

# Web Services Reliable Messaging Policy Assertion (WS-RM Policy) Version 1.1

## 4 OASIS Standard incorporating Approved Errata

## 5 07 January 2008

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28
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29
30
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31
    Declared XML Namespaces:
33
           http://docs.oasis-open.org/ws-rx/wsrmp/200702
34
    Abstract:
35
           This specification describes a domain-specific policy assertion for WS-ReliableMessaging [WS-
36
            RM] that that can be specified within a policy alternative as defined in WS-Policy Framework
           [WS-Policy].
37
38
            By using the XML [XML], SOAP [SOAP 1.1], [SOAP 1.2] and WSDL [WSDL 1.1] extensibility
            models, the WS* specifications are designed to be composed with each other to provide a rich
39
40
           Web services environment. This by itself does not provide a negotiation solution for Web
41
           services. This is a building block that is used in conjunction with other Web service and
42
           application-specific protocols to accommodate a wide variety of policy exchange models.
```

#### 43 **Status**: 44 This document was last revised or approved by the WS-RX Technical Committee on the above date. The level of approval is also listed above. Check the "Latest Version" or "Latest Approved 45 Version" location noted above for possible later revisions of this document. 46 47 Technical Committee members should send comments on this specification to the Technical 48 Committee's email list. Others should send comments to the Technical Committee by using the "Send A Comment" button on the Technical Committee's web page at http://www.oasis-49 open.org/committees/ws-rx/. 50 51 For information on whether any patents have been disclosed that may be essential to 52 implementing this specification, and any offers of patent licensing terms, please refer to the Intellectual Property Rights section of the Technical Committee web page (http://www.oasis-53

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## 119 1 Introduction

- 120 This specification defines a domain-specific policy assertion for reliable messaging for use with WS-Policy
- and WS-ReliableMessaging.

### 122 1.1 Terminology

- 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 124
- in RFC 2119 [KEYWORDS]. 125
- This specification uses the following syntax to define normative outlines for messages: 126
- 127 The syntax appears as an XML instance, but values in italics indicate data types instead of values.
- 128 Characters are appended to elements and attributes to indicate cardinality:

```
129
                        "?" (0 or 1)
```

- "\*" (0 or more) 130
- 131 "+" (1 or more)
- 132 The character "|" is used to indicate a choice between alternatives.
- 133 The characters "[" and "]" are used to indicate that contained items are to be treated as a group 134 with respect to cardinality or choice.
- 135 An ellipsis (i.e. "...") indicates a point of extensibility that allows other child, or attribute, content. 136 Additional children and/or attributes MAY be added at the indicated extension points but MUST NOT contradict the semantics of the parent and/or owner, respectively. If an extension is not 137 138 recognized it SHOULD be ignored.
- 139 XML namespace prefixes (see section 1.4) are used to indicate the namespace of the element 140 being defined.
- Elements and Attributes defined by this specification are referred to in the text of this document using 141
- XPath 1.0 [XPATH 1.0] expressions. Extensibility points are referred to using an extended version of this
- 143 syntax:
- 144 An element extensibility point is referred to using {any} in place of the element name. This 145 indicates that any element name can be used, from any namespace other than the wsrm: 146 namespace.
- An attribute extensibility point is referred to using @{any} in place of the attribute name. This 147 indicates that any attribute name can be used, from any namespace other than the wsrm: 148 149 namespace.

#### 1.2 Normative 150

151	[KEYWORDS]	S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," RFC
152		2119, Harvard University, March 1997.
153		http://www.ietf.org/rfc/rfc2119.txt
154	[SOAP 1.1]	W3C Note, "SOAP: Simple Object Access Protocol 1.1" 08 May 2000.
