

Grid Data Service Specification for XML Databases

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1 Introduction

This document defines the OGSA[1] specification for a prototype Grid data service (GDS). In our terminology, a Grid data service is a Grid service designed to provide transparent access to a data source, either a database, a semi-structured data storage system or some other data collection.

This specification is written from the perspective of access to an XML database, by which we mean a collection of data stored as full XML Schema documents and which are accessed by XML languages such as XPath or XML Query. We refer to the Grid data services designed to access XML databases as Grid XML Data Services (GXDS).

In this document, the OGSA PortTypes which GXDSs must support are defined, as are messages and types associated with these. This document does *not* define or specify additional Grid services related to GDSs. In particular, the following services will be covered by their own specification documents:

- GridDataServiceFactory [2]
- GridDataTransportService [3]
- GridDataRegistryService [4]

This work builds on the early specification of the Grid service interfaces [5] and early work carried out by the UK e-Science Data Base Task Force [6, 7]. It also builds upon prototyping experience carried out at EPCC as part of the OGSA-DAI project.

NB this version of this document describes a prototype GXDS specification. This specification is currently mutable and should not be viewed as representing a complete or finalised definition of a Grid data service.

1.1 A note on terminology

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [8].

2 XML database definition

The framework described here is intended to be generic and applicable to a wide range of XML databases. The requirements for a database to use the framework are therefore relatively loose.

The database **MUST** have:

- one or more query template schema describing the formats of data contained in the database;
- one or more supported query languages;
- zero or more supported update languages;
- all of the above referenced by an XML document describing the database schema.

The XML document will form part of the Grid Service Reference for the XML database service. The query template schema will be obtained from the GSR or directly from the database service, and will be used by clients to determine the types of queries which can be made to the database.

Supported query and update languages will be stored as service data elements within the GDS, but are also very likely to be the kind of information registered with a discovery service such as a Grid Data Registry Service.

3 PortTypes

This section identifies the PortTypes which Grid XML Data Services (GXDS) MUST support.

The service type of a GXDS must be as follows:

- There MUST be a *portTypeList* element which contains references to the *GridServicePortType* and the *GridDataServicePortType* of this GXDS. It MAY also contain a reference to the *NotificationSourcePortType*, if this GXDS supports the NotificationSource porttype.
- There MAY be a *compatibilityStatement* element containing describing compatibility assertions.

3.1 Grid Service PortType

As for all Grid Services, a GXDS MUST implement the GridService PortType [5].

3.2 Grid Data Service PortType

Fundamentally, a GXDS MUST support the GridDataService PortType, defined in Section 4 below. It MAY optionally also support the GridDataTransportService PortType [3], or a separate service may be used to provide required data transport or delivery services.

3.3 Notification Source PortType

Finally, a GXDS MAY support the NotificationSource PortType [5], as it may need to inform clients of updates to the database record-schema or the database itself. Clients rely on the former to structure queries on data in the database, and so have a need stay up-to-date with any changes.

It may also need to inform clients of changes in the data, which might be deleted records, updated records or new records. Such a notification might be used by a client to decide whether it needs to refresh its data.

Two notification source topics are available:

- *ChangedSchemaTopic*: refers to changes being made to the database record-schema. One message type is proposed for this notification topic, ChangedSchema. This message supplies the time at which the database record-schema was changed, and the new record-schema.

Message: ChangedSchema**Parameters:**

Name:	ChangeTime
Description:	The time at which the database record-schema was changed.
Type:	dateTime
Namespace:	http://www.w3.org/2001/XMLSchema
Name:	NewSchema
Description:	The new database record-schema.
Type:	qname
Namespace:	http://www.w3.org/2001/XMLSchema

- *ChangedDataTopic*: refers to changes being made to data in the database. One message type is proposed for this topic, ChangedData. The message supplies the time at which the data was changed, the record IDs of the records involved in the change, and what kind of change was made (typically a deletion, addition or edit).

