Web Services Service Group 1.2 (WS-ServiceGroup)

Working Draft 04, 18 February 2005

Document identifier:

wsrf-WS-ServiceGroup-1.2-draft-04

Location:

http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.pdf

Editors:

Tom Maguire, IBM <tmaguire@us.ibm.com>
David Snelling, Fujitsu <d.snelling@fle.fujitsu.com>

Abstract:

A ServiceGroup is a heterogeneous by-reference collection of Web services. ServiceGroups can be used to form a wide variety of collections of services or WS-Resources [**WS-Resource**], including registries of services and associated WS-Resources.

Members of a ServiceGroup are represented using components called *entries*. A ServiceGroup entry is a WS-Resource. The Web service associated with a ServiceGroup entry can be composed from a variety of Web services standards including WS-ResourceLifetime [**WS-ResourceLifetime**] which defines standard patterns by which resources can be destroyed, WS-BaseNotification [**WS-BaseNotification**] which defines how third parties may subscribe to be informed of changes to the ServiceGroup and WS-ResourceProperties [**WS-ResourceProperties**] which defines how the properties of a ServiceGroup and its entries are made accessible through a Web service interface.

Status:

This document and associated schema are published by this TC as a "working draft". It is possible that it may change significantly during this process, but should nonetheless provide a stable reference for discussion and early adopters' implementations.

Committee members should send comments on this specification to the wsrf@lists.oasis-open.org list. Others should subscribe to and send comments to the wsrf-comment@lists.oasis-open.org list. To subscribe, send an email message to wsrf-comment-subscribe@lists.oasis-open.org with the word "subscribe" as the body of the message.

For information on whether any patents have been disclosed that may be essential to implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the WSRF TC web page (http://www.oasis-open.org/committees/wsrf/).

Table of Contents

1 Introduction 5
1.1 Goals and Requirements 5
1.1.1 Requirements 5
1.1.2 Non-Goals 6
1.2 Notational Conventions 6
1.3 Namespaces 6
2 Example 8
3 Terminology and Concepts 10
4 Grouping Services 11
5 ServiceGroup 12
5.1 ServiceGroup ResourceProperties 12
5.1.1 MembershipContentRule Resource Property 12
5.1.2 Entry Resource Property 14
5.2 ServiceGroup: Operations 15
6 ServiceGroupEntry 16
6.1 ServiceGroupEntry: Resource Property Declarations 16
6.1.1 ServiceGroupEPR 16
6.1.2 MemberEPR 16
6.1.3 Content 17
6.2 ServiceGroupEntry: Message Exchanges 17
7 ServiceGroupRegistration 18
7.1 ServiceGroupRegistration: Resource Property Declarations 18
7.2 Add 18
7.2.1 Example SOAP Encoding of the Add Message Exchange 20
8 Notification of ServiceGroup Modification 22
8.1 EntryAdditionNotification Message 23
8.2 EntryRemovalNotification Message 24
9 Security Model 26
9.1 Securing the message exchanges 26
9.2 Securing the resource properties 27
9.2.1 A Note on MembershipContentRules 27

70 Appendix A. Acknowledgments 29
71 10 References 30
72 10.1 Normative.....30
73 10.2 Non-Normative 30
74 Appendix B. XML Schema.....32
75 Appendix C. WSDL 1.1.....39
76 Appendix D. Revision History 46
77 Appendix E. Notices.....48
78

1 Introduction

In this document, we consider a distributed computing environment consisting of Web services and resources. A pattern defining the relationship between Web services and resources is detailed in "Web Services Resource" [**WS-Resource**]. The term WS-Resource is used to describe the relationship between a Web service and a resource.

This WS-ServiceGroup specification defines a means by which Web services and WS-Resources can be aggregated or grouped together for a domain specific purpose. In order for requestors to form meaningful queries against the contents of the ServiceGroup, membership in the group must be constrained in some fashion. The constraints for membership are expressed by intension using a classification mechanism. Further, the members of each intension must share a common set of information over which queries can be expressed.

In this specification, the ServiceGroup membership rules, membership constraints and classifications are expressed using the resource property model [**WS-ResourceProperties**]. Groups are defined as a collection of members that meet the constraints of the group. The ServiceGroupRegistration interface extends the basic ServiceGroup capabilities with message exchanges for managing the membership of a ServiceGroup.

The ServiceGroup and ServiceGroupRegistration interfaces defined in this document are commonly expected to be composed with other application domain specific interfaces, which define more specialized interaction with the service group and/or with the services that are members of the service group. For example, specialized interfaces may offer means of querying the contents of the ServiceGroup, and for performing collective operations across members of the ServiceGroup.

WS-ServiceGroup is inspired by a portion of the Global Grid Forum's "Open Grid Services Infrastructure (OGSI) Version 1.0" specification [**OGSI 1.0**].

1.1 Goals and Requirements

The goal of WS-ServiceGroup is to standardize the terminology, concepts, message exchanges, WSDL and XML needed to express the aggregations of Web services and resources as defined by the WS-Resource access pattern [**WS-Resource**].

1.1.1 Requirements

This specification intends to satisfy the following requirements:

- Define the standard resource properties by which a requestor can query and retrieve contents of a service group.
- Define the standard resource properties by which a requestor can query and retrieve details of an entry in the service group.
- Define standard message exchanges and resource properties by which a requestor can add new entries for a member in a service group.

1.1.2 Non-Goals

The following topics are outside the scope of this specification:

- It is not an objective of this specification to define the message exchanges representing the function of a member.

1.2 Notational Conventions

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 [**RFC 2119**].

When describing abstract data models, this specification uses the notational convention used by the [**XML-Infoset**]. Specifically, abstract property names always appear in square brackets (e.g., [some property]).

This specification uses a notational convention, refered to as “Pseudo-schemas” in a fashion similar to the WSDL 2.0 Part 1 specification [**WSDL 2.0**]. A Pseudo-schema uses a BNF-style convention to describe attributes and elements:

- `?' denotes optionality (i.e. zero or one occurrences),
- `*' denotes zero or more occurrences,
- `+' one or more occurrences,
- `[' and `]' are used to form groups,
- `|' represents choice.
- Attributes are conventionally assigned a value which corresponds to their type, as defined in the normative schema.

```
<!-- sample pseudo-schema -->
<element
    required_attribute_of_type_QName="xs:QName"
    optional_attribute_of_type_string="xs:string"? >
  <required_element />
  <optional_element />?
  <one_or_more_of_these_elements />+
  [ <choice_1 /> | <choice_2 /> ]*
</element>
```

1.3 Namespaces

The following namespaces are used in this document:

Prefix	Namespace
s12	http://www.w3.org/2003/05/soap-envelope

xsd	http://www.w3.org/2001/XMLSchema
wsa	http://schemas.xmlsoap.org/ws/2004/08/addressing
wsrf-bf	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-draft-04.xsd
wsrf-rp	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceProperties-1.2-draft-06.xsd
wsrf-rpw	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceProperties-1.2-draft-06.wsdl
wsrf-rl	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceLifetime-1.2-draft-05.xsd
wsrf-rw	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-Resource-1.2-draft-03.wsdl
wsnt	http://docs.oasis-open.org/wsrf/2004/06/wsn-WS-BaseNotification-1.2-draft-01.xsd
wsrf-sg	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd
wsrf-sgw	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.wsdl
wstop	http://docs.oasis-open.org/wsn/2004/06/wsn-WS-Topics-1.2-draft-01.xsd

2 Example

As an example of using a service group, let's consider a group containing services that one has accessed recently. In effect, this is a Web services equivalent of a Web browser's "history" feature. The services that have been accessed can implement any interface. They could be simple Web services or Web services that are part of a WS-Resource, so they can have resource properties or not.

The only constraint the group has on its members is that the membership information of the members contains the date of last interaction with the service and whether the outcome or this interaction was successful or not. This constraint is exposed by the following membership rule:

```
…
<wsrf-sg:MembershipContentRule
  ContentElements="ns1:DateOfLastInvoke ns1:Outcome”/>
…
```

In the schema for the namespace referenced by prefix ns1, ns1:DateOfLastInvoke has been defined as an xsd:dateTime representing when the member service was last invoked and ns1:Outcome has been defined as either "success" or "failure" and is used to represent the outcome of the last invocation.

