"
          id="MODEL_MARKER"/>
        <loggableItem isEnabled="false" name="Scoring Configuration Serial"
          id="CONFIGURATION_SERIAL"/>
        <loggableItem isEnabled="false" name="Model ID" id="MODEL_ID"/>
      </loggableItemGroup>
      <loggableItemGroup name="Score Provider Properties" id="PROVIDER_PROPERTY"/>
    </logSettings>
    <inputAttributeOrder>
      <attributes>age</attributes>
      <attributes>educ</attributes>
      <attributes>prestg80</attributes>
      <attributes>speduc</attributes>
    </inputAttributeOrder>
    <cacheSize value="1" min="1" max="100"/>
    <batchEnabledFlag>false</batchEnabledFlag>
    <configurationItem>
      <xml>&lt;?xml version="1.0" encoding="UTF-8" &gt; &lt;node
        name="Model Specific" objectType="Model Specific" &gt; &lt;boolean
        objectType="PredictionOnly" name="A flag for prediction only" required="true"
        value="false" /&gt; &lt;choice
        objectType="MissingValuePolicy" name="Missing value handling policy for this model"
        required="true" &gt; &lt;item
        value="Substitute: Different model has different substitute

```

```

        policy"><item value="Score as SYSMIS: Score
        result would be SYSMIS"><item value="Throw
        exception: A SCSMissingPredictorException is
        thrown"><value>Score as SYSMIS: Score result
        would be
        SYSMIS</value></choice></node></xml>
    </configurationItem>
</configurationDetails>
</setConfigurationDetails>
</soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `setConfigurationDetails` 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>
    <d:setConfigurationDetailsResponse xmlns:a="http://xml.spss.com/data"
      xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
      xmlns:d="http://xml.spss.com/scoring-v2/remote"
      xmlns:e="http://xml.spss.com/scoring/exception">
    </soapenv:Body>
</soapenv:Envelope>

```

The updateConfigurationDetails operation

Updates values of configuration settings for an existing scoring configuration. Scoring requests are queued until the updated settings are applied.

Input fields

The following table lists the input fields for the `updateConfigurationDetails` operation.

Table 20. Fields for updateConfigurationDetails.

Field	Type/Valid Values	Description
configurationDetails	configurationDetails	This element contains the information that's exchanged to view or adjust the configuration settings.

Return information

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

Table 21. Return Value.

Type	Description
configurationDetails	This element contains the information that's exchanged to view or adjust the configuration settings.

Java example

To update a scoring configuration:

1. Retrieve a `ConfigurationDetails` object for the configuration to be modified using the `getConfigurationDetails` operation.
2. Update the details object.
3. Supply the `updateConfigurationDetails` operation with the revised details object.

The following sample updates the nb-config configuration. The input metadata fields are modified to be omitted from any score results. The updated information is then stored by calling the updateConfigurationDetails operation.

```
String configId = "nb-config";
ConfigurationDetails details = stub.getConfigurationDetails(configId);

ModelInputMetadata inputMetadata = details.getModelInputMetadata();
inputMetadata.setIsReturnEnabled(false);
ModelInputMetadataField[] inputMetadataField = inputMetadata.getModelInputMetadataField();
for (int i = 0; i < inputMetadataField.length; i++) {
    inputMetadataField[i].setIsReturned(false);
}
inputMetadata.setModelInputMetadataField(inputMetadataField);
details.setModelInputMetadata(inputMetadata);

ConfigurationDetails updatedDetails = stub.updateConfigurationDetails(details);
```

For web service clients based on JAX-WS, replace the arrays in the sample with List collections and update the array processing accordingly. For example:

```
String configId = "nb-config";
ConfigurationDetails details = stub.getConfigurationDetails(configId);
ModelInputMetadata inputMetadata = details.getModelInputMetadata();
inputMetadata.setIsReturnEnabled(false);
List<ModelInputMetadataField> inputMetadataFieldList = inputMetadata.getModelInputMetadataField();
for (ModelInputMetadataField inputMetadataField : inputMetadataFieldList)
{
    inputMetadataField.setIsReturned(false);
}
inputMetadata.setModelInputMetadataField(inputMetadataField);
details.setModelInputMetadata(inputMetadata);
ConfigurationDetails updatedDetails = stub.updateConfigurationDetails(details);
```

SOAP request example

Client invocation of the updateConfigurationDetails 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:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0"
      xmlns:wsse="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-secext-1.0.xsd">
      <wsse:UsernameToken
        xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd">
        <wsse:Username>Native/admin</wsse:Username>
        <wsse:Password
          wsse:Type="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-username-token-profile-1.0
            #PasswordText">pass</wsse:Password>
        <wsse:Nonce>of0ShsZM1gHcdD0o6A8PkQ==</wsse:Nonce>
        <wsu:Created
          xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd"
          >2009-01-08T20:36:10Z</wsu:Created>
        </wsse:UsernameToken>
      </wsse:Security>
    <ns1:client-accept-language soapenv:actor="http://schemas.xmlsoap.org/soap/actor/next"
      soapenv:mustUnderstand="0" 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>
    <updateConfigurationDetails xmlns="http://xml.spss.com/scoring-v2/remote">
      <configurationDetails cfgSerial="21c881e0-ddc4-11dd-aca9-dcb0b853b9a7" id="nb-config"
        xmlns="http://xml.spss.com/scoring-v2">
        <modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
          id="0a010a07d3dc251c0000011eac84bfd18771"/>
        <modelInputMetadata isReturnEnabled="false">
          <modelInputMetadataField name="age" type="double"
            description="Age of Respondent" isReturned="false"/>
          <modelInputMetadataField name="educ" type="double"
            description="Highest Year of School Completed" isReturned="false"/>
          <modelInputMetadataField name="prestg80" type="double"
            description="R's Occupational Prestige Score (1980)" isReturned="false"/>
          <modelInputMetadataField name="speduc" type="double"
            description="Highest Year School Completed, Spouse" isReturned="false"/>
        </modelInputMetadata>
        <logSettings isEnabled="false" logDestination="queue/PASWLog">
          <loggableItemGroup name="Context Data" id="INPUT_CONTEXT"/>
          <loggableItemGroup name="Model Inputs" id="INPUT_MODEL">

```

```

        <loggableItem isEnabled="false" name="age" id="age"/>
        <loggableItem isEnabled="false" name="educ" id="educ"/>
        <loggableItem isEnabled="false" name="prestg80" id="prestg80"/>
        <loggableItem isEnabled="false" name="speduc" id="speduc"/>
    </loggableItemGroup>
    <loggableItemGroup name="Model Outputs" id="OUTPUT">
        <loggableItem isEnabled="false" name="Prediction" id="Prediction"/>
        <loggableItem isEnabled="false" name="Prob" id="Prob"/>
        <loggableItem isEnabled="false" name="Prob-1.0" id="Prob-1.0"/>
        <loggableItem isEnabled="false" name="Prob-2.0" id="Prob-2.0"/>
        <loggableItem isEnabled="false" name="Confidence" id="Confidence"/>
    </loggableItemGroup>
    <loggableItemGroup name="Scoring Engine Properties" id="ENGINE_PROPERTY">
        <loggableItem isEnabled="false" name="Model Path" id="MODEL_PATH"/>
        <loggableItem isEnabled="false" name="Scoring Configuration Name"
            id="CONFIGURATION_NAME"/>
        <loggableItem isEnabled="false" name="Model Version Label" id="MODEL_LABEL"/>
        <loggableItem isEnabled="false" name="Model MIME type" id="MODEL_MIME_TYPE"/>
        <loggableItem isEnabled="false" name="Model Version Marker"
            id="MODEL_MARKER"/>
        <loggableItem isEnabled="false" name="Scoring Configuration Serial"
            id="CONFIGURATION_SERIAL"/>
        <loggableItem isEnabled="false" name="Model ID" id="MODEL_ID"/>
    </loggableItemGroup>
    <loggableItemGroup name="Score Provider Properties" id="PROVIDER_PROPERTY"/>
</logSettings>
<inputAttributeOrder>
    <attributes>age</attributes>
    <attributes>educ</attributes>
    <attributes>prestg80</attributes>
    <attributes>speduc</attributes>
</inputAttributeOrder>
<cacheSize value="1" min="1" max="100"/>
<batchEnabledFlag>false</batchEnabledFlag>
<configurationItem>
    <xml>&lt;?xml version="1.0" encoding="UTF-8" &node
        name="Model Specific" objectType="Model
        Specific" boolean
        objectType="PredictionOnly" name="A flag for
        prediction only" required="true"
        value="false" /&choice
        objectType="MissingValuePolicy" name="Missing
        value handling policy for this model"
        required="true" /&item
        value="Substitute: Different model has different substitute
        policy" /&item value="Score as SYSMIS: Score
        result would be SYSMIS" /&item value="Throw
        exception: A SCMissingPredictorException is
        thrown" /&item value="Score as SYSMIS: Score result
        would be
        SYSMIS" /value /&choice /&node />
    </configurationItem>
</configurationDetails>
</updateConfigurationDetails>
</soapenv:Body>
</soapenv:Envelope>

```

SOAP response example

The server responds to a `updateConfigurationDetails` 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>
        <d:updateConfigurationDetailsResponse xmlns:a="http://xml.spss.com/data"
            xmlns:b="http://xml.spss.com/pev/types" xmlns:c="http://xml.spss.com/scoring-v2"
            xmlns:d="http://xml.spss.com/scoring-v2/remote"
            xmlns:e="http://xml.spss.com/scoring/exception">
            <c:configurationDetails cfgSerial="21c881e0-ddc4-11dd-aca9-dcb0b853b9a7" id="nb-config">
                <c:modelReference label="LATEST" resourcePath="/PMML/naivebayes.xml"
                    id="0a010a07d3dc251c0000011eac84bfd18771"/>
                <c:modelInputMetadata isReturnEnabled="false">
                    <c:modelInputMetadataField name="age" type="double"
                        description="Age of Respondent" isReturned="false"/>
                    <c:modelInputMetadataField name="educ" type="double"
                        description="Highest Year of School Completed" isReturned="false"/>
                    <c:modelInputMetadataField name="prestg80" type="double"
                        description="R's Occupational Prestige Score (1980)" isReturned="false"/>
                    <c:modelInputMetadataField name="speduc" type="double"

```

