



1 Web Services Make Connection 2 (WS-MakeConnection) 1.0

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26 Abstract:

27 This specification (WS-MakeConnection) describes a protocol that allows messages to be transferred
28 between nodes implementing this protocol by using a transport-specific back-channel. The protocol is
29 described in this specification in a transport-independent manner allowing it to be implemented using
30 different network technologies. To support interoperable Web services, a SOAP binding is defined within
31 this specification.

32 The protocol defined in this specification depends upon other Web services specifications for the
33 identification of service endpoint addresses and policies. How these are identified and retrieved are
34 detailed within those specifications and are out of scope for this document.

35 By using the XML [XML], SOAP [SOAP 1.1], [SOAP 1.2] and WSDL [WSDL 1.1] extensibility model,
36 SOAP-based and WSDL-based specifications are designed to be composed with each other to define a
37 rich Web services environment. As such, WS-MakeConnection by itself does not define all the features
38 required for a complete messaging solution. WS-MakeConnection is a building block that is used in

39 conjunction with other specifications and application-specific protocols to accommodate a wide
40 variety of requirements and scenarios related to the operation of distributed Web services.

41 **Status:**

42 This document was last revised or approved by the WS-RX on the above date. The level of
43 approval is also listed above. Check the "Latest Version" or "Latest Approved Version" location
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Table of Contents

100			
101	1	Introduction.....	6
102	1.1	Terminology.....	6
103	1.2	Namespace.....	7
104	1.3	Conformance.....	7
105	2	MakeConnection Model.....	8
106	2.1	Glossary.....	9
107	2.2	Protocol Preconditions.....	9
108	2.3	Example Message Exchange.....	9
109	3	MakeConnection.....	11
110	3.1	MakeConnection Anonymous URI.....	11
111	3.2	MakeConnection Message.....	11
112	3.3	MessagePending.....	13
113	3.4	MakeConnection Policy Assertion.....	13
114	4	Faults.....	15
115	4.1	Unsupported Selection	16
116	4.2	Missing Selection	16
117	5	Security Considerations.....	18
118	6	References.....	19
119	6.1	Normative.....	19
120	6.2	Non-Normative.....	20
121		Appendix A. Schema.....	22
122		Appendix B. WSDL.....	24
123		Appendix C. Message Examples.....	26
124		Appendix C.1 Example use of MakeConnection.....	26
125		Appendix D. Acknowledgments.....	30
126		Appendix E. Revision History.....	31

1 Introduction

The primary goal of this specification is to create a mechanism for the transfer of messages between two endpoints when the sending endpoint is unable to initiate a new connection to the receiving endpoint. It defines a mechanism to uniquely identify non-addressable endpoints, and a mechanism by which messages destined for those endpoints can be delivered. It also defines a SOAP binding that is required for interoperability. Additional bindings can be defined.

This mechanism is extensible allowing additional functionality, such as security, to be tightly integrated. This specification integrates with and complements the WS-ReliableMessaging[WS-RM], WS-Security [WS-Security], WS-Policy [WS-Policy], and other Web services specifications. Combined, these allow for a broad range of reliable, secure messaging options.

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 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 specified in this document. Additional children elements and/or attributes MAY be added at the indicated extension points but they 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 Section 1.2) are used to indicate the namespace of the element being defined.

Elements and Attributes defined by this specification are referred to in the text of this document using XPath 1.0 [XPATH 1.0] expressions. Extensibility points are referred to using an extended version of this syntax:

- An element extensibility point is referred to using {any} in place of the element name. This indicates that any element name can be used, from any namespace other than the `wsmc:` namespace.
- An attribute extensibility point is referred to using @{any} in place of the attribute name. This indicates that any attribute name can be used, from any namespace other than the `wsmc:` namespace.

1.2 Namespace

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

<http://docs.oasis-open.org/ws-rx/wsmc/200702>

Dereferencing the above URI will produce the Resource Directory Description Language [RDDL 2.0] document that describes this namespace.

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

Table 1

Prefix	Namespace
S	(Either SOAP 1.1 or 1.2)
S11	http://schemas.xmlsoap.org/soap/envelope/
S12	http://www.w3.org/2003/05/soap-envelope
wsmc	http://docs.oasis-open.org/ws-rx/wsmc/200702
wsrc	http://docs.oasis-open.org/ws-rx/wsrc/200702
wsa	http://www.w3.org/2005/08/addressing
wsam	http://www.w3.org/2007/02/addressing/metadata
xs	http://www.w3.org/2001/XMLSchema

The normative schema for WS-MakeConnection can be found linked from the namespace document that is located at the namespace URI specified above.

All sections explicitly noted as examples are informational and are not to be considered normative.

1.3 Conformance

An implementation is not conformant 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) within SOAP Envelopes unless it is conformant 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 MakeConnection Model

The WS-Addressing [WS-Addressing] specification defines the anonymous URI to identify non-addressable endpoints and to indicate a protocol-specific back-channel is to be used for any messages destined for that endpoint. For example, when used in the WS-Addressing ReplyTo EPR, the use of this anonymous URI is meant to indicate that any response message is to be transmitted on the transport-specific back-channel. In the HTTP case this would mean that any response message is sent back on the HTTP response flow.

