Web Services Base Faults 1.2
(WS-BaseFaults)
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Abstract:

    Problem determination in a Web services setting is simplified by standardizing a base set of information that may appear in fault messages. WS-BaseFaults defines an XML Schema type for base faults, along with rules for how this base fault type is used and extended by Web services.

Status:

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

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Table of Contents

51 1 Introduction

52 A designer of a Web services application often uses interfaces defined by others. Managing faults
53 in such an application is more difficult when each interface uses a different convention for
54 representing common information in fault messages.

55 Support for problem determination and fault management can be enhanced by specifying Web
56 services fault messages in a common way. When the information available in faults from various
57 interfaces is consistent, it is easier for requestors to understand faults. It is also more likely that
58 common tooling can be created to assist in the handling of faults.

59 WS-BaseFaults defines an XML Schema type for a base fault, along with rules for how this fault
60 type is used by Web services.

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

63 1.1 Goals and Requirements

64 The goal of WS-BaseFaults is to standardize the terminology, concepts, XML types, and WSDL
65 usage of a base fault type for Web service interfaces.

66 1.1.1 Requirements

67 This specification intends to meet the following requirements:

68 • Define a standard XML Schema type containing base fault information.

69 • Define how this base fault type is used within WSDL defined interfaces.

70 1.1.2 Non-Goals

71 The following topics are outside the scope of this specification:

72 • It is not an objective of this specification to define a common hierarchy of common faults
73 upon the base fault.

74 1.2 Notational Conventions

75 The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD",
76 "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be
77 interpreted as described in RFC 2119.

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

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

84 • `?` denotes optionality (i.e. zero or one occurrences),

85 • `*` denotes zero or more occurrences,

86 • `+` one or more occurrences,

87   •   `['` and `]'` are used to form groups,

88   •   `|'` represents choice.

89   •   Attributes are conventionally assigned a value which corresponds to their type, as
90   defined in the normative schema.

```
91  <!-- sample pseudo-schema -->
92  <element
93      required_attribute_of_type_QName="xs:QName"
94      optional_attribute_of_type_string="xs:string"? >
95      <required_element />
96      <optional_element />?
97      <one_or_more_of_these_elements />+
98      [ <choice_1 /> | <choice_2 /> ]*
99  </element>
```

100

101 1.3 Namespaces

102 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
xsi	http://www.w3.org/2001/XMLSchema-instance
wsrf-bf	http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-draft-04.xsd
wsa	http://schemas.xmlsoap.org/ws/2004/08/addressing

2 Base Fault Type

104   The basic fault has the following syntax. The normative XML Schema definition is in Appendix D:

```
105    <BaseFault>
106        <Timestamp>xsd:dateTime</Timestamp>
107        <OriginatorReference>
108            wsa:EndpointReferenceType
109        </OriginatorReference> ?
110        <ErrorCode dialect="anyURI">xsd:string</ErrorCode> ?
111        <Description>xsd:string</Description> *
112        <FaultCause>wsrf-bf:BaseFault</FaultCause> *
113    </BaseFault>
```

114   /wsbf:BaseFault/Timestamp

115   This REQUIRED element MUST be the time at which the fault occurred. There MUST be
116   only one timestamp element in BaseFault. In the absence of the time zone designation,
117   the xsd:dateTime value MUST be interpreted as universal time (UTC) time.

118   /wsbf:BaseFault/OriginatorReference

119   This OPTIONAL element is a WS-Addressing [WS-Addressing] EndpointReference of the
120   Web service that generated the fault. This element MAY be omitted if the fault originator
121   is clearly implied by the context in which the fault appears (for example in a simple
122   request response message exchange). One use of this element is in a situation of nested
123   faults.

124   /wsbf:BaseFault/ErrorCode

125   This OPTIONAL element provides convenient support for legacy fault reporting systems
126   (e.g., POSIX errno). The dialect attribute on ErrorCode MUST be a URI that defines the
127   context in which the ErrorCode MUST be interpreted. For example, a URI might be
128   defined that describes how a POSIX errno is mapped to an ErrorCode and that URI must
129   appear on any ErrorCode element carrying a POSIX errno.

