Guarantee Terms in WS-Agreement

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Abstract

This document specifies definition of guarantee terms in WS-Agreement. Current specification of WS-Agreement defines only a generic term with “usage” and “negotiability” attributes that are used by the negotiation protocol. The generic WS-Agreement term type is extended for defining agreement terms. Each guarantee term expresses a guarantee on service quality from the provider to the agreement initiator. Examples of service quality includes guarantee on service attributes such as response time, availability of reserved resources, etc. Service quality is specified as an expression over service attributes that must be satisfied (e.g., response time < 1 second). Each guarantee term is expressed as three tuples: service quality, qualifying conditions (if any) for the guarantee to be valid and business value, i.e., importance of meeting this guarantee.

Status

This document is a proposal for specifying guarantee terms in WS-Agreement. The document will be submitted to the GRAAP WG as input for the overall WS-Agreement specification.

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1. Introduction

Current specification of WS-Agreement defines only a generic term with “usage” and “negotiability” attributes that are used by the negotiation protocol. The generic WS-Agreement term type can be extended for specific use of agreement terms. Hence, it is left as an exercise for defining guarantee terms, which are rather fundamental in an agreement specification. The current document provides mechanisms for defining guarantee terms.

The primary motivation for creating a service agreement between a provider and an agreement initiator is to provide assurance to the agreement initiator on the service quality and/or resource availability by the provider. For example, it may provide assurance on the bounds on service response time and availability. Alternatively, it may provide assurance on the availability of minimum resources such as memory, CPU MIPS, storage, etc. These bounds are referred to as service level objectives. An expression of assurance also includes qualifying conditions on external factors such as time of the day as well as the conditions that a service client must meet. For example, bound on response time is assured only if client request rate is below a specified threshold during weekdays.

An assurance also includes strength of this commitment by the provider, referred to as a business value. This may include the importance of this assurance to the agreement initiator and/or provider’s confidence in meeting this assurance. In business SLAs, this importance to agreement initiator, and a measure of provider’s confidence, is indirectly expressed by specifying the consequences of not meeting this guarantee. Here, each violation of a guarantee term will incur a certain penalty.

Expression of guarantee terms, i.e., business value in meeting certain assurances and flexible specification of client requirements also free a provider from fixed allocation of resources. A provider dynamically allocates resources based on actual measured or estimated client requirements, and evaluation of business value. For example, a new arrival of a high priority job may result in reduction of allocated resources or suspension of an existing low priority job.

1.1 Goals and Requirements

1.1.1 Requirements

The goal of WS-Agreement guarantee term specification is to provide the mechanisms needed to enable Web Services applications to specify agreement terms expressing guarantee semantics irrespective of resource or service definition language. Specifically, this specification extends the definition of agreement term to specify three essential parts in expressing a guarantee:

- Conditions under which a specific guarantee is to be observed,
- Service level objective expressed as conditions over the attributes of the service, and

? Business value or importance associated with meeting this guarantee.

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 specification of conditions to be used in specifying guarantee terms. We assume standards will emerge elsewhere for a common expression definition language. Alternative, different expression language may used in different usage domain.

? It is also not the objective of this document to define specific guarantee terms for a specific usage domain, such as network, server, application, etc.

1.2 Notational Conventions

(Replace with latest 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 [RFC 2119].

1.3 Namespaces

The following namespaces are used in this document:

Prefix	Namespace
xs	http://www.w3.org/2001/XMLSchema
wsag	http://GRAAP/WS-Agreement
xqx	XML Syntax for XQuery 1.0 (XQueryX)

2. Terminology and Concepts

(We introduce the following terms which are used throughout this document:

Guarantee term – A *WS-Agreement term* for specifying a guarantee.

Qualifying condition – A component of *guarantee term* that represents conditions on external factors and/or conditions the client must meet.

Service Level Objective - A component of *guarantee term* that represents conditions over service attributes, that are being assured.

Business Value List – A component of *guarantee term* that represents list of business values representing assurances either to agreement initiator, or to the provider for meeting (or not meeting) this service level objective.

3. Guarantee Term Specification

The WS-Agreement *TermType* is extended to define a *GuaranteeTermType*.

```
<xsd:complexType name=”GuaranteeTermType”>
 <xsd:complexcontent>
  <xsd:extension  base=”wsag:TermType”
     <xsd:sequence>
      <xsd:element name=”QualifyingCondition” type=”ConditionType”
                   minOccurs=”0” />
```

```
<xsd:element name=”ServiceLevelObjective” type=”ConditionType”/>
<xsd:element name=”BusinessValueList” type=”BusinessValueListType”/>
     </xsd:sequence>
   </xsd:extension>
</xsd:complexContent
</xsd:complexType>

<xsd:element GuaranteeTerm type=”GuaranteeTermType”
                        substitutionGroup=”AgreementTerm”>
```

A guarantee term consists of an optional qualifying condition expression, a specification of service level objective and a list of associated business values.