In cases where the connection is still available the WS-Addressing URI is sufficient. However, in cases where the original connection is no longer available, additional mechanisms are needed. Take the situation where the original connection that carried a request message is broken and therefore is no longer available to carry a response back to the original sender. Traditionally, non-anonymous (addressable) EPRs would be used in these cases to allow for the sender of the response message to initiate new connections as needed. However, if the sender of the request message is unable (or unwilling) to accept new connections then the only option available is for it to establish a new connection for the purposes of allowing the response message to be sent. This specification defines a mechanism by which a new connection can be established.

The MakeConnection model consists of a two key aspects:

- An optional anonymous-like URI template is defined that has similar semantics to WS-Addressing's anonymous, but also allows for each non-addressable endpoint to be uniquely identified
- A new message is defined that establishes a connection that can then be used to transmit messages to these non-addressable endpoints

Figure 1 below illustrates the overall flow involved in the use of MakeConnection:

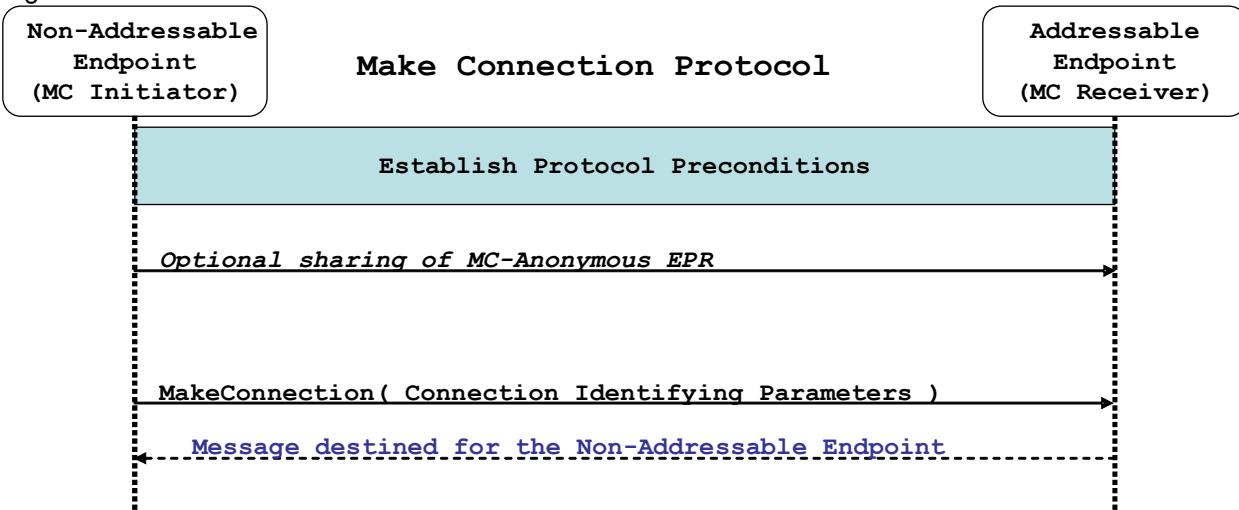


Figure 1 – Make Connection Model

The MakeConnection message is used to establish a new connection between the two endpoints. Within the message is identifying information that is used to uniquely identify a message that is eligible for transmission.

2.1 Glossary

The following definitions are used throughout this specification:

212 **Back-channel:** When the underlying transport provides a mechanism to return a transport-protocol
213 specific response, capable of carrying a SOAP message, without initiating a new connection, this
214 specification refers to this mechanism as a back-channel.

215 **Endpoint:** As defined in the WS-Addressing specification; a Web service Endpoint is a (referenceable)
216 entity, processor, or resource to which Web service messages can be addressed. Endpoint references
217 (EPRs) convey the information needed to address a Web service Endpoint.

218 **MC Initiator** The endpoint that transmits the MakeConnection message – the destination endpoint for the
219 messages being sent on the transport-specific back-channel.

220 **MC Receiver:** The endpoint that receives the MakeConnection message – the source endpoint for the
221 messages being sent on the transport-specific back-channel.

222 **Receive:** The act of reading a message from a network connection.

223 **Transmit:** The act of writing a message to a network connection.

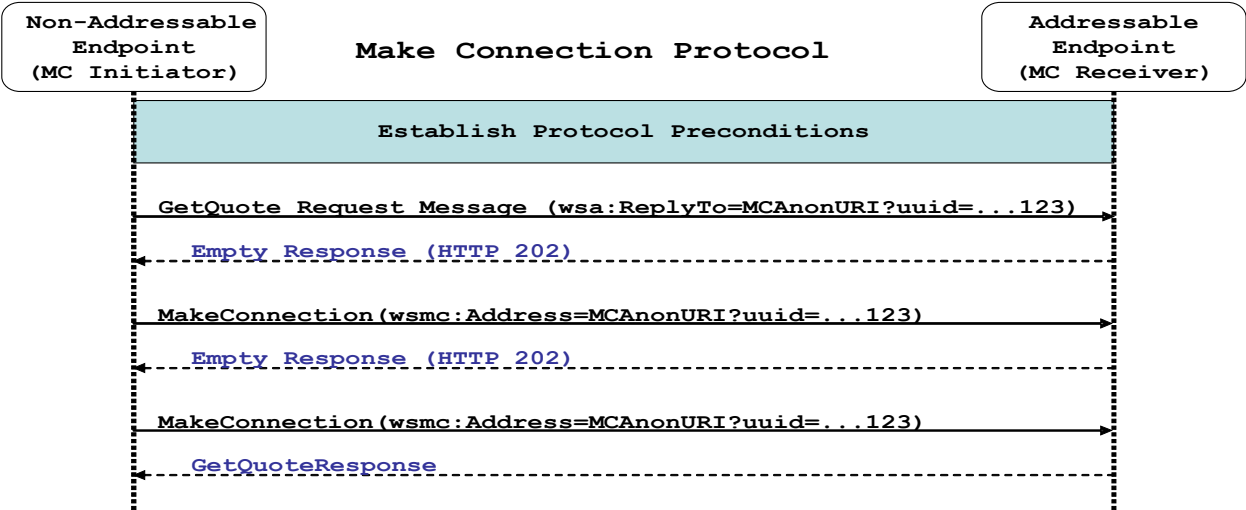
224 **2.2 Protocol Preconditions**

225 The correct operation of the protocol requires that a number of preconditions **MUST** be established prior
226 to the processing of the initial sequenced message:

- 227 ● The MC Receiver **MUST** be capable of accepting new incoming connections.
- 228 ● The MC Initiator **MUST** be capable of creating new outgoing connections to the MC Receiver, and
229 those connections **MUST** have a back-channel.
- 230 ● If a secure exchange of messages is **REQUIRED**, then the MC Initiator and MC Receiver **MUST**
231 have a security context.

232 **2.3 Example Message Exchange**

233 Figure 2 illustrates a message exchange in which the response message is delivered using
234 MakeConnection.



235 Figure 2: Example WS-MakeConnection Message Exchange

- 236 1. The protocol preconditions are established. These include policy exchange, endpoint resolution,
237 and establishing trust.
- 238 2. The client (MC Initiator) sends a GetQuote request message to the service (MC Receiver). The
239 WS-Addressing `wsa:ReplyTo` EPR uses the MakeConnection Anonymous URI Template –
240 indicating that if the GetQuoteResponse message is not sent back on this connection's back-
241 channel, then the client will use MakeConnection to retrieve it.
- 242 3. The service receives the request message and decides to close the connection by sending back an
243 empty response (in the HTTP case an HTTP 202 Accept is sent).
- 244 4. The client sends a MakeConnection message to the service. Within the MakeConnection element is
245 the `wsmc:Address` element containing the same MakeConnection Anonymous URI used in step 2.
- 246 5. The service has not completed executing the GetQuote operation and decides to close the
247 connection by sending back an empty response (in the HTTP case an HTTP 202 Accept) indicating
248 that no messages destined for this MC Initiator are available at this time.
- 249 6. The client sends a second MakeConnection message to the service. Within the MakeConnection
250 element is the `wsmc:Address` element containing the same MakeConnection Anonymous URI
251 used in step 2.
- 252 7. The service uses this new connection to transmit the GetQuoteResponse message.
- 253 The service can assume that because the MakeConnection Anonymous URI Template was used in the
254 `wsa:ReplyTo` EPR the client will act as an MC Initiator for the purposes of retrieving messages destined
255 to that EPR (i.e. responses to the GetQuote). This allows the service the option of immediately releasing
256 resources used by the original connection – knowing that the client will, at some later point in time,
257 establish a new connection on which the GetQuoteResponse can be transmitted. Likewise, when the first
258 MakeConnection is received by the service, it again has the option of leaving the connection open until the
259 GetQuoteResponse is ready to be transmitted, or it can close the connection immediately knowing that the
260 MC Initiator will retransmit the MakeConnection message at some later point in time. Since the nature and
261 dynamic characteristics of the underlying transport and potential intermediaries are unknown in the
262 general case, the timing of re-transmissions cannot be specified. Additionally, over-aggressive re-
263 transmissions have been demonstrated to cause transport or intermediary flooding which are
264 counterproductive. Consequently, implementers are encouraged to utilize adaptive mechanisms that
265 dynamically adjust re-transmission time and the back-off intervals that are appropriate to the nature of the
266 transports and intermediaries envisioned. For the case of TCP/IP transports, a mechanism similar to that
267 described as RTTM in RFC 1323 [RTTM] SHOULD be considered.
- 268 Now that the basic model has been outlined, the details of this protocol are now provided in Section 3.

3 MakeConnection

The following sub-sections define the various MakeConnection features, and prescribe their usage by a conformant implementations.

3.1 MakeConnection Anonymous URI

When an Endpoint is not directly addressable (e.g. behind a firewall or not able to allow incoming connections), an anonymous URI in the EPR address property can indicate such an Endpoint. The WS-Addressing anonymous URI is one such anonymous URI. This specification defines a URI template (the WS-MC anonymous URI) which may be used to uniquely identify anonymous Endpoints.

```
http://docs.oasis-open.org/ws-rx/wsmc/200702/anonymous?id={unique-String}
```

The appearance of an instance of this URI template in the `wsa:Address` value of an EPR indicates a protocol-specific back-channel will be established through a mechanism such as `MakeConnection`, defined below. When using this URI template, "{unique-String}" MUST be replaced by a globally unique string (e.g a UUID value as defined by RFC4122[UUID]). This specification does not require the use of one particular string generation scheme. This string uniquely distinguishes the Endpoint. A sending Endpoint SHOULD Transmit messages at Endpoints identified with the URI template using a protocol-specific back-channel, including but not limited to those established with a `MakeConnection` message. Note, this URI template is semantically similar to the WS-Addressing anonymous URI if a protocol-specific back-channel is available.

3.2 MakeConnection Message

The `MakeConnection` element is sent in the body of a one-way message that establishes a contextualized back-channel for the transmission of messages according to matching criteria (defined below). In the non-faulting case, if no matching message is available then no SOAP envelope will be returned on the back-channel. A common usage will be a client sending `MakeConnection` to a server for the purpose of receiving asynchronous response messages.

