[MS-OXCPRPT]:
Property and Stream Object Protocol Specification

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1 Introduction

This document specifies how to set, get, and delete data from a **property set**.

1.1 Glossary

The following terms are defined in [MS-OXGLOS]:

address book container
Address Book object
attachment
Attachment object
attachments table
code page
Coordinated Universal Time (UTC)
distribution list
folder
Folder object
global identifier (GID)
GUID
handle
identifier
little-endian
Long ID (LID)
Logon object
mail user
message
Message object
messaging object
multiple-byte character set (MBCS)
named property
parameter
property(1)
property ID
property name
property tag
property set
property type
recipient table
remote operation (ROP)
remote procedure call (RPC)
ROP request buffer
ROP response buffer
rule
Server object
Server object handle table
store
Store object
stream(1)
Stream object
Unicode

The following terms are specific to this document:

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property object: An abstract concept that specifies the shared behaviors of **Message objects**, **Folder objects**, **Logon objects**, and **Attachment objects**.

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

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.

[MS-DTYP] Microsoft Corporation, "Windows Data Types", March 2007, http://msdn.microsoft.com/en-us/library/cc230273.aspx

[MS-OXCDATA] Microsoft Corporation, "Data Structures", April 2008.

[MS-OXCFOLD] Microsoft Corporation, "Folder Object Protocol Specification", April 2008.

[MS-OXCFXICS] Microsoft Corporation, "Bulk Data Transfer Protocol Specification", April 2008.

[MS-OXCMSG] Microsoft Corporation, "Message and Attachment Object Protocol Specification", April 2008.

[MS-OXCROPS] Microsoft Corporation, "Remote Operations (ROP) List and Encoding Protocol Specification", April 2008.

[MS-OXCRPC] Microsoft Corporation, "Wire Format Protocol Specification", April 2008.

[MS-OXCSTOR] Microsoft Corporation, "Store Object Protocol Specification", April 2008.

[MS-OXPROPS] Microsoft Corporation, "Exchange Server Protocols Master Property List", April 2008.

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

1.2.2 Informative References

[MS-OXGLOS] Microsoft Corporation, "Exchange Server Protocols Master Glossary", April 2008.

1.3 Overview

The **Property** and **Stream object** protocol specifies how to set, get and delete **properties** associated with a **messaging object**.

1.3.1 Setting, Getting, and Deleting Properties

Properties are used to store data about messaging objects. Properties can store data of various types, such as **PtypBoolean**, **PtypString**, **PtypInteger32**, and **PtypBinary** [MS-OXCDATA]. A property is identified by a **property tag** which the client uses to set, get, or delete the properties.

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1.3.2 Named Properties Operations

In addition to static **property IDs**, clients can create additional properties using **named properties**. Named properties provide a mechanism for clients to map their own property IDs with property tags understood by the server. Clients can query the server for existing **property name**-to-property ID mappings or existing property ID-to-property name mappings. Clients can also query the server for a complete list of property names.

1.3.3 Copying Properties

Properties can be copied from one object to another. Clients can copy just a select few properties, or copy all properties.

1.3.4 Using Streams to Read and Write Properties

Some properties on **Message objects** and **Attachment objects** can be opened as a **stream**. With an open stream, the client can seek, read, write, and commit data to the stream.

1.3.5 Saving

There are two different transaction models for property objects. Changes to properties on **Folder objects** and **logon objects** are saved immediately, whereas changes to properties on Message objects and Attachment objects are not saved until the client explicitly saves the object.

1.4 Relationship to Other Protocols

This protocol relies on understanding how **ROPs** are transmitted to the server using the underlying **remote procedure call (RPC)** transport (see [MS-OXCROPS] and [MS-OXCRPC]).

1.5 Prerequisites/Preconditions

This protocol assumes the messaging client has previously logged on to the server and has acquired a **handle** to the property object on which it is going to operate. Methods to open the object and acquire a handle are dependent on the object type and are specified in detail for Message objects and Attachment objects in [MS-OXCMSG], for Folder objects in [MS-OXCFOLD], and for Logon objects in [MS-OXCSTOR].

1.6 Applicability Statement

The Property and Stream object protocol is used to query or modify properties associated with messaging objects on the server.

1.7 Versioning and Capability Negotiation

None.

1.8 Vendor-Extensible Fields

1.8.1 Named Properties

Named properties allow clients to use additional property IDs without having to worry about reusing properties that other clients are using. Named properties provide a persistent mapping from property names to property IDs.

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1.9 Standards Assignments

None.

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2 Messages

Unless otherwise specified, sizes in this section are expressed in BYTEs.

The following data types are specified in [MS-DTYP]:

BYTE

ULONG

The following data types are specified in [MS-OXCDATA] section 2.11.1:

PtypBinary

PtypBoolean

PtypErrorCode

PtypInteger32

PtypObject

PtypString

PtypString8

PtypTime

PtypUnspecified

2.1 Transport

The **ROP request buffers** and **ROP response buffers** specified by this protocol are sent to and are received from the server using the underlying remote procedure call (RPC) transport as specified in [MS-OXCROPS] and [MS-OXCRPC].

2.2 Message Semantics

The following sections specify the usage of ROP requests and responses that are specific to the Property and Stream object protocol.

2.2.1 Common Object Properties

When a property is specified as "read-only for the client", the server MUST return an error and ignore any request to change the value of that property.

2.2.1.1 PidTagAccess

Type: **PtypInteger32**.

Indicates the operations available to the client for the object. The value is a bitwise-OR of zero or more values from the following table. This property is read-only for the client.

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Value	Meaning
0x00000001	Modify
0x00000002	Read
0x00000004	Delete
0x00000008	Create Hierarchy Table
0x00000010	Create Contents Table
0x00000020	Create Associated Contents Table

2.2.1.2 PidTagAccessLevel

Type: **PtypInteger32**.

Indicates the client's access level to the object. This property is read-only for the client. MUST be one of the following values:

Value	Meaning
0x00000000	Read-Only
0x00000001	Modify

2.2.1.3 PidTagChangeKey

Type: **PtypBinary**.

Contains a **global identifier (GID)** indicating the last change to the object [MS-OXCFXICS].

2.2.1.4 PidTagCreationTime

Type: **PtypTime**

Contains the time the object was created in **UTC**.

2.2.1.5 PidTagLastModifierName

Type: **PtypString**.

Contains the name of the last **mail user** to modify the object.

2.2.1.6 PidTagLastModificationTime

Type: **PtypTime**.

Contains the time of the last modification to the object in UTC.

2.2.1.7 PidTagObjectType

Type: **PtypInteger32**.

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Indicates the type of **Server object**. This property is read-only for the client. MUST be one of the following values:

Value	Meaning
0x00000001	**Store object**
0x00000002	**Address Book object**
0x00000003	Folder Object
0x00000004	**address book container**
0x00000005	Message object
0x00000006	mail user
0x00000007	Attachment object
0x00000008	**distribution list**

2.2.1.8 PidTagRecordKey

Type: **PtypBinary**.

Contains a unique binary-comparable **identifier** for a specific object. Whenever a copy of this object is created the server generates a new value for the new object. This property is read-only for the client.

2.2.1.9 PidTagSearchKey

Type: **PtypBinary**.

Contains a unique binary-comparable key that identifies an object for a search. Whenever a copy of this object is created this value is also copied from the original object.

2.2.2 RopGetPropertiesSpecific

RopGetPropertiesSpecific queries for and returns the values of properties specified in the property array field. The property values MUST be returned in the same order as they were requested. Objects that are supported for this operation are: Message objects, Folder objects, Attachment objects and Logon objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.2.1 Request Parameter Overview

2.2.2.1.1 PropertySizeLimit

Maximum size allowed for a property value. Properties larger than this *PropertySizeLimit* MUST get a **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2) error returned for their value in the response. If this value is zero, the property values are only limited by the size of the ROP response buffer. If this value is non-zero, the property values are limited by the size of the ROP response buffer and the value of *PropertySizeLimit*.

