ByteIO OGSA WSRF Basic Profile Rendering 1.0

Status of This Memo

This memo provides information to the Grid community on efficient manipulation of, access to, and management of bulk data sources and sinks in the grid. Distribution is unlimited.

Abstract

The ByteIO Specification is a description of a set of port types that give users a concise, standard way of interacting with bulk data sources and sinks in the grid. The purpose of these port types is to provide the means for treating such data resources as *POSIX-like* files. At the same time, clients will be able to leverage these port types to provide users with a convenient way of interacting with these grid resources. The purpose of this specification is to address a common case and common requirement in the grid community. Other applications may choose to provide more application specific interfaces for accessing and modifying bulk data in their own resource endpoints, however it is hoped that they will choose to additionally support ByteIO as a means of providing a common interface to which arbitrary clients can speak.

ByteIO is divided into two port types and each addresses a unique set of use cases. The first of these port types supports the notion that a data resource is directly accessible and that clients can handle the maintenance of any session state (such as file pointer, buffering, caching, etc.). The other port type presents a more stream-like interface to clients and as such contains implicit session state. In this latter case data resources with this port type don't represent that bulk data source/sink directly but rather represent the resource of the open stream between the client and the data source/sink.

Contents

1. Introduction

This document is the normative description of the ByteIO specification in terms of the OGSA WSRF Basic Profile 1.0 [**WSRFProfileDoc**]. The ByteIO Draft Recommendation Document [**ByteIORecDoc**] 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 ByteIO specification MUST conform to the requirements contained within the OGSA WSRF Basic Profile 1.0 document [**WSRFProfileDoc**].

1.1 Important Note

At the time of the writing of this document, the OGSA WSRF Basic Profile 1.0 document referred to normative schemas and wsdl for WS-Notification **[WS-Notification]** which were not yet available. This limitation meant that either wsdl and schema produced herein would not have been usable or that the contents of this document would not fully satisfy the requirements of the OGSA WSRF Basic Profile 1.0. The latter was chosen and should be fixed as soon as the OGSA WSRF Basic Profile 1.0 document is fully implementable.

1.2 Terminology

The keywords “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, “OPTIONAL” in this document are to be interpreted as described in **[RFC 2119]**.

1.3 Namespaces

The following namespaces are used in this document:

Prefix	Namespace
wsa	http://www.w3.org/2005/03/addressing
byteio	http://schemas.ggf.org/byteio/2005/10/byte-io
rbyteio	http://schemas.ggf.org/byteio/2005/10/random-access
sbyteio	http://schemas.ggf.org/byteio/2005/10/streamable-access

2. ByteIO Properties

This section describes the resource properties that the various ByteIO port types MUST or MAY export (as per [**ByteIORecDoc**]).

2.1 RandomByteIO Resource Properties

In order to satisfy the “properties” requirements given in the ByteIO Draft Recommendation document [**ByteIORecDoc**], the Resource Properties Document (as described by [**WS-ResourceProperties**]) for a RandomByteIO implementation MUST include a reference to the following resource property elements[1]:

```
…
        targetNamespace=”http://schemas.ggf.org/byteio/2005/10/random-access”
…
```

[1] This is in addition to any resource properties required by the OGSA WSRF Basic Profile 1.0.

```
      <xsd:element name="Size" type="xsd:unsignedLong"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="Readable" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="Writeable" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="TransferMechanisms" type="xsd:anyURI"
            minOccurs="1" maxOccurs="unbounded"/>

      <xsd:element name="CreateTime" type="xsd:dateTime"
            minOccurs="0" maxOccurs="1" nillable="true"/>

      <xsd:element name="ModificationTime" type="xsd:dateTime"
            minOccurs="0" maxOccurs="1" nillable="true"/>

      <xsd:element name="AccessTime" type="xsd:dateTime"
            minOccurs="0" maxOccurs="1" nillable="true"/>
```

These Resource Property elements are constrained as indicated in the ByteIO Draft Recommendation Document [**ByteIORecDoc**].

