

Example of the Space Reservation as WS-Agreement

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The following is the modification of the compute example from WS-Agreement [1].

Scenario

A typical srm application scenario is the request for requesting space on an SRM managed storage element. A SRM posts a Space Reservation agreement template available to interested requesters. In this scenario, the agreement template defines the allowed types of space allowed (one or more of Volatile, Durable, or Permanent), maximum allocation size, maximum reservation lifetime and possibly other parameters. SRM consumers are given a quality of service guarantee in terms of number of transfer servers and amount of network bandwidth available for writing/reading to/from the reserved space for the lifetime of reservation; without such guaranties consumer might not be able to utilize the reserved space. An SRM consumer requesting a space reservation must fill in the type, size and lifetime (and possibly the future time, from which the reservation should become observed). The filled template is sent as an offer to the SRM server. The SRM server decides whether to accept or reject the reservation request. The SRM service answers the offer with a confirmation or a fault. If the SRM accepts the offer, it becomes observed, and client may now rely on SRM honoring the terms of the agreement.

In WS-Agreement, the agreed upon agreement is the web service in itself which has various methods for termination/renegotiation of the agreement, etc.

Examples of Template, Offer and Negotiated Agreement

The schema below is an example of Service Description Language Used in these Examples. The elements it defines are used in the following examples.

srm_reservation.xsd

```
<xsd:schema targetNamespace="http://www.gridforum.org/namespaces/srm"
xmlns:xsd="http://www.w3.org/2001/XMLSchema"
xmlns:srm="http://www.gridforum.org/namespaces/srm"
elementFormDefault="qualified" attributeFormDefault="qualified">
  <xsd:simpleType name="TSpaceType">
    <restriction base="xsd:string">
```

```

        <enumeration value="Volatile"/>
        <enumeration value="Durable"/>
        <enumeration value="Permanent"/>
    </restriction>
</xsd:simpleType>

<xsd:complexType name="TSizeInBytes">
    <sequence>
        <element name="value" type="xsd:long"/>
    </sequence>
</xsd:complexType>

<xsd:complexType name="TLifeTimeInSeconds">
    <sequence>
        <element name="value" type="xsd:long"/>
    </sequence>
</xsd:complexType>

    <element name="spaceType" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TSpaceType"/>
    <element name="spaceTotalSize" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TSizeInBytes"/>
    <element name="spaceGuaranteedSize" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TSizeInBytes"/>
    <!-- Should not be here !!! -->
    <element name="spaceUnusedSize" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TSizeInBytes"/>
    <!--substitute these lifetimes by two numbers: start and end times-->
    <!--note agreement lifetime and space lifetime are two different
things in general-->
    <element name="spaceLifetimeAssigned" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TLifeTimeInSeconds"/>
    <element name="spaceLifetimeLeft" minOccurs="0" maxOccurs="1"
nillable="true" type="srm:TLifeTimeInSeconds"/>
</xsd:schema>

```

Template

This example template enumerates the domain-specific service description elements that are allowed by the factory which advertises it. Note that while most service description elements bear no creational constraints, some of them are restricted in terms of value space. There is no constraint in this example that spans several items.

```

<wsag:Template xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:job="http://www.gridforum.org/namespaces/srm"
xmlns:wsag="http://www.ggf.org/namespaces/ws-agreement"
xsi:schemaLocation="http://www.ggf.org/namespaces/ws-agreement
agreement_types.xsd http://www.gridforum.org/namespaces/srm srm_reservation.xsd">
    <wsag:Name>Template1</wsag:Name>
    <wsag:Context>
    </wsag:Context>

    <wsag:Terms/>

```

```

<wsag:CreationConstraints>
  <!--
    Space Reservation Agreement can
    refer to a single space of each type
    (i.e. volatile, durable, permanent).
    It does not include
    the extra space needed to hold the directory structures.
  -->

</wsdl:documentation>
<wsag:Item wsag:name="type">
  <wsag:Location>
    //wsag:ServiceDescriptionTerm/srm:spaceType
  </wsag:Location>
  <!-- for each domain-specific SRM service description
    <srm: TSpaceType>,
    constrain the Space Types further to
    types of space supported by this Storage only
    (i.e. reduce list of Space Types values) -->
    <xs:enumeration xs:value=""Volatile""/>
    <xs:enumeration xs:value=""Durable""/>
</wsag:Item>
<wsag:Item wsag:name="totalSize">
  <wsag:Location>
    //wsag:ServiceDescriptionTerm/srm:spaceTotalSize
  </wsag:Location>
  <!--<srm:TSizeInBytes> must be
    within a range-->
    <xs:minInclusive xs:value="1024"/>
    <xs:maxInclusive xs:value="0xFFFFFFFF"/>
</wsag:Item>
<wsag:Item wsag:name="garanteedSize">
  <wsag:Location>
    //wsag:ServiceDescriptionTerm/srm:spaceGaranteedSize
  </wsag:Location>
  <!--<srm:TSizeInBytes> must be
    within a range-->
    <xs:minInclusive xs:value="1024"/>
    <xs:maxInclusive xs:value="0xFFFFFFFF"/>
</wsag:Item>
<?-- are lifetimes supposed to be in the template or only in the offer as
as variables??-->
<wsag:Item wsag:name="lifetime">
  <wsag:Location>
    //wsag:ServiceDescriptionTerm/srm:spaceLifetimeAssigned
  </wsag:Location>
  <!--<srm:TLifeTimeInSeconds> must be
    within a range-->
    <xs:minInclusive xs:value="600"/> <!-- ten minutes -->
    <xs:maxInclusive xs:value="360000"/> <!-- one hundred hours -->

