Web Services Reliable Messaging Policy Assertion (WS-RM Policy)

Version 1.0

February 2005

Authors

Stefan Batres, Microsoft (Editor)
Ruslan Bilorusets, BEA
Don Box, Microsoft
Luis Felipe Cabrera, Microsoft
Derek Collison, TIBCO Software
Donald Ferguson, IBM
Christopher Ferris, IBM (Editor)
Tom Freund, IBM
Mary Ann Hondo, IBM
John Ibbotson, IBM
Lei Jin, BEA
Chris Kaler, Microsoft
David Langworthy, Microsoft
Amelia Lewis, TIBCO Software
Rodney Limprecht, Microsoft
Steve Lucco, Microsoft
Don Mullen, TIBCO Software
Anthony Nadalin, IBM
Mark Nottingham, BEA
David Orchard, BEA
Shivajee Samdarshi, TIBCO Software
John Shewchuk, Microsoft
Tony Storey, IBM

Copyright Notice

Abstract

This specification describes a domain-specific policy assertion for WS-ReliableMessaging [WS-RM] that that can be specified within a policy alternative as defined in WS-Policy Framework [WS-Policy].

Composable Architecture

By using the XML [XML], SOAP [SOAP], and WSDL [WSDL 1.1] extensibility models, the WS* specifications are designed to be composed with each other to provide a rich Web services environment. This by itself does not provide a negotiation solution for Web services. This is a building block that is used in conjunction with other Web service and application-specific protocols to accommodate a wide variety of policy exchange models.

Status

This and related specifications are provided for use as-is and for review and evaluation only. BEA, IBM, Microsoft, and TIBCO Software will solicit your contributions and suggestions in the near future. BEA, IBM, Microsoft, and TIBCO Software make no warrantees or representations regarding the specification in any manner whatsoever.

Acknowledgements

Rick Hill, Microsoft
Scott Hinkelman, IBM
Tim Holloway, IBM
Efim Hudis, Microsoft
Johannes Klein, Microsoft
Frank Leymann, IBM
Martin Nally, IBM
Peter Niblett, IBM
Jeffrey Schlimmer, Microsoft
Chris Sharp, IBM
James Snell, IBM
Keith Stobie, Microsoft
Satish Thatte, Microsoft
Stephen Todd, IBM
Sanjiva Weerawarana, IBM
Roger Wolter, Microsoft

Table of Contents

1. Introduction

This specification defines a domain-specific policy assertion for reliable messaging for use with WS-Policy [WS-Policy] and WS-Reliable Messaging [WS-RM]

1.1 Notational Conventions

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

This specification uses the following syntax to define normative outlines for messages:

- The syntax appears as an XML instance, but values in italics indicate data types instead of values.

- Characters are appended to elements and attributes to indicate cardinality:

  - "?" (0 or 1)

  - "*" (0 or more)

  - "+" (1 or more)

- The character "|" is used to indicate a choice between alternatives.

- The characters "[" and "]" are used to indicate that contained items are to be treated as a group with respect to cardinality or choice.

- An ellipsis (i.e. "...") indicates a point of extensibility that allows other child, or attribute, content. 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 recognized it SHOULD be ignored.

- XML namespace prefixes (see Table 1) are used to indicate the namespace of the element being defined.

1.2 Namespace

The XML namespace [XML-ns] URI that MUST be used by implementations of this specification is:

http://schemas.xmlsoap.org/ws/2005/02/rm/policy

Table 1 lists XML namespaces that are used in this specification. The choice of any namespace prefix is arbitrary and not semantically significant.

Table 1: Prefixes and XML namespaces used in this specification

Prefix	Namespace	Specification
wsp	http://schemas.xmlsoap.org/ws/2004/09/policy	[WS-Policy]
wsrm	http://schemas.xmlsoap.org/ws/2005/02/rm/policy	This specification

1.3 Compliance

An implementation is not compliant with this specification if it fails to satisfy one or more of the MUST or REQUIRED level requirements defined herein. A SOAP Node MUST NOT use the XML namespace identifier for this specification (listed in Section 1.2 Namespace) within SOAP Envelopes unless it is compliant with this specification.

