

[MS-XWDNOTIF]: Web Distributed Authoring and Versioning (WebDAV) Extensions for Notifications

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Table of Contents

1	Introduction	5
1.1	Glossary	5
1.2	References.....	6
1.2.1	Normative References.....	6
1.2.2	Informative References	6
1.3	Overview	6
1.4	Relationship to Other Protocols.....	7
1.5	Prerequisites/Preconditions	7
1.6	Applicability Statement.....	7
1.7	Versioning and Capability Negotiation.....	7
1.8	Vendor-Extensible Fields.....	7
1.9	Standards Assignments	8
2	Messages.....	9
2.1	Transport.....	9
2.2	Message Syntax	9
2.2.1	Notification-Type Header	9
2.2.2	Call-Back Header.....	10
2.2.3	Subscription-Lifetime Header	10
2.2.4	Notification-Delay Header.....	11
2.2.5	Subscription-ID Header	11
2.2.6	Subscribe-Group Header	12
2.2.7	SUBSCRIBE Method	13
2.2.8	UNSUBSCRIBE Method	14
2.2.9	POLL Method	14
2.2.10	NOTIFY Method	15
3	Protocol Details.....	16
3.1	Abstract Data Model.....	16
3.2	Subscription Details	16
3.2.1	Subscribing	16
3.2.1.1	Subscription Types.....	16
3.2.1.2	Request.....	18
3.2.1.3	Response.....	19
3.2.1.4	Errors	19
3.2.2	Renewing a Subscription	20
3.2.2.1	Request.....	20
3.2.2.2	Response.....	20
3.2.2.3	Errors	21
3.2.3	Canceling a Subscription	21
3.2.3.1	Request.....	21
3.2.3.2	Response.....	22
3.2.3.3	Errors	22
3.3	Notification Details.....	22
3.3.1	Poll Notification	23
3.3.1.1	Request.....	23
3.3.1.2	Response.....	23
3.3.1.3	Errors	24
3.3.2	UDP Notification	24

4 Protocol Examples	26
4.1 Subscribe Example	26
4.1.1 Subscribing to Notifications on a Resource	26
4.1.1.1 Request	26
4.1.1.2 Response	26
4.1.2 Setting the Subscription Lifetime	26
4.1.2.1 Request	26
4.1.2.2 Response	26
4.1.3 Setting the Notification Delay	27
4.1.3.1 Request	27
4.1.3.2 Response	27
4.1.4 Renewing a Subscription	27
4.1.4.1 Request	27
4.1.4.2 Response	27
4.2 Unsubscribe Example	28
4.2.1 Request	28
4.2.2 Response	28
4.3 Notify Example	28
4.4 Poll Example	29
4.4.1 Request	29
4.4.2 Response	29
5 Security	30
5.1 Security Considerations for Implementers	30
5.2 Index of Security Parameters	30
6 Appendix A: Product Behavior	31
7 Change Tracking	32
8 Index	34

1 Introduction

This document specifies the Web Distributed Authoring and Versioning (WebDAV) Extensions for Notifications, which extend the HTTP Extensions for Distributed Authoring – WebDAV protocol to provide [event notification](#) for content that is contained on a [WebDAV server](#).

This specification extends [WebDAV](#) by introducing new **HTTP** request and response headers that enable clients to subscribe to [events \(1\)](#) on a WebDAV server and for the server to notify the client that an event (1) has occurred. This document also specifies four new WebDAV methods that are used to manage and create event notifications.

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 RFC 2119. Sections 1.5 and 1.9 are also normative but cannot contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

The following terms are defined in [\[MS-GLOS\]](#):

Augmented Backus-Naur Form (ABNF)
GUID
Hypertext Transfer Protocol (HTTP)
Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)
Secure Sockets Layer (SSL)
User Datagram Protocol (UDP)
XML

The following terms are defined in [\[MS-OXGLOS\]](#):

base64 encoding
endpoint
event
event notification
mailbox
message store
permission
public folder
Transport Layer Security (TLS)
Uniform Resource Identifier (URI)
Uniform Resource Locator (URL)
Web Distributed Authoring and Versioning Protocol (WebDAV)
WebDAV client
WebDAV server

The following terms are specific to this document:

top-level hierarchy: A hierarchy of content locations that are based on the URI of a resource. For example, the resource located at /exchange/resources/folder is contained within the top-level hierarchy /exchange/resources.

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

1.2 References

References to Microsoft Open Specifications documentation do not include a publishing year because links are to the latest version of the technical documents, which are updated frequently. References to other documents include a publishing year when one is available.

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. Please check the archive site, <http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624>, as an additional source.

[RFC2068] Fielding, R., Gettys, J., Mogul, J., et al., "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2068, January 1997, <http://www.ietf.org/rfc/rfc2068.txt>

[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>

[RFC2246] Dierks, T., and Allen, C., "The TLS Protocol Version 1.0", RFC 2246, January 1999, <http://www.ietf.org/rfc/rfc2246.txt>

[RFC2518] Goland, Y., Whitehead, E., Faizi, A., et al., "HTTP Extensions for Distributed Authoring - WebDAV", RFC 2518, February 1999, <http://www.ietf.org/rfc/rfc2518.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>

[RFC768] Postel, J., "User Datagram Protocol", STD 6, RFC 768, August 1980, <http://www.ietf.org/rfc/rfc768.txt>

1.2.2 Informative References

[MS-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

[MS-OXGLOS] Microsoft Corporation, "[Exchange Server Protocols Master Glossary](#)".

[MS-OXPROTO] Microsoft Corporation, "[Exchange Server Protocols System Overview](#)".

[MS-XWDEXT] Microsoft Corporation, "[Web Distributed Authoring and Versioning \(WebDAV\) Core Extensions](#)".

[RFC2818] Rescorla, E., "HTTP Over TLS", RFC 2818, May 2000, <http://www.ietf.org/rfc/rfc2818.txt>

1.3 Overview

The WebDAV Extensions for Notifications extend the [WebDAV](#) protocol, as described in [\[RFC2518\]](#), to add support for [event notifications](#) for content stored on the [WebDAV server](#). Client applications can subscribe to [events \(1\)](#) on the server and then receive notifications from the server when those events (1) occur.

The WebDAV Extensions for Notifications specify the following extensions to the base WebDAV protocol:

- A header that identifies a subscription to event notifications.

- A header that indicates the event (1) that a client is subscribing to.
- A header that specifies the call-back address for event notifications.
- A header that specifies a time period for grouping event notifications.
- A header that specifies the lifetime of the event (1) subscription.
- Extensions that enable clients to subscribe and unsubscribe to events (1).
- An extension that enables the client to poll the WebDAV server for events (1).
- An extension that enables a WebDAV server to notify subscribed clients when an event (1) occurs.