```

```

    </wsag:Item>
  </wsag:CreationConstraints>
</wsag:Template>

```

Offer

This is an example of an agreement offer that is compliant with the template above. Note the various structural complexities of the different domain-specific service description elements (srm:spaceType, etc&). This example shows alternate branches using logical grouping compositors: the requested number bytes in space to allocate and type of space to use. For Volatile Space the requested size of space is relatively large, while for Durable space the requested size is rather low.

Concepts for which it makes sense to specify single fixed values are expressed as domain-specific service descriptions inside wsag:ServiceDescriptionTerm elements.

```

<wsag:AgreementOffer xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xmlns:wsag="http://www.ggf.org/namespaces/ws-agreement"
  xmlns:job="http://www.gridforum.org/namespaces/job"
  xsi:schemaLocation="http://www.ggf.org/namespaces/wsagreement agreement_types.xsd
    http://www.gridforum.org/namespaces/srm srm_terms.xsd">
  <wsag:Name>Offer1</wsag:Name>
  <wsag:Context/>
  <wsag:Terms>
    <wsag:exactlyOne>
      <wsag:All>

        <wsag:ServiceDescriptionTerm wsag:Name="type"
          wsag:ServiceName="SpaceReservation1">
          <srm:spaceType>Volatile</srm:spaceType >
        </wsag:ServiceDescriptionTerm> \

        <wsag:ServiceDescriptionTerm wsag:Name="type"
          wsag:ServiceName="SpaceReservation2">
          <srm:spaceType>Durable</srm:spaceType >
        </wsag:ServiceDescriptionTerm>

        <wsag:ServiceDescriptionTerm wsag:Name="totalSize"
          wsag:ServiceName="SpaceReservation1">
          <srm:spaceTotalSize >654321</srm:spaceTotalSize >
        </wsag:ServiceDescriptionTerm>

        <wsag:ServiceDescriptionTerm wsag:Name="guaranteedSize"
          wsag:ServiceName="SpaceReservation2">
          <srm:guaranteedSize >10000</srm:guaranteedSize >
        </wsag:ServiceDescriptionTerm>
      </wsag:All>
    </wsag:exactlyOne>
  </wsag:Terms>
</wsag:AgreementOffer>

```

```

        <wsag:ExactlyOne>
            <wsag:All>
                <wsag:ServiceDescriptionTerm
                    wsag:Name="garanteedSize"
                    wsag:ServiceName="SpaceReservation1">
                        <srm:garanteedSize >
                            10000
                        </srm:garanteedSize >
                    </wsag:ServiceDescriptionTerm>
                    <!-- lifetime probably should not should be here --
                >

                <wsag:ServiceDescriptionTerm
                    wsag:Name="lifetime"
                    wsag:ServiceName="spaceLifetime">
                        <srm:TLifeTimeInSeconds >
                            30000
                        </srm:TLifeTimeInSeconds >
                    </wsag:ServiceDescriptionTerm>
                </wsag:All>
            </wsag:ExactlyOne>

        <wsag:GuaranteeTerm
            wsag:Name="lifetimeGuarantee"
            wsag:ServiceScope="SpaceReservation1 SpaceReservation2">
                <wsag:Variables>
                    <!-- should lifetime be here ?-->
                    <wsag:Variable wsag:Name="spaceLifetime"
                        wsag:Metric="srm:TLifeTimeInSeconds">
                        <wsag:Location>

                        /wsag:AgreementOffer/wsag:Terms/wsag:All/wsag:ServiceDescriptionTerm[ @w
sag:Name='fileStageIn1']
                    </wsag:Location>
                </wsag:Variable>
            </wsag:Variables>

            <wsag:ServiceLevelObjective>
                (duration1 + duration2) IS_LESS_INCLUSIVE 50S
            </wsag:ServiceLevelObjective>
            <!-- not clear
        <wsag:BusinessValueList>
            <wsag:Penalty>
                <wsag:AssessmentInterval>
                    <wsag:Count>
                        1</wsag:Count>
                    </wsag:AssessmentInterval>
                    <wsag:ValueExpression>2</wsag:ValueExpression>
                </wsag:Penalty>