Let us now modify the example to one where the services invoked can only be of one of two different types: either a catalog service or a purchase service. In addition, if the service invoked was a purchase service, we want the amount of the purchase to be specified as a content element in the membership. The set of rules to describe the constraints of this group now is:

```
…
<wsrf-sg:MembershipContentRule
  ContentElements="ns1:DateOfLastInvoke ns1:Outcome”/>

<wsrf-sg:MembershipContentRule
    MemberInterface="ns2:CatalogPortType"
    ContentElements=""/>

<wsrf-sg:MembershipContentRule
    MemberInterface="ns3:PurchasePortType"
    ContentElements="ns3:PurchaseAmount"/>
…
```

As a result, the WS-Resource that represents the membership of a service of type ns3:PurchasePortType in the service group is guaranteed to include the elements described by the following pseudo-schema:

```
…
```

```
<wsrf-sg:Content>
  <ns1:DateOfLastInvoke>xsd:dateTime</ns1:DateOfLastInvoke>
  <ns1:Outcome>xsd:string</ns1:Outcome>
  <ns3:PurchaseAmount>xsd:nonNegativeInteger</ns3:PurchaseAmount>
</wsrf-sg:Content>
…
```

The WS-Resource that represents the membership of a service of type ns2:CatalogPortType is not required to contain the property ns3:PurchaseAmount.

Once this service group has been established, requestors can retrieve the composition of the group, subscribe for notifications on modification of the group composition (if supported) and retrieve content elements of the memberships by using the mechanisms described in this specification.

3 Terminology and Concepts

The following definitions outline the terminology and usage in this specification. This section gives only brief description of these terms

Member:

- A Web service that belongs to a ServiceGroup. Note, this Web service may be a component of a WS-Resource as defined in “Web Services Resources” [**WS-Resource**].

ServiceGroup:

- A Web service that is a collection of other Web services or WS-Resources and the information that pertains to them. The purpose of the group is application domain specific. The means by which the membership in the ServiceGroup is formed may be through ServiceGroupRegistration, or through other means not defined by this specification.

ServiceGroupEntry:

- An atomic entry in a ServiceGroup which associates a member to a ServiceGroup. A ServiceGroupEntry also contains content information by which the member’s participation in the ServiceGroup is advertised.

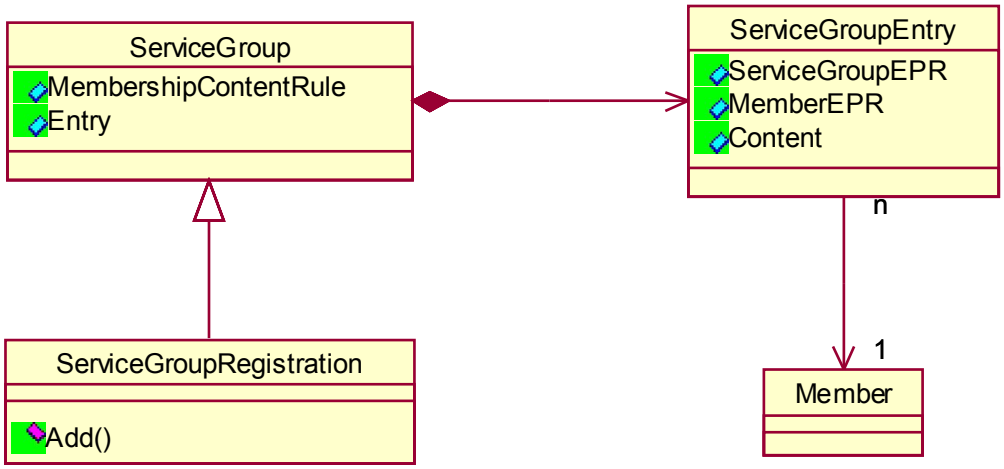
ServiceGroupRegistration:

- A ServiceGroup that provides the means to allow users of the service to explicitly insert new members.

4 Grouping Services

A ServiceGroup maintains information about a collection of Web services. Each of the Web services represented in the collection may be a component of a WS-Resource. These Web services may be members of a ServiceGroup for a specific reason, such as being part of a federated service, or they may have no specific relationship, such as the Web services contained in an index or registry operated for Web service discovery purposes.

Three sets of message exchanges provide the interface to service groups ServiceGroup, ServiceGroupEntry and ServiceGroupRegistration. The member interface is not a part of the WS-ServiceGroup specification but is included for completeness. The depiction below details the interfaces relevant to ServiceGroups.



5 ServiceGroup

A ServiceGroup is a WS-Resource, following the WS-Resource access pattern [**WS-Resource**], which represents a collection of other Web services. The individual services represented within the ServiceGroup are the ServiceGroup's members, or its membership. The model for membership of a ServiceGroup is an *entry* WS-Resource. An entry WS-Resource represents an association with a given member in the ServiceGroup. Additionally a ServiceGroup has the following characteristics:

- When a ServiceGroup WS-Resource is destroyed, all of the ServiceGroupEntry WS-Resources, modeling the membership of the ServiceGroup, are also RECOMMENDED to be destroyed. Note however, that the actual member Web services or WS-Resources are not affected.
- Once a ServiceGroup is destroyed, a requestor MUST make no assumptions about either the existence of the entry WS-Resources that represent the ServiceGroup membership or the validity of the contents of those WS-Resources.
- A member MAY belong to several ServiceGroups.
- A member MAY belong to the same ServiceGroup more then once.
- The member of a ServiceGroup MAY implement message exchanges from various interfaces.
- If a member WS-Resource is destroyed, the ServiceGroup MAY destroy the corresponding entry WS-Resource that represents the membership of that WS-Resource in the ServiceGroup.
- The grouping and membership aspects of a ServiceGroup are only manifest in the linkage between a ServiceGroup and a ServiceGroupEntry. Accordingly, a ServiceGroupEntry in isolation has no semantic meaning.

5.1 ServiceGroup ResourceProperties

In addition to the message exchanges described in this specification, a ServiceGroup MUST also support the required message exchanges defined in the WS-ResourceProperties specification and MAY support the optional message exchanges defined in the WS-ResourceProperties specification. The resource property document defined by the ServiceGroup MUST include the following resource property elements.

5.1.1 MembershipContentRule Resource Property

The resource property document contains a potentially empty set of MembershipContentRule elements that specify the intensional constraints on *membership* of the *service group*. That is, membership can be restricted to members that implement a particular interface and/or it can require the presence of particular child elements in the wsrf-sg:Content resource property of the ServiceGroupEntry representing the membership in the group.

The ServiceGroup resource property document MAY contain zero MembershipContentRule child elements. When no MembershipContentRule elements are specified, the members of the ServiceGroup are unconstrained. When the ServiceGroup is unconstrained any member MAY be present in the ServiceGroup.

When at least one MembershipContentRule element specification exists, the members of the ServiceGroup are constrained. When the ServiceGroup is constrained, the ServiceGroup MUST NOT include a member that does not conform to at least one MembershipContentRule element. If more than one rule applies to a given member all rules that apply MUST be satisfied. Membership conformance to an individual MembershiptContentRule is described below in the MembershipContentRule component constraints.

The general form of a MembershipContentRule resource property element is:

```
<wsrf-sg:MembershipContentRule
    MemberInterface="QName"?
    ContentElements="list of QName"
/>
```

(see Appendix I: MembershipContentRule element definition & Appendix II: ServiceGroup resource property)

This resource property element is further constrained as follows:

/wsrf-sg:MembershipContentRule

The MembershipContentRule constrains the ServiceGroup membership to those members that implement the interface described below in /wsrf-sg:membershipContentRule/@MemberInterface if present. A MembershipContentRule is further satisfied according to the rules defined below in wsrf-sg:membershipContentRule/@ContentElements.

/wsrf-sg:membershipContentRule/@MemberInterface

This optional attribute, when present, specifies the members to which this MembershipConentRule applies according to the interface (WSDL 1.1 portType) of the member Web service. For MembershipContentRules where @MemberInterface is specified, there MUST be at most one MembershipContentRule for any given value of @MemberInterface.

