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Interoperability Experiences with the OGSA[®] WSRF Basic Profile 1.0

Status of This Document

This document provides information to the Grid community regarding the experiences of the authors in implementing the OGSA[®] WSRF Basic Profile 1.0. Distribution is unlimited.

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Abstract

This document describes the experiences of interoperability testing of independent implementations of the OGSA WSRF Basic Profile 1.0 [**OGSA-WSRFBP**], and the specifications that it incorporates by reference, namely Web Services Addressing 1.0 - Core [**WS-Addressing**], Web Services Resource Properties 1.2 [**WS-ResourceProperties**], Web Services Resource Lifetime 1.2 [**WS-Resource Lifetime**], Web Service Base Faults 1.2 [**WS-Base Faults**], and Web Services Base Notification 1.3 [**WS-BaseNotification**].

Many problems were encountered during the tests, largely related to schema errors, platform/tooling incapability, and specification issues. Despite this the tests proved in so much as they identified two issues in the OGSA WSRF Basic Profile and the WS-BaseNotification specifications. Solutions were proposed and were agreed by all implementers and original Profile authors.

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1. Introduction

This document describes the experiences gained during the interoperability tests on different implementations of the OGSA WSRF Basic Profile 1.0 (hereafter “the Profile”). The tests cover all the mandatory elements from the Profile, and its reference specifications, including WS-Addressing, WS-ResourceProperties, WS-ResourceLifetime, WS-BaseFaults, and WS-BaseNotification. To avoid unnecessary errors that might be caused by using different schemas, a full set of valid schema and WSDL is defined as appendixes of this document

Four organizations participated the tests and the event started with each participant publishing their endpoints on the ogsa-bp interop wiki page.¹ Participants then paired up their clients against other services and communicated/investigated problems via email and phone conversations.

2. Participants information

Details for each participant are listed below, along with descriptions of their implementation platforms, software names, and endpoints.

Organizations/ Software	Platform /tools	Endpoints
University of Virginia Global Bio Grid Group (Genesis II)	Axis 1.4, Java	http://sulla.cs.virginia.edu:19090/axis/services http://sulla.cs.virginia.edu:19090/axis/services/TickerFactory
Forschungszentrum Juelich (UNICORE)	XFire, XMLBeans, Java	http://zam461.zam.kfa-juelich.de:9126/services/TickerService http://zam461.zam.kfa-juelich.de:9126/services/TickerFactoryService http://zam461.zam.kfa-juelich.de:9126/services/SubscriptionManagerService
Fujitsu Labs of Europe (USMT)	JAXWS, JAXB, Java	http://193.122.18.162:8080/ogsabp-interop/ticker-factory http://193.122.18.162:8080/ogsabp-interop/ticker http://193.122.18.162:8080/ogsabp-interop/subscription
Argonne National Laboratory (Globus)	Axis 1.4 (With Custom Modifications) Java	http://128.135.125.21:50111/wsrf/services/interop/TickerFactoryService http://128.135.125.21:50111/wsrf/services/interop/TickerService http://128.135.125.21:50111/wsrf/services/interop/Subscription

3. OGSA WSRF Basic Profile 1.0 Interoperability Tests

The tests were carried out with clients and services implementing the OGSA WSRF Basic Profile 1.0 as well as the referenced specifications. The specifications and operations tested follow:

- WS-Addressing
- WS-Resource Properties
 - From the Profile
 - ResourcePropertyNames
 - FinalWSResourceInterface
 - WSResourceInterfaces
 - ResourceEndpointReference
 - From Resource Lifetime
 - CurrentTime
 - TerminationTime

¹ <https://forge.gridforum.org/sf/wiki/do/viewPage/projects.ogsa-wg/wiki/OGSAWSRFBP1.0Tests>

- WS-Resource Properties Operations
 - GetResourceProperty
 - GetMultipleResourceProperties
 - QueryResourceProperties
- WS-Resource Lifetime
 - Destroy
 - SetTerminationTime
- WS-Notification
 - Subscription
 - Resource Property Change Notification
 - Notify
- WS-Base Fault

The scenarios are designed based on a Ticker service, which ticks at a designated interval.

This simple service provides all the necessary content for testing, including WSRF resource properties, operations, lifetime, and notification. The creation of a ticker service object is done via a stateless TickerFactory service on request.

Eight scenarios were designed for this interoperability test and the details and results are shown in tables below.

3.1 Get ResourcePropertyNames using specified operations:

1. GetResourceProperty
2. GetMultipleResourceProperties
3. QueryResourceProperties using XPath queries

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	1,2,-	1,2,-	-	1,2,-
UNICORE	1,2,-	1,2,3	-	1,2,-
Globus (Java)	-	-	-	-
USMT	1,2,-	1,2,-	-	1,2,-

3.2 Get FinalWSResourceInterface using specified operations:

1. GetResourceProperty
2. GetMultipleResourceProperties
3. QueryResourceProperties using XPath queries

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	1,2,-	1,2,-	-	1,2,-
UNICORE	1,2,-	1,2,3	-	1,2,-
Globus (Java)	-	-	-	-
USMT	1,2,-	1,2,-	-	1,2,-

3.3 Get WSResourceInterfaces using specified operations:

1. GetResourceProperty
2. GetMultipleResourceProperties
3. QueryResourceProperties using XPath queries

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	1,2,-	1,2,-	-	1,2,-
UNICORE	1,2,-	1,2,3	-	1,2,-
Globus (Java)	-	-	-	-
USMT	1,2,-	1,2,-	-	1,2,-

3.4 Get ResourceEndpointReference using specified operations:

1. GetResourceProperty
2. GetMultipleResourceProperties
3. QueryResourceProperties using XPath queries

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	1,2,-	1,2,-	-	1,2,-
UNICORE	1,2,-	1,2,3	-	1,2,-
Globus (Java)	-	-	-	-
USMT	1,2,-	1,2,-	-	1,2,-

3.5 Destroy the service using ResourceLifetime Destroy operation

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	Done	Done	Done	Done
UNICORE	Done	Done	Done	Done
Globus (Java)	Done	Done	Done	Done
USMT	Done	Done	Done	Done

3.6 Terminate the service using ResourceLifetime SetTerminationTime operation

1. Duration
2. Absolute Time

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	1,2	1,2	-	1,2
UNICORE	1,2	1,2	-,2	1,2
Globus (Java)	1,2	1,2	-,2	1,2
USMT	1,2	1,2	-,2	1,2

3.7 BaseFault

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	Done	Done	Done	Done
UNICORE	Done	Done	Done	Done
Globus (Java)	Done	Done	Done	Done
USMT	Done	Done	Done	Done

3.8 Subscribe

1. Using Simple QName filter
2. Using XPath filter

Client \ Service	Genesis II	UNICORE	Globus (Java)	USMT
Genesis II	-	-	-	-
UNICORE	-	1,-	1,-	1,-
Globus (Java)	-	1,-	1,-	1,-
USMT	-	1,-	1,-	1,-

4. Issues

Most of the service implementations have successfully interoperated with the others, despite the fact that some of the specifications or operations were not implemented by various endpoints, for example, QueryResourceProperties operation using XPath query.