130   /wsbf:BaseFault/Description

131   This OPTIONAL element contains a plain language description of the fault. This
132   description is expected to be helpful in explaining the fault to users. There MAY be any
133   number of description elements.

134   /wsbf:BaseFault/FaultCause

135   This OPTIONAL element is a BaseFault that describes an underlying cause of this fault.
136   There MAY be any number of FaultCause elements. This element SHOULD be used with
137   xsi:type to describe a more specialized fault that extends BaseFault. The ability to include
138   FaultCause elements in a fault allows for *chaining* of fault information so that a recipient
139   of a fault MAY examine details underlying the cause of the fault.

140   Note that there is no required child element within BaseFault that identifies the particular type (or
141   class) of fault. Rather, an application-specific extension of BaseFault MUST be defined for each
142   distinct type of fault

143   BaseFault does NOT include open element extensibility. To define an extended fault, you MUST
144   use XML Schema extension to extend the BaseFault type to include additional attributes and/or
145   elements.

3 Use of Base Faults in WSDL 1.1

146

147 Each distinct type of fault associated with a WSDL operation MUST be listed as a separate fault
148 response in the WSDL operation definition, as follows. For each distinct fault associated with a
149 Web service operation:

150   1. As described above, there MUST be a distinct XML Schema complexType that extends
151   wsrf-bf:BasicFaultType, which represents this fault's distinct type. This extendedfault
152   complexType MAY contain additional attributes and/or elements.

153   2. An element MUST be defined for this distinct fault, whose type is the complexType of the
154   distinct fault as defined in step 1.

155   3. A WSDL message MUST be defined for this distinct fault. This message MUST have one
156   part. The value of the WSDL part's *name* attribute MUST be *fault*, and the value of its
157   *element* attribute MUST refer by QName to the element of this distinct fault as defined in
158   step 2.

159   4. The WSDL operation MUST have a fault element for this distinct fault. The value of the
160   WSDL fault element's *name* attribute SHOULD be the same as the NCName of the fault
161   element defined in step 2, although it MAY choose to ignore this rule (for example to
162   avoid NCName collisions between fault elements defined in different namespaces). The
163   value of the WSDL fault element's *message* attribute MUST refer by QName to the
164   WSDL message element of this distinct fault as defined in step 3.

165 In addition to any operation-specific faults, all WSDL operations MAY also have a WSDL fault
166 element whose name attribute has the value "BaseFault" and whose message element has the
167 value "wsrf-bf:BaseFaultMessage".

168 The following non-normative example defines a portType named "pt" with a single operation
169 named "op" that has two distinct faults, "hisFault" and "herFault", in addition to a basic
170 "baseFault". The "hisFault" element does not extend "BaseFault" with any additional information
171 (i.e. it just defines a distinct fault type with the base information), while the "herFault" element
172 extends "BaseFault" with an additional details element.

173
```
…
174 <wsdl:definitions …>
175   <wsdl:types>
176     <xsd:schema …>
177       <!-- Type and element declarations for each distinct fault
178 -->
179         <xsd:complexType name="HisFaultType">
180           <xsd:complexContent>
181             <xsd:extension base="wsrf-bf:BaseFaultType"/>
182           </xsd:complexContent>
183         </xsd:complexType>
184         <xsd:element name="hisFault" type="tns:HisFaultType"/>
185
186         <xsd:complexType name="HerFaultType">
187           <xsd:complexContent>
188             <xsd:extension base="wsrf-bf:BaseFaultType">
189               <xsd:sequence>
190                 <xsd:element name="details" type="xsd:string"/>
191               </xsd:sequence>
192             </xsd:extension>
193           </xsd:complexContent>
194         </xsd:complexType>
195         <xsd:element name="herFault" type="tns:HerFaultType"/>
196
```

```
197        </xsd:schema>
198      </wsdl:types>
199
200      <!-- WSDL messages for each distinct fault -->
201      <wsdl:message name="hisFaultMessage">
202         <wsdl:part name="fault" element="tns:hisFault"/>
203      </wsdl:message>
204      <wsdl:message name="herFaultMessage">
205         <wsdl:part name="fault" element="tns:herFault"/>
206      </wsdl:message>
207
208      <wsdl:portType name="pt">
209         <wsdl:operation name="op">
210         <!-- WSDL operation fault elements for each distinct fault
211    -->
212            <wsdl:input … />
213            <wsdl:output … />
214            <wsdl:fault name="hisFault"
215                      message="tns:hisFaultMessage"/>
216            <wsdl:fault name="herFault"
217                      message="tns:herFaultMessage"/>
218            <wsdl:fault name="BaseFault"
219                      message="wsrf-bf:BaseFaultMessage"/>
220         </wsdl:operation>
221      </wsdl:portType>
222    </wsdl:definitions>
223
```