1.4 Relationship to Other Protocols

The WebDAV Extensions for Notifications rely on [WebDAV](#), as described in [\[RFC2518\]](#), and the WebDAV Core Extensions, as described in [\[MS-XWDEXT\]](#). WebDAV in turn relies on HTTP 1.1, as described in [\[RFC2068\]](#). These extensions can use **Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)** for data protection, as described in [\[RFC2818\]](#). Server notification of clients relies on the **User Datagram Protocol (UDP)**, as described in [\[RFC768\]](#).

For conceptual background information and overviews of the relationships and interactions between this and other protocols, see [\[MS-OXPROTO\]](#).

1.5 Prerequisites/Preconditions

The WebDAV Extensions for Notifications require a [WebDAV server](#), as specified in [\[RFC2518\]](#).

These extensions also require that [WebDAV clients](#) have [URLs](#) that point to WebDAV servers, and that client applications that are receiving the **NOTIFY** message have a [Uniform Resource Identifier \(URI\)](#) that identifies a UDP [endpoint \(4\)](#).

1.6 Applicability Statement

These extensions are applicable in scenarios that require client applications to receive notifications of [events \(1\)](#) that occur on a [WebDAV server](#).

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- **Supported Transports:** These extensions use HTTP as the primary transport. The **NOTIFY** method uses UDP transport.
- **Protocol Versions:** This document introduces no new versioning mechanisms beyond those that already exist in [\[RFC2518\]](#) and in [\[RFC2068\]](#).
- **Capability Negotiation:** This document introduces no new capability negotiations beyond those that already exist in [\[RFC2518\]](#) and [\[RFC2068\]](#) via the **OPTIONS** method.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

Messages are transported by using HTTP, as specified in [\[RFC2518\]](#) and [\[RFC2068\]](#). The **NOTIFY** method is transported by using UDP, as specified in [\[RFC768\]](#).

These extensions can be used with **Secure Sockets Layer (SSL)** or [Transport Layer Security \(TLS\)](#), as specified in [\[RFC2246\]](#).

Port 80 is the standard port assignment for HTTP, and port 443 is the standard port assignment for HTTP over SSL or TLS; however, individual implementations can support other ports.

2.2 Message Syntax

The extension headers defined in this document conform to the form and behavior of other custom HTTP headers, as specified in [\[RFC2068\]](#) section 4.2, and are consistent with the [WebDAV](#) verbs and headers, as specified in [\[RFC2518\]](#) sections 8 and 9.

This section specifies the following header extensions:

- The **Notification-Type** header
- The **Call-Back** header
- The **Notification-Delay** header
- The **Subscription-Lifetime** header
- The **Subscription-ID** header
- The **Subscribe-Group** header

This section specifies the following methods:

- **SUBSCRIBE**
- **UNSUBSCRIBE**
- **POLL**

This section specifies the following message:

- **NOTIFY**

2.2.1 Notification-Type Header

The **Notification-Type** header is used by a [WebDAV client](#) in a **SUBSCRIBE** method request, as specified in section [2.2.7](#), to indicate the [events \(1\)](#) for which the server notifies the client.

The **Notification-Type** header is used by a [WebDAV server](#) in a **SUBSCRIBE** method response to indicate the events (1) for which the server will notify the client.

This header extension is defined as follows, using the **Augmented Backus-Naur Form (ABNF)** syntax, as specified in [\[RFC2068\]](#) section 2.1.

```
Notification-Type:= "notification-type:" ntype
```

```

ntype = "update" |
        "update/newmember" |
        "delete" |
        "move" |
        "pragma/<http://schemas.microsoft.com/exchange/newmail>"

```

The **Notification-Type** header MUST appear in a new **SUBSCRIBE** method request. The **Notification-Type** header SHOULD NOT appear in a **SUBSCRIBE** method request if the **Subscription-ID** header is specified to renew a subscription.

The **Notification-Type** header MUST appear in the **SUBSCRIBE** method 200 (OK) response, as specified in section [2.2.7](#), for a new subscription.

For details about the events (1) that can be specified in the **Notification-Type** header, see the table in section [3.2.1.1](#).

2.2.2 Call-Back Header

The **Call-Back** header is used by a [WebDAV client](#) in a **SUBSCRIBE** method request, as specified in section [2.2.7](#), to specify the [URI](#) to which the [WebDAV server](#) sends notifications.

The **Call-Back** header can appear in a **SUBSCRIBE** method request. If the header is present and includes a call-back address, the client has chosen the notify delivery model; the server will send a **NOTIFY** method, as specified in section [2.2.10](#), to the specified call-back URI when an [event \(1\)](#) occurs.

If the **Call-Back** header does not appear in a **SUBSCRIBE** method request, the client has chosen the poll delivery model. In this case, the client polls the server for events (1) by using the **POLL** method, as specified in section [2.2.9](#).

This header extension is partially defined as follows, using the ABNF syntax, as specified in [\[RFC2068\]](#) section 2.1. For a complete definition of a URI, see [\[RFC3986\]](#).

```

Call-Back := "Call-Back:" URI
URI := "http://" computer_name[ ":" port ][ "/" path ]

```

The URI MUST begin with "httpu". The port and path elements are optional. If the port is not specified, port 80 MUST be used. The path enables multiple clients to subscribe to the same event (1) without conflict.

The maximum length of the value part of the **Call-Back** header is 419 characters.

2.2.3 Subscription-Lifetime Header

The **Subscription-Lifetime** header indicates the minimum length of time that a subscription for an [event \(1\)](#) will be valid. The lifetime is specified in seconds.

The **Subscription-Lifetime** header can appear in a **SUBSCRIBE** method request, as specified in section [2.2.7](#), from a [WebDAV client](#).

If the server does not accept the length of the subscription, the server MUST return the actual subscription lifetime in the response.

This header extension is defined as follows, using the ABNF syntax, as specified in [\[RFC2068\]](#) section 2.1.

```
Subscription-Lifetime := "Subscription-Lifetime:" 1*DIGIT
```

2.2.4 Notification-Delay Header

The **Notification-Delay** header specifies the delay, expressed in milliseconds, that the server SHOULD use between notifications of [events \(1\)](#). The default value is 1000 milliseconds (1 second). The delay only applies to the notify delivery model. If the subscription request does not contain a **Call-Back** header, as specified in section [2.2.2](#), the server MUST ignore the **Notification-Delay** header.