2.2 StreamableByteIO Resource Properties

In order to satisfy the "properties" requirements given in the ByteIO Draft Recommendation document [**ByteIORecDoc**], the Resource Properties Document (as described by [**WS-ResourceProperties**]) for a StreamableByteIO implementation MUST include a reference to the following resource property elements[2]:

```
…
      targetNamespace="http://schemas.ggf.org/byteio/2005/10/streamable-access"
…

      <xsd:element name="Size" type="xsd:unsignedLong"
            minOccurs="0" maxOccurs="1" nillable="true"/>

      <xsd:element name="Position" type="xsd:unsignedLong"
            minOccurs="0" maxOccurs="1" nillable="true"/>

      <xsd:element name="Readable" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="Writeable" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="Seekable" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="TransferMechanisms" type="xsd:anyURI"
            minOccurs="1" maxOccurs="unbounded"/>
```

[2] This is in addition to any resource properties required by the OGSA WSRF Basic Profile 1.0.

```
      <xsd:element name="EndOfStream" type="xsd:boolean"
            minOccurs="1" maxOccurs="1"/>

      <xsd:element name="DataResource"
            type="wsa:EndpointReferenceType"
            minOccurs="0" maxOccurs="1" nillable="true"/>
```

These Resource Property elements are constrained as indicated in the ByteIO Draft Recommendation Document [**ByteIORecDoc**].

3. ByteIO Lifetime Management

The ByteIO Draft Recommendation Document [**ByteIORecDoc**] requires that the StreamableByteIO implementation contain a means of closing or destroying the stream. As per the OGSA WSRF Basic Profile 1.0, the OGSA WSRF Basic Profile 1.0 rendering of this port type MUST use both the [**WS-ResourceLifetime**] ImmediateResourceTermination port type as well as the Schedulded Resource Termination port type. RandomByteIO implementations may choose not to include a notion of destruction, but if they do contain that concept, the implementation MUST conform to the OGSA WSRF Basic Profile 1.0 on that regard.

4. ByteIO Message Faults

The ByteIO Draft Recommendation Document [**ByteIORecDoc**] clearly identifies the faults or exceptions that may be generated during the normal operation of the various ByteIO port types. 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="UnsupportedTransferFaultType">
      <xsd:complexContent>
            <xsd:extension base="wsbf:BaseFaultType"/>
      </xsd:complexContent>
</xsd:complexType>
<xsd:element name="UnsupportedTransferFault"
      type="byteio:UnsupportedTransferFaultType"/>

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

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

<xsd:complexType name="CustomFaultType">
      <xsd:complexContent>
```

```
            <xsd:extension base="wsbf:BaseFaultType"/>
      </xsd:complexContent>
</xsd:complexType>
<xsd:element name="CustomFault"
      type="byteio:CustomFaultType"/>
```

5. Security Considerations

In addition to security considerations given in the ByteIO Draft Recommendation Document [**ByteIORecDoc**], OGSA WSRF Basic Profile 1.0 Renderings of the ByteIO specification MUST be fully compliant with all security sections indicated in the OGSA WSRF Basic Profile 1.0 [**WSRFProfileDoc**].

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[XML-Infoset] http://www.w3.org/TR/xml-infoset/

[XPATH] http://www.w3.org/TR/xpath

[DIME] http://www.gotdotnet.com/team/xml_wsspecs/dime/draft-nielsen-dime-01.txt

[MTOM] http://www.w3.org/TR/soap12-mtom

[SOAP 1.2] http://www.w3.org/TR/soap12-part1

[Base64] http://rfc.net/rfc3548.html

Appendix A: ByteIO XML Schema

```
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-->

<xsd:schema
    xmlns="http://schemas.ggf.org/byteio/2005/10/byte-io"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:byteio="http://schemas.ggf.org/byteio/2005/10/byte-io"
    xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-1"
    targetNamespace="http://schemas.ggf.org/byteio/2005/10/byte-io"
    elementFormDefault="qualified"
    attributeFormDefault="unqualified">

    <xsd:import
```

```
        namespace="http://docs.oasis-open.org/wsrf/bf-1"
        schemaLocation="http://docs.oasis-open.org/wsrf/bf-1"/>

    <!-- Bulk Data Transfer Container -->
    <xsd:complexType name="transfer-information-type" mixed="false">
        <xsd:sequence>
            <xsd:element type="xsd:anyType" name="any"
                minOccurs="0" maxOccurs="unbounded"/>
        </xsd:sequence>
        <xsd:attribute name="transfer-mechanism" type="xsd:anyURI"/>
    </xsd:complexType>

