GWD-R
OGSA Naming WG

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RNS 1.1 OGSA WSRF Basic Profile Rendering 1.0

Status of This Document

This document provides information to the Grid community on a simple higher-level naming grid service that allows users to associate human-readable names to WS-Addressing **[WS-Addressing]** Endpoint Reference Types. Distribution is unlimited.

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Abstract

In their 2002 book, "Distributed Systems: Principles and Paradigms", Andrew Tannenbaum and Martin van Steen describe in great detail the properties, function, and benefit of naming schemes in distributed systems **[Tannenbaum]**. Specifically, they describe a typical three-layer naming scheme whereby human readable names map to location-independent names or identifiers, which in turn map to location-dependent addresses. This three-tiered approach is instrumental in providing both usability for clients, as well as many of the classic distributed systems "transparencies" like fault and location transparency. WS-Naming **[WS-Naming]** provides the mapping between location-independent names (in the form of *EndpointIdentifiers*) and location-dependent addresses (i.e., WS-Addressing EPRs). In this specification we describe the Resource Namespace Service (RNS), a grid port type that allows clients to manipulate and retrieve mappings from human-readable strings to WS-Addressing Endpoint Reference Types[1], thus providing the higher level mapping described by Tannenbaum and van Steen.

Contents

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[1] Of course, since WS-Naming compliant endpoints are merely extensions on WS-Addressing EPRs, RNS can map to either.

1. Introduction

This document is the normative description of the RNS 1.1 specification in terms of the OGSA WSRF Basic Profile 1.0 **[WSRFProfileDoc]**. The RNS Draft Recommendation Document **[RNS1.1]** describes most operations in detail and where possible, information from that document is not repeated here. In addition to information contained within this document, all implementations of the OGSA WSRF Basic Profile 1.0 rendering of the RNS specification MUST conform to the requirements contained within the OGSA WSRF Basic Profile 1.0 document **[WSRFProfileDoc]**.

1.1   Terminology

The key words 'MUST," "MUST NOT," "REQUIRED," "SHALL," "SHALL NOT," "SHOULD," "SHOULD NOT," "RECOMMENDED," "MAY," and "OPTIONAL" are to be interpreted as described in RFC 2119 **[RFC2119]**.

In addition to the terms introduced in **[RFC2119]**, additional terms commonly used in this document are defined in the Glossary in the back.

When describing abstract data models, this specification uses the notational convention used by the **[XML-Infoset]**.

When describing concrete XML schemas, this specification uses the notational convention of [WS-Security]. Specifically, each member of an element's [children] or [attributes] property is described using an Xpath-like **[XPATH]** notation (e.g., /x:MyHeader/x:SomeProperty@value1). The use of {any} indicates the presence of an element wildcard (<xsd:any/>). The use of @{any} indicates the presence of an attribute wildcard (<xsd:anyAttribute/>).

1.2   Namespaces

The following namespaces are used in this document:

Prefix	Namespace
s11	http://schemas.xmlsoap.org/soap/envelope
xsd	http://www.w3.org/2001/XMLSchema
wsa	http://www.w3.org/2005/08/addressing
iterator	http://schemas.ogf.org/ws-iterator/2008/06/iterator
rns	http://schemas.ogf.org/rns/2009/12/rns
wsbf	http://docs.oasis-open.org/wsrf/bf-2

2. Iterators

As per the RNS Draft Recommendation document, response messages to RNS lookup operations MAY contain the WS-Addressing EndpointReferenceType of a valid iterator for iterating through long lists of entry endpoints. If an iterator is returned from the lookup operation on an OGSA WSRF Basic Profile 1.0 rendering of the RNS port type, then that iterator MUST support the WS-Iterator specification as defined in **[WS-Iterator]** as this port types defines an OGSA WSRF Basic Profile compliant implementation.