The client can include the **Notification-Delay** header in a subscription request. If the **Notification-Delay** header is not set in the original **SUBSCRIBE** method request, as specified in section [2.2.7](#), the server SHOULD use the default value. If the **Notification-Delay** header is set to a value that is less than the default value, the server uses the default value and SHOULD return the client's requested value in the response. If the **Notification-Delay** header is set to a value that the server does not accept, the server SHOULD return the actual delay value that it uses.

If the client includes a **Notification-Delay** header in a subscription renewal request, the server SHOULD ignore the **Notification-Delay** header.

When multiple subscriptions are made on the same resource with different notification delays, the server SHOULD use the shortest value specified in a **Notification-Delay** header.

This header extension is defined as follows, using ABNF syntax, as specified in [\[RFC2068\]](#) section 2.1.

```
Notification-Delay := "Notification-Delay:" 1*DIGIT
```

2.2.5 Subscription-ID Header

The **Subscription-ID** header contains a number assigned by the [WebDAV server](#) to uniquely identify a subscription. The [WebDAV client](#) uses this number to identify the subscription when using the **POLL** method, as specified in section [2.2.9](#) and the **UNSUBSCRIBE** method, as specified in section [2.2.8](#), and when using the **SUBSCRIBE** method, as specified in section [2.2.7](#), to renew a subscription. The WebDAV server uses this number to identify the subscription when using the **NOTIFY** method, as specified in section [2.2.10](#), and in response messages.

A WebDAV client can have multiple subscriptions on the same resource for the same [event \(1\)](#); these will be distinguished only by the **Subscription-ID** header. The WebDAV server always includes the **Subscription-ID** header so that clients can identify a specific subscription.

This header extension is defined as follows, using ABNF syntax, as specified in [\[RFC2068\]](#) section 2.1.

```
Subscription-ID:= "Subscription-ID:" 1*DIGIT 0*["," 1*DIGIT]
```

Multiple subscription IDs can be specified in a **SUBSCRIBE**, **POLL**, or **UNSUBSCRIBE** method request. The IDs are separated by commas, as follows:

```
Subscription-ID: 1, 18, 243
```

The **Subscription-ID** header is used as follows:

- **SUBSCRIBE** method: The **Subscription-ID** header can be present. If the header is present and the subscription IDs match the specified content location, the server will renew the subscriptions. When renewing the subscription, the client SHOULD NOT send the **Depth** header, as specified in [\[RFC2518\]](#) section 9.2, **Notification-Type** header, as specified in section [2.2.4](#), or **Subscription-Lifetime** header, as specified in section [2.2.3](#).
 - 200 response to the **SUBSCRIBE** method: The WebDAV server MUST include the subscription IDs of the requested subscriptions in the body of the response message.
 - 412 response to the **SUBSCRIBE** method: When the **SUBSCRIBE** method request includes any non-valid subscription IDs, the WebDAV server responds with a 207 (Multi-Status) response and MUST include the non-valid IDs in a 412 (Precondition Failed) status element, as specified in section [2.2.7](#), within the **XML** body of the response.
- **UNSUBSCRIBE** method: The **Subscription-ID** header MUST be present. If the header is present and the subscription IDs match the specified content location, the server will cancel the subscription.
 - 207 response to the **UNSUBSCRIBE** method: The server MUST include the subscription identifiers of the canceled subscription in the XML body of the response.
 - 412 response to the **UNSUBSCRIBE** method: When the **UNSUBSCRIBE** method request includes only non-valid subscription IDs, the WebDAV server responds with a 207 (Multi-Status) response and MUST include the non-valid IDs in a 412 (Precondition Failed) status element, as specified in section [2.2.8](#), within the XML body of the response.
- **POLL** method: The **Subscription-ID** header MUST be present.
 - 207 response to the **POLL** method: The WebDAV server returns a 207 (Multi-Status) response body with 200 (OK) status elements for subscriptions on which events (1) occurred. The server returns a 204 (No Content) status element, as specified in section [2.2.7](#), for subscriptions on which events (1) have not occurred.
 - 412 response to the **POLL** method: When the **POLL** method request includes only non-valid subscription IDs, the WebDAV server responds with a 207 (Multi-Status) response and MUST include the non-valid IDs in a 412 (Precondition Failed) status element, as specified in section [2.2.9](#), within the XML body of the response.
- **NOTIFY** method: The **Subscription-ID** header MUST be present. The header will include all subscription IDs that are at the same content location on which events (1) happened.

2.2.6 Subscribe-Group Header

The **Subscribe-Group** header contains a **GUID** encoded with [base64 encoding](#) that is assigned by the [WebDAV server](#) to uniquely identify a [message store](#). The **Subscribe-Group** header is included in **SUBSCRIBE** method response messages, as specified in section [2.2.7](#), and **NOTIFY** messages, as specified in section [2.2.10](#).

The server MUST include the **Subscribe-Group** header in the **NOTIFY** message.

This header extension is defined as follows, using ABNF syntax, as specified in [\[RFC2068\]](#) section 2.1.

```
Subscribe-group := "Subscribe-group:" subscribe-group-spec
```

Subscribe-group-spec := 24*24VCHAR

2.2.7 SUBSCRIBE Method

[WebDAV clients](#) use the **SUBSCRIBE** method to subscribe to and renew notifications for [events \(1\)](#) that occur on the [WebDAV server](#). This method is used to specify the details of the monitored event (1): where to look for it, how long to monitor the event (1), what the notification mechanism is, and how long to delay before generating the notification of the event (1). If the **SUBSCRIBE** method specifies an existing notification subscription, the subscription is renewed.

Clients can subscribe to the following events (1):

- New mail (pragma/<<http://schemas.microsoft.com/exchange/newmail>>)
- Object created (update/newmember)
- Object deleted (delete)
- Object modified (update)
- Object moved (move)

The client includes a **Notification-Type** header, as specified in section [2.2.1](#), to indicate the type of event (1) to which it is subscribing and possibly includes a **Call-Back** header, as specified in section [2.2.2](#), to specify the [URI](#) of the UDP listener to which the WebDAV server sends [event notifications](#).

If the **Subscription-ID** header, as specified in section [2.2.5](#), is present, the **SUBSCRIBE** method call is a subscription renewal; the **Notification-Type** header MUST NOT be present. If the **Subscription-ID** header appears with the **Notification-Type** header, it is a bad request and the server MUST refuse the request. When the **Subscription-ID** header is present, the **Notification-Delay** header, **Depth** header, as specified in [\[RFC2518\]](#) section 9.2, and **Call-Back** header SHOULD be ignored.

