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Web Services Make Connection (WS-MakeConnection) Version 1.0

Committee Draft 05

29 March 2007

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

Abstract:

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

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

By using the XML [XML], SOAP [SOAP 1.1], [SOAP 1.2] and WSDL [WSDL 1.1] extensibility model, SOAP-based and WSDL-based specifications are designed to be composed with each other to define a rich Web services environment. As such, WS-MakeConnection by itself does not define all the

44 features required for a complete messaging solution. WS-MakeConnection is a building block that is
45 used in conjunction with other specifications and application-specific protocols to accommodate a
46 wide variety of requirements and scenarios related to the operation of distributed Web services.

47 **Status:**

48 This document was last revised or approved by the WS-RX Technical Committee on the above date.
49 The level of approval is also listed above. Check the "Latest Version" or "Latest Approved Version"
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51 Technical Committee members should send comments on this specification to the Technical
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58 rx/ipr.php](http://www.oasis-open.org/committees/ws-rx/ipr.php)).

59 The non-normative errata page for this specification is located at [http://www.oasis-
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132 1 Introduction

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

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

142 1.1 Terminology

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

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

- 147 • The syntax appears as an XML instance, but values in italics indicate data types instead of values.
- 148 • Characters are appended to elements and attributes to indicate cardinality:
 - 149 ○ "?" (0 or 1)
 - 150 ○ "*" (0 or more)
 - 151 ○ "+" (1 or more)
- 152 • The character "|" is used to indicate a choice between alternatives.
- 153 • The characters "[" and "]" are used to indicate that contained items are to be treated as a group
154 with respect to cardinality or choice.
- 155 • An ellipsis (i.e. "...") indicates a point of extensibility that allows other child or attribute content
156 specified in this document. Additional children elements and/or attributes MAY be added at the
157 indicated extension points but they MUST NOT contradict the semantics of the parent and/or
158 owner, respectively. If an extension is not recognized it SHOULD be ignored.
- 159 • XML namespace prefixes (see section 1.4) are used to indicate the namespace of the element
160 being defined.

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

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

170 1.2 Normative

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202 <http://www.w3.org/TR/REC-xml/>
- 203 **[XML-ns]** W3C Recommendation, "Namespaces in XML," 14 January 1999.
204 <http://www.w3.org/TR/1999/REC-xml-names-19990114/>
- 205 **[XML-Schema Part1]** W3C Recommendation, "XML Schema Part 1: Structures," October 2004.
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208 <http://www.w3.org/TR/xmlschema-2/>
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210 1999.
211 <http://www.w3.org/TR/xpath>

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- 213 **[RDDL 2.0]** Jonathan Borden, Tim Bray, eds. "Resource Directory Description Language
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 236
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 244 [security-1.0.pdf](http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-soap-message-security-1.0.pdf)

245
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 247 Web Services Security: SOAP Message Security 1.1 (WS-Security 2004)", OASIS
 248 Standard 200602, February 2006.
 249 <http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-SOAPMessageSecurity.pdf>

250 1.4 Namespace

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

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

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

255 Table 1 lists the XML namespaces that are used in this specification. The choice of any namespace prefix
 256 is arbitrary and not semantically significant. The assertions defined within this specification have been
 257 designed to work independently of a specific version of WS-Policy and WS-Policy Attachment. Within this
 258 specification the use of the namespace prefix "wsp" refers generically to the WS-Policy namespace, not a
 259 specific version.

260 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
wstrm	http://docs.oasis-open.org/ws-rx/wstrm/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

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

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

264 **1.5 Conformance**

265 An implementation is not conformant with this specification if it fails to satisfy one or more of the MUST or
266 REQUIRED level requirements defined herein. A SOAP Node MUST NOT use the XML namespace
267 identifier for this specification (listed in section 1.4) within SOAP Envelopes unless it is conformant with this
268 specification.