A MembershipContentRule applies to a member if the value of @MemberInterface matches the QName of the member's interface. Two QNames are equivalent when they have the same local part and they have prefixes which have been bound to namespace names that are identical [**XML-Names**]. If this attribute is not present, all members MUST satisfy the enclosing MembershipContentRule's @ContentElements constraint.

/wsrf-sg:membershipContentRule/@ContentElements

This attribute specifies the content restrictions according to the list of QNames, each of which refer to a XML Schema global element declaration. This list defines the constraints on the wsrf-sg:Content resource property of the ServiceGroupEntry that MUST be satisfied

for membership. The list MAY be an empty list. When an empty list is specified there are no content constraints on the resource properties of the ServiceGroupEntries that match the enclosing MembershipContentRule.

A member satisfies a MembershipContentRule if, for each QName in the value of @ContentElements, there is at least one child element of the wsrf-sg:Content of the ServiceGroupEntry's resource properties document whose name matches that QName. Two QNames are equivalent when they have the same local part and they have prefixes which have been bound to namespace names that are identical [**XML-Names**].

Note: It is possible to construct a MembershipContentRule without a MemberInterface and with an empty list for the ContentElements. Such a MembershipContentRule would have no effect on the membership as per the normative semantics described for this component.

5.1.2 Entry Resource Property

An Entry resource property is a projection of the aggregation of the resource property documents of the ServiceGroup's entry resources. An Entry resource property has the following form:

```
<wsrf-sg:Entry>
   <wsrf-sg:ServiceGroupEntryEPR>
     wsa:EndpointReferenceType
   </wsrf-sg:ServiceGroupEntryEPR>
   <wsrf-sg:MemberServiceEPR>
     wsa:EndpointReferenceType
   </wsrf-sg:MemberServiceEPR>
   <wsrf-sg:Content> {any} </wsrf-sg:Content> ?
</wsrf-sg:Entry>
```

(see Appendix I: Entry type and element definition & Appendix II: ServiceGroup resource property)

This resource property element is further constrained as follows

/wsrf-sg:Entry

The entry provides the logical structure of the constituent members of the ServiceGroup. There is one entry element for each entry in the ServiceGroup. In the event of an entry's removal or destruction from a ServiceGroup, the corresponding element in the ServiceGroup's resource property MUST also be removed. The removal of the element from the ServiceGroup's resource property SHOULD occur temporally near the removal or destruction of the entry.

/wsrf-sg:Entry/ServiceGroupEntryEPR

Endpoint reference as defined in [**WS-Addressing**] to the ServiceGroupEntry WS-Resource with which the entry is associated. This WS-Resource is the representation of the membership of the member in the group. Existence of this WS-Resource is the definitive test that the member is indeed part of the group. If the WS-Resource referenced by ServiceGroupEntryEPR is not available, the consumer MUST NOT assume that the Web service referenced

by the @MemberServiceEPR is a member of the service group.

/wsrf-sg:Entry/MemberServiceEPR

Endpoint reference as defined in [**WS-Addressing**] to the member to which the entry refers.

/wsrf-sg:Entry/Content

The optional Content element contains the resource property values that conform to the wsrf-sg:MembershipContentRule/@ContentElements of the ServiceGroup. In the absence of concurrency controls a requestor MUST NOT assume that this element will be identical to the element that the WS-Resource, referenced by @ServiceGroupEntryEPR, contains in its wsrf-sg:Content resource property. In the case that wsrf-sg:Entry/Content is not identical to the wsrf-sg:Content resource property of the WS-Resource referenced by the @ServiceGroupEntryEPR then the wsrf-sg:Content is assumed to be authoritative. (For further discussion reference "ACID Properties of Operations on WS-Resources" [**WS-ResourceProperties**])

5.2 ServiceGroup: Operations

The ServiceGroup interface defines no message exchanges. A ServiceGroup SHOULD implement one of the message exchange sets defined in WS-ResourceLifetime if it needs to support either immediate resource destruction or scheduled resource destruction.

6 ServiceGroupEntry

The representation of a member Web service within the ServiceGroup is a WS-Resource. The Web service component of this WS-Resource implements the ServiceGroupEntry interface. The ServiceGroupEntry interface describes the requirements on the Web service through which management of the entry occurs.

A member MAY appear in a ServiceGroup multiple times. A separate ServiceGroupEntry WS-Resource represents each appearance of that member in a ServiceGroup. A ServiceGroupEntry WS-Resource MUST belong to exactly one service group.

A ServiceGroupEntry interface MAY provide additional management functions for a ServiceGroupEntry WS-Resource. In particular, it MAY provide independent lifetime management functions for individual ServiceGroupEntry WS-Resources (if it implements message exchanges defined in WS-ResourceLifetime). In the case where the ServiceGroupEntry Web service implements one of the message exchange sets defined in WS-ResourceLifetime, a ServiceGroupEntry WS-Resource MAY be removed from a ServiceGroup by managing the lifetime of the ServiceGroupEntry WS-Resource. Additional message exchanges MAY be defined to provide more advanced ServiceGroupEntry capabilities.

6.1 ServiceGroupEntry: Resource Property Declarations

In addition to the message exchanges described in this specification, a ServiceGroupEntry MUST also support the required message exchanges defined in the WS-ResourceProperties specification and MAY support the optional message exchanges defined in the WS-ResourceProperties specification.

6.1.1 ServiceGroupEPR

The general form of a ServiceGroupEPR resource property element is:

```
<wsrf-sg:ServiceGroupEPR>
  wsa:EndpointReferenceType
</wsrf-sg:ServiceGroupEPR>
```

(see Appendix I: ServiceGroupEPR element definition & Appendix II: ServiceGroupEntry resource property)

This resource property element is further constrained as follows:

/wsrf-sg:ServiceGroupEPR

> Contains an endpoint reference [**WS-Addressing**] to the ServiceGroup of which this entry represents membership. This endpoint reference MUST refer to the same Web service or WS-Resource throughout the lifetime of the ServiceGroupEntry.

6.1.2 MemberEPR

The general form of a MemberEPR resource property element is:

```
<wsrf-sg:MemberEPR>
  wsa:EndpointReferenceType
</wsrf-sg:MemberEPR>
```

(see Appendix I: MemberEPR element definition & Appendix II: ServiceGroupEntry resource property)

This resource property element is further constrained as follows:

/wsrf-sg:MemberEPR

Contains an endpoint reference [**WS-Addressing**] to the member to which this entry pertains. This endpoint reference MUST refer to the same Web service or WS-Resource throughout the lifetime of the ServiceGroupEntry.

6.1.3 Content

The general form of the Content resource property element is:

```
<wsrf-sg:Content>
  {any}
</wsrf-sg:Content>
```

(see Appendix I: Content element definition & Appendix II: ServiceGroupEntry resource property)

This resource property element is further constrained as follows:

/wsrf-sg:Content

This XML element contains information pertinent to the group membership represented by the ServiceGroupEntry. The Content elements conform to the XSD element declarations listed (by QName) in the membershipContentRule resource property of the ServiceGroup containing this ServiceGroupEntry.

6.2 ServiceGroupEntry: Message Exchanges

The ServiceGroupEntry interface defines no operations. The service implementing the ServiceGroupEntry interface SHOULD implement the message exchanges and resource properties from one of the interfaces described in WS-ResourceLifetime if it supports immediate destruction and scheduled destruction of ServiceGroupEntry resources. In addition, the service implementing the ServiceGroupEntry interface SHOULD implement the message exchanges and resource properties for the NotificationProducer interface [**WS-BaseNotification**]. The service implementing the ServiceGroupEntry SHOULD also support resource property value change notification as defined in [**WS-ResourceProperties**]. In particular, it SHOULD include wsrf-sg:Content as a value of its Topics resource property.

7 ServiceGroupRegistration

The ServiceGroupRegistration interface is an extension of the ServiceGroup interface. ServiceGroupRegistration defines the message exchanges that allow a requestor to add entries to a ServiceGroup WS-Resource explicitly. Third party controlled aggregations of services are made possible by the ServiceGroupRegistration extension of ServiceGroup.