Many issues were encountered during this interoperability test event. They are categorized into three types:

- schema error
- platform/tooling incapability
- specification issues

4.1 Schema error

This was the most common cause of an inability to interoperate during the tests and refers to developers having used different schemas or WSDLs than the one that was agreed to in the appendixes of this document. It also occurred when an older version of the namespaces were implemented and not updated for the interop tests.

The solution most often was to use the schema designated for the interop. And as advice to all future interop-fest participants, before you start any implementation, double check the schema and WSDL and make sure they are the correct ones as this will reduce simple, trivial interop issues.

4.2 Platform/tooling inadequacies

Many Web services development platforms exist with various kinds of available tooling, and they all have different characteristics and strength. However, a major side effect of this is that they tend to cause serialization and deserialization problems with generated data types.

Other problems exist concerning faults. For example, the ResourceUnknownFault is still unresolved due to an xfire tooling problem in the UNCORE implementation. Specifically, inheriting the BaseFault type from SOAPFault does not seem to work in the XFire SOAP engine. It is possible to resolve this, but only by changing certain parts of the XFire SOAP engine source code.

4.3 Specification issues

Two issues were identified during the test.

4.3.1 *ISSUE 1* Elements of the Profile are inconsistent to a typical WSRF style

University of Virginia identified this issue. The OGSA WSRF BP1.0 specification (see GFD-R-P.072), mandates the use of the four resource property elements listed below:

- ResourcePropertyNames
- FinalWSResourceInterface
- WSResourceInterfaces
- ResourceEndpointReference

The ResourcePropertyNames and WSResourceInterfaces are defined as a list of all resource property element QNames and a list of all known portTypes respectively. In the OGSA-BP schema <http://schemas.ggf.org/ogsa/2006/05/wsrf-bp>, these two elements are of QNameListType. An example of these properties may be:

```

<ogsa:ResourcePropertyNames>
  wsrf-rl:CurrentTime
  ogsa:ResourceEndpointReference
  ticker:Ticker
  ogsa:FinalWSResourceInterface
  wsrf-rl:TerminationTime
  ogsa:WSResourceInterfaces
  ogsa:ResourcePropertyNames
</ogsa:ResourcePropertyNames>

```

However, a more consistent (with respect to WSRF) rendering would be:

```

<ogsa:ResourcePropertyName>
  wsrf-rl:CurrentTime
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  ogsa:ResourceEndpointReference
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  ticker:Ticker
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  ogsa:FinalWSResourceInterface
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  wsrf-rl:TerminationTime
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  ogsa:WSResourceInterfaces
</ogsa:ResourcePropertyName>
<ogsa:ResourcePropertyName>
  ogsa:ResourcePropertyNames
</ogsa:ResourcePropertyNames>

```

Proposed solution

Element <ResourcePropertyNames>

Remove plural on this element, so on page 19 of the Profile Appendix C.1 the title becomes: ResourcePropertyName Resource Property Element Definition
And the general form will be:

```

<ogsa-bp:ResourcePropertyName>
  xsd:QName
</ogsa-bp:ResourcePropertyName>

```

And the cardinality becomes:

```

<xsd:element ref="ogsa-bp:ResourcePropertyName"
  minOccurs="1" maxOccurs="unbounded" />

```

The element definition in the schema document will be:

```
<xsd:element name="ResourcePropertyName" type="xsd:QName" />
```

Element <WSResourceInterfaces>

Remove plural on this element, so on page 19 of the Profile Appendix C.3, the title becomes: WSResourceInterface Resource Property Element Definition

And the general form will be:

```
<ogsa-bp:WSResourceInterface>
  xsd:QName
</ogsa-bp:WSResourceInterface>
```

Its cardinality becomes:

```
<xsd:element ref="ogsa-bp:WSResourceInterface"
  minOccurs="0" maxOccurs="unbounded" />
```

The element definition in the schema document will be:

```
<xsd:element name="WSResourceInterface" type="xsd:QName" />
```

4.3.2 ISSUE 2 The ambiguous rendering in the complexType TopicExpressionType Simple dialect

Fujitsu Labs of Europe identified this issue. The WS-Notification and WS-Topics specifications do not contain any clear normative text mandating the exact serialization of topic QName when using the Simple dialect, e.g., no "MUST" etc. in the context. However, they indicate in the XML Schema that the authors of the specification may have had an element-based rendering in mind. The specification contains an XML type definition for the Simple dialect. It does not, however, contain an XML element definition to use for the Simple dialect.

Proposed solution

Mandate the use of the WS-BaseNotification dialect URI and the SimpleTopicExpression XML type defined in WS-Topics, but in the mean time, to introduce an OGSA BP specific XML element of the BaseNotification data type.

An example may look like this:

```
<xsd:element name="Topic" type="wstop:SimpleTopicExpression" />
```

This way, implementers will have to tool up only one new XML element, and some application logic to extract the topic QName, which should be trivial regardless the tooling platform.

5. Security Considerations

To avoid complications, the design of the interoperability testing scenarios avoided security issues addressed in the basic profile, despite the fact that the specification of the Profile mandates composition with an OGSA Basic Security profile.

6. Author Information

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7. Contributors

We gratefully acknowledge the contributions from Rachana Ananthkrishnan, Michel Drescher, Donald Fellows, Tom Howe, Hiro Kishimoto, Shiraz Memon, Mark Morgan, Andreas Savva, Dave Snelling, Ian Foster, and Tom Maguire.