3. RNS Properties

In order to satisfy the "properties" requirements given in the RNS Draft Recommendation document **[RNS1.1]**, the Resource Properties Document (as described by **[WS-**

ResourceProperties]) for a RNS implementation MUST include a reference to the following resource property elements[2]:

```
...
        targetNamespace="http://schemas.ogf.org/rns/2009/12/rns"
...
        <xsd:element name="elementCount" type="xsd:unsignedLong"
                nillable="false"/>
        <xsd:element name="createTime" type="xsd:dateTime"
                nillable="true"/>
        <xsd:element name="accessTime" type="xsd:dateTime"
                nillable="true"/>
        <xsd:element name="modificationTime" type="xsd:dateTime"
                nillable="true"/>
```

These Resource Property elements are constrained as indicated in the RNS Draft Recommendation Document **[RNS1.1]**.

4. RNS Message Faults

The RNS Draft Recommendation Document clearly identifies the faults or exceptions that may be generated during the normal operation of the RNS port type. The OGSA WSRF Basic Profile 1.0 rendering of these faults MUST be completely conformant with faulting mechanisms described therein (i.e., they will rely on WS-BaseFaults **[WS-BaseFaults]**). The schema for the faults are described as follows.

```
<xsd:complexType name="ReadNotPermittedFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
</xsd:complexType>
<xsd:element name="ReadNotPermittedFault"
        type="rns:ReadNotPermittedFaultType"/>

<xsd:complexType name="WriteNotPermittedFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType"/>
```

5. Security Considerations

In addition to security considerations given in the RNS Draft Recommendation Document, OGSA WSRF Basic Profile 1.0 Renderings of the RNS specification MUST be fully compliant with all security sections indicated in the OGSA WSRF Basic Profile 1.0 document.

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[2] This is in addition to any resource properties required by the OGSA WSRF Basic Profile 1.0 or any other included and referenced specifications.

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7. Contributors and Acknowledgements

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11. References

[WSRFProfileDoc]   I. Foster, T. Maguire, D. Snelling, OGSA WSRF Basic Profile 1.0, https://forge.gridforum.org/projects/ogsa-wg/document/draft-ggf-ogsa-wsrf-basic-profile/en/15, GWS-R (draft-ggf-ogsa-wsrf-basic-profile-021), 2005.

[RFC2119]   S. Bradner, Key words for use in RFCs to Indicate Requirement Levels, http://www.ietf.org/rfc/rfc2991.txt, IETF RFC 2119, 1997.

[XML-Infoset]   J. Cowan, Richard Tobin, XML Information Set (Second Edition), http://www.w3.org/TR/xml-infoset/, 2004

[XPATH]   J. Clark, S. DeRose, XML Path Language (XPath) Version 1.0, http://www.w3.org/TR/xpath, 1999

[WS-Addressing]   M. Gudgin, M. Hadley, and T. Rogers (ed.), Web Services Addressing 1.0 – Core (WS-Addressing), http://www.w3.org/TR/2006/REC-ws-addr-core-20060509, 2006

[WS-Enumeration]   J. Alexander, D. Box, L. F. Cabrera, D. Chappell, G. Daniels, C. Kaler, D. Orchard, I. Sedukhin, M. Simek, M. Theimer, Web Services Enumeration (WS-Enumeration), http://www.w3.org/Submission/WS-Enumeration/, 2006

[ByteIOSpec]   M. Morgan (ed.), ByteIO Specification 1.0, http://www.ggf.org/documents/GFD.88.pdf, GFD.88, 31 October 2006.

[Tannenbaum]   Tannenbaum, A. and van Steen, M., Distributed Systems: Principles and Paradigms, Prentice Hall, 2002. p. 184-210.

[ByteIOWSRFRend]   M. Morgan (ed.), ByteIO OGSA WSRF Basic Profile Rendering 1.0, http://www.ggf.org/documents/GFD.87.pdf, GFD.87, 31 October 2006.

[BES]   I. Foster, A. Grimshaw, P. Lane, W. Lee, M. Morgan, S. Newhouse, S. Pickles, D. Pulsipher, C. Smith, M. Theimer, OGSA® Basic Execution Service Version 1.0, http://www.ggf.org/documents/GFD.108.pdf, GFD.108, 2007

[WS-Naming]   A. Grimshaw, D. Snelling, WS-Naming Specification, http://www.ggf.org/documents/GFD.109.pdf, GFD.109, 2007

[RNS1.1]   M. Morgan, A. Grimshaw, O. Tatebe, RNS Specification 1.1, Open Grid Forum (to appear)