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2.2.2.1.2 WantUnicode

If non-zero, indicates that string properties which are requested with **PtypUnspecified** ([MS-OXCDATA]) are encoded by the server using the **Unicode** format. If *WantUnicode* is zero, the server MUST return string properties which are requested with **PtypUnspecified** as the **property type** using a **multiple-byte character set**.

Properties requested with a specific string type MUST be returned using that type.

For properties on Message objects the **code page** used for strings in MBCS format MUST be the code page set on the Message object when it was opened if any, otherwise the code page of the Logon objects ([MS-OXCMSG]).

For properties on Attachment objects the code page used for strings in MBCS format MUST be the code page set on the parent Message object when it was opened if any otherwise the code page of the Logon objects.

All other objects the code page used for strings in MBCS format MUST be the code page of the Logon objects.

2.2.2.1.3 PropertyTagCount

Count of the property tags in the *PropertyTags* field.

2.2.2.1.4 PropertyTags

Array of property tags. This is a list of property tags for which the client is requesting the value. The server MUST order properties in the *PropertyValues* element of the ROP response buffer in the same order in which properties are specified in this *PropertyTags*. The buffer format of a property tag is specified in [MS-OXCDATA].

2.2.2.2 Response Parameter Overview

2.2.2.2.1 RowData

The *RowData* field is an array of **PropertyRow** ([MS-OXCDATA]) elements. The number of items in the array is specified in the *PropertyTagCount* field of the request buffer. For properties larger than the requested *PropertySizeLimit*, the server MUST return a **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2) error for their values in the response.

2.2.3 RopGetPropertiesAll

RopGetPropertiesAll queries for and returns all of the property tags and values that have been set. The server returns all properties necessary for the client to create an equivalent duplicate by copying only these properties, without considering its **attachments table** and **recipient table** that might be on the object. Objects that are supported for this operation are: Message objects, Folder objects, Attachment objects and Logon objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.3.1 Request Parameter Overview

2.2.3.1.1 PropertySizeLimit

Maximum size allowed for a property value. Properties larger than this *PropertySizeLimit* MUST get a **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2) error returned for their value in the response.

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If this value is zero, the property values are only limited by the size of the ROP response buffer. If this value is non-zero, the property values are limited by the size of the ROP response buffer and the value of *PropertySizeLimit*.

2.2.3.1.2 WantUnicode

If non-zero, indicates that string properties which are requested with **PtypUnspecified** ([MS-OXCDATA]) are encoded by the server using the Unicode format. If *WantUnicode* is zero, the server MUST return string properties which are requested with **PtypUnspecified** as the property type using a multiple-byte character set.

Properties requested with a specific string type MUST be returned using that type.

For properties on Message objects the code page used for strings in MBCS format MUST be the code page set on the Message object when it was opened if any, otherwise the code page of the Logon objects.

For properties on Attachment objects the code page used for strings in MBCS format MUST be the code page set on the parent Message object when it was opened if any otherwise the code page of the Logon objects.

All other objects the code page used for strings in MBCS format MUST be the code page of the Logon objects.

2.2.3.2 Response Parameter Overview

2.2.3.2.1 PropertyValueCount

The value of the *PropertyTagCount* field MUST be the number of elements in *PropertyValues*.

2.2.3.2.2 PropertyValues

The *PropertyValues* field is a list of all property tags and property values on the queried object. If a value was too big to fit in the response or if the property value is larger than *PropertySizeLimit* the type MUST be **PtypErrorCode** [MS-OXCDATA] with a value of **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2).

2.2.4 RopGetPropertiesList

RopGetPropertiesList queries for and returns all of the property tags that have been set. The server returns all properties necessary for the client to create an equivalent duplicate by copying only these properties, without considering its attachments table and recipient table that might be on the object. Objects that are supported for this operation are: Message objects, Folder objects, Attachment objects and Logon objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.4.1 Response Parameter Overview

2.2.4.1.1 PropertyTagCount

The value of the *PropertyTagCount* field is the number of elements in *PropertyTags*.

2.2.4.1.2 PropertyTags

If the *ReturnValue* is zero, the PropertyTags field contains a list of property tags for each property currently set on the object.

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2.2.5 RopSetProperties

RopSetProperties updates values of properties specified in the property array field. Objects that are supported for this operation are: Message objects, Folder objects, Attachment objects and Logon objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.5.1 Request Parameter Overview

2.2.5.1.1 PropertyValueSize

The value of the *PropertyValueSize* field is the number of bytes in *PropertyValueCount* plus the number of bytes in *PropertyValues*.

2.2.5.1.2 PropertyValueCount

The value of the *PropertyValueCount* field is the number of elements in *PropertyValues*.

2.2.5.1.3 PropertyValues

The *PropertyValues* field contains a list of **TaggedPropertyValue** elements as specified in [MS-OXCDATA].

2.2.5.2 Response Parameter Overview

2.2.5.2.1 PropertyProblemCount

The value of *PropertyProblemCount* is the number of elements in *PropertyProblems*.

2.2.5.2.2 PropertyProblems

The value of *PropertyProblems* is a list of any properties that were unable to be set, and the reason the property was unable to be set. See *PropertyProblem* in [MS-OXCDATA] for the format of this field.

2.2.6 RopSetPropertiesNoReplicate

RopSetPropertiesNoReplicate has the same parameters and works the same way as RopSetProperties, with the exception that when used to set properties on a Folder Object, the set properties will not undergo **folder** replication. For more information on folder replication, see [MS-OXCSTOR]. On all other objects, RopSetPropertiesNoReplicate works exactly the same as RopSetProperties.

2.2.7 RopDeleteProperties

RopDeleteProperties removes the values of properties specified in the *PropertyValues* field from the base object. Objects that are supported for this operation are: Message objects, Folder objects, Attachment objects and Logon objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.7.1 Request Parameter Overview

2.2.7.1.1 PropertyTagCount

The value of *PropertyTagCount* is the number of elements in *PropertyTags*.

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2.2.7.1.2 PropertyTags

PropertyTags contains a list of property tags for the properties that the client is deleting. See **PropertyTag** in [MS-OXCDATA].

2.2.7.2 Response Parameter Overview

2.2.7.2.1 PropertyProblemCount

The value of *PropertyProblemCount* is the number of elements in *PropertyProblems*.

2.2.7.2.2 PropertyProblems

The *PropertyProblems* field contains a list of which properties the server failed to delete, and the reason the property was unable to be deleted. See **PropertyProblem** in [MS-OXCDATA] for the format of this field.

2.2.8 RopDeletePropertiesNoReplicate

RopDeletePropertiesNoReplicate has the same **parameters** and works the same way as RopDeleteProperties, with the exception that when used to delete properties from a Folder Object, the deleted properties will not undergo folder replication. (See [MS-OXCSTOR] for details on folder replication.) On all other objects, RopDeletePropertiesNoReplicate works exactly the same as RopDeleteProperties.

2.2.9 RopQueryNamedProperties

RopQueryNamedProperties queries an object for all the named properties and their IDs. Objects that are supported for this operation are: Message objects and Attachment objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.9.1 Request Parameter Overview

2.2.9.1.1 QueryFlags

QueryFlags is a **BYTE** bit field. Any bits not specified below SHOULD be ignored by the server.

Name	Value	Description
NoStrings	0x01	Named properties with a **Kind** [MS-OXCDATA] of 0x1 MUST NOT be included in the response.
NoIds	0x02	Named properties with a **Kind** [MS-OXCDATA] of 0x0 MUST NOT be included in the response.

2.2.9.1.2 HasGUID

If the *HasGUID* field is non-zero then the *PropertyGUID* field MUST be included in the request. If no *PropertyGUID* is specified, then properties from any **GUID** MUST be returned in the results. If the *HasGUID* field is zero then the *PropertyGUID* field MUST NOT be present.