```

        description="Highest Year School Completed, Spouse" isReturned="false"/>
    </c:modelInputMetadata>
    <c:logSettings isEnabled="false" logDestination="queue/PASWLog">
        <c:loggableItemGroup name="Context Data" id="INPUT_CONTEXT"/>
        <c:loggableItemGroup name="Model Inputs" id="INPUT_MODEL">
            <c:loggableItem isEnabled="false" name="age" id="age"/>
            <c:loggableItem isEnabled="false" name="educ" id="educ"/>
            <c:loggableItem isEnabled="false" name="prestg80" id="prestg80"/>
            <c:loggableItem isEnabled="false" name="speduc" id="speduc"/>
        </c:loggableItemGroup>
        <c:loggableItemGroup name="Model Outputs" id="OUTPUT">
            <c:loggableItem isEnabled="false" name="Prediction" id="Prediction"/>
            <c:loggableItem isEnabled="false" name="Prob" id="Prob"/>
            <c:loggableItem isEnabled="false" name="Prob-1.0" id="Prob-1.0"/>
            <c:loggableItem isEnabled="false" name="Prob-2.0" id="Prob-2.0"/>
            <c:loggableItem isEnabled="false" name="Confidence" id="Confidence"/>
        </c:loggableItemGroup>
        <c:loggableItemGroup name="Scoring Engine Properties" id="ENGINE_PROPERTY">
            <c:loggableItem isEnabled="false" name="Model Path" id="MODEL_PATH"/>
            <c:loggableItem isEnabled="false" name="Scoring Configuration Name"
                id="CONFIGURATION_NAME"/>
            <c:loggableItem isEnabled="false" name="Model Version Label" id="MODEL_LABEL"/>
            <c:loggableItem isEnabled="false" name="Model MIME type" id="MODEL_MIME_TYPE"/>
            <c:loggableItem isEnabled="false" name="Model Version Marker"
                id="MODEL_MARKER"/>
            <c:loggableItem isEnabled="false" name="Scoring Configuration Serial"
                id="CONFIGURATION_SERIAL"/>
            <c:loggableItem isEnabled="false" name="Model ID" id="MODEL_ID"/>
        </c:loggableItemGroup>
        <c:loggableItemGroup name="Score Provider Properties" id="PROVIDER_PROPERTY"/>
    </c:logSettings>
    <c:inputAttributeOrder>
        <c:attributes>age</c:attributes>
        <c:attributes>educ</c:attributes>
        <c:attributes>prestg80</c:attributes>
        <c:attributes>speduc</c:attributes>
    </c:inputAttributeOrder>
    <c:cacheSize value="1" min="1" max="100"/>
    <c:batchEnabledFlag>>false</c:batchEnabledFlag>
    <c:configurationItem>
        <c:xml>&lt;?xml version="1.0" encoding="UTF-8" ?&gt; &lt;node
            name="Model Specific" objectType="Model
            Specific"&gt;&lt;boolean
            objectType="PredictionOnly" name="A flag for
            prediction only" required="true"
            value="false"/&gt;&lt;choice
            objectType="MissingValuePolicy" name="Missing
            value handling policy for this model"
            required="true"&gt;&lt;item
            value="Substitute: Different model has different substitute
            policy"/&gt;&lt;item value="Score as SYSMIS: Score
            result would be SYSMIS"/&gt;&lt;item value="Throw
            exception: A SCSMissingPredictorException is
            thrown"/&gt;&lt;value>Score as SYSMIS: Score result
            would be
            SYSMIS</value>&lt;/choice>&lt;/node>&lt;/c:xml>
    </c:configurationItem>
</c:configurationDetails>
</d:updateConfigurationDetailsResponse>
</soapenv:Body>
</soapenv:Envelope>

```

Chapter 5. Scoring Service logging

IBM SPSS Collaboration and Deployment Services provides the facilities for logging the operations of the Scoring Service which include database objects for storing the information as well as programmable Java Platform Enterprise Edition objects that allow customization of the Scoring Service logging.

Database objects

The following database objects are used to store the Scoring Service log information:

- Request log table
- Database views
- XML schema

Scoring Service logging is supported on the following DBMSs that can be used for the IBM SPSS Collaboration and Deployment Services Repository:

- DB2 (Windows and UNIX)
- MS SQL Server
- Oracle

DB2 on iSeries cannot be used for Scoring Service logging.

Request log table

By default, the scoring service request information is stored in the SPSSSCORE_LOG table. Each row in the table corresponds to a scoring service request.

Scoring log table (SPSSSCORE_LOG)

SERIAL. The unique identifier of the scoring service request.

STAMP. The date and time of the scoring service request.

INFO. Additional information about the scoring request in XML format. The information is generated according to the XML schema registered with the database. See the topic “XML schema” on page 48 for more information. The same information is available in relational format from the scoring log view.

Clean-up and maintenance

Over time, as scoring service requests are logged, the SPSSSCORE_LOG can become quite large and it may be necessary to delete records from this table. For example, the administrator may to purge old records before January 1, 2009 by running the following SQL statement:

```
DELETE FROM spssscore_log WHERE STAMP < '2009-01-01'
```

Database views

The following scoring views are created in the database by default when the repository is installed. They present the information stored as XML in the INFO column of SPSSSCORE_LOG table in relational format. Use database client application tools to obtain additional information about the properties of the views or run SQL queries.

Scoring request (SPSSSCORE_V_LOG_HEADER)

This view contains a row for every scoring request row in the SPSSSCORE_LOG table.

SERIAL. The unique identifier of the scoring request.

ADDRESS. The IP address for the machine initiating the scoring request. Note that in certain cases it may be the address of the server rather than the client, for example, the address of the cluster load balancer or proxy server.

HOSTNAME. The name of the machine initiating the scoring request. If the servlet container running the scoring service on this machine does not allow Domain Name System reverse lookups, the value corresponds to the IP address of the machine. If no host name can be determined, a null value is used. In cases when hostname lookup takes too long, it may be possible to improve scoring service performance by configuring the system not to look up the hostname using the corresponding configuration option in browser-based IBM SPSS Deployment Manager.

PRINCIPAL. The user name associated with the scoring request. If this value is not included in the request, no information is logged.

STAMP. This column contains the timestamp of when the scoring service logged the request.

MODEL_OBJECT_ID. The repository identifier of the object that was configured with the scoring service. For example, if a IBM SPSS Modeler stream was configured for scoring, this is the repository identifier of the stream.

MODEL_VERSION_MARKER. The identifier of the specific version of the repository object that was configured for scoring.

CONFIGURATION_NAME The name of the scoring service configuration entry. The name is assigned when a model is configured for scoring.

Scoring request input (SPSSSCORE_V_LOG_INPUT)

The view contains the information about the model inputs that were used to produce the score. There may be multiple rows in SPSSSCORE_V_LOG_INPUT for each row in SPSSSCORE_LOG table and SPSSSCORE_V_LOG_HEADER view. Each row in the SPSSSCORE_V_LOG_INPUT represents a single input value.

SERIAL. The unique identifier of the scoring request row.

INPUT_TABLE. The table name.

INPUT_NAME. The name of an input field.

INPUT_VALUE. Input value.

INPUT_TYPE. Input data type. The following data types are allowed:

- date
- daytime
- decimal
- double
- float
- integer
- long
- string

- timestamp

Scoring request context data (SPSSSCORE_V_LOG_CONTEXT_INPUT)

This view contains the information about the data that was passed to the scoring service. There may be multiple rows in SPSSSCORE_V_LOG_CONTEXT_INPUT view for each row in SPSSSCORE_V_LOG_HEADER view.

SERIAL. The unique identifier of the scoring request row.

CONTEXT_TABLE. The name of the table used in the Context data source.

CONTEXT_ROW. The row number of the context data row starting at 1.

CONTEXT_NAME. The name of an input field corresponding to the name of the column in the Context data source.

CONTEXT_VALUE. Input value.

Scoring request input (SPSSSCORE_V_LOG_REQUEST_INPUT)

This view contains the information about the data used as input for the scoring service request.

SERIAL. The unique identifier of the scoring request row.

RI_TABLE. The name of the table used in the request.

RI_ROW. The row number of the request data row starting at 1.

RI_NAME. The name of an input field corresponding to the name of the column in the request.

RI_VALUE. Input value.

Scoring request properties (SPSSSCORE_V_LOG_REQUEST_PROP)

This view contains the information about the properties associated with an input table.

SERIAL. The unique identifier of the scoring request row.

RI_TABLE. The name of the table used in the request.

RI_PROP_NAME. The name of the property.

RI_PROP_VALUE. The value for the property.

Scoring request output (SPSSSCORE_V_LOG_OUTPUT)

The SPSSSCORE_V_LOG_OUTPUT view is used to log the outputs of the scoring service. There may be multiple rows in SPSSSCORE_V_LOG_OUTPUT view for each row in SPSSSCORE_V_LOG_HEADER view. The scoring service has the ability to provide multiple outputs. Each output can consist of multiple values. For example, the scoring service may provide two recommendations (two outputs). Each of these recommendation will be assigned a unique row number starting at 1. For each recommendation, there may be multiple output values.

SERIAL. The unique identifier of the scoring request row.

OUTPUT_ROW. The row number of context data row starting at 1.

OUTPUT_NAME. The output field name (attribute name) corresponding to the name of the column in the Context data source.

OUTPUT_VALUE. Output value.

Scoring request metrics (SPSSSCORE_V_LOG_METRIC)

The SPSSSCORE_V_LOG_METRIC view is used to log the output metrics of the scoring service, for example, the time to process the scoring request. There may be multiple rows in SPSSSCORE_V_LOG_METRIC view for each row in SPSSSCORE_V_LOG_HEADER view.

SERIAL. The unique identifier of the scoring request row.

METRIC_NAME. The name of an metric field.

METRIC_VALUE. Metric value.

Scoring request properties (SPSSSCORE_V_LOG_PROPERTY)

The SPSSSCORE_V_LOG_PROPERTY view is used to log the properties used in processing the request. There may be multiple rows in the SPSSSCORE_V_LOG_PROPERTY view for each row in the SPSSSCORE_V_LOG_HEADER view. The properties that can be logged depend on the selected score provider.

SERIAL. The unique identifier of the scoring request row.

PROPERTY_NAME. The name of a property.

PROPERTY_VALUE. Property value.

XML schema

The following XML schema is registered with the database and used for the INFO column of the SPSSSCORE_LOG table. This schema is required for MS SQL Server and Oracle. It is not required on DB2.

```
<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  attributeFormDefault="unqualified"
  elementFormDefault="qualified"
  targetNamespace="http://xml.spss.com/scoring/logging"
  version="2.0"
  xmlns:jaxb="http://java.sun.com/xml/ns/jaxb"
  xmlns:spss_ss_logging="http://xml.spss.com/scoring/logging"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <!-- ***** -->
  <!-- SIMPLE TYPES -->
  <!-- ***** -->
  <xs:simpleType name="pevDataType">
    <xs:annotation>
      <xs:documentation>The type of this column. This maps to the same types defined by
        the DD EventServer. We will map these types to the SQL types using the same
        mapping that the DD Event Server uses.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="boolean"/>
      <!-- <xs:enumeration value="character"></xs:enumeration> not needed, as string
        should be sufficient for mapping to SQL -->
      <xs:enumeration value="date"/>
      <xs:enumeration value="daytime"/>
      <xs:enumeration value="decimal"/>
      <xs:enumeration value="double"/>
      <xs:enumeration value="float"/>
      <xs:enumeration value="integer"/>
      <xs:enumeration value="long"/>
      <xs:enumeration value="string"/>
      <xs:enumeration value="timestamp"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:attributeGroup name="nillableValueAttributeGroup">
    <xs:attribute name="value" type="xs:string" use="optional">
      <xs:annotation>
        <xs:documentation>A value, in string representation. If this attribute is not
          specified, the value is considered to be null. The text representation of the
```

```

        numeric types is obvious, but several types are not. The format of the
        non-numeric types must be as follows: boolean='true'(case insensitive) or '1'
        or 'false'(case insensitive) or '0', date='yyyy-MM-dd', daytime='HH:mm:ss', and
        timestamp='yyyy-MM-ddTHH:mm:ss'.</xs:documentation>
    </xs:annotation>
</xs:attribute>
</xs:attributeGroup>

<!-- ***** -->
<!-- COMPLEX TYPES -->
<!-- ***** -->
<xs:complexType name="modelInputValue">
    <xs:annotation>
        <xs:documentation>This element is optionally returned as part of the scoreResult
        element. If the configuration is programmed to return the model input fields
        (see spss_ss:modelInputMetadataField), then this element contains the value that
        was used to produce the score. The value might be null.</xs:documentation>
    </xs:annotation>
    <xs:attribute name="name" type="xs:string" use="required">
        <xs:annotation>
            <xs:documentation>The name of the input item.</xs:documentation>
        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
        <xs:annotation>
            <xs:documentation>The data type of the input item.</xs:documentation>
        </xs:annotation>
    </xs:attribute>
    <xs:attributeGroup ref="spss_ss_logging:nilableValueAttributeGroup"/>
</xs:complexType>

<xs:complexType name="inputTable">
    <xs:annotation>
        <xs:documentation>One table of input values, may contain zero or more
        rows.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
        <xs:element name="columns" type="spss_ss_logging:inputColumn" minOccurs="1"
            maxOccurs="unbounded">
            <xs:annotation>
                <xs:documentation>An ordered list of column names</xs:documentation>
            </xs:annotation>
        </xs:element>
        <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="0"
            maxOccurs="unbounded">
            <xs:annotation>
                <xs:documentation>A row of values, value order must match defined column
                order.</xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
    <xs:attribute name="sourceTable" type="xs:string" use="required">
        <xs:annotation>
            <xs:documentation>This attribute holds the name of the source table as defined
            in the model.</xs:documentation>
        </xs:annotation>
    </xs:attribute>
</xs:complexType>

<xs:complexType name="inputColumn">
    <xs:annotation>
        <xs:documentation>Describes a column in the designated input table. If the
        configuration is programmed to return the model input fields (see
        spss_ss:modelInputMetadataField), then this element contains the value that
        was used to produce the score. The value might be null.</xs:documentation>
    </xs:annotation>
    <xs:attribute name="name" type="xs:string" use="required">
        <xs:annotation>
            <xs:documentation>The name of the input item.</xs:documentation>
        </xs:annotation>
    </xs:attribute>
    <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
        <xs:annotation>
            <xs:documentation>The data type of the input item.</xs:documentation>
        </xs:annotation>
    </xs:attribute>
</xs:complexType>

<xs:complexType name="inputTableWithProperties" >
    <xs:annotation>
        <xs:documentation>Input tables can have loggable properties</xs:documentation>
    </xs:annotation>
    <xs:complexContent>
        <xs:extension base="spss_ss_logging:inputTable">