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

271 2 MakeConnection Model

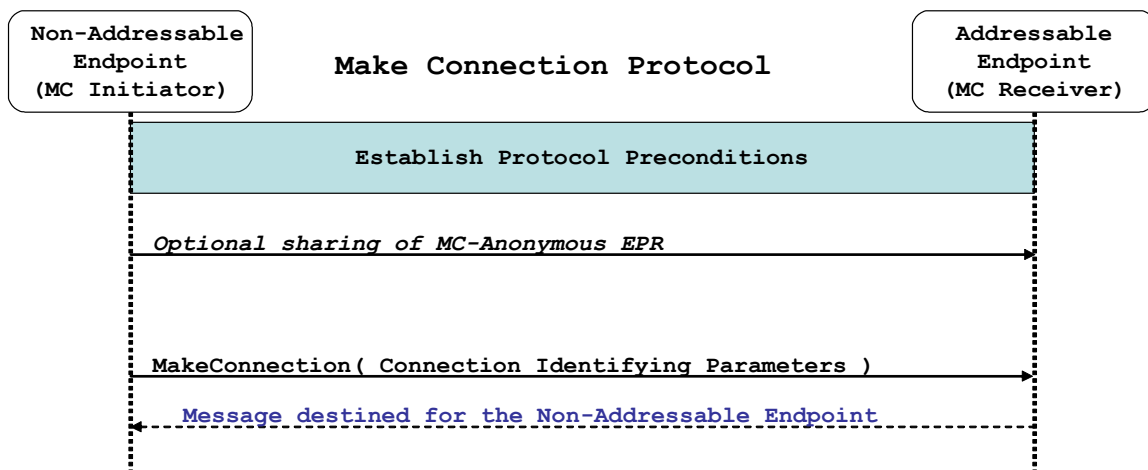
272 The WS-Addressing [WS-Addressing] specification defines the anonymous URI to identify non-
273 addressable endpoints and to indicate a protocol-specific back-channel is to be used for any messages
274 destined for that endpoint. For example, when used in the WS-Addressing ReplyTo EPR, the use of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