Message: ChangedData**Parameters:**

Name:	ChangeTime
Description:	The time at which the data was changed.
Type:	dateTime
Namespace:	http://www.w3.org/2001/XMLSchema
Name:	IDList
Description:	A list of the Record IDs of changed records.
Type:	DBRecordIDList
Namespace:	http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/
Name:	ChangeType
Description:	The type of change which was made to the data i.e. delete, update or add
Type:	DBChangeType
Namespace:	http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/

An alternative to having a parameter specifying if the operation was add/delete/update is to have separate message types for each of these. Using one message means that if the DBChangeType is extended, no new message types need to be defined. It is suggested that constraints are allowed on the ChangeType parameter of the ChangedData message, so clients can restrict messages to e.g. only deletion messages.

NB it is expected that in due course these notification topics and related mechanisms will be merged with the service data element framework as discussed in Tuecke *et al.* [5].

4 The GridDataService PortType

This section defines in detail the specification for the GridDataService PortType.

4.1 GridDataService PortType: ServiceData Elements

A GXDS MUST make the following service data elements available:

Type: QueryTemplateType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: Exactly 1
Name: GridDataServiceQueryTemplate
Description: An XML document which is a template for the database document structure.

Type: SchemaVersionNumberType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: Exactly 1
Name: GridDataServiceCurrentSchemaVersionNumber
Description: The current version number of the record-schema. A record-schema version number is a positive integer.

Type: QueryNotationListType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: 1 or more
Name: GridDataServiceQueryNotationTypes
Description: A list of query notation types this database service supports. Query notations are URIs pointing to a query language specification (e.g. for XPath “<http://www.w3.org/TR/1999/REC-xpath-19991116>”).

Type: UpdateNotationListType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: 0 or more
Name: GridDataServiceUpdateNotationTypes
Description: A list of update notation types this database service supports. Update notations are URIs pointing to an update language specification.

Type: LoadNotationListType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: 0 or more
Name: GridDataServiceLoadNotationTypes
Description: A list of load notation types this database service supports.

Type: EditNotationListType
Namespace: <http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/>
Number: 0 or more
Name: GridDataServiceEditNotationTypes
Description: A list of edit notation types this database service supports. Edit notations are URIs pointing to a language specification.

4.2 GridDataService PortType: Operations and Messages

4.2.1 GridDataService::query

Query the database.

Input

- *queryNotation*: A query notation the database service supports
- *query*: A string containing the query to be performed. The query has to conform to the above *queryNotation*.
- *values* (optional): The parameters of the query operation. These parameters may be passed by value or by reference (by specifying the GSH of a delivery system).
- *txHandle* (optional): A transaction handle
- *expires* (optional): The expiry time until which the result may be claimed. When omitted, a default value is used.
- *resultHandle* (optional): The GSH of a structured data delivery system. When omitted, the query result is delivered as an output parameter. When *Null*, the database service supplies a GSH of a delivery system as output.

Output

- *status*: A boolean value, indicating success or fail.
- *result* (optional): The results of the query, if the input parameter *resultHandle* was not specified, or the GSH of a delivery system if the input *resultHandle* was *Null*.

Fault(s)

- *invalidQueryNotation*: The query notation is not supported by this database service.
- *invalidQuery*: The query does not conform to the specified query notation.

4.2.2 GridDataService::update

Perform a database update.

Input

- *updateNotation*: An update notation the database service supports
- *update*: A string containing a database update which conforms to the above *updateNotation*.
- *values* (optional): The values of the update operation. For example, this might be (a URL pointing to) an XML document which is to be inserted at a location specified by the *update* parameter.
- *txHandle* (optional): A transaction handle

- *expires* (optional): The expiry time until which the result may be claimed.

Output

- *status*: A boolean value, indicating success or fail.

Fault(s)

- *invalidUpdateNotation*: The update notation is not supported by this database service.
- *invalidUpdate*: The update does not conform to the specified update notation.