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        <xs:sequence>
          <xs:element name="RequestInputProperties"
            type="spss_ss_logging:requestInputProperties" minOccurs="0" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>Properties that are associated with an input
                table</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:extension>
    </xs:complexContent>
  </xs:complexType>

  <xs:complexType name="requestInputProperties">
    <xs:annotation>
      <xs:documentation>Properties that are associated with an input table</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="property" type="spss_ss_logging:nameValueType" minOccurs="1"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>Properties that are associated with an input
            table</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="columnNames">
    <xs:annotation>
      <xs:documentation/>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="rowValues">
    <xs:annotation>
      <xs:documentation>One row of values, note that a value may be null.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="value" type="spss_ss_logging:nullableValue" minOccurs="1"
        maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="output">
    <xs:sequence>
      <xs:element name="columnNames" type="spss_ss_logging:columnNames">
        <xs:annotation>
          <xs:documentation>An ordered list of column names</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>A row of score data, following the order in the
            columnNames element</xs:documentation>
        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:complexType>

  <xs:complexType name="nameValueType">
    <xs:annotation>
      <xs:documentation>A name value pair.</xs:documentation>
    </xs:annotation>
    <xs:attribute name="name" type="xs:string" use="required"/>
    <xs:attribute name="value" type="xs:string" use="required"/>
  </xs:complexType>

  <xs:complexType name="context">
    <xs:annotation>
      <xs:documentation>This element contains all the context data inputs to the score
        request.</xs:documentation>
    </xs:annotation>
    <xs:sequence>
      <xs:element name="columnNames" type="spss_ss_logging:columnNames">
        <xs:annotation>
          <xs:documentation>An ordered list of column names</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"

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        maxOccurs="unbounded">
          <xs:annotation>
            <xs:documentation>A row of context data, following the order in the
              columnNames element</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
      <xs:attribute name="table" type="xs:string" use="required">
        <xs:annotation>
          <xs:documentation>This attribute describes which context table the input data
            belongs to.</xs:documentation>
        </xs:annotation>
      </xs:attribute>
    </xs:complexType>

    <xs:complexType name="nillableValue">
      <xs:annotation>
        <xs:documentation>Nillable elements and simpleTypes are not well supported by most
          of the popular frameworks, especially Castor. Instead of a nillable string element,
          use an optional string attribute to represent null values.</xs:documentation>
        </xs:annotation>
      <xs:attributeGroup ref="spss_ss_logging:nillableValueAttributeGroup"/>
    </xs:complexType>

    <!-- ***** -->
    <!-- ELEMENTS -->
    <!-- ***** -->
    <xs:element name="Info">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="Output" type="spss_ss_logging:output" minOccurs="0" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>PA has the ability to generate multiple outputs
                (multiple offers). There will be one OutputRow for each output
                (for each offer). </xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ContextInput" type="spss_ss_logging:context" minOccurs="0"
            maxOccurs="unbounded">
            <xs:annotation>
              <xs:documentation>Context data that is fed into the data engine
                and not necessarily into the model. </xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="RequestInputs" type="spss_ss_logging:inputTableWithProperties"
            minOccurs="0" maxOccurs="unbounded">
            <xs:annotation>
              <xs:documentation>Zero to N score request input tables. The data
                contained in each table represents the inputs provided with the score
                request.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Metric" type="spss_ss_logging:nameValueType" minOccurs="0"
            maxOccurs="unbounded">
            <xs:annotation>
              <xs:documentation>A metric which is defined by either the HSS engine
                or the provider.
                Value is a double represented as a string to account for the
                correct precision and scale.
                An example might be the time to produce the output.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="Property" type="spss_ss_logging:nameValueType" minOccurs="0"
            maxOccurs="unbounded">
            <xs:annotation>
              <xs:documentation>A property value. The name is the name of the
                property.</xs:documentation>
            </xs:annotation>
          </xs:element>
          <xs:element name="ModelObjectId" type="xs:string" minOccurs="1" maxOccurs="1"/>
          <xs:element name="ModelVersionMarker" type="xs:string" minOccurs="1" maxOccurs="1"/>
          <xs:element name="ConfigurationName" type="xs:string" minOccurs="1" maxOccurs="1"/>
          <xs:element name="ModelInputTable" type="xs:string" minOccurs="0" maxOccurs="1">
            <xs:annotation>
              <xs:documentation>THIS ELEMENT IS NOW DEPRECATED.</xs:documentation>
            </xs:annotation>
          </xs:element>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
  </xs:schema>

```

SQL for creating database objects

The following are SQL statements for creating the default database objects for scoring logging.

MS SQL Server (scoring_logging_sql_server.sql)

```
CREATE XML SCHEMA COLLECTION SPSSSCORE_LOG AS '<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  attributeFormDefault="unqualified"
  elementFormDefault="qualified"
  targetNamespace="http://xml.spss.com/scoring/logging"
  version="2.0"
  jaxb:version="2.0"
  xmlns:jaxb="http://java.sun.com/xml/ns/jaxb"
  xmlns:spss_ss_logging="http://xml.spss.com/scoring/logging"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <!-- ***** -->
  <!-- SIMPLE TYPES -->
  <!-- ***** -->
  <xs:simpleType name="pevDataType">
    <xs:annotation>
      <xs:documentation>The type of this column. This maps to the same types defined by
        the DD EventServer. We will map these types to the SQL types using the same
        mapping that the DD Event Server uses.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="boolean"/>
      <!-- <xs:enumeration value="character"/> not needed, as string
        should be sufficient for mapping to SQL -->
      <xs:enumeration value="date"/>
      <xs:enumeration value="daytime"/>
      <xs:enumeration value="decimal"/>
      <xs:enumeration value="double"/>
      <xs:enumeration value="float"/>
      <xs:enumeration value="integer"/>
      <xs:enumeration value="long"/>
      <xs:enumeration value="string"/>
      <xs:enumeration value="timestamp"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:attributeGroup name="nillableValueAttributeGroup">
    <xs:attribute name="value" type="xs:string" use="optional">
      <xs:annotation>
        <xs:documentation>A value, in string representation. If this attribute is not
          specified, the value is considered to be null. The text representation of the
          numeric types is obvious, but several types are not. The format of the
          non-numeric types must be as follows: boolean='true'(case insensitive) or '1'
          or 'false'(case insensitive) or '0', date='yyyy-MM-dd', daytime='HH:mm:ss', and
          timestamp='yyyy-MM-ddTHH:mm:ss'.</xs:documentation>
      </xs:annotation>
    </xs:attribute>
  </xs:attributeGroup>

  <!-- ***** -->
  <!-- COMPLEX TYPES -->
  <!-- ***** -->
  <xs:complexType name="modelInputValue">
    <xs:annotation>
      <xs:documentation>This element is optionally returned as part of the scoreResult
        element. If the configuration is programmed to return the model input fields
        (see spss_ss:modelInputMetadataField), then this element contains the value that
        was used to produce the score. The value might be null.</xs:documentation>
    </xs:annotation>
    <xs:attribute name="name" type="xs:string" use="required">
      <xs:annotation>
        <xs:documentation>The name of the input item.</xs:documentation>
      </xs:annotation>
    </xs:attribute>
    <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
      <xs:annotation>
        <xs:documentation>The data type of the input item.</xs:documentation>
      </xs:annotation>
    </xs:attribute>
    <xs:attributeGroup ref="spss_ss_logging:nillableValueAttributeGroup"/>
  </xs:complexType>

  <xs:complexType name="inputTable">
    <xs:annotation>
      <xs:documentation>One table of input values, may contain zero or more
```



```

        rows.</xs:documentation>
</xs:annotation>
<xs:sequence>
  <xs:element name="columns" type="spss_ss_logging:inputColumn" minOccurs="1"
    maxOccurs="unbounded">
    <xs:annotation>
      <xs:documentation>An ordered list of column names</xs:documentation>
    </xs:annotation>
  </xs:element>
  <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="0"
    maxOccurs="unbounded">
    <xs:annotation>
      <xs:documentation>A row of values, value order must match defined column
        order.</xs:documentation>
    </xs:annotation>
  </xs:element>
</xs:sequence>
<xs:attribute name="sourceTable" type="xs:string" use="required">
  <xs:annotation>
    <xs:documentation>This attribute holds the name of the source table as defined
      in the model.</xs:documentation>
  </xs:annotation>
</xs:attribute>
</xs:complexType>

<xs:complexType name="inputColumn">
  <xs:annotation>
    <xs:documentation>Describes a column in the designated input table. If the
      configuration is programmed to return the model input fields (see
      spss_ss:modelInputMetadataField), then this element contains the value that
      was used to produce the score. The value might be null.</xs:documentation>
  </xs:annotation>
  <xs:attribute name="name" type="xs:string" use="required">
    <xs:annotation>
      <xs:documentation>The name of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
  <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
    <xs:annotation>
      <xs:documentation>The data type of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
</xs:complexType>

<xs:complexType name="inputTableWithProperties" >
  <xs:annotation>
    <xs:documentation>Input tables can have loggable properties</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="spss_ss_logging:inputTable">
      <xs:sequence>
        <xs:element name="RequestInputProperties"
          type="spss_ss_logging:requestInputProperties" minOccurs="0" maxOccurs="1">
          <xs:annotation>
            <xs:documentation>Properties that are associated with an input
              table</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

<xs:complexType name="requestInputProperties">
  <xs:annotation>
    <xs:documentation>Properties that are associated with an input table</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="property" type="spss_ss_logging:nameValueType" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>Properties that are associated with an input
          table</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="columnNames">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

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    </xs:sequence>
</xs:complexType>

<xs:complexType name="rowValues">
  <xs:annotation>
    <xs:documentation>One row of values, note that a value may be null.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="value" type="spss_ss_logging:nillableValue" minOccurs="1"
      maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="output">
  <xs:sequence>
    <xs:element name="columnNames" type="spss_ss_logging:columnNames">
      <xs:annotation>
        <xs:documentation>An ordered list of column names</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>A row of score data, following the order in the
          columnNames element</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="nameValueType">
  <xs:annotation>
    <xs:documentation>A name value pair.</xs:documentation>
  </xs:annotation>
  <xs:attribute name="name" type="xs:string" use="required"/>
  <xs:attribute name="value" type="xs:string" use="required"/>
</xs:complexType>

<xs:complexType name="context">
  <xs:annotation>
    <xs:documentation>This element contains all the context data inputs to the score
      request.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="columnNames" type="spss_ss_logging:columnNames">
      <xs:annotation>
        <xs:documentation>An ordered list of column names</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>A row of context data, following the order in the
          columnNames element</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
  <xs:attribute name="table" type="xs:string" use="required">
    <xs:annotation>
      <xs:documentation>This attribute describes which context table the input data
        belongs to.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
</xs:complexType>

<xs:complexType name="nillableValue">
  <xs:annotation>
    <xs:documentation>Nillable elements and simpleTypes are not well supported by most
      of the popular frameworks, especially Castor. Instead of a nillable string element,
      use an optional string attribute to represent null values.</xs:documentation>
  </xs:annotation>
  <xs:attributeGroup ref="spss_ss_logging:nillableValueAttributeGroup"/>
</xs:complexType>

<!-- ***** -->
<!-- ELEMENTS -->
<!-- ***** -->
<xs:element name="Info">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Output" type="spss_ss_logging:output" minOccurs="0" maxOccurs="1">
        <xs:annotation>
          <xs:documentation>PA has the ability to generate multiple outputs
            (multiple offers). There will be one OutputRow for each output

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        (for each offer). </xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="Input" type="spss_ss_logging:modelInputValue" minOccurs="0"
maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>This might be a PEV AV input column or data from some
            other source. THIS ELEMENT IS NOW DEPRECATED. The DpdOutputs and
            RequestInputs elements will be used for all future log entries, and this
            element is kept for backwards compatibility.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="ContextInput" type="spss_ss_logging:context" minOccurs="0"
maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>Context data that is fed into the DPD (data engine)
            and not necessarily into the model. </xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="DpdOutputs" type="spss_ss_logging:inputTable" minOccurs="0"
maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>Zero to N input tables. The data contained in each
            table represents the values that have been provided by the data service.
            If a RT-DPD is not used for the model, these entries are not
            present.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="RequestInputs" type="spss_ss_logging:inputTableWithProperties"
minOccurs="0" maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>Zero to N score request input tables. The data
            contained in each table represents the inputs provided with the score
            request.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="Metric" type="spss_ss_logging:nameValueType" minOccurs="0"
maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>A metric which is defined by either the HSS engine
            or the provider.
            Value is a double represented as a string to account for the
            correct precision and scale.
            An example might be the time to produce the output.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="Property" type="spss_ss_logging:nameValueType" minOccurs="0"
maxOccurs="unbounded">
    <xs:annotation>
        <xs:documentation>A property value. The name is the name of the
            property.</xs:documentation>
    </xs:annotation>
</xs:element>
<xs:element name="ModelObjectId" type="xs:string" minOccurs="1" maxOccurs="1"/>
<xs:element name="ModelVersionMarker" type="xs:string" minOccurs="1" maxOccurs="1"/>
<xs:element name="ConfigurationName" type="xs:string" minOccurs="1" maxOccurs="1"/>
<xs:element name="ModelInputTable" type="xs:string" minOccurs="0" maxOccurs="1">
    <xs:annotation>
        <xs:documentation>THIS ELEMENT IS NOW DEPRECATED.</xs:documentation>
    </xs:annotation>
</xs:element>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>;
GO

```