The **SUBSCRIBE** method request returns one of the [WebDAV](#) protocol status codes that are listed in the following table. This list is not comprehensive. For details about the 500-level status codes, see [\[RFC2518\]](#).

Status code	Meaning
200 (OK)	The subscription was successful. The server might have changed some of the parameters.
207 (Multi-Status)	Multiple response codes are contained in the XML body.
400 (Bad Request)	One or more included headers were non-valid.
401 (Unauthorized)	User does not have permission to subscribe to this resource.
403 (Forbidden)	A subscription resource cannot be created by using the specified target URL .
412 (Precondition Failed)	The subscription ID(s) in the header did not match the specified resource.
501 (Not Implemented)	The server does not support the specified notification method.

2.2.8 UNSUBSCRIBE Method

[WebDAV clients](#) use the **UNSUBSCRIBE** method to remove the subscription to an [event notification](#) that occurs on the [WebDAV server](#). The client includes a **Subscription-ID** header, as specified in section [2.2.5](#), in the **UNSUBSCRIBE** method request to indicate which event notification has to be removed.

The **UNSUBSCRIBE** request returns one of the [WebDAV](#) protocol status codes that are listed in the following table. This list is not comprehensive; for details about the 500-level status codes, see [\[RFC2518\]](#).

Status Code	Meaning
200 (OK)	The subscription was canceled.
207 (Multi-Status)	Multiple response codes are contained in the XML body.
400 (Bad Request)	An illegal combination of headers was included in the request.
412 (Precondition Failed)	A subscription ID that was specified in the UNSUBSCRIBE method request was not valid.

2.2.9 POLL Method

[WebDAV clients](#) use the **POLL** method to inquire about [events \(1\)](#) that have occurred on the [WebDAV server](#). The client includes a **Subscription-ID** header that contains one or more event (1) subscriptions that it is querying, and the server sends a multi-status response that contains the identifiers of all subscribed events (1) that have occurred since the last **POLL** request.

The [URI](#) that is used in the **POLL** method request that is sent by the client **MUST** be the one that is provided in the **Content-Location** header, as specified in [\[RFC2068\]](#) section 14.15, or fall within the **top-level hierarchy** of the **URI** in the **POLL** method request and it **MUST** match the **Subscription-ID** header, as specified in section [2.2.5](#), that is sent in the same request. If more than one **Subscription-ID** header is used, they **MUST** be valid for all resources within the same top-level hierarchy. When the client uses the **POLL** method, the server **MUST** renew the subscription for all polled subscription IDs.

The **POLL** method can be used with or without **NOTIFY** messages, as specified in section [2.2.10](#), being sent from server to client.

The **POLL** request returns one of the [WebDAV](#) protocol status codes that are listed in the following table. This list is not comprehensive; for details about the 500-level status codes, see [\[RFC2518\]](#).

Status Code	Meaning
200 (OK)	Successful poll; events (1) occurred since the last POLL method request on the specified subscriptions. This response code occurs only within a 207 (Multi-Status) response body.
204 (No Content)	Successful poll, but no events (1) occurred since the last POLL method request on the specified subscriptions. This response code occurs only within a 207 (Multi-Status) response body.
207 (Multi-Status)	Status codes appear in the XML body for the polled subscriptions.
401 (Unauthorized)	The user does not have access permissions or authorization to poll this resource.

Status Code	Meaning
404 (Not Found)	Resource was not found.
406 (Non Acceptable)	The POLL method request contained an Accept header, as specified in [RFC2068] section 14.1, that could not be satisfied by the server. This response code can appear outside of a 207 (Multi-Status) response.
412 (Precondition Failed)	A subscription ID specified in the POLL method request did not match the resource named. The subscription ID(s) that did not match are included as a list within the XML body of the status response.

2.2.10 NOTIFY Method

[WebDAV servers](#) use the **NOTIFY** method to notify subscribed clients that an [event \(1\)](#) has occurred on the subscribed event (1). The **NOTIFY** message is sent to the [URI](#) that is specified in the **Call-Back** header, as specified in section [2.2.2](#), in the associated **SUBSCRIBE** method request, as specified in section [2.2.7](#), and MUST include the **Subscription-ID** header, as specified in section [2.2.5](#), that indicates the event (1) subscription that triggered the notification.

Because UDP packets might be lost, the server MUST keep track of events (1) that have subscriptions. The server MUST maintain subscriptions for which events (1) occurred until the client sends an acknowledgement by using the **Subscription-ID** header in any method request.

The server MUST continue to send the **NOTIFY** messages until either the subscription expires or the client sends an acknowledgement. The interval for the **NOTIFY** messages is based on the **Notification-Delay** header, as specified in section [2.2.4](#).

When the server sends a **NOTIFY** message, it waits the interval specified in the **Notification-Delay** header for an acknowledgment before sending a second **NOTIFY** message. The interval between **NOTIFY** messages doubles between each message sent for a particular subscription until an acknowledgment is received. For example, when the notification delay is set to 3000 milliseconds (3 seconds), **NOTIFY** messages will be sent out at the following intervals:

0 seconds Event occurs.

3 seconds **NOTIFY** message #1

9 seconds **NOTIFY** message #2 (6 seconds after message #1)

21 seconds **NOTIFY** message #3 (12 seconds after message #2)

45 seconds **NOTIFY** message #4 (24 seconds after message #3)

3 Protocol Details

As specified in [\[RFC2518\]](#), the [WebDAV](#) protocol operates between an initiator (a [WebDAV client](#)) and a responder (a [WebDAV server](#)). This section specifies both the client and server behaviors for the WebDAV Extensions for Notifications.

3.1 Abstract Data Model

A server that provides [event notifications](#) MUST maintain a list of subscribers, keeping for each subscriber the information listed in the following table.

Information	Description
Unique subscription identifier	Required. MUST be unique over the lifetime of the subscription. Generated by the server in response to a subscription message.
Delivery URI for event messages	Optional. The URI of a UDP endpoint (4) for event notifications.
Subscription duration	Required. The amount of time in seconds, or the duration until the subscription expires.

The server SHOULD accept as many subscriptions as it can reasonably maintain and deliver.

The list of subscribers is updated via subscription, renewal, cancellation, and expiration. Requests that affect the subscription list are specified in section [3.2](#).

3.2 Subscription Details

Clients send subscription requests to the server to subscribe to [event notifications](#). The client can either provide a **Call-Back** header, as specified in section [2.2.2](#), to specify a UDP [endpoint \(4\)](#) for notifications, or leave out the **Call-Back** header and use polling to determine when an [event \(1\)](#) has occurred. The following subsections provide details about creating, renewing, and canceling subscriptions.