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2.2.9.1.3 PropertyGUID

Only named properties with GUIDs matching **PropertyGUID** MUST be returned in a successful response.

2.2.9.2 Response Parameter Overview

2.2.9.2.1 IdCount

The value of *IdCount* is the number of elements in *PropertyIds* and in *PropertyNames*. *PropertyIds* MUST have *IdCount* number of elements, and *PropertyNames* MUST have *IdCount* number of elements.

2.2.9.2.2 PropertyIds

The *PropertIds* field contains a list of Property IDs (see [MS-OXCDATA]), one for each of the named properties which match the *PropertyGUID* requested.

2.2.9.2.3 PropertyNames

The *PropertyNames* field contains a list of Property Names in the format specified in [MS-OXCROPS]. This field MUST contain *IdCount* entries. The entries in this list MUST match the order of the entries in *PropertyIds* to form Property ID to Name pairs for each named property matching the *PropertyGUID* specified in the request.

2.2.10 RopCopyProperties

RopCopyProperties copies or moves one or more properties from one object to another. It can be used for replying to and forwarding Message objects, in which only some of the properties from the original Message object travel with the reply or forwarded copy. This ROP is valid on objects of type Folder objects, Attachment objects and Message objects. Also, the source and destination object MUST be of the same type. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.10.1 Request Parameter Overview

2.2.10.1.1 WantAsynchronous

If this field is set to zero, then the server MUST perform the ROP synchronously. If the field is set to non-zero, then the server can either perform the ROP synchronously or asynchronously. If the server performs the ROP asynchronously, then it MUST return a RopProgress response instead of a RopCopyProperties response. For more details, see section 2.2.22 and section 3.1.5.

2.2.10.1.2 CopyFlags

CopyFlags is a BYTE bit field. Any bits not specified below MUST be ignored by the server.

Name	Value	Description
Move	0x01	If set, makes the call a move operation rather than a copy operation.
NoOverwrite	0x02	If set, any properties being set by RopCopyProperties that already have a value on the destination object will not be overwritten; otherwise, they are overwritten.

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2.2.10.1.3 PropertyTagCount

The value of *PropertyTagCount* is the number of elements in *PropertyTags*.

2.2.10.1.4 PropertyTags

The *PropertyTags* field contains a list of property tags ([MS-OXCDATA]) to be copied or moved.

2.2.10.2 Response Parameter Overview

2.2.10.2.1 PropertyProblemCount

The value of *PropertyProblemCount* is the number of elements in *PropertyProblems*. This field MUST NOT be present if the **ReturnValue** field is set to **NullDestinationObject**.

2.2.10.2.2 PropertyProblems

The *PropertyProblems* field contains a list of which properties the server failed to copy, and the reason the property was unable to be copied. See **PropertyProblem** in [MS-OXCDATA] for the format of this field. This field MUST NOT be present if the **ReturnValue** field is set to **NullDestinationObject**.

2.2.10.2.3 DestHandleIndex

The *DestHandleIndex* field MUST be present in a response if the *ReturnValue* field is set to **NullDestinationObject**, and it MUST be set to the value of the *DestHandleIndex* field in the request buffer. The *DestHandleIndex* MUST NOT be present in a response if the *ReturnValue* field is not set to **NullDestinationObject**.

2.2.11 RopCopyTo

The RopCopyTo ROP is used to copy or move all but a specified few properties from a source object to a destination object. The ROP is valid on Message objects, Attachment objects and Folder objects. The client can specify whether to copy the sub-objects in the source object as a flag in request buffer.

If any of the copied or moved properties already exist in the destination object, the existing properties are overwritten by the new properties, unless *CopyFlags* in the request buffer specifies the 0x02 bit. Existing information in the destination object that is not overwritten is left untouched.

The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.11.1 Request Parameter Overview

2.2.11.1.1 WantAsynchronous

If this field is set to zero, then the server MUST perform the ROP synchronously. If the field is set to non-zero, then the server can either perform the ROP synchronously or asynchronously. If the server performs the ROP asynchronously, then it MUST return a RopProgress response instead of a RopCopyTo response. For more details, see section 2.2.22 and section 3.1.5.

2.2.11.1.2 WantSubObjects

If *WantSubObjects* is non-zero then sub-objects MUST also be copied. Otherwise they are not.

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2.2.11.1.3 CopyFlags

CopyFlags is a bit field of the following values.

Name	Value	Description
Move	0x01	If set, makes the call a move operation rather than a copy operation. This will delete the moved properties from the source object.
NoOverwrite	0x02	If set, any properties being set by RopCopyTo that already have a value on the destination object will not be overwritten; otherwise, they are overwritten.

2.2.11.1.4 ExcludedTagCount

The value of *ExcludedTagCount* is the number of elements in *ExcludedTags*.

2.2.11.1.5 ExcludedTags

The value of *ExcludedTags* is a list of property tags (as specified in [MS-OXCDATA]). This is a list of properties that MUST NOT be copied or moved as part of this operation.

2.2.11.2 Response Parameter Overview

2.2.11.2.1 PropertyProblemCount

The value of *PropertyProblemCount* is the number of elements in *PropertyProblems*. This field MUST NOT be present if the **ReturnValue** field is set to **NullDestinationObject**.

2.2.11.2.2 PropertyProblems

The *PropertyProblems* field contains a list of which properties the server failed to copy, and the reason the property was unable to be copied. See **PropertyProblem** in [MS-OXCDATA] for the format of this field. This field MUST NOT be present if the **ReturnValue** field is set to **NullDestinationObject**.

2.2.11.2.3 DestHandleIndex

The *DestHandleIndex* field MUST be present in a response if the *ReturnValue* field is set to **NullDestinationObject**, and it MUST be set to the value of the *DestHandleIndex* field in the request buffer. The *DestHandleIndex* MUST NOT be present in a response if the *ReturnValue* field is not set to **NullDestinationObject**.

2.2.12 RopGetPropertyIdsFromNames

The RopGetPropertyIdsFromNames remote operation (ROP) is used to map abstract, client-defined property names into concrete 16-bit property IDs (15 of which are significant). A fully formed property tag is built from the 16-bit property ID and a 16-bit type code. All operations with properties, (setting, getting, deleting) on messaging objects are done with the concrete 32-bit property tag. In case the predefined set of property tags does not cover a semantic need for a new client feature, the client is able to register new property IDs using this remote operation. The client provides a namespace identifier; a property identifier in either integer or string form and the server returns a property ID to use when the client wishes to make use of that property. String-form names are case-sensitive, except for names in the *PS-INTERNET-HEADERS* namespace [MS-OXPROPS], which are always coerced to lower case.

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Because there are only 32,767 available property IDs (15 significant bits), the server MUST impose a limit of at most 32,767 on the total number of mappings it will allow before returning errors to the client. If the server reaches this limit, then it MUST return an **OutOfMemory** error in response to a request to create further mappings.

This ROP is valid on Message objects, Attachment objects, Folder objects and Logon objects. When issued against a Logon objects, the messaging client can request to map zero names to IDs. In that event, the server MUST return a comprehensive list of all registered named property IDs.

2.2.12.1 Request Parameter Overview

2.2.12.1.1 Flags

Name	Value	Description
Create	0x00000002	If set, indicates that the server MUST create new entries for any name parameters that are not found in the existing mapping set, and return existing entries for any name parameters that are found in the existing mapping set.

2.2.12.1.2 PropertyNameCount

The number of **PropertyName** structures that follow. Can be zero. Zero indicates the messaging client is querying the complete list of registered named properties.

2.2.12.1.3 PropertyNames

An array of **PropertyName** ([MS-OXCDATA]) structures, the length of which MUST be *PropertyNameCount* elements.