```

CREATE TABLE SPSSSCORE_LOG (
SERIAL    NVARCHAR(40) NOT NULL,
STAMP     datetime NOT NULL,
INFO      XML (
CONTENT SPSSSCORE_LOG) NULL,
CONSTRAINT PK_SPSSSCORE_LOG PRIMARY KEY (SERIAL )
);
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_HEADER
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
STAMP,
INFO.value('data(/Info/ModelObjectId)[1]','VARCHAR(40)') AS MODEL_OBJECT_ID,
INFO.value('data(/Info/ModelVersionMarker)[1]','VARCHAR(40)') AS MODEL_VERSION_MARKER,

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INFO.value('data(/Info/ConfigurationName)[1]', 'VARCHAR(256)') AS CONFIGURATION_NAME,
INFO.value('data(/Info/Property[@name="PRINCIPAL"])[1]/@value)', 'VARCHAR(256)') AS PRINCIPAL,
INFO.value('data(/Info/Property[@name="ADDRESS"])[1]/@value)', 'VARCHAR(256)') AS ADDRESS,
INFO.value('data(/Info/Property[@name="HOSTNAME"])[1]/@value)', 'VARCHAR(256)') AS HOSTNAME
FROM dbo.spssscore_log
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_INPUT
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
INFO.value('data(/Info/ModelInputTable)[1]', 'VARCHAR(256)') AS INPUT_TABLE,
R.nref.value('@name[1]', 'VARCHAR(256)') AS INPUT_NAME,
R.nref.value('./@value', 'VARCHAR(256)') AS INPUT_VALUE,
R.nref.value('@type[1]', 'VARCHAR(20)') AS INPUT_TYPE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/Input') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_OUTPUT
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.query('for $s in ../../ return count($s/../rowValues[. << $s])+1').value('.', 'int') as OUTPUT_ROW,
R.nref.query('for $s in . return $s../../columnNames/name[count($s../../[*] << $s) +1]').value('.', 'nvarchar(256)')
as OUTPUT_NAME,
R.nref.value('./@value', 'nvarchar(256)') as OUTPUT_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/Output/rowValues/value') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_METRIC
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('@name[1]', 'VARCHAR(256)') AS METRIC_NAME,
R.nref.value('@value', 'VARCHAR(256)') AS METRIC_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/Metric') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_PROPERTY
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('@name[1]', 'VARCHAR(256)') AS PROPERTY_NAME,
R.nref.value('@value', 'VARCHAR(256)') AS PROPERTY_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/Property') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_CONTEXT_INPUT
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('string((../../)[1]/@table)', 'nvarchar(256)') as CONTEXT_TABLE,
R.nref.query('for $s in ../../ return count($s/../rowValues[. << $s])+1').value('.', 'int') as CONTEXT_ROW,
R.nref.query('for $s in . return $s../../columnNames/name[count($s../../[*] << $s) +1]').value('.', 'nvarchar(256)')
as CONTEXT_NAME,
R.nref.value('./@value', 'nvarchar(256)') as CONTEXT_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/ContextInput/rowValues/value') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_DPD_OUTPUT
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('string((../../)[1]/@sourceTable)', 'nvarchar(256)') as DO_TABLE,
R.nref.query('for $s in ../../ return count($s/../rowValues[. &lt;&lt; $s])+1').value('.', 'int') AS DO_ROW,
R.nref.query('data(for $s in . return $s../../columns[count($s../../[*] &lt;&lt; $s) +1]/@name)').value('.', 'nvarchar(256)')
as DO_NAME,

```

```

R.nref.value('./@value', 'nvarchar(256)') AS DO_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/DpdOutputs/rowValues/value') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_INPUT
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('string((../..)[1]/@sourceTable)', 'nvarchar(256)') AS RI_TABLE,
R.nref.query('for $s in ../. return count($s/../rowValues[. &lt;&lt; $s])+1').value('.', 'int') AS RI_ROW,
R.nref.query('data(for $s in . return $s/../columns[count($s/../*. &lt;&lt; $s) +1]/@name)').value('.', 'nvarchar(256)')
AS RI_NAME,
R.nref.value('./@value', 'nvarchar(256)') AS RI_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/RequestInputs/rowValues/value') AS R(nref)
;
GO

```

```

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_PROP
AS with xmlnamespaces(default 'http://xml.spss.com/scoring/logging')
SELECT
SERIAL,
R.nref.value('string((../..)[1]/@sourceTable)', 'nvarchar(256)') AS RI_TABLE,
R.nref.value('./@name', 'nvarchar(256)') AS RI_PROP_NAME,
R.nref.value('./@value', 'nvarchar(256)') AS RI_PROP_VALUE
FROM dbo.spssscore_log
CROSS APPLY INFO.nodes('/Info/RequestInputs/RequestInputProperties/property') AS R(nref)
;
GO

```

Oracle (scoring_logging_ora.sql)

```

declare x VARCHAR(15000) := '<?xml version="1.0" encoding="UTF-8"?>
<xs:schema
  attributeFormDefault="unqualified"
  elementFormDefault="qualified"
  targetNamespace="http://xml.spss.com/scoring/logging"
  version="2.0"
  jaxb:version="2.0"
  xmlns:jaxb="http://java.sun.com/xml/ns/jaxb"
  xmlns:spss_ss_logging="http://xml.spss.com/scoring/logging"
  xmlns:xs="http://www.w3.org/2001/XMLSchema">

  <!-- ***** -->
  <!-- SIMPLE TYPES -->
  <!-- ***** -->
  <xs:simpleType name="pevDataType">
    <xs:annotation>
      <xs:documentation>The type of this column. This maps to the same types defined by
        the DD EventServer. We will map these types to the SQL types using the same
        mapping that the DD Event Server uses.</xs:documentation>
    </xs:annotation>
    <xs:restriction base="xs:NMTOKEN">
      <xs:enumeration value="boolean"/>
      <!-- <xs:enumeration value="character"></xs:enumeration> not needed, as string
        should be sufficient for mapping to SQL -->
      <xs:enumeration value="date"/>
      <xs:enumeration value="datetime"/>
      <xs:enumeration value="decimal"/>
      <xs:enumeration value="double"/>
      <xs:enumeration value="float"/>
      <xs:enumeration value="integer"/>
      <xs:enumeration value="long"/>
      <xs:enumeration value="string"/>
      <xs:enumeration value="timestamp"/>
    </xs:restriction>
  </xs:simpleType>

  <xs:attributeGroup name="nillableValueAttributeGroup">
    <xs:attribute name="value" type="xs:string" use="optional">
      <xs:annotation>
        <xs:documentation>A value, in string representation. If this attribute is not
          specified, the value is considered to be null. The text representation of the
          numeric types is obvious, but several types are not. The format of the
          non-numeric types must be as follows: boolean='true'(case insensitive) or '1'
          or 'false'(case insensitive) or '0', date='yyyy-MM-dd', daytime='HH:mm:ss', and
          timestamp='yyyy-MM-ddTHH:mm:ss'.</xs:documentation>
      </xs:annotation>
    </xs:attribute>
  </xs:attributeGroup>

```

```

</xs:attributeGroup>

<!-- ***** -->
<!-- COMPLEX TYPES -->
<!-- ***** -->
<xs:complexType name="modelInputValue">
  <xs:annotation>
    <xs:documentation>This element is optionally returned as part of the scoreResult
      element. If the configuration is programmed to return the model input fields
      (see spss_ss:modelInputMetadataField), then this element contains the value that
      was used to produce the score. The value might be null.</xs:documentation>
  </xs:annotation>
  <xs:attribute name="name" type="xs:string" use="required">
    <xs:annotation>
      <xs:documentation>The name of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
  <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
    <xs:annotation>
      <xs:documentation>The data type of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
  <xs:attributeGroup ref="spss_ss_logging:nilableValueAttributeGroup"/>
</xs:complexType>

<xs:complexType name="inputTable">
  <xs:annotation>
    <xs:documentation>One table of input values, may contain zero or more
      rows.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="columns" type="spss_ss_logging:inputColumn" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>An ordered list of column names</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="0"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>A row of values, value order must match defined column
          order.</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
  <xs:attribute name="sourceTable" type="xs:string" use="required">
    <xs:annotation>
      <xs:documentation>This attribute holds the name of the source table as defined
        in the model.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
</xs:complexType>

<xs:complexType name="inputColumn">
  <xs:annotation>
    <xs:documentation>Describes a column in the designated input table. If the
      configuration is programmed to return the model input fields (see
      spss_ss:modelInputMetadataField), then this element contains the value that
      was used to produce the score. The value might be null.</xs:documentation>
  </xs:annotation>
  <xs:attribute name="name" type="xs:string" use="required">
    <xs:annotation>
      <xs:documentation>The name of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
  <xs:attribute name="type" type="spss_ss_logging:pevDataType" use="required">
    <xs:annotation>
      <xs:documentation>The data type of the input item.</xs:documentation>
    </xs:annotation>
  </xs:attribute>
</xs:complexType>

<xs:complexType name="inputTableWithProperties" >
  <xs:annotation>
    <xs:documentation>Input tables can have loggable properties</xs:documentation>
  </xs:annotation>
  <xs:complexContent>
    <xs:extension base="spss_ss_logging:inputTable">
      <xs:sequence>
        <xs:element name="RequestInputProperties"
          type="spss_ss_logging:requestInputProperties" minOccurs="0" maxOccurs="1">
          <xs:annotation>
            <xs:documentation>Properties that are associated with an input
              table</xs:documentation>
          </xs:annotation>
        </xs:element>
      </xs:sequence>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>

```

```

        </xs:annotation>
      </xs:element>
    </xs:sequence>
  </xs:extension>
</xs:complexContent>
</xs:complexType>

<xs:complexType name="requestInputProperties">
  <xs:annotation>
    <xs:documentation>Properties that are associated with an input table</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="property" type="spss_ss_logging:nameValueType" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>Properties that are associated with an input
          table</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="columnNames">
  <xs:annotation>
    <xs:documentation/>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="name" type="xs:string" minOccurs="1" maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="rowValues">
  <xs:annotation>
    <xs:documentation>One row of values, note that a value may be null.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="value" type="spss_ss_logging:nullableValue" minOccurs="1"
      maxOccurs="unbounded"/>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="output">
  <xs:sequence>
    <xs:element name="columnNames" type="spss_ss_logging:columnNames">
      <xs:annotation>
        <xs:documentation>An ordered list of column names</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>A row of score data, following the order in the
          columnNames element</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

<xs:complexType name="nameValueType">
  <xs:annotation>
    <xs:documentation>A name value pair.</xs:documentation>
  </xs:annotation>
  <xs:attribute name="name" type="xs:string" use="required"/>
  <xs:attribute name="value" type="xs:string" use="required"/>
</xs:complexType>

<xs:complexType name="context">
  <xs:annotation>
    <xs:documentation>This element contains all the context data inputs to the score
      request.</xs:documentation>
  </xs:annotation>
  <xs:sequence>
    <xs:element name="columnNames" type="spss_ss_logging:columnNames">
      <xs:annotation>
        <xs:documentation>An ordered list of column names</xs:documentation>
      </xs:annotation>
    </xs:element>
    <xs:element name="rowValues" type="spss_ss_logging:rowValues" minOccurs="1"
      maxOccurs="unbounded">
      <xs:annotation>
        <xs:documentation>A row of context data, following the order in the
          columnNames element</xs:documentation>
      </xs:annotation>
    </xs:element>
  </xs:sequence>
</xs:complexType>

```