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

287 The MakeConnection model consists of two key aspects:

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

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



294 Figure 1 – Make Connection Model

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

298 **2.1 Glossary**

299 The following definitions are used throughout this specification:

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

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

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

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

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

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

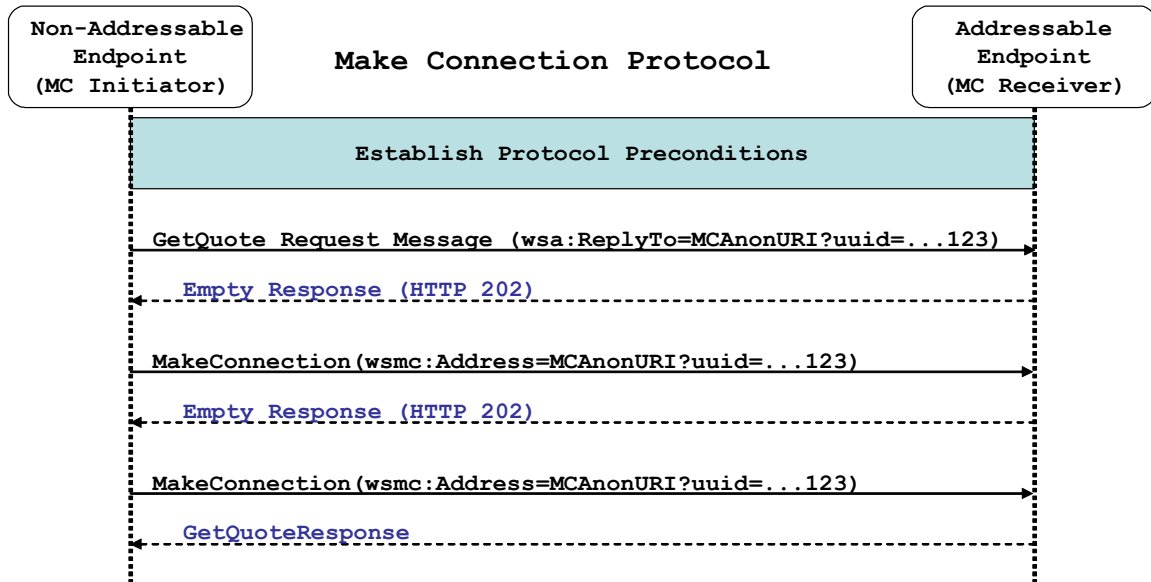
312 **2.2 Protocol Preconditions**

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

- 315 • The MC Receiver **MUST** be capable of accepting new incoming connections.
- 316 • The MC Initiator **MUST** be capable of creating new outgoing connections to the MC Receiver, and
317 those connections **MUST** have a back-channel.
- 318 • If a secure exchange of messages is **REQUIRED**, then the MC Initiator and MC Receiver **MUST**
319 have a security context.

320 **2.3 Example Message Exchange**

321 Figure 2 illustrates a message exchange in which the response message is delivered using
322 MakeConnection.



323 Figure 2: Example WS-MakeConnection Message Exchange

324 1. The protocol preconditions are established. These include policy exchange, endpoint resolution,
325 and establishing trust.

326 2. The client (MC Initiator) sends a GetQuote request message to the service (MC Receiver). The
327 WS-Addressing `wsa:ReplyTo` EPR uses the MakeConnection Anonymous URI Template –
328 indicating that if the GetQuoteResponse message is not sent back on this connection's back-
329 channel, then the client will use MakeConnection to retrieve it.

330 3. The service receives the request message and decides to close the connection by sending back
331 an empty response (in the HTTP case an HTTP 202 Accept is sent).

332 4. The client sends a MakeConnection message to the service. Within the MakeConnection element
333 is the `wsmc:Address` element containing the same MakeConnection Anonymous URI in
334 step 2.

335 5. The service has not completed executing the GetQuote operation and decides to close the
336 connection by sending back an empty response (in the HTTP case an HTTP 202 Accept)
337 indicating that no messages destined for this MC Initiator are available at this time.

338 6. The client sends a second MakeConnection message to the service. Within the MakeConnection
339 element is the `wsmc:Address` element containing the same MakeConnection Anonymous URI
340 used in step 2.

341 7. The service uses this new connection to transmit the GetQuoteResponse message.

342 The service can assume that because the MakeConnection Anonymous URI Template was used in the
343 `wsa:ReplyTo` EPR the client will act as an MC Initiator for the purposes of retrieving messages destined
344 to that EPR (i.e. responses to the GetQuote). This allows the service the option of immediately releasing
345 resources used by the original connection – knowing that the client will, at some later point in time,
346 establish a new connection on which the GetQuoteResponse can be transmitted. Likewise, when the first
347 MakeConnection is received by the service, it again has the option of leaving the connection open until the
348 GetQuoteResponse is ready to be transmitted, or it can close the connection immediately knowing that the
349 MC Initiator will retransmit the MakeConnection message at some later point in time. Since the nature and
350 dynamic characteristics of the underlying transport and potential intermediaries are unknown in the general
351 case, the timing of re-transmissions cannot be specified. Additionally, over-aggressive re-transmissions
352 have been demonstrated to cause transport or intermediary flooding which are counterproductive.
353 Consequently, implementers are encouraged to utilize adaptive mechanisms that dynamically adjust re-

354 transmission time and the back-off intervals that are appropriate to the nature of the transports and
355 intermediaries envisioned. For the case of TCP/IP transports, a mechanism similar to that described as
356 RTTM in RFC 1323 [RTTM] SHOULD be considered.