7.1 ServiceGroupRegistration: Resource Property Declarations

The ServiceGroupRegistration interface defines no resource properties. The resource properties defined by the interfaces in WS-ResourceLifetime SHOULD be included in the ResourceProperty document of a ServiceGroupRegistration. The resource properties defined in the ServiceGroup interface MUST be included in the resource property document of a ServiceGroupRegistration.

7.2 Add

When a requestor wishes to add a new entry to a ServiceGroup WS-Resource, the requestor must issue a request message of the following form:

```
<wsrf-sg:Add>
  <wsrf-sg:MemberEPR>
    wsa:EndpointReferenceType
  </wsrf-sg:MemberEPR>
  <wsrf-sg:Content>
    {any}
  </wsrf-sg:Content>
  <wsrf-sg:InitialTerminationTime>
    xsd:dateTime
  </wsrf-sg:InitialTerminationTime>?
</wsrf-sg:Add>
```

The components of the Add message are further described as follows:

/wsrf-sg:Add/MemberEPR

This component contains the endpoint reference of the member Web service to include in the ServiceGroup. It MUST satisfy the semantics as specified by the ServiceGroup resource property /wsrf-sg:MemberhipContentRules.

/wsrf-sg:Add/Content

This component contains information to associate with the MemberEPR in the ServiceGroup. This component MUST be an element that conforms to those MembershipContentRules that apply to the member within the ServiceGroup. This component represents input for the ServiceGroupEntry content element. This input MAY be augmented or modified with other information that the ServiceGroup may derive. This allows the ServiceGroup to tailor or modify the content.

/wsrf-sg:Add/InitialTerminationTime

An optional element, indicating the requestor's suggestion for the initial setting of the termination time resource property [**WS-ResourceLifetime**] of the ServiceGroupEntry WS-Resource.

If a SOAPAction URI is included in the transport portion of the Add message, it MUST contain the URI http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.wsdl/ServiceGroupRegistration/AddRequest.

If the ServiceGroupRegistration accepts the request to add a member, it MUST respond with an AddResponse message of the following form:

```
<wsrf-sg:AddResponse>
  wsa:endpointReferenceType
</wsrf-sg:AddResponse>
```

The content of an AddResponse message is an EndpointReference as described in [**WS-Addressing**]. This endpoint reference refers to the ServiceGroupEntry WS-Resource created by the ServiceGroup to represent the association of the member within the ServiceGroup. The Web service associated with the ServiceGroupEntry returned by the AddResponse MUST implement the message exchanges and resource properties specified by the ScheduledResourceTermination interface and the ImmediateResourceTermination interface [**WS-ResourceLifetime**].

If a SOAPAction URI is included in the transport portion of the AddResponse message, it MUST contain the URI http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.wsdl/ServiceGroupRegistration/AddResponse.

Instead of the AddResponse message, the Web service may also send the following faults in response to an Add message. For those faults associated with failure to process an Add message

ContentCreationFailedFault:

The operation was unable to create a valid Content element (as defined by the membershipContentRule resource property) from the provided Content and MemberEPR components of the Add request message.

UnsupportedMemberInterfaceFault:

The member service referred to by the MemberEPR argument is not conformant with the MembershipContentRule.

AddRefusedFault:

The ServiceGroupRegistration refused to create a new entry for the member service based the semantics of the ServiceGroupRegistration (or subtype).

ResourceUnknownFault:

The ServiceGroupRegistration WS-Resource, which is the target of the Add message, is unknown. The enumeration of this fault and the conditions under which it may occur appear in the [**WS-Resource**] specification.

7.2.1 Example SOAP Encoding of the Add Message Exchange

The following is a non-normative example of an Add request message using SOAP 1.2 [**SOAP 1.2**]. Note: The presence of ReferenceProperties in the following example represents the special case when the member is a WS-Resource with a WS-Addressing embodiment [**WS-Resource**]

```
<s12:Envelope
    xmlns:s12="http://www.w3.org/2003/05/soap-envelope"
    xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
    xmlns:wsnt=
      "http://docs.oasis-open.org/wsrf/2004/06/wsn-WS-
BaseNotification-1.2-draft-01.xsd"
    xmlns:wsrf-rl=
      "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceLifetime-1.2-draft-05.xsd"
    xmlns:wsrf-sg=
      "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-draft-05.xsd"
    xmlns:npex="http://www.producer.org/RefProp">
  <s12:Header>
    <wsa:Action>
        http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-draft.04.wsdl/ServiceGroupRegistration/AddRequest
    </wsa:Action>
    <wsa:To s12:mustUnderstand="1">
        http://www.producer.org/ServiceGroupEndpoint
    </wsa:To>
  </s12:Header>
  <s12:Body>
    <wsrf-sg:Add>
      <wsrf-sg:MemberEPR>
         <wsa:Address>
            http://www.producer.org/ProducerEndpoint
         </wsa:Address>
         <wsa:ReferenceProperties>
           <npex:ResourceDisambiguator>
               uuid:84decd55-7d3f-65ad-ac44-675d9fce5d22
           </npex:ResourceDisambiguator>
         </wsa:ReferenceProperties>
      </wsrf-sg:MemberEPR>
      </wsrf-sg:Content>
        <wstop:Topic>wsrf-
rp:ResourcePropertiesValueChanges</wstop:Topic>
```

```
      <wsrf-sg:Content>
      <wsrf-sg:InitialTerminationTime>
         2003-12-25T00:00:00.00000Z
      </wsrf-sg:InitialTerminationTime>
    </wsrf-sg:Add>
  </s12:Body>
</s12:Envelope>
```

The following is a non-normative example of an Add response message using SOAP 1.2 [**SOAP 1.2**2]:

```
<s12:Envelope
    xmlns:s12="http://www.w3.org/2003/05/soap-envelope"
    xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
    xmlns:npex="http://www.consumer.org/RefProp">
    xmlns:wsrf-sg=
      "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-draft-04.xsd"
  <s12:Header>
    <wsa:Action>
        http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-
draft.04.wsdl/ServiceGroupRegistration/AddResponse
    </wsa:Action>
    <npex:ResourceDisambiguator>
        uuid:84decd55-7d3f-65ad-ac44-675d9fce12ef
    </npex:ResourceDisambiguator>
  </s12:Header>
  <s12:Body>
    <wsrf-sg:AddResponse>
      <wsa:EndpointReference>
        <wsa:Address>
           http://www.producer.org/ServiceGroupEndpoint
        </wsa:Address>
        <wsa:ReferenceProperties>
          <npex:ResourceDisambiguatore>
             uuid:95fefeb3-f37d-5dfe-44fe-675d9fce12df
          </npex:ResourceDisambiguator>
        </wsa:ReferenceProperties>
      </wsa:EndpointReference>
    </wsrf-sg:AddResponse>
  </s12:Body>
</s12:Envelope>
```

8 Notification of ServiceGroup Modification

If the Web service component of the ServiceGroup WS-Resource also implements the NotificationProducer interface defined by the WS-BaseNotification specification [**WS-BaseNotification**], then it MUST provide a topic [**WS-Topics**] to allow requestors to subscribe for notification of the modification of the ServiceGroup. The form of the TopicSpace [**WS-Topics**] is:

```
<wstop:TopicSpace name="ServiceGroupTopicSpace"
   targetNamespace=
      "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-draft-04.xsd"
    xmlns:wsrf-rp=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
   xmlns:wstop=
      "http://docs.oasis-open.org/wsn/2004/06/wsn-WS-Topics-1.2-
draft-01.xsd" >
   <wstop:Topic name="ServiceGroupModification" >
      <wstop:MessagePattern>
         <wsrf-rp:QueryExpression
           dialect="http://www.w3.org/TR/1999/REC-xpath-19991116"
>
              boolean((/*/*EntryAdditionNotification
                \[namespace-uri()='http://docs.oasis-
open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd']) |
                (/*/*EntryRemovalNotification
                \[namespace-uri()='http://docs.oasis-
open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd']))
             boolean(/*/EntryAdditionNotification |
                      /*/ EntryRemovalNotification)
         </wsrf-rp:QueryExpression>
      </wstop:MessagePattern>
   </wstop:Topic>
</wstop:TopicSpace>
```

This TopicSpace defines the TopicSpace associated with the WS-ServiceGroup XML namespace (http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd). The TopicSpace is further constrained as follows:

/wstop:TopicSpace/@name

The name of the TopicSpace associated with the WS-ServiceGroup XML namespace MUST be “ServiceGroupTopicSpace”.