[WS-Iterator]   M. Morgan, WS-Iterator 1.0, Open Grid Forum (to appear)

[WS-ResourceProperties]   S. Graham, J. Treadwell, Web Services Resource Properties 1.2 (WS-ResourceProperties), Working Draft 04, http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-ResourceProperties-1.2-draft-04.pdf, 2004

[WS-BaseFaults]   S. Tuecke, L. Liu, S. Meder, Web Services Base Faults 1.2 (WS-BaseFaults), Working Draft 02, http://docs.oasis-open.org/wsrf/2004/06/wsrf-WS-BaseFaults-1.2-draft-02.pdf, 2004

[SOAP1.1]   D. Box, D. Ehnebuske, G. Kakivaya, A. Layman, N. Mendelsohn, H. F. Nielsen, S. Thatte, D. Winer, Simple Object Access Protocol (SOAP) 1.1, http://www.w3.org/TR/soap11, 2000

Appendix A. RNS XML Schema

```xml
<?xml version="1.0" encoding="UTF-8"?>
<!--
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-->
<xsd:schema
        xmlns="http://schemas.ogf.org/rns/2009/12/rns"
        xmlns:xsd="http://www.w3.org/2001/XMLSchema"
        xmlns:rns="http://schemas.ogf.org/rns/2009/12/rns"
        xmlns:wsa="http://www.w3.org/2005/08/addressing"
        xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-2"
        targetNamespace="http://schemas.ogf.org/rns/2009/12/rns"
        elementFormDefault="qualified"
        attributeFormDefault="unqualified">

        <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/bf-2"
                schemaLocation="http://docs.oasis-open.org/wsrf/bf-2.xsd"/>
```

```
<xsd:import
        namespace="http://www.w3.org/2005/08/addressing"
        schemaLocation="http://www.w3.org/2005/08/addressing/ws-addr.xsd"/>

<!-- Faults -->
<xsd:complexType name="ReadNotPermittedFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
</xsd:complexType>
<xsd:element name="ReadNotPermittedFault"
        type="rns:ReadNotPermittedFaultType"/>

<xsd:complexType name="WriteNotPermittedFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
</xsd:complexType>
<xsd:element name="WriteNotPermittedFault"
        type="rns:WriteNotPermittedFaultType"/>

<xsd:complexType name="RNSEntryExistsFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType">
                        <xsd:sequence>
                                <xsd:element name="entry-name" type="xsd:string"
                                        minOccurs="1" maxOccurs="1"/>
                        </xsd:sequence>
                </xsd:extension>
        </xsd:complexContent>
</xsd:complexType>
<xsd:element name="RNSEntryExistsFault"
        type="rns:RNSEntryExistsFaultType"/>

<xsd:complexType name="RNSEntryDoesNotExistFaultType">
        <xsd:complexContent>
                <xsd:extension base="wsbf:BaseFaultType">
                        <xsd:sequence>
                                <xsd:element name="entry-name" type="xsd:string"
                                        minOccurs="1" maxOccurs="1"/>
                        </xsd:sequence>
                </xsd:extension>
        </xsd:complexContent>
</xsd:complexType>
<xsd:element name="RNSEntryDoesNotExistFault"
        type="rns:RNSEntryDoesNotExistFaultType"/>

<!-- Resource Properties -->
<xsd:element name="elementCount" type="xsd:unsignedLong"
        nillable="false"/>
<xsd:element name="createTime" type="xsd:dateTime"
        nillable="true"/>
<xsd:element name="accessTime" type="xsd:dateTime"
        nillable="true"/>
<xsd:element name="modificationTime" type="xsd:dateTime"
```

```
                    nillable="true"/>
        <xsd:element name="readable" type="xsd:boolean"
                nillable="false"/>
        <xsd:element name="writable" type="xsd:boolean"
                nillable="false"/>

        <!-- Helper Types -->
        <xsd:simpleType name="EntryNameType">
                <xsd:restriction base="xsd:string"/>
        </xsd:simpleType>

        <xsd:simpleType name="RNSSupportType">
                <xsd:restriction base="xsd:string">
                        <xsd:enumeration value="true"/>
                        <xsd:enumeration value="false"/>
                        <xsd:enumeration value="unknown"/>
                </xsd:restriction>
        </xsd:simpleType>

        <xsd:complexType name="SupportsRNSType">
                <xsd:attribute name="value" type="rns:RNSSupportType"
                        use="required"/>
        </xsd:complexType>

        <xsd:complexType name="RNSMetadataType">
                <xsd:sequence>
                        <xsd:element name="supports-rns" type="rns:SupportsRNSType"
                                minOccurs="1" maxOccurs="1"/>
                        <xsd:any namespace="##other" processContents="lax"
                                minOccurs="0" maxOccurs="unbounded"/>
                </xsd:sequence>
        </xsd:complexType>

        <xsd:complexType name="RNSEntryType">
                <xsd:sequence>
                        <xsd:element name="endpoint" type="wsa:EndpointReferenceType"
                                minOccurs="0" maxOccurs="1" nillable="true"/>
                        <xsd:element name="metadata" type="rns:RNSMetadataType"
                                minOccurs="0" maxOccurs="1" nillable="true"/>
                </xsd:sequence>