357 Now that the basic model has been outlined, the details of this protocol are now provided in section 3.

358 3 MakeConnection

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

361 3.1 MakeConnection Anonymous URI

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

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

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

376 3.2 MakeConnection Message

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

382 The following exemplar defines the `MakeConnection` syntax:

```
383 <wsmc:MakeConnection ...>  
384   <wsmc:Address ...> xs:anyURI </wsmc:Address> ?  
385   <wsrm:Identifier ...> xs:anyURI </wsrm:Identifier> ?  
386   ...  
387 </wsmc:MakeConnection>
```

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

389 /wsmc:MakeConnection

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

394 /wsmc:MakeConnection/wsmc:Address

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

399 identical in this sense may in fact be functionally equivalent. Examples include URI references
400 which differ only in case, or which are in external entities which have different effective base URIs.

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

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

404 `/wsmc:MakeConnection/wsrn:Identifier`

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

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

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

412 `/wsmc:MakeConnection/{any}`

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

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

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

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

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

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

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

- 437 • The `MakeConnection` message is logically part of a one-way operation; there is no reply
438 message to the `MakeConnection` itself, and any response flowing on the transport back-channel
439 is a pending message.
- 440 • Since there is no reply message to `MakeConnection`, the WS-Addressing specific rules in
441 section 3.4 "Formulating a Reply Message" are not used. Therefore, the value of any
442 `wsa:ReplyTo` element in the `MakeConnection` message has no effective impact since the WS-

- 443 Addressing [reply endpoint] property that is set by the presence of `wsa:ReplyTo` is not
444 used.
- 445 • In the absence of any pending message, there will be no message transmitted on the transport
446 back-channel. E.g. in the HTTP case just an `HTTP 202 Accepted` will be returned without any
447 SOAP envelope in the HTTP response message.
 - 448 • When there is a message pending, it is sent on the transport back-channel, using the connection
449 that has been initiated by the `MakeConnection` request.

450 3.3 MessagePending

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

455 The following exemplar defines the `MessagePending` syntax:

```
456 <wsmc:MessagePending pending="xs:boolean" ...>  
457   ...  
458 </wsmc:MessagePending>
```

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

460 `/wsmc:MessagePending`

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

462 `/wsmc:MessagePending/@pending`

463 This attribute, when set to "true", indicates that there is at least one message waiting to be
464 retrieved. When this attribute is set to "false" it indicates there are currently no messages waiting
465 to be retrieved.

466 `/wsmc:MessagePending/{any}`

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

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

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

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

474 3.4 MakeConnection Policy Assertion

475 The `MakeConnection` policy assertion indicates that the `MakeConnection` protocol (operation and the use
476 of the `MakeConnection` URI template in `EndpointReferences`) is required for messages sent from this
477 endpoint. This assertion has `Endpoint Policy Subject` [[WS-PolicyAttachment](#)].

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

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

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

481 `/wsmc:MCSupported`

482 A policy assertion that specifies that the MakeConnection protocol is required for messages sent
483 from this endpoint.

484 /wsmc:MCSupported/{any}

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

487 /wsmc:MCSupported/@{any}

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

490 4 Faults

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

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

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

496 The definitions of faults use the following properties:

497 [Code] The fault code.

498 [Subcode] The fault subcode.

499 [Reason] The English language reason element.

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

503 Entities that generate WS-MakeConnection faults MUST set the [Code] property to either "Sender" or
504 "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

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

```
506 <S:Envelope>  
507 <S:Header>  
508 <wsa:Action>  
509 http://docs.oasis-open.org/ws-rx/wsmc/200702/fault  
510 </wsa:Action>  
511 <!-- Headers elided for brevity. -->  
512 </S:Header>  
513 <S:Body>  
514 <S:Fault>  
515 <S:Code>  
516 <S:Value> [Code] </S:Value>  
517 <S:Subcode>  
518 <S:Value> [Subcode] </S:Value>  
519 </S:Subcode>  
520 </S:Code>  
521 <S:Reason>  
522 <S:Text xml:lang="en"> [Reason] </S:Text>  
523 </S:Reason>  
524 <S:Detail>  
525 [Detail]  
526 ...  
527 </S:Detail>  
528 </S:Fault>  
529 </S:Body>  
530 </S:Envelope>
```

