



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 is published by this TC as a "public review draft". It is possible that it may change 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 may submit comments to the TC via the web form found on the TC's web page at <http://www.oasis-open.org/committees/wsrf>. Click the button for "Send A Comment" at the top of the page. Submitted comments (for this work as well as other works of that TC) are publicly archived and can be viewed at <http://lists.oasis-open.org/archives/wsrf-comment/>.

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/>).

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52 **1 Introduction**

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

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

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

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

64 **1.1 Goals and Requirements**

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

67 **1.1.1 Requirements**

68 This specification intends to meet the following requirements:

69 Define a standard XML Schema type containing base fault information.

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

71 **1.1.2 Non-Goals**

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

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

75 **1.2 Terminology**

76 The keywords "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD",
77 "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be
78 interpreted as described in [RFC 2119](#).

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

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

85 `?' denotes optionality (i.e. zero or one occurrences),

86 `*' denotes zero or more occurrences,

87 `+' one or more occurrences,

88 `[` and `]' are used to form groups,

89 `|` represents choice.
90 Attributes are conventionally assigned a value which corresponds to their type, as defined in the
91 normative schema.

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

101
102 Where there is disagreement between the separate XML schema and WSDL files describing the
103 messages defined by this specification and the normative descriptive text (excluding any pseudo-
104 schema) in this document, the normative descriptive text will take precedence over the separate
105 files. The separate files take precedence over any pseudo-schema and over any schema and
106 WSDL included in the appendices

107 1.3 Namespaces

108 The following namespaces are used in this document:

Prefix	Namespace
s11	http://schemas.xmlsoap.org/soap/envelope/
s12	http://www.w3.org/2003/05/soap-envelope
xsd	http://www.w3.org/2001/XMLSchema
xsi	http://www.w3.org/2001/XMLSchema-instance
wsrflbf	http://docs.oasis-open.org/wsrflbf-1
wsa	http://www.w3.org/2005/03/addressing

109 1.4 Fault Definition

110 All faults defined by this specification MUST use the following wsa:Action
111 URI:

112
113 <http://docs.oasis-open.org/wsrflfault>
114

115 2 Base Fault Type

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

```
117 <BaseFault>
118   <Timestamp>xsd:dateTime</Timestamp>
119   <OriginatorReference>
120     wsa:EndpointReferenceType
121   </OriginatorReference> ?
122   <ErrorCode dialect="anyURI">xsd:anyType</ErrorCode> ?
123   <Description>xsd:string</Description> *
124   <FaultCause>{any}</FaultCause> ?
125   {any}*
126 </BaseFault>
```

127 /wsrf-bf:BaseFault/Timestamp

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

131 /wsrf-bf:BaseFault/OriginatorReference

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

136 /wsrf-bf:BaseFault/ErrorCode

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

142 /wsrf-bf:BaseFault/Description

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

146 /wsrf-bf:BaseFault/FaultCause

147 This OPTIONAL element, if present, MUST contain a BaseFault or an element whose type
148 extends the BaseFaultType that describes an underlying cause of this fault. The ability to include
149 a FaultCause element in a fault allows for *chaining* of fault information so that a recipient of a fault
150 MAY examine details underlying the cause of the fault.

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

154 /wsrf-bf:BaseFault/{any}

155 BaseFault does include open element extensibility for the purpose of allowing generic fault
156 processors to validate faults that have extended the BaseFault type.

157 To define an extended fault, you MUST use XML Schema extension to extend the BaseFault type
158 to include additional attributes and/or elements.

159 2.1 Example SOAP 1.1 Encoding of a Base Fault

160 The WS-Resource [WS-Resource] specification defines the ResourceUnknownFault BaseFault.
161 The below shows a non-normative example SOAP 1.1 [SOAP 1.1] encoding of such a fault:

```
162 <s11:Envelope
163     xmlns="http://schemas.xmlsoap.org/soap/envelope/"
164     xmlns:s11="http://schemas.xmlsoap.org/soap/envelope/"
165     xmlns:wsa=" http://www.w3.org/2005/03/addressing"
166     xmlns:wsrf-bf="http://docs.oasis-open.org/wsrf/bf-1"
167     xmlns:wsrf-r="http://docs.oasis-open.org/wsrf/r-1">
168   <s11:Header>
169     <wsa:Action>
170       http://docs.oasis-open.org/wsrf/fault
171     </wsa:Action>
172     ...
173     <!-- other headers elided for clarity -->
174   </s11:Header>
175   <s11:Body>
176     <s11:Fault>
177       <faultcode>s11:Client</faultcode>
178       <faultstring>No such resource exists</faultstring>
179       <faultactor>http://example.org/someactor</faultactor>
180       <detail>
181         <wsrf-r:ResourceUnknownFault>
182           <wsrf-bf:Timestamp>
183             2005-05-04T20:18:44.970Z
184           </wsrf-bf:Timestamp>
185           <wsrf-bf:Description>
186             Resource unknown
187           </wsrf-bf:Description>
188         </wsrf-r:ResourceUnknownFault>
189       </detail>
190     </s11:Fault>
191   </s11:Body>
192 </s11:Envelope>
```