3.2.1 Subscribing

3.2.1.1 Subscription Types

The following table provides information about the [events \(1\)](#) to which the client can subscribe. The events (1) are specified in the **Notification-Type** header, as specified in section [2.2.1](#).

The Depth column indicates the extent of the subscription. The values in the Depth column are interpreted as follows:

- 0 – The subscription is for the entity only.
- 1 – The subscription is for the entity and any items contained within that entity.
- infinity – The subscription is for the entity and all items contained within that entity or within the children of that entity. The value "infinity" is valid only on new mail subscriptions on the root [mailbox](#).

Event type	Target	Depth	Store event	Description
delete	Any	0	Delete	The entity was deleted.
delete	Collection	1	Delete	The collection or any member of the collection up to depth 1 was deleted.
move	Any	0	Move	The entity was moved.
move	Collection	1	Move	The collection or any member of the collection up to depth 1 was moved.
pragma/<http://schemas.microsoft.com/exchange/newmail>	Mailbox or Collection	infinity	NewMail	Special new mail update.
update	Non-collection entity	0	Property update or body change.	The content of the entity was changed.
update	Collection	0	Property update	The properties on a collection were modified.
update	Collection	1	Create, Modify, Delete, Move, Property update, Copy	An entity (collection or noncollection) was created in, copied to, moved to or from, or deleted from the collection; or the collection's properties were updated.
update/newmember	Any	0	None	Not valid – server MUST

Event type	Target	Depth	Store event	Description
				return a 400 (Bad Request) error response.
update/newmember	Collection	1	Create, Move, Copy	An entity (collection or noncollection) was created in, moved to, or copied to the collection.

3.2.1.2 Request

To subscribe to an [event \(1\)](#), the client MUST send a request with method **SUBSCRIBE**, as specified in section [2.2.7](#), by using the following format.

```
SUBSCRIBE publisher path HTTP/1.1
Host: server:port
Notification-Type: one of the Notification-Type header values
Call-Back: UDP endpoint
Subscription-Lifetime: lifetime in seconds
Notification-Delay: delay in milliseconds
```

The details about the request line and headers shown in the previous example are given in the following table.

Item	Description
SUBSCRIBE	The method used to initiate or renew a subscription.
publisher path	The path component of the content to subscribe. A single, relative URL.
HTTP/1.1	HTTP version.
Host	Required. Domain name or IP address and optional port components of the server URL . If the port is missing, port 80 is assumed.
Notification-Type	Required. One of the Notification-Type header values, as specified in section 2.2.1 , that indicate the event (1) that the client wants notifications for.
Call-Back	Optional. The UDP endpoint (4) that receives notification messages when an event (1) occurs on the server. If the Call-Back header, as specified in section 2.2.2 , is not included in the subscription request, the client polls the server for events (1).
Subscription-Lifetime	Optional. Requested duration of the subscription expressed in seconds.
Notification-Delay	Optional. When a notification delay is specified, the server treats any number of events that occur during the specified time period as a single event (1). Expressed in milliseconds.

3.2.1.3 Response

If there are enough resources to maintain the subscription, the server **SHOULD** accept it. To accept the subscription, the server **MUST** send a response in the following format.

```
HTTP/1.1 200 OK
Date: when the response was generated
Server: server/version
Notification-Type: one of the notification types
Subscription-Lifetime: lifetime in seconds
Notification-Delay: delay in milliseconds
Call-Back: UDP endpoint
Content-Location: fully-qualified content location
Subscribe-group: unique message store identifier
Subscription-ID: unique subscription identifier
```

The details about the request line and headers shown in the previous example are given in the following table.

Item	Description
Date	Required. The date and time at which the response was generated.
Server	Optional. Server name and version of the server that generated the response.
Notification-Type	Required. One of the Notification-Type header values, as specified in section 2.2.1 , that indicate the event (1) for which the client wants notifications. This MUST be the same as the value specified in the request.
Subscription-Lifetime	Required. Duration of the subscription expressed in seconds. Can be different from the lifetime requested by the client.
Notification-Delay	Optional; required when the client includes the Notification-Delay header, as specified in section 2.2.4 . Can be different than the notification delay requested by the client.
Call-Back	Optional. The UDP endpoint (4) that receives notification messages when an event (1) occurs on the server. If the Call-Back header, as specified in section 2.2.2 , is not included in the subscription request, the server MUST NOT include the Call-Back header. If specified, it MUST be the same as the value specified in the request.
Content-Location	Required. Fully qualified URI that describes the content location for which events (1) will be received.
Subscribe-group	Required. Unique identifier of the message store where the subscription was made.
Subscription-ID	Required. Unique identifier assigned to the subscription by the server. MUST be unique within the subscription lifetime.

3.2.1.4 Errors

If the server cannot accept the subscription, it **MUST** respond with one of the error codes that are listed in the following table.

Status code	Meaning
400 (Bad Request)	One or more included headers were non-valid.

Status code	Meaning
401 (Unauthorized)	User does not have permission to subscribe to this resource.
403 (Forbidden)	A subscription resource cannot be created by using the specified target URL .
415 (Unsupported Media Type)	The request type of the body is not supported by the server.
501 (Not Implemented)	The server does not support the specified notification method.

3.2.2 Renewing a Subscription

Clients **MUST** renew a subscription before the duration expires; otherwise, the server **MUST** remove the subscription from the subscription list.

A subscription is renewed each time a client sends a **POLL** method request for the subscription. If the client is using UDP notification, it can renew the subscription by sending a **SUBSCRIBE** method request, as specified in section [2.2.7](#).

3.2.2.1 Request

The following request format is used to renew a subscription by using method **SUBSCRIBE**, as specified in section [2.2.7](#).

```
SUBSCRIBE publisher path HTTP/1.1
Host: server:port
Subscription-ID: unique subscription identifier
```

The details for the request line and headers that appear in the previous example are given in the following table.

Item	Description
SUBSCRIBE	The method to initiate or renew a subscription.
publisher path	The path component of the content to renew. A single, relative URL.
HTTP/1.1	HTTP version.
Host	Required. Domain name or IP address and optional port components of the server URL . If the port is missing, port 80 is assumed.
Subscription-ID	Required. The unique identifier of the subscription to renew. The subscription ID MUST be a subscription for events (1) on the specified publisher path.

3.2.2.2 Response

To accept a renewal, the server **MUST** send a response that contains the subscription ID of the renewed subscription.

3.2.2.3 Errors

If the server cannot accept the subscription renewal, it **MUST** respond with one of the error codes that are listed in the following table.