The following exemplar defines the `MakeConnection` syntax:

```
<wsmc:MakeConnection ...>
  <wsmc:Address ...> xs:anyURI </wsmc:Address> ?
  <wsrm:Identifier ...> xs:anyURI </wsrm:Identifier> ?
  ...
</wsmc:MakeConnection>
```

The following describes the content model of the `MakeConnection` element.

/wsmc:MakeConnection

This element allows the sender to create a transport-specific back-channel that can be used to return a message that matches the selection criteria. Endpoints MUST NOT send this element as a header block. At least one selection criteria sub-element MUST be specified – if not a `MissingSelection` fault MUST be generated.

/wsmc:MakeConnection/wsmc:Address

This element specifies the URI (`wsa:Address`) of the initiating Endpoint. Endpoints MUST NOT return messages on the transport-specific back-channel unless they have been addressed to this URI. This `Address` property and a message's WS-Addressing destination property are considered identical when they are exactly the same character-for-character. Note that URIs which are not identical in this sense

310 may in fact be functionally equivalent. Examples include URI references which differ only in case, or
311 which are in external entities which have different effective base URIs.

312 `/wsmc:MakeConnection/wsmc:Address/@{any}`

313 This is an extensibility mechanism to allow additional attributes, based on schemas, to be added to the
314 element.

315 `/wsmc:MakeConnection/wsrn:Identifier`

316 This element specifies the WS-RM Sequence Identifier that establishes the context for the transport-
317 specific back-channel. The Sequence Identifier should be compared with the Sequence Identifiers
318 associated with the messages held by the sending Endpoint, and if there is a matching message it will be
319 returned.

320 `/wsmc:MakeConnection/wsrn:Identifier/@{any}`

321 This is an extensibility mechanism to allow additional attributes, based on schemas, to be added to the
322 element.

323 `/wsmc:MakeConnection/{any}`

324 This is an extensibility mechanism to allow different (extensible) types of information, based on a schema,
325 to be passed. This allows fine-tuning of the messages to be returned, additional selection criteria included
326 here are logically ANDed with the `Address` and/or `wsrn:Identifier`. If an extension is not supported
327 by the Endpoint then it should generate an `UnsupportedSelection` fault.

328 `/wsmc:MakeConnection/@{any}`

329 This is an extensibility mechanism to allow additional attributes, based on schemas, to be added to the
330 element.

331 If more than one selection criteria element is present, then the MC Receiver processing the
332 `MakeConnection` message MUST insure that any SOAP Envelope flowing on the back-channel satisfies
333 all of those selection criteria.

334 The management of messages that are awaiting the establishment of a back-channel to their receiving
335 Endpoint is an implementation detail that is outside the scope of this specification. Note, however, that
336 these messages form a class of asynchronous messages that is not dissimilar from "ordinary"
337 asynchronous messages that are waiting for the establishment of a connection to their destination
338 Endpoints.

339 This specification places no constraint on the types of messages that can be returned on the transport-
340 specific back-channel. As in an asynchronous environment, it is up to the recipient of the
341 `MakeConnection` message to decide which messages are appropriate for transmission to any particular
342 Endpoint. However, the Endpoint processing the `MakeConnection` message MUST insure that the
343 messages match the selection criteria as specified by the child elements of the `MakeConnection`
344 element.

345 Since the message exchange pattern use by `MakeConnection` is untraditional, the following points need
346 to be reiterated for clarification:

- 347 ● The `MakeConnection` message is logically part of a one-way operation; there is no reply
348 message to the `MakeConnection` itself, and any response flowing on the transport back-channel
349 is a pending message.
- 350 ● Since there is no reply message to `MakeConnection`, the WS-Addressing specific rules in
351 section 3.4 "Formulating a Reply Message" are not used. Therefore, the value of any

352 `wsa:ReplyTo` element in the `MakeConnection` message has no effective impact since the WS-
353 Addressing [`reply endpoint`] property that is set by the presence of `wsa:ReplyTo` is not
354 used.

- 355 ● In the absence of any pending message, there will be no message transmitted on the transport
356 back-channel. E.g. in the HTTP case just an `HTTP 202 Accepted` will be returned without any
357 SOAP envelope in the HTTP response message.
- 358 ● When there is a message pending, it is sent on the transport back-channel, using the connection
359 that has been initiated by the `MakeConnection` request.

360 3.3 MessagePending

361 When `MakeConnection` is used, and a message is returned on the transport-specific back-channel, the
362 `MessagePending` header SHOULD be included on the returned message as an indicator whether there
363 are additional messages waiting to be retrieved using the same selection criteria that was specified in the
364 `MakeConnection` element.

365 The following exemplar defines the `MessagePending` syntax:

```
366        <wsmc:MessagePending pending="xs:boolean" ...>  
367            ...  
368        </wsmc:MessagePending>
```

369 The following describes the content model of the `MessagePending` header block.

370 `/wsmc:MessagePending`

371 This element indicates whether additional messages are waiting to be retrieved.

372 `/wsmc:MessagePending@pending`

373 This attribute, when set to "true", indicates that there is at least one message waiting to be retrieved.

374 When this attribute is set to "false" it indicates there are currently no messages waiting to be retrieved.

375 `/wsmc:MessagePending/{any}`

376 This is an extensibility mechanism to allow different (extensible) types of information, based on a schema,
377 to be passed.