    <xsd:element name="transfer-information-type"
        type="byteio:transfer-information-type" />

    <!-- Common Faults -->
    <xsd:complexType name="UnsupportedTransferFaultType">
        <xsd:complexContent>
            <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
    </xsd:complexType>
    <xsd:element name="UnsupportedTransferFault"
        type="byteio:UnsupportedTransferFaultType"/>

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

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

    <xsd:complexType name="CustomFaultType">
        <xsd:complexContent>
            <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
    </xsd:complexType>
    <xsd:element name="CustomFault"
        type="byteio:CustomFaultType"/>

</xsd:schema>
```

Appendix B: Random ByteIO XML Schema

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

<xsd:schema
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:rbyteio="http://schemas.ggf.org/byteio/2005/10/random-access"
    xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-1"
    xmlns:wsrp="http://docs.oasis-open.org/wsrf/rp-1"
    targetNamespace="http://schemas.ggf.org/byteio/2005/10/random-
         access"
    elementFormDefault="qualified"
    attributeFormDefault="unqualified">
```

```
    <xsd:import
        namespace="http://docs.oasis-open.org/wsrf/rp-1"
        schemaLocation="http://docs.oasis-open.org/wsrf/rp-1"/>

    <xsd:import
        namespace="http://docs.oasis-open.org/wsrf/bf-1"
        schemaLocation="http://docs.oasis-open.org/wsrf/bf-1"/>

    <xsd:complexType name="TruncateNotPermittedFaultType">
        <xsd:complexContent>
            <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
    </xsd:complexType>
    <xsd:element name="TruncateNotPermittedFault"
        type="rbyteio:TruncateNotPermittedFaultType"/>

<!-- Resource Property Related -->
<!-- Resource Properties for RandomByteIO -->

<xsd:element name="Size" type="xsd:unsignedLong"/>
<xsd:element name="Readable" type="xsd:boolean"/>
<xsd:element name="Writeable" type="xsd:boolean"/>
<xsd:element name="TransferMechanisms" type="xsd:anyURI"/>
<xsd:element name="CreateTime" type="xsd:dateTime"/>
<xsd:element name="ModificationTime" type="xsd:dateTime"/>
<xsd:element name="AccessTime" type="xsd:dateTime"/>

</xsd:schema>
```

Appendix C: Streamable ByteIO XML Schema

```
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-->

<xsd:schema
    xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:wsa="http://www.w3.org/2005/03/addressing"
    xmlns:sbyteio="http://schemas.ggf.org/byteio/2005/10/streamable-
         access"
    xmlns:wsrp="http://docs.oasis-open.org/wsrf/rp-1"
    xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-1"
    targetNamespace="http://schemas.ggf.org/byteio/2005/10/streamable-
         access"
```

```
    elementFormDefault="qualified"
    attributeFormDefault="unqualified">

    <xsd:import
        namespace="http://www.w3.org/2005/03/addressing"
        schemaLocation="http://www.w3.org/2005/03/addressing"/>

    <xsd:import
        namespace="http://docs.oasis-open.org/wsrf/rp-1"
        schemaLocation="http://docs.oasis-open.org/wsrf/rp-1"/>

    <xsd:import
        namespace="http://docs.oasis-open.org/wsrf/bf-1"
        schemaLocation="http://docs.oasis-open.org/wsrf/bf-1"/>

    <xsd:complexType name="SeekNotPermittedFaultType">
        <xsd:complexContent>
            <xsd:extension base="wsbf:BaseFaultType"/>
        </xsd:complexContent>
    </xsd:complexType>
    <xsd:element name="SeekNotPermittedFault"
        type="sbyteio:SeekNotPermittedFaultType"/>

<!-- Resource Property Related -->
<!-- Resource Properties for StreamableByteIO -->

<xsd:element name="Size" type="xsd:unsignedLong"/>
<xsd:element name="Position" type="xsd:unsignedLong"/>
<xsd:element name="Readable" type="xsd:boolean"/>
<xsd:element name="Writeable" type="xsd:boolean"/>
<xsd:element name="Seekable" type="xsd:boolean"/>
<xsd:element name="TransferMechanisms" type="xsd:anyURI"/>
<xsd:element name="EndOfStream" type="xsd:boolean"/>
<xsd:element name="DataResource" type="wsa:EndpointReferenceType"/>

</xsd:schema>
```