Normative text within this specification takes precedence over normative outlines, which in turn take precedence over the XML Schema [XML Schema Part 1, Part 2] descriptions.

2. RM Policy Assertion

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

2.1 Assertion Model

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

The assertion defines an inactivity timeout parameter that either the RM Source or RM Destination MAY include. If during this duration, an endpoint has received no application or control messages, the endpoint MAY consider the RM Sequence to have been terminated due to inactivity.

This assertion also defines a base retransmission interval parameter that the RM Source MAY include. If no acknowledgement has been received for a given message within the interval, the RM Source will retransmit the message. The retransmission interval MAY be modified at the Source's discretion during the lifetime of the Sequence. This parameter does not alter the formulation of messages as transmitted, only the timing of their transmission.

Similarly, this assertion defines a backoff parameter that the RM Source MAY include to indicate the retransmission interval will be adjusted using the commonly known exponential backoff algorithm [Tanenbaum].

Finally, this assertion defines an acknowledgement interval parameter that the RM Destination MAY include. Per WS-ReliableMessaging [WS-RM], acknowledgements are sent on return messages or sent stand-alone. If a return message is not available to send an acknowledgement, an RM Destination MAY wait for up to the acknowledgement interval before sending a stand-alone acknowledgement. If there are no unacknowledged messages, the RM Destination MAY choose not to send an acknowledgement. This parameter does not alter the formulation of messages or acknowledgements as transmitted; it does not alter the meaning of the wsrm:AckRequested directive. Its purpose is to communicate the timing of acknowledgements so that the RM Source may tune appropriately.

2.2 Normative Outline

The normative outline for the RM version assertion is:

```
<wsrm:RMAssertion [wsp:Optional="true"]? ... >

  <wsrm:InactivityTimeout Milliseconds="xs:unsignedLong" ... /> ?

  <wsrm:BaseRetransmissionInterval Milliseconds="xs:unsignedLong".../>?

  <wsrm:ExponentialBackoff ... /> ?
```

```
  <wsrm:AcknowledgementInterval Milliseconds="xs:unsignedLong" ... /> ?

  ...

</wsrm:RMAssertion>
```

The following describes additional, normative constraints on the outline listed above:

/wsrm:RMAssertion

A policy assertion that specifies that WS-ReliableMessaging [WS-RM] protocol MUST be used for a Sequence.

/wsrm:RMAssertion/@wsp:Optional="true"

Per WS-Policy [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.

/wsrm:RMAssertion/wsrm:InactivityTimeout

A parameter that specifies a period of inactivity for a Sequence. If omitted, there is no implied value.

/wsrm:RMAssertion/wsrm:InactivityTimeout/@Milliseconds

The inactivity timeout duration, specified in milliseconds.

/wsrm:RMAssertion/wsrm:BaseRetransmissionInterval

A parameter that specifies how long the RM Source will wait after transmitting a message and before retransmitting the message. If omitted, there is no implied value.

/wsrm:RMAssertion/wsrm:BaseRetransmissionInterval/@Milliseconds

The base retransmission interval, specified in milliseconds.

/wsrm:RMAssertion/wsrm:ExponentialBackoff

A parameter that specifies that the retransmission interval will be adjusted using the exponential backoff algorithm [Tanenbaum]. If omitted, there is no implied value.

/wsrm:RMAssertion/wsrm:AcknowledgementInterval

A parameter that specifies the duration after which the RM Destination will transmit an acknowledgement. If omitted, there is no implied value.

/wsrm:RMAssertion/wsrm:AcknowledgementInterval/@Milliseconds

The acknowledgement interval, specified in milliseconds.

2.3 Assertion Attachment

Because the RM policy assertion indicates endpoint behavior over an RM Sequence, the assertion has Endpoint Policy Subject [WS-PolicyAttachment].