/wstop:Topic

This topic is associated with notification messages when a ServiceGroupEntries are added or removed from a ServiceGroup. A Web service that supports the message exchanges associated with the NotificationProducer role as specified in WS-BaseNotification and that wishes to support subscriptions and notifications related to ServiceGroup modifications SHOULD include this topic in its list of supported topics. When a ServiceGroup detects that the contents of the group have been modified, it SHOULD create a notification message artifact recording the situation and, if the message artifact is generated, it MUST associate this notification message with this topic. Note: there are many circumstances in which a modification of a ServiceGroup does not result in the generation of a notification message.

/wstop:Topic/@name

The name of the Topic representing ServiceGroup modifications MUST be named “ServiceGroupModification”. The namespace property of this topic MUST be the WS-ServiceGroup XML namespace (http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd).

/wstop:Topic/wstop:MessagePattern

This topic is associated with messages that MUST contain an wsrf-sg:EntryAdditionNotification element or an wsrf-sg:EntryRemovalNotification element. These elements and their corresponding complexTypes are described later in this section.

8.1 EntryAdditionNotification Message

The wsrf-sg:EntryAdditionNotification element is a form of notification message associated with the wsrf-sg:ServiceGroupModification topic. This element is defined as follows:

```
<wsrf-sg:EntryAdditionNotification>
   <wsrf-sg:ServiceGroupEntryEPR>
     wsa:EndpointReferenceType
   </wsrf-sg:ServiceGroupEntryEPR>
   <wsrf-sg:MemberServiceEPR>
     wsa:EndpointReference
   </wsrf-sg:MemberServiceEPR>
   <wsrf-sg:Content>{any}</wsrf-sg:Content>?
</wsrf-sg:EntryAddtionNotification>
```

The form of the EntryAdditionNotification is further constrained as follows:

/wsrf-sg:EntryAdditionNotification

One EntryAdditionNotification element is created for each ServiceGroupEntry addition situation detected by the service associated with ServiceGroup resource. This artifact records the addition of an entry to the ServiceGroup.

/wsrf-sg:EntryAdditionNotification/ServiceGroupEntryEPR

This element MUST contain the EndpointReference of the ServiceGroupEntry that was added to the ServiceGroup.

/wsrf-sg:EntryAdditionNotification/MemberServiceEPR

This element MUST contain the EndpointReference of the member service that the WS-Resource referenced by @ServiceGroupEntryEPR contains in its MemberEPR resource property.

/wsrf-sg:EntryAdditionNotification/Content

If this optional element is present, it MUST contain a copy of the Contents resource property element of the ServiceGroupEntry referenced by @ServiceGroupEntryEPR.

8.2 EntryRemovalNotification Message

The wsrf-sg:EntryRemovalNotification element is a form of notification message associated with the wsrf-sg:ServiceGroupModification topic. This element is defined as follows:

```
<wsrf-sg:EntryRemovalNotification>
   <wsrf-sg:ServiceGroupEntryEPR>
     wsa:EndpointReferenceType
   </wsrf-sg:ServiceGroupEntryEPR>
   <wsrf-sg:MemberServiceEPR>
     wsa:EndpointReferenceType
   </wsrf-sg:MemberServiceEPR>
   <wsrf-sg:Content>{any}</wsrf-sg:Content>?
   <wsrf-sg:Reason>xsd:string</wsrf-sg:Reason>?
</wsrf-sg:EntryRemovalNotification>
```

The form of the EntryRemovalNotification is further constrained as follows:

/wsrf-sg:EntryRemovalNotification

One EntryRemovalNotification element is created for each ServiceGroupEntry removal situation detected by the service associated with ServiceGroup resource. This artifact records the removal of an entry to the ServiceGroup.

/wsrf-sg:EntryRemovalNotification/ServiceGroupEntryEPR

This element MUST contain the EndpointReference of the ServiceGroupEntry that was removed to the ServiceGroup. Note: The EndpointReference for the ServiceGroupEntry will not be a valid reference since the removal mechanism from a ServiceGroup is removal of the ServiceGroupEntry.

/wsrf-sg:EntryRemovalNotification/MemberServiceEPR

This element MUST contain the EndpointReference of the member service that the WS-Resource referenced by @serviceGroupEntryEPR contains in its MemberEPR resource property.

/wsrf-sg:EntryRemovalNotification/Content

If this optional element is present, it MUST contain a copy, from some point prior to the removal, of the Contents resource property element of the ServiceGroupEntry referenced by @ServiceGroupEntryEPR.

/wsrf-sg:EntryRemovalNotification/Reason

If this optional element is present it will contain human readable text regarding the reason for the removal for the ServiceGroup.

9 Security Model

In the context of this specification, there are two categories of security aspects that need to be considered: (a) securing the message exchanges and (b) securing the resource properties.

9.1 Securing the message exchanges

When messages exchanges occur between a requestor and a Web service in order to access or act on one or more resource properties, it is RECOMMENDED that the communication between services be secured using the mechanisms described in WS-Security. In order to properly secure messages, the message body and all relevant headers need to be included in the digital signature so as to prove the integrity of the message. In addition, the ReferenceProperties from an EndpointReference, used as part of any message exchange, may be encrypted to ensure their privacy. In the event that a requestor communicates frequently with a Web service to access resource properties, either directly through a query or accomplished through notification of state change, it is RECOMMENDED that a security context be established using mechanisms like those described in WS-Trust [**WS-Trust**] and WS-SecureConversation [**WS-SecureConversation**] allowing for potentially more efficient means of authentication.

It is common for communication between requestors and Web service component of a WS-Resource to exchange multiple messages. As a result, the usage profile may be susceptible to key attacks. For this reason, it is RECOMMENDED that the keys used to secure the channel be changed frequently. This "re-keying" can be effected a number of ways. The following list outlines four common techniques:

- Attaching a nonce to each message and using it in a derived key function with the shared secret
- Using a derived key sequence and switch "generations"
- Closing and re-establishing a security context
- Exchanging new secrets between the parties

It should be noted that the mechanisms listed above are independent of the security context token (SCT). That is, the keys used to secure the channel during message exchanges may be independent of the key used to prove the right to access WS-ResourceProperties.

The security context MAY be re-established using the mechanisms described in WS-Trust and WS-SecureConversation. Similarly, secrets can be exchanged using the mechanisms described in WS-Trust. Note, however, that the current shared secret SHOULD NOT be used to encrypt the new shared secret. Derived keys, the preferred solution from this list, can be specified using the mechanisms described in WS-SecureConversation.

The following list summarizes common classes of attacks that apply to this protocol and identifies the mechanism to prevent/mitigate the attacks:

- **Message alteration** – Alteration is prevented by including signatures of the message information using WS-Security.
- **Message disclosure** – Confidentiality is preserved by encrypting sensitive data using WS-Security.
- **Key integrity** – Key integrity is maintained by using the strongest algorithms possible (by comparing secured policies – see WS-Policy [**WS-Policy**] and WS-SecurityPolicy [**WS-SecurityPolicy**]).
- **Authentication** – Authentication is established using the mechanisms described in WS-Security and WS-Trust. Each message is authenticated using the mechanisms described in WS-Security.
- **Accountability** – Accountability is a function of the type of and string of the key and algorithms being used. In many cases, a strong symmetric key provides sufficient accountability. However, in some environments, strong PKI signatures are required.
- **Availability** – Many services are subject to a variety of availability attacks. Replay is a common attack and it is RECOMMENDED that this be addressed as described in the next bullet. Other attacks, such as network-level denial of service attacks are harder to avoid and are outside the scope of this specification. That said, care should be taken to ensure that minimal processing be performed prior to any authenticating sequences.
- **Replay** – Messages may be replayed for a variety of reasons. To detect and eliminate this attack, mechanisms should be used to identify replayed messages such as the timestamp/nonce outlined in WS-Security and the sequences outlined in WS-ReliableMessaging [**WS-ReliableMessaging**].