Appendix D: Random ByteIO WSDL

```
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-->

<wsdl:definitions name="RandomByteIO"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http:/www.w3.org/2001/XMLSchema-instance"
    xmlns:wsa="http://www.w3.org/2005/03/addressing"
    xmlns:byteio="http://schemas.ggf.org/byteio/2005/10/byte-io"
    xmlns:rbyteio="http://schemas.ggf.org/byteio/2005/10/random-access"
    xmlns:wsrp="http://docs.oasis-open.org/wsrf/rp-1"
    xmlns:wsrpw="http://docs.oasis-open.org/wsrf/rpw-1"
```

```
    xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-1"
    xmlns:wsrl="http://docs.oasis-open.org/wsrf/rl-1"
    xmlns:wsrlw="http://docs.oasis-open.org/wsrf/rlw-1"
    xmlns:wsrf-rw="http://docs.oasis-open.org/wsrf/rw-1"
    targetNamespace="http://schemas.ggf.org/byteio/2005/10/random-
         access">

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rpw-1"
        location="http://docs.oasis-open.org/wsrf/rpw-1"/>

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rlw-1"
        location="http://docs.oasis-open.org/wsrf/rlw-1"/>

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rw-1"
        location="http://docs.oasis-open.org/wsrf/rw-1"/>

<!-- ===== Types Definitions ==== -->
    <wsdl:types>

        <xsd:schema

         targetNamespace="http://schemas.ggf.org/byteio/2005/10/byte-
         io"
            elementFormDefault="qualified"
            attributeFormDefault="unqualified">

            <xsd:include schemaLocation="./byteio.xsd"/>
        </xsd:schema>

        <xsd:schema

         targetNamespace="http://schemas.ggf.org/byteio/2005/10/random-
         access"
            elementFormDefault="qualified"
            attributeFormDefault="unqualified">

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

            <xsd:import
            namespace="http://www.w3.org/2005/03/addressing"
            schemaLocation="http://www.w3.org/2005/03/addressing"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/bf-1"
                schemaLocation="http://docs.oasis-open.org/wsrf/bf-1"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/rp-1"
                schemaLocation="http://docs.oasis-open.org/wsrf/rp-1"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/rl-1"
                schemaLocation="http://docs.oasis-open.org/wsrf/rl-1"/>
```

```
<!-- ==== Resource Property Related ==== -->
            <xsd:element name="RandomByteIORP">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element ref="rbyteio:Size"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element ref="rbyteio:Readable"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element ref="rbyteio:Writeable"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element ref="rbyteio:TransferMechanisms"
                            minOccurs="1" maxOccurs="unbounded"/>
                        <xsd:element ref="rbyteio:CreateTime"
                            minOccurs="0" maxOccurs="1"
        nillable="true"/>
                        <xsd:element ref="rbyteio:ModificationTime"
                            minOccurs="0" maxOccurs="1"
        nillable="true"/>
                        <xsd:element ref="rbyteio:AccessTime"
                            minOccurs="0" maxOccurs="1"
        nillable="true"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

<!-- Message Helper Types -->
            <xsd:element name="read">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="start-offset"
                            type="xsd:unsignedLong"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="bytes-per-block"
                            type="xsd:unsignedInt"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="num-blocks"
                            type="xsd:unsignedInt"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="stride"
                            type="xsd:long"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

            <xsd:element name="readResponse">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>
```

```
            <xsd:element name="write">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="start-offset"
                            type="xsd:unsignedLong"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="bytes-per-block"
                            type="xsd:unsignedInt"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="stride"
                            type="xsd:long"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

            <xsd:element name="writeResponse">
                  <xsd:complexType>
                      <xsd:sequence>
                        <xsd:element name=”transfer-information”
                              type=”byteio:transfer-information-type”
                              minOccurs=”1” maxOccurs=”1”/>
                      </xsd:sequence>
                  </xsd:complexType>
            </xsd:element>

            <xsd:element name="append">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

            <xsd:element name="appendResponse">
                  <xsd:complexType>
                      <xsd:sequence>
                        <xsd:element name=”transfer-information”
                              type=”byteio:transfer-information-type”
                              minOccurs=”1” maxOccurs=”1”/>
                      </xsd:sequence>
                  </xsd:complexType>
            </xsd:element>

            <xsd:element name="truncAppend">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="offset"
                            type="xsd:unsignedLong"
                            minOccurs="1" maxOccurs="1"/>
                        <xsd:element name="transfer-information"
```

```
                        type="byteio:transfer-information-type"
                        minOccurs="1" maxOccurs="1"/>
                </xsd:sequence>
            </xsd:complexType>
        </xsd:element>