378 `/wsmc:MessagePending/@{any}`

379 This is an extensibility mechanism to allow additional attributes, based on schemas, to be added to the
380 element.

381 The absence of the `MessagePending` header has no implication as to whether there are additional
382 messages waiting to be retrieved.

383 3.4 MakeConnection Policy Assertion

384 The `MakeConnection` policy assertion indicates that the `MakeConnection` protocol (operation and the use
385 of the `MakeConnection` URI template in `EndpointReferences`) is supported. This assertion has `Endpoint`
386 Policy Subject [`WS-PolicyAttachment`].

387 The normative outline for the `MakeConnection` assertion is:

```
388        <wsmc:MCSupported ...> ... </wsmc:MCSupported>
```

389 The following describes the content model of the `MCSupported` element.

390 /wsmc:MCSupported

391 A policy assertion that specifies that the MakeConnection protocol is supported.

392 /wsmc:MCSupported/{any}

393 This is an extensibility mechanism to allow different (extensible) types of information, based on a schema,
394 to be passed.

395 /wsmc:MCSupported/@{any}

396 This is an extensibility mechanism to allow additional attributes, based on schemas, to be added to the
397 element.

398 Because this policy assertion expresses a capability of a receiver (rather than a requirement on the
399 sender), care should be taken to ensure that it is decorated with the appropriate WS-Policy artifacts to
400 indicate that use, support and understanding, of this assertion is optional to the sender.

4 Faults

Entities that generate WS-MakeConnection faults MUST include as the [action] property the default fault action IRI defined below. The value from the W3C Recommendation is below for informational purposes:

```
http://docs.oasis-open.org/ws-rx/wsmc/200702/fault
```

The faults defined in this section are generated if the condition stated in the preamble is met. Fault handling rules are defined in section 6 of WS-Addressing SOAP Binding.

The definitions of faults use the following properties:

[Code] The fault code.

[Subcode] The fault subcode.

[Reason] The English language reason element.

[Detail] The detail element(s). If absent, no detail element is defined for the fault. If more than one detail element is defined for a fault, implementations MUST include the elements in the order that they are specified.

Entities that generate WS-MakeConnection faults MUST set the [Code] property to either "Sender" or "Receiver". These properties are serialized into text XML as follows:

SOAP Version	Sender	Receiver
SOAP 1.1	S11:Client	S11:Server
SOAP 1.2	S:Sender	S:Receiver

The properties above bind to a SOAP 1.2 fault as follows:

```
<S:Envelope>
  <S:Header>
    <wsa:Action>
      http://docs.oasis-open.org/ws-rx/wsmc/200702/fault
    </wsa:Action>
    <!-- Headers elided for brevity. -->
  </S:Header>
  <S:Body>
    <S:Fault>
      <S:Code>
        <S:Value> [Code] </S:Value>
        <S:Subcode>
          <S:Value> [Subcode] </S:Value>
        </S:Subcode>
      </S:Code>
      <S:Reason>
        <S:Text xml:lang="en"> [Reason] </S:Text>
      </S:Reason>
      <S:Detail>
        [Detail]
        ...
      </S:Detail>
    </S:Fault>
  </S:Body>
</S:Envelope>
```

The properties bind to a SOAP 1.1 fault as follows when the fault is generated as a result of processing a MakeConnection message:

```

444 <S11:Envelope>
445   <S11:Body>
446     <S11:Fault>
447       <faultcode> [Subcode] </faultcode>
448       <faultstring> [Reason] </faultstring>
449     </S11:Fault>
450   </S11:Body>
451 </S11:Envelope>

```

4.1 Unsupported Selection

The QName of the unsupported element(s) are included in the detail.

Properties:

[Code] Receiver

[Subcode] wsmc:UnsupportedSelection

[Reason] The extension element used in the message selection is not supported by the MakeConnection receiver

[Detail]

```

460 <wsmc:UnsupportedElement> xs:QName </wsmc:UnsupportedElement>+

```

Generated by	Condition	Action Upon Generation	Action Upon Receipt
MakeConnection receiver	In response to a MakeConnection message containing a selection criteria in the extensibility section of the message that is not supported	Unspecified.	Unspecified.

4.2 Missing Selection

The MakeConnection element did not contain any selection criteria.

Properties:

[Code] Receiver

[Subcode] wsmc:MissingSelection

[Reason] The MakeConnection element did not contain any selection criteria.

[Detail]

Generated by	Condition	Action Upon Generation	Action Upon Receipt
MakeConnection receiver	In response to a MakeConnection message that does not contain any selection criteria	Unspecified.	Unspecified.

5 Security Considerations

It is strongly RECOMMENDED that the communication between Web services be secured using the mechanisms described in WS-Security. In order to properly secure messages, the body and all relevant headers need to be included in the signature. Specifically, any standard messaging headers, such as those from WS-Addressing, need to be signed with the body in order to "bind" the two together.

Different security mechanisms may be desired depending on the frequency of messages. For example, for infrequent messages, public key technologies may be adequate for integrity and confidentiality. However, for high-frequency events, it may be more performant to establish a security context for the events using the mechanisms described in WS-Trust [[Trust](#)] and WS-SecureConversation [[SecureConversation](#)]. It should be noted that if a shared secret is used it is RECOMMENDED that derived keys be used to strengthen the secret as described in WS-SecureConversation.

Requests for messages which are not available to anonymous parties are strongly RECOMMENDED to require usage of WS-Security so that the requestor can be authenticated and authorized to access the indicated messages. Similarly, integrity and confidentiality SHOULD be used whenever messages have restricted access.