```

```

        </wsag:BusinessValueList>
    </wsag:GuaranteeTerm>

    </wsag:All>
</wsag:Terms>
</wsag:AgreementOffer>

```

Agreement

This is an example of an agreement after acceptance of the offer. Notice that in this example, the only difference with the offer is that the alternate branches have been reduced to only one, corresponding to the choice made by the factory (based on resource availability). The service provider could have inserted qualifying conditions on certain terms of service, depending on factors such as resource availability. This agreement document is the response of a GetResourceProperty request with the QName of the wsag:Terms resource property as the input parameter.

```

<wsrp:GetResourcePropertyResponse
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:wsag="http://www.ggf.org/namespaces/ws-agreement"
xmlns:wsrp="http://www.ibm.com/xmlns/stdwip/webservices/ WS-ResourceProperties"
xmlns:job="http://www.gridforum.org/namespaces/srm">

```

```

    <wsag:Terms>
        <wsag:All>
            <wsag:ServiceDescriptionTerm wsag:Name="type"
                wsag:ServiceName="SpaceReservation1">
                <srm:spaceType>Volatile</srm:spaceType >
            </wsag:ServiceDescriptionTerm> \

            <wsag:ServiceDescriptionTerm wsag:Name="totalSize"
                wsag:ServiceName="SpaceReservation1">
                <srm:spaceTotalSize >654321</srm:spaceTotalSize >
            </wsag:ServiceDescriptionTerm>

            <wsag:ServiceDescriptionTerm wsag:Name="guaranteedSize"
                wsag:ServiceName="SpaceReservation2">
                <srm:guaranteedSize >10000</srm:guaranteedSize >
            </wsag:ServiceDescriptionTerm>

        <wsag:ExactlyOne>
            <wsag:All>
                <wsag:ServiceDescriptionTerm
                    wsag:Name="guaranteedSize"
                    wsag:ServiceName="SpaceReservation1">
                    <srm:guaranteedSize >

```

```

10000
    </srm:garanteedSize >
  </wsag:ServiceDescriptionTerm>
  <!-- should lifetime be here? -->
    <wsag:ServiceDescriptionTerm
      wsag:Name="lifetime"
      wsag:ServiceName="spaceLifetime">
      <srm:TLifeTimeInSeconds >
        30000
      </srm:TLifeTimeInSeconds >
    </wsag:ServiceDescriptionTerm>
  </wsag:All>
</wsag:ExactlyOne>

<wsag:GuaranteeTerm
  wsag:Name="lifetimeGuarantee"
  wsag:ServiceScope="SpaceReservation1">
  <wsag:Variables>
    <!-- or should lifetime be here ?-->
    <wsag:Variable wsag:Name="spaceLifetime"
      wsag:Metric="srm:TLifeTimeInSeconds">
      <wsag:Location>

    /wsag:AgreementOffer/wsag:Terms/wsag:All/wsag:ServiceDescriptionTerm[ @w
sag:Name='fileStageIn1']
      </wsag:Location>
    </wsag:Variable>
  </wsag:Variables>

  <wsag:ServiceLevelObjective>
    (duration1 + duration2) IS_LESS_INCLUSIVE 50S
  </wsag:ServiceLevelObjective>
  <wsag:BusinessValueList>
    <wsag:Penalty>
      <wsag:AssessmentInterval>
        <wsag:Count>1</wsag:Count>
      </wsag:AssessmentInterval>
      <wsag:ValueExpression>2</wsag:ValueExpression>
    </wsag:Penalty>
  </wsag:BusinessValueList>
</wsag:GuaranteeTerm>

  </wsag:All>
</wsag:Terms>

</wsrp:GetResourcePropertyResponse>

```

Questions:

1. The agreement is about the usage of the service and /or resources. How does the service tell that in order to use it you need to negotiate an agreement?
2. Agreement itself is a service, and its subject is some other service, should it all be one entity, then the agreement template might also include the wsdl of the service that will be the result of the agreement negotiation.
3. Some service parameters are not negotiated, but indicate the progress of utilization of the agreed upon service/resource. How could you enquire about these parameters, and how these parameters should be advertised in the agreement template?
4. In the job execution agreement example, it appears, that the agreement template does not provide sufficient info so that to be able to specify the agreement offer.

Appendix 1. Skeleton of WS-Agreement extracted from [1].