155		http://www.w3.org/TR/2000/NOTE-SOAP-20000508/

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156 157 158	[SOAP 1.2]	W3C Recommendation, "SOAP Version 1.2 Part 1: Messaging Framework" June 2003. http://www.w3.org/TR/2003/REC-soap12-part1-20030624/	
159 160 161 162	[URI]	T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifiers (URI): Generic Syntax," RFC 3986, MIT/LCS, U.C. Irvine, Xerox Corporation, January 2005. http://ietf.org/rfc/rfc3986	
163 164 165	[WS-RM]	OASIS WS-RX Technical OASIS Standard, "Web Services Reliable Messaging (WS-ReliableMessaging)," June 2007. http://docs.oasis-open.org/ws-rx/wsrm/v1.1/wsrm.pdf	
166 167	[WSDL 1.1]	W3C Note, "Web Services Description Language (WSDL 1.1)," 15 March 2001. http://www.w3.org/TR/2001/NOTE-wsdl-20010315	
168 169 170	[XML]	W3C Recommendation, "Extensible Markup Language (XML) 1.0 (Fourth Edition)", September 2006. http://www.w3.org/TR/REC-xml/	
171 172	[XML-ns]	W3C Recommendation, "Namespaces in XML," 14 January 1999. http://www.w3.org/TR/1999/REC-xml-names-19990114/	
173 174	[XML-Schema Pa	rt1] W3C Recommendation, "XML Schema Part 1: Structures," October 2004. http://www.w3.org/TR/xmlschema-1/	
175 176			
177 178 179	[XPATH 1.0]	W3C Recommendation, "XML Path Language (XPath) Version 1.0," 16 November 1999. http://www.w3.org/TR/xpath	
180 1	I.3 Non Norma	tive	
180 <b>1</b> 181 182 183	[RDDL 2.0]	Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html	
181 182 183 184 185		Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html G. Della-Libra, et. al. "Web Services Security Policy Language (WS-SecurityPolicy)", July 2005	
181 182 183 184 185 186 187 188	[RDDL 2.0]	Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html G. Della-Libra, et. al. "Web Services Security Policy Language (WS-	
181 182 183 184 185 186 187	[RDDL 2.0] [SecurityPolicy]	Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html G. Della-Libra, et. al. "Web Services Security Policy Language (WS-SecurityPolicy)", July 2005 http://specs.xmlsoap.org/ws/2005/07/securitypolicy/ws-securitypolicy.pdf W3C Member Submission "Web Services Policy 1.2 - Framework", April 2006	
181 182 183 184 185 186 187 188 189 190 191 192 193 194 195	[RDDL 2.0] [SecurityPolicy]	Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html G. Della-Libra, et. al. "Web Services Security Policy Language (WS-SecurityPolicy)", July 2005 http://specs.xmlsoap.org/ws/2005/07/securitypolicy/ws-securitypolicy.pdf W3C Member Submission "Web Services Policy 1.2 - Framework", April 2006 http://www.w3.org/Submission/2006/SUBM-WS-Policy-20060425/ W3C Recommendation, "Web Services Policy 1.5 - Framework," September 2007. http://www.w3.org/TR/2007/REC-ws-policy-20070904	
181 182 183 184 185 186 187 188 189 190 191 192 193 194	[RDDL 2.0] [SecurityPolicy] [WS-Policy]	Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language (RDDL) 2.0," January 2004 http://www.openhealth.org/RDDL/20040118/rddl-20040118.html G. Della-Libra, et. al. "Web Services Security Policy Language (WS-SecurityPolicy)", July 2005 http://specs.xmlsoap.org/ws/2005/07/securitypolicy/ws-securitypolicy.pdf W3C Member Submission "Web Services Policy 1.2 - Framework", April 2006 http://www.w3.org/Submission/2006/SUBM-WS-Policy-20060425/ W3C Recommendation, "Web Services Policy 1.5 - Framework," September 2007. http://www.w3.org/TR/2007/REC-ws-policy-20070904 ment] W3C Member Submission "Web Services Policy 1.2 - Attachment", April 2006	

205
206 Anthony Nadalin, Chris Kaler, Phillip Hallam-Baker, Ronald Monzillo, eds. "OASIS
207 Web Services Security: SOAP Message Security 1.1 (WS-Security 2004)", OASIS
208 Standard 200602, February 2006.
209 http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-SOAPMessageSecurity.pdf

#### **1.4 Namespace**

- 211 The XML namespace [XML-ns] URI that MUST be used by implementations of this specification is:
- http://docs.oasis-open.org/ws-rx/wsrmp/200702
- 213 Dereferencing the above URI will produce the Resource Directory Description Language [RDDL 2.0]
- 214 document that describes this namespace.
- 215 Table 1 lists the XML namespaces that are used in this specification. The choice of any namespace prefix
- 216 is arbitrary and not semantically significant. The assertions defined within this specification have been
- 217 designed to work independently of a specific version of WS-Policy. At the time of the publication of this
- 218 specification the versions of WS-Policy known to correctly compose with this specification are WS-Policy
- 219 1.2 and 1.5. Within this specification the use of the namespace prefix wsp refers generically to the WS-
- 220 Policy namespace, not a specific version.