WS-PolicyAttachment defines three WSDL [WSDL 1.1] policy attachment points with Endpoint Policy Subject:

- wsdl:portType – A policy expression containing the RM policy assertion MUST NOT be attached to a wsdl:portType; the RM policy assertion specifies a concrete behavior whereas the wsdl:portType is an abstract construct.

- wsdl:binding – A policy expression containing the RM policy assertion SHOULD be attached to a wsdl:binding.

- wsdl:port – A policy expression containing the RM policy assertion MAY be attached to a wsdl:port.

If the RM policy assertion appears in a policy expression attached to both a wsdl:port and its corresponding wsdl:binding, the parameters in the former MUST be used and the latter ignored.

Per WS-ReliableMessaging [WS-RM], a wsrm:CreateSequence request MAY contain an offer to create an "inbound" Sequence. If the RM policy assertion is attached to an endpoint declaring only input messages, the endpoint MUST reject a wsrm:CreateSequence request containing a wsrm:Offer to create a corresponding Sequence. If the assertion is attached to an endpoint declaring both input and output messages, the endpoint MUST reject a wsrm:CreateSequence request that does not contain a wsrm:Offer to create a corresponding Sequence.

2.4 Assertion Example

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

Table 2: Example policy with RM policy assertion

```
(01)   <wsdl:definitions
(02)       targetNamespace="example.com"
(03)       xmlns:tns="example.com"
(04)       xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
(05)       xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
(06)       xmlns:wsrm="http://schemas.xmlsoap.org/ws/2005/02/rm/policy"
(07)       xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-
200401-wss-wssecurity-utility-1.0.xsd" >
(08)
(09)     <wsp:UsingPolicy wsdl:required="true" />
(10)
(11)     <wsp:Policy wsu:Id="MyPolicy" >
(12)       <wsrm:RMAssertion>
(13)         <wsrm:InactivityTimeout Milliseconds="600000" />
(14)         <wsrm:BaseRetransmissionInterval Milliseconds="3000" />
(15)         <wsrm:ExponentialBackoff />
(16)         <wsrm:AcknowledgementInterval Milliseconds="200" />
(17)       </wsrm:RMAssertion>
(18)       <!-- omitted assertions -->
(19)     </wsp:Policy>
(20)
```

```
(21)     <!-- omitted elements -->

(22)

(23)     <wsdl:binding name="MyBinding" type="tns:MyPortType" >

(24)       <wsp:PolicyReference URI="#MyPolicy" />

(25)       <!-- omitted elements -->

(26)     </wsdl:binding>

(27)

(28)   </wsdl:definitions>

(29)
```

Line (09) in Table 2 indicates that WS-Policy [WS-Policy] is in use as a required extension.

Lines (11-19) are a policy expression that includes a RM policy assertion (Lines 12-17) to indicate that WS-ReliableMessaging [WS-RM] must used. Line (13) indicates the endpoint will consider the Sequence terminated if there is no activity after ten minutes. Line (14) indicates the RM Source will retransmit unacknowledged messages after three seconds, and Line (15) indicates that exponential backoff algorithm will be used for timing of successive retransmissions should the message continue to go unacknowledged. Line (16) indicates the RM Destination may buffer acknowledgements for up to two-tenths of a second.

Lines (23-26) are a WSDL [WSDL 1.1] binding. Line (24) indicates that the policy in Lines (11-19) applies to this binding, specifically indicating that WS-ReliableMessaging must be used over all the messages in the binding.

3. Security Considerations

It is strongly RECOMMENDED that policies and assertions be signed to prevent tampering.

It is RECOMMENED that policies SHOULD NOT be accepted unless they are signed and have an associated security token to specify the signer has proper claims for the given policy. That is, a relying party shouldn't rely on a policy unless the policy is signed and presented with sufficient claims to pass the relying parties acceptance criteria.