Recipients of messages are RECOMMENDED to validate the signature to authenticate and verify the integrity of the data. Specifically, recipients SHOULD verify that the sender has the right to "speak" for the message.

The following list summarizes common classes of attacks that apply to this protocol and identifies the mechanism to prevent/mitigate the attacks:

- Message alteration - Alteration is prevented by including signatures of the message information using WS-Security.
- Message disclosure - Confidentiality is preserved by encrypting sensitive data using WS-Security.
- Key integrity - Key integrity is maintained by using the strongest algorithms possible (by comparing secured policies - see WS-Policy and WS-SecurityPolicy [[SecurityPolicy](#)]).
- Authentication - Authentication is established using the mechanisms described in WS-Security and WS-Trust. Each message is authenticated using the mechanisms described in WS-Security.
- Accountability - Accountability is a function of the type of and strength of the key and algorithms being used. In many cases, a strong symmetric key provides sufficient accountability. However, in some environments, strong PKI signatures are required.
- Availability - All reliable messaging services are subject to a variety of availability attacks. Replay detection is a common attack and it is RECOMMENDED that this be addressed by the mechanisms described in WS-Security. Other attacks, such as network-level denial of service attacks are harder to avoid and are outside the scope of this specification. That said, care should be taken to ensure that minimal state is saved prior to any authenticating sequences.
- Replay - Messages may be replayed for a variety of reasons. To detect and eliminate this attack, mechanisms should be used to identify replayed messages such as the timestamp/nonce outlined in WS-Security. Alternatively, and optionally, other technologies, such as sequencing, can also be used to prevent replay of application messages.

Service endpoints SHOULD scope its searching of messages to those that were processed under the same security context as the requesting MakeConnection message.

6 References

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601

602 Appendix A. Schema

603 The normative schema that is defined for WS-MakeConnection using [XML-Schema Part1] and [XML-
604 Schema Part2] is located at:

605 <http://docs.oasis-open.org/ws-rx/wsmc/200702/wsmc-1.0-schema-200702.xsd>

606 The following copy is provided for reference.

```
607 <?xml version="1.0" encoding="UTF-8"?>
608 <!--
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638 basis and OASIS DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT
639 NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT
640 INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS
641 FOR A PARTICULAR PURPOSE.
642 -->
643 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
644 xmlns:wsa="http://www.w3.org/2005/08/addressing"
645 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
646 targetNamespace="http://docs.oasis-open.org/ws-rx/wsmc/200702"
647 elementFormDefault="qualified" attributeFormDefault="unqualified">
648   <xs:import namespace="http://www.w3.org/2005/08/addressing"
649   schemaLocation="http://www.w3.org/2006/03/addressing/ws-addr.xsd"/>
650   <!-- Protocol Elements -->
651   <xs:complexType name="MessagePendingType">
652     <xs:sequence>
653       <xs:any namespace="##other" processContents="lax" minOccurs="0"
654 maxOccurs="unbounded"/>
655     </xs:sequence>
656     <xs:attribute name="pending" type="xs:boolean"/>
657     <xs:anyAttribute namespace="##other" processContents="lax"/>

```

```

657 </xs:complexType>
658 <xs:element name="MessagePending" type="wsmc:MessagePendingType"/>
659 <xs:element name="Address">
660   <xs:complexType>
661     <xs:simpleContent>
662       <xs:extension base="xs:anyURI">
663         <xs:anyAttribute namespace="##other" processContents="lax"/>
664       </xs:extension>
665     </xs:simpleContent>
666   </xs:complexType>
667 </xs:element>
668 <xs:complexType name="MakeConnectionType">
669   <xs:sequence>
670     <xs:element ref="wsmc:Address" minOccurs="0" maxOccurs="1"/>
671     <xs:any namespace="##other" processContents="lax" minOccurs="0"
672 maxOccurs="unbounded"/>
673   </xs:sequence>
674   <xs:anyAttribute namespace="##other" processContents="lax"/>
675 </xs:complexType>
676 <xs:element name="MakeConnection" type="wsmc:MakeConnectionType"/>
677 <xs:element name="UnsupportedElement">
678   <xs:simpleType>
679     <xs:restriction base="xs:QName"/>
680   </xs:simpleType>
681 </xs:element>
682 </xs:schema>

```

683 Appendix B. WSDL

684 This WSDL describes the WS-MC protocol from the point of view of the endpoint that receives the
685 MakeConnection message.

686 Also note that this WSDL is intended to describe the internal structure of the WS-MC protocol, and will not
687 generally appear in a description of a WS-MC-capable Web service. See section 3.4 Policy for a higher-
688 level mechanism to indicate that WS-MC is supported.