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http://docs.oasis-open.org/wsrf/wsrf-ws_resource_lifetime-1.2-spec-os.pdf

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http://docs.oasis-open.org/wsrf/wsrf-ws_base_faults-1.2-spec-os.pdf

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http://docs.oasis-open.org/wsn/wsn-ws_base_notification-1.3-spec-os.pdf

[WS-Topics] S. Graham, W. Vambenepe and P. Niblett (ed.) Web Services Topics 1.3 (WS-Topics), OASIS Standard, 1 October 2006. http://docs.oasis-open.org/wsn/wsn-ws_topics-1.3-spec-os.pdf

Appendix A Interoperability Testing Specification

This appendix defines a set of scenarios that will be used in the OGSA WSRF Basic Profile (hereafter the Profile) interoperability workshop. In particular, it will focus on the following topics that the OGSA Basic Profile specification addressed, they are:

- WS-Addressing
- WS-Resource Properties
 - From the Profile
 - ResourcePropertyNames
 - FinalWSResourceInterface
 - WSResourceInterfaces
 - ResourceEndpointReference
 - From Resource Lifetime
 - CurrentTime
 - TerminationTime
- WS-Resource Properties Operations
 - GetResourceProperty
 - GetMultipleResourceProperties
 - QueryResourceProperties
- WS-Resource Lifetime
 - Destroy
 - SetTerminationTime
- WS-Notification
 - Subscription
 - Resource Property Change Notification
 - Notify
- WS-Base Fault

The scenarios are based on a Ticker service that will tick in a designated interval, this provide a simple service to test WSRF resource properties, operations, lifetime, and particularly notification easily. The creation of a ticker object is done via a factory on request.

A.1. Scope

To avoid complication this document tries to avoid security issues addressed in the basic profile, although the specification of the Profile mandates composition with an OGSA Basic Security profile.

A.2. Terminology

The keywords “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in RFC2119.

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 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/>).

A.3. Namespaces

The following namespaces are used in this document:

Prefix	Namespace
ogsa-bp	http://schemas.ggf.org/ogsa/2006/05/wsrf-bp
xsd	http://www.w3.org/2001/XMLSchema
soap	http://schemas.xmlsoap.org/soap/envelope
wsdl	http://schemas.xmlsoap.org/wsdl
wsa	http://www.w3.org/2005/08/addressing
wsrf-bf	http://docs.oasis-open.org/wsrf/bf-2
wsrf-r	http://docs.oasis-open.org/wsrf/r-2
wsrf-rp	http://docs.oasis-open.org/wsrf/rp-2
wsrf-rpw	http://docs.oasis-open.org/wsrf/rpw-2
wsrf-rl	http://docs.oasis-open.org/wsrf/rl-2
wsrf-rlw	http://docs.oasis-open.org/wsrf/rlw-2
wsnt	http://docs.oasis-open.org/wsn/b-2
wsntw	http://docs.oasis-open.org/wsn/bw-2
ticker	http://schemas.ggf.org/ogsa/2007/12/wsrf-bp-interop/ticker
factory	http://schemas.ggf.org/ogsa/2007/12/wsrf-bp-interop/ticker-factory

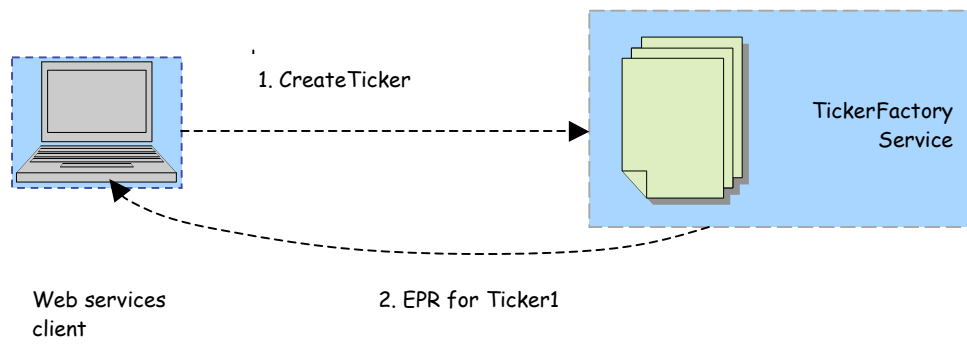
Appendix B Ticker Factory Service

In OGSA, factory operations are not standardised, Web services endpoints are obtained either from the beginning, or through other discovery mechanisms. However, to simplify the interoperability test, this document defines a complete factory service to create ticker service instances. The access to the factory service is through a published addressing URL. A factory service contains only one operation, called CreateTicker.

```
<soap:Body>
  <ticker-factory:CreateTicker
    xmlns=http://www.w3.org/2005/08/addressing
    xmlns:ticker-factory="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
      interop/ticker-factory"/>
</soap:Body>
```

and a response should contain an EndpointReference to a ticker service instance.

```
<soap:Body>
  <ticker-factory:CreateTickerResponse
    xmlns="http://www.w3.org/2005/08/addressing"
    xmlns:ticker-factory="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
      interop/ticker-factory">
    <ticker-factory:TickerReference>
      <Address>
        http://193.122.18.162:8080/ogsabp-interop/ticker
      </Address>
      <ReferenceParameters>
        <jaxws:objectId
          xmlns:jaxws="http://jax-ws.dev.java.net/xml/ns/"
          xmlns:wsa="http://www.w3.org/2005/08/addressing">
          ca1124a5-6d11-4160-b21b-c46709344317
        </jaxws:objectId>
      </ReferenceParameters>
      <Metadata>
        <ServiceName:ServiceName
          xmlns:ServiceName="http://www.w3.org/2007/05/addressing/metadata"
          xmlns:ns2="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker"
          xmlns:ns6="http://www.w3.org/2007/05/addressing/metadata"
          EndpointName="TickerPort"> ticker-
          factory:TickerService</ServiceName:ServiceName>
        <WSDLLocation:WSDLLocation
          xmlns:WSDLLocation="http://usmt.fujitsu.com/nucleus/ext/addressing"
          xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">http://193.122.18.16
          2:8080/ogsabp-interop/ticker?wsdl</WSDLLocation:WSDLLocation>
        </Metadata>
      </ns2:TickerReference>
    </ns2:CreateTickerResponse>
</soap:Body>
```



Appendix C Ticker Service

This section defines resource properties and operations of a ticker service in the interoperability test.