It should be noted that the mechanisms described in this document could be secured as part of a SOAP message using WS-Security [WSS] or embedded within other objects using object-specific security mechanisms.

4. References

[KEYWORDS]
  S. Bradner, "Key words for use in RFCs to Indicate Requirement Levels," RFC 2119, Harvard University, March 1997

[SOAP]
  W3C Note, "SOAP: Simple Object Access Protocol 1.1," 08 May 2000.

[Tanenbaum]

"Computer Networks," Andrew S. Tanenbaum, Prentice Hall PTR, 2003.

[URI]
T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifiers (URI): Generic Syntax," RFC 2396, MIT/LCS, U.C. Irvine, Xerox Corporation, August 1998.

[WS-RM]
R. Bilorusets, et all, "Web Services Reliable Messaging (WS-ReliableMessaging)," February 2005.

[WS-Policy]
D. Box, et al, "Web Services Policy Framework (WS-Policy)," September 2004.

[WS-PolicyAttachment]
D. Box, et al, "Web Services Policy Attachment (WS-PolicyAttachment)," September 2004.

[WSS]
"OASIS Web Services Security: SOAP Message Security 1.0 (WS-Security 2004)", Chris Kaler, Phillip Hallam-Baker, Ronald Monzillo, eds, OASIS Standard 200401, March 2004.

[WSDL 1.1]
W3C Note, "Web Services Description Language (WSDL 1.1)," 15 March 2001.

[XML]
W3C Recommendation, "Extensible Markup Language (XML) Third Edition," 4 February 2004.

[XML-ns]
W3C Recommendation, "Namespaces in XML," 14 January 1999.

[XML-Schema1]
W3C Recommendation, "XML Schema Part 1: Structures," 2 May 2001.

[XML-Schema2]
W3C Recommendation, "XML Schema Part 2: Datatypes," 2 May 2001.

Appendix I – XML Schema

A normative copy of the XML Schema [XML Schema Part 1, Part 2] description for this specification may be retrieved from the following address:

http://schemas.xmlsoap.org/ws/2005/02/rm/wsrm-policy.xsd

A non-normative copy of the XML Schema description is listed below for convenience.

```
<xs:schema

    targetNamespace="http://schemas.xmlsoap.org/ws/2005/02/rm/policy"

    xmlns:tns="http://schemas.xmlsoap.org/ws/2005/02/rm/policy"

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

    elementFormDefault="qualified"

    attributeFormDefault="unqualified" >
```

```xml
<xs:element name="RMAssertion" >
  <xs:complexType>
    <xs:sequence>
      <xs:element name="InactivityTimeout" minOccurs="0" >
        <xs:complexType>
          <xs:attribute name="Milliseconds"
                        type="xs:unsignedLong"
                        use="required" />
          <xs:anyAttribute namespace="##any" processContents="lax" />
        </xs:complexType>
      </xs:element>
      <xs:element name="BaseRetransmissionInterval" minOccurs="0">
        <xs:complexType>
          <xs:attribute name="Milliseconds"
                        type="xs:unsignedLong"
                        use="required" />
          <xs:anyAttribute namespace="##any" processContents="lax" />
        </xs:complexType>
      </xs:element>
      <xs:element name="ExponentialBackoff" minOccurs="0" >
        <xs:complexType>
          <xs:anyAttribute namespace="##any" processContents="lax" />
        </xs:complexType>
      </xs:element>
      <xs:element name="AcknowledgementInterval" minOccurs="0" >
        <xs:complexType>
          <xs:attribute name="Milliseconds"
                        type="xs:unsignedLong"
                        use="required" />
          <xs:anyAttribute namespace="##any" processContents="lax" />
        </xs:complexType>
      </xs:element>
      <xs:any namespace="##other"
              processContents="lax"
              minOccurs="0"
              maxOccurs="unbounded" />
```

```
        </xs:sequence>

        <xs:anyAttribute namespace="##any" processContents="lax" />

      </xs:complexType>

    </xs:element>


</xs:schema>
```