Status code	Meaning
207 (Multi-Status)	Multiple response codes are contained in the XML body.
400 (Bad Request)	One or more included headers were non-valid.
401 (Unauthorized)	User does not have permission to subscribe to this resource.
403 (Forbidden)	A subscription resource cannot be created by using the specified target URL .
412 (Precondition Failed)	The subscription ID(s) in the header did not match the specified resource.
415 (Unsupported Media Type)	The request type of the body is not supported by the server.
501 (Not Implemented)	The server does not support the specified notification method.

3.2.3 Canceling a Subscription

When a client no longer needs to receive notifications from an [event \(1\)](#), the client **SHOULD** cancel the subscription.

3.2.3.1 Request

To cancel a subscription, the client **SHOULD** send a request with method **UNSUBSCRIBE**, as specified in section [2.2.8](#), by using the following format.

```
UNSUBSCRIBE publisher path HTTP/1.1
Host: server:port
Subscription-ID: subscription identifier
```

The details for the request line and headers that appear in the previous example are given in the following table.

Item	Description
UNSUBSCRIBE	The method to cancel the subscription for an event (1) .
publisher path	The path component of the content to unsubscribe. A single, relative URL.
HTTP/1.1	HTTP version.
Host	Required. Domain name or IP address and optional port components of the server URL . If the port is missing, port 80 is assumed.
Subscription-ID	Required. The subscription identifier of the subscription to cancel.

3.2.3.2 Response

To cancel the subscription, the server **MUST** respond in the following format.

```
HTTP/1.1 207 Multi-Status
Content-Type: text/xml
Content-Length: response length

<?xml version="1.0"?>
<a:multistatus xmlns:b="http://schemas.microsoft.com/Exchange/" xmlns:a="DAV:">
  <a:response>
    <a:href>fully qualified path to content</a:href>
    <a:status>HTTP/1.1 Status Code Message</a:status>
    <b:subscriptionID>
      <li>subscription identifier</li>
      <li>additional subscription identifiers</li>
    </b:subscriptionID>
  </a:response>
  <a:response>
    <a:href>fully qualified path to content</a:href>
    <a:status>HTTP/1.1 Status Code Message</a:status>
    <b:subscriptionID>
      <li>subscription identifier</li>
      <li>additional subscription identifiers</li>
    </b:subscriptionID>
  </a:response>
</a:multistatus>
```

3.2.3.3 Errors

If the server cannot respond to the **UNSUBSCRIBE** method request, it **MUST** respond with one of the errors status codes that are listed in the following table.

Status Code	Meaning
207 (Multi-Status)	Multiple response codes are contained in the XML body.
400 (Bad Request)	An illegal combination of headers was included or the Subscription-ID header was non-valid.

3.3 Notification Details

Clients subscribe to [events \(1\)](#) to receive notifications when those events (1) occur. If the client includes a **Call-Back** header, as specified in section [2.2.2](#), in the subscription request, the client is requesting that the server send notifications via UDP to the specified call-back [URI](#). If the **Call-Back** header is not included, the client will use the **POLL** method, as specified in section [2.2.9](#), to request information about events (1) that have been raised. This section describes the two notification methods in detail.

If a client subscribes to events (1) on a folder and the folder is later deleted, the subscription remains valid for **POLL** method requests until the first **POLL** method request is sent; subsequent **POLL** method requests will return a 412 (Precondition Failed) response. Clients using UDP notification will receive **NOTIFY** messages for events (1) on the subscription until the first acknowledgement is sent to the server, and then **NOTIFY** messages for events (1) will cease.

If the pragma/<http://schemas.microsoft.com/exchange/newmail> event (1) is subscribed on a [public folder](#) and a message is posted to that folder, the event (1) will not be raised.

3.3.1 Poll Notification

Clients that do not include a **Call-Back** header, as specified in section [2.2.2](#), in the subscription request MUST send a **POLL** method request, as specified in section [2.2.9](#), to receive notification of [events \(1\)](#). When a client sends a **POLL** method request, the subscription is also renewed.

3.3.1.1 Request

To poll the server for [events \(1\)](#) that have occurred since the last **POLL** method request, as specified in section [2.2.9](#), the client MUST send a request with method **POLL** by using the following format:

```
POLL publisher path HTTP/1.1
Host: server:port
Subscription-ID: one or more subscription identifiers
```

The details for the request line and headers that appear in the previous example are given in the following table.

Item	Description
POLL	The method to poll the server for notification of events (1).
publisher path	The path component of the content to poll. A single, relative URL.
HTTP/1.1	HTTP version.
Host	Required. Domain name or IP address and optional port components of the server URL . If the port is missing, port 80 is assumed.
Subscription-ID	Required. One or more subscription identifiers. If more than one subscription identifier is included, all of the subscription identifiers MUST be for subscriptions to the content specified in the publisher path.

3.3.1.2 Response

To respond to the **POLL** method request, the server MUST return the following response.

```
HTTP/1.1 207 Multi-Status
Content-Type: text/xml
Content-Length: response length

<?xml version="1.0"?>
<a:multistatus xmlns:b="http://schemas.microsoft.com/Exchange/" xmlns:a="DAV:">
  <a:response>
    <a:href>fully qualified path to content</a:href>
    <a:status>HTTP/1.1 Status Code Message</a:status>
    <b:subscriptionID>
      <li>subscription identifier</li>
      <li>additional subscription identifiers</li>
    </b:subscriptionID>
  </a:response>
```

```

<a:response>
  <a:href>fully qualified path to content</a:href>
  <a:status>HTTP/1.1 Status Code Message</a:status>
  <b:subscriptionID>
    <li>subscription identifier</li>
    <li>additional subscription identifiers</li>
  </b:subscriptionID>
</a:response>
</a:multistatus>

```

The details for the content in the previous example are given in the following table.

Element	Description
<response>	The server MUST include one response element for each status code returned for the subscription identifiers in the poll request.
<subscriptionID>	The server MUST include a li element for each subscription identifier in the poll request that returns the associated HTTP status code.

3.3.1.3 Errors

If the server cannot respond to the **POLL** method request, it MUST respond with one of errors status codes that are listed in the following table.

Status Code	Meaning
204 (No Content)	Successful poll, but no events (1) occurred since the last POLL method request on the specified subscriptions. This response code occurs only within a 207 (Multi-Status) response body.
207 (Multi-Status)	Status codes appear in the XML body for the polled subscriptions.
401 (Unauthorized)	The user does not have access permissions or authorization to poll this resource.
404 (Not Found)	Resource was not found. This response code only occurs within a 207 (Multi-Status) response body.
412 (Precondition Failed)	A subscription ID specified in the POLL method request did not match the resource named. The subscription ID(s) that did not match are returned in the body of the 412 response.

