

[MS-NMFMB]:

.NET Message Framing MSMQ Binding Protocol

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Table of Contents

1	Introduction	5
1.1	Glossary	5
1.2	References	7
1.2.1	Normative References	7
1.2.2	Informative References	8
1.3	Overview	8
1.4	Relationship to Other Protocols	9
1.5	Prerequisites/Preconditions	9
1.6	Applicability Statement	9
1.7	Versioning and Capability Negotiation	9
1.8	Vendor-Extensible Fields	9
1.9	Standards Assignments.....	9
2	Messages.....	10
2.1	Transport	10
2.2	Common Message Syntax	10
2.2.1	Namespaces	10
2.2.2	Messages.....	10
2.2.3	Elements	10
2.2.3.1	MSMQ Best-Effort.....	10
2.2.3.2	MSMQ Session	11
2.2.3.3	MSMQ Volatile	11
2.2.3.4	MSMQ Authenticated	11
2.2.3.5	MSMQ Windows Domain	11
3	Protocol Details.....	12
3.1	Common Details	12
3.1.1	Abstract Data Model.....	12
3.1.1.1	NetMsmqMessage	12
3.1.1.2	net.msmq URI	12
3.1.1.3	MQPCO	12
3.1.2	Timers	13
3.1.3	Initialization.....	13
3.1.4	Higher-Layer Triggered Events	13
3.1.5	Message Processing Events and Sequencing Rules	13
3.1.6	Timer Events.....	13
3.1.7	Other Local Events.....	13
3.1.7.1	Construct Direct Format Name.....	13
3.1.7.2	Construct Public Format Name.....	14
3.1.7.3	Construct SRMP Format Name	14
3.2	Initiator Details.....	15
3.2.1	Abstract Data Model.....	15
3.2.1.1	SendQueue	15
3.2.1.2	SendNetMsmqMessage	15
3.2.1.3	UseActiveDirectory	15
3.2.1.4	QueueTransferProtocol	16
3.2.1.5	Message	16
3.2.1.6	Transaction	16
3.2.2	Timers	16
3.2.3	Initialization.....	16
3.2.4	Higher-Layer Triggered Events	16
3.2.4.1	Initialize Session.....	16
3.2.4.2	Send Message	16
3.2.4.3	Session Close	17
3.2.5	Message Processing Events and Sequencing Rules	18

3.2.5.1	Constructing an MSMQ Message.....	18
3.2.6	Timer Events.....	19
3.2.7	Other Local Events.....	19
3.2.7.1	Open Queue for Send	19
3.3	Receiver Details	20
3.3.1	Abstract Data Model.....	21
3.3.1.1	ReceiveQueue.....	21
3.3.2	Timers	21
3.3.3	Initialization.....	21
3.3.4	Higher-Layer Triggered Events	21
3.3.4.1	Initialize Session.....	21
3.3.4.2	Receive Message.....	21
3.3.4.3	Session Close	22
3.3.5	Message Processing Events and Sequencing Rules	22
3.3.6	Timer Events.....	22
3.3.7	Other Local Events.....	22
3.3.7.1	Open Queue for Receive	22
4	Protocol Examples	24
5	Security.....	25
5.1	Security Considerations for Implementers	25
5.2	Index of Security Parameters	25
6	Appendix A: Full WSDL	26
6.1	.Net Message Framing MSMQ Binding Protocol WSDL and Policy Assertions	26
7	Appendix B: Product Behavior	27
8	Change Tracking.....	28
9	Index.....	30

1 Introduction

This document specifies the .NET Message Framing MSMQ Binding Protocol, as well as a collection of Web service policy assertions that define behavior for the interaction with a Web service entity. This set of policy assertions pertains to an endpoint using the .NET Message Framing MSMQ Binding Protocol as the transport. This document does not define any specific Web service endpoints or message exchanges.

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in [\[RFC2119\]](#). Sections 1.5 and 1.9 are also normative but do not contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are specific to this document:

.NET Framework: An integral Windows component that supports building and running applications and XML web services. The Microsoft .NET Framework has two main components: the common language runtime and the .NET Framework class library. For more information about the .NET Framework, see [\[MSDN-.NET-FRAMEWORK\]](#). The following versions of the .NET Framework are available in the following released Windows products or as supplemental software. Microsoft .NET Framework 1.0: Windows NT 4.0 operating system, Microsoft Windows 98 operating system, Windows 2000 operating system, Windows Millennium Edition operating system, Windows XP operating system, and Windows Server 2003 operating system. Microsoft .NET Framework 1.1: Windows 98, Windows 2000, Windows Millennium Edition, Windows XP, Windows Server 2003, Windows Server 2003 R2 operating system, Windows Vista operating system, and Windows Server 2008 operating system. Microsoft .NET Framework 2.0: Windows 98, Windows 2000, Windows Millennium Edition, Windows XP, Windows Server 2003, Windows Server 2003 R2, Windows Vista, Windows Server 2008, Windows 7 operating system, Windows Server 2008 R2 operating system, Windows 8 operating system, Windows Server 2012 operating system, Windows 8.1 operating system, Windows Server 2012 R2 operating system, Windows 10 operating system, and Windows Server 2016 Technical Preview operating system. Microsoft .NET Framework 3.0: Windows XP, Windows Server 2003, Windows Server 2003 R2, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, and Windows Server 2016 Technical Preview. Microsoft .NET Framework 3.5: Windows XP, Windows Server 2003, Windows Server 2003 R2, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, and Windows Server 2016 Technical Preview. Microsoft .NET Framework 4.0: Windows XP, Windows Server 2003, Windows Server 2003 R2, Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, Windows 10, and Windows Server 2016 Technical Preview. Microsoft .NET Framework 4.5: Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, and Windows 10. Microsoft .NET Framework 4.6: Windows Vista, Windows Server 2008, Windows 7, Windows Server 2008 R2, Windows 8, Windows Server 2012, Windows 8.1, Windows Server 2012 R2, and Windows 10.

best effort: Indicates that a Message Queuing System makes a best effort to meet the specified **message** delivery assurance, but does not raise an error if the delivery assurance is not met.

certificate: A certificate is a collection of attributes (1) and extensions that can be stored persistently. The set of attributes in a certificate can vary depending on the intended usage of the certificate. A certificate securely binds a public key to the entity that holds the corresponding private key. A certificate is commonly used for authentication (2) and secure exchange of information on open networks, such as the Internet, extranets, and intranets. Certificates are

digitally signed by the issuing certification authority (CA) and can be issued for a user, a computer, or a service. The most widely accepted format for certificates is defined by the ITU-T X.509 version 3 international standards. For more information about attributes and extensions, see [\[RFC3280\]](#) and [\[X509\]](#) sections 7 and 8.

endpoint: A node that sends or receives a protocol stream.

envelope record: A record that contains data, such as a SOAP message. For more information about envelope records, see [\[SOAP1.1\]](#) and [\[SOAP1.2-1/2007\]](#).

express message: A volatile **message** that does not persist through queue manager restarts. These express **messages** provide best-effort, at-most-once delivery assurance.

format name: A name that is used to reference a queue when making calls to API functions.

globally unique identifier (GUID): A term used interchangeably with universally unique identifier (UUID) in Microsoft protocol technical documents (TDs). Interchanging the usage of these terms does not imply or require a specific algorithm or mechanism to generate the value. Specifically, the use of this term does not imply or require that the algorithms described in [\[RFC4122\]](#) or [\[C706\]](#) must be used for generating the **GUID**. See also universally unique identifier (UUID).