                <xsd:attribute name="entry-name" type="rns:EntryNameType"
                        use="required"/>
        </xsd:complexType>

        <xsd:complexType name="RNSEntryResponseType">
                <xsd:sequence>
                        <xsd:element name="endpoint" type="wsa:EndpointReferenceType"
                                minOccurs="0" maxOccurs="1"/>
                        <xsd:element name="metadata" type="rns:RNSMetadataType"
                                minOccurs="0" maxOccurs="1" nillable="true"/>
                        <xsd:element name="fault" type="wsbf:BaseFaultType"
                                minOccurs="0" maxOccurs="1"/>
                </xsd:sequence>
                <xsd:attribute name="entry-name" type="rns:EntryNameType"
                        use="required"/>
        </xsd:complexType>
```

```
<xsd:complexType name="NameMappingType">
        <xsd:attribute name="source-name" type="rns:EntryNameType"
                use="required"/>
        <xsd:attribute name="target-name" type="rns:EntryNameType"
                use="required"/>
</xsd:complexType>

<xsd:complexType name="MetadataMappingType">
        <xsd:complexContent>
                <xsd:extension base="rns:RNSMetadataType">
                        <xsd:attribute name="entry-name"
                                type="rns:EntryNameType" use="required"/>
                </xsd:extension>
        </xsd:complexContent>
</xsd:complexType>

<!-- Messages -->
<xsd:complexType name="AddRequestType">
        <xsd:sequence>
                <xsd:element name="entry" type="rns:RNSEntryType"
                        minOccurs="1" maxOccurs="unbounded" nillable="false"/>
        </xsd:sequence>
</xsd:complexType>
<xsd:element name="AddRequest" type="rns:AddRequestType"/>

<xsd:complexType name="AddResponseType">
        <xsd:sequence>
                <xsd:element name="entry-response"
                        type="rns:RNSEntryResponseType"
                        minOccurs="1" maxOccurs="unbounded" nillable="false"/>
        </xsd:sequence>
</xsd:complexType>
<xsd:element name="AddResponse" type="rns:AddResponseType"/>

<xsd:complexType name="LookupRequestType">
        <xsd:sequence>
                <xsd:element name="entry-name" type="rns:EntryNameType"
                        minOccurs="0" maxOccurs="unbounded"/>
        </xsd:sequence>
</xsd:complexType>
<xsd:element name="LookupRequest" type="rns:LookupRequestType"/>

<xsd:complexType name="LookupResponseType">
        <xsd:sequence>
                <xsd:element name="entry-response"
                        type="rns:RNSEntryResponseType"
                        minOccurs="0" maxOccurs="unbounded"/>
                <xsd:element name="iterator" type="wsa:EndpointReferenceType"
                        minOccurs="0" maxOccurs="1"/>
        </xsd:sequence>
</xsd:complexType>
<xsd:element name="LookupResponse" type="rns:LookupResponseType"/>

<xsd:complexType name="RemoveRequestType">
        <xsd:sequence>
```

```
                    <xsd:element name="entry-name" type="rns:EntryNameType"
                            minOccurs="1" maxOccurs="unbounded" nillable="false"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="RemoveRequest" type="rns:RemoveRequestType"/>

        <xsd:complexType name="RemoveResponseType">
            <xsd:sequence>
                    <xsd:element name="entry-response"
                            type="rns:RNSEntryResponseType"
                            minOccurs="1" maxOccurs="unbounded"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="RemoveResponse" type="rns:RemoveResponseType"/>

        <xsd:complexType name="RenameRequestType">
            <xsd:sequence>
                    <xsd:element name="rename-request"
                            type="rns:NameMappingType"
                            minOccurs="1" maxOccurs="unbounded"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="RenameRequest" type="rns:RenameRequestType"/>

        <xsd:complexType name="RenameResponseType">
            <xsd:sequence>
                    <xsd:element name="entry-response"
                            type="rns:RNSEntryResponseType"
                            minOccurs="1" maxOccurs="unbounded"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="RenameResponse" type="rns:RenameResponseType"/>

        <xsd:complexType name="SetMetadataRequestType">
            <xsd:sequence>
                    <xsd:element name="set-metadata-request"
                            type="rns:MetadataMappingType"
                            minOccurs="1" maxOccurs="unbounded"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="SetMetadataRequest" type="rns:SetMetadataRequestType"/>

        <xsd:complexType name="SetMetadataResponseType">
            <xsd:sequence>
                    <xsd:element name="entry-response"
                            type="rns:RNSEntryResponseType"
                            minOccurs="1" maxOccurs="unbounded"/>
            </xsd:sequence>
        </xsd:complexType>
        <xsd:element name="SetMetadataResponse"
type="rns:SetMetadataResponseType"/>
</xsd:schema>
```