```

</xs:sequence>
<xs:attribute name="table" type="xs:string" use="required">
  <xs:annotation>
    <xs:documentation>This attribute describes which context table the input data
      belongs to.</xs:documentation>
  </xs:annotation>
</xs:attribute>
</xs:complexType>

<xs:complexType name="nillableValue">
  <xs:annotation>
    <xs:documentation>Nillable elements and simpleTypes are not well supported by most
      of the popular frameworks, especially Castor. Instead of a nillable string element,
      use an optional string attribute to represent null values.</xs:documentation>
  </xs:annotation>
  <xs:attributeGroup ref="spss_ss_logging:nillableValueAttributeGroup"/>
</xs:complexType>

<!-- ***** -->
<!-- ELEMENTS -->
<!-- ***** -->
<xs:element name="Info">
  <xs:complexType>
    <xs:sequence>
      <xs:element name="Output" type="spss_ss_logging:output" minOccurs="0" maxOccurs="1">
        <xs:annotation>
          <xs:documentation>PA has the ability to generate multiple outputs
            (multiple offers). There will be one OutputRow for each output
            (for each offer). </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Input" type="spss_ss_logging:modelInputValue" minOccurs="0"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>This might be a PEV AV input column or data from some
            other source. THIS ELEMENT IS NOW DEPRECATED. The DpdOutputs and
            RequestInputs elements will be used for all future log entries, and this
            element is kept for backwards compatibility.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="ContextInput" type="spss_ss_logging:context" minOccurs="0"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>Context data that is fed into the DPD (data engine)
            and not necessarily into the model. </xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="DpdOutputs" type="spss_ss_logging:inputTable" minOccurs="0"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>Zero to N input tables. The data contained in each
            table represents the values that have been provided by the data service.
            If a RT-DPD is not used for the model, these entries are not
            present.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="RequestInputs" type="spss_ss_logging:inputTableWithProperties"
        minOccurs="0" maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>Zero to N score request input tables. The data
            contained in each table represents the inputs provided with the score
            request.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Metric" type="spss_ss_logging:nameValueType" minOccurs="0"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>A metric which is defined by either the HSS engine
            or the provider.
            Value is a double represented as a string to account for the
            correct precision and scale.
            An example might be the time to produce the output.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="Property" type="spss_ss_logging:nameValueType" minOccurs="0"
        maxOccurs="unbounded">
        <xs:annotation>
          <xs:documentation>A property value. The name is the name of the
            property.</xs:documentation>
        </xs:annotation>
      </xs:element>
      <xs:element name="ModelObjectId" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="ModelVersionMarker" type="xs:string" minOccurs="1" maxOccurs="1"/>
      <xs:element name="ConfigurationName" type="xs:string" minOccurs="1" maxOccurs="1"/>
    </xs:sequence>
  </xs:complexType>

```



```

        <xs:element name="ModelInputTable" type="xs:string" minOccurs="0" maxOccurs="1">
            <xs:annotation>
                <xs:documentation>THIS ELEMENT IS NOW DEPRECATED.</xs:documentation>
            </xs:annotation>
        </xs:element>
    </xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>';

begin
dbms_xmlschema.registerSchema('http://xml.spss.com/scoring/logging', xmltype.createxml(x) );

CREATE TABLE SPSSSCORE_LOG (
SERIAL VARCHAR(40) NOT NULL, STAMP DATE NOT NULL, INFO XMLTYPE NULL,
CONSTRAINT PK_SPSSSCORE_LOG PRIMARY KEY (SERIAL )
) XMLTYPE INFO STORE AS OBJECT RELATIONAL XMLSCHEMA "http://xml.spss.com/scoring/logging" ELEMENT "Info";

CREATE VIEW SPSSSCORE_V_LOG_HEADER
AS
SELECT SERIAL, STAMP,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:ModelObjectId/text()' passing INFO returning content) AS VARCHAR(40)) as MODEL_OBJECT_ID,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:ModelVersionMarker/text()' passing INFO returning content) AS VARCHAR(40)) as MODEL_VERSION_MARKER,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:ConfigurationName/text()' passing INFO returning content) AS VARCHAR(256)) as CONFIGURATION_NAME,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Property[@name="PRINCIPAL"]/@value' passing INFO returning content) AS VARCHAR(256)) as PRINCIPAL,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Property[@name="ADDRESS"]/@value' passing INFO returning content) AS VARCHAR(256)) as ADDRESS,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Property[@name="HOSTNAME"]/@value' passing INFO returning content) AS VARCHAR(256)) as HOSTNAME
FROM spssscore_log
;

CREATE VIEW SPSSSCORE_V_LOG_INPUT
AS
select SERIAL,
CAST(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:ModelInputTable/text()' passing INFO returning content) AS VARCHAR(256)) as INPUT_TABLE,
xtab.INPUT_NAME,
xtab.INPUT_VALUE,
xtab.INPUT_TYPE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Input' PASSING Info COLUMNS INPUT_NAME VARCHAR(256) PATH './@name',
INPUT_VALUE VARCHAR(256) PATH './@value', INPUT_TYPE VARCHAR(20) PATH './@type') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_OUTPUT
AS
select SERIAL,
xtab.OUTPUT_ROW,
xtab.OUTPUT_NAME,
xtab.OUTPUT_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in /s:Info/s:Output/s:rowValues/s:value return
<row>
<num>{count($i/././s:rowValues[. << $i/././]) +1} </num>
<col>{$i/././s:columnNames/s:name[count($i/././[* << $i]) +1]}</col>
{if (($i/./)[1]/@value) then <val>{ string(($i/./)[1]/@value)} </val> else <dummy></dummy>}
</row>'
PASSING Info COLUMNS OUTPUT_NAME VARCHAR(256) PATH '/row/col', OUTPUT_VALUE VARCHAR(256)
PATH '/row/val',OUTPUT_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_METRIC
AS
select SERIAL,
xtab.METRIC_NAME,
xtab.METRIC_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Metric' PASSING Info COLUMNS METRIC_NAME VARCHAR(256) PATH './@name',
METRIC_VALUE VARCHAR(256) PATH './@value') xtab
;

```

```

CREATE VIEW SPSSSCORE_V_LOG_PROPERTY
AS
select SERIAL,
xtab.PROPERTY_NAME,
xtab.PROPERTY_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
/s:Info/s:Property' PASSING Info COLUMNS PROPERTY_NAME VARCHAR(256) PATH './@name',
PROPERTY_VALUE VARCHAR(256) PATH './@value') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_CONTEXT_INPUT
AS
select SERIAL,
xtab.CONTEXT_TABLE,
xtab.CONTEXT_ROW,
xtab.CONTEXT_NAME,
xtab.CONTEXT_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in /s:Info/s:ContextInput/s:rowValues/s:value return
<row>
<table>{string(($i/./..)[1]/@table)} </table>
<num>{count($i/./../s:rowValues[. << $i/./..]) +1} </num>
<col>{string($i/./../s:columnNames/s:name[count($i/./.*[. << $i]) +1])}</col>
{if (($i/./..)[1]/@value) then <val>{ string(($i/./..)[1]/@value)} </val> else <dummy></dummy>}
</row>'
PASSING Info COLUMNS CONTEXT TABLE VARCHAR(256) PATH '/row/table', CONTEXT_NAME VARCHAR(256)
PATH '/row/col', CONTEXT_VALUE VARCHAR(256) PATH '/row/val',CONTEXT_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_DPD_OUTPUT
AS
SELECT SERIAL,
xtab.DO_TABLE,
xtab.DO_ROW,
xtab.DO_NAME,
xtab.DO_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in /s:Info/s:DpdOutputs/s:rowValues/s:value return
<row>
<table>{string(($i/./..)[1]/@sourceTable)} </table>
<num>{count($i/./../s:rowValues[. << $i/./..]) +1} </num>
<col>{string($i/./../s:columns[count($i/./.*[. << $i]) +1])/@name}</col>
{if (($i/./..)[1]/@value) then <val>{ string(($i/./..)[1]/@value)} </val> else <dummy></dummy>}
</row>'
PASSING Info COLUMNS DO TABLE VARCHAR(256) PATH '/row/table', DO_NAME VARCHAR(256)
PATH '/row/col', DO_VALUE VARCHAR(256) PATH '/row/val', DO_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_INPUT
AS
SELECT SERIAL,
xtab.RI_TABLE,
xtab.RI_ROW,
xtab.RI_NAME,
xtab.RI_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in /s:Info/s:RequestInputs/s:rowValues/s:value return
<row>
<table>{string(($i/./..)[1]/@sourceTable)} </table>
<num>{count($i/./../s:rowValues[. << $i/./..]) +1} </num>
<col>{string($i/./../s:columns[count($i/./.*[. << $i]) +1])/@name}</col>
{if (($i/./..)[1]/@value) then <val>{ string(($i/./..)[1]/@value)} </val> else <dummy></dummy>}
</row>'
PASSING Info COLUMNS RI TABLE VARCHAR(256) PATH '/row/table', RI_NAME VARCHAR(256)
PATH '/row/col', RI_VALUE VARCHAR(256) PATH '/row/val', RI_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_PROP
AS
SELECT SERIAL,
xtab.RI_TABLE,
xtab.RI_PROP_NAME,
xtab.RI_PROP_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in /s:Info/s:RequestInputs/s:RequestInputProperties/s:property return

```

```

<row>
<table>{string(($i/./..)[1]/@sourceTable)} </table>
{if (($i/./..)[1]/@name) then <nam>{ string(($i/./..)[1]/@name)} </nam> else <dummy></dummy>}
{if (($i/./..)[1]/@value) then <val>{ string(($i/./..)[1]/@value)} </val> else <dummy></dummy>}
</row>'
PASSING Info COLUMNS RI_TABLE VARCHAR(256) PATH '/row/table', RI_PROP_NAME VARCHAR(256)
PATH '/row/nam', RI_PROP_VALUE VARCHAR(256) PATH '/row/val', RI_ROW INT PATH '/row/val') xtab
;

```

DB2 (scoring_logging_db2.sql)

```

CREATE TABLE SPSSSCORE_LOG (
SERIAL VARCHAR(40) NOT NULL, STAMP TIMESTAMP NOT NULL, INFO XML ,
CONSTRAINT PK_SPSSSCORE_LOG PRIMARY KEY (SERIAL)
);

CREATE VIEW SPSSSCORE_V_LOG_HEADER
AS
SELECT SERIAL, STAMP,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:ModelObjectId/text()')
passing INFO as "x" ) as varchar(40) ) as MODEL_OBJECT_ID,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:ModelVersionMarker/text()')
passing INFO as "x" ) as varchar(40) ) as MODEL_VERSION_MARKER,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:ConfigurationName/text()')
passing INFO as "x" ) as varchar(256) ) as CONFIGURATION_NAME,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Property[@name="PRINCIPAL"]/@value')
passing INFO as "x" ) as varchar(256) ) as PRINCIPAL,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Property[@name="ADDRESS"]/@value')
passing INFO as "x" ) as varchar(256) ) as ADDRESS,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Property[@name="HOSTNAME"]/@value')
passing INFO as "x" ) as varchar(256) ) as HOSTNAME
FROM spssscore_log
;

CREATE VIEW SPSSSCORE_V_LOG_INPUT
AS
select SERIAL,
xmlcast(xmlquery('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:ModelInputTable/text()') passing INFO as "x") as VARCHAR(256) ) as INPUT_TABLE,
xtab.INPUT_NAME,
xtab.INPUT_VALUE,
xtab.INPUT_TYPE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Input' PASSING Info as "x" COLUMNS INPUT_NAME VARCHAR(256)
PATH './@name', INPUT_VALUE VARCHAR(256) PATH './@value', INPUT_TYPE VARCHAR(20) PATH './@type') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_OUTPUT
AS
select SERIAL,
xtab.OUTPUT_ROW,
xtab.OUTPUT_NAME,
xtab.OUTPUT_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in $x/s:Info/s:Output/s:rowValues/s:value return
document {
<row>
<num>{count($i/./././s:rowValues[. << $i/././]) +1} </num>
<col>{($i/./././s:columnNames/s:name[count($i/././[* << $i]) +1]}</col>
{if (($i/./..)[1]/@value) then <val>{ string(($i/./..)[1]/@value)} </val> else <dummy></dummy>}
</row> }'
PASSING Info as "x" COLUMNS OUTPUT_NAME VARCHAR(256) PATH '/row/col', OUTPUT_VALUE VARCHAR(256)
PATH '/row/val',OUTPUT_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_METRIC
AS
select SERIAL,
xtab.METRIC_NAME,
xtab.METRIC_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Metric' PASSING Info as "x" COLUMNS METRIC_NAME VARCHAR(256) PATH './@name',
METRIC_VALUE VARCHAR(256) PATH './@value') xtab
;

```