Hypertext Transfer Protocol (HTTP): An application-level protocol for distributed, collaborative, hypermedia information systems (text, graphic images, sound, video, and other multimedia files) on the World Wide Web.

initiator: The node that initiates the connection over which a protocol stream flows.

IPv4 address in string format: A string representation of an IPv4 address in dotted-decimal notation, as described in [\[RFC1123\]](#) section 2.1.

message: A data structure representing a unit of data transfer between distributed applications. A message has message properties, which may include message header properties, a message body property, and message trailer properties.

receiver: The node that is the receiver of the protocol stream.

recoverable message: A **message** that persists through queue manager restarts and provides best-effort, at-most-once delivery assurance.

SOAP: A lightweight protocol for exchanging structured information in a decentralized, distributed environment. **SOAP** uses XML technologies to define an extensible messaging framework, which provides a message construct that can be exchanged over a variety of underlying protocols. The framework has been designed to be independent of any particular programming model and other implementation-specific semantics. SOAP 1.2 supersedes SOAP 1.1. See [\[SOAP1.2-1/2003\]](#).

web service: A software entity that responds to SOAP messages ([\[SOAP1.1\]](#), [\[WSDL\]](#)).

Web Services Description Language (WSDL): An XML format for describing network services as a set of endpoints that operate on messages that contain either document-oriented or procedure-oriented information. The operations and messages are described abstractly and are bound to a concrete network protocol and message format in order to define an endpoint. Related concrete endpoints are combined into abstract endpoints, which describe a network service. WSDL is extensible, which allows the description of endpoints and their messages regardless of the message formats or network protocols that are used.

X.509: An ITU-T standard for public key infrastructure subsequently adapted by the IETF, as specified in [\[RFC3280\]](#).

XML namespace: A collection of names that is used to identify elements, types, and attributes in XML documents identified in a URI reference [\[RFC3986\]](#). A combination of XML namespace and local name allows XML documents to use elements, types, and attributes that have the same names but come from different sources. For more information, see [\[XMLNS-2ED\]](#).

XML schema: A description of a type of XML document that is typically expressed in terms of constraints on the structure and content of documents of that type, in addition to the basic syntax constraints that are imposed by XML itself. An XML schema provides a view of a document type at a relatively high level of abstraction.

MAY, SHOULD, MUST, SHOULD NOT, MUST NOT: These terms (in all caps) are used as defined in [\[RFC2119\]](#). All statements of optional behavior use either MAY, SHOULD, or SHOULD NOT.

1.2 References

Links to a document in the Microsoft Open Specifications library point to the correct section in the most recently published version of the referenced document. However, because individual documents in the library are not updated at the same time, the section numbers in the documents may not match. You can confirm the correct section numbering by checking the [Errata](#).

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information.

[MC-MQSRM] Microsoft Corporation, "[Message Queuing \(MSMQ\): SOAP Reliable Messaging Protocol \(SRMP\)](#)".

[MC-NMF] Microsoft Corporation, "[.NET Message Framing Protocol](#)".

[MS-DTYP] Microsoft Corporation, "[Windows Data Types](#)".

[MS-MQDMPR] Microsoft Corporation, "[Message Queuing \(MSMQ\): Common Data Model and Processing Rules](#)".

[MS-MQMQ] Microsoft Corporation, "[Message Queuing \(MSMQ\): Data Structures](#)".

[MS-MQQB] Microsoft Corporation, "[Message Queuing \(MSMQ\): Message Queuing Binary Protocol](#)".

[MS-WSPOL] Microsoft Corporation, "[Web Services: Policy Assertions and WSDL Extensions](#)".

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997, <http://www.rfc-editor.org/rfc/rfc2119.txt>

[RFC3280] Housley, R., Polk, W., Ford, W., and Solo, D., "Internet X.509 Public Key Infrastructure Certificate and Certificate Revocation List (CRL) Profile", RFC 3280, April 2002, <http://www.ietf.org/rfc/rfc3280.txt>

[RFC3986] Berners-Lee, T., Fielding, R., and Masinter, L., "Uniform Resource Identifier (URI): Generic Syntax", STD 66, RFC 3986, January 2005, <http://www.ietf.org/rfc/rfc3986.txt>

[SOAP1.1] Box, D., Ehnebuske, D., Kakivaya, G., et al., "Simple Object Access Protocol (SOAP) 1.1", May 2000, <http://www.w3.org/TR/2000/NOTE-SOAP-20000508/>

[SOAP1.2-1/2007] Gudgin, M., Hadley, M., Mendelsohn, N., et al., "SOAP Version 1.2 Part 1: Messaging Framework (Second Edition)", W3C Recommendation 27, April 2007, <http://www.w3.org/TR/2007/REC-soap12-part1-20070427/>

[WS-Policy] Siddharth, B., Box, D., Chappell, D., et al., "Web Services Policy 1.2 - Framework (WS-Policy)", April 2006, <http://www.w3.org/Submission/2006/SUBM-WS-Policy-20060425/>

[WSDL] Christensen, E., Curbera, F., Meredith, G., and Weerawarana, S., "Web Services Description Language (WSDL) 1.1", W3C Note, March 2001, <http://www.w3.org/TR/2001/NOTE-wsdl-20010315>

[XMLNS] Bray, T., Hollander, D., Layman, A., et al., Eds., "Namespaces in XML 1.0 (Third Edition)", W3C Recommendation, December 2009, <http://www.w3.org/TR/2009/REC-xml-names-20091208/>

[XMLSCHEMA1] Thompson, H., Beech, D., Maloney, M., and Mendelsohn, N., Eds., "XML Schema Part 1: Structures", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/>

[XMLSCHEMA2] Biron, P.V., Ed. and Malhotra, A., Ed., "XML Schema Part 2: Datatypes", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-2-20010502/>

1.2.2 Informative References

[MS-MQOD] Microsoft Corporation, "[Message Queuing Protocols Overview](#)".