2.2.12.2 Response Parameter Overview

2.2.12.2.1 PropertyIdCount

The number of 16-bit property IDs that follow. MUST be equal to the *PropertyNameCount* parameter unless the *PropertyNameCount* parameter was zero. In that case, MUST be equal to the total number of registered named properties.

2.2.12.2.2 PropertyIds

An array of 16-bit property IDs. Total item length MUST be *PropertyNameCount*. For names that could not be mapped, the associated value MUST be zero. In this event, the *Return Code* MUST be equal to ecWarnWithErrors (0x00040380). The order of IDs in this array MUST match the order of the names specified in the *PropertyNames* parameter.

For any entries in the *PropertyNames* array with a *NamespaceGUID* equal to *PS-MAPI* ([MS-OXPROPS]), the resultant entry in the *PropertyIds* MUST be equal to the **IntegerID** value from the *PropertyNames* entry. For other namespaces, the resultant entry MUST have the most significant bit set (0x8000) to indicate the property ID is a named property.

Reasons a name couldn't be mapped include:

- Use of the PS-MAPI ([MS-OXPROPS]) namespace and not specifying 0x00 for **Kind** ([MS-OXCDATA])

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- The name wasn't found in the mapping table and the *Create* flag wasn't set in the *Flags* parameter
- The user does not have permission to register new named properties
- The user has reached an artificial quota of named properties imposed by the server
- The user has reached the hard limit of 32,767 registered named properties.

2.2.13 RopGetNamesFromPropertyIds

The RopGetNamesFromPropertyIds remote operation (ROP) is used to map concrete property IDs to abstract, client-defined property names. A fully formed property tag is built from the 16-bit property ID and a 16-bit type code. All operations with properties, (setting, getting, deleting) on messaging objects are done with the concrete 32-bit property tag. In case the predefined set of property tags does not cover a semantic need for a new client feature, the client is able to register new property IDs using RopGetPropertyIdsFromNames. The client provides a namespace identifier; a property identifier in either integer or string form and the server returns a property ID to use when the client wishes to make use of that property. This remote operation is used to recover the abstract name from previously registered named property IDs.

This ROP is valid on Message objects, Attachment objects, Folder objects and Logon objects. Named property IDs are identified by having their most significant bit set (0x8000). The client can request to map non-named property IDs (IDs with the most significant bit unset) into names. The abstract name for such IDs is comprised of the *PS-MAPI* ([MS-OXPROPS]) namespace GUID, a **Kind** ([MS-OXCDATA]) value equal to 0x00, and a **LID** ([MS-OXCDATA]) value equal to the property ID given.

The *PS-MAPI* namespace is used for mapping non-named property IDs into names.

2.2.13.1 Request Parameter Overview

2.2.13.1.1 PropertyIdCount

The number of 16-bit property IDs in *PropertyIds*.

2.2.13.1.2 PropertyIds

An array of 16-bit property IDs to map into abstract names. The length MUST be equal to **PropertyIdCount** elements. The client can pass property ID values less than 0x8000. These values will be mapped into names in the *PS-MAPI* ([MS-OXPROPS]) namespace.

2.2.13.2 Response Parameter Overview

If the Return Code value is **Success** ([MS-OXCDATA]) or **ErrorsReturned** ([MS-OXCDATA]), the following fields are present.

2.2.13.2.1 PropertyNameCount

The number of elements in *PropertyNames*. Value MUST be equal to the *PropertyIdCount* parameter.

2.2.13.2.2 PropertyNames

An array of **PropertyName** ([MS-OXCDATA]) structures.

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2.2.14 RopOpenStream

RopOpenStream is used to open a property to perform a streaming operation. This ROP enables the client to perform various streaming operations on the specified property tag.

This ROP is valid on Folder objects, Attachment objects, and Message objects.

Only single-valued **PtypBinary**, **PtypObject**, **PtypString8**, and **PtypString** type properties are supported. Folder objects only support **PtypBinary** type properties.

The client MUST use RopRelease ([MS-OXCROPS] section 2.2.15.3) to release the stream once it is done with the Stream object.

The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.14.1 Request Parameter Overview

2.2.14.1.1 PropertyTag

The *PropertyTag* field specifies which property the client is opening. It is in the format of a property tag as specified in [MS-OXCDATA].

2.2.14.1.2 OpenModeFlags

The value of *OpenModeFlags* MUST be one of the following values.

Name	Value	Description
ReadOnly	0x00	Open stream for read-only access.
ReadWrite	0x01	Open stream for read/write access.
Create	0x02	Opens new stream, this will delete the current property value and open stream for read/write access. This is required to open a property that has not been set.
BestAccess	0x03	If the object this ROP is acting on was opened with ReadWrite access, then the stream MUST be opened with ReadWrite access. Otherwise, the stream MUST be opened with ReadOnly access.

2.2.14.2 Response Parameter Overview

2.2.14.2.1 StreamSize

StreamSize MUST be the current number of BYTES in the stream.

2.2.15 RopReadStream

RopReadStream is used to read the stream of bytes from a Stream object. This ROP is valid only on Stream object. The syntax of this ROP is fully specified in [MS-OXCROPS].

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2.2.15.1 Request Parameter Overview

2.2.15.1.1 ByteCount

The value of *ByteCount* SHOULD be the size of the data buffer that will be sent back in the response. If the value is 0xBABE then the server will determine what buffer size to use in the response.

2.2.15.1.2 MaximumByteCount

This field MUST be present if and only if the value of *ByteCount* is 0xBABE. The value of *MaximumByteCount* specifies the maximum buffer size that the server can return in the response. Note that since *MaximumByteCount* can exceed the amount of data that can be returned in a single ROP response buffer, the response can span multiple ROP response buffers.

2.2.15.2 Response Parameter Overview

2.2.15.2.1 DataSize

The value of *DataSize* is the number of **BYTES** in *Data*.

If *ByteCount* was specified as 0xBABE, the value of *DataSize* will be smaller than *MaximumByteCount* if the end of the stream is reached or to fit the data into the ROP response buffer. If the stream is exactly the same size as *MaximumByteCount*, the client MUST issue another RopReadStream operation and get back zero bytes to determine that the end of the stream was reached.

If *ByteCount* a value other than 0xBABE, the value of *DataSize* is smaller than *ByteCount* if the end of the stream is reached or to fit the data into the ROP response buffer. If the stream is exactly the same size as *ByteCount*, the client MUST issue another RopReadStream operation and get back zero bytes to determine that the end of the stream was reached.

In the case of a failure, *DataSize* SHOULD be zero, and the client SHOULD ignore any data it might get back from the server.

2.2.15.2.2 Data

Data contains the data read from the stream. Data MUST contain exactly *DataSize* BYTES.

2.2.16 RopWriteStream

RopWriteStream is used to write the stream of BYTES into a Stream object. This ROP is valid only on Stream objects. For Stream objects opened on properties on Folder objects, information written to the stream requires a RopCommitStream before it is persisted to the Folder object. For all other Stream objects, the server will commit the stream to the parent object when the client calls RopRelease ([MS-OXCROPS] section 2.2.15.3) on the Stream object. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.16.1 Request Parameters Overview

2.2.16.1.1 DataSize

The value of *DataSize* is the number of BYTES in *Data*.

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2.2.16.1.2 Data

Data contains the data to be written to the stream.

2.2.16.2 Response Parameters Overview

2.2.16.2.1 WrittenSize

The value of *WrittenSize* is the number of BYTES actually written.

2.2.17 RopCommitStream

RopCommitStream ensures that any changes made to a Stream object are persisted in storage. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.17.1 Request Parameters Overview

None.

2.2.17.2 Response Parameters Overview

None.

2.2.18 RopGetStreamSize

RopGetStreamSize is used to retrieve the size of the stream. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.18.1 Request Parameter Overview

None.

2.2.18.2 Response Parameter Overview

2.2.18.2.1 StreamSize

The value of *StreamSize* is the number of BYTES in the stream. The maximum allowed stream size is 2^31 BYTES.