Agreement Structure:

```
<wsag:Agreement> <wsag:Name> xs:NCName </wsag:Name> ?  
<wsag:AgreementContext> wsag:AgreementContextType </wsag:AgreementContext>  
<wsag:Terms> wsag:TermCompositorType </wsag:Terms> </wsag:Agreement>
```

Agreement Context:

```
<wsag:AgreementContext xsd:anyAttribute>  
<wsag:AgreementInitiator>xs:anyType</wsag:AgreementInitiator> +  
<wsag:AgreementProvider>xs:anyType</wsag:AgreementProvider> +  
<wsag:AgreementInitiatorIsServiceConsumer> xsd:boolean  
</wsag:AgreementInitiatorIsServiceConsumer> +  
<wsag:TerminationTime>xs:DateTime</wsag:TerminationTime> +  
<wsag:RelatedAgreements> <wsag:RelatedAgreement wsag:RelationshipType=  
wsag:dependency > <wsag:RelatedAgreementEPR> wsa:EndpointReferenceType  
</wsag:AgreementEPR> </wsag:RelatedAgreement> * </wsag:RelatedAgreements> +  
<xsd:any/> * </wsag:AgreementContext>
```

Guarantee Terms Structure:

```
<wsag:GuaranteeTerm wsag:ServiceScope= wsag:ListOfServiceNames >  
<wsag:Variables>&</wsag:Variables>  
<wsag:QualifyingCondition>&</wsag:QualifyingCondition>?  
<wsag:ServiceLevelObjective>&</wsag:ServiceLevelObjective>
```



```

<wsag:BusinessValueList>&</wsag:BusinessValueList> </wsag:GuaranteeTerm>
<wsag:Variable wsag:Name= xsd:NCName wsag:Metric= xsd:QName >
<wsag:Reference>xsd:anyType<wsag:Reference> </wsag:Variable>

```

Agreement Terms

Term Compositor Structure:

```

<wsag:Terms> <wsag:All> wsag:TermCompositorType </wsag:All> |
<wsag:OneOrMore> wsag:TermCompositorType </wsag:OneOrMore> |
<wsag:ExactlyOne>wsag:TermCompositorType </wsag:ExactlyOne> | {
<wsag:ServiceDescriptionTerm> wsag:ServiceDescriptionTermType
</wsag:ServiceDescriptionTerm> | <wsag:GuaranteeTerm> wsag:GuaranteeTermType
</wsag:GuaranteeTerm> } * </wsag:Terms>

```

ServiceDescriptionTerms Structure:

```

<wsag:ServiceDescriptionTerm wsag:Name= xs:NCName wsag:ServiceName=
xs:NCName > <xsd:any> & </xsd:any> </wsag:ServiceDescriptionTerm>

```

```

<wsag:GuaranteeTerm wsag:ServiceScope= wsag:ListOfServiceNames >
<wsag:Variables>&</wsag:Variables>
<wsag:QualityCondition>&</wsag:QualifyingCondition>?
<wsag:ServiceLevelObjective>&</wsag:ServiceLevelObjective>
<wsag:BusinessValueList>&</wsag:BusinessValueList> </wsag:GuaranteeTerm>

```

Variables:

```

<wsag:Variable wsag:Name= xsd:NCName wsag:Metric= xsd:QName >
<wsag:Reference>xsd:anyType<wsag:Reference> </wsag:Variable>

```

Template

Template structure

```

<wsag:template> <wsag:Name> xs:NCName</wsag:Name> ?
<wsag:AgreementContext> wsag:AgreementContextType </wsag:AgreementContext>
<wsag:Terms> wsag:TermCompositorType </wsag:Terms> <wsag:CreationConstraints>
& </wsag:CreationConstraints> ? </wsag:template>

```

Creation Constraints

```

<wsag:template> & <wsag:CreationConstraints> ? <wsag:Item>&</wsag:Item> *
<wsag:Constraint>&</wsag:Constraint> * </wsag:CreationConstraints>
</wsag:template>

```

Offer Items:

```
<wsag:Item Name= xsd:NCName > <wsag:Location> xsd:anyType <wsag:location/>
<xsd:restriction> xsd:simpleRestrictionModel <xsd:restriction> ? </wsag:Item>
```

PortTypes And Operations:

wsag:AgreementFactory.wsag:CreateAgreement function

Input:

```
<wsag:createAgreementInput> <initiatorAgreementEPR> EPR1
</initiatorAgreementEPR> ? <offer> ... </AgreementOffer>
</wsag:createAgreementInput>
```

EPR is an(Endpoint Reference.)

Output:

```
<wsag:createAgreementResponse> <createdAgreementEPR> EPR2
</createdAgreementEPR> </wsag:createAgreementResponse>
```

Refernces

[1]. Web Services Agreement Specification (WS-Agreement), Version 1.1,

Alain Andrieux, Karl Czajkowski, Asit Dan (IBM) Kate Keahey, Heiko Ludwig Jim Pruyne, John Rofrano, Steve Tuecke, Ming Xu.