3.3.2 UDP Notification

When a client includes a **Call-Back** header, as specified in section [2.2.2](#), in the initial subscription request, the server MUST notify the client of [events \(1\)](#) on the subscription by sending a UDP datagram to the [URI](#) that is specified in the **Call-Back** header. The UDP datagram MUST be in the following format:

```

NOTIFY UDP call back URI HTTP/1.1
Subscribe-group: unique message store identifier
Subscription-ID: subscription identifier

```


The details for the request line and headers that appear in the previous example are given in the following table.

Item	Description
NOTIFY	The method to notify the client that a subscribed event (1) occurred.
UDP call back URI	The URI specified in the Call-Back header that is sent with the subscription request.
HTTP/1.1	HTTP version.
Subscribe-group	Required. Unique identifier of the message store where the subscription was made.
Subscription-ID	Required. The subscription identifier of the event subscription that raised the event (1).

4 Protocol Examples

4.1 Subscribe Example

4.1.1 Subscribing to Notifications on a Resource

The following example creates a subscription on a resource. The **Call-Back** header, as described in section [2.2.2](#), is used in this subscription to instruct the server to send a **NOTIFY** message, as described in section [2.2.10](#), for the UDP server at www.fourthcoffee.com by using port 8080.

4.1.1.1 Request

```
SUBSCRIBE /public/subtest HTTP/1.1
Host: www.contoso.com
Notification-Type: Update
Call-Back: http://www.fourthcoffee.com:8080/510
```

4.1.1.2 Response

```
HTTP/1.1 200 OK
Server: Microsoft-IIS/5.0
Date: Fri, 06 Jul 2001 18:37:44 GMT
Notification-Type: Update
Subscription-Lifetime: 3600
Call-Back: http://www.fourthcoffee.com:8080/510
Content-Location: http://www.contoso.com/public/subtest/
Content-Length: 0
Subscribe-Group: sRKxaABd3kGPV0chHGtCpw==
Subscription-ID: 3
```

4.1.2 Setting the Subscription Lifetime

The following example creates a subscription on a resource that expires after 600 seconds. No **Call-Back** header is specified, so the client uses the **POLL** method, as described in section [2.2.9](#), to poll for notifications.

4.1.2.1 Request

```
SUBSCRIBE /public/subtest HTTP/1.1
Host: www.contoso.com
Notification-Type: Update
Subscription-Lifetime: 600
```

4.1.2.2 Response

```
HTTP/1.1 200 OK
Server: Microsoft-IIS/5.0
Date: Fri, 06 Jul 2001 18:39:28 GMT
Notification-Type: Update
Subscription-Lifetime: 600
Content-Location: http://www.contoso.com/public/subtest/
```

```
Content-Length: 0
Subscribe-Group: sRKxaABd3kGPV0chHGtCpw==
Subscription-ID: 4
```

4.1.3 Setting the Notification Delay

The following example creates a subscription on a resource and sets the notification delay to 4 seconds. This means that any number of [events \(1\)](#) that occur during the 4-second window will result in only one notification. Because a **Call-Back** header, as described in section [2.2.2](#), is specified, the server will call the **NOTIFY** message, as described in section [2.2.10](#), for the UDP server specified in the **Call-Back** header.

4.1.3.1 Request

```
SUBSCRIBE /public/subtest HTTP/1.1
Host: www.contoso.com
Notification-Type: Update
Notification-Delay: 4000
Call-Back: http://www.fourthcoffee.com:8080/510
```

4.1.3.2 Response

```
HTTP/1.1 200 OK
Server: Microsoft-IIS/5.0
Date: Fri, 06 Jul 2001 18:43:40 GMT
Notification-Type: Update
Subscription-Lifetime: 3600
Call-Back: http://www.fourthcoffee.com:8080/510
Content-Location: http://www.contoso.com/public/subtest/
Content-Length: 0
Subscribe-Group: sRKxaABd3kGPV0chHGtCpw==
Subscription-ID: 7
Notification-Delay: 4000
```

4.1.4 Renewing a Subscription

The following example renews a previously made subscription.

4.1.4.1 Request

```
SUBSCRIBE /public/subtest HTTP/1.1
Host: www.contoso.com
Subscription-ID: 21
```

4.1.4.2 Response

```
HTTP/1.1 207 Multi-Status
Server: Microsoft-IIS/5.0
Date: Fri, 06 Jul 2001 18:45:37 GMT
Content-Type: text/xml
Content-Length: 272
```

```
<?xml version="1.0"?>
<a:multistatus xmlns:b="http://schemas.microsoft.com/Exchange/" xmlns:a="DAV:">
  <a:response>
    <a:href>http://www.contoso.com/public/subtest</a:href>
    <a:status>HTTP/1.1 200 OK</a:status>
    <b:subscriptionID>
      <li>21</li>
    </b:subscriptionID>
  </a:response>
</a:multistatus>
```

4.2 Unsubscribe Example

The following example shows a client terminating a subscription.

4.2.1 Request

```
UNSUBSCRIBE /public/subtest HTTP/1.1
Host: www.contoso.com
Subscription-ID: 16
```

4.2.2 Response

```
HTTP/1.1 207 Multi-Status
Server: Microsoft-IIS/5.0
Date: Fri, 06 Jul 2001 22:03:15 GMT
Content-Type: text/xml
Content-Length: 273
```

```
<?xml version="1.0"?>
<a:multistatus xmlns:b="http://schemas.microsoft.com/Exchange/" xmlns:a="DAV:">
  <a:response>
    <a:href>http://www.contoso.com/public/subtest</a:href>
    <a:status>HTTP/1.1 200 OK</a:status>
    <b:subscriptionID>
      <li>16</li>
    </b:subscriptionID>
  </a:response>
</a:multistatus>
```

4.3 Notify Example

The following example is packet dump of a UDP message from a [WebDAV server](#). The [URI](#) used is the one specified in the **Call-Back** header, as described in section [2.2.2](#), of the **SUBSCRIBE** method request, as described in section [2.2.7](#), that is used to create the subscription. The **Subscription-ID** header, as described in section [2.2.5](#), contains the identifier of the [event \(1\)](#).