#### 221 Table 1

Prefix	Namespace	Specification
wsdl	http://schemas.xmlsoap.org/wsdl/	[WSDL 1.1]
wsrmp	http://docs.oasis-open.org/ws-rx/wsrmp/200702	This specification.
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd	WS-Security-Utility Schema

- The normative schema for WS-ReliableMessaging can be found linked from the namespace document that is located at the namespace URI specified above.
- 224 All sections explicitly noted as examples are informational and are not to be considered normative.

#### 225 1.5 Conformance

- 226 An implementation is not compliant with this specification if it fails to satisfy one or more of the MUST or
- 227 REQUIRED level requirements defined herein. A SOAP Node MUST NOT use the XML namespace
- 228 identifier for this specification (listed in section 1.4) within SOAP Envelopes unless it is compliant with this
- 229 specification.
- 230 Normative text within this specification takes precedence over normative outlines, which in turn take
- 231 precedence over the XML Schema [XML-Schema Part1, XML-Schema Part2] descriptions.

## 232 2 RM Policy Assertions

- 233 WS-Policy Framework and WS-Policy Attachment [WS-PolicyAttachment] collectively define a framework,
- 234 model and grammar for expressing the requirements, and general characteristics of entities in an XML
- 235 Web services-based system. To enable an RM Destination and an RM Source to describe their
- 236 requirements for a given Sequence, this specification defines a single RM policy assertion that leverages
- 237 the WS-Policy framework.

#### 238 2.1 Assertion Model

- 239 The RM policy assertion indicates that the RM Source and RM Destination MUST use WS-
- 240 ReliableMessaging to ensure reliable delivery of messages. Specifically, the WS-ReliableMessaging
- 241 protocol determines invariants maintained by the reliable messaging endpoints and the directives used to
- 242 track and manage the delivery of a Sequence of messages.

#### 243 2.2 Normative Outline

44 The normative outline for the RM assertion is:

```
245
         <wsrmp:RMAssertion [wsp:Optional="true"]? ... >
246
           <wsp:Policy>
247
             [ <wsrmp:SequenceSTR/> |
248
               <wsrmp:SequenceTransportSecurity/> ] ?
249
             <wsrmp:DeliveryAssurance>
250
               <wsp:Policy>
251
                 [ <wsrmp:ExactlyOnce/> |
252
                   <wsrmp:AtLeastOnce/> |
253
                   <wsrmp:AtMostOnce/> ]
254
                 <wsrmp:InOrder/> ?
255
               </wsp:Policy>
256
             </wsrmp:DeliveryAssurance> ?
257
           </wsp:Policy>
258
259
         </wsrmp:RMAssertion>
```

- 260 The following describes the content model of the RMAssertion element.
- 261 /wsrmp:RMAssertion
- A policy assertion that specifies that WS-ReliableMessaging protocol MUST be used when sending messages.
- 264 /wsrmp:RMAssertion/@wsp:Optional="true"
- Per WS-Policy, this is compact notation for two policy alternatives, one with and one without the assertion. The intuition is that the behavior indicated by the assertion is optional, or in this case, that WS-ReliableMessaging MAY be used.
- 268 /wsrmp:RMAssertion/wsp:Policy
- 269 This required element allows for the inclusion of nested policy assertions.
- 270 /wsrmp:RMAssertion/wsp:Policy/wsrmp:SequenceSTR
- When present, this assertion defines the requirement that an RM Sequence MUST be bound to an
- 272 explicit token that is referenced from a wsse:SecurityTokenReference in the
- 273 CreateSequence message. See section 2.5.1.

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	/ wsfffip.RMAssertion/ wsp.Policy/ wsfffip.Sequence fransportSecurity
275	When present, this assertion defines the requirement that an RM Sequence MUST be bound to
276	the session(s) of the underlying transport-level protocol used to carry the CreateSequence and
277 278	CreateSequenceResponse message. When present, this assertion MUST be used in
	conjunction with the sp: TransportBinding assertion, see section 2.5.2.