C. 1. Ticker service resource properties

A ticker service has only one native resource property, the primitive long type “Ticker” property, which indicates a ticker service instance’s ticking frequency. A default value is set to 30 seconds, and should be changeable by using either WSRF UpdateResourceProperty operation or SetResourceProperties operation. However, this will not be normatively defined in this interoperability test document. The Ticker resource property looks like:

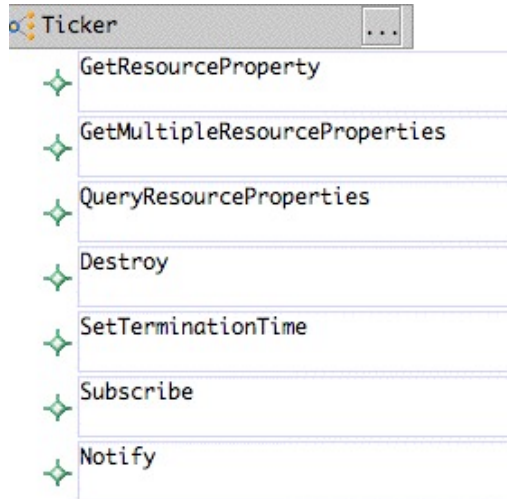
```
<xsd:element name="Ticker" type="xsd:long" />
```

Since the Ticker service conforms to the Profile, it should also contain resource properties recommended and defined by the Profile, this includes Resource lifetime properties wsrf-rlw:CurrentTime, wsrf-rlw:TerminationTime, and the four mandatory resource properties from the Profile, these are summarised in the following table:

Property Name	Type	Cardinality	Comments
Ticker	long	1	
CurrentTime	dateTime	1	
TerminationTime	dateTime	1	
ResourcePropertyNames	QNameListType	1	
FinalWSResourceInterface	QName	1	
WSResourceInterfaces	QNameListType	1	
ResourceEndpointReference	EndpointReferenceType	1	

C. 2. Ticker service interoperability operations

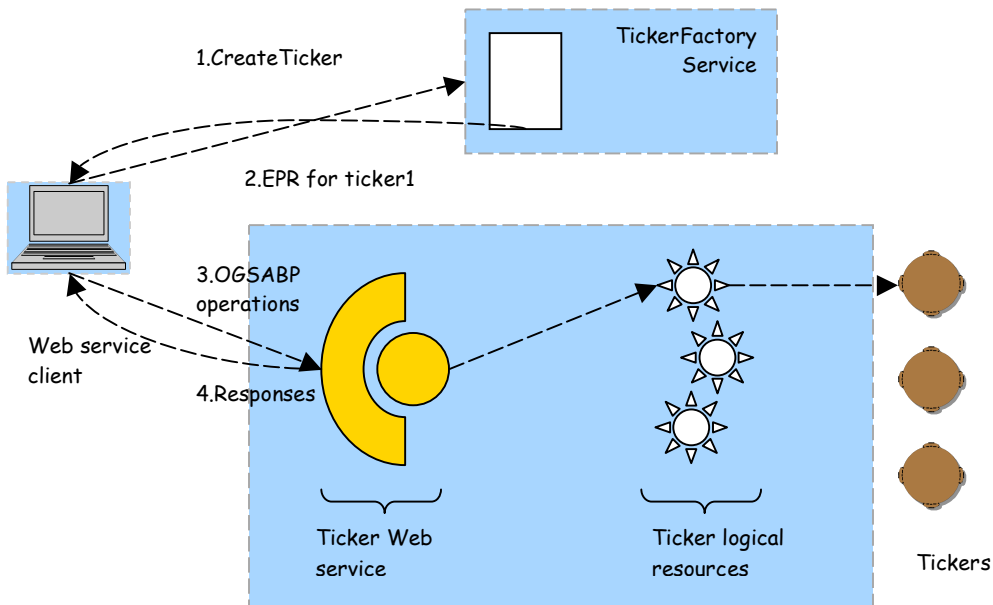
All the operations that are going to be tested in this interoperability tests are as follows:



Appendix D WSRF Basic Profile interoperability test scenarios

D. 1 . Scenario A: Initial Creation of a ticker service instance

A Web service client should contact any factory endpoint published by interoperability participants by sending a CreateTicker request, a successful response should contain an EndpointReference of the Ticker service instance. In the case of not successful, the service fails silently with an empty response.



D. 2 . Scenario B: OGSA Resource Properties Tests

Ticker WS Resources are accessed using endpoint references created by the TickerFactory Web service. WSRF operations can be used to get and query the ticker's OGSA resource properties. These operations are:

- GetResoruceProperty
- GetMultipleResourceProperties
- QueryResourceProperties

D. 2 . 1 .Test 1: ResourcePropertyNames

A *GetResourceProperty* operation on this property looks like:

```
<soap:Body>
  <wsrf-rp:GetResourceProperty
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
```

```

        xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
        ogsa:ResourcePropertyNames
    </wsrf-rp:GetResourceProperty>
</soap:Body>

```

and the response message should look like:

```

<soap:Body>
  <wsrf-rp:GetResourcePropertyResponse xmlns:wsrf-rp="http://docs.oasis-
  -open.org/wsrf/rp- 2">
    <ogsa:ResourcePropertyNames
      xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
      xmlns:ticker="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
      -interop/ticker"
      xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2">
      wsrf-rl:CurrentTime
      ogsa:ResourceEndpointReference
      ticker:Ticker
      ogsa:FinalWSResourceInterface
      wsrf-rl:TerminationTime
      ogsa:WSResourceInterfaces
    </ogsa:ResourcePropertyNames>
  </wsrf-rp:GetResourcePropertyResponse>
</soap:Body>

```

A *GetMultipleResourceProperties* operation on this property looks like:

```

<soap:Body>
  <wsrf-rp:GetMultipleResourceProperties
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2">
    <wsrf-rp:ResourceProperty
      xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
      ogsa:ResourcePropertyNames
    </wsrf-rp:ResourceProperty>
    <wsrf-rp:ResourceProperty
      xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2">
      wsrf-rl:CurrentTime
    </wsrf-rp:ResourceProperty>
  </wsrf-rp:GetMultipleResourceProperties>
</soap:Body>

```

And the response:

```
<soap:Body>
  <wsrf-rp:GetMultipleResourcePropertiesResponse
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
    xmlns:ns2="http://www.w3.org/2005/08/addressing"
    xmlns:ns3="http://docs.oasis-open.org/wsn/b-2"
    xmlns:ns4="http://docs.oasis-open.org/wsrf/bf-2"
    xmlns:ns5="http://docs.oasis-open.org/wsn/t-1"
    xmlns:ns6="http://schemas.ogf.org/rm/2007/05/lifecycle"
    xmlns:ns9="http://usmt.fujitsu.com/nucleus/ext/addressing"
    xmlns:ns10="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
    xmlns:ns11="http://docs.oasis-open.org/wsrf/r-2"
    xmlns:ns12="http://www.w3.org/2007/05/addressing/metadata">
    <wsrf-rl:CurrentTime>2008-02-12T15:38:59.840Z</wsrf-rl:CurrentTime>
    <ogsa:ResourcePropertyNames
      ="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker">
      ns10:ResourceEndpointReference
      ns6:CommissioningParameterName
      ns6:LifecycleState
      ns6:ActivationParameterName
      wsrf-rl:TerminationTime
      ns10:FinalWSResourceInterface
      wsrf-rl:CurrentTime
      ns6:ActivationParameterValues
      ns10:ResourcePropertyNames
      ns6:CommissioningParameterValues
      ns3:FixedTopicSet
      ns10:WSResourceInterfaces
      ns3:TopicExpressionDialect
      Ticker
      ns3:TopicExpression
      ns6:PreviousLifecycleState
    </ogsa:ResourcePropertyNames>
  </wsrf-rp:GetMultipleResourcePropertiesResponse>
</soap:Body>
```