193 2.2 Example SOAP 1.2 Encoding of a Base Fault

194 The WS-Resource [WS-Resource] specification defines the ResourceUnknownFault BaseFault.
195 The below shows a non-normative example SOAP 1.2 [SOAP 1.2] encoding of such a fault:

```
196 <s12:Envelope
197     xmlns="http://schemas.xmlsoap.org/soap/envelope/"
198     xmlns:s12="http://www.w3.org/2003/05/soap-envelope"
199     xmlns:wsa=" http://www.w3.org/2005/03/addressing"
200     xmlns:wsrf-bf="http://docs.oasis-open.org/wsrf/bf-1"
201     xmlns:wsrf-r="http://docs.oasis-open.org/wsrf/r-1">
202   <s12:Header>
203     <wsa:Action>
204       http://docs.oasis-open.org/wsrf/fault
205     </wsa:Action>
206     ...
207     <!-- other headers elided for clarity -->
208   </s12:Header>
209   <s12:Body>
```

```
210 <s12:Fault>
211   <Code>
212     <Value>s12:Sender</Value>
213   </Code>
214   <Reason>
215     <Text xml:lang="en">No such resource exists</Text>
216   </Reason>
217   <Detail>
218     <wsrf-r:ResourceUnknownFault>
219       <wsrf-bf:Timestamp>
220         2005-05-04T20:18:44.970Z
221       </wsrf-bf:Timestamp>
222       <wsrf-bf:Description>
223         Resource unknown
224       </wsrf-bf:Description>
225     </wsrf-r:ResourceUnknownFault>
226   </Detail>
227 </s12:Fault>
228 </s12:Body>
229 </s12:Envelope>
230
```

3 Use of Base Faults in WSDL 1.1

232 Each distinct type of base fault associated with a WSDL [WSDL 1.1] operation SHOULD be listed
233 as a separate fault response in the WSDL operation definition, as follows:

234 As described above, there MUST be a distinct XML Schema complexType that extends wsrf-
235 bf:BaseFaultType, which represents this fault's distinct type. This extended fault complexType
236 MAY contain additional attributes and/or elements.

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

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

242 The WSDL operation MUST have a fault element for this distinct fault. The value of the WSDL
243 fault element's *name* attribute SHOULD be the same as the NCName of the fault element defined
244 in step 2, although it MAY choose to ignore this rule (for example to avoid NCName collisions
245 between fault elements defined in different namespaces). The value of the WSDL fault element's
246 *message* attribute MUST refer by QName to the WSDL message element of this distinct fault as
247 defined in step 3.

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

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

```
256 ...
257 <wsdl:definitions ...>
258   <wsdl:types>
259     <xsd:schema ...>
260       <!-- Type and element declarations for each distinct fault
261 -->
262       <xsd:complexType name="HisFaultType">
263         <xsd:complexContent>
264           <xsd:extension base="wsrf-bf:BaseFaultType"/>
265         </xsd:complexContent>
266       </xsd:complexType>
267       <xsd:element name="hisFault" type="tns:HisFaultType"/>
268
269       <xsd:complexType name="HerFaultType">
270         <xsd:complexContent>
271           <xsd:extension base="wsrf-bf:BaseFaultType">
272             <xsd:sequence>
273               <xsd:element name="details" type="xsd:string"/>
274             </xsd:sequence>
275           </xsd:extension>
276         </xsd:complexContent>
277       </xsd:complexType>
278       <xsd:element name="herFault" type="tns:HerFaultType"/>
279
280     </xsd:schema>
281   </wsdl:types>
```



```

282
283 <!-- WSDL messages for each distinct fault -->
284 <wsdl:message name="hisFaultMessage">
285   <wsdl:part name="fault" element="tns:hisFault" />
286 </wsdl:message>
287 <wsdl:message name="herFaultMessage">
288   <wsdl:part name="fault" element="tns:herFault" />
289 </wsdl:message>
290
291 <wsdl:portType name="pt">
292   <wsdl:operation name="op">
293     <!-- WSDL operation fault elements for each distinct fault
294 -->
295     <wsdl:input ... />
296     <wsdl:output ... />
297     <wsdl:fault name="hisFault"
298       message="tns:hisFaultMessage" />
299     <wsdl:fault name="herFault"
300       message="tns:herFaultMessage" />
301     <wsdl:fault name="BaseFault"
302       message="wsrf-bf:BaseFaultMessage" />
303   </wsdl:operation>
304 </wsdl:portType>
305 </wsdl:definitions>