689 The normative WSDL 1.1 definition for WS-MakeConnection is located at:

690 <http://docs.oasis-open.org/ws-rx/wsmc/200702/wsd/wsmc-1.0-wsdl-200702.wsdl>

691 The following non-normative copy is provided for reference.

```
692 <?xml version="1.0" encoding="utf-8"?>
693 <!--
694 OASIS takes no position regarding the validity or scope of any intellectual
695 property or other rights that might be claimed to pertain to the
696 implementation or use of the technology described in this document or the
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698 neither does it represent that it has made any effort to identify any such
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700 specifications can be found at the OASIS website. Copies of claims of rights
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702 available, or the result of an attempt made to obtain a general license or
703 permission for the use of such proprietary rights by implementors or users of
704 this specification, can be obtained from the OASIS Executive Director.
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724 NOT LIMITED TO ANY WARRANTY THAT THE USE OF THE INFORMATION HEREIN WILL NOT
725 INFRINGE ANY RIGHTS OR ANY IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS
726 FOR A PARTICULAR PURPOSE.
727 -->
728 <wsc:definitions xmlns:wsc="http://schemas.xmlsoap.org/wsc/"
729 xmlns:xs="http://www.w3.org/2001/XMLSchema"
730 xmlns:wsa="http://www.w3.org/2005/08/addressing"
731 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
732 xmlns:tns="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsd"
733 targetNamespace="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsd">
734
735   <wsc:types>
```

```

736     <xs:schema>
737         <xs:import namespace="http://docs.oasis-open.org/ws-rx/wsmc/200702"
738 schemaLocation="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsmc-1.1-schema-
739 200702.xsd"/>
740     </xs:schema>
741 </wsdl:types>

742 <wsdl:message name="MakeConnection">
743     <wsdl:part name="makeConnection" element="wsmc:MakeConnection"/>
744 </wsdl:message>

745 <wsdl:portType name="MCAbstractPortType">
746     <wsdl:operation name="MakeConnection">
747         <wsdl:input message="tns:MakeConnection" wsam:Action="http://docs.oasis-
748 open.org/ws-rx/wsmc/200702/MakeConnection"/>
749         <!-- As described in the WS-MakeConnection specification, the
750              MakeConnection operation establishes a connection. If a matching
751              message is available then the back-channel of the connection will
752              be used to carry the message. In SOAP terms the returned message
753              is not a response, so there is no WSDL output message. -->
754     </wsdl:operation>
755 </wsdl:portType>

756 </wsdl:definitions>

```

757 Appendix C. Message Examples

758 Appendix C.1 Example use of MakeConnection

759 To illustrate how a `MakeConnection` message exchange can be used to deliver messages to an
760 Endpoint that is not addressable, consider the case of a pub/sub scenario in which the Endpoint to which
761 notifications are to be delivered (the "event consumer") is not addressable by the notification sending
762 Endpoint (the "event producer"). In this scenario the event consumer must initiate the connections in order
763 for the notifications to be delivered. One possible set of message exchanges (using HTTP) that
764 demonstrate how this can be achieved using `MakeConnection` is shown below.

765 **Step 1** – During a "subscribe" operation, the event consumer's EPR specifies the MC anonymous URI
766 and the WS-RM Policy Assertion to indicate whether or not RM is required:

```
767 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
768 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
769 xmlns:wsrm="http://docs.oasis-open.org/ws-rx/wsrm/200702"
770 xmlns:wsa="http://www.w3.org/2005/08/addressing">
771   <S:Header>
772     <wsa:To> http://example.org/subscriptionService </wsa:To>
773     <wsa:MessageID> http://client456.org/id-a6d8-a7c2eb546813</wsa:MessageID>
774     <wsa:ReplyTo>
775       <wsa:To> http://client456.org/response </wsa:To>
776     </wsa:ReplyTo>
777   </S:Header>
778   <S:Body>
779     <sub:Subscribe xmlns:sub="http://example.org/subscriptionService">
780       <!-- subscription service specific data -->
781       <targetEPR>
782         <wsa:Address>http://docs.oasis-open.org/ws-
783 rx/wsrm/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsa:Address>
784         <wsa:Metadata>
785           <wsp:Policy wsu:Id="MyPolicy">
786             <wsrm:RMAssertion/>
787           </wsp:Policy>
788         </wsa:Metadata>
789       </targetEPR>
790     </sub:Subscribe>
791   </S:Body>
792 </S:Envelope>
```

793 In this example the `subscribe` and `targetEPR` elements are simply examples of what a subscription
794 request message might contain. Note: the `wsa:Address` element contains the MC anonymous URI
795 indicating that the notification producer needs to queue the messages until they are requested using the
796 `MakeConnection` message exchange. The EPR also contains the WS-RM Policy Assertion indicating
797 the RM must be used when notifications related to this subscription are sent.

798 **Step 2** – Once the subscription is established, the event consumer checks for a pending message:

```
799 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
800 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
801 xmlns:wsa="http://www.w3.org/2005/08/addressing">
802   <S:Header>
803     <wsa:Action>http://docs.oasis-open.org/ws-
804 rx/wsmc/200702/MakeConnection</wsa:Action>
```

```

805     <wsa:To> http://example.org/subscriptionService </wsa:To>
806   </S:Header>
807   <S:Body>
808     <wsmc:MakeConnection>
809       <wsmc:Address>http://docs.oasis-open.org/ws-
810 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-
811 446655440000</wsmc:Address>
812     </wsmc:MakeConnection>
813   </S:Body>
814 </S:Envelope>

```

815 **Step 3** – If there are messages waiting to be delivered then a message will be returned back to the event
816 consumer. However, because WS-RM is being used to deliver the messages, the first message returned
817 is a `CreateSequence`:

```

818 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
819 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
820 xmlns:wsmr="http://docs.oasis-open.org/ws-rx/wsmr/200702"
821 xmlns:wsa="http://www.w3.org/2005/08/addressing">
822   <S:Header>
823     <wsa:Action>http://docs.oasis-open-org/ws-
824 rx/wsmr/200702/CreateSequence</wsa:Action>
825     <wsa:To>http://docs.oasis-open.org/ws-
826 rx/wsmr/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsa:To>
827     <wsa:ReplyTo> http://example.org/subscriptionService </wsa:ReplyTo>
828     <wsa:MessageID> http://example.org/id-123-456 </wsa:MessageID>
829     <wsmc:MessagePending pending="true"/>
830   </S:Header>
831   <S:Body>
832     <wsmr:CreateSequence>
833       <wsmr:AcksTo>
834         <wsa:Address> http://example.org/subscriptionService </wsa:Address>
835       </wsmr:AcksTo>
836     </wsmr:CreateSequence>
837   </S:Body>
838 </S:Envelope>