279	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance
280	This expression, which may be omitted, describes the message delivery quality of service between
281	the RM and application layer. When used by an RM Destination it expresses the delivery
282	assurance in effect between the RM Destination and its corresponding application destination, and
283 284	it also indicates requirements on any RM Source that transmits messages to this RM destination.  Conversely when used by an RM Source it expresses the delivery assurance in effect between the
285	RM Source and its corresponding application source, as well as indicating requirements on any
286	RM Destination that receives messages from this RM Source. In either case the delivery
287	assurance does not affect the messages transmitted on the wire. Absence of this expression from
288	a wsrmp:RMAssertion policy assertion simply means that the endpoint has chosen not to
289	advertise its delivery assurance characteristics.
290 291	Note that when there are multiple policy alternatives of the RM Assertion, the Delivery Assurance on each MUST NOT conflict.
292	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance/wsp:Policy
293 294	This required element identifies additional requirements for the use of the wsrmp: DeliveryAssurance.
295	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance/wsp:Policy/wsrmp:ExactlyOnce
296	This expresses the ExactlyOnce Delivery Assurance defined in [WS-RM].
297	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance/wsp:Policy/wsrmp:AtLeastOnce
298	This expresses the AtLeastOnce Delivery Assurance defined in [WS-RM].
299	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance/wsp:Policy/wsrmp:AtMostOnce
300	This expresses the AtMostOnce Delivery Assurance defined in [WS-RM].
301	/wsrmp:RMAssertion/wsp:Policy/wsrmp:DeliveryAssurance/wsp:Policy/wsrmp:InOrder
302	This expresses the InOrder Delivery Assurance defined in [WS-RM].
303	/wsrmp:RMAssertion/{any}
304	This is an extensibility mechanism to allow different (extensible) types of information, based on a
305	schema, to be passed.
306	/wsrmp:RMAssertion/@{any}
307 308	This is an extensibility mechanism to allow different (extensible) types of information, based on a schema, to be passed.
200	2.3 Assertion Attachment

- 310 The RM policy assertion is allowed to have the following Policy Subjects [WS-PolicyAttachment]:
- 311 **Endpoint Policy Subject**
- 312 Message Policy Subject

- 313 WS-PolicyAttachment defines a set of WSDL/1.1 policy attachment points for each of the above Policy
- 314 Subjects. Since an RM policy assertion specifies a concrete behavior, it MUST NOT be attached to the
- 315 abstract WSDL policy attachment points.
- 316 The following is the list of WSDL/1.1 elements whose scope contains the Policy Subjects allowed for an
- 317 RM policy assertion but which MUST NOT have RM policy assertions attached:
- 318 wsdl:message
- wsdl:portType/wsdl:operation/wsdl:input
- wsdl:portType/wsdl:operation/wsdl:output
- wsdl:portType/wsdl:operation/wsdl:fault
- 322 wsdl:portType
- The following is the list of WSDL/1.1 elements whose scope contains the Policy Subjects allowed for an RM policy assertion and which MAY have RM policy assertions attached:
- 325 wsdl:port
- 326 wsdl:binding
- wsdl:binding/wsdl:operation/wsdl:input
- wsdl:binding/wsdl:operation/wsdl:output
- wsdl:binding/wsdl:operation/wsdl:fault
- 330 If an RM policy assertion is attached to any of:
- wsdl:binding/wsdl:operation/wsdl:input
- wsdl:binding/wsdl:operation/wsdl:output
- wsdl:binding/wsdl:operation/wsdl:fault
- 334 then an RM policy assertion, specifying wsp:Optional="true" MUST be attached to the corresponding
- ${\tt 335 \ \, wsdl:} {\tt binding} \ \text{or} \ {\tt wsdl:} {\tt port}, \ \text{indicating that the endpoint supports WS-RM}. \ Any \ \text{messages}, \ \text{regardless}$
- 336 of whether they have an attached Message Policy Subject RM policy assertion, MAY be sent to that
- 337 endpoint using WS-RM. Additionally, the receiving endpoint MUST NOT reject any message belonging to
- 338 a Sequence, simply because there was no Message Policy Subject RM policy assertion attached to that
- 339 message. There might be certain RM implementations that are incapable of applying RM Quality of
- 340 Service (QoS) semantics on a per-message basis. In order to ensure the broadest interoperability, when
- 341 an endpoint decorates its WSDL with RM policy assertions using Message Policy Subject, it MUST also be
- 342 prepared to accept that all messages sent to that endpoint might be sent within the context of an RM
- 343 Sequence, regardless of whether the corresponding wsdl:input, wsdl:output or wsdl:fault had an attached
- 344 RM policy assertion.