```

CREATE VIEW SPSSSCORE_V_LOG_PROPERTY
AS
select SERIAL,
xtab.PROPERTY_NAME,
xtab.PROPERTY_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
$/s:Info/s:Property' PASSING Info as "x" COLUMNS PROPERTY_NAME VARCHAR(256) PATH './@name',
PROPERTY_VALUE VARCHAR(256) PATH './@value') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_CONTEXT_INPUT
AS
select SERIAL,
xtab.CONTEXT_TABLE,
xtab.CONTEXT_ROW,
xtab.CONTEXT_NAME,
xtab.CONTEXT_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in $x/s:Info/s:ContextInput/s:rowValues/s:value return
document {
<row>
<table>{string(($i/./..)[1]/@table)} </table>
<num>{count($i/./..:rowValues[. << $i/./..]) +1} </num>
<col>{string($i/./..:columnNames/s:name[count($i/./.*[. << $i]) +1]}</col>
{if (($i/.)[1]/@value) then <val>{ string(($i/.)[1]/@value)} </val> else <dummy></dummy>}
</row>}'
PASSING Info as "x" COLUMNS CONTEXT_TABLE VARCHAR(256) PATH '/row/table', CONTEXT_NAME VARCHAR(256)
PATH '/row/col', CONTEXT_VALUE VARCHAR(256) PATH '/row/val',CONTEXT_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_DPD_OUTPUT
AS
SELECT SERIAL,
xtab.DO_TABLE,
xtab.DO_ROW,
xtab.DO_NAME,
xtab.DO_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in $x/s:Info/s:DpdOutputs/s:rowValues/s:value return
document {
<row>
<table>{string(($i/./..)[1]/@sourceTable)}</table>
<num>{count($i/./..:rowValues[. << $i/./..]) +1}</num>
<col>{string($i/./..:columns[count($i/./.*[. << $i]) +1]/@name)}</col>
{if (($i/.)[1]/@value) then <val>{ string(($i/.)[1]/@value)} </val> else <dummy></dummy>}
</row>}'
PASSING Info as "x" COLUMNS DO_TABLE VARCHAR(256) PATH '/row/table', DO_NAME VARCHAR(256)
PATH '/row/col', DO_VALUE VARCHAR(256) PATH '/row/val', DO_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_INPUT
AS
SELECT SERIAL,
xtab.RI_TABLE,
xtab.RI_ROW,
xtab.RI_NAME,
xtab.RI_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";
for $i in $x/s:Info/s:RequestInputs/s:rowValues/s:value return
document {
<row>
<table>{string(($i/./..)[1]/@sourceTable)}</table>
<num>{count($i/./..:rowValues[. << $i/./..]) +1}</num>
<col>{string($i/./..:columns[count($i/./.*[. << $i]) +1]/@name)}</col>
{if (($i/.)[1]/@value) then <val>{ string(($i/.)[1]/@value)} </val> else <dummy></dummy>}
</row>}'
PASSING Info as "x" COLUMNS RI_TABLE VARCHAR(256) PATH '/row/table', RI_NAME VARCHAR(256)
PATH '/row/col', RI_VALUE VARCHAR(256) PATH '/row/val', RI_ROW INT PATH '/row/num') xtab
;

CREATE VIEW SPSSSCORE_V_LOG_REQUEST_PROP
AS
SELECT SERIAL,
xtab.RI_TABLE,
xtab.RI_PROP_NAME,
xtab.RI_PROP_VALUE
FROM spssscore_log,
XMLTable('xquery version "1.0"; declare namespace s="http://xml.spss.com/scoring/logging";

```

```
$x/s:Info/s:RequestInputs/s:RequestInputProperties/s:property'
PASSING Info as "x" COLUMNS RI_TABLE VARCHAR(256) PATH './../@sourceTable',
RI_PROP_NAME VARCHAR(256) ATH './@name', RI_PROP_VALUE VARCHAR(256) PATH './@value') xtab
;
```

Customizing logging

The Scoring Service uses the Java Messaging Service (JMS) to log information. Messages generated by the service are placed into *PASWLog* queue (JNDI name *queue/PASWLog*) and subsequently retrieved and written to the database by the *ScoreLogMDB* Message Driven bean (MDB). The MDB is preinstalled with IBM SPSS Collaboration and Deployment Services and changes to the default configuration are not allowed. To customize logging, you must deploy a custom MDB. While *ScoreLogMDB* may be patched by applying IBM SPSS Collaboration and Deployment Services patches, any custom MDB deployments must be patched manually.

The IBM SPSS Collaboration and Deployment Services architecture enables the following customization of Scoring Service logging:

- JMS settings
- Logging all scoring request to a different table
- Logging requests for an individual scoring configuration to a different table

Custom MDB

Custom MDBs must be deployed in accordance with Java Platform Enterprise Edition EJB specification and their configuration must include the following settings:

- `<ejb-name>` The name of the EJB. Always substitute the name with a new one when creating your MDB. Do not use *ScoreLogMDB*.
- `<ejb-class>` The class name. The property must always be set to *com.spss.logging.ejb.LoggingMDB*. The class can be found in *logging.jar*.
- `<message-selector>` By default, when the Scoring Service queues messages onto the *PASWLog*, it sets the *LoggingDestination* property to *ScoringService*. The *ScoreLogMDB* only requests messages with this property set.
- `<env-entry-name>` The target database table name to which the MDB writes the records as it retrieves them from the JMS queue.
- `<transaction-type>` Transaction type. *ScoreLogMDB* uses bean-managed transactions on *jdbc/spss/PlatformDS* data source. The data source does not support XA transactions. If you need to use container-managed transactions, you must configure a different data source that is capable of XA transactions.

The following example is the deployment descriptor for *ScoreLogMDB* (*ejb-jar.xml*).

```
<message-driven>
  <ejb-name>ScoreLogMDB</ejb-name>
  <ejb-class>com.spss.logging.ejb.LoggingMDB</ejb-class>
  <message-selector>LoggingDestination = 'ScoringService'</message-selector>
  <transaction-type>Bean</transaction-type>
  <message-driven-destination>
    <destination-type>javax.jms.Queue</destination-type>
  </message-driven-destination>
  <env-entry>
    <description>target table name</description>
    <env-entry-name>target_table</env-entry-name>
    <env-entry-type>java.lang.String</env-entry-type>
    <env-entry-value>SPSSSCORE_LOG</env-entry-value>
  </env-entry>
</message-driven>
```

Data source

The scoring MDB class (*com.spss.logging.ejb.LoggingMDB*) determines what Java Platform Enterprise Edition data source to log to by doing a JNDI lookup on *jdbc/spss/PlatformDS*.

```
(DataSource)initialContext.lookup("jdbc/spss/PlatformDS")
```

The JNDI name *jdbc/spss/PlatformDS* points to the repository database. As a result, *ScoreLogMDB* logs to the *SPSSSCORE_LOG* table in the repository. When deploying a custom MDB, use the application server configuration facilities to map this JNDI name to a different data source, if needed.

Custom JMS settings

In certain cases it may be necessary to customize the JMS settings of Scoring Service logging, for instance, to improve performance. JMS settings must be modified through the configuration facilities of the application server. For example, when using WebSphere it is possible to customize the maximum number of instances (threads) for the MDB. In general, allowing more instances will result in greater message throughput at the expense of higher system resources use.

Logging all requests to a different table

Note: The following information is intended for application server administrators. Please contact your local administrator if you have any questions.

By default, the scoring requests are logged to *SPSSSCORE_LOG* in the repository. See the topic “Request log table” on page 45 for more information. To log to a different table:

1. Customize the SQL scripts to create a different table. You must re-use the existing schema. The script must also be modified to use the new target table for creating the database views. See the topic “SQL for creating database objects” on page 52 for more information.
2. Create your own MDB. In the deployment descriptor, specify a different value for the *target_table* element.
3. Deploy your new MDB.

Note: Issues can arise when target tables are located in different databases. In cases where the target tables are in different databases the issue should be resolved at the database level so that remote tables can be treated as normal local tables in the IBM SPSS Collaboration and Deployment Services repository. Many databases provide functions that treat tables in other databases as local tables (db-link in Oracle for example).

Logging specific scoring configurations to a different table

To log specific Scoring Service configurations to a table other than the default:

1. Follow the steps in “Logging all requests to a different table.”
2. When creating the MDB, specify a unique message selector. For example:

```
LoggingDestination = 'MyCustomLogging'
```
3. When configuring the Scoring Service for a particular model, specify *MyCustomLogging* as the Log Destination property. If the model configuration is performed in IBM SPSS Deployment Manager, the setting appears on the Advanced Settings page of the configuration wizard.

Chapter 6. Scoring Service access using the Java Message Service

Scoring Service access using the Java Message Service

The standard mechanism for accessing the Scoring Service is through SOAP messages. The typical approach involves using HTTP as the transport layer for the messages. However, it is possible to access the service using the Java Message Service (JMS) as the transport layer.

Basically, your client application needs to access the Scoring Service using JMS from outside of the application server. The requirements for gaining access to a JMS queue vary across application servers. If you are not familiar with configuring your environment for such access, you should consult the application server documentation. This discussion assists you with configuring your environment, but the information may not correspond to your particular application server version. The application server documentation should serve as the ultimate reference.

Using JMS to access the Scoring Service

The following list is a general overview of the required steps you should take to access the scoring service through JMS. Each of these steps is explained in detail, and sample Java code is provided afterward.

1. Create your SOAP message.
2. Initialize JMS.
3. Open a temporary reply-to queue.
4. Create a consumer for the temporary reply-to queue.
5. Create a JMS message using the SOAP message.
6. Set the reply-to queue on the JMS message. Set the reply-to queue for the outgoing message to the temporary queue created earlier. This will ensure that the scoring service knows where to send the response message.
7. Send the message to a JMS queue.
8. Receive the reply message.

After sending and receiving JMS messages, be sure to close out the various JMS objects. Care should be taken to ensure that all communication is complete before closing these objects.

Creating the SOAP message

Create a SOAP message to send via JMS. For example, a SOAP message for the `getVersion` operation follows:

```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:rem="http://xml.spss.com/scoring-v2/remote">
  <soapenv:Header/>
  <soapenv:Body>
    <rem:getVersion/>
  </soapenv:Body>
</soapenv:Envelope>
```

Note that the SOAP envelopes you send via JMS do not require a SOAP security header. It is assumed that an application server administrator will take the necessary measures to secure the JMS queues. Consult your application server documentation for further information.

Initializing JMS

Create a `Hashtable` with the environment properties that are required to access your application server. For information about values for specific application servers, see “Environment configuration” on page 70.

Once the `InitialContext` object has been populated with the `Hashtable`, use it to discover the `Queue` and `QueueConnectionFactory` that are defined in the application server. With the `QueueConnectionFactory`, obtain a `QueueConnection` and start communicating with the application server.

Opening a queue

Use the `QueueConnection` to create a `QueueSession`, which can be used to create a temporary queue. This temporary queue will be used to receive replies from the scoring service.

You can define a dedicated reply-to queue instead of a temporary queue. In that case, you would likely be using a `Message Driven` bean or a `MessageListener` to receive the reply messages. Due to the asynchronous nature of this alternate approach, the messages that are sent and received must be matched to each other using the `JMSCorrelationID`. When the message is received, be sure to extract this value for later processing. You should also consider matching the `JMSCorrelationID` between outgoing and incoming messages even when using a temporary reply-to queue and receiving messages synchronously.

Creating a consumer

Create a message consumer that will listen to the temporary queue for reply messages by using a `MessageConsumer` object. Alternatively, you could use a `Message Driven` bean that implements the `MessageListener` interface. The `MessageConsumer` object receives messages synchronously, with calls to the `receive` method blocking further processing until a reply message arrives. It is possible to receive the messages asynchronously using a `MessageListener` or `Message Driven` bean. See the Java documentation for details.

Creating a JMS message

Create a JMS message that contains the SOAP message by creating a `QueueSession` for sending the message. Use this session object to create a `QueueSender` that points to the destination queue and to create a `BytesMessage` object.

Sending the message

Place the bytes of the outgoing SOAP message into the JMS message and send the message. Be sure to use UTF-8 encoding when converting the string. Once the message has been sent, you can extract the `JMSCorrelationID` from the message. The `JMSCorrelationID` header field is used for linking a sent message with a reply message. Do not try to obtain this value before sending the message because the value may not have been set before sending.

Receiving the reply message

To receive the JMS reply, call the `receive` method for the `MessageConsumer`. Assuming you get a reply message, extract the body of the message by casting the `javax.jms.Message` object to a `javax.jms.BytesMessage`. The JMS message is a sequence of bytes that represents the SOAP reply message. These bytes can be reconstituted into a Java `String` object using UTF-8 encoding.

Java example for JMS

The following Java example assumes the method `getSOAPMessage` returns a string that defines a SOAP message. Once the SOAP message is created, the remaining steps should be followed to send the message and receive a response. To focus on the JMS steps, the example omits error handling. Actual implementations should include code that checks for errors.