Appendix B. RNS WSDL

```
<wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rw-2"
        location="http://docs.oasis-open.org/wsrf/rw-2.wsdl"/>

<wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rpw-2"
        location="http://docs.oasis-open.org/wsrf/rpw-2.wsdl"/>

<wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rlw-2"
        location="http://docs.oasis-open.org/wsrf/rlw-2.wsdl"/>

<wsdl:types>
        <xsd:schema
                xmlns:xsd="http://www.w3.org/2001/XMLSchema"
                attributeFormDefault="unqualified"
                elementFormDefault="qualified"
                targetNamespace="http://schemas.ogf.org/rns/2009/12/rns">

                <xsd:include schemaLocation="rns.xsd"/>

                <xsd:import
                        namespace="http://docs.oasis-open.org/wsrf/bf-2"
                        schemaLocation="http://docs.oasis-open.org/wsrf/bf-2.xsd"/>

                <xsd:import
                        namespace="http://docs.oasis-open.org/wsrf/rp-2"
                        schemaLocation="http://docs.oasis-open.org/wsrf/rp-2.xsd"/>

                <xsd:import
                        namespace="http://docs.oasis-open.org/wsrf/rl-2"
                        schemaLocation="http://docs.oasis-open.org/wsrf/rl-2.xsd"/>

                <!-- == Resource Property Related === -->
                <xsd:element name="RNSRP">
                        <xsd:complexType>
                                <xsd:sequence>
                                        <xsd:any namespace="##other"
                                                minOccurs="0"
                                                maxOccurs="unbounded"/>
                                        <xsd:element ref="rns:elementCount"
                                                minOccurs="1" maxOccurs="1"/>
                                        <xsd:element ref="rns:createTime"
                                                minOccurs="0" maxOccurs="1"/>
                                        <xsd:element ref="rns:accessTime"
                                                minOccurs="0" maxOccurs="1"/>
                                        <xsd:element ref="rns:modificationTime"
                                                minOccurs="0" maxOccurs="1"/>
                                        <xsd:element ref="rns:readable"
                                                minOccurs="1" maxOccurs="1"/>
                                        <xsd:element ref="rns:writable"
                                                minOccurs="1" maxOccurs="1"/>
                                </xsd:sequence>
                        </xsd:complexType>
                </xsd:element>
        </xsd:schema>
```

```
        </wsdl:types>

        <wsdl:message name="AddRequest">
                <wsdl:part name="AddRequest"
                        element="rns:AddRequest"/>
        </wsdl:message>

        <wsdl:message name="AddResponse">
                <wsdl:part name="AddResponse"
                        element="rns:AddResponse"/>
        </wsdl:message>

        <wsdl:message name="LookupRequest">
                <wsdl:part name="LookupRequest"
                        element="rns:LookupRequest"/>
        </wsdl:message>

        <wsdl:message name="LookupResponse">
                <wsdl:part name="LookupResponse"
                        element="rns:LookupResponse"/>
        </wsdl:message>

        <wsdl:message name="RemoveRequest">
                <wsdl:part name="RemoveRequest"
                        element="rns:RemoveRequest"/>
        </wsdl:message>

        <wsdl:message name="RemoveResponse">
                <wsdl:part name="RemoveResponse"
                        element="rns:RemoveResponse"/>
        </wsdl:message>