2.2.19 RopSetStreamSize

The RopSetStreamSize remote operation (ROP) sets the size of a stream. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS]. If the size of the stream is increased, then value of the extended stream MUST be zero. If the size of the stream is decreased, the information that extends past the end of the new size is lost.

RopSetStreamSize is not required prior to writing to the stream.

2.2.19.1 Request Parameter Overview

2.2.19.1.1 StreamSize

The value of *StreamSize* is the size that the stream will be set to. The maximum allowed stream size is 2^31 BYTES.

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2.2.19.2 Response Parameter Overview

None.

2.2.20 RopSeekStream

RopSeekStream sets the seek pointer to a new location. This ROP is valid only on Stream objects. The new location is relative to either the beginning of the stream, the end of the stream, or the current seek pointer, which is specified by *Origin* parameter. RopSeekStream can also be used to get the current seek pointer, by setting *Origin* to 0x01 and *Offset* to zero. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.20.1 Request Parameter Overview

2.2.20.1.1 Origin

The value of the *Origin* field MUST be one of the following values:

Value	Description
0x00	The new seek pointer is an offset relative to the beginning of the stream.
0x01	The new seek pointer is an offset relative to the current seek pointer location.
0x02	The new seek pointer is an offset relative to the end of the stream.

2.2.20.1.2 Offset

The value of the *Offset* field is a signed value representing the number of BYTES to offset the seek pointer from the origin. This value can be positive or negative.

2.2.20.2 Response Parameter Overview

2.2.20.2.1 NewPosition

The value of *NewPosition* is the number of BYTES from the beginning of the stream of the seek pointer.

2.2.21 RopCopyToStream

RopCopyToStream copies a specified number of bytes from the current seek pointer in the source stream to the current seek pointer in another destination stream. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.21.1 Request Parameter Overview

2.2.21.1.1 ByteCount

The value of *ByteCount* is the number of BYTES to copy from the source stream to the destination stream.

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2.2.21.2 Response Parameter Overview

2.2.21.2.1 ReadByteCount

If *ReturnValue* is not **NullDestinationObject** ([MS-OXCDATA]) the value of *ReadByteCount* MUST be the number of BYTES read from the base object. Otherwise the value is undefined.

2.2.21.2.2 WrittenByteCount

If *ReturnValue* is not **NullDestinationObject** ([MS-OXCDATA]) the value of *WrittenByteCount* MUST be the number of BYTES written to the destination object. Otherwise the value is undefined.

2.2.21.2.3 DestHandleIndex

The *DestHandleIndex* field MUST be present in a response if the *ReturnValue* field is set to **NullDestinationObject**, and it MUST be set to the value of the *DestHandleIndex* field in the request buffer. The *DestHandleIndex* MUST NOT be present in a response if the *ReturnValue* field is not set to **NullDestinationObject**.

2.2.22 RopProgress

RopProgress responses report the progress status of an asynchronous operation to the client. RopProgress requests are used to request the status of an asynchronous operation. They also can be used to abort an in-progress operation. If the abort flag sent by the client is non-zero, then the operation is aborted.

RopProgress responses can be used as a response to the following ROPs:

- RopCopyTo (section 2.2.11)
- RopCopyProperties (section 2.2.10)
- RopEmptyFolder ([MS-OXCFOLD])
- RopDeleteMessages ([MS-OXCFOLD])
- RopSetReadFlags ([MS-OXCMSG])
- RopMoveCopyMessages ([MS-OXCFOLD])
- RopMoveFolder ([MS-OXCFOLD])
- RopCopyFolder ([MS-OXCFOLD])

2.2.22.1 Request Parameter Overview

2.2.22.1.1 WantCancel

WantCancel is a BYTE sized field that MUST be zero if the client wants the current operation to continue. If the value is non-zero, the client is requesting that the server attempt to cancel the operation.

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2.2.22.2 Response Parameter Overview

2.2.22.2.1 CompletedTaskCount

CompletedTaskCount is a 4-BYTE field that SHOULD report an approximation of the number of tasks that the server has completed out of *TotalTaskCount* operations to complete the entire operation that the progress is being reported on.

2.2.22.2.2 TotalTaskCount

TotalTaskCount is a 4-BYTE field that MUST be greater than or equal to *CompletedTaskCount*. This field SHOULD represent an approximation of the number of tasks the server will complete for the operation that the progress is being reported on.

2.2.23 RopLockRegionStream

RopLockRegionStream is used to lock a specified range of bytes in a stream object. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.23.1 Request Parameter Overview

2.2.23.1.1 RegionOffset

RegionOffset is an unsigned 64-bit integer representing the number of bytes from the beginning of the stream where the beginning of the region to be locked is located.

2.2.23.1.2 RegionSize

RegionSize is an unsigned 64-bit integer representing the size of the region to be locked.

2.2.23.1.3 LockFlags

The value of the *LockFlags* field MUST be one of the following values.

Value	Description
0x001	If this lock is granted, then the specified range of bytes can be opened and read any number of times, but writing to the locked range is prohibited except for the owner that was granted this lock.
Any other value	If this lock is granted, then reading and writing to the specified range of bytes is prohibited except by the owner that was granted this lock.

2.2.23.2 Response Parameter Overview

None.

2.2.24 RopUnlockRegionStream

RopUnlockRegionStream is used to unlock a specified range of bytes in a Stream object. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

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2.2.24.1 Request Parameter Overview

2.2.24.1.1 RegionOffset

RegionOffset is an unsigned 64-bit integer representing the number of bytes from the beginning of the stream where the beginning of the region to be unlocked is located.

2.2.24.1.2 RegionSize

RegionSize is an unsigned 64-bit integer representing the size of the region to be unlocked.

2.2.24.1.3 LockFlags

The value of the *LockFlags* field MUST be one of the values specified in section 2.2.23.1.3. In addition, it MUST be set to the same value that was used in the RopLockRegionStream operation that was used to lock the region of bytes to be unlocked.

2.2.24.2 Response Parameter Overview

None.

2.2.25 RopWriteAndCommitStream

RopWriteAndCommitStream is functionally equivalent to RopWriteStream followed by RopCommitStream. This ROP is valid only on Stream objects. This ROP MUST NOT be used on Stream objects opened on properties on Folder objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

2.2.25.1 Request Parameter Overview

2.2.25.1.1 DataSize

The value of *DataSize* is the number of BYTES in *Data*.

2.2.25.1.2 Data

Data contains the data to be written to the stream.

2.2.25.2 Response Parameter Overview

2.2.25.2.1 WrittenSize

The value of *WrittenSize* is the number of BYTES actually written.

2.2.26 RopCloneStream

RopCloneStream creates a new Stream object for accessing the same bytes but using a separate seek pointer. The new Stream object contains the same data as the source Stream object. Changes made to one Stream object are immediately visible in the other. The initial setting of the seek pointer in the cloned Stream object is the same as the current setting of the seek pointer in the original Stream object at the time of the clone operation. This ROP is valid only on Stream objects. The syntax of this ROP is fully specified in [MS-OXCROPS].

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2.2.26.1 Request Parameter Overview

None.

2.2.26.2 Response Parameter Overview

None.

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3 Protocol Details

3.1 Client Details

3.1.1 Abstract Data Model

This section describes a conceptual model of possible data organization that an implementation maintains to participate in this protocol. The described organization is provided to facilitate the explanation of how the protocol behaves. This document does not mandate that implementations adhere to this model as long as their external behavior is consistent with that described in this document.

3.1.1.1 Property Transactions

There are two different transaction models for property objects. Changes to properties on Folder objects and Logon objects are saved implicitly, whereas changes to Message objects are not saved until the client sends a RopSaveChangesMessage request ([MS-OXCROPS] section 2.2.6.3). Attachment objects are not saved until the client sends a RopSaveChangesAttachment request ([MS-OXCROPS] section 2.2.6.15).