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

```

533 <S11:Envelope>
534 <S11:Body>
535 <S11:Fault>
536 <faultcode> [Subcode] </faultcode>
537 <faultstring> [Reason] </faultstring>
538 </S11:Fault>
539 </S11:Body>
540 </S11:Envelope>

```

541 4.1 Unsupported Selection

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

543 Properties:

544 [Code] Receiver

545 [Subcode] wsmc:UnsupportedSelection

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

548 [Detail]

```

549 <wsmc:UnsupportedSelection> xs:QName </wsmc:UnsupportedSelection>+

```

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.

550 4.2 Missing Selection

551 The MakeConnection element did not contain any selection criteria.

552 Properties:

553 [Code] Receiver

554 [Subcode] wsmc:MissingSelection

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

556 [Detail]

Generated by	Condition	Action Upon Generation	Action Upon Receipt
--------------	-----------	------------------------	---------------------

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.

557 5 Security Considerations

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

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

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

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

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

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

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

598 Appendix A. Schema

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

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

602 The following copy is provided for reference.

```
603 <?xml version="1.0" encoding="UTF-8"?>
604 <!-- Copyright (C) OASIS (R) 1993-2007. All Rights Reserved.
605      OASIS trademark, IPR and other policies apply. -->
606 <xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
607   xmlns:wsa="http://www.w3.org/2005/08/addressing" xmlns:wsmc="http://docs.oasis-
608   open.org/ws-rx/wsmc/200702" targetNamespace="http://docs.oasis-open.org/ws-
609   rx/wsmc/200702" elementFormDefault="qualified"
610   attributeFormDefault="unqualified">
611   <xs:import namespace="http://www.w3.org/2005/08/addressing"
612     schemaLocation="http://www.w3.org/2006/03/addressing/ws-addr.xsd"/>
613   <!-- Protocol Elements -->
614   <xs:complexType name="MessagePendingType">
615     <xs:sequence>
616       <xs:any namespace="##other" processContents="lax" minOccurs="0"
617   maxOccurs="unbounded"/>
618     </xs:sequence>
619     <xs:attribute name="pending" type="xs:boolean"/>
620     <xs:anyAttribute namespace="##other" processContents="lax"/>
621   </xs:complexType>
622   <xs:element name="MessagePending" type="wsmc:MessagePendingType"/>
623   <xs:element name="Address">
624     <xs:complexType>
625       <xs:simpleContent>
626         <xs:extension base="xs:anyURI">
627           <xs:anyAttribute namespace="##other" processContents="lax"/>
628         </xs:extension>
629       </xs:simpleContent>
630     </xs:complexType>
631   </xs:element>
632   <xs:complexType name="MakeConnectionType">
633     <xs:sequence>
634       <xs:element ref="wsmc:Address" minOccurs="0" maxOccurs="1"/>
635       <xs:any namespace="##other" processContents="lax" minOccurs="0"
636   maxOccurs="unbounded"/>
637     </xs:sequence>
638     <xs:anyAttribute namespace="##other" processContents="lax"/>
639   </xs:complexType>
640   <xs:element name="MakeConnection" type="wsmc:MakeConnectionType"/>
641   <xs:element name="UnsupportedSelection">
642     <xs:simpleType>
643       <xs:restriction base="xs:QName"/>
644     </xs:simpleType>
645   </xs:element>
646 </xs:schema>
```