4.2.3 GridDataService::bulkLoad

Input

- *loadNotation*: A load notation the database service supports
- *valuesHandle*: The parameters of the load operation. These parameters can be passed by value or by reference (by specifying the GSH of a delivery system)
- *txHandle* (optional): A transaction handle
- *expires* (optional): The expiry time until which the result may be claimed.

Output

- *status*: A boolean value, indicating success or fail.

Fault(s)

- *invalidLoadNotation*: The load notation is not supported by this database service.
- *invalidValuesHandle*

4.2.4 GridDataService::schemaUpdate

Update the schema of the database. The existing data is validated against the new schema.

Input

- *editNotation*: A schema edit notation the database service supports
- *edit*: A string containing a new database schema
- *txHandle* (optional): A transaction handle

Output

- *status*: A boolean value, indicating success or fail.

Fault(s)

- *invalidEditNotation*: The edit notation is not supported by this database service.
- *invalidSchema*: The schema is not valid.
- *schemaValidationFail*: The validation of the existing data against the new schema failed.

References

- [1] Foster,I., Kesselman,C., Nick,J. and Tuecke,S., The Physiology of the Grid: an Open Grid Services Architecture for Distributed Systems Integration, presented at GGF4, Feb. 2002.
- [2] NeSC OGSA-DAI team, *Grid Data Service Factory Specification for XML Databases*, in preparation.
- [3] NeSC OGSA-DAI team, *Grid Data Transport Service Specification for XML Databases*, in preparation.
- [4] NeSC OGSA-DAI team, *Grid Data Registry Service Specification for XML Databases*, in preparation.
- [5] Tuecke, S., Czajkowski, K., Foster, I., Frey, J., Graham, S., Kesselman, C. and Nick, J., *Grid Service Specification*, February 15 2002.
- [6] Paton, N.W., Atkinson, M.P., Dialani, V., Pearson, D., Storey, T. and Watson, P., *Database Access and Integration Services on the Grid*, UK DBTF working paper, January 2002.
- [7] Atkinson, M.P., *The Open Grid Services Architecture and a Model for Database Access and Integration Services on the Grid*, contribution to UK DBTF discussions, January 2002.
- [8] RFC 2199, <http://www.ietf.org/rfc/rfc2119.txt>

A XML Schema and WSDL Definitions

A.1 GridDataService PortType: Types Definition Schema

```
<xsd:schema targetNamespace="http://schemas.ogsa/GDS/GXDS/"
  xmlns:gxds="http://schemas.ogsa/GDS/GXDS/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns="http://schemas.ogsa/GDS/GXDS/">

  <xsd:element name="serviceData" type="gxds:serviceDataType"/>

  <xsd:simpleType name="SchemaVersionNumberType">
    <xsd:restriction base="xsd:integer">
      <xsd:minInclusive value="1"/>
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:complexType name="QueryNotationListType">
    <xsd:sequence>
      <xsd:element name="QueryNotationItem"
        type="xsd:anyURI"
        minOccurs="0"
        maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:complexType>

  <xsd:complexType name="UpdateNotationListType">
    <xsd:sequence>
      <xsd:element name="UpdateNotationItem"
        type="xsd:anyURI"
        minOccurs="0"
        maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:complexType>

  <xsd:complexType name="LoadNotationListType">
    <xsd:sequence>
      <xsd:element name="LoadNotationItem"
        type="xsd:anyURI"
        minOccurs="0"
        maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:complexType>

  <xsd:complexType name="EditNotationListType">
    <xsd:sequence>
      <xsd:element name="EditNotationItem"
        type="xsd:anyURI"
        minOccurs="0"
        maxOccurs="unbounded"/>
    </xsd:sequence>
  </xsd:complexType>
```

```
<xsd:complexType name="serviceDataType">
  <xsd:sequence>
    <xsd:element name="serviceData">
      <xsd:complexType>
        <xsd:choice>
          <xsd:element name="QueryTemplate"
            type="xsd:string"/>
          <xsd:element name="SchemaVersionNumber"
            type="gxds:SchemaVersionNumberType"/>
          <xsd:element name="QueryNotationList"
            type="gxds:QueryNotationListType"/>
          <xsd:element name="UpdateNotationList"
            type="gxds:UpdateNotationListType"/>
          <xsd:element name="LoadNotationList"
            type="gxds:LoadNotationListType"/>
          <xsd:element name="EditNotationList"
            type="gxds>EditNotationListType"/>
        </xsd:choice>
      </xsd:complexType>
      <xsd:attribute name="name" type="xsd:NMTOKEN"/>
      <xsd:attribute name="goodFrom"
        type="xsd:dateTime"
        use="required"/>
      <xsd:attribute name="goodUntil"
        type="xsd:dateTime"
        use="required"/>
      <xsd:attribute name="notGoodAfter"
        type="xsd:dateTime"
        use="required"/>
    </xsd:element>
  </xsd:sequence>
  <xsd:attribute name="name" type="xsd:NMTOKEN"/>
  <xsd:attribute name="goodFrom" type="xsd:dateTime"
    use="required"/>
  <xsd:attribute name="goodUntil" type="xsd:dateTime"
    use="required"/>
  <xsd:attribute name="notGoodAfter" type="xsd:dateTime"
    use="required"/>
</xsd:complexType>

</xsd:schema>
```