4e 4f 54 49 46 59 20 68	74 74 70 75 3a 2f 2f 66	NOTIFY http://f
65 61 6d 64 31 30 3a 38	30 38 30 20 48 54 54 50	eamd10:8080 HTTP
2f 31 2e 31 0d 0a 53 75	62 73 63 72 69 62 65 2d	/1.1..Subscribe-
67 72 6f 75 70 3a 20 4a	71 59 59 33 55 46 6e 70	group: JqYY3UFnp
45 53 4f 59 36 31 38 43	30 36 72 4a 41 3d 3d 0d	ES0Y618C06rJA==.
0a 53 75 62 73 63 72 69	70 74 69 6f 6e 2d 69 64	.Subscription-id

4.4 Poll Example

The following example is a **POLL** method request, as described in section [2.2.9](#), that queries subscriptions with the specified IDs. The response includes an [event \(1\)](#) for subscription ID 11 but not for the other subscription IDs.

4.4.1 Request

```
POLL /public/subtest/ HTTP/1.1
Host: www.contoso.com
Subscription-ID: 8,9,10,11,12
Content-Length: 0
```

4.4.2 Response

```
HTTP/1.1 207 Multi-Status
Content-Type: text/xml
Content-Length: 489

<?xml version="1.0"?>
<a:multistatus xmlns:b="http://schemas.microsoft.com/Exchange/" xmlns:a="DAV:">
  <a:response>
    <a:href>http://www.contoso.com/public/subtest</a:href>
    <a:status>HTTP/1.1 200 OK</a:status>
    <b:subscriptionID>
      <li>11</li>
    </b:subscriptionID>
  </a:response>
  <a:response>
    <a:href>http://www.contoso.com/public/subtest</a:href>
    <a:status>HTTP/1.1 204 No Content</a:status>
    <b:subscriptionID>
      <li>8</li>
      <li>9</li>
      <li>10</li>
      <li>12</li>
    </b:subscriptionID>
  </a:response>
</a:multistatus>
```

5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

None.

6 Appendix A: 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:

- Microsoft Exchange Server 2003
- Microsoft Exchange Server 2007

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.

7 Change Tracking

This section identifies changes that were made to the [MS-XWDNOTIF] protocol document between the October 2012 and February 2013 releases. 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.
- An extensive rewrite, addition, or deletion of major portions of content.
- The removal of a document from the documentation set.
- Changes made for template compliance.

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 language and 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 or language changes were introduced. The technical content of the document is identical to the last released version, but minor editorial and formatting changes, as well as updates to the header and footer information, and to the revision summary, may have been made.

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.
- New content added for template compliance.
- Content updated for template compliance.
- Content removed for template compliance.
- 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 protocol@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
1.1 Glossary	Removed "store" from the list of terms that are defined in [MS-OXGLOS].	N	Content updated.
1.1 Glossary	Added "message store" to the list of terms that are defined in [MS-OXGLOS].	N	Content updated.

8 Index

A

[Applicability](#) 7

C

[Call-Back Header message](#) 10

Canceling a subscription

[errors](#) 22

[overview](#) 21

[request](#) 21

[response](#) 22

[Capability negotiation](#) 7

[Change tracking](#) 32

E

Errors

[canceling a subscription](#) 22

[renewing a subscription](#) 21

[subscribing](#) 19

Examples

[notify example](#) 28

[poll example](#) 29

[renewing a subscription](#) 27

[setting the notification delay](#) 27

[setting the subscription lifetime](#) 26

[subscribing to notifications on a resource](#) 26

[unsubscribe example](#) 28

F

[Fields - vendor-extensible](#) 7

G

[Glossary](#) 5

I

[Implementer - security considerations](#) 30

[Index of security parameters](#) 30

[Informative references](#) 6

[Introduction](#) 5

M

Message syntax

[overview](#) 9

Messages

[Call-Back Header](#) 10

[Notification-Delay Header](#) 11

[Notification-Type Header](#) 9

[NOTIFY Method](#) 15

[POLL Method](#) 14

[SUBSCRIBE Method](#) 13

[Subscribe-Group Header](#) 12

[Subscription-ID Header](#) 11

[Subscription-Lifetime Header](#) 10

[syntax overview](#) 9

[transport](#) 9

[UNSUBSCRIBE Method](#) 14

N

[Normative references](#) 6

Notification details

[overview](#) 22

[poll notification](#) 23

[UDP notification](#) 24

[Notification-Delay Header message](#) 11

[Notification-Type Header message](#) 9

[Notify example](#) 28

[NOTIFY Method message](#) 15

O

Overview

[message syntax](#) 9

[notification details](#) 22

[protocol details](#) 16

[subscription details](#) 16

[Overview \(synopsis\)](#) 6

P

[Parameters - security index](#) 30

Poll example

[overview](#) 29

[request](#) 29

[response](#) 29

[POLL Method message](#) 14

Poll notification

[errors](#) 24

[overview](#) 23

[request](#) 23

[response](#) 23

[Preconditions](#) 7

[Prerequisites](#) 7

[Product behavior](#) 31

Protocol details

[overview](#) 16

R

[References](#) 6

[informative](#) 6

[normative](#) 6

[Relationship to other protocols](#) 7

Renewing a subscription

[errors](#) 21

[overview](#) 20

[request](#) 20

[response](#) 20

Renewing a subscription example

[overview](#) 27

[request](#) 27
[response](#) 27
Request
 [canceling a subscription](#) 21
 [renewing a subscription](#) 20
 [subscribing](#) 18
Response
 [canceling a subscription](#) 22
 [renewing a subscription](#) 20
 [subscribing](#) 19

S

Security
 [implementer considerations](#) 30
 [parameter index](#) 30
Setting the notificatin delay example
 [response](#) 27
Setting the notification delay example
 [overview](#) 27
 [request](#) 27
Setting the subscription lifetime example
 [overview](#) 26
 [request](#) 26
 [response](#) 26
[Standards assignments](#) 8
[SUBSCRIBE Method message](#) 13
[Subscribe-Group Header message](#) 12
Subscribing
 [errors](#) 19
 [request](#) 18
 [response](#) 19
 [subscription types](#) 16
Subscribing to notifications on a resource example
 [overview](#) 26
 [request](#) 26
 [response](#) 26
Subscription details
 [canceling a subscription](#) 21
 [overview](#) 16
 [renewing a subscription](#) 20
[Subscription types - subscribing](#) 16
[Subscription-ID Header message](#) 11
[Subscription-Lifetime Header message](#) 10

T

[Tracking changes](#) 32
[Transport](#) 9

U

[UDP notification](#) 24
Unsubscribe example
 [overview](#) 28
 [request](#) 28
 [response](#) 28
[UNSUBSCRIBE Method message](#) 14

V

[Vendor-extensible fields](#) 7