647 Appendix B. WSDL

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

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

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

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

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

```
656 <?xml version="1.0" encoding="utf-8"?>
657 <!-- Copyright (C) OASIS(R) 1993-2007. All Rights Reserved.
658 OASIS trademark, IPR and other policies apply. -->
659 <wSDL:definitions xmlns:wSDL="http://schemas.xmlsoap.org/wSDL/"
660 xmlns:xs="http://www.w3.org/2001/XMLSchema"
661 xmlns:wsa="http://www.w3.org/2005/08/addressing"
662 xmlns:wsam="http://www.w3.org/2007/02/addressing/metadata"
663 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
664 xmlns:tns="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsdl"
665 targetNamespace="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsdl">
666
667   <wSDL:types>
668     <xs:schema
669       <xs:import namespace="http://docs.oasis-open.org/ws-rx/wsmc/200702"
670       schemaLocation="http://docs.oasis-open.org/ws-rx/wsmc/200702/wsmc-1.0-schema-
671       200702.xsd"/>
672     </xs:schema>
673   </wSDL:types>
674
675   <wSDL:message name="MakeConnection">
676     <wSDL:part name="makeConnection" element="wsmc:MakeConnection"/>
677   </wSDL:message>
678
679   <wSDL:portType name="MCAbstractPortType">
680     <wSDL:operation name="MakeConnection">
681       <wSDL:input message="tns:MakeConnection" wsam:Action="http://docs.oasis-
682 open.org/ws-rx/wsmc/200702/MakeConnection"/>
683       <!-- As described in the WS-MakeConnection specification, the
684 MakeConnection operation establishes a connection. If a matching
685 message is available then the back-channel of the connection will
686 be used to carry the message. In SOAP terms the returned message
687 is not a response, so there is no WSDL output message. -->
688     </wSDL:operation>
689   </wSDL:portType>
690
691 </wSDL:definitions>
```

692 Appendix C. Message Examples

693 Appendix C.1 Example use of MakeConnection

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

700 **Step 1** – During a "subscribe" operation, the event consumer's EPR specifies the MC anonymous URI and
701 the WS-RM Policy Assertion [[WS-RM Policy](#)] to indicate whether or not RM is required:

```
702 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"  
703 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"  
704 xmlns:wsrmp="http://docs.oasis-open.org/ws-rx/wsrmp/200702"  
705 xmlns:wsa="http://www.w3.org/2005/08/addressing">  
706   <S:Header>  
707     <wsa:To> http://example.org/subscriptionService </wsa:To>  
708     <wsa:MessageID> http://client456.org/id-a6d8-a7c2eb546813</wsa:MessageID>  
709     <wsa:ReplyTo>  
710       <wsa:To> http://client456.org/response </wsa:To>  
711     </wsa:ReplyTo>  
712   </S:Header>  
713   <S:Body>  
714     <sub:Subscribe xmlns:sub="http://example.org/subscriptionService">  
715       <!-- subscription service specific data -->  
716       <targetEPR>  
717         <wsa:Address>http://docs.oasis-open.org/ws-  
718 rx/wsrmp/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsa:Address>  
719         <wsa:Metadata>  
720           <wsp:Policy wsu:Id="MyPolicy">  
721             <wsrmp:RMAssertion/>  
722           </wsp:Policy>  
723         </wsa:Metadata>  
724       </targetEPR>  
725     </sub:Subscribe>  
726   </S:Body>  
727 </S:Envelope>
```

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

733

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

```
735 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"  
736 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"  
737 xmlns:wsa="http://www.w3.org/2005/08/addressing">  
738   <S:Header>  
739     <wsa:Action>http://docs.oasis-open.org/ws-  
740 rx/wsmc/200702/MakeConnection</wsa:Action>  
741     <wsa:To> http://example.org/subscriptionService </wsa:To>
```

```

742     </S:Header>
743     <S:Body>
744         <wsmc:MakeConnection>
745             <wsmc:Address>http://docs.oasis-open.org/ws-
746 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsmc:Address>
747         </wsmc:MakeConnection>
748     </S:Body>
749 </S:Envelope>