1.3 Overview

The .Net Message Framing MSMQ Binding Protocol specifies how the mechanism described in [\[MC-NMF\]](#) for framing messages over any transport protocol can be applied over Message Queue (MSMQ). This protocol specification also includes how to indicate the use of .NET Message Framing over MSMQ as a **SOAP** transport in **Web Services Description Language (WSDL)**. Finally, the protocol details how the protocol behavior changes if any of the set of policy assertions (as defined in section 1.1 of [\[MS-WSPOL\]](#)) are set on an **endpoint**. This document specifies the following policy assertions:

- **MSMQ Best-Effort**

The MSMQ Best-Effort policy assertion indicates that a **Web service** endpoint requires messages to be delivered in a best-effort manner, which does not guarantee that the message will be delivered only one time.
- **MSMQ Session**

The MSMQ Session policy assertion indicates that a Web service endpoint requires multiple **envelope records** to be sent within a single message.
- **MSMQ Volatile**

The MSMQ Volatile policy assertion indicates that a Web service endpoint requires the use of express messages; otherwise, **recoverable messages** MUST be used.
- **MSMQ Authenticated**

The MSMQ Authenticated policy assertion indicates that a Web service endpoint requires MSMQ messages to be authenticated, as described in section 3.1.5.8.3 of [\[MS-MQQB\]](#).
- **MSMQ Windows Domain**

The MSMQ Windows Domain policy assertion indicates that a Web service endpoint requires authentication to be performed using the sender's security identifier (SID), as defined in [\[MS-DTYP\]](#) section 2.4.2. If this policy assertion is not set, the service endpoint requires authentication to be performed using **X.509 certificates** [\[RFC3280\]](#).

These assertions are used to ensure the client is using the Web service through the binding as intended.

The .Net Message Framing MSMQ Binding Protocol makes use of MSMQ protocols to set the proper message attributes in order to conform with policy assertions set by the Web service.

1.4 Relationship to Other Protocols

This protocol uses events defined in Message Queuing (MSMQ): Common Data Model and Processing Rules [\[MS-MQDMPR\]](#) to transfer messages between the client and the destination endpoint.

This protocol uses MSMQ as the transport to send envelope records, as specified in section 2.2.4 of [\[MC-NMF\]](#).

1.5 Prerequisites/Preconditions

The .NET Message Framing MSMQ Binding Protocol requires that both the **initiator** and **receiver** satisfy all preconditions stated in section 2.4 of [\[MS-MQOD\]](#). The **Queue**, as defined in section 3.1.1.2 of [\[MS-MQDMPR\]](#), is used for communication exists and is accessible by both the sender and receiver.

1.6 Applicability Statement

The .NET Message Framing MSMQ Binding Protocol is applicable in scenarios where an initiator and a receiver require a communication mechanism to send and receive envelope records [\[MC-NMF\]](#) over MSMQ. This is the case if the WSDL file contains a soap binding element with a transport value of "http://schemas.microsoft.com/soap/msmq" as specified in section [2.1](#).

1.7 Versioning and Capability Negotiation

This protocol requires .NET Message Framing Protocol version 1.0 [\[MC-NMF\]](#). When this protocol is implemented by using SOAP, it requires the use of SOAP version 1.1 [\[SOAP1.1\]](#) or SOAP version 1.2 [\[SOAP1.2-1/2007\]](#).

This protocol does not support capability negotiation.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

The following sections specify the message transport and the common data types of the .Net Message Framing MSMQ Binding Protocol.

2.1 Transport

The .NET Message Framing MSMQ Binding Protocol requires MSMQ.

An endpoint that uses the .NET Message Framing MSMQ Binding Protocol with [\[SOAP1.2-1/2007\]](#) MUST specify the value of the transport attribute of the <soap12:binding> element [\[WSDL\]](#) to be "http://schemas.microsoft.com/soap/msmq".

An endpoint that uses the .NET Message Framing MSMQ Binding Protocol with [\[SOAP1.1\]](#) MUST specify the value of the transport attribute of the <soap:binding> element [\[WSDL\]](#) to be "http://schemas.microsoft.com/soap/msmq".

2.2 Common Message Syntax

2.2.1 Namespaces

This specification defines and references various **XML namespaces** using the mechanisms specified in [\[XMLNS\]](#). Although this specification associates a specific XML namespace prefix for each XML namespace that is used, the choice of any particular XML namespace prefix is implementation-specific and is not significant for interoperability.

Prefix	Namespace URI	Reference
msmq	http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq	This specification
soap	http://schemas.xmlsoap.org/wsdl/soap	[WSDL]
soap12	http://schemas.xmlsoap.org/wsdl/soap12/	[WSDL]
wsdl	http://schemas.xmlsoap.org/wsdl/	[WSDL]
wsp	http://schemas.xmlsoap.org/ws/2004/09/policy	[WS-Policy]

2.2.2 Messages

This specification does not define any messages.

2.2.3 Elements

The following sections contain the **XML schema** description for the policy assertions defined in this document and the schema for the transport that this protocol operates on. The following elements are policy assertions and belong to the wsp:Policy tag, as described in [\[WS-Policy\]](#).

2.2.3.1 MSMQ Best-Effort

```
<msmq:BestEffort
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq" />
```

The following describes the content model of the <MsmqBestEffort> element.

/msmq:BestEffort: A Web service endpoint with MSMQ best-effort policy assertion MUST NOT transfer messages as part of a transaction which ensures exactly once guarantee. The client and service instead MUST make a **best effort** attempt to deliver messages.

2.2.3.2 MSMQ Session

```
<msmq:Session  
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq" />
```

The following describes the content model of the <MsmqSession> element.

/msmq:Session: A Web service endpoint with the MSMQ session policy assertion MUST require the initiator to create a connection with the service in which numerous messages are sent within a single MSMQ **message**.

2.2.3.3 MSMQ Volatile

```
<msmq:Volatile  
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq" />
```

The following describes the content model of the <MsmqVolatile> element.

/msmq:Volatile: A Web service endpoint with MSMQ volatile policy assertion MUST require the client to send **express messages**.

2.2.3.4 MSMQ Authenticated

```
<msmq:Authenticated  
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq" />
```

The following describes the content model of the <MsmqAuthenticated> element.

/msmq:Authenticated: A Web service endpoint with MSMQ authenticated policy assertion MUST require MSMQ messages sent on the transport to be authenticated.

2.2.3.5 MSMQ Windows Domain

```
<msmq:WindowsDomain  
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq" />
```

The following describes the content model of the <MsmqWindowsDomain> element.

/msmq:WindowsDomain: This assertion only applies to policies which also include the MSMQ Authenticated policy assertion. A Web service endpoint with MSMQ Windows Domain policy assertion MUST authenticate the user using Windows logon authentication; otherwise, if this assertion is not set, they MUST authenticate the user using X.509 certificates.

3 Protocol Details

A node can participate in this protocol in one of two roles: initiator or receiver. An initiator begins the process by opening and delivering messages to a queue that the receiver is monitoring. MSMQ is used as the lower-level protocol transport for performing the .NET Message Framing Protocol [\[MC-NMF\]](#).

3.1 Common Details

3.1.1 Abstract Data Model

3.1.1.1 NetMsmqMessage

A **NetMsmqMessage** is a structure that encapsulates the data placed into a **Message.Body**, as defined in section 3.1.1.12 of [\[MS-MQDMPR\]](#). It contains the following attributes:

Preamble: A preamble message as defined in section 2.2.6 of the .NET Message Framing Protocol [\[MC-NMF\]](#).

EnvelopeRecords: A single or multiple envelope record as defined in section 2.2.4 of the .NET Message Framing Protocol [\[MC-NMF\]](#).

EndRecord: An end record as specified in section 2.2.3.9 of the .NET Message Framing Protocol [\[MC-NMF\]](#).