- 345 Rather than turn away messages that were unnecessarily sent with RM semantics, the receiving endpoint
- 346 described by the WSDL MUST accept these messages.
- 347 By attaching an RM policy assertion that specifies wsp:Optional="true" to the corresponding endpoint
- 348 that has attached RM policy assertions at the Message Policy Subject level, the endpoint is describing the
- 349 above constraint in policy.
- 350 In the case where an optional RM Assertion applies to an output message, there is no requirement on the
- 351 client to support an RM Destination implementation

#### 352 2.4 Assertion Example

353 Table 2 lists an example use of the RM policy assertion.

#### 354 Table 2: Example policy with RM policy assertion

```
355
         (01) < wsdl: definitions
356
         (02)
                 targetNamespace="example.com"
357
         (03)
                 xmlns:tns="example.com"
358
         (04)
                 xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
359
                 xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
         (05)
360
         (06)
                 xmlns:wsrmp="http://docs.oasis-open.org/ws-rx/wsrmp/200702"
361
         (07)
                 xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-
362
         wssecurity-utility-1.0.xsd">
363
         (80)
364
         (09) <wsp:UsingPolicy wsdl:required="true" />
365
         (10)
366
         (11) <wsp:Policy wsu:Id="MyPolicy" >
367
                <wsrmp:RMAssertion>
         (12)
368
         (13)
                  <wsp:Policy/>
369
         (14)
                </wsrmp:RMAssertion>
370
         (15)
                <!-- omitted assertions -->
371
         (16) </wsp:Policy>
372
         (17)
373
         (18) <!-- omitted elements -->
374
         (19)
375
         (20) <wsdl:binding name="MyBinding" type="tns:MyPortType" >
376
         (21)
                <wsp:PolicyReference URI="#MyPolicy" />
377
         (22)
                <!-- omitted elements -->
378
         (23) </wsdl:binding>
379
         (24)
380
         (25) </wsdl:definitions>
```

- 381 Line (09) in Table 2 indicates that WS-Policy is in use as a required extension.
- 382 Lines (11-16) are a policy expression that includes a RM policy assertion (lines 12-14) to indicate that WS-
- 383 ReliableMessaging must be used.
- 384 Lines (20-23) are a WSDL binding. Line (21) indicates that the policy in lines (11-16) applies to this
- 385 binding, specifically indicating that WS-ReliableMessaging must be used over all the messages in the
- 386 binding.

## 387 2.5 Sequence Security Policy

- 388 WS-SecurityPolicy [SecurityPolicy] provides a framework and grammar for expressing the security
- 389 requirements and characteristics of entities in a XML web services based system. The following assertions
- 390 MAY be used in conjunction with WS-SecurityPolicy to express additional security requirements particular
- 391 to RM Sequences.

## 392 2.5.1 RM Assertion with Sequence STR Assertion

- 393 This version of the RM assertion includes the requirement that an RM Sequence MUST be bound to an
- 394 explicit token that is referenced from a wsse: SecurityTokenReference in the CreateSequence
- 395 message.
- 396 This assertion MUST apply to [Endpoint Policy Subject]. The normative outline for this form of the 397 Sequence STR Assertion is:

```
400 <wsrmp:SequenceSTR/>
401 <wsp:Policy>
402 </wsrmp:RMAssertion>
```

- 403 The following describes the content model of the SequenceSTR element.
- 404 /wsrmp:SequenceSTR
- A policy assertion that specifies security requirements which MUST be used with an RM Sequence
- that are particular to WS-RM and beyond what can be expressed in WS-SecurityPolicy.

#### 407 2.5.2 RM Assertion with Sequence Transport Security Assertion

- 408 This version of the RM assertion includes the requirement that an RM Sequence MUST be bound to the
- 409 session(s) of the underlying transport-level security protocol (e.g. SSL/TLS) used to carry the
- 410 CreateSequence and CreateSequenceResponse messages.
- 411 This assertion MUST apply to [Endpoint Policy Subject]. This assertion MUST be used in conjunction with
- 412 the sp:TransportBinding assertion that requires the use of some transport-level security mechanism
- 413 (e.g. sp:HttpsToken).