9.2 Securing the resource properties

Given WS-ServiceGroup defines a mechanism to expose properties about its member WS-Resources through its “Content” resource property on ServiceGroupEntry, security considerations specified in WS-ResourceProperties are applicable to ServiceGroupEntry. Therefore, security policies should be established that ensure that only authorized requestors can access the value of a resource property of a member WS-Resource. It should also be noted that the authorization policies on the properties of a WS-Resource accessible through a ServiceGroup should be consistent with the authorization policies that are applicable when those properties are accessed directly form the resource itself. Similarly, the security policies about message exchanges (e.g., requiring the resource property value to be encrypted when sent in a response) should be equivalent in order to provide the same protection irrespective of the access point.

9.2.1 A Note on MembershipContentRules

The MembershipContentRules resource property along with Entry resource property provide a mechanism to allow for requestors to query about the members of a service group based on their interface or a resource property that is contained in member Ws-Resource’s resource properties document, as well as the value of a resource property itself. There may need to be privacy

770 considerations with respect to exposing those values. Therefore, authorization policies as well as
771 message protection policies should be consistent between these values retrieved through
772 ServiceGroup, and those values retrieved through the WS-Resource itself. In general, it is not a
773 good practice to form membership rules based on properties whose values are to remain
774 confidential.

Appendix A. Acknowledgments

Special thanks to the Global Grid Forum's Open Grid Services Infrastructure working group, which defined the OGSI v1.0 [**OGSI 1.0**] specification which was a large inspiration for the ideas expressed in this specification.

The following individuals were members of the committee during the development of this specification:

Akhil Arora (Sun Microsystems), Tim Banks (IBM), Jeff Bohren (OpenNetwork), Conor Cahill (AOL), Fred Carter (AmberPoint), Martin Chapman (Oracle), Glen Daniels (Sonic Software), Thomas Freund (IBM), Stephen Graham (IBM), Anish Karmarkar (Oracle), Hideharu Kato (Hitachi), David Levine (IBM), Paul Lipton (Computer Associates), Mark Little (Arjuna Technologies Limited), Lily Liu (WebMethods, Inc.), Tom Maguire (IBM), Susan Malaika (IBM), David Martin (IBM), Samuel Meder (ArgonneNational Laboratory), Jeff Mischkinsky (Oracle), Bryan Murray (Hewlett-Packard), Dave Orchard (BEA Systems, Inc.), Savas Parastatidis (Individual), Greg Pavlik (Oracle), Mark Peel (Novell), Alain Regnier (Ricoh Company, Ltd.), Ian Robinson (IBM), Junaid Saiyed (Sun Microsystems), Igor Sedukhin (Computer Associates), Hitoshi Sekine (Ricoh Company, Ltd.), Frank Siebenlist (ArgonneNational Laboratory), David Snelling (Fujitsu), Latha Srinivasan (Hewlett-Packard), John Tollefsrud (Sun Microsystems), Jem Treadwell (Hewlett-Packard), Steve Tuecke (ArgonneNational Laboratory), William Vambenepe (Hewlett-Packard), Katy Warr (IBM), Alan Weissberger (NEC Corporation), and Pete Wenzel (SeeBeyond Technology Corporation)

In addition, the following people made contributions to this specification:

Nick Butler (IBM), Karl Czajkowski (Globus / USC/ISI), Donald F Ferguson (IBM), Ian Foster (Globus / Argonne), Diane Jordan (IBM), Andreas Meier (IBM), Nataraj Nagaratnam (IBM), Martin Nally (IBM), John Rofrano (IBM), Ellen Stokes (IBM), Tony Storey (IBM), Jay Unger (IBM), Sanjiva Weerawarana (IBM), Dave Booz (IBM), Jim Knutson (IBM), Heather Kreger (IBM), Frank Leymann (IBM).

10 References

10.1 Normative

[RFC 2119] S. Bradner, *Key words for use in RFCs to Indicate Requirement Levels*, http://www.ietf.org/rfc/rfc2119.txt, IETF RFC 2119, March 1997.

[URI] T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifiers (URI): Generic Syntax," RFC 2396, MIT/LCS, U.C. Irvine, Xerox Corporation, August 1998.

[WS-Basic Profile 1.1] http://www.ws-i.org/Profiles/BasicProfile-1.1.html

[WS-Resource] http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-Resource-1.2-draft-02.pdf

[WS-Addressing] http://www.w3.org/Submission/2004/SUBM-ws-addressing-20040810

[WS-BaseNotification] http://docs.oasis-open.org/wsn/2004/06/wsn-WS-BaseNotification-1.2-draft-03.pdf

[WS-ResourceLifetime] http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceLifetime-1.2-draft-05.pdf

[WS-ResourceProperties] http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceProperties-1.2-draft-06.pdf

[WS-Security] http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf

[WS-Topics] http://docs.oasis-open.org/wsn/2004/06/wsn-WS-Topics-1.2-draft-01.pdf

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

[XML-Names] http://www.w3.org/TR/REC-xml-names/

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

10.2 Non-Normative

[OGSI 1.0] Open Grid Services Infrastructure (OGSI) V1.0 http://forge.gridforum.org/projects/ggf-editor/document/draft-ogsi-service-1/en/1

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

[WSDL 2.0] http://www.w3.org/TR/wsdl12/

[WS-AtomicTransaction] http://www.ibm.com/developerworks/webservices/library/ws-atomtran/

[WS-Policy] http://www.ibm.com/developerworks/library/ws-policy
[WS-ReliableMessaging] http://www.ibm.com/developerworks/webservices/library/ws-rm/
[WS-SecureConversation] http://www.ibm.com/developerworks/library/ws-secon/
[WS-SecurityPolicy] http://www.ibm.com/developerworks/library/ws-secpol/
[WS-Trust] http://www.ibm.com/developerworks/library/specification/ws-trust/

Appendix B. XML Schema

The XML types and elements used in this specification are included here for convenience. The authoritative version of this schema document is available at http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.xsd,

The XML types and elements used in this specification are defined in the following XML Schema

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

OASIS takes no position regarding the validity or scope of any
intellectual property or other rights that might be claimed to
pertain to the implementation or use of the technology described
in this document or the extent to which any license under such
rights might or might not be available; neither does it represent
that it has made any effort to identify any such rights.
Information on OASIS's procedures with respect to rights in OASIS
specifications can be found at the OASIS website. Copies of claims
of rights made available for publication and any assurances of
licenses to be made available, or the result of an attempt made to
obtain a general license or permission for the use of such
proprietary rights by implementors or users of this specification,
can be obtained from the OASIS Executive Director.

OASIS invites any interested party to bring to its attention any
copyrights, patents or patent applications, or other proprietary
rights which may cover technology that may be required to
implement this specification. Please address the information to
the OASIS Executive Director.

Copyright (C) OASIS Open (2005). All Rights Reserved.

This document and translations of it may be copied and furnished
to others, and derivative works that comment on or otherwise
explain it or assist in its implementation may be prepared,
copied, published and distributed, in whole or in part, without
restriction of any kind, provided that the above copyright notice
and this paragraph are included on all such copies and derivative
works. However, this document itself may not be modified in any
way, such as by removing the copyright notice or references to
```

```
OASIS, except as needed for the purpose of developing OASIS
specifications, in which case the procedures for copyrights
defined in the OASIS Intellectual Property Rights document must be
followed, or as required to translate it into languages other than
English.

The limited permissions granted above are perpetual and will not
be revoked by OASIS or its successors or assigns.