A.2 GridDataService PortType: Example Service Data Elements

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

<gsdl:serviceData name="root"
    goodFrom="2002-03-01T00:00:00.000"
    goodUntil=2003-03-01T00:00:00.000"
    notGoodAfter=2003-03-01T00:00:00.000"

    xmlns:gsdl="http://schemas.gridforum.org/gridServices/"
    xmlns:gxds="http://schemas.ogsa/GDS/GXDS/">

    <gsdl:serviceData name="DatabaseServiceQueryTemplate"
        goodFrom="2002-03-01T00:00:00.000"
        goodUntil=2003-03-01T00:00:00.000"
        notGoodAfter=2003-03-01T00:00:00.000"
        <gxds:QueryTemplate>
            <!-- some XML document -->
        </gxds:QueryTemplate>
    </gsdl:serviceData>

    <gsdl:serviceData name="DatabaseServiceCurrentSchemaVersionNumber"
        goodFrom="2002-03-01T00:00:00.000"
        goodUntil=2003-03-01T00:00:00.000"
        notGoodAfter=2003-03-01T00:00:00.000"
        <gxds:SchemaVersionNumber>1</gxds:SchemaVersionNumber>
    </gsdl:serviceData>

    <gsdl:serviceData name="DatabaseServiceQueryNotationTypes"
        goodFrom="2002-03-01T00:00:00.000"
        goodUntil=2003-03-01T00:00:00.000"
        notGoodAfter=2003-03-01T00:00:00.000"
        <gxds:QueryNotationList>
            <gxds:QueryNotationItem>
                http://www.w3.org/TR/1999/REC-xpath-19991116
            </gxds:QueryNotationItem>
        </gxds:QueryNotationList>
    </gsdl:serviceData>