3.1.1.2 net.msmq URI

A **net.msmq URI** is a URI that satisfies the following constraints:

- The scheme component of the URI **MUST** be net.msmq.
- The URI **MUST** be a hierarchical URI.
- The authority component of the URI **MUST** be specified.
- The authority component of the URI **MUST NOT** include user information.
- The URI **MUST NOT** include the query URI component.
- The URI **MUST NOT** include the fragment URI component.

3.1.1.3 MQPCO

An **MQPCO** is a configuration object as defined in section 3.1.3 of [\[MC-NMF\]](#), but with the following constraints:

- The protocol version, section 2.2.3.1 [\[MC-NMF\]](#), specified by the MQPCO **MUST** be 1.0.
- If the MSMQ Session policy assertion described in section [2.2.3.2](#) is set, then the communication mode, section 2.2.3.2 [\[MC-NMF\]](#), **MUST** be Simplex.
- Otherwise, the communication mode **MUST** be Singleton Sized.
- The Via URI, section 2.2.3.3 of [\[MC-NMF\]](#), specified by the MQPCO **MUST** be a **net.msmq URI** as specified in [3.1.1.2](#).

3.1.2 Timers

None.

3.1.3 Initialization

A MQPCO with an uninitialized transport is made available to the protocol as part of a higher-layer triggered event.

3.1.4 Higher-Layer Triggered Events

None.

3.1.5 Message Processing Events and Sequencing Rules

None.

3.1.6 Timer Events

None.

3.1.7 Other Local Events

3.1.7.1 Construct Direct Format Name

This event MUST be generated with the following argument:

- *iVia*: A URI, as specified in [\[RFC3986\]](#).

Return Values:

- **rFormatName**: The constructed **format name**.

The protocol MUST construct a direct format name as specified in section 2.1.2 for [\[MS-MQMQ\]](#), as follows:

- Initialize **rFormat** to "DIRECT=".
- If the host section as defined in section 3.2.2 of [\[RFC3986\]](#), of the Via URI is localhost:
 - Append "OS:" to **rFormat**.
- Otherwise:
 - If the host section of the Via URI is an **IPv4 address in string format**:
 - Append "TCP:" to **rFormat**.
 - Otherwise:
 - Append "OS:" to **rFormat**.
 - Append the host portion of the Via URI to **rFormat**.
- Append "\" to **rFormat**.
- Append the relative path of the URI as defined in section 3.3 of [\[RFC3986\]](#) to **rFormat**.

- Set *rFormatName* to *rFormat*.

3.1.7.2 Construct Public Format Name

This event MUST be generated with the following argument:

- *iVia*: A URI as specified in [\[RFC3986\]](#).

Return Values:

- **rReturnStatus**: A status code signifying the success or failure of the raised [\[MS-MQDMPR\]](#) events.
- **rFormatName**: The constructed format name.

The protocol MUST construct a public format name as specified in section 2.1.3 of [\[MS-MQMQ\]](#), as follows:

- Initialize **rPathName** to *iVia*.
- Remove the "net.msmq://" prefix from **rPathName** to create a path name
- Generate a Read Directory event as specified in section 3.1.7.1.20 of [\[MS-MQDMPR\]](#), with the following arguments.
 - *iDirectoryObjectType* = "Queue"
 - *iFilter* = An array of the following attribute-filter expressions:
 - Queue.Pathname EQUALS **rPathName**
 - *iAttributeList* : = An array of the following queue attributes:
 - Queue.Identifier
- Set *rReturnStatus* to **rStatus**.
- If the **rStatus** returned by the Read Directory event is not set to Success:
 - Set **rReturnStatus** equal to **rStatus**.
- Set *queueIdentifier* to the Queue.Identifier of the returned queue object.
- Set *rFormat* to the following string where *queueIdentifier* is replaced by its value:
 - "PUBLIC="queueIdentifier
- Set **rFormatName** to **rFormat**.

3.1.7.3 Construct SRMP Format Name

This event MUST be generated with the following argument:

- *iVia* : A URI, as specified in [\[RFC3986\]](#).
- *iSecureSrmP* : A boolean value, indicating whether the transport will use "https" or "http".

Return Values:

- *rFormatName* : The constructed format name.

The initiator MUST construct a direct format name as specified in section 2.1.2 for [\[MS-MQMQ\]](#), as follows:

- Initialize *rFormat* to "DIRECT=".
- If *iSecureSmp* is set to true:
 - Append "https://" to *rFormat*.
- Otherwise:
 - Append "http://" to *rFormat*.
- Append the host portion of *iVia* to *rFormat*.
- If the port number of the *iVia* URI is set:
 - Append the port number to *rFormat*.
- Append "/msmq/" to *rFormat*.
- Append the relative Path of the URI as defined in section 3.3 of [RFC3986] to *rFormat*.
- Set *rFormatName* to *rFormat*.

3.2 Initiator Details

The initiator MUST use the binding and policy assertions enforced by the Web service in the WSDL to properly construct a valid MQPCO as specified in section [3.1.1.2](#). To communicate with the receiver the initiator MUST send an MSMQ **Message** [\[MS-MQDMPR\]](#) with a **NetMsmqMessage** in the **Message.Body** to an opened queue.

3.2.1 Abstract Data Model

3.2.1.1 SendQueue

SendQueue is an **OpenQueueDescriptor** as defined in section 3.1.1.16 of [\[MS-MQDMPR\]](#). The initiator MUST maintain an instance of this element referred to as **rSendQueue**.

3.2.1.2 SendNetMsmqMessage

SendNetMsmqMessage is a NetMsmqMessage structure as defined in section [3.1.1.1](#). The initiator MUST maintain an instance of this element referred to as **rNetMsmqMessage**.

3.2.1.3 UseActiveDirectory

UseActiveDirectory is a user-configurable element that changes how the protocol constructs a format name. This element MUST be enabled for authentication to be performed as specified in section [3.2.5.1](#). The initiator MUST maintain an instance of this element referred to as **rUseActiveDirectory**.

Valid values for this element are:

- **True** = Use Public format names, as specified in section 2.1.3 of [\[MS-MQMQ\]](#).
- **False** = Use Direct Format Names as specified in section 2.1.2 of [\[MS-MQMQ\]](#).

3.2.1.4 QueueTransferProtocol

QueueTransferProtocol is a user-configurable element that allows messages to be delivered using the Message Queuing (MSMQ): SOAP Reliable Messaging Protocol (SRMP) [\[MC-MQSRM\]](#). The initiator MUST maintain an instance of this element referred to as **rQueueTransferProtocol**.

Valid values for this element are:

- **Native** = Use native MSMQ protocols.
- **SRMP** = Use SRMP [MC-MQSRM] over **HTTP**.
- **SecureSRMP** = Use SRMP [MC-MQSRM] over HTTPS.

3.2.1.5 Message

Message is defined in section 3.1.1.12 of [\[MS-MQDMPR\]](#). The initiator MUST maintain an instance of this element referred to as *rMsmqMessage*.

3.2.1.6 Transaction

Transaction is defined in section 3.1.1.14 of [\[MS-MQDMPR\]](#). The initiator MUST maintain an instance of this element referred to as **rTransaction**.

3.2.2 Timers

None.