        <wsdl:message name="RenameRequest">
                <wsdl:part name="RenameRequest"
                        element="rns:RenameRequest"/>
        </wsdl:message>

        <wsdl:message name="RenameResponse">
                <wsdl:part name="RenameResponse"
                        element="rns:RenameResponse"/>
        </wsdl:message>

        <wsdl:message name="SetMetadataRequest">
                <wsdl:part name="SetMetadataRequest"
                        element="rns:SetMetadataRequest"/>
        </wsdl:message>

        <wsdl:message name="SetMetadataResponse">
                <wsdl:part name="SetMetadataResponse"
                        element="rns:SetMetadataResponse"/>
        </wsdl:message>

        <wsdl:message name="ReadNotPermittedFault">
                <wsdl:part name="ReadNotPermittedFault"
                        element="rns:ReadNotPermittedFault"/>
        </wsdl:message>
```

```
        <wsdl:message name="WriteNotPermittedFault">
                <wsdl:part name="WriteNotPermittedFault"
                        element="rns:WriteNotPermittedFault"/>
        </wsdl:message>

        <wsdl:portType name="RNSPortType"
                wsrp:ResourceProperties="rns:RNSRP">

<!-- Strictly speaking one would insert here operations that were being "imported" from other
port types (specifically, those required by the OGSA WSRF Base Profile 1.0). However,
doing so would tremendously bloat and obfuscate the material relevant to this document and
as such I merely introduce via comments the other port types that should be added. There
are a few mechanisms for doing this such as Globus' wsdlpp:extends element and the
Genesis II genii-ext:extend element. However, since neither of these mechanisms is
standard and each grid provider currently has its own methods for accomplishing this, we
resort simply to comments here. -->
<!-- extends wsrpw:ResourceProperties-->
<!-- extends wsrlw:ImmediateTerminate-->
<!-- extends wsrlw:ScheduledTermination-->

                <wsdl:operation name="add">
                        <wsdl:input message="rns:AddRequest"/>
                        <wsdl:output message="rns:AddResponse"/>
                        <wsdl:fault name="WriteNotPermittedFault"
                                message="rns:WriteNotPermittedFault"/>
                </wsdl:operation>

                <wsdl:operation name="lookup">
                        <wsdl:input message="rns:LookupRequest"/>
                        <wsdl:output message="rns:LookupResponse"/>
                        <wsdl:fault name="ReadNotPermittedFault"
                                message="rns:ReadNotPermittedFault"/>
                </wsdl:operation>

                <wsdl:operation name="rename">
                        <wsdl:input message="rns:RenameRequest"/>
                        <wsdl:output message="rns:RenameResponse"/>
                        <wsdl:fault name="WriteNotPermittedFault"
                                message="rns:WriteNotPermittedFault"/>
                </wsdl:operation>

                <wsdl:operation name="remove">
                        <wsdl:input message="rns:RemoveRequest"/>
                        <wsdl:output message="rns:RemoveResponse"/>
                        <wsdl:fault name="WriteNotPermittedFault"
                                message="rns:WriteNotPermittedFault"/>
                </wsdl:operation>

                <wsdl:operation name="setMetadata">
                        <wsdl:input message="rns:SetMetadataRequest"/>
                        <wsdl:output message="rns:SetMetadataResponse"/>
                        <wsdl:fault name="WriteNotPermittedFault"
                                message="rns:WriteNotPermittedFault"/>
                </wsdl:operation>
        </wsdl:portType>
```

```
</wsdl:definitions>
```