This document and the information contained herein is provided on
an "AS IS" basis and OASIS DISCLAIMS ALL WARRANTIES, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF
THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

-->
<xsd:schema
  xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:wsrf-rp=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
  xmlns:wsrf-bf=
   "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-
1.2-draft-04.xsd"
  xmlns:wsrf-sg=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.xsd"
  xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
  elementFormDefault="qualified"
attributeFormDefault="unqualified"
  targetNamespace=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.xsd" >
<!-- ======================== Imports ============================
-->

  <xsd:import
     namespace="http://schemas.xmlsoap.org/ws/2004/08/addressing"
     schemaLocation=
              "http://schemas.xmlsoap.org/ws/2004/08/addressing"
```

```
/>
     <xsd:import
       namespace="http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
       schemaLocation="http://docs.oasis-
open.org/wsrf/2005/03/wsrf-WS-ResourceProperties-1.2-draft-06.xsd"
/>
     <xsd:import namespace=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
draft-04.xsd"
        schemaLocation=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
draft-04.xsd"
     />

<!-- =============== Resource Property Related
=================== -->
<!-- ============ Resource Properties for ServiceGroup
============ -->

  <xsd:simpleType name="ContentElementsType">
    <xsd:list itemType="xsd:QName"/>
  </xsd:simpleType>

  <xsd:element name="MembershipContentRule">
    <xsd:complexType>
      <xsd:attribute name="MemberInterface" type="xsd:QName"/>
      <xsd:attribute name="ContentElements"
                     type="wsrf-sg:ContentElementsType"
                     use="required"/>
      <xsd:anyAattribute namespace="##other"
processContents="lax"/>
    </xsd:complexType>
  </xsd:element>

  <xsd:complexType name="EntryType">
    <xsd:sequence>
      <xsd:element name="ServiceGroupEntryEPR"
                   type="wsa:EndpointReferenceType"
                   minOccurs="1" maxOccurs="1"
                   nillable="true"/>
```

```
      <xsd:element name="MemberServiceEPR"
                   type="wsa:EndpointReferenceType"
                   minOccurs="1" maxOccurs="1"/>
      <xsd:element name="Content"
                   type="xsd:anyType"
                   minOccurs="1" maxOccurs="1"/>
    </xsd:sequence>
    <xsd:anyAttribute namespace="##other" processContents="lax"/>
  </xsd:complexType>

<!-- ========== Resource Properties for ServiceGroupEntry
========= -->

  <xsd:element name="Entry"
               type="wsrf-sg:EntryType"/>

  <xsd:element name="Content"
               type="xsd:anyType"/>

  <xsd:element name="MemberEPR"
               type="wsa:EndpointReferenceType"/>

  <xsd:element name="ServiceGroupEPR"
               type="wsa:EndpointReferenceType"/>

<!-- =============== Resource Property Related
=================== -->
<!-- ============ Resource Properties for ServiceGroup
============ -->
        <xsd:element name="ServiceGroupRP">
          <xsd:complexType>
            <xsd:sequence>
              <xsd:element ref="wsrf-sg:MembershipContentRule"
                           minOccurs="0" maxOccurs="unbounded"/>
              <xsd:element ref="wsrf-sg:Entry"
                           minOccurs="0" maxOccurs="unbounded"/>
            </xsd:sequence>
          </xsd:complexType>
          <xsd:unique name="UniqueInterfaces">
            <xsd:selector
               xpath="./wsrf-sg:MembershipContentRule"/>
```

```
            <xsd:field xpath="@MemberInterface"/>
          </xsd:unique>
        </xsd:element>

<!-- ========== Resource Properties for ServiceGroupEntry
========= -->
        <xsd:element name="ServiceGroupEntryRP">
          <xsd:complexType>
            <xsd:sequence>
              <xsd:element ref="wsrf-sg:ServiceGroupEPR"
                           minOccurs="1" maxOccurs="1"/>
              <xsd:element ref="wsrf-sg:MemberEPR"
                           minOccurs="1" maxOccurs="1"/>
              <xsd:element ref="wsrf-sg:Content"
                           minOccurs="1" maxOccurs="1"/>
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>

<!-- ================= Message Specific Types
==================== -->
<!-- ======== Message Types for ServiceGroupRegistration
========= -->
        <xsd:element name="Add">
          <xsd:complexType>
            <xsd:sequence>
              <xsd:element name="MemberEPR"
                           type="wsa:EndpointReferenceType" />
              <xsd:element name="Content"
                           type="xsd:anyType" />
              <xsd:element name="InitialTerminationTime"
                           type="xsd:dateTime"
                           minOccurs="0" maxOccurs="1" />
            </xsd:sequence>
          </xsd:complexType>
        </xsd:element>

        <xsd:element name="AddResponse"
                     type="wsa:EndpointReferenceType" />

        <xsd:complexType name="ContentCreationFailedFaultType">
```

```
          <xsd:complexContent>
            <xsd:extension base="wsrf-bf:BaseFaultType"/>
          </xsd:complexContent>
        </xsd:complexType>
        <xsd:element name="ContentCreationFailedFault"
                     type="wsrf-
sg:ContentCreationFailedFaultType"/>

        <xsd:complexType
name="UnsupportedMemberInterfaceFaultType">
          <xsd:complexContent>
            <xsd:extension base="wsrf-bf:BaseFaultType"/>
          </xsd:complexContent>
        </xsd:complexType>
        <xsd:element name="UnsupportedMemberInterfaceFault"
                     type="wsrf-
sg:UnsupportedMemberInterfaceFaultType"/>

        <xsd:complexType name="AddRefusedFaultType">
          <xsd:complexContent>
            <xsd:extension base="wsrf-bf:BaseFaultType"/>
          </xsd:complexContent>
        </xsd:complexType>
        <xsd:element name="AddRefusedFault"
                     type="wsrf-sg:AddRefusedFaultType"/>

<!-- = Messages Related to ServiceGroup Change Notification
======= -->
  <xsd:complexType
name="ServiceGroupModificationNotificationType">
    <xsd:sequence>
      <xsd:element name="ServiceGroupEntryEPR"
                   type="wsa:EndpointReferenceType"
                   minOccurs="1" maxOccurs="1"
                   nillable="true"/>
      <xsd:element name="MemberServiceEPR"
                   type="wsa:EndpointReferenceType"
                   minOccurs="1" maxOccurs="1"/>
      <xsd:element name="Content"
                   type="xsd:anyType"
                   minOccurs="0" maxOccurs="1"/>
```

```
    </xsd:sequence>
  </xsd:complexType>

  <xsd:complexType name="ServiceGroupRemovalNotificationType">
    <xsd:complexContent>
      <xsd:extension
           base="wsrf-
sg:ServiceGroupModificationNotificationType">
        <xsd:sequence>
          <xsd:element name="Reason"
                       type="xsd:string"
                       minOccurs="0" maxOccurs="1"/>
        </xsd:sequence>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

  <xsd:element name="EntryAdditionNotification"
               type="wsrf-
sg:ServiceGroupModificationNotificationType" />

  <xsd:element name="EntryRemovalNotification"
               type="wsrf-sg:ServiceGroupRemovalNotificationType"
/>