3.1 Qualifying Condition

QualifyingCondition is expressed as a condition over service attributes and/or external factor such as date time. Expression of arithmetic, Boolean and date-time expression is required in many contexts, and not just in agreements. An example of condition expression language can be found in [XQUERYX]. Hence, the *conditionType* is defined as an abstract type that can be extended with specific condition expression language.

```
<xsd:complexType name=”conditionType” abstract=”true”>
```

3.2 Service Level Objective

Service Level Objective is expressed as a condition over the service attributes that must be met. The condition is expressed using *conditionType*.

3.3 Business Value

In many cases, all service level objectives (SLO) will not carry the same level of importance. It is necessary therefore, to be able to assign a “business value” to an objective so that its importance can be understood, and so tradeoffs can be made amongst various guarantees. The importance can be expressed either in relative terms or in absolute terms. Relative terms, such as high, low, medium, etc. are used to prioritize across many guarantees. Each term expresses its value using a default unit of importance, and comparison of importance across guarantees establishes their priority or relative importance. Absolute value of a guarantee on the other hand specifies business impact of meeting or violating an individual guarantee. Additionally, a business value may include expressing provider’s confidence in meeting an objective, e.g., availability of a resource reserved in advance.

A single SLO may be associated with multiple business values, each expressing a different aspect of the value. For example, meeting an objective will result in a business value of certain reward, while failure to meet this objective will incur a certain penalty. Alternatively, a value item may express provider confidence while another may express priority of agreement initiator. *BusinessValueListType* is expressed as a list of *BusinessValue*, each item expressing a different aspect of value.

```
<xsd:complexType name=”BusinessValueListType”>
```

```
 <xsd:sequence>
   <xsd:element name=”BusinessValue” type=”BusinessValueType”
                  maxOccurs=”unbounded” />
 <xsd:sequence>
```

Each business value item is expressed via *BusinessValueType* consisting of two attributes, *Label* and *Unit,* and a *ValueExpression.* The label expresses purpose in use of this value, e.g., reward, penalty, confidence, etc. and unit expresses measurement unit for this value, e.g., reward and penalty in USD or some other currency, confidence as probability or percentile. The *ValueExpression* can be an integer, string, or any arbitrary expression defined elsewhere.

```
<xsd:complexType name=”BusinessValueType”>
  <xsd:simpleContent>
    <xsd:extension base="ValueExpressionType">
     <xsd:attribute name=”Label” type=”xsd:string” />
     <xsd:attribute name=”Unit” type=”string”/>
     </xsd:extension>
   </xsd:simpleContent>
 </xsd:complexType>

 <xsd:simpleType name = “ValueExpression”
    <xsd:union memberTypes = “xsd:integer xsd:string xsd:NCName”
  </xsd:simpleType>
```

3.4 Example

An example of guarantee term is illustrated below. This represents a guarantee of 12 MB of memory by the provider to the agreement initiator for a certain time period, weekdays. Provider has a high confidence (probability of 0.99) in meeting this guarantee. In the event, the provider is not able to meet this guarantee, it will pay a penalty of 5 USD. The example uses predicates defined in [XQueryX].

```
<GuaranteeTerm>
  <QualifyingCondition xsi:type=”XQXCondition”>
     <xqx:predicates>
      <xqx:expr xsi:type=”xqx:operatorExpr” >
        <xqx:opType> = </xqx:opType>
         <xqx:parameters>
          <xqx:expr xsi:type=”xqx:variable”>
             <xqx :name>currentDateTime</xqx :name>
           </xqx:expr>
           <xqx:expr xsi:type=”ns:dateTime”>
             <xqx:value>weekday</xqx:value>
           </xqx:expr>
         </xqx:parameters>
      </xqx:predicates>
  </ServiceLevelObjective>
  <ServiceLevelObjective xsi:type=”XQXCondition”>
     <xqx:predicates>
      <xqx:expr xsi:type=”xqx:operatorExpr” >
        <xqx:opType> = </xqx:opType>
         <xqx:parameters>
           <xqx:expr xsi:type=”xqx:variable”>
             <xqx :name> memory </xqx :name>
           </xqx:expr>
           <xqx:expr xsi:type=”xqx:integerConstantExpr”>
             <xqx:value>12</xqx:value>
```

```
          </xqx:expr>
        </xqx:parameters>
     </xqx:predicates>
  </ServiceLevelObjective>
  <BusinessValueList>
     <BusinessValue Label=”confidence” Unit=”probability” 0.99>
     <BusinessValue Label=”penalty” Unit=”USD” 5>
  </BusinessValueList>
```

4. Acknowledgements

We would like to thank the following people for their contributions towards this specification: David Kaminsky, John Sweitzer.

5. References

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