```

839 Notice from the perspective of how the RM Source on the event producer interacts with the RM
840 Destination of those messages, nothing new is introduced by the use of the `MakeConnection`, the use
841 of RM protocol is the same as the case where the event consumer is addressable. Note the message
842 contains a `wsmc:MessagePending` header indicating that additional message are waiting to be
843 delivered.

844 **Step 4** – The event consumer will respond with a `CreateSequenceResponse` message per normal WS-
845 Addressing rules:

```

846 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
847 xmlns:wsmr="http://docs.oasis-open.org/ws-rx/wsmr/200702"
848 xmlns:wsa="http://www.w3.org/2005/08/addressing">
849   <S:Header>
850     <wsa:Action>http://docs.oasis-open-org/ws-
851 rx/wsmr/200702/CreateSequenceResponse</wsa:Action>
852     <wsa:To> http://example.org/subscriptionService </wsa:To>
853     <wsa:RelatesTo> http://example.org/id-123-456 </wsa:RelatesTo>
854   </S:Header>
855   <S:Body>
856     <wsmr:CreateSequenceResponse>
857       <wsmr:Identifier> http://example.org/rmid-456 </wsmr:Identifier>

```

```

858     </wsrm:CreateSequenceResponse>
859   </S:Body>
860 </S:Envelope>

```

861 Note, this message is carried on an HTTP request directed to the `wsa:ReplyTo` EPR, and the HTTP
 862 response will be an HTTP 202.

863 **Step 5** – The event consumer checks for another message pending:

```

864 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
865   xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
866   xmlns:wsa="http://www.w3.org/2005/08/addressing">
867   <S:Header>
868     <wsa:Action>http://docs.oasis-open.org/ws-
869 rx/wsmc/200702/MakeConnection</wsa:Action>
870     <wsa:To> http://example.org/subscriptionService </wsa:To>
871   </S:Header>
872   <S:Body>
873     <wsmc:MakeConnection>
874       <wsmc:Address>http://docs.oasis-open.org/ws-
875 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-
876 446655440000</wsmc:Address>
877     </wsmc:MakeConnection>
878   </S:Body>
879 </S:Envelope>

```

880 Notice this is the same message as the one sent in step 2.

881 **Step 6** – Since there is a message pending for this destination then it is returned on the HTTP response:

```

882 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
883   xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
884   xmlns:wsrm="http://docs.oasis-open.org/ws-rx/wsrm/200702"
885   xmlns:wsa="http://www.w3.org/2005/08/addressing">
886   <S:Header>
887     <wsa:Action> http://example.org/eventType1 </wsa:Action>
888     <wsa:To>http://docs.oasis-open.org/ws-
889 rx/wsrm/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsa:To>
890     <wsrm:Sequence>
891       <wsrm:Identifier> http://example.org/rmid-456 </wsrm:Identifier>
892     </wsrm:Sequence>
893     <wsmc:MessagePending pending="true"/>
894   </S:Header>
895   <S:Body>
896     <!-- event specific data -->
897   </S:Body>
898 </S:Envelope>

```

899 As noted in step 3, the use of the RM protocol does not change when using `MakeConnection`. The
 900 format of the messages, the order of the messages sent and the timing of when to send it remains the
 901 same.

902 **Step 7** – At some later interval, or immediately due to the `MessagePending` header's "pending"
 903 attribute being set to "true", the event consumer will poll again:

```

904 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
905   xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
906   xmlns:wsa="http://www.w3.org/2005/08/addressing">

```

```

907     <S:Header>
908         <wsa:Action>http://docs.oasis-open.org/ws-
909 rx/wsmc/200702/MakeConnection</wsa:Action>
910         <wsa:To> http://example.org/subscriptionService </wsa:To>
911     </S:Header>
912     <S:Body>
913         <wsmc:MakeConnection>
914             <wsmc:Address>http://docs.oasis-open.org/ws-
915 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-
916 446655440000</wsmc:Address>
917         </wsmc:MakeConnection>
918     </S:Body>
919 </S:Envelope>

```

920 Notice this is the same message as the one sent in steps 2 and 5. As in steps 3 and 6, the response to
 921 the `MakeConnection` can be any message destined to the specified Endpoint. This allows the event
 922 producer to send not only application messages (events) but RM protocol messages (e.g.
 923 `CloseSequence`, `TerminateSequence` or even additional `CreateSequences`) as needed.

924 **Step 8** – If at any point in time there are no messages pending, in response to a `MakeConnection` the
 925 event producer returns an HTTP 202 back to the event consumer. The process then repeats (back to step
 926 7) until the subscription ends.

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Appendix E. Revision History

Rev	Date	By Whom	What
wd-01	2006-12-31	Doug Davis	Initial version created based on section 10(MakeConnection) in the WS-RM spec
wd-02	2007-01-31	Doug Davis	Lots of typos from MarcG Updated WD number and date
wd-02	2007-02-01	Doug Davis	PR015 and PR029 applied