</gsdl:serviceData>
```

A.3 GridDataService PortType: Prototype WSDL Specification

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

<wsdl:definitions name="DatabaseService"
targetNamespace="http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/DatabaseServicePort.wsdl"
xmlns:tns="http://schemas.nesc.ac.uk/gridServices/GDS/GXDS/DatabaseServicePort.wsdl"
xmlns:gddl="http://schemas.gridforum.org/gridServices/"
xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:ns1="java"
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
    xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
xmlns="http://schemas.xmlsoap.org/wsdl/">

<!-- message definitions -->

<wsdl:message name="QueryInput">
  <wsdl:part name="QueryNotation" type="xsd:string"/>
  <wsdl:part name="Query" type="xsd:string"/>
  <wsdl:part name="Values" type="xsd:string"/>
  <wsdl:part name="txHandle" type="xsd:string"/>
  <wsdl:part name="expires" type="xsd:dateTime"/>
  <wsdl:part name="resultHandle" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="QueryOutput">
  <wsdl:part name="result" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="InvalidQueryNotationError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="InvalidQueryError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="UpdateInput">
  <wsdl:part name="UpdateNotation" type="xsd:string"/>
  <wsdl:part name="Update" type="xsd:string"/>
  <wsdl:part name="Values" type="xsd:string"/>
  <wsdl:part name="txHandle" type="xsd:string"/>
  <wsdl:part name="expires" type="xsd:dateTime"/>
</wsdl:message>

<wsdl:message name="UpdateOutput">
  <wsdl:part name="status" type="xsd:boolean"/>
</wsdl:message>

<wsdl:message name="InvalidUpdateNotationError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>
```

```
<wsdl:message name="InvalidUpdateError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="LoadInput">
  <wsdl:part name="LoadNotation" type="xsd:string"/>
  <wsdl:part name="Values" type="xsd:string"/>
  <wsdl:part name="txHandle" type="xsd:string"/>
  <wsdl:part name="expires" type="xsd:dateTime"/>
</wsdl:message>

<wsdl:message name="LoadOutput">
  <wsdl:part name="status" type="xsd:boolean"/>
</wsdl:message>

<wsdl:message name="InvalidLoadNotationError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="InvalidValuesHandleError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="SchemaUpdateInput">
  <wsdl:part name="EditNotation" type="xsd:string"/>
  <wsdl:part name="Edit" type="xsd:string"/>
  <wsdl:part name="txHandle" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="SchemaUpdateOutput">
  <wsdl:part name="status" type="xsd:boolean"/>
</wsdl:message>

<wsdl:message name="InvalidEditNotationError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="InvalidSchemaError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="SchemaValidationFailError">
  <wsdl:part name="ErrorString" type="xsd:string"/>
</wsdl:message>

<wsdl:message name="serviceDataOutput">
  <wsdl:part name="ServiceData" type="xsd:string"/>
</wsdl:message>

<!-- portType definitions -->

<wsdl:portType name="DatabaseServicePortType">
  <wsdl:operation name="query">
    <wsdl:input message="tns:QueryInput"/>
```

```
<wsdl:output message="tns:QueryOutput"/>
<wsdl:fault message="tns:InvalidQueryNotationError"/>
<wsdl:fault message="tns:InvalidQueryError"/>
</wsdl:operation>
<wsdl:operation name="update">
  <wsdl:input message="tns:UpdateInput"/>
  <wsdl:output message="tns:UpdateOutput"/>
  <wsdl:fault message="tns:InvalidUpdateNotationError"/>
  <wsdl:fault message="tns:InvalidUpdateError"/>
</wsdl:operation>
<wsdl:operation name="bulkLoad">
  <wsdl:input message="tns:LoadInput"/>
  <wsdl:output message="tns:LoadOutput"/>
  <wsdl:fault message="tns:InvalidLoadNotationError"/>
  <wsdl:fault message="tns:InvalidValuesHandleError"/>
</wsdl:operation>
<wsdl:operation name="schemaUpdate">
  <wsdl:input message="tns:SchemaUpdateInput"/>
  <wsdl:output message="tns:SchemaUpdateOutput"/>
  <wsdl:fault message="tns:InvalidEditNotationError"/>
  <wsdl:fault message="tns:InvalidSchemaError"/>
  <wsdl:fault message="tns:SchemaValidationFailError"/>
</wsdl:operation>