A QueryResourceProperties operation on this property looks like:

And the response:

D. 2. 2. Test 2: FinalWSResourceInterface

A *GetResourceProperty* operation on this property looks like:

```
<soap:Body>
  <wsrf-rp:GetResourceProperty
    xmlns:rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    ogsa:FinalWSResourceInterface
  </wsrf-rp:GetResourceProperty>
</soap:Body>
```

and the response message should look like:

```
<soap:Body>
  <wsrf-rp:GetResourcePropertyResponse
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2">
    <ogsa:FinalWSResourceInterface
      xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
      xmlns:ticker="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp
        -interop/ticker">
      ticker:Ticker
    </ogsa:FinalWSResourceInterface>
  </wsrf-rp:GetResourcePropertyResponse>
</soap:Body>
```

A *GetMultipleResourceProperties* operation on this property looks like:

```
<soap:Body>
  <wsrf-rp:GetMultipleResourceProperties
    xmlns:wsrf-rp="http://ocs.oasis-open.org/wsrf/rp-2"
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    <wsrf-rp:ResourceProperty>
      wsrf-rl:CurrentTime
    </wsrf-rp:ResourceProperty>
    <wsrf-rp:ResourceProperty>
      wsrf-rl:TerminationTime
    </wsrf-rp:ResourceProperty>
    <wsrf-rp:ResourceProperty>
      ogsa:FinalWSResourceInterface
    </wsrf-rp:ResourceProperty>
  </wsrf-rp:GetMultipleResourceProperties>
</soap:Body>
```

And the response:

```
<soap:Body>
  <wsrf-rp:GetMultipleResourcePropertiesResponse
    xmlns:wsrf-rl=http://docs.oasis-open.org/wsrf/rl-2
    xmlns:wsrf-rp=http://docs.oasis-open.org/wsrf/rp-2
```

```

xmlns:ogsa=http://schemas.ggf.org/ogsa/2006/05/wsrf-bp>
<wsrf-rl:CurrentTime>
    2008-02-12T15:39:00.131Z
</wsrf-rl:CurrentTime>
<ogsa:FinalWSResourceInterface
xmlns="http://schemas.ggf.org/ogsa/2007/12/wsrf-bp-interop/ticker">
    Ticker
</ogsa:FinalWSResourceInterface>
</wsrf-rp:GetMultipleResourcePropertiesResponse>
</soap:Body>

```

A QueryResourceProperties operation on this property looks like:

And the response:

D. 2. 3. Test 3: WSResourceInterfaces

A GetResourceProperty operation on this property looks like:

```

<soap:Body>
  <wsrf-rp:GetResourceProperty
xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    ogsa:WSResourceInterfaces
  </wsrf-rp:GetResourceProperty>
</soap:Body>

```

and the response message should look like:

```

<soap:Body>
  <wsrf-rp:GetResourcePropertyResponse
xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2">
    <WSResourceInterfaces
xmlns="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
xmlns:ticker="http://schemas.ggf.org/ogsa/2007/12/wsrf-bp
-interop/ticker"
xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rpw-2"
xmlns:wsrf-rl=http://docs.oasis-open.org/wsrf/rlw-2>
      wsrf-rl:ScheduledResourceTermination
      wsrf-rp:GetResourceProperty
      ticker:Ticker
      wsrf-rp:GetResourcePropertyDocument
      wsrf-rl:ImmediateResourceTermination
      wsrf-rp:QueryResourceProperties
    </WSResourceInterfaces>

```

```
</wsrf-rp:GetResourcePropertyResponse>
</soap:Body>
```

A *GetMultipleResourceProperties* operation on this property looks like:

```
<soap:Body>
  <wsrf-rp:GetMultipleResourceProperties
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    <wsrf-rp:ResourceProperty>
      wsrf-rl:CurrentTime
    </wsrf-rp:ResourceProperty>
    <wsrf-rp:ResourceProperty>
      wsrf-rl:TerminationTime
    </wsrf-rp:ResourceProperty>
    <wsrf-rp:ResourceProperty>
      ogsa:WSResourceInterfaces
    </wsrf-rp:ResourceProperty>
  </wsrf-rp:GetMultipleResourceProperties>
</soap:Body>
```

And the response:

```
<soap:Body>
  <wsrf-rp:GetMultipleResourcePropertiesResponse
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    <wsrf-rl:CurrentTime>2008-02-12T15:39:00.561Z</wsrf-rl:CurrentTime>
    <ogsa:WSResourceInterfaces
      xmlns="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker"
      xmlns:usmt="http://usmt.fujitsu.com/service/basicService"
      xmlns:nt="http://docs.oasis-open.org/wsn/bw-2"
      xmlns:wsrf-lc="http://schemas.ogf.org/rm/2007/05/lifecycle"
      xmlns:wsrf-rlw="http://docs.oasis-open.org/wsrf/rlw-2"
      xmlns:wsrf-rpw="http://docs.oasis-open.org/wsrf/rpw-2"
      xmlns:rw="http://docs.oasis-open.org/wsrf/rw-2">
      Ticker usmt:USMTBasicService
      nt:NotificationProducer
      nt:NotificationConsumer
      wsrf-lc:WSResourceLifecycle
      wsrf-rlw:ImmediateResourceTermination
      wsrf-rlw:ScheduledResourceTermination
      wsrf-rpw:GetResourceProperty
      wsrf-rpw:GetMultipleResourceProperties
    </ogsa:WSResourceInterfaces>
  </wsrf-rp:GetMultipleResourcePropertiesResponse>
</soap:Body>
```

```

        rw:WSResource
    </ogsa:WSResourceInterfaces>
</wsrf-rp:GetMultipleResourcePropertiesResponse>
</soap:Body>

```

A QueryResourceProperties operation on this property looks like:

And the response:

D. 2. 4. Test 4: ResourceEndpointReference

A *GetResourceProperty* operation on this property looks like:

```

<soap:Body>
  <wsrf-rp:GetResourceProperty
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    ogsa:ResourceEndpointReference
  </wsrf-rp:GetResourceProperty>
</soap:Body>