3.1.1.2 Named Properties

Named properties are a set of mappings between property IDs and property names. The client can cache the property ID for any property names that it has queried using RopGetPropertyIdsFromNames, for the length of its session, but MUST re-query the server before using these property IDs on a new session. A property ID obtained for a property name is valid on any item within the Logon object.

3.1.1.3 Streams

Changes made to properties that have been opened as a stream using RopOpenStream and written to using RopWriteStream MUST not be persisted to the property object that property is on unless the client calls RopCommitStream for streams opened on properties of folders, or RopRelease ([MS-OXCROPS] section 2.2.15.3) for streams opened on properties of **attachments** or **messages**.

3.1.2 Timers

None.

3.1.3 Initialization

There is no initialization specific to this protocol. Higher layers calling this protocol MUST obtain handles to the objects required by the message syntax specified in [MS-OXCROPS].

3.1.4 Higher-Layer Triggered Events

3.1.4.1 When Client Needs to Query Data from an Object

If any of the properties the client wants are named properties, the client obtains the property IDs for those properties using RopGetPropertyIdsFromNames.

The client then uses RopGetPropertiesSpecific to query the value of those properties. The client checks the ReturnValue of the ROP, and the values of the properties returned for errors.

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3.1.4.2 When Client Needs to Set Data

If any of the properties the client wants to set are named properties, the client obtains the property IDs for those properties using RopGetPropertyIdsFromNames.

The client then uses RopSetProperties to set the value of those properties. The client checks the ReturnValue of the ROP and if **PropertyProblemCount** field in the response is non-zero, then the client checks the problem array, to verify which properties failed to be set. Clients SHOULD NOT include read-only properties in the **PropertyValues** field of the ROP request buffer for RopSetProperties.

3.1.4.3 When the Client Needs to Query Data Larger than Will Fit in a Single ROP

The client uses a stream to read a property that came back with an error of **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2) in a *PropertyProblem* ([MS-OXCDATA]). A client can use RopOpenStream to read a property even before attempting to read it using RopGetPropertiesSpecific if it expects the property to be big.

If the property the client wants to get is a named property, the client obtains the property ID for that property using RopGetPropertyIdsFromNames.

The client then uses RopOpenStream to obtain a handle to a stream on the property. The client uses ReadOnly as the value for *OpenModeFlags* if the client is just going to read from the stream. The client can also use BestAccess or ReadWrite if the client later wishes to write to this stream. The client checks the ReturnValue of the ROP to verify that the handle was correctly retrieved.

The client can use RopSeekStream if the client does not want to read from the start of the stream. The client then uses one or more RopReadStream ROPs to read data from the stream. The client stops after it has read all the data it requires, or after RopReadStream returns zero as its *StreamDataSize*.

The client uses RopRelease ([MS-OXCROPS] section 2.2.15.3) after it is done with the Stream object.

3.1.4.4 When the Client Needs to Set Data Larger than Will Fit in a Single RopSetProperties

If the property the client wants to set is a named property, the client obtains the property ID for that property using RopGetPropertyIdsFromNames.

The client then uses RopOpenStream to obtain a handle to the stream on the property. The client specifies ReadWrite, Create, or BestAccess as the value for *OpenModeFlags*. The client checks the ReturnValue of the ROP to verify that the handle was correctly retrieved.

The client can use RopSeekStream if the client does not wish to write from the start of the stream. The client then uses one or more RopWriteStream ROPs to write data to the stream.

The client uses RopCommitStream to commit the changes to the property.

The client uses RopRelease ([MS-OXCROPS] section 2.2.15.3) once it is done with the Stream object.

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3.1.5 Message Processing Events and Sequencing Rules

With the exception of RopProgress, all the messages specified in section 2 of this protocol are all sent by the client and processed by the server. The client SHOULD process the ROP response buffer associated with each message it sends.

If the client specified *WantAsynchronous* for any of the following ROPs the server can respond with a RopProgress response.

- RopCopyTo (section 2.2.11)
- RopCopyProperties (section 2.2.10)
- RopEmptyFolder ([MS-OXCFOLD])
- RopDeleteMessages ([MS-OXCFOLD])
- RopSetReadFlags ([MS-OXCMSG])
- RopMoveCopyMessages ([MS-OXCFOLD])
- RopMoveFolder ([MS-OXCFOLD])
- RopCopyFolder ([MS-OXCFOLD])

The server can respond with a RopProgress response buffer to notify the client of its current progress. When the client receives a RopProgress response it can use the *CompletedTaskCount* and *TotalTaskCount* to provide progress information to the user. The client can send additional RopProgress requests to request additional status, or to abort the operation. In response to the client's RopProgress request, the server MUST respond with either the response to the original ROP, or another RopProgress response. If the client sends a ROP other than RopProgress to the server with the same logon before the asynchronous operation is complete the server MUST abort the asynchronous operation and respond to the new ROP.

3.1.6 Timer Events

None.

3.1.7 Other Local Events

None.

3.2 Server Details

3.2.1 Abstract Data Model

The Server Abstract Data Model is the same as the Client Abstract Data Model. See section 3.1.1.

3.2.2 Timers

None.

3.2.3 Initialization

None.

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3.2.4 Higher-Layer Triggered Events

None.

3.2.5 Message Processing Events and Sequencing Rules

3.2.5.1 Processing RopGetPropertiesSpecific

Provides access to property values on a property object on the server. The server MUST return the values for all properties on the object, including those set by any client, server, or computed properties. If the *WantUnicode* flag is used, the server MUST return string properties which are requested without a specified type (**PtypUnspecified**) in Unicode format.

If the *WantUnicode* flag is not used, the server MUST return string properties which are requested without a specified type (**PtypUnspecified**) in MBCS format.

Properties requested with a specific string type MUST be returned using that type.

For properties on Message objects the code page used for strings in MBCS format MUST be the code page set on the Message object when it was opened if any, otherwise the code page of the Logon object MUST be used.

For properties on Attachment objects the code page used for strings in MBCS format MUST be the code page set on the parent Message object when it was opened if any, otherwise the code page of the Logon object MUST be used.

All other objects the code page used for strings in MBCS format MUST be the code page of the Logon object.

In the case of a binary, object or **string property** the server can return **NotEnoughMemory** ([MS-OXCDATA] section 2.4.2) for that property to indicate that the value is too large to be returned using this ROP. The client can use RopOpenStream to retrieve the values of such large properties.

This ROP SHOULD only be supported by Message objects, Folder objects, Attachment objects and Logon objects.

3.2.5.2 Processing RopGetPropertiesAll

Provides access to all property values on a property object on the server. This ROP works the same as RopGetPropertiesSpecific except that it MUST return the values for all properties on the object.

3.2.5.3 Processing RopGetPropertiesList

The server MUST return the list of all properties currently set on the object.

This ROP SHOULD only be supported for Message objects, Folder objects, Attachment objects and Logon objects.

3.2.5.4 Processing RopSetProperties

The server MUST modify the value of the properties of the object.

For Message objects, the new value of the properties MUST be made available immediately when using the same handle. If the client uses the same handle to read those same properties using RopGetPropertiesSpecific ([MS-OXCROPS] section 2.2.8.3) or RopGetPropertiesAll ([MS-OXCROPS] section 2.2.8.4), then the modified value MUST be returned. However, the modified value MUST

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NOT be persisted to the database until a successful RopSaveChangesMessage ([MS-OXCROPS] section 2.2.6.3) is issued.

For Attachment objects, the new value of the properties MUST be made available immediately when using the same handle. However, the modified value MUST NOT be persisted to the database until a successful RopSaveChangesAttachment ([MS-OXCROPS] section 2.2.6.15) is issued.

For Folder objects and Logon objects, the new value of the properties MUST be persisted immediately without requiring another ROP to commit it.

This ROP SHOULD only be supported for Message objects, Folder objects, Attachment objects and Logon objects.