```
// Get a SOAP envelope using whatever means you want.
String soap = getSOAPMessage();
System.out.println("Message to send...\n  " + soap);

// Initialize JMS.
// Create a hash table of settings required to access JMS.
// Note that these settings are application server specific.
Hashtable<String, String> hashTable = new Hashtable<String, String>();
hashTable.put(javax.naming.InitialContext.URL_PKG_PREFIXES, "...");
hashTable.put(javax.naming.InitialContext.PROVIDER_URL, "...");
hashTable.put(javax.naming.InitialContext.INITIAL_CONTEXT_FACTORY, "...");

// Create an InitialContext object so you can discover
// various objects such as connection factories and queues.
javax.naming.InitialContext context = new javax.naming.InitialContext(hashTable);

// Attempt to get the connection factory and queue.
javax.jms.Queue scoringQueue = (javax.jms.Queue)context.lookup("queue/PASWScore");
javax.jms.QueueConnectionFactory factory = (javax.jms.QueueConnectionFactory)context.lookup("ConnectionFactory");

// Create a connection to the queue and start it.
javax.jms.QueueConnection queueConnection = factory.createQueueConnection();
queueConnection.start();

// Open a temporary reply queue.
javax.jms.QueueSession listenerSession =
    queueConnection.createQueueSession(false, javax.jms.Session.AUTO_ACKNOWLEDGE);
javax.jms.TemporaryQueue temporaryQueue = listenerSession.createTemporaryQueue();

// Listen to the temporary reply queue for messages returned by the scoring service
javax.jms.MessageConsumer consumer = listenerSession.createConsumer(temporaryQueue);

// Create a JMS message using the SOAP message.
// With this session, you can send as many messages as you like.
javax.jms.QueueSession senderSession =
    queueConnection.createQueueSession(false, javax.jms.Session.AUTO_ACKNOWLEDGE);
javax.jms.QueueSender sender = senderSession.createSender(scoringQueue);
javax.jms.BytesMessage message = senderSession.createBytesMessage();

// Set the reply-to queue on the JMS message.
message.setJMSReplyTo(temporaryQueue);

// Send the message to a JMS queue.
// Populate the message with the soap envelope and send it
message.writeBytes(soap.getBytes("UTF-8"));
sender.send(message);

// Receive the reply message.
// NOTE: This method blocks until a message is received.
Message replyJMSMessage = consumer.receive();

// The message format should be a bytes message.
if (replyJMSMessage != null && replyJMSMessage instanceof javax.jms.BytesMessage)
{
    javax.jms.BytesMessage bytesMessage = (javax.jms.BytesMessage) replyJMSMessage;
    byte[] bytes = new byte[(int) bytesMessage.getBodyLength()];
    bytesMessage.readBytes(bytes);
    System.out.println("Reply Message");
    // the reply message
    String replyMessage = new String(bytes, "UTF-8");
    System.out.println("  " + replyMessage);
    // the JMS correlation ID can be used to match a sent message with a response message
    String jmsCorrelationID = replyJMSMessage.getJMSCorrelationID();
    System.out.println("  reply message ID = " + jmsCorrelationID);
}

// After the message is sent, get the message ID.
// You would keep the message ID around somewhere so you can match it to a reply later.
String messageID = message.getJMSMessageID();
System.out.println("  message ID = " + messageID + "\n");
sender.close();

// Cleanup
```

```
listenerSession.close();
queueConnection.stop();
senderSession.close();
queueConnection.close();
```

Environment configuration

Each application server has its own specific requirements for accessing JMS outside of the application server environment. However, in general, configuring your environment to use JMS as the transport protocol for web service calls involves the following steps:

- Use the correct JMS and InitialContext values for your application server in the client code
- Include the correct .jar files on the class path. The application server documentation is the authoritative reference for setting your environment to access JMS. Refer to that documentation for the exact .jar files that are required to be in the class path.

When defining these values, be sure to use the correct host name and port number corresponding to your application server.

IBM SPSS Collaboration and Deployment Services defines a queue under the JNDI name *queue/PASWScoring*, and a queue connection factory under the JNDI name *ConnectionFactory*. Use these values in your code when performing JNDI lookups.

Configuring a WebSphere environment

To communicate with a WebSphere Application Server using JMS, your client should use the following values:

```
javax.naming.InitialContext.PROVIDER_URL = iiop://cds.server.example.com:<BOOTSTRAP_ADDRESS>
javax.naming.InitialContext.INITIAL_CONTEXT_FACTORY = com.ibm.websphere.naming.WsnInitialContextFactory
```

Replace *<BOOTSTRAP_ADDRESS>* with the WebSphere *BOOTSTRAP_ADDRESS* port number listed in the WebSphere Integrated Solutions Console (ISC).

The WebSphere documentation is the authoritative reference for setting your environment to access JMS. Refer to that documentation for the exact .jar files that are required to be in the class path.

The JNDI name *ConnectionFactory* is used to refer to the queue connection factory. In order to enable external access to this factory, you must define a provider endpoint for this factory.

Determining endpoint provider triplet for a service integration bus

From the WebSphere Integrated Solutions Console (ISC), locate the service integration bus port number, *SIB_ENDPOINT_ADDRESS*. The endpoint triplet reference for this service integration bus is in the following format:

```
<HOST>:<SIB-ENDPOINT-ADDRESS-PORT>:BootstrapBasicMessaging
```

The value of *<HOST>* is the host name or IP address for the WebSphere server and *<SIB-ENDPOINT-ADDRESS-PORT>* is the Service Integration Bus port number.

Configuring a JBoss environment

To communicate with a JBoss application server using JMS, your client should use the following values:

```
javax.naming.InitialContext.URL_PKG_PREFIXES = org.jboss.naming:org.jnp.interfaces
javax.naming.InitialContext.PROVIDER_URL = jnp://cds.server.example.com:<JNP_PORT>
javax.naming.InitialContext.INITIAL_CONTEXT_FACTORY = org.jnp.interfaces.NamingContextFactory
```

Replace *<JNP_PORT>* with the JNP port listed in the JBoss Admin Console. On the *Configuration* page, under the *Standard Bindings* section, the JNP port number is listed in the row containing the following service and binding names:

- Service Name: `jboss:service=Naming`
- Binding Name: `Port`

The JBoss documentation is the authoritative reference for setting your environment to access JMS. Refer to that documentation for the exact `.jar` files that are required to be in the class path.

Configuring a WebLogic environment

To communicate with a WebLogic application server using JMS, your client should use the following values:

```
javax.naming.InitialContext.PROVIDER_URL = t3://cds.server.example.com:<PORT>  
javax.naming.InitialContext.INITIAL_CONTEXT_FACTORY = weblogic.jndi.WLInitialContextFactory
```

Replace `<PORT>` with the TCP port number listed in the WebLogic Administration Console for *Listen Port*.

The WebLogic documentation is the authoritative reference for setting your environment to access JMS. Refer to that documentation for the exact `.jar` files that are required to be in the class path.

Chapter 7. 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/wsd1/scoring.wsd1"),
        new QName("http://xml.spss.com/scoring/wsd1", "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.

```
/*
*****
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**
*****
*/

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(USER_NAME_TOKEN, WSSE_PREFIX, WS_SECURITY_NAMESPACE);

    // add the username element
    SOAPElement usernameElement =
        factory.createElement(USER_NAME, 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 8. 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 78 for more information.
3. Programmatically configure the necessary endpoint behaviors. See the topic “Configuring endpoint behaviors” on page 79 for more information.
4. Exercise the web service. See the topic “Exercising the service” on page 79 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 9. 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 22. 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/
spssec	http://xml.spss.com/security

Security element

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

Table 23. Attributes of wsse:Security

Attribute	Description	Example
<code>soapenv:actor</code>	Targets a given endpoint along the message path. This value is ignored.	http://schemas.xmlsoap.org/soap/actor/next
<code>soapenv:mustUnderstand</code>	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 24. Attributes of `wsse:UsernameToken`

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

Table 25. Child elements of `wsse:UsernameToken`

Attribute	Description	Example
<code>wsse:Username</code>	The xml value represents the identity of the user.	<code>a_user</code>
<code>wsse:Password</code>	The attribute <code>Type</code> specifies the type of password. <code>PasswordText</code> is currently the only supported type. The xml value can handle plain text passwords and encrypted data.	<code>myPassword</code> <code>[{AES}KrY+KLIOYo4O6545tgGsYQ==]</code>
<code>wsse:Nonce</code>	The xml value represents a cryptographically random nonce encoded as base64 data. This is currently ignored.	<code>RUx1ugQo0o3g0Xyl+sUEsA==</code>
<code>wsu:Created</code>	The xml value represents the creation time as a timestamp conforming to <code>wsu:Timestamp</code> . This is currently ignored.	<code>2013-10-08T02:09:20Z</code>

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 26. Attributes of `wsse:BinarySecurityToken`

Attribute	Description	Example
<code>ValueType</code>	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 <code>spssec:BinarySecuritySSOToken</code> .	<code>spssec:BinarySecurityToken</code> <code>spssec:BinarySecuritySSOToken</code>

Table 26. 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 <code>wsse:Base64Binary</code> . IBM SPSS Collaboration and Deployment Services always writes these values when creating its own XML, but this value is currently ignored during processing.	<code>wsse:Base64Binary</code>
<code>wsu:Id</code>	An identifier for the token. This value must be correctly provided. You should always provide <code>spssSSOToken</code> . The only valid case for using <code>spssToken</code> is for internal web service calls, which use an internal token format.	<code>spssToken</code> <code>spssSSOToken</code>
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 27. HTTP headers

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

Appendix. Deprecated features

If you are migrating from an earlier release of IBM SPSS Collaboration and Deployment Services, you should be aware of the various features that have been deprecated since the last version.

If a feature is deprecated, IBM Corp. might remove this capability in a subsequent release of the product. Future investment will be focussed on the strategic function listed under recommended migration action. Typically, a feature is not deprecated unless an equivalent alternative is provided.

The following tables indicate what is deprecated. Where possible, the table also indicates the recommended migration action.

Table 28. Features deprecated in previous versions

Deprecation	Recommended migration action
Security Provider: Active Directory with local override, which supports extended groups and allowed users	Use the standard Active Directory security provider with any necessary groups added
IBM SPSS Collaboration and Deployment Services Enterprise View	Use the Analytic Data View feature
IBM SPSS Collaboration and Deployment Services Enterprise View Driver	Use the Analytic Data View feature
Scenario files	Scenario files (.scn) are no longer supported. Enterprise View source nodes cannot be modified in Deployment Manager. Old scenario files can be modified in IBM SPSS Modeler client and resaved as stream files. Also, scoring configurations that used a scenario file must be deleted and recreated based on a stream file.
Web Install for IBM SPSS Deployment Manager	Use the standalone installer
BIRT Report Designer for IBM SPSS	None
BIRT Report Designer for IBM SPSS viewer	None
IBM SPSS Collaboration and Deployment Services Portlet	Use the IBM SPSS Collaboration and Deployment Services Deployment Portal directly, or use the web services APIs
IBM SPSS Collaboration and Deployment Services Web Part	Use the IBM SPSS Collaboration and Deployment Services Deployment Portal directly, or use the web services APIs
Scoring Service V1 API	Scoring Service V2 API
Scheduling Server Service	None
Reporting Service	None
Authentication Service login operation	Authentication Service doLogin operation
Search Service search operation	Search Service search2.5 operation
SPSS AXIS/Castor web services client jar	Use the tools provided with the Java Runtime Environment, Integrated Development Environment, or Eclipse Web Tools Platform (WTP)

For updated information about deprecated features, see the IBM Knowledge Center.

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Glossary

This glossary includes terms and definitions for IBM SPSS Collaboration and Deployment Services.

The following cross-references are used in this glossary:

- See refers you from a term to a preferred synonym, or from an acronym or abbreviation to the defined full form.
- See also refers you to a related or contrasting term.

To view glossaries for other IBM products, go to www.ibm.com/software/globalization/terminology (opens in new window).