224 A Web service MAY return a more refined fault in place of a particular fault that is defined by a
225 WSDL operation. To do so, a complexType MUST be defined that extends one of the faults found
226 in the WSDL operation. The fault message that is returned by the service MUST then use the
227 element of the fault from which the more refined fault is derived with an xsi:type attribute whose
228 value is the QName of the complexType for the more refined fault.

229 For example, if an implementation of the "pt" example above wants to return a more refined
230 version hisFault for the "op" operation, it must define a complexType of hisFault such as:

```
231      … targetNamespace="http://example.com/ExtendedFaults" …
232
233      <xsd:complexType name="ExtendedHisFaultType">
234         <xsd:complexContent>
235            <xsd:extension base="tns:HisFaultType">
236               <xsd:sequence>
237                  <xsd:element name="otherDetails"
238                               type="xsd:string"/>
239               </xsd:sequence>
240            </xsd:extension>
241         </xsd:complexContent>
242      </xsd:complexType>
```

243 This example service can then return a fault message for the "op" operation such as:

```
244      <hisFault>
245            xmlns:ef="http://example.com/ExtendedFaults"
246            xsi:type="ef:ExtendedHisFaultType">
247        <timeStamp>…</timeStamp>
248      …
249        <otherDetails>…</otherDetails>
250      </hisFault>
```

251 4 Security Considerations

252 Fault messages may contain sensitive information. Policies should be defined such that such
253 sensitive content of fault messages are appropriately protected. For example, the security policy
254 can be specified to require that the sensitive content be encrypted based on WS-Security.
255 Depending on the context in which the fault occurred, it may also be desired that the integrity of
256 the message be ensured. In such cases, the security policy can reflect this by specifying the need
257 to digitally sign the resulting fault messages based on WS-Security specification.

5 References

258

259   **[SOAP 1.2]**
260   http://www.w3.org/TR/soap12-part1/
261

262   **[OGSI]**
263   http://www.ggf.org/ogsi-wg/drafts/draft-ggf-ogsi-gridservice-29_2003-04-05.pdf
264

265   **[WS-Addressing]**
266   http://www.w3.org/Submission/2004/SUBM-ws-addressing-20040810
267

268   **[Web Services Security]**
269   http://www.oasis-open.org/committees/download.php/5531/oasis-200401-wss-soap-
270   message-security-1.0.pdf
271

272   **[XML-Infoset]**
273   http://www.w3.org/TR/xml-infoset/
274

275   **[XML]**
276   http://www.w3.org/TR/REC-xml
277

278

Appendix A. Acknowledgments

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

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Appendix B. Revision History

Rev	Date	By Whom	What
wd-01	2004-06-02	Lily Liu, Sam Meder	Initial version created from submission by contributing companies. Minor modifications made to reflect OASIS formatting.
wd-02	2004-06-10	Sam Meder	Consistency fixes from Ian Robinson Updated namespaces Cleaned up the references
wd-02	2004-06-28	Lily Liu	Namespace fixes in xsd and wsdl and minor format changes in the requirement section.
wd-02	2004-06-30	Sam Meder	Inserted updated schema and wsdl – adds elementFormDefault="qualified" attributeFormDefault="unqualified" attributes to schema declarations.
wd-03	2004-11-11	Lily Liu	Issue resolutions from October F2F: o WSRF43 o Updated the status section o Updated document identifier, location and namespaces o Changed doc identifier to "Summary Info Title"
wd-04	2005-02-17	Lily Liu	Issue resolutions from Jan F2F, 2005: o Updated draft number and namespaces o Applied resolutions to issues 62, 81, 90, and 96.