3.2.5.5 Processing RopDeleteProperties

Removes the value of a set property. If the server returns success it MUST NOT have a valid value to return to a client that asks for the value of this property.

The server MUST remove the value of the property from the object.

For Message objects, the new value of the properties MUST be made available immediately when using the same handle. In other words, if the client uses the same handle to read those same properties using RopGetPropertiesSpecific or RopGetPropertiesAll, then the modified value MUST be returned. However, the modified value MUST NOT be persisted to the database until a successful RopSaveChangesMessage is issued.

For Attachment objects, the new value of the properties MUST be made available immediately when using the same handle. However, the modified value MUST NOT be persisted to the database until a successful RopSaveChangesAttachment is issued.

For Folder objects and Logon objects, the new value of the properties MUST be persisted immediately without requiring another ROP to commit it.

This ROP SHOULD only be supported for Message objects, Folder objects, Attachment objects and Logon objects.

3.2.5.6 Processing RopQueryNamedProperties

The server MUST return the list of all named properties and their PropertyIds.

If a property GUID is specified, the server MUST only return the named properties with that GUID.

If a property GUID is not specified, the server MUST return all named properties.

This ROP SHOULD only be supported for Message objects, Folder objects, and Attachment objects.

3.2.5.7 Processing RopCopyProperties

The server MUST copy the properties specified from the source object to the destination object.

If the move flag is specified, the server MUST delete the properties from the original object.

In the case of Attachment objects and Message objects, the changes on either source or destination MUST not be persisted until RopSaveChangesMesssage or RopSaveChangesAttachment is successfully issued.

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In the case of Folder objects, the changes on the source and destination MUST be immediately persisted.

If the client requests asynchronous execution, then the server can execute this ROP asynchronously. See section 3.1.5.

This ROP SHOULD only be supported for Message objects, Attachment objects, and Folder objects.

3.2.5.8 Processing RopCopyTo

This ROP works in the same way as RopCopyProperties except that it MUST copy all writable properties on the source to the destination except for the properties specified.

The following error codes can be returned:

Name	Value	Meaning
NotSupported	0x80040102	The source object and destination object are not compatible with each other for the copy operation. The source object and destination object need to be of the same type, and MUST be a Message object, Folder Object, or Attachment object.
MessageCycle	0x00000504	The source object performing the copy or move operation directly or indirectly contains the destination object.
CollidingNames	0x80040604	A sub-object cannot be copied because there is already a sub-object existing in the destination object with the same display name (PidTagDisplayName) as the sub-object to be copied.

3.2.5.9 Processing RopGetNamesFromPropertiesIds

This ROP SHOULD only be supported by Folder objects, Message objects, Attachment objects and Logon objects.

For each property ID in the *PropertyIds* parameter, the server MUST perform the following:

1. If the property ID value is less than 0x8000, the associated **PropertyName** ([MS-OXCDATA]) MUST be composed:
    1. A GUID [MS-OXCDATA] of *PS-MAPI* ([MS-OXPROPS]).
    2. A **Kind** ([MS-OXCDATA]) of 0x00.
    3. An LID ([MS-OXCDATA]) value equal to the property ID entry.
2. For property ID values that have an associated **PropertyName** ([MS-OXCDATA]), the server MUST return the **PropertyName** associated with the **PropertyId**.
3. For property ID values that do not have an associated **PropertyName**, the associated name MUST be composed:
    - A **Kind** ([MS-OXCDATA]) of 0xFF. There is no other return data for this entry.

3.2.5.10 Processing RopGetPropertyIdsFromNames

The server MUST validate all name structures passed by the client as specified in section 2.2.12.

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If the *Count* parameter is zero, and the RopGetPropertyIdsFromNames is acting on a Logon object, the server MUST enumerate all PropertyNames associated with property IDs. Otherwise, the server MUST, for each entry in the *NamedPropertyArray* parameter:

1. If the GUID ([MS-OXCDATA]) is equal to *PS-MAPI*, the associated return value is obtained from the *LID*.

2. Otherwise, if the GUID ([MS-OXCDATA]) is equal to *PS-INTERNET-HEADERS* ([MS-OXPROPS]) and **Kind** ([MS-OXCDATA]) is 0x01, coerce the *Name* value to all lower case.

3. Find the property ID associated with the PropertyName which precisely matches the **Kind** [MS-OXCDATA] and ID values from the name entry. The ID value is the value of *Name* if *Kind* is equal to 0x01 or is the value of LID ([MS-OXCDATA]) if **Kind** ([MS-OXCDATA]) is equal to 0x00.

4. For unfound rows, the associated return value MUST be 0xFFFF unless the *flags* parameter has the *Create* flag bit set and the user has permission to create new entries and any enforceable quota hasn't yet been reached and there are fewer than 32,767 PropertyNames already associated with property IDs, a new PropertyID is associated with this PropertyName. The newly assigned ID MUST be unique in that it MUST NOT be assigned to another other PropertyName, and MUST NOT be equal to 0xFFFF. The newly assigned ID MUST be greater than 0x8000.

3.2.5.11 Processing RopOpenStream

When the client sends the server a RopOpenStream request, the server MUST parse the request as specified in [MS-OXCROPS] and section 2.2.14.1. The server MUST respond with a RopOpenStream response as specified in section 2.2.14.2.

RopOpenStream provides access to a property in the form of a Stream object. The object returned by this ROP can then be used on subsequent ROPs, such as RopReadStream, RopWriteStream and RopCommitStream. See specific ROPs for information of which operate on streams.

This ROP SHOULD only be supported by Message objects, Attachment objects and Folder objects.

The implementation of RopOpenStream can allocate some temporary resource on the server to represent the link between the Folder object returned to the client and the Folder object in the database. The client MUST call RopRelease ([MS-OXCROPS] section 2.2.15.3) on the Folder object to free this resource.

The server MUST store the location of the seek pointer until the client calls RopRelease. The seek pointer MUST be initialized as specified in the request. The stream MUST be prepopulated with the current value of the property specified in the request. When the client calls RopRelease on the Stream object, and the property the Stream object is acting on is not on a Folder object, the server MUST commit the Stream object.

The following error codes can be returned.

Name	Value	Meaning
NotFound	0x8004010F	The property tag does not exist for the object and it cannot be created because Create was not specified in *OpenModeFlags*.

3.2.5.12 Processing RopReadStream

The server MUST read less or equal to the amount of data requested.

This ROP SHOULD only be supported for Stream objects.

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The server MUST reply with data read from the stream reading forward from the current seek pointer and place it in the response. The seek pointer MUST be moved forward the same number of BYTES as was read from the Stream object.

3.2.5.13 Processing RopWriteStream

The server can write less than the amount requested, in which case **StreamSizeError** MUST be returned.

This ROP SHOULD only be supported for Stream objects.

The server MUST store the data specified in the request into the stream buffer, writing forward starting at the current seek pointer. The seek pointer MUST be moved forward the same number of BYTES as was written to the Stream object. Calling only RopWriteStream on this stream MUST not change the value of the property specified in the RopOpenStream request. The value of the property MUST only be changed when RopCommitStream is called on the stream, or in the case of properties on non-Folder objects, when either RopCommitStream or RopRelease is called, as specified in section 2.2.16.

The following error codes can be returned:

Name	Value	Description
StreamSizeError	0x80030070	The write will exceed the maximum stream size.
STG_E_ACCESSDENIED	0x80030005	Write access is denied.

3.2.5.14 Processing RopCommitStream

This ROP SHOULD only be supported for Stream objects.

The server MUST set the property specified in the RopOpenStream request that opened this stream with the data from the stream.

The following error code can be returned

Name	Value	Description
STG_E_ACCESSDENIED	0x80030005	Write access is denied.

3.2.5.15 Processing RopGetStreamSize

RopGetStreamSize MUST return the current size of the Stream object.

This ROP SHOULD only be supported by Stream objects.