<wsdl:operation name="getDatabaseServiceQueryTemplate">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceCurrentSchemaVersionNumber">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceQueryNotationTypes">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceUpdateNotationTypes">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceLoadNotationTypes">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceEditNotationTypes">
  <wsdl:output message="tns:serviceDataOutput"/>
</wsdl:operation>
</wsdl:portType>

<!-- binding definitions -->

<wsdl:binding name="DatabaseServiceSOAPBinding" type="tns:DatabaseServicePortType">
  <soap:binding style="rpc" transport="http://schemas.xmlsoap.org/soap/http"/>

  <wsdl:operation name="query">
    <soap:operation soapAction=""/>
    <wsdl:input>
      <soap:body parts="QueryInput" use="literal" style="document"/>
    </wsdl:input>
```

```
<wsdl:output>
  <soap:body parts="QueryOutput" use="literal" style="document"/>
</wsdl:output>
<wsdl:fault name="QueryErrorMessage">
  <soap:fault name="QueryErrorMessage" namespace="DatabaseService"
    encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
</wsdl:fault>
</wsdl:operation>

<wsdl:operation name="update">
  <soap:operation soapAction="" />
  <wsdl:input>
    <soap:body parts="UpdateInput" use="literal" style="document"/>
  </wsdl:input>
  <wsdl:output>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:output>
  <wsdl:fault name="UpdateErrorMessage">
    <soap:fault name="UpdateErrorMessage" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
      namespace="DatabaseService" />
  </wsdl:fault>
</wsdl:operation>

<wsdl:operation name="bulkLoad">
  <soap:operation soapAction="" />
  <wsdl:input>
    <soap:body parts="LoadInput" use="literal" style="document"/>
  </wsdl:input>
  <wsdl:output>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:output>
  <wsdl:fault name="LoadErrorMessage">
    <soap:fault name="LoadErrorMessage" namespace="DatabaseService"
      encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:fault>
</wsdl:operation>

<wsdl:operation name="schemaUpdate">
  <soap:operation soapAction="" />
  <wsdl:input>
    <soap:body parts="SchemaUpdateInput" use="literal" style="document"/>
  </wsdl:input>
  <wsdl:output>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:output>
  <wsdl:fault name="UpdateErrorMessage">
    <soap:fault name="SchemaUpdateErrorMessage" namespace="DatabaseService"
      encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:fault>
</wsdl:operation>

<wsdl:operation name="getDatabaseServiceQueryTemplate">
  <soap:operation soapAction="" style="rpc"/>
  <wsdl:input>
```

```
<soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
</wsdl:input>
<wsdl:output>
  <soap:body parts="ServiceData" use="literal" style="document" />
</wsdl:output>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceCurrentSchemaVersionNumber">
  <soap:operation soapAction="" style="rpc" />
  <wsdl:input>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:input>
  <wsdl:output>
    <soap:body parts="ServiceData" use="literal" style="document" />
  </wsdl:output>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceQueryNotationTypes">
  <soap:operation soapAction="" style="rpc" />
  <wsdl:input>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:input>
  <wsdl:output>
    <soap:body parts="ServiceData" use="literal" style="document" />
  </wsdl:output>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceUpdateNotationTypes">
  <soap:operation soapAction="" style="rpc" />
  <wsdl:input>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:input>
  <wsdl:output>
    <soap:body parts="ServiceData" use="literal" style="document" />
  </wsdl:output>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceLoadNotationTypes">
  <soap:operation soapAction="" style="rpc" />
  <wsdl:input>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:input>
  <wsdl:output>
    <soap:body parts="ServiceData" use="literal" style="document" />
  </wsdl:output>
</wsdl:operation>
<wsdl:operation name="getDatabaseServiceEditNotationTypes">
  <soap:operation soapAction="" style="rpc" />
  <wsdl:input>
    <soap:body use="encoded" encodingStyle="http://schemas.xmlsoap.org/soap/encoding/" />
  </wsdl:input>
  <wsdl:output>
    <soap:body parts="ServiceData" use="literal" style="document" />
  </wsdl:output>
</wsdl:operation>
</wsdl:binding>

</wsdl:definitions>
```