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330

331   **Appendix D. XML Schema**

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

```
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336     <!--
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378        WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
379     -->
380
381     <xsd:schema
382       xmlns="http://www.w3.org/2001/XMLSchema"
383       xmlns:xsd="http://www.w3.org/2001/XMLSchema"
384       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
385       xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
386       xmlns:wsrf-bf=
387         "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
388     draft-04.xsd"
389       elementFormDefault="qualified" attributeFormDefault="unqualified"
```

```
390      targetNamespace=
391        "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
392    draft-04.xsd">
393      <xsd:import
394        namespace="http://schemas.xmlsoap.org/ws/2004/08/addressing"
395        schemaLocation=
396                "http://schemas.xmlsoap.org/ws/2004/08/addressing" />
397
398      <xsd:import namespace="http://www.w3.org/XML/1998/namespace"
399                schemaLocation="http://www.w3.org/2001/xml.xsd">
400        <xsd:annotation>
401          <xsd:documentation>
402            Get access to the xml: attribute groups for xml:lang as
403    declared on 'schema'
404            and 'documentation' below
405          </xsd:documentation>
406        </xsd:annotation>
407      </xsd:import>
408    <!-- ===================== BaseFault Types ======================= -->
409
410      <xsd:element name="BaseFault" type="wsrf-bf:BaseFaultType"/>
411
412      <xsd:complexType name="BaseFaultType">
413        <xsd:sequence>
414          <xsd:element name="Timestamp" type="xsd:dateTime"
415                    minOccurs="1" maxOccurs="1"/>
416          <xsd:element name="Originator" type="wsa:EndpointReferenceType"
417                    minOccurs="0" maxOccurs="1"/>
418          <xsd:element name="ErrorCode"
419                    minOccurs="0" maxOccurs="1">
420            <xsd:complexType>
421              <xsd:complexContent mixed="true">
422                <xsd:extension base="xsd:anyType">
423                  <xsd:attribute name="dialect" type="xsd:anyURI"
424                            use="required"/>
425                </xsd:extension>
426              </xsd:complexContent>
427            </xsd:complexType>
428          </xsd:element>
429
430          <xsd:element name="Description"
431                    minOccurs="0" maxOccurs="unbounded">
432            <xsd:complexType>
433              <xsd:simpleContent>
434                <xsd:extension base="xsd:string">
435                  <xsd:attribute ref="xml:lang" use="optional"/>
436                </xsd:extension>
437              </xsd:simpleContent>
438            </xsd:complexType>
439          </xsd:element>
440
441          <xsd:element name="FaultCause" type="wsrf-bf:BaseFaultType"
442                    minOccurs="0" maxOccurs="unbounded"/>
443        </xsd:sequence>
444      </xsd:complexType>
445    </xsd:schema>
```

446 Appendix E. WSDL 1.1

447 The WSDL 1.1 for the Web service methods described in this specification is compliant with WS-I
448 Basic Profile 1.1 and is included here for convenience. The authoritative version of this WSDL is
449 available at:
450 http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-draft-04.wsdl

```
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495     -->
496     <wsdl:definitions name="BaseFaults"
497       xmlns="http://schemas.xmlsoap.org/wsdl/"
498       xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
499       xmlns:xsd="http://www.w3.org/2001/XMLSchema"
500       xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
501       xmlns:wsrf-bf=
502          "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
503       draft-04.xsd"
```

```
504    targetNamespace=
505       "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
506    draft-04.wsdl">
507
508    <!-- ==================== Types Definitions ====================== -->
509      <wsdl:types>
510        <xsd:schema
511          elementFormDefault="qualified"
512    attributeFormDefault="unqualified" >
513          <xsd:import
514            namespace=
515            "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-
516    1.2-draft-04.xsd"
517            schemaLocation=
518        "http://docs.oasis-open.org/wsrf/2005/03/wsrf-WS-BaseFaults-1.2-
519    draft-04.xsd"/>
520        </xsd:schema>
521      </wsdl:types>
522
523      <wsdl:message name="BaseFaultMessage" >
524        <wsdl:part name="Fault" element="wsrf-bf:BaseFault" />
525      </wsdl:message>
526    </wsdl:definitions>
```