3.2.3 Initialization

None.

3.2.4 Higher-Layer Triggered Events

3.2.4.1 Initialize Session

The initiator MUST open a queue by performing the following:

- Raising the Open Queue for Send event as specified in section [3.2.7.1](#) with the following parameters set:
 - *iUseActiveDirectory* set to **rUseActiveDirectory**.
 - *iQueueTransferProtocol* set to **rQueueTransferProtocol**.
- If the returned **rReturnStatus** is not equal to MQ_OK (0x00000000), then an error MUST be propagated to the higher layer, and no further processing done.
- Set **rSendQueue** to the returned **rOpenQueue** .

The initiator MUST set **rMsmqMessage** equal to NULL.

3.2.4.2 Send Message

The initiator MUST perform the following steps.

- If **rMsmqMessage** is equal to NULL:

- Construct an MSMQ **Message** as specified in section [3.2.5.1](#) with the following parameters:
 - *iQueueTransferProtocol* set to **rQueueTransferProtocol**.
 - Set *rMsmqMessage* equal to **rReturnMsmqMessage**.
 - Set *rTransaction* equal to the returned **rReturnTransaction**.
 - Construct a **Preamble Message**, referred to as **rPreamble** using the logic described in section 3.2.4.2 of [\[MC-NMF\]](#).
 - Set *rNetMsmqMessage.Preamble* to **rPreamble**.
- Append the envelope record passed from the higher level protocol to **rNetMsmqMessage.EnvelopeRecords**.
- If the MSMQ Session policy assertion described in section [2.2.3.2](#) is not set:
 - Set *rMsmqMessage.Body* to **rNetMsmqMessage**.
 - Deliver **rMsmqMessage** by raising the Enqueue Message event from section 3.1.7.1.9 of [\[MS-MQDMPR\]](#) with the following parameters:
 - *iQueue* set to **rSendQueue**, the opened queue from section [3.2.4.1](#).
 - *iMessage* set to **rMsmqMessage**.
 - *iTransaction* set to **rTransaction**.
 - If the returned **rStatus**, is not equal to MQ_OK (0x00000000), then an error MUST be propagated to the higher layer.
 - Set *rMsmqMessage* equal to NULL.

3.2.4.3 Session Close

If the MSMQ Session policy assertion described in section [2.2.3.2](#) is set, the initiator MUST deliver the envelope records together as one MSMQ **Message** by performing the following:

- If **rMsmqMessage** is not equal to NULL:
 - Construct an end record, referred to as **rEndRecord**, using the logic described in section 3.2.4.5 of [\[MC-NMF\]](#).
 - Set *rNetMsmqMessage.EndRecord* equal to **rEndRecord**.
 - Set *rMsmqMessage.Body* to **rNetMsmqMessage**.
 - Raise the Enqueue Message event from section 3.1.7.1.9 of [\[MS-MQDMPR\]](#) with the following parameters:
 - *iQueue* set to **rSendQueue**, the opened queue from section [3.2.4.1](#).
 - *iMessage* set to **rMsmqMessage**.
 - *iTransaction* set to **rTransaction**.
 - If the returned **rStatus** is not equal to MQ_OK (0x00000000), then an error MUST be propagated to the higher layer, and no further processing done.

The initiator MUST also close the queue by performing the following:

- Raise the Close Queue event from section 3.1.7.1.6 of [MS-MQDMPR], with the following parameters:
 - *iQueueDesc* set to **rSendQueue**.
- If the returned **rStatus**, is not equal to MQ_OK (0x00000000), then an error MUST be propagated to the higher layer, and no further processing done.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 Constructing an MSMQ Message

This event MUST be generated with the following arguments:

- *iQueueTransferProtocol*: A **QueueTransferProtocol** value.

Return Values:

- **rReturnMsmqMessage**: An MSMQ **Message**.
- **rReturnTransaction**: An MSMQ **Transaction**.

The initiator MUST construct a **Message** as defined in section 3.1.1.12 of [MS-MQDMPR]. The **Message** MUST be constructed as specified in the following sections.

The initiator MUST set specific properties on a **Message**, depending on the policy assertions that were set as follows:

- If the Best-Effort policy assertion described in [2.2.3.1](#) is not set:
 - Raise the Create Transaction event, as specified in section 3.1.7.1.8 Create Transaction of [MS-MQDMPR], with the following parameters:
 - *iTransactionIdentifier* set to a unique transaction identifier **GUID**, as specified in [MS-DTYP] section 2.3.4.
 - Set **rReturnTransaction** equal to **rTransaction**.
- Otherwise:
 - Set **rReturnTransaction** equal to NULL
- If the Volatile policy assertion described in section [2.2.3.3](#) is set:
 - Set **Message.DeliveryGuarantee** to **Express** for volatile messages
- Otherwise, if the Volatile policy assertion is not set:
 - Set **Message.DeliveryGuarantee** to **Recoverable** for durable messages.
- If the Authenticated policy assertion described in section [2.2.3.5](#) is set:
 - Set **Message.PrivacyLevel** to **Enhanced**.
 - Set **Message.EncryptionAlgorithm** to **RC4**.
 - Set **Message.HashAlgorithm** to **SHA1**.
 - If **iQueueTransferProtocol** is set to **SRMP** or **SecureSRMP**:
 - Set **Message.AuthenticationLevel** to **XmlSig**.

- Otherwise:
 - Set **Message.AuthenticationLevel** to **Sig30**.
- If the Windows Domain policy assertion described in section 2.2.3.5 is set:
 - Set **Message.SenderIdentifierType** to **Sid**, as specified in [MS-MQDMPR] section 2.
- Otherwise:
 - Set **Message.SenderIdentifierType** to **None**.
 - Set **Message.SenderCertificate** to a user-provided X.509 certificate as described in [\[RFC3280\]](#).
- Otherwise, if the Authenticated policy assertion is not set:
 - Set **Message.SenderIdentifierType** to **None**.
 - Set **Message.AuthenticationLevel** to **None**.
- Set **rReturnMsmqMessage** to the constructed **Message**.

3.2.6 Timer Events

None.

3.2.7 Other Local Events

3.2.7.1 Open Queue for Send

This event MUST be generated with the following arguments:

- *iUseActiveDirectory*: A **UseActiveDirectory** value.
- *iQueueTransferProtocol*: A **QueueTransferProtocol** value.

Return Values:

- **rOpenQueue**: An OpenQueueDescriptor value for the opened queue.
- **rReturnStatus**: A status code signifying the success or failure of the raised [\[MS-MQDMPR\]](#) events.

The initiator MUST open the queue corresponding to the endpoint specified in the service's WSDL, which also corresponds to the **MQPCO** Via record, referred to as *rVia*. This MUST be performed before any messages are sent. To do so, the initiator MUST perform the following:

- Construct a format name, referred to as **rFormat** as follows:
 - If *iQueueTransferProtocol* is set to **SRMP**
 - Raise the Construct SRMP Format Name Event, as specified in section [3.1.7.3](#) with the following properties set:
 - *iVia*: Set to **rVia**.
 - *iSecureSrpm*: Set to false.
 - Set *rFormat* to the returned **rFormatName**.

