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# 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.

Committee members should send comments on this specification to the [wsrf@lists.oasis-open.org](mailto:wsr/WS-BaseFaults-1.2-draft-03@lists.oasis-open.org) list. Others should subscribe to and send comments to the [wsrf-comment@lists.oasis-open.org](mailto:wsrf-comment@lists.oasis-open.org) list. To subscribe, send an email message to [wsrf-comment-subscribe@lists.oasis-open.org](mailto:wsrf-comment-subscribe@lists.oasis-open.org) with the word "subscribe" as the body of the message.

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# 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, referred 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>

```

### 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	<a href="http://docs.oasis-open.org/wsr/2004/11/wsr-WS-BaseFaults-1.2-draft-03.xsd">http://docs.oasis-open.org/wsr/2004/11/wsr-WS-BaseFaults-1.2-draft-03.xsd</a>
wsa	http://schemas.xmlsoap.org/ws/2004/08/addressing

## 103 2 Base Fault Type

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

```
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. The outer-most fault may use this component to reference the actual original  
124 source of the fault condition.

125 /wsbf:BaseFault/ErrorCode

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

131 /wsbf:BaseFault/Description

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

135 /wsbf:BaseFault/FaultCause

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

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

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

### 3 Use of Base Faults in WSDL 1.1

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

1. As described above, there MUST be a distinct XML Schema complexType that extends `wsrf-bf:BasicFaultType`, which represents this fault's distinct type. This extended fault complexType MAY contain additional attributes and/or elements.
2. An element MUST be defined for this distinct fault, whose type is the complexType of the distinct fault as defined in step 1.
3. A WSDL message MUST be defined for this distinct fault. This message MUST have one part. The value of the WSDL part's *name* attribute MUST be *fault*, and the value of its *element* attribute MUST refer by QName to the element of this distinct fault as defined in step 2.
4. The WSDL operation MUST have a fault element for this distinct fault. The value of the WSDL fault element's *name* attribute SHOULD be the same as the NCName of the fault element defined in step 2, although it MAY choose to ignore this rule (for example to avoid NCName collisions between fault elements defined in different namespaces). The value of the WSDL fault element's *message* attribute MUST refer by QName to the WSDL message element of this distinct fault as defined in step 3.

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

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

```

174 ...
175 <wsdl:definitions ...>
176   <wsdl:types>
177     <xsd:schema ...>
178       <!-- Type and element declarations for each distinct fault
179       -->
180         <xsd:complexType name="HisFaultType">
181           <xsd:complexContent>
182             <xsd:extension base="wsrf-bf:BaseFaultType"/>
183           </xsd:complexContent>
184         </xsd:complexType>
185         <xsd:element name="hisFault" type="tns:HisFaultType"/>
186
187         <xsd:complexType name="HerFaultType">
188           <xsd:complexContent>
189             <xsd:extension base="wsrf-bf:BaseFaultType">
190               <xsd:sequence>
191                 <xsd:element name="details" type="xsd:string"/>
192               </xsd:sequence>
193             </xsd:extension>
194           </xsd:complexContent>
195         </xsd:complexType>
196         <xsd:element name="herFault" type="tns:HerFaultType"/>
197

```

```

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

```

224

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

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

```

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

```

244 This example service can then return a fault message for the “op” operation such as:

```

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

```

## 252 **4 Security Considerations**

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



259 **5 References**

260 **[SOAP 1.2]**

261 <http://www.w3.org/TR/soap12-part1/>

262

263 **[OGSI]**

264 [http://www.ggf.org/ogsi-wg/drafts/draft-ggf-ogsi-gridservice-29\\_2003-04-05.pdf](http://www.ggf.org/ogsi-wg/drafts/draft-ggf-ogsi-gridservice-29_2003-04-05.pdf)

265

266 **[WS-Addressing]**

267 <http://www.w3.org/Submission/2004/SUBM-ws-addressing-20040810>

268

269 **[Web Services Security]**

270 <http://www.oasis-open.org/committees/download.php/5531/oasis-200401-wss-soap->

271 [message-security-1.0.pdf](http://www.oasis-open.org/committees/download.php/5531/oasis-200401-wss-soap-)

272

273 **[XML-Infoset]**

274 <http://www.w3.org/TR/xml-infoset/>

275

276 **[XML]**

277 <http://www.w3.org/TR/REC-xml>

278

279

## 280 **Appendix A. Acknowledgments**

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

284 The following individuals were members of the committee during the development of this  
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286 Akhil Arora (Sun Microsystems), Tim Banks (IBM), Jeff Bohren (OpenNetwork), Conor Cahill  
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288 Thomas Freund (IBM), Stephen Graham (IBM), Anish Karmarkar (Oracle), Hideharu Kato  
289 (Hitachi), David Levine (IBM), Paul Lipton (Computer Associates), Mark Little (Arjuna  
290 Technologies Limited), Lily Liu (WebMethods, Inc.), Tom Maguire (IBM), Susan Malaika (IBM),  
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293 (Individual), Greg Pavlik (Oracle), Mark Peel (Novell), Alain Regnier (Ricoh Company, Ltd.), Ian  
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295 Hitoshi Sekine (Ricoh Company, Ltd.), Frank Siebenlist (ArgonneNational Laboratory), David  
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299 (SeeBeyond Technology Corporation)

300 **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: <ul style="list-style-type: none"> <li>○ WSRF43</li> <li>○ Updated the status section</li> <li>○ Updated document identifier, location and namespaces</li> <li>○ Changed doc identifier to “Summary Info Title”</li> </ul>

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331

## 332 Appendix D. XML Schema

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

```
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336 <!--
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376     INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE
377     INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
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:wsrif-bf=
387         "http://docs.oasis-open.org/wsrif/2004/11/wsrif-WS-BaseFaults-1.2-
388         draft-03.xsd"
389     elementFormDefault="qualified" attributeFormDefault="unqualified"
```

```

390 targetNamespace=
391   "http://docs.oasis-open.org/wsr/2004/11/wsr-WS-BaseFaults-1.2-
392 draft-03.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 following illustrates the WSDL 1.1 for the Web service methods described in this

448

specification:

449

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

450

```
<!--
```

451

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493

```
-->
```

494

```
<wsdl:definitions name="BaseFaults"
```

495

```
  xmlns="http://schemas.xmlsoap.org/wsdl/"
```

496

```
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
```

497

```
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
```

498

```
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
```

499

```
  xmlns:wsrf-bf=
```

500

```
    "http://docs.oasis-open.org/wsrf/2004/11/wsrf-WS-BaseFaults-1.2-
```

501

```
draft-03.xsd"
```

502

```
  targetNamespace=
```

```
503     "http://docs.oasis-open.org/wsr/2004/11/wsr/WS-BaseFaults-1.2-
504 draft-03.wsdl">
505
506 <!-- ===== Types Definitions ===== -->
507 <wsdl:types>
508   <xsd:schema
509     elementFormDefault="qualified"
510     attributeFormDefault="unqualified" >
511     <xsd:import
512       namespace=
513       "http://docs.oasis-open.org/wsr/2004/11/wsr/WS-BaseFaults-
514 1.2-draft-03.xsd"
515       schemaLocation=
516       "http://docs.oasis-open.org/wsr/2004/11/wsr/WS-BaseFaults-1.2-
517 draft-03.xsd"/>
518   </xsd:schema>
519 </wsdl:types>
520
521 <wsdl:message name="BaseFaultMessage" >
522   <wsdl:part name="Fault" element="wsr-bf:BaseFault" />
523 </wsdl:message>
524 </wsdl:definitions>
```