A

access control list (ACL)

In computer security, a list associated with an object that identifies all the subjects that can access the object and their access rights.

ACL See access control list.

action A permission for an aspect of system functionality. For example, the ability to set up notifications is defined as an action. Actions are grouped and assigned to users through roles. See also role.

Active Directory (AD)

A hierarchical directory service that enables centralized, secure management of an entire network, which is a central component of the Microsoft Windows platform.

AD See Active Directory.

allowed user

A subset of the users defined in a remote directory, such as SiteMinder or Windows Active Directory, that are allowed access to SPSS Predictive Enterprise Services. Allowed users are defined when only a few users in a remote directory need access to the application.

API See application programming interface.

appender

A component that receives logging

requests from a logger and writes log statements to a specified file or console.

See also logger.

application programming interface (API)

An interface that allows an application program that is written in a high-level language to use specific data or functions of the operating system or another program.

B

batch file

A file that contains instructions that are processed sequentially, as a unit.

binary large object (BLOB)

A data type whose value is a sequence of bytes that can range in size from 0 bytes to 2 gigabytes less 1 byte. This sequence does not have an associated code page and character set. BLOBs can contain, for example, image, audio, or video data.

BLOB See binary large object.

break group

A set of rows of returned data that are grouped according to a common column value. For example, in a column of states, the rows of data for each state are grouped together.

burst report

A report that generates multiple output files during a single run by using multiple input parameters taken from break groups in the report.

C

cascading permission

A permission of a parent folder in the content repository that has been propagated to its child objects.

character large object (CLOB)

A data type whose value is a sequence of characters (single byte, multibyte, or both) that can range in size from 0 bytes to 2 gigabytes less 1 byte. In general, the CLOB data type is used whenever a

character string might exceed the limits of the VARCHAR data type.

CLOB See character large object.

common warehouse metamodel (CWM)

A metamodel written to be a common standard by the Object Management Group (OMG).

content repository

A centralized location for storing analytical assets, such as models and data. Content repository includes facilities for security and access control, content management, and process automation.

context data

Input data that is passed with a scoring request in real time. For example, when a score is requested for a customer based on credit rating and geocode, the credit score and geocode will be the context data for the request.

credential

Information acquired during authentication that describes a user, group associations, or other security-related identity attributes, and that is used to perform services such as authorization, auditing, or delegation. For example, a user ID and password are credentials that allow access to network and system resources.

CWM See common warehouse metamodel.

D

data warehouse

A subject-oriented collection of data that is used to support strategic decision making. The warehouse is the central point of data integration for business intelligence. It is the source of data for data marts within an enterprise and delivers a common view of enterprise data.

distinguished name (DN)

The name that uniquely identifies an entry in a directory. A distinguished name is made up of attribute:value pairs, separated by commas. For example, CN=person name and C=country or region.

DN See distinguished name.

Document Object Model (DOM)

A system in which a structured document, for example an XML file, is viewed as a tree of objects that can be programmatically accessed and updated. See also Simple API for XML.

document type definition (DTD)

The rules that specify the structure for a particular class of SGML or XML documents. The DTD defines the structure with elements, attributes, and notations, and it establishes constraints for how each element, attribute, and notation can be used within the particular class of documents.

DOM See Document Object Model.

dormant schedule

A schedule associated with a deleted or unlabeled version of a job. A dormant schedule cannot be used until it is associated with a valid labeled job version.

DTD See document type definition.

E

EAR See enterprise archive.

enterprise archive (EAR)

A specialized type of JAR file, defined by the Java EE standard, used to deploy Java EE applications to Java EE application servers. An EAR file contains EJB components, a deployment descriptor, and web archive (WAR) files for individual web applications. See also Java archive, web archive.

execution server

A server that enables analytical processing of resources stored in the repository. For example, to execute an IBM SPSS Statistics syntax in an IBM SPSS Collaboration and Deployment Services job, an IBM SPSS Statistics execution server must be designated.

export The process of storing objects and metadata from the content repository to an external file.

extended group

A locally-defined group of remote users. Extended groups are defined when groups in the remote directory are not fine-grained enough.

Extensible Markup Language (XML)

A standard metalanguage for defining markup languages that is based on Standard Generalized Markup Language (SGML).

Extensible Stylesheet Language (XSL)

A language for specifying style sheets for XML documents. Extensible Stylesheet Language Transformation (XSLT) is used with XSL to describe how an XML document is transformed into another document.

F**field content assist**

A feature that provides predefined system and variable values for entry fields.

G**general job step**

A method for running native operating system commands and executable programs on a host or a remote process server. General jobs have access to files stored within the repository and on the file system and can be used to control the input/output of analytical processing.

I**import**

The process of adding objects and metadata defined in an external file generated by export, to the content repository.

iterative consumer reporting job step

A job step that is passed a set of input values generated by a preceding iterative producer reporting job step. The report in iterative consumer job step is executed for each tuple in the received data set.

iterative producer reporting job step

A job step that generates a set of values passed as input parameters to a following iterative consumer job step.

J

JAAS See Java Authentication and Authorization Service.

JAR See Java archive.

Java archive (JAR)

A compressed file format for storing all of the resources that are required to install and run a Java program in a single file. See also enterprise archive, web archive.

Java Authentication and Authorization Service (JAAS)

In Java EE technology, a standard API for performing security-based operations. Through JAAS, services can authenticate and authorize users while enabling the applications to remain independent from underlying technologies.

Java Generic Security Services (JGSS)

A specification that provides Java programs access to the services that include the signing and sealing of messages and a generic authentication mechanism.

Java Naming and Directory Interface (JNDI)

An extension to the Java platform that provides a standard interface for heterogeneous naming and directory services.

JGSS See Java Generic Security Services.

JNDI See Java Naming and Directory Interface.

job A mechanism for automating analytical processing. A job consists of job steps, executed sequentially or conditionally. Input parameters can be defined for a job. A job can be run on demand or triggered by time-based or message-based schedules, with records of job execution stored as job history.

job step

A discrete unit of processing in a job. Depending on the type, job steps can be run on the content repository host or specially defined execution or remote process servers. Objects stored in the repository or the file system can provide input for a job step, and job step output can be stored in the repository or written to the file system.

K

KDC See key distribution center.

Kerberos

A network authentication protocol that is based on symmetric key cryptography. Kerberos assigns a unique key, called a

ticket, to each user who logs on to the network. The ticket is embedded in messages that are sent over the network. The receiver of a message uses the ticket to authenticate the sender.

key distribution center (KDC)

A network service that provides tickets and temporary session keys. The KDC maintains a database of principals (users and services) and their associated secret keys. It is composed of the authentication server and the ticket granting ticket server.

keystore

In security, a file or a hardware cryptographic card where identities and private keys are stored, for authentication and encryption purposes. Some keystores also contain trusted or public keys.

L

LDAP See Lightweight Directory Access Protocol.

Lightweight Directory Access Protocol (LDAP)

An open protocol that uses TCP/IP to provide access to directories that support an X.500 model and that does not incur the resource requirements of the more complex X.500 Directory Access Protocol (DAP). For example, LDAP can be used to locate people, organizations, and other resources in an Internet or intranet directory.

lock The process by which integrity of data is ensured by preventing more than one user from accessing or changing the same data or object at the same time.

logger A component that prepares log statements to be written to console or log file. See also appender.

M

message-based schedule

A schedule that is used to trigger job execution by an event signalled by a Java Messaging Service (JMS) message. For example, when a job relies on the input from a third-party application, the application must send a JMS message when the input file is ready for processing.

metamodel

A model that defines the language for expressing a model.

meta-object

An instance of an XMI class as defined in the metamodel.

meta-object facility (MOF)

A generalized facility and repository for storing abstract information about concrete object systems; dealing mostly with construction, standardized by the Object Management Group (OMG).

MIME See Multipurpose Internet Mail Extensions.

MOF See meta-object facility.

Multipurpose Internet Mail Extensions (MIME)

An Internet standard that allows different forms of data, including video, audio, or binary data, to be attached to email without requiring translation into ASCII text.

N

notification

A mechanism that is used to generate email messages informing users of specific types of system events, such as changes to content repository objects and processing success and failure. Unlike subscriptions, notifications can be set up to send email to multiple users.

O

Object Management Group (OMG)

A non-profit consortium whose purpose is to promote object-oriented technology and the standardization of that technology. The Object Management Group was formed to help reduce the complexity, lower the costs, and hasten the introduction of new software applications.

ODS See Output Delivery System.

OMG See Object Management Group.

Output Delivery System (ODS)

A method of controlling the destination for output within SAS. ODS can route SAS output to a SAS data file, a text listing file, HTML files, and files optimized for high-resolution printing.

P

package

An installable unit of a software product. Software product packages are separately installable units that can operate independently from other packages of that software product.

principal

An entity that can communicate securely with another entity. A principal is identified by its associated security context, which defines its access rights.

R

remote process server

A remote system that is designated for running native operating system commands and executable programs.

repository content adapter

An optional software package that enables storing and processing content from other IBM SPSS applications, such as Statistics, Modeler, and Data Collection, as well as third parties.

repository database

A relational database that is used for storing content repository objects and metadata.

resource

A content repository object.

resource definition

A subset of content repository resources used to enable analytical processing, such as definitions of data sources, credentials, execution servers, and JMS message domains.

role

A set of permissions or access rights. See also action.

S

SAX See Simple API for XML.

schedule

A content repository object that triggers job execution.

scoring configuration

A configuration that defines model-specific settings for generating

real-time scores, such as input data, processing rules, outputs, logging, etc.

security provider

A system that performs user authentication. Users and groups can be defined locally (in which case, IBM SPSS Collaboration and Deployment Services itself is the security provider) or derived from a remote directory, such as Windows Active Directory or OpenLDAP.

service provider interface (SPI)

An API that supports replaceable components and can be implemented or extended by a third party.

SGML

See Standard Generalized Markup Language.

shell script

A program, or script, that is interpreted by the shell of an operating system.

Simple API for XML (SAX)

An event-driven, serial-access protocol for accessing XML documents, used. A Java-only API, SAX is used by most servlets and network programs to transmit and receive XML documents. See also Document Object Model.

single sign-on (SSO)

An authentication process in which a user can access more than one system or application by entering a single user ID and password.

SOAP A lightweight, XML-based protocol for exchanging information in a decentralized, distributed environment. SOAP can be used to query and return information and invoke services across the Internet.

SPI See service provider interface.

SSO See single sign-on.

Standard Generalized Markup Language (SGML)

A standard metalanguage for defining markup languages that is based on the ISO 8879 standard. SGML focuses on structuring information rather than presenting information; it separates the structure and content from the presentation. It also facilitates the interchange of documents across an electronic medium.

stop word

A word that is commonly used, such as "the," "an," or "and," that is ignored by a search application.

subscription

Email notices and Really Simple Syndication (RSS) feeds that repository users create to receive when the state of an asset changes.

T

TGT See ticket-granting ticket.

ticket-granting ticket (TGT)

A ticket that allows access to the ticket granting service on the key distribution center (KDC). Ticket granting tickets are passed to the principal by the KDC after the principal has completed a successful request. In a Windows 2000 environment, a user logs on to the network and the KDC will verify the principal's name and encrypted password and then send a ticket granting ticket to the user.

time-based schedule

A schedule that triggers job execution at a specified time or date. For example, a time-based schedule may run a job at 5:00 pm every Thursday.

U**Universally Unique Identifier (UUID)**

The 128-bit numeric identifier that is used to ensure that two components do not have the same identifier.

UUID See Universally Unique Identifier.

V**Velocity**

A Java-based template engine that provides a simple and powerful template language to reference objects defined in Java code. Velocity is an open source package directed by the Apache Project.

W

W3C See World Wide Web Consortium.

WAR See web archive.

web archive (WAR)

A compressed file format, defined by the Java EE standard, for storing all the resources required to install and run a web application in a single file. See also enterprise archive, Java archive.

Web Services Description Language (WSDL)

An XML-based specification for describing networked services as a set of endpoints operating on messages containing either document-oriented or procedure-oriented information.

World Wide Web Consortium (W3C)

An international industry consortium set up to develop common protocols to promote evolution and interoperability of the World Wide Web.

WSDL

See Web Services Description Language.

X

XMI See XML Metadata Interchange.

XML See Extensible Markup Language.

XML Metadata Interchange (XMI)

A model-driven XML integration framework for defining, interchanging, manipulating, and integrating XML data and objects. XMI-based standards are in use for integrating tools, repositories, applications, and data warehouses.

XSL See Extensible Stylesheet Language.

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