- If *iQueueTransferProtocol* is set to **SecureSRMP**
 - Raise the Construct SRMP Format Name Event, as specified in section 3.1.7.3 with the following properties set:
 - *iVia*: Set to **rVia**.
 - *iSecureSrpm*: Set to true.
 - Set *rFormat* to the returned **rFormatName**.
- If *iQueueTransferProtocol* is set to **Native**
 - If *iUseActiveDirectory* is set to true:
 - Raise the Construct Public Format Name event, as specified in section [3.1.7.2](#) with the following properties set:
 - *iVia*: Set to **rVia**.
 - If the returned **rReturnStatus** from the Construct Public Format Name event, is not equal to MQ_OK (0x00000000), then set **rReturnStatus** to the same value, and perform no further processing.
 - Set *rFormat* to the returned **rFormatName**.
 - Otherwise, if **iUseActiveDirectory** is set to false:
 - Raise the Construct Direct Format Name event, as specified in section [3.1.7.1](#) with the following properties set:
 - *iVia*: Set to **rVia**.
 - Set *rFormat* to the returned **rFormatName**.
- Generate an Open Queue event as specified in section 3.1.7.1.5 of [MS-MQDMPR], with the following properties set:
 - *iFormatName*: Set to **rFormat**.
 - *iRequiredAccess*: Set to **QueueAccessType.SendAccess**.
 - *iSharedMode*: Set to **QueueShareMode.DenyNone**, as specified in section 3.1.1.17 of [MS-MQDMPR].
- Set *rOpenQueue* to the returned **rOpenQueueDescriptor**.
- Set *rReturnStatus* to the returned **rStatus**.

3.3 Receiver Details

The receiver listens on the queue discovered at the path name introduced in section [3.1.7.2](#). The receiver MUST open a queue at this address and process the messages as described in the following sections.

3.3.1 Abstract Data Model

3.3.1.1 ReceiveQueue

ReceiveQueue is an **OpenQueueDescriptor** as defined in section 3.1.1.16 of [\[MS-MQDMPR\]](#). The receiver MUST maintain an instance of this element referred to as **rReceiveQueue**.

3.3.2 Timers

None.

3.3.3 Initialization

None.

3.3.4 Higher-Layer Triggered Events

3.3.4.1 Initialize Session

The receiver MUST open a queue by performing the following:

- Raising the Open Queue for Receive event, as specified in section [3.3.7.1](#).
- Set **rReceiveQueue** to the returned **rOpenQueue**.

3.3.4.2 Receive Message

The receiver MUST receive the MSMQ **Message**, referred to as **rMsmqMessage**, by performing the following:

- Raise the Dequeue Message event as specified in section 3.1.7.1.10 of Message Queuing (MSMQ) Common Data Model and Processing Rules [\[MS-MQDMPR\]](#).
 - Set *iQueueDesc* to **rReceiveQueue**.
 - Set *iTimeout* to the amount of time to wait for message arrival in seconds.
 - Set *iCursor* to NULL.
 - If the Best-Effort policy assertion described in [2.2.3.1](#) is not set:
 - Raise the Create Transaction event, as specified in section 3.1.7.1.8 Create Transaction of [\[MS-MQDMPR\]](#), with the following parameters:
 - *iTransactionIdentifier* set to a unique transaction identifier GUID.
 - Set *iTransaction* to **rTransaction**.
- If the returned **rStatus** is set to MQ_OK (0x00000000), then assign the returned **rMessage** to **rMsmqMessage**.
- Otherwise, an error MUST be propagated to the higher layer, and no further processing done.
 - An error MUST be propagated to the higher layer, and no further processing done.

After the MSMQ **Message** has been received from the MSMQ protocol the receiver MUST do the following:

- Assign **rMsmqMessage.Body** to a **NetMsmqMessage**, referred to as **rNetMsmqMessage**.
- Perform the steps for verifying the Preamble Message as specified in section 3.3.4.2 of [\[MC-NMF\]](#), on **rNetMsmqMessage.Preamble**.
- Read and propagate the **envelope record** in **rNetMsmqMessage.EnvelopeRecords** to a higher layer as specified in section 3.3.4.4 of [\[MC-NMF\]](#).

3.3.4.3 Session Close

The receiver MUST also close the queue by performing the following:

- Raise the Close Queue event from section 3.1.7.1.6 of [\[MS-MQDMPR\]](#), with the following parameters:
 - *iQueueDesc* set to **rReceiveQueue**.
- If the returned **rStatus**, is not equal to MQ_OK (0x00000000), then an error MUST be propagated to the higher layer, and no further processing done.

3.3.5 Message Processing Events and Sequencing Rules

None.

3.3.6 Timer Events

None.

3.3.7 Other Local Events

3.3.7.1 Open Queue for Receive

This event is raised without any arguments supplied.

Return Values:

- **rOpenQueue**: An OpenQueueDescriptor value for the opened queue.
- **rReturnStatus**: A status code signifying the success or failure of the raised [\[MS-MQDMPR\]](#) events.

The receiver MUST open the queue corresponding to the endpoint specified in the service's WSDL, which also corresponds to the **MQPCO** Via record, referred to as **rVia**. This MUST be performed before any messages are received. The receiver MUST perform the following:

- Construct a format name, referred to as **rFormat** as follows:
 - Raise the Construct Direct Format Name event, as specified in section [3.1.7.1](#) with the following properties set:
 - *iVia*: Set to **rVia**.
 - Set **rFormat** to the returned **rFormatName**.
- Generate an Open Queue event as specified in section 3.1.7.1.5 of [\[MS-MQDMPR\]](#), with the following properties set:
 - *iFormatName*: Set to **rFormat**.

- *iRequiredAccess*: Set to **QueueAccessType.SendAccess**, as specified in section 3.1.1.17 of [MS-MQDMPR].
- *iSharedMode*: Set to **QueueShareMode.DenyNone**, as specified in section 3.1.1.17 of [MS-MQDMPR].
- Set **rOpenQueue** to the returned **rOpenQueueDescriptor**.
- Set **rReturnStatus** to the returned **rStatus**.

4 Protocol Examples

The following packet capture shows the message payload of the Preamble message sent out while using the .NET Message Framing MSMQ Binding Protocol. The specifics of network transport are excluded from this example.

Raw Message

```
00 01 00 01 04 02 2B 6E .....+n
65 74 2E 6D 73 6D 71 3A et.msmq:
2F 2F 6C 6F 63 61 6C 68 //localh
6F 73 74 2F 70 72 69 76 ost/priv
61 74 65 2F 74 72 61 6E ate/tran
73 61 63 74 69 6F 6E 61 sactiona
6C 71 03 07                lq..
```

Parsed Message

```
NMF: Preamble
-NMF: Version = 1.0
      Record Type = Version Record (0X00)
      Major Version = 1 (0X01)
      Minor Version = 0 (0X00)
-NMF: Mode = Duplex Mode
      Record Type = Mode Record (0X01)
      Mode = Singleton Sized (0X04)
-NMF: Via = net.msmq://<QueuePathName>/
      Record Type = Via Record (0X02)
      Size = 43 (0X2B)
      Via = net.tcp://localhost/private/transactionalq/
-NMF: Encoding = Binary Session Encoding
      Record Type = Known Encoding Record (0X03)
      Encoding = Binary Encoding (0X07)
```


5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

None.