```

306

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

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

```

314 ... targetNamespace="http://example.com/ExtendedFaults" ...
315
316 <xsd:complexType name="ExtendedHisFaultType">
317   <xsd:complexContent>
318     <xsd:extension base="tns:HisFaultType">
319       <xsd:sequence>
320         <xsd:element name="otherDetails"
321           type="xsd:string" />
322       </xsd:sequence>
323     </xsd:extension>
324   </xsd:complexContent>
325 </xsd:complexType>

```

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

```

327 <hisFault
328   xmlns:ef="http://example.com/ExtendedFaults"
329   xsi:type="ef:ExtendedHisFaultType">
330   <timeStamp>...</timeStamp>
331   ...
332   <otherDetails>...</otherDetails>
333 </hisFault>

```

334 **4 Security Considerations**

335 Fault messages may contain sensitive information. Policies should be defined such that such
336 sensitive content of fault messages are appropriately protected. For example, the security policy
337 can be specified to require that the sensitive content be encrypted based on WS-Security [Error!
338 Reference source not found.]. Depending on the context in which the fault occurred, it may also
339 be desirable that the integrity of the message be ensured. In such cases, the security policy can
340 reflect this by specifying the need to digitally sign the resulting fault messages based on the WS-
341 Security specification.

342 5 References

343 5.1 Normative References

344 [WSDL 1.1]

345 <http://www.w3.org/TR/wsdl>

346

347 [XML-Infoset]

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

349

350 [XML]

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

352 5.2 Non-Normative References

353 [OGSI]

354 <http://www.gridforum.org/documents/GFD.15.pdf>

355

356 [SOAP 1.1]

357 <http://www.w3.org/TR/2000/NOTE-SOAP-20000508/>

358

359 [SOAP 1.2]

360 <http://www.w3.org/2003/05/soap-envelope>

361

362 [WS-Addressing]

363 <http://www.w3.org/TR/2005/WD-ws-addr-core-20050331>

364

365 [WS-Resource]

366 http://docs.oasis-open.org/wsrf/wsrf-ws_resource-1.2-spec-cd-01.pdf

367

368 [WS-Security]

369 [http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf)
370 [1.0.pdf](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf)

371

372 **Appendix A. Acknowledgments**

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395 **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: WSRF43 Updated the status section Updated document identifier, location and namespaces <ul style="list-style-type: none"> o Changed doc identifier to "Summary Info Title"
wd-04	2005-02-17	Lily Liu	Issue resolutions from Jan F2F, 2005: Updated draft number and namespaces <ul style="list-style-type: none"> o Applied resolutions to issues 62, 81, 90, and 96.
wd-05	2005-05-17	Sam Meder	Updated draft number and namespaces <ul style="list-style-type: none"> o Applied resolutions to issues 92, 99, 100, 106, 109, 110, 114
pr-01	2005-06-13	Sam Meder	Changed status to PR

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426

427 Appendix D. XML Schema

428 The XML types and elements used in this specification are included here for convenience. The
429 authoritative version of this schema document is available at:

430 <http://docs.oasis-open.org/wsrf/bf-1>

```
431 <?xml version="1.0" encoding="UTF-8"?>
432 <!--
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472     INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE
473     INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
474     WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
475     -->
476
477 <xsd:schema
478     xmlns="http://www.w3.org/2001/XMLSchema"
479     xmlns:xsd="http://www.w3.org/2001/XMLSchema"
480     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
481     xmlns:wsa="http://www.w3.org/2005/03/addressing"
482     xmlns:wsrf-bf=
483         "http://docs.oasis-open.org/wsrf/bf-1"
484     elementFormDefault="qualified" attributeFormDefault="unqualified"
```



```

485 targetNamespace=
486     "http://docs.oasis-open.org/wsrf/bf-1">
487 <xsd:import
488     namespace="http://www.w3.org/2005/03/addressing"
489     schemaLocation=
490         "http://www.w3.org/2005/03/addressing/" />
491
492 <xsd:import namespace="http://www.w3.org/XML/1998/namespace"
493     schemaLocation="http://www.w3.org/2001/xml.xsd">
494
495 <xsd:annotation>
496     <xsd:documentation>
497         Get access to the xml: attribute groups for xml:lang as
498         declared on 'schema'
499         and 'documentation' below
500     </xsd:documentation>
501 </xsd:annotation>
502 </xsd:import>
503 <!-- ===== BaseFault Types ===== -->
504
505 <xsd:element name="BaseFault" type="wsrf-bf:BaseFaultType" />
506
507 <xsd:complexType name="BaseFaultType">
508     <xsd:sequence>
509         <xsd:element name="Timestamp" type="xsd:dateTime"
510             minOccurs="1" maxOccurs="1" />
511         <xsd:element name="Originator" type="wsa:EndpointReferenceType"
512             minOccurs="0" maxOccurs="1" />
513         <xsd:element name="ErrorCode"
514             minOccurs="0" maxOccurs="1" />
515         <xsd:complexType>
516             <xsd:complexContent mixed="true">
517                 <xsd:extension base="xsd:anyType">
518                     <xsd:attribute name="dialect" type="xsd:anyURI"
519                         use="required" />
520                 </xsd:extension>
521             </xsd:complexContent>
522         </xsd:complexType>
523     </xsd:sequence>
524
525 <xsd:element name="Description"
526     minOccurs="0" maxOccurs="unbounded">
527     <xsd:complexType>
528         <xsd:simpleContent>
529             <xsd:extension base="xsd:string">
530                 <xsd:attribute ref="xml:lang" use="optional" />
531             </xsd:extension>
532         </xsd:simpleContent>
533     </xsd:complexType>
534 </xsd:element>
535
536 <xsd:element name="FaultCause" minOccurs="0" maxOccurs="1">
537     <xsd:complexType>
538         <xsd:sequence>
539             <xsd:any namespace="##other" processContents="lax"
540                 minOccurs="1" maxOccurs="1" />
541         </xsd:sequence>
542     </xsd:complexType>
543 </xsd:element>
544
545 <xsd:any namespace="##other" processContents="lax"
546     minOccurs="0" maxOccurs="unbounded" />
547 </xsd:sequence>

```

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549

```
<xsd:anyAttribute namespace="##other" processContents="lax"/>  
</xsd:complexType>  
</xsd:schema>
```

550 Appendix E. WSDL 1.1

551 The WSDL 1.1 for the Web service methods described in this specification is compliant with WS-I
552 Basic Profile 1.1 and is included here for convenience. The authoritative version of this WSDL is
553 available at:

554 <http://docs.oasis-open.org/wsrf/bfw-1>

```
555 <?xml version="1.0" encoding="UTF-8"?>
556 <!--
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558     intellectual property or other rights that might be claimed to pertain
559     to the implementation or use of the technology described in this
560     document or the extent to which any license under such rights might or
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568     specification, can be obtained from the OASIS Executive Director.
569
570     OASIS invites any interested party to bring to its attention any
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593
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596     INCLUDING BUT NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE
597     INFORMATION HEREIN WILL NOT INFRINGE ANY RIGHTS OR ANY IMPLIED
598     WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.
599     -->
600 <wsdl:definitions name="BaseFaults"
601     xmlns="http://schemas.xmlsoap.org/wsdl/"
602     xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
603     xmlns:xsd="http://www.w3.org/2001/XMLSchema"
604     xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
605     xmlns:wsrf-bf=
606     "http://docs.oasis-open.org/wsrf/bf-1"
```

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```
targetNamespace=  
  "http://docs.oasis-open.org/wsrp/bfw-1">  
  
<!-- ===== Types Definitions ===== -->  
<wsdl:types>  
  <xsd:schema  
    elementFormDefault="qualified"  
    attributeFormDefault="unqualified" >  
    <xsd:import  
      namespace="http://docs.oasis-open.org/wsrp/bf-1"  
      schemaLocation="http://docs.oasis-open.org/wsrp/bf-1"/>  
    </xsd:schema>  
  </wsdl:types>  
  
<wsdl:message name="BaseFaultMessage" >  
  <wsdl:part name="Fault" element="wsrp-bf:BaseFault" />  
</wsdl:message>  
</wsdl:definitions>
```