```

and the response message should look like:

```

<soap:Body>
  <wsrf-rp:GetResourcePropertyResponse
    xmlns:rp="http://docs.oasis-open.org/wsrf/rp-2">
    <ticker:Ticker
      xmlns:ticker=http://schemas.ggf.org/ogsa/2007/12/wsrf-bp-interop/ticker>
      0
    </ticker:Ticker>
  </wsrf-rp:GetResourcePropertyResponse>
</soap:Body>

```

A *GetMultipleResourceProperties* operation on this property looks like:

```

<soap:Body>
  <wsrf-rp:GetMultipleResourceProperties
    xmlns:wsrf-rp="http://ocs.oasis-open.org/wsrf/rp-2"
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp">
    <ogsa:ResourceProperty>wsrf-rl:CurrentTime</ogsa:ResourceProperty>
    <ogsa:ResourceProperty>
      ogsa:ResourceEndpointReference
    </ogsa:ResourceProperty>
  </wsrf-rp:GetMultipleResourceProperties>
</soap:Body>

```

```

    </ogsa:ResourceProperty>
  </wsrf-rp:GetMultipleResourceProperties>
</soap:Body>

```

And the response:

```

<soap:Body>
  <wsrf-rp:GetMultipleResourcePropertiesResponse
    xmlns:wsa="http://www.w3.org/2005/08/addressing"
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:ogsa="http://schemas.ggf.org/ogsa/2006/05/wsrf-bp"
    xmlns:wsa-meta="http://www.w3.org/2007/05/addressing/metadata"
    xmlns:usmt-adress="http://usmt.fujitsu.com/nucleus/ext/addressing">
    <wsrf-rl:CurrentTime>
      2008-02-12T15:39:00.349Z
    </wsrf-rl:CurrentTime>
    <ogsa:ResourceEndpointReference>
      <wsa:Address>
        http://193.122.18.162:8080/ogsabp-interop/ticker
      </wsa:Address>
      <wsa:ReferenceParameters>
        <jaxws:objectId
          xmlns:jaxws="http://jax-ws.dev.java.net/xml/ns/"
          xmlns=http://www.w3.org/2005/08/addressing
          xmlns:wsa="http://www.w3.org/2005/08/addressing">
          ca1124a5-6d11-4160-b21b-c46709344317
        </jaxws:objectId>
      </wsa:ReferenceParameters>
      <wsa:Metadata>
        <wsa-meta:ServiceName xmlns=""
xmlns:ticker=http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker
xmlns:wsa-meta="http://www.w3.org/2007/05/addressing/metadata"
EndpointName="TickerPort">
          ticker:TickerService
        </wsa-meta:ServiceName>
        <usmt-adress:WSDLLocation
          xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">
          http://193.122.18.162:8080/ogsabp-interop/ticker?wsdl
        </usmt-adress:WSDLLocation>
      </wsa-meta:Metadata>
    </wsa:ResourceEndpointReference>
  </wsrf-rp:GetMultipleResourcePropertiesResponse>
</soap:Body>

```

A QueryResourceProperties operation on this property looks like:

And the response:

D. 3 . Scenario C: Resource Lifetime Operations and Base Fault

A Ticker service MUST also support Resource lifetime operations.

D. 3 . 1 . Test 5: Immediate Resource Termination and Base Fault

After a Ticker resource has been created from Scenario A, it can be terminated via the Destroy operation from the Resource Lifetime:

```
<soap:Body>
  <wsrf-rl:Destroy
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2" />
</soap:Body>
```

A successful Destroy response should look like:

```
<soap:Body>
  <wsrf-rl:DestroyResponse
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2" />
</soap:Body>
```

A second Destroy request should result in a “ResourceUnknownFault” in response. This fault is an extension to BaseFault.

D. 3 . 2 . Test 6: Scheduled Resource Termination and Base Fault

An alternative way to terminate a Ticker resource is through the SetTerminationTime operation. By invoking this operation, the Lifetime resource property TerminationTime is set to the value as required in the SetTerminationTime request message, and the Ticker resource should be destructed in a future time specified by the TerminationTime resource property, to simplify the test, 1-2 minutes into the future is recommended. The request message should look like:

```
<soap:Body>
  <wsrf-rl:SetTerminationTime
    xmlns:rl="http://docs.oasis-open.org/wsrf/rl-2">
    <wsrf-rl:RequestedTerminationTime>
      2008-11- 29T00:06:01.211Z
    </wsrf-rl:RequestedTerminationTime>
  </wsrf-rl:SetTerminationTime>
</soap:Body>
```

```
</wsrf-rl:SetTerminationTime>
</soap:Body>
```

and a successful response should look like:

```
<soap:Body>
  <wsrf-rl:SetTerminationTimeResponse
    xmlns:wsrf-rl="http://docs.oasis-open.org/wsrf/rl-2">
    <wsrf-rl:NewTerminationTime>
      2008-11-29T00:06:01.211Z
    </wsrf-rl:NewTerminationTime>
    <wsrf-rl:CurrentTime>
      2008-11-29T00:06:01.211Z
    </wsrf-rl:CurrentTime>
    </wsrf-rl:SetTerminationTimeResponse>
  </soap:Body>
```

To verify if the Ticker service instance has been terminated at the required time, any operations from the above scenarios can be called again, and a "ResourceUnknownFault" should be expected in response if the SetTerminationTime operation is successful.

D. 4. Scenario D: Base Notification

To test ResourcePropertyChangeNotification, an implementation should implement Notification Producer to produce the notification messages, and Notification Consumer to get notified by other servers' notifications. In this test, a client should invoke a "Subscribe" operation first on the Ticker property to the remote site, since this is the only property whose value changes in certain frequency.