6 Appendix A: Full WSDL

For ease of implementation the full WSDL with schemas is provided in the following section.

6.1 .Net Message Framing MSMQ Binding Protocol WSDL and Policy Assertions

```
<?xml version="1.0" encoding="utf-8"?>
<wsdl:definitions name="OrderProcessorService"
  targetNamespace="http://tempuri.org/"
  xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
  xmlns:wsa10="http://www.w3.org/2005/08/addressing"
  xmlns:wsx="http://schemas.xmlsoap.org/ws/2004/09/mex"
  xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
  xmlns:wsu="http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-
wssecurity-utility-1.0.xsd"
  xmlns:wsp="http://schemas.xmlsoap.org/ws/2004/09/policy"
  xmlns:wsap="http://schemas.xmlsoap.org/ws/2004/08/addressing/policy"
  xmlns:msc="http://schemas.microsoft.com/ws/2005/12/wsdl/contract"
  xmlns:wsa="http://schemas.xmlsoap.org/ws/2004/08/addressing"
  xmlns:wsam="http://www.w3.org/2007/05/addressing/metadata"
  xmlns:wsaw="http://www.w3.org/2006/05/addressing/wsdl"
  xmlns:tns="http://tempuri.org/"
  xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/"
  xmlns:i0="http://Microsoft.ServiceModel.Samples"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema"
  xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:msmq="http://schemas.microsoft.com/ws/06/2004/mspolicy/msmq">
  <wsp:Policy wsu:Id="NetMsmqBinding_IOrderProcessor_policy">
    <wsp:ExactlyOne>
      <wsp>All>
        <!-- omitted elements -->
        <msmq:MsmqVolatile />
        <msmq:MsmqBestEffort />
        <msmq:MsmqSession />
        <msmq:Authenticated />
        <msmq:WindowsDomain />
        <!-- omitted elements -->
      </wsp>All>
    </wsp:ExactlyOne>
  </wsp:Policy>
  <!-- omitted elements -->
  <wsdl:binding name="NetMsmqBinding_IOrderProcessor" type="i0:IOrderProcessor">
    <wsp:PolicyReference URI="#NetMsmqBinding_IOrderProcessor_policy"/>
    <soap12:binding transport="http://schemas.microsoft.com/soap/msmq"/>
    <wsdl:operation name="SubmitPurchaseOrder">
      <soap12:operation
soapAction="http://SampleNamespace/IOrderProcessor/SubmitPurchaseOrder" style="document"/>
      <wsdl:input>
        <soap12:body use="literal"/>
      </wsdl:input>
    </wsdl:operation>
  </wsdl:binding>
  <wsdl:service name="OrderProcessorService">
    <wsdl:port name="NetMsmqBinding_IOrderProcessor"
binding="tns:NetMsmqBinding_IOrderProcessor">
      <soap12:address location="net.msmq://localhost/private/testq"/>
      <wsa10:EndpointReference>
        <wsa10:Address>net.msmq://localhost/private/testq</wsa10:Address>
      </wsa10:EndpointReference>
    </wsdl:port>
  </wsdl:service>
</wsdl:definitions>
```

7 Appendix B: Product Behavior

The information in this specification is applicable to the following Microsoft products or supplemental software. References to product versions include released service packs.

This document specifies version-specific details in the Microsoft .NET Framework. For information about which versions of .NET Framework are available in each released Windows product or as supplemental software, see [.NET Framework](#).

- Microsoft .NET Framework 3.0
- Microsoft .NET Framework 3.5
- Microsoft .NET Framework 4.0
- Microsoft .NET Framework 4.5
- Microsoft .NET Framework 4.6

Exceptions, if any, are noted below. If a service pack or Quick Fix Engineering (QFE) number appears with the product version, behavior changed in that service pack or QFE. The new behavior also applies to subsequent service packs of the product unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

Unless otherwise specified, any statement of optional behavior in this specification that is prescribed using the terms SHOULD or SHOULD NOT implies product behavior in accordance with the SHOULD or SHOULD NOT prescription. Unless otherwise specified, the term MAY implies that the product does not follow the prescription.

8 Change Tracking

This section identifies changes that were made to this document since the last release. Changes are classified as New, Major, Minor, Editorial, or No change.

The revision class **New** means that a new document is being released.

The revision class **Major** means that the technical content in the document was significantly revised. Major changes affect protocol interoperability or implementation. Examples of major changes are:

- A document revision that incorporates changes to interoperability requirements or functionality.
- The removal of a document from the documentation set.

The revision class **Minor** means that the meaning of the technical content was clarified. Minor changes do not affect protocol interoperability or implementation. Examples of minor changes are updates to clarify ambiguity at the sentence, paragraph, or table level.

The revision class **Editorial** means that the formatting in the technical content was changed. Editorial changes apply to grammatical, formatting, and style issues.

The revision class **No change** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the technical content of the document is identical to the last released version.

Major and minor changes can be described further using the following change types:

- New content added.
- Content updated.
- Content removed.
- New product behavior note added.
- Product behavior note updated.
- Product behavior note removed.
- New protocol syntax added.
- Protocol syntax updated.
- Protocol syntax removed.
- New content added due to protocol revision.
- Content updated due to protocol revision.
- Content removed due to protocol revision.
- New protocol syntax added due to protocol revision.
- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- Obsolete document removed.

Editorial changes are always classified with the change type **Editorially updated**.

Some important terms used in the change type descriptions are defined as follows:

- **Protocol syntax** refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.
- **Protocol revision** refers to changes made to a protocol that affect the bits that are sent over the wire.

The changes made to this document are listed in the following table. For more information, please contact dochelp@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
Z Appendix B: Product Behavior	Added .NET Framework 4.6 to the applicability list.	Y	Content update.

9 Index

A

Abstract data model

initiator

[Message](#) 16
[MQPCO](#) 12
[net.msmq.URI](#) 12
[NetMsmqMessage](#) 12
[QueueTransferProtocol](#) 16
[SendNetMsmqMessage](#) 15
[SendQueue](#) 15
[Transaction](#) 16
[UseActiveDirectory](#) 15

receiver

[MQPCO](#) 12
[net.msmq.URI](#) 12
[NetMsmqMessage](#) 12
[ReceiveQueue](#) 21

[Applicability](#) 9

C

[Capability negotiation](#) 9

[Change tracking](#) 28

D

Data model - abstract

initiator

[Message](#) 16
[MQPCO](#) 12
[net.msmq.URI](#) 12
[NetMsmqMessage](#) 12
[QueueTransferProtocol](#) 16
[SendNetMsmqMessage](#) 15
[SendQueue](#) 15
[Transaction](#) 16
[UseActiveDirectory](#) 15

receiver

[MQPCO](#) 12
[net.msmq.URI](#) 12
[NetMsmqMessage](#) 12
[ReceiveQueue](#) 21

E

Elements

[MSMQ Authenticated](#) 11
[MSMQ Best-Effort](#) 10
[MSMQ Session](#) 11
[MSMQ Volatile](#) 11
[MSMQ Windows Domain](#) 11
[MsmqAuthenticated](#) 11
[MsmqBestEffort](#) 10