- 414 The normative outline for this form of the RM Assertion with the Sequence Transport Security Assertion is:

```
415
         <wsp:Policy>
416
           <wsp:ExactlyOne>
417
             <wsp:All>
418
               <wsrm:RMAssertion [wsp:Optional="true"]> ...>
419
                 <wsp:Policy>
420
                   <wsrmp:SequenceTransportSecurity/>
421
                 </wsp:Policy>
422
               </wsrm:RMAssertion>
423
               <sp:TransportBinding ...>
424
425
               </sp:TransportBinding>
426
             <wsp:All>
427
           <wsp:ExactlyOne>
428
         </wsp:Policy>
```

- 429 The following describes the content model of the SequenceTransportSecurity element.
- 430 /wsrmp:SequenceTransportSecurity
- 431 A policy assertion that specifies that any Sequences targeted to the indicated endpoint MUST be
- bound to the underlying session(s) of the transport-level security used to carry messages related to the
- 433 Sequence.
- 434 This form of the RM Assertion says that an endpoint MAY have RM as an option but always requires
- 435 HTTPS to be used. All the SequenceTransportSecurity assertion indicates is that RM's rules for
- 436 protecting the Sequence over TLS are followed.

## **3 Security Considerations**

- 438 It is strongly RECOMMENDED that policies and assertions be signed to prevent tampering.
- 439 It is RECOMMENED that policies SHOULD NOT be accepted unless they are signed and have an
- 440 associated security token to specify the signer has proper claims for the given policy. That is, a relying
- 441 party shouldn't rely on a policy unless the policy is signed and presented with sufficient claims to pass the
- 442 relying parties acceptance criteria.
- 443 It should be noted that the mechanisms described in this document could be secured as part of a SOAP
- 444 message using WS-Security [WS-Security] or embedded within other objects using object-specific security
- 445 mechanisms.

## 446 Appendix A. Schema

447 A normative copy of the XML Schema [XML-Schema Part1, XML-Schema Part2] description for this specification may be retrieved from the following address:

http://docs.oasis-open.org/ws-rx/wsrmp/200702/wsrmp-1.1-schema-200702.xsd

450 The following copy is provided for reference.

449

```
451
         <?xml version="1.0" encoding="UTF-8"?>
452
         <!-- Copyright(C) OASIS(R) 1993-2007. All Rights Reserved.
453
              OASIS trademark, IPR and other policies apply. -->
454
         <xs:schema xmlns:tns="http://docs.oasis-open.org/ws-rx/wsrmp/200702"</pre>
         xmlns:xs="http://www.w3.org/2001/XMLSchema" targetNamespace="http://docs.oasis-
455
456
         open.org/ws-rx/wsrmp/200702" elementFormDefault="qualified"
457
         attributeFormDefault="unqualified">
458
           <xs:element name="RMAssertion">
459
             <xs:complexType>
460
               <xs:sequence>
461
                 <xs:any namespace="##other" processContents="lax" minOccurs="0"</pre>
462
         maxOccurs="unbounded"/>
463
               </xs:sequence>
464
               <xs:anyAttribute namespace="##any" processContents="lax"/>
465
             </xs:complexType>
466
           </xs:element>
467
           <xs:element name="SequenceSTR">
468
             <xs:complexType>
469
               <xs:sequence/>
470
               <xs:anyAttribute namespace="##any" processContents="lax"/>
471
             </xs:complexType>
472
           </xs:element>
473
           <xs:element name="SequenceTransportSecurity">
474
             <xs:complexType>
475
               <xs:sequence/>
476
               <xs:anyAttribute namespace="##any" processContents="lax"/>
477
             </xs:complexType>
478
           </xs:element>
479
           <xs:element name="DeliveryAssurance">
480
             <xs:complexType>
481
               <xs:sequence>
482
                 <xs:any namespace="##any" processContents="lax" minOccurs="0"</pre>
483
         maxOccurs="unbounded"/>
484
               </xs:sequence>
485
             </xs:complexType>
486
           </xs:element>
487
           <xs:element name="ExactlyOnce">
488
             <xs:complexType>
489
               <xs:sequence/>
490
             </xs:complexType>
491
           </xs:element>
492
           <xs:element name="AtLeastOnce">
493
             <xs:complexType>
494
               <xs:sequence/>
495
             </xs:complexType>
496
           </xs:element>
497
           <xs:element name="AtMostOnce">
498
             <xs:complexType>
499
               <xs:sequence/>
500
             </xs:complexType>
```

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## **Appendix B. Acknowledgments**

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