D. 4. 1. Test 8: Subscribe

an example of Subscribe request on the Ticker resource property should look like this:

```
<soap:Body>
  <wsn:Subscribe xmlns:wsrf-rp="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:wsa="http://www.w3.org/2005/08/addressing"
    xmlns:wsn="http://docs.oasis-open.org/wsn/b-2"
    xmlns:usmt-adress="http://usmt.fujitsu.com/nucleus/ext/addressing"
    xmlns:wsa-meta=http://www.w3.org/2007/05/addressing/metadata>
    <wsn:ConsumerReference>
      <wsa:Address>
        http://86.0.247.126:58080/SimpleNotificationConsumer
      </wsa:Address>
    </wsn:ConsumerReference>
    <wsa:ReferenceParameters/>
    <wsa:Metadata>
      <wsa-meta:ServiceName xmlns=""
        xmlns:wsrf-rp="http://schemas.ogf.org/ogsa/2007/10/bp_interop"
        xmlns:ns17="http://www.w3.org/2007/05/addressing/metadata"
```

```

EndpointName="OGSABPNotificationConsumerPort">
  wsrf-rp:OGSABPNotificationConsumerService
</wsa-meta:ServiceName>
<usmt-adress:WSDLLocation
  xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">
  http://86.0.247.126:58080/SimpleNotificationConsumer?wsdl
</usmt-adress:WSDLLocation>
</wsa:Metadata>
</wsn:ConsumerReference>
<wsn:Filter>
  <wsn:TopicExpression Dialect="http://docs.oasis
    -open.org/wsn/t-1/TopicExpression/Simple">
    {http://schemas.ogf.org/ogsa/2007/12/wsrf-bp
      -interop/ticker}Ticker
  </wsn:TopicExpression>
</wsn:Filter>
<wsn:InitialTerminationTime>
  PT15M0.000S
</wsn:InitialTerminationTime>
</wsn:Subscribe>
</soap:Body>

```

and the response should look as follows, if the request is successful:

```

<soap:Body>
  <wsn:SubscribeResponse xmlns="http://www.w3.org/2005/08/addressing"
    xmlns:wsn="http://docs.oasis-open.org/wsn/b-2"
    xmlns:usmt-adress="http://usmt.fujitsu.com/nucleus/ext/addressing"
    xmlns:ns9="http://schemas.ogf.org/ogsa/2006/05/wsrf-bp"
    xmlns:ns10="http://docs.oasis-open.org/wsrf/r-2"
    xmlns:wsa-meta="http://www.w3.org/2007/05/addressing/metadata">
    <wsn:SubscriptionReference>
      <Address>
        http://193.122.18.162:8080/ogsabpinterop/subscription
      </Address>
      <ReferenceParameters>
        <jaxws:objectId
          xmlns:jaxws="http://jax-ws.dev.java.net/xml/ns/"
          xmlns:wsa="http://www.w3.org/2005/08/addressing">
          a5bedfd2-b487-46dd-81bc-6f5df68d1ef4
        </jaxws:objectId>
      </ReferenceParameters>
      <Metadata>
        <wsa-meta:ServiceName xmlns=""
          xmlns:wsn="http://docs.oasis-open.org/wsn/bw-2"
          EndpointName="SubscriptionManagerPort">
          wsn:SubscriptionManagerService
        </wsa-meta:ServiceName>
        <usmt-adress:WSDLLocation

```

```
        xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">
        http://193.122.18.162:8080/ogsabp-interop/subscription?wsdl
        </usmt-adress:WSDLLocation>
        </Metadata>
        </wsn:SubscriptionReference>
        <wsn:TerminationTime>
        2008-02-12T15:54:05.740Z
        </wsn:TerminationTime>
        </wsn:SubscribeResponse>
</soap:Body>
```

D. 4. 2. Scenario D2: Notify

If a subscription is successful, the Notification Producer should send out a Notify message to the client whenever the value of this Ticker resource property changes. A sample Notify message should look like:

```
<soap:Body>
  <ns6:Notify
    xmlns:ns2="http://docs.oasis-open.org/wsn/t-1"
    xmlns:ns3="http://docs.oasis-open.org/wsrf/rp-2"
    xmlns:ns4="http://docs.oasis-open.org/wsrf/bf-2"
    xmlns:ns5="http://www.w3.org/2005/08/addressing"
    xmlns:ns6="http://docs.oasis-open.org/wsn/b-2"
    xmlns:ns7="http://usmt.fujitsu.com/nucleus/service/factory"
    xmlns:ns8="http://docs.oasis-open.org/wsrf/rl-2"
    xmlns:ns9="http://usmt.fujitsu.com/nucleus/ext/addressing"
    xmlns:ns10="http://schemas.ogf.org/rm/2007/05/lifecycle"
    xmlns:ns12="http://usmt.fujitsu.com/nucleus/service/registry"
    xmlns:ns13="http://www.w3.org/2007/05/addressing/metadata"
    xmlns:ns14="http://schemas.ogf.org/ogsa/2006/05/wsrf-bp"
    xmlns:ns15="http://docs.oasis-open.org/wsrf/r-2">
    <ns6:NotificationMessage>
      <ns6:SubscriptionReference>
        <ns5:Address>
          http://86.0.247.126:8080/ogsabp-interop/subscription
        </ns5:Address>
        <ns5:ReferenceParameters>
          <jaxws:objectId
            xmlns:jaxws="http://jax-ws.dev.java.net/xml/ns/"
            xmlns="http://www.w3.org/2005/08/addressing"
            xmlns:wsa="http://www.w3.org/2005/08/addressing">
            23521533-5972-49c4-b084-68392323179a
          </jaxws:objectId>
        </ns5:ReferenceParameters>
        <ns5:Metadata>
          <ns13:ServiceName xmlns=""
            xmlns:ns2="http://docs.oasis-open.org/wsn/bw-2"
            xmlns:ns18="http://www.w3.org/2007/05/addressing/metadata"
            EndpointName="SubscriptionManagerPort">
            ns2:SubscriptionManagerService
          </ns13:ServiceName>
          <ns9:WSDLLocation
            xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">
            http://86.0.247.126:8080/ogsabp-
            interop/subscription?wsdl
          </ns9:WSDLLocation>
        </ns5:Metadata>
      </ns6:SubscriptionReference>
      <ns6:Topic Dialect="http://docs.oasis-open.org/wsn/t-
```

```

1/TopicExpression/Simple">
{http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker}Ticker
  </ns6:Topic>
  <ns6:ProducerReference>
    <ns5:Address>
      http://86.0.247.126:8080/ogsabp-interop/ticker
    </ns5:Address>
    <ns5:ReferenceParameters>
      <jaxws:objectId>
        xmlns:jaxws="http://jax-ws.dev.java.net/xml/ns/"
        xmlns="http://www.w3.org/2005/08/addressing"
        xmlns:wsa="http://www.w3.org/2005/08/addressing">
          55f37800-aff8-4d25-a26c-4af05300ef40
        </jaxws:objectId>
      </ns5:ReferenceParameters>
      <ns5:Metadata>
        <ns13:ServiceName xmlns=""
xmlns:ns2="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker"
xmlns:ns18="http://www.w3.org/2007/05/addressing/metadata"
EndpointName="TickerPort">ns2:TickerService
        </ns13:ServiceName>
        <ns9:WSDLLocation
xmlns="http://usmt.fujitsu.com/nucleus/ext/addressing">
          http://86.0.247.126:8080/ogsabp-interop/ticker?wsdl
        </ns9:WSDLLocation>
      </ns5:Metadata>
    </ns6:ProducerReference>
    <ns6:Message>
      <ns3:ResourcePropertyValueChangeNotification>
        <ns3:NewValues>
          <ns16:Ticker
xmlns:ns16="http://schemas.ogf.org/ogsa/2007/12
/wsrf-bp-interop/ticker">3
          </ns16:Ticker>
        </ns3:NewValues>
      </ns3:ResourcePropertyValueChangeNotification>
    </ns6:Message>
  </ns6:NotificationMessage>
</ns6:Notify>
</soap:Body>