        <xsd:element name="truncAppendResponse">
              <xsd:complexType>
                  <xsd:sequence>
                    <xsd:element name="transfer-information"
                        type="byteio:transfer-information-type"
                        minOccurs="1" maxOccurs="1"/>
                  </xsd:sequence>
              </xsd:complexType>
        </xsd:element>
    </xsd:schema>
</wsdl:types>

<!-- Fault Messages -->
<wsdl:message name="UnsupportedTransferFault">
    <wsdl:part name="UnsupportedTransferFault"
        element="byteio:UnsupportedTransferFault"/>
</wsdl:message>

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

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

<wsdl:message name="TruncateNotPermittedFault">
    <wsdl:part name="TruncateNotPermittedFault"
        element="rbyteio:TruncateNotPermittedFault"/>
</wsdl:message>

<wsdl:message name="CustomFault">
    <wsdl:part name="CustomFault"
        element="byteio:CustomFault"/>
</wsdl:message>

<!-- RandomByteIO::read -->
<wsdl:message name="readRequest">
    <wsdl:part name="readRequest"
        element="rbyteio:read"/>
</wsdl:message>

<wsdl:message name="readResponse">
    <wsdl:part name="readResponse"
        element="rbyteio:readResponse"/>
</wsdl:message>

<!-- RandomByteIO::write -->
<wsdl:message name="writeRequest">
```

```
        <wsdl:part name="writeRequest"
            element="rbyteio:write"/>
    </wsdl:message>

    <wsdl:message name="writeResponse">
        <wsdl:part name="writeResponse"
            element="rbyteio:writeResponse"/>
    </wsdl:message>

    <!-- RandomByteIO::append -->
    <wsdl:message name="appendRequest">
        <wsdl:part name="appendRequest"
            element="rbyteio:append"/>
    </wsdl:message>

    <wsdl:message name="appendResponse">
        <wsdl:part name="appendResponse"
            element="rbyteio:appendResponse"/>
    </wsdl:message>

    <!-- RandomByteIO::truncAppend -->
    <wsdl:message name="truncAppendRequest">
        <wsdl:part name="truncAppendRequest"
            element="rbyteio:truncAppend"/>
    </wsdl:message>

    <wsdl:message name="truncAppendResponse">
        <wsdl:part name="truncAppendResponse"
            element="rbyteio:truncAppendResponse"/>
    </wsdl:message>

<!-- Port Type Definitions -->

<wsdl:portType name="RandomByteIO"
    wsrp:ResourceProperties="rbyteio:RandomByteIORP">
    <!-- extends wsrpw:ResourceProperties -->
    <wsdl:operation name="GetResourceProprety">
        <wsdl:input name="GetResourcePropertyRequest"
            message="wsrpw:GetResourcePropertyRequest"/>
        <wsdl:output name="GetResourcePropertyResponse"
            message="wsrpw:GetResourcePropertyResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
    </wsdl:operation>

    <!-- extends wsrpw:GetMultiple -->
    <wsdl:operation name="GetMultipleResourceProperties">
        <wsdl:input name="GetMultipleResourcePropertiesRequest"
            message="wsrpw:GetMultipleResourcePropertiesRequest"/>
        <wsdl:output name="GetMultipleResourcePropertiesResponse"
            message="wsrpw:GetMultipleResourcePropertiesResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
```

```
    </wsdl:operation>

    <!-- extends wsrpw:Query -->
    <wsdl:operation name="QueryResourceProperties">
        <wsdl:input name="QueryResourcePropertiesRequest"
            message="wsrpw:QueryResourcePropertiesRequest"/>
        <wsdl:output name="QueryResourcePropertiesResponse"
            message="wsrpw:QueryResourcePropertiesResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
        <wsdl:fault name="UnknownQueryExpressionDialectFault"
            message="wsrpw:UnknownQueryExpressionDialectFault"/>
        <wsdl:fault name="InvalidQueryExpressionFault"
            message="wsrpw:InvalidQueryExpressionFault"/>
        <wsdl:fault name="QueryEvaluationErrorFault"
            message="wsrpw:QueryEvaluationErrorFault"/>
    </wsdl:operation>

    <!-- RandomByteIO specific -->
    <wsdl:operation name="read">
        <wsdl:input message="rbyteio:readRequest"/>
        <wsdl:output message="rbyteio:readResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="rbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="ReadNotPermittedFault"
            message="rbyteio:ReadNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
            message="rbyteio:CustomFault"/>
    </wsdl:operation>

    <wsdl:operation name="write">
        <wsdl:input message="rbyteio:writeRequest"/>
        <wsdl:output message="rbyteio:writeResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="rbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="WriteNotPermittedFault"
            message="rbyteio:WriteNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
            message="rbyteio:CustomFault"/>
    </wsdl:operation>

    <wsdl:operation name="append">
        <wsdl:input message="rbyteio:appendRequest"/>
        <wsdl:output message="rbyteio:appendResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="rbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="WriteNotPermittedFault"
            message="rbyteio:WriteNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
```

```
            message="rbyteio:CustomFault"/>
    </wsdl:operation>

    <wsdl:operation name="truncAppend">
        <wsdl:input message="rbyteio:truncAppendRequest"/>
        <wsdl:output message="rbyteio:truncAppendResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="rbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="TruncateNotPermittedFault"
            message="rbyteio:TruncateNotPermittedFault"/>
        <wsdl:fault name="WriteNotPermittedFault"
            message="rbyteio:WriteNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
            message="rbyteio:CustomFault"/>
    </wsdl:operation>
</wsdl:portType>

</wsdl:definitions>
```