</xsd:schema>
```

Appendix C. WSDL 1.1

The WSDL 1.1 for the Web service methods described in this specification is compliant with **[WS-Basic Profile 1.1]** and is included here for convenience. The authoritative version of this WSDL is available at http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-1.2-draft-04.wsdl,

The following illustrates the WSDL 1.1 for the Web service methods described in this specification:

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

OASIS takes no position regarding the validity or scope of any
intellectual property or other rights that might be claimed to
pertain to the implementation or use of the technology described
in this document or the extent to which any license under such
rights might or might not be available; neither does it represent
that it has made any effort to identify any such rights.
Information on OASIS's procedures with respect to rights in OASIS
specifications can be found at the OASIS website. Copies of claims
of rights made available for publication and any assurances of
licenses to be made available, or the result of an attempt made to
obtain a general license or permission for the use of such
proprietary rights by implementors or users of this specification,
can be obtained from the OASIS Executive Director.

OASIS invites any interested party to bring to its attention any
copyrights, patents or patent applications, or other proprietary
rights which may cover technology that may be required to
implement this specification. Please address the information to
the OASIS Executive Director.

Copyright (C) OASIS Open (2005). All Rights Reserved.

This document and translations of it may be copied and furnished
to others, and derivative works that comment on or otherwise
explain it or assist in its implementation may be prepared,
copied, published and distributed, in whole or in part, without
restriction of any kind, provided that the above copyright notice
and this paragraph are included on all such copies and derivative
works. However, this document itself may not be modified in any
way, such as by removing the copyright notice or references to
```

```
OASIS, except as needed for the purpose of developing OASIS
specifications, in which case the procedures for copyrights
defined in the OASIS Intellectual Property Rights document must be
followed, or as required to translate it into languages other than
English.

The limited permissions granted above are perpetual and will not
be revoked by OASIS or its successors or assigns.

This document and the information contained herein is provided on
an "AS IS" basis and OASIS DISCLAIMS ALL WARRANTIES, EXPRESS OR
IMPLIED, INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF
THE INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

-->

<wsdl:definitions name="ServiceGroup"
  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://schemas.xmlsoap.org/ws/2004/08/addressing"
  xmlns:wsrf-bf=
   "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-
1.2-draft-04.xsd"
  xmlns:wsrf-rp=
   "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
  xmlns:wsrf-rpw=
   "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.wsdl"
  xmlns:wsrf-rl=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceLifetime-1.2-draft-05.xsd"
  xmlns:wsrf-rw=
   "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-Resource-1.2-
draft-03.wsdl"
  xmlns:wsrf-sg=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.xsd"
```

```
  xmlns:wsrf-sgw=
    "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.wsdl"
  targetNamespace=
    "http://docs.oasis-open.org/wsrf/2005/04/wsrf-WS-ServiceGroup-
1.2-draft-04.wsdl">

<!-- ========================= Imports
========================== -->
   <wsdl:import namespace=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.wsdl"
     location=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.wsdl" />

   <wsdl:import namespace=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceLifetime-
1.2-draft-05.wsdl"
     location=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ResourceLifetime-
1.2-draft-05.wsdl" />

  <wsdl:import namespace=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-Resource-1.2-
draft-03.wsdl"
     location=
"http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-Resource-1.2-
draft-03.wsdl" />

       <xsd:import namespace=
  "http://schemas.xmlsoap.org/ws/2004/08/addressing"
          schemaLocation=
  "http://schemas.xmlsoap.org/ws/2004/08/addressing"
       />

<!-- ===================== Types Definitions
====================== -->
   <wsdl:types>
      <xsd:schema
        xmlns:xsd="http://www.w3.org/2001/XMLSchema"
```

```
        targetNamespace=
        "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ServiceGroup-1.2-draft-04.xsd"
         elementFormDefault="qualified"
         attributeFormDefault="unqualified">

        <xsd:import namespace=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.xsd"
           schemaLocation=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-ServiceGroup-
1.2-draft-04.xsd"
        />

        <xsd:import namespace=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceLifetime-1.2-draft-05.xsd"
           schemaLocation=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceLifetime-1.2-draft-05.xsd"
        />

       <xsd:import namespace=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
        schemaLocation=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-
ResourceProperties-1.2-draft-06.xsd"
       />

       <xsd:import namespace=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
draft-04.xsd"
          schemaLocation=
  "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
draft-04.xsd"
       />
    </xsd:schema>
  </wsdl:types>

<!-- ==================== Message Definitions
```

```
===================== -->
<!-- =============== ServiceGroupRegistration::Add
================
  Add(MemberEPR, Content, [InitialTerminationTime])
  returns: EPR to ServiceGroupEntry
-->
  <wsdl:message name="AddRequest">
    <wsdl:part name="AddRequest" element="wsrf-sg:Add"/>
  </wsdl:message>

  <wsdl:message name="AddResponse">
    <wsdl:part name="AddResponse" element="wsrf-sg:AddResponse"/>
  </wsdl:message>

  <wsdl:message name="ContentCreationFailedFault">
    <wsdl:part name="ContentCreationFailedFault"
               element="wsrf-sg:ContentCreationFailedFault" />
  </wsdl:message>

  <wsdl:message name="UnsupportedMemberInterfaceFault">
    <wsdl:part name="UnsupportedMemberInterfaceFault"
               element="wsrf-sg:UnsupportedMemberInterfaceFault"
/>
  </wsdl:message>

  <wsdl:message name="AddRefusedFault">
    <wsdl:part name="AddRefusedFault"
               element="wsrf-sg:AddRefusedFault" />
  </wsdl:message>

<!-- ================== PortType Definitions
===================== -->
  <wsdl:portType name="ServiceGroup"
            wsrf-rp:ResourceProperties="wsrf-sg:ServiceGroupRP">
    <wsdl:operation name="GetResourceProperty">
      <wsdl:input name="GetResourcePropertyRequest"
            message="wsrf-rpw:GetResourcePropertyRequest" />
      <wsdl:output name="GetResourcePropertyResponse"
            message="wsrf-rpw:GetResourcePropertyResponse" />
      <wsdl:fault name="InvalidResourcePropertyQNameFault"
            message="wsrf-rpw:InvalidResourcePropertyQNameFault"
/>
```

```
      <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault" />

    </wsdl:operation>
  </wsdl:portType>

  <wsdl:portType name="ServiceGroupEntry"
                 wsrf-rp:ResourceProperties="wsrf-
sg:ServiceGroupEntryRP">
    <wsdl:operation name="GetResourceProperty">
      <wsdl:input name="GetResourcePropertyRequest"
                  message="wsrf-rpw:GetResourcePropertyRequest" />
      <wsdl:output name="GetResourcePropertyResponse"
                   message="wsrf-rpw:GetResourcePropertyResponse"
/>
      <wsdl:fault name="InvalidResourcePropertyQNameFault"
                  message="wsrf-
rpw:InvalidResourcePropertyQNameFault" />
      <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault" />
    </wsdl:operation>
  </wsdl:portType>

  <wsdl:portType name="ServiceGroupRegistration"
                 wsrf-rp:ResourceProperties="wsrf-
sg:ServiceGroupRP">
    <wsdl:operation name="GetResourceProperty">
      <wsdl:input name="GetResourcePropertyRequest"
                  message="wsrf-rpw:GetResourcePropertyRequest" />
      <wsdl:output name="GetResourcePropertyResponse"
                  message="wsrf-rpw:GetResourcePropertyResponse"
/>
      <wsdl:fault name="InvalidResourcePropertyQNameFault"
                  message="wsrf-
rpw:InvalidResourcePropertyQNameFault" />
      <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault" />
    </wsdl:operation>
    <wsdl:operation name="Add">
      <wsdl:input name="AddRequest" message="wsrf-
sgw:AddRequest"/>
```

```
      <wsdl:output name="AddResponse" message="wsrf-
sgw:AddResponse"/>
      <wsdl:fault name="ContentCreationFailedFault"
                  message="wsrf-sgw:ContentCreationFailedFault"/>
      <wsdl:fault name="UnsupportedMemberInterfaceFault"
                  message="wsrf-
sgw:UnsupportedMemberInterfaceFault"/>
      <wsdl:fault name="AddRefusedFault"
                  message="wsrf-sgw:AddRefusedFault"/>
      <wsdl:fault name="ResourceUnknownFault"
            message="wsrf-rw:ResourceUnknownFault" />
    </wsdl:operation>
  </wsdl:portType>

</wsdl:definitions>
```

Appendix D. Revision History

Rev	Date	By Whom	What
wd-01	2004-06-05	Tom Maguire	Initial version created from submission by contributing companies. Minor modifications made to reflect OASIS formatting.
wd-02	2004-06-07	Tom Maguire	Updated to include elementFormDefault and attributeFormDefault. Changed URI from 2004/05 to 2004/06. Updated acknowledgements section.
wd-02	2004-06-11	Ian Robinson	Consistency edit for status, acknowledgements and references sections.
wd-03	2004-11-10	Tom Maguire	Issue resolutions from October F2F: o WSRF30, WSRF43, WSRF49, WSRF53, WSRF56 o Replaced refs to [State Paper] o Update to use “WS-Resource Access Pattern” o Changed doc identifier to “Summary Info Title” o Added missing wsdl:import for WS-Addressing in wsdl o Fixed selector for “UniqueInterfaces” in wsdl (WSRF60 & WSRF70) o Fixed namespace prefix errors in wsdl o Fixed namespace prefix errors in SOAP examples o Updated UML diagram o Removed erroneous wsa:to in AddResponse example
wd-04	2005-02-18	Tom Maguire	Corrected concrete message element

Rev	Date	By Whom	What
			namespaces. Updated OASIS copyright to 2005. Issue resolutions from February F2F: o Updated namespace declarations to latest 2005/03 o WSRF62 Basic profile 1.1 statement o WSRF96 Statement specifying the authoritative versions of wsdl and xsd o WSRF63 add attribute extensibility o WSRF86 add ResourceUnknown fault to all operations o WSRF81 remove xsd:include in favor of xsd:import. Move all schema definitions to xsd.

1372

Appendix E. Notices