```

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

```

753 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
754 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"
755 xmlns:wsmr="http://docs.oasis-open.org/ws-rx/wsmr/200702"
756 xmlns:wsa="http://www.w3.org/2005/08/addressing">
757     <S:Header>
758         <wsa:Action>http://docs.oasis-open.org/ws-
759 rx/wsmr/200702/CreateSequence</wsa:Action>
760         <wsa:To>http://docs.oasis-open.org/ws-rx/wsmr/200702/anonymous?id=550e8400-
761 e29b-11d4-a716-446655440000</wsa:To>
762         <wsa:ReplyTo> http://example.org/subscriptionService </wsa:ReplyTo>
763         <wsa:MessageID> http://example.org/id-123-456 </wsa:MessageID>
764         <wsmc:MessagePending pending="true"/>
765     </S:Header>
766     <S:Body>
767         <wsmr:CreateSequence>
768             <wsmr:AcksTo>
769                 <wsa:Address> http://example.org/subscriptionService </wsa:Address>
770             </wsmr:AcksTo>
771         </wsmr:CreateSequence>
772     </S:Body>
773 </S:Envelope>

```

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

778

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

```

781 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"
782 xmlns:wsmr="http://docs.oasis-open.org/ws-rx/wsmr/200702"
783 xmlns:wsa="http://www.w3.org/2005/08/addressing">
784     <S:Header>
785         <wsa:Action>http://docs.oasis-open.org/ws-
786 rx/wsmr/200702/CreateSequenceResponse</wsa:Action>
787         <wsa:To> http://example.org/subscriptionService </wsa:To>
788         <wsa:RelatesTo> http://example.org/id-123-456 </wsa:RelatesTo>
789     </S:Header>
790     <S:Body>
791         <wsmr:CreateSequenceResponse>
792             <wsmr:Identifier> http://example.org/rmid-456 </wsmr:Identifier>
793         </wsmr:CreateSequenceResponse>
794     </S:Body>
795 </S:Envelope>

```

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

798

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

```
800 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"  
801 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"  
802 xmlns:wsa="http://www.w3.org/2005/08/addressing">  
803   <S:Header>  
804     <wsa:Action>http://docs.oasis-open.org/ws-  
805 rx/wsmc/200702/MakeConnection</wsa:Action>  
806     <wsa:To> http://example.org/subscriptionService </wsa:To>  
807   </S:Header>  
808   <S:Body>  
809     <wsmc:MakeConnection>  
810       <wsmc:Address>http://docs.oasis-open.org/ws-  
811 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsmc:Address>  
812     </wsmc:MakeConnection>  
813   </S:Body>  
814 </S:Envelope>
```

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

816

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

```
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://example.org/eventType1</wsa:Action>  
824     <wsa:To>http://docs.oasis-open.org/ws-rx/wsmr/200702/anonymous?id=550e8400-  
825 e29b-11d4-a716-446655440000</wsa:To>  
826     <wsmr:Sequence>  
827       <wsmr:Identifier> http://example.org/rmid-456 </wsmr:Identifier>  
828     </wsmr:Sequence>  
829     <wsmc:MessagePending pending="true"/>  
830   </S:Header>  
831   <S:Body>  
832     <!-- event specific data -->  
833   </S:Body>  
834 </S:Envelope>
```

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

838

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

```
841 <S:Envelope xmlns:S="http://www.w3.org/2003/05/soap-envelope"  
842 xmlns:wsmc="http://docs.oasis-open.org/ws-rx/wsmc/200702"  
843 xmlns:wsa="http://www.w3.org/2005/08/addressing">  
844   <S:Header>  
845     <wsa:Action> http://docs.oasis-open.org/ws-rx/wsmc/200702/MakeConnection  
846   </wsa:Action>  
847     <wsa:To> http://example.org/subscriptionService </wsa:To>  
848   </S:Header>
```

```
849 <S:Body>
850 <wsmc:MakeConnection>
851 <wsmc:Address>http://docs.oasis-open.org/ws-
852 rx/wsmc/200702/anonymous?id=550e8400-e29b-11d4-a716-446655440000</wsmc:Address>
853 </wsmc:MakeConnection>
854 </S:Body>
855 </S:Envelope>
```

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

860

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

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