```

Appendix E Normative Factory Service Schema

This Appendix normatively defines the Ticker factory interface, any OGSA Basic Profile implementation must support either directly or indirectly:

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

```
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  targetNamespace="http://schemas.ogf.org/ogsa/2007/12/
    wsrf-bp-interop/ticker-factory"
  xmlns:wsa="http://www.w3.org/2005/08/addressing"
  elementFormDefault="qualified"
  attributeFormDefault="unqualified">

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

  <!--
    message used to create a Ticker WS-Resource
  -->
  <xsd:element name="CreateTicker">
    <xsd:complexType/>
  </xsd:element>

  <!--
    the response, simply contains an EPR to a new Ticker resource
  -->
  <xsd:element name="CreateTickerResponse">
    <xsd:complexType>
      <xsd:sequence>
        <xsd:element name="TickerReference"
          type="wsa:EndpointReferenceType" />
      </xsd:sequence>
    </xsd:complexType>
  </xsd:element>

</xsd:schema>
```

Note: The node “//wsdl:definitions/wsdl:service/wsdl:port/soap:address@location” MAY be altered to suit the needs of concrete interoperability tests without violating the normative requirements of this document.

Appendix F Normative Factory Service WSDL

This section normatively defines the transport binding any Random Access ByteIO implementation MUST support to participate in Interoperability tests. This does not restrict the implementation by no means to support other transport bindings.

```
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-->
```

```

<wsdl:definitions
  targetNamespace="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
    interop/ticker-factory"
  xmlns:factory="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
    -interop/tickerfactory"
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/">

  <wsdl:types>
    <xsd:schema targetNamespace="http://schemas.ogf.org/ogsa/2007/12/
      wsrf-bp-interop/ticker-factory" >
      <xsd:include schemaLocation="wsrfbp-interop-factory.xsd" />
    </xsd:schema>
  </wsdl:types>

  <wsdl:message name="CreateTickerRequest">
    <wsdl:part name="CreateTicker"
      element="factory:CreateTicker" />
  </wsdl:message>

  <wsdl:message name="CreateTickerResponse">
    <wsdl:part name="CreateTickerResponse"
      element="factory:CreateTickerResponse" />
  </wsdl:message>

  <wsdl:portType name="TickerFactory">
    <wsdl:operation name="CreateTicker">
      <wsdl:input name="CreateTickerRequest"
        message="factory:CreateTickerRequest" />
      <wsdl:output name="CreateTickerResponse"
        message="factory:CreateTickerResponse" />
    </wsdl:operation>
  </wsdl:portType>

  <wsdl:binding name="TickerFactoryHttpBinding"
    type="factory:TickerFactory">
  <soap:binding style="document"
    transport="http://schemas.xmlsoap.org/soap/http" />
    <wsdl:operation name="CreateTicker">
      <soap:operation
        soapAction="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
          interop/ticker-factory/CreateTickerRequest" />
      <wsdl:input name="CreateTickerRequest">
        <soap:body use="literal" />
      </wsdl:input>
      <wsdl:output name="CreateTickerResponse">
        <soap:body use="literal" />
      </wsdl:output>
    </wsdl:operation>
  </wsdl:binding>

```

```
        </wsdl:operation>
    </wsdl:binding>

    <wsdl:service name="TickerFactoryService">
        <wsdl:port name="TickerFactory"
            binding="factory:TickerFactoryHttpBinding">
            <soap:address
                location="http://localhost:8080/services/wsrf-bp-
                    interop/TickerFactoryService"/>
            </wsdl:port>
        </wsdl:service>
    </wsdl:definitions>
```

Note: The node “//wsdl:definitions/wsdl:service/wsdl:port/soap:address@location” MAY be altered to suit the needs of concrete interoperability tests without violating the normative requirements of this document.

Appendix G Normative Ticker Service Schema

This section normatively defines the resource properties of the Ticker service, implementations MUST support to participate in Interoperability tests.

```
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-->
```

```
<xsd:schema
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
                    interop/ticker"
elementFormDefault="qualified" attributeFormDefault="unqualified">

    <!-- Ticker Resource property -->
    <xsd:element name="Ticker" type="xsd:long"/>

</xsd:schema>
```

Note: The node “//wsdl:definitions/wsdl:service/wsdl:port/soap:address@location” MAY be altered to suit the needs of concrete interoperability tests without violating the normative requirements of this document.

Appendix H Normative Ticker Service WSDL

This section normatively defines the resource properties of the Ticker service, implementations MUST support to participate in Interoperability tests.

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

```
targetNamespace="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
                                interop/ticker"
xmlns:ticker="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-interop/ticker"
xmlns:wSDL="http://schemas.xmlsoap.org/wSDL/"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:soap="http://schemas.xmlsoap.org/wSDL/soap/">

<wSDL:types>
  <xsd:schema
    targetNamespace="http://schemas.ogf.org/ogsa/2007/12/wsrf-bp-
                                interop/ticker"
    elementFormDefault="qualified">
    <xsd:include schemaLocation="wsrfbp-interop-ticker.xsd" />
  </xsd:schema>
</wSDL:types>

<wSDL:portType name="Ticker" />

<wSDL:binding name="TickerHttpBinding" type="ticker:Ticker">
  <soap:binding style="document"
    transport="http://schemas.xmlsoap.org/soap/http" />
</wSDL:binding>

<wSDL:service name="TickerService">
  <wSDL:port name="Ticker" binding="ticker:TickerHttpBinding">
    <soap:address location="http://localhost:8080/services/wsrf-bp-
                                interop/TickerService" />
  </wSDL:port>
</wSDL:service>

</wSDL:definitions>
```

Note: The node “//wSDL:definitions/wSDL:service/wSDL:port/soap:address@location” MAY be altered to suit the needs of concrete interoperability tests without violating the normative requirements of this document.