[MsmqSession](#) 11

[MsmqVolatile](#) 11

[MsmqWindowsDomain](#) 11

Events

local

initiator

[Construct Direct Format Name](#) 13
[Construct Public Format Name](#) 14
[Construct SRMP Format Name](#) 14
[Open Queue for Send](#) 19

receiver

[Construct Direct Format Name](#) 13
[Construct Public Format Name](#) 14
[Construct SRMP Format Name](#) 14
[Open Queue for Receive](#) 22

timer

initiator ([section 3.1.6](#) 13, [section 3.2.6](#) 19)
receiver ([section 3.1.6](#) 13, [section 3.3.6](#) 22)

[Examples - overview](#) 24

F

[Fields - vendor-extensible](#) 9

[Full WSDL](#) 26

[.Net Message Framing MSMQ Binding Protocol
WSDL and Policy Assertions](#) 26

G

[Glossary](#) 5

H

Higher-layer triggered events

initiator

[message - send](#) 16
session
[close](#) 17
[initialize](#) 16

receiver

[message - receive](#) 21
session
[close](#) 22
[initialize](#) 21

I

[Implementer - security considerations](#) 25

[Index of security parameters](#) 25

[Informative references](#) 8

Initialization

initiator ([section 3.1.3](#) 13, [section 3.2.3](#) 16)
receiver ([section 3.1.3](#) 13, [section 3.3.3](#) 21)

Initiator

- abstract data model
 - [Message](#) 16
 - [MQPCO](#) 12
 - [net.msmq URI](#) 12
 - [NetMsmqMessage](#) 12
 - [QueueTransferProtocol](#) 16
 - [SendNetMsmqMessage](#) 15
 - [SendQueue](#) 15
 - [Transaction](#) 16
 - [UseActiveDirectory](#) 15
- higher-layer triggered events
 - [message - send](#) 16
 - session
 - [close](#) 17
 - [initialize](#) 16
- initialization ([section 3.1.3](#) 13, [section 3.2.3](#) 16)
- local events
 - [Construct Direct Format Name](#) 13
 - [Construct Public Format Name](#) 14
 - [Construct SRMP Format Name](#) 14
 - [Open Queue for Send](#) 19
- message processing ([section 3.1.5](#) 13, [section 3.2.5.1](#) 18)
 - [overview](#) 15
 - sequencing rules ([section 3.1.5](#) 13, [section 3.2.5.1](#) 18)
 - timer events ([section 3.1.6](#) 13, [section 3.2.6](#) 19)
 - timers ([section 3.1.2](#) 13, [section 3.2.2](#) 16)
- [Introduction](#) 5

L

- Local events
 - initiator
 - [Construct Direct Format Name](#) 13
 - [Construct Public Format Name](#) 14
 - [Construct SRMP Format Name](#) 14
 - [Open Queue for Send](#) 19
 - receiver
 - [Construct Direct Format Name](#) 13
 - [Construct Public Format Name](#) 14
 - [Construct SRMP Format Name](#) 14
 - [Open Queue for Receive](#) 22

M

- Message processing
 - initiator ([section 3.1.5](#) 13, [section 3.2.5.1](#) 18)
 - receiver ([section 3.1.5](#) 13, [section 3.3.5](#) 22)
- Messages
 - [elements](#) 10
 - [enumerated](#) 10
 - [MSMQ Authenticated element](#) 11
 - [MSMQ Best-Effort element](#) 10
 - [MSMQ Session element](#) 11
 - [MSMQ Volatile element](#) 11
 - [MSMQ Windows Domain element](#) 11
 - [MsmqAuthenticated element](#) 11
 - [MsmqBestEffort element](#) 10
 - [MsmqSession element](#) 11
 - [MsmqVolatile element](#) 11

- [MsmqWindowsDomain element](#) 11
- [namespaces](#) 10
- [transport](#) 10
- [MSMQ Authenticated element](#) 11
- [MSMQ Best-Effort element](#) 10
- [MSMQ Session element](#) 11
- [MSMQ Volatile element](#) 11
- [MSMQ Windows Domain element](#) 11
- [MsmqAuthenticated element](#) 11
- [MsmqBestEffort element](#) 10
- [MsmqSession element](#) 11
- [MsmqVolatile element](#) 11
- [MsmqWindowsDomain element](#) 11

N

- [Namespaces](#) 10
- [Normative references](#) 7

O

- [Overview \(synopsis\)](#) 8

P

- [Parameters - security index](#) 25
- [Preconditions](#) 9
- [Prerequisites](#) 9
- [Product behavior](#) 27
- Protocol Details
 - [overview](#) 12

R

- Receiver
 - abstract data model
 - [MQPCO](#) 12
 - [net.msmq URI](#) 12
 - [NetMsmqMessage](#) 12
 - [ReceiveQueue](#) 21
 - higher-layer triggered events
 - [message - receive](#) 21
 - session
 - [close](#) 22
 - [initialize](#) 21
 - initialization ([section 3.1.3](#) 13, [section 3.3.3](#) 21)
 - local events
 - [Construct Direct Format Name](#) 13
 - [Construct Public Format Name](#) 14
 - [Construct SRMP Format Name](#) 14
 - [Open Queue for Receive](#) 22
 - message processing ([section 3.1.5](#) 13, [section 3.3.5](#) 22)
 - [overview](#) 20
 - sequencing rules ([section 3.1.5](#) 13, [section 3.3.5](#) 22)
 - timer events ([section 3.1.6](#) 13, [section 3.3.6](#) 22)

timers ([section 3.1.2](#) 13, [section 3.3.2](#) 21)
[References](#) 7
 [informative](#) 8
 [normative](#) 7
[Relationship to other protocols](#) 9

S

Security
 [implementer considerations](#) 25
 [parameter index](#) 25
Sequencing rules
 initiator ([section 3.1.5](#) 13, [section 3.2.5.1](#) 18)
 receiver ([section 3.1.5](#) 13, [section 3.3.5](#) 22)
[Standards assignments](#) 9

T

Timer events
 initiator ([section 3.1.6](#) 13, [section 3.2.6](#) 19)
 receiver ([section 3.1.6](#) 13, [section 3.3.6](#) 22)
Timers
 initiator ([section 3.1.2](#) 13, [section 3.2.2](#) 16)
 receiver ([section 3.1.2](#) 13, [section 3.3.2](#) 21)
[Tracking changes](#) 28
[Transport](#) 10
Triggered events - higher-layer
 initiator
 [message - send](#) 16
 session
 [close](#) 17
 [initialize](#) 16
 receiver
 [message - receive](#) 21
 session
 [close](#) 22
 [initialize](#) 21

V

[Vendor-extensible fields](#) 9
[Versioning](#) 9

W

[WSDL](#) 26
 [.Net Message Framing MSMQ Binding Protocol](#)
[WSDL and Policy Assertions](#) 26