Appendix E: Streamable ByteIO WSDL

```
<?xml version="1.0" encoding="utf-8"?>
<!--
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PURPOSE."

-->

<wsdl:definitions name="StreamableByteIO"
    xmlns="http://schemas.xmlsoap.org/wsdl/"
    xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
    xmlns:xsd="http://www.w3.org/2001/XMLSchema"
    xmlns:xsi="http:/www.w3.org/2001/XMLSchema-instance"
    xmlns:wsa="http://www.w3.org/2005/03/addressing"
    xmlns:byteio="http://schemas.ggf.org/byteio/2005/10/byte-io"
    xmlns:sbyteio="http://schemas.ggf.org/byteio/2005/10/streamable-
         access"
    xmlns:wsrp="http://docs.oasis-open.org/wsrf/rp-1"
```

```
    xmlns:wsrpw="http://docs.oasis-open.org/wsrf/rpw-1"
    xmlns:wsbf="http://docs.oasis-open.org/wsrf/bf-1"
    xmlns:wsrl="http://docs.oasis-open.org/wsrf/rl-1"
    xmlns:wsrlw="http://docs.oasis-open.org/wsrf/rlw-1"
    xmlns:wsrf-rw="http://docs.oasis-open.org/wsrf/rw-1"
    targetNamespace="http://schemas.ggf.org/byteio/2005/10/streamable-
         access">

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rpw-1"
        location="http://docs.oasis-open.org/wsrf/rpw-1"/>

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rlw-1"
        location="http://docs.oasis-open.org/wsrf/rlw-1"/>

    <wsdl:import
        namespace="http://docs.oasis-open.org/wsrf/rw-1"
        location="http://docs.oasis-open.org/wsrf/rw-1"/>

<!-- ===== Types Definitions ==== -->
    <wsdl:types>

        <xsd:schema

         targetNamespace="http://schemas.ggf.org/byteio/2005/10/byte-
         io"
            elementFormDefault="qualified"
            attributeFormDefault="unqualified">

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

        </xsd:schema>

        <xsd:schema

         targetNamespace="http://schemas.ggf.org/byteio/2005/10/streama
         ble-access"
            elementFormDefault="qualified"
            attributeFormDefault="unqualified">

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

            <xsd:import
            namespace="http://www.w3.org/2005/03/addressing"
            schemaLocation="http://www.w3.org/2005/03/addressing"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/bf-1"
                schemaLocation="http://docs.oasis-open.org/wsrf/bf-1"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/rp-1"
                schemaLocation="http://docs.oasis-open.org/wsrf/rp-1"/>

            <xsd:import
                namespace="http://docs.oasis-open.org/wsrf/rl-1"
```

```
                schemaLocation="http://docs.oasis-open.org/wsrf/rlw-
        1"/>

<!-- ==== Resource Property Related ==== -->
           <xsd:element name="StreamableByteIORP">
               <xsd:complexType>
                   <xsd:sequence>
       <!-- WS-ResourceLifetime ScheduledResourceTermination -->
                       <xsd:element ref="wsrl:CurrentTime"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element ref="wsrl:TerminationTime"
                           minOccurs="1" maxOccurs="1"/>
       <!-- Streamable Byte IO -->
                       <xsd:element ref="sbyteio:Size"
                           minOccurs="0" maxOccurs="1"
        nillable="true"/>
                       <xsd:element ref="sbyteio:Position"
                           minOccurs="0" maxOccurs="1"
        nillable="true"/>
                       <xsd:element ref="sbyteio:Readable"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element ref="sbyteio:Writeable"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element ref="sbyteio:Seekable"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element ref="sbyteio:TransferMechanisms"
                           minOccurs="1" maxOccurs="unbounded"/>
                       <xsd:element ref="sbyteio:EndOfStream"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element ref="sbyteio:DataResource"
                           minOccurs="0" maxOccurs="1"
        nillable="true"/>
                   </xsd:sequence>
               </xsd:complexType>
           </xsd:element>

<!-- Message Helper Types -->
           <xsd:element name="seekRead">
               <xsd:complexType>
                   <xsd:sequence>
                       <xsd:element name="offset"
                           type="xsd:long" minOccurs="1"
        maxOccurs="1"/>
                       <xsd:element name="seek-origin"
                           type="xsd:anyURI" minOccurs="1"
        maxOccurs="1"/>
                       <xsd:element name="num-bytes"
                           type="xsd:unsignedInt"
                           minOccurs="1" maxOccurs="1"/>
                       <xsd:element name="transfer-information"
                           type="byteio:transfer-information-type"
                           minOccurs="1" maxOccurs="1"/>
                   </xsd:sequence>
               </xsd:complexType>
           </xsd:element>

           <xsd:element name="seekReadResponse">
```

```
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

            <xsd:element name="seekWrite">
                <xsd:complexType>
                    <xsd:sequence>
                        <xsd:element name="offset"
                            type="xsd:long" minOccurs="1"
        maxOccurs="1"/>
                        <xsd:element name="seek-origin"
                            type="xsd:anyURI" minOccurs="1"
        maxOccurs="1"/>
                        <xsd:element name="transfer-information"
                            type="byteio:transfer-information-type"
                            minOccurs="1" maxOccurs="1"/>
                    </xsd:sequence>
                </xsd:complexType>
            </xsd:element>

            <xsd:element name="seekWriteResponse">
                  <xsd:complexType>
                        <xsd:sequence>
                              <xsd:element name="transfer-information"
                                    type="byteio:transfer-information-
        type"
                                    minOccurs="1" maxOccurs="1"/>
                        </xsd:sequence>
                  </xsd:complexType>
            </xsd:element>
        </xsd:schema>
    </wsdl:types>

    <!-- Fault Messages -->
    <wsdl:message name="UnsupportedTransferFault">
        <wsdl:part name="UnsupportedTransferFault"
            element="byteio:UnsupportedTransferFault"/>
    </wsdl:message>

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

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

    <wsdl:message name="SeekNotPermittedFault">
        <wsdl:part name="SeekNotPermittedFault"
            element="sbyteio:SeekNotPermittedFault"/>
```

```
    </wsdl:message>

    <wsdl:message name="CustomFault">
        <wsdl:part name="CustomFault"
            element="byteio:CustomFault"/>
    </wsdl:message>

    <!-- StreamableByteIO::seekRead -->
    <wsdl:message name="seekReadRequest">
        <wsdl:part name="seekReadRequest"
            element="sbyteio:seekRead"/>
    </wsdl:message>

    <wsdl:message name="seekReadResponse">
        <wsdl:part name="seekReadResponse"
            element="sbyteio:seekReadResponse"/>
    </wsdl:message>

    <!-- StreamableByteIO::seekWrite -->
    <wsdl:message name="seekWriteRequest">
        <wsdl:part name="seekWriteRequest"
            element="sbyteio:seekWrite"/>
    </wsdl:message>

    <wsdl:message name="seekWriteResponse">
        <wsdl:part name="seekWriteResponse"
            element="sbyteio:seekWriteResponse"/>
    </wsdl:message>

<!-- Port Type Definitions -->

<wsdl:portType name="StreamableByteIO"
    wsrp:ResourceProperties="sbyteio:StreamableByteIORP">
    <!-- extends wsrpw:ResourceProperties -->
    <wsdl:operation name="GetResourceProprety">
        <wsdl:input name="GetResourcePropertyRequest"
            message="wsrpw:GetResourcePropertyRequest"/>
        <wsdl:output name="GetResourcePropertyResponse"
            message="wsrpw:GetResourcePropertyResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
    </wsdl:operation>

    <!-- extends wsrpw:GetMultiple -->
    <wsdl:operation name="GetMultipleResourceProperties">
        <wsdl:input name="GetMultipleResourcePropertiesRequest"
            message="wsrpw:GetMultipleResourcePropertiesRequest"/>
        <wsdl:output name="GetMultipleResourcePropertiesResponse"
            message="wsrpw:GetMultipleResourcePropertiesResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
    </wsdl:operation>
```

```
    <!-- extends wsrpw:Query -->
    <wsdl:operation name="QueryResourceProperties">
        <wsdl:input name="QueryResourcePropertiesRequest"
            message="wsrpw:QueryResourcePropertiesRequest"/>
        <wsdl:output name="QueryResourcePropertiesResponse"
            message="wsrpw:QueryResourcePropertiesResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrpw:InvalidResourcePropertyQNameFault"/>
        <wsdl:fault name="UnknownQueryExpressionDialectFault"
            message="wsrpw:UnknownQueryExpressionDialectFault"/>
        <wsdl:fault name="InvalidQueryExpressionFault"
            message="wsrpw:InvalidQueryExpressionFault"/>
        <wsdl:fault name="QueryEvaluationErrorFault"
            message="wsrpw:QueryEvaluationErrorFault"/>
    </wsdl:operation>

    <!-- extends wsrlw:ImmediateResourceTermination -->
    <wsdl:operation name="Destroy">
        <wsdl:input message="wsrlw:DestroyRequest"/>
        <wsdl:output message="wsrlw:DestroyResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="ResourceNotDestroyedFault"
            message="wsrlw:ResourceNotDestroyedFault"/>
    </wsdl:operation>

    <!-- extends wsrlw:ScheduledResourceTermination -->
    <wsdl:operation name="SetTerminationTime">
        <wsdl:input message="wsrlw:SetTerminationTimeRequest"/>
        <wsdl:output message="wsrlw:SetTerminationTimeResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnableToSetTerminationTimeFault"
            message="wsrlw:UnableToSetTerminationTimeFault"/>
        <wsdl:fault name="TerminationTimeChangeRejectedFault"
            message="wsrlw:TerminationTimeChangeRejectedFault"/>
    </wsdl:operation>

    <!-- StreamableByteIO specific -->
    <wsdl:operation name="seekRead">
        <wsdl:input message="sbyteio:seekReadRequest"/>
        <wsdl:output message="sbyteio:seekReadResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="sbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="SeekNotPermittedFault"
            message="sbyteio:SeekNotPermittedFault"/>
        <wsdl:fault name="ReadNotPermittedFault"
            message="sbyteio:ReadNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
            message="sbyteio:CustomFault"/>
    </wsdl:operation>

    <wsdl:operation name="seekWrite">
```

```
        <wsdl:input message="sbyteio:seekWriteRequest"/>
        <wsdl:output message="sbyteio:seekWriteResponse"/>
        <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault"/>
        <wsdl:fault name="UnsupportedTransferFault"
            message="sbyteio:UnsupportedTransferFault"/>
        <wsdl:fault name="SeekNotPermittedFault"
            message="sbyteio:SeekNotPermittedFault"/>
        <wsdl:fault name="WriteNotPermittedFault"
            message="sbyteio:WriteNotPermittedFault"/>
        <wsdl:fault name="CustomFault"
            message="sbyteio:CustomFault"/>
    </wsdl:operation>
</wsdl:portType>

</wsdl:definitions>
```