3.2.5.16 Processing RopSetStreamSize

This ROP MUST set the current size of the Stream object.

This ROP SHOULD only be supported by Stream objects.

3.2.5.17 Processing RopSeekStream

This ROP SHOULD only be supported by Stream objects.

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The value of the seek point associated with this Stream object MUST be modified according to the request. If the client requests the seek pointer be moved beyond 2^31 BYTES, the server MUST return **StreamSeekError**. If the client requests the seek pointer be moved beyond the end of the stream, the stream is extended, and zero filled to the new seek location.

The following error codes can be returned.

Name	Value	Description
StreamSeekError	0x80030019	Tried to seek to offset before the start, or beyond the max stream size of 2^31.
StreamInvalidParam	0x80030057	The value of *Origin* is invalid.

3.2.5.18 Processing RopCopyToStream

This ROP SHOULD <1> only be supported by Stream objects.

The position of both the source and destination streams MUST be moved forward the same number of BYTES as was copied.

The server MUST read the number of BYTES requested from the source Stream object, and write those bytes into the destination Stream object.

The following error code can be returned.

Name	Value	Description
DestinationNullObject	0x00000503	Destination object does not exist. Only if the *ReturnValue* is **DestinationNullObject**, which means that the destination object passed does not exist anymore, then the server sends the *DestinationHandleIndex* back in 4 bytes.

3.2.5.19 Processing RopProgress

If the server is not done with the asynchronous operation, then it MUST respond with a RopProgress response, as specified in section 2.2.22.2. If *WantCancel* is non-zero, then the server can abort the operation instead of completing it. If the server has completed or aborted the operation, it MUST respond with a ROP response corresponding to the original request.

3.2.5.20 Processing RopLockRegionStream

Servers SHOULD <2> implement this ROP as follows:

If the server implements this ROP, the server MUST check for any existing locks on the requested region. If any are found, the server MUST check the last activity time on the session that locked the region previously. If the last activity time was greater than 30 seconds prior to the new request, the server MUST mark the previous lock as expired and discard any pending changes to the Stream object from the session that owned that lock. If all previous locks are expired, or if there are no previous locks, the server MUST grant the requesting client a new lock. If there are previous locks that are not expired, the server MUST return an **AccessDenied** error.

If a session with an expired lock calls any ROP for this Stream object that would encounter the locked region, the server MUST return a **NetworkError**.

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3.2.5.21 Processing RopUnlockRegionStream

Servers SHOULD <3> implement this ROP as follows:

If the server implements this ROP, the server MUST remove any existing locks on the requested region that are owned by the session calling the ROP. Additionally, if there are any expired locks (as specified in section 3.2.5.20) that are owned by other sessions, the server MUST remove them. If there are previous locks that are not owned by the session calling the ROP, the server MUST return an **AccessDenied** error.

3.2.5.22 Processing RopWriteAndCommitStream

Servers SHOULD<4> process this ROP as follows:

1. Process the request as specified in section 3.2.5.13.

2. Process the request as specified in section 3.2.5.14.

3.2.5.23 Processing RopCloneStream

Servers SHOULD <5> implement this ROP as follows:

If the server implements this ROP, it MUST create a new Stream object that contains the same data as the source Stream object. Changes made to the stream in one Stream object MUST be immediately visible in the other. The initial setting of the seek pointer in the cloned Stream object MUST be the same as the current setting of the seek pointer in the source Stream object at the time that this ROP is processed. Afterwards, the seek pointers MUST be independent of each other.

3.2.6 Timer Events

None.

3.2.7 Other Local Events

None.

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4 Protocol Examples

The following examples illustrate the byte order of ROPs in a buffer being prepared for transmission. Please note that the examples listed here only show the relevant portions of the specified ROPs; this is not the final byte sequence which gets transmitted over the wire. Also note that the data for a multi-byte field appear in **little-endian** format, with the bytes in the field presented from least significant to most significant. Generally speaking, these ROP requests are packed with other ROP requests, compressed and packed in one or more RPC calls according to the specification in [MS-OXCROPS]. These examples assume the client has already successfully logged onto the server and opened the folder they wish to modify the **rules** on. For more details, see [MS-OXCROPS].

Examples in this section use the following format for byte sequences:

```
0080: 45 4d 53 4d 44 42 2e 44-4c 4c 00 00 00 00 00 00
```

The value at the left of the colon is the offset of the following bytes into the buffer, expressed in hexadecimal notation. Following the offset is a series of up to 16 bytes, with each two character sequence describing the value of one byte in hexadecimal notation. Here, the bold byte **4d** (01001101) is located 0x83 bytes (131 bytes) from the beginning of the buffer. The dash between the eighth byte ("44") and ninth byte ("4c") has no semantic value, and serves only to distinguish the eight byte boundary for readability purposes.

Such a byte sequence is then followed by one or more lines interpreting it. In larger examples the byte sequence is shown once in its entirety and then repeated in smaller chunks, with each smaller chunk interpreted separately.

The following example shows how a property tag and its value are represented in a buffer and interpreted directly from it (according to the property Buffer format specified in [MS-OXCDATA]). The property tag appears in the buffer in little-endian format.

```
0021: 03 00 76 66 0a 00 00-00
```

PropertyTag: 0x66760003 (PidTagRuleSequence [MS-OXPROPS])

PropertyValue: 10

Generally speaking interpreted values will be shown in their native format, interpreted appropriately from the raw byte sequence as described in the appropriate section. Here, the byte sequence "0a 00 00 00" has been interpreted as a **ULONG** with a value of 10 because the type of the PidTagRuleSequence property is ULONG.

4.1 Getting PropertyIds

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopGetPropertyIdsFromNames operation as described in section 2.2.12.

4.1.1 Client Request Buffer

In this example the client calls server to get property IDs for 2 named properties it wants to create on a Message object.

A complete ROP request buffer is formatted as follows:

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```
0000: 56 00 00 02 02 00 01 02-20 06 00 00 00 00 00 c0
0010: 00 00 00 00 00 00 46 14-54 00 65 00 73 00 74 00
0020: 50 00 72 00 6f 00 70 00-31 00 00 00 01 02 20 06
0030: 00 00 00 00 00 c0 00 00-00 00 00 00 46 14 54 00
0040: 65 00 73 00 74 00 50 00-72 00 6f 00 70 00 32 00
0050: 00 00
```

The first three bytes of the buffer refer to the *RopId*, *LogonId*, and *InputHandleIndex* fields of RopGetPropertyIdsFromNames as defined in [MS-OXCROPS].

```
0000: 56 00 00
```

RopId: 0x56 (RopGetPropertyIdsFromNames)

LogonId: 0x00

InputHandleIndex: 0x00

The next three bytes refer to the *Flags* and *PropertyNameCount* fields defined in section 2.2.12.1.

```
0003: 02 02 00
```

Flags: 0x02. Create flag, indicating that server will create new property IDs for any property names that do not already have an existing mapping.

PropertyNameCount: 0x0002. Two properties in **PropertyNames** follow.

The remaining bytes form the **PropertyNames** field. Each row in **PropertyNames** contains a **PropertyName** structure. For details, see [MS-OXCDATA].

```
0006: 01 02-20 06 00 00 00 00 00 c0
0010: 00 00 00 00 00 00 46 14-54 00 65 00 73 00 74 00
0020: 50 00 72 00 6f 00 70 00-31 00 00 00 01 02 20 06
0030: 00 00 00 00 00 c0 00 00-00 00 00 00 46 14 54 00
0040: 65 00 73 00 74 00 50 00-72 00 6f 00 70 00 32 00
0050: 00 00
```

Property Name 1:

Kind: 0x01 MNID_STRING

GUID: 00062002-0000-0000-c000-000000000046

NameSize: 0x14

Name: TestProp1

Property Name 2:

Kind: 0x01 MNID_STRING

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GUID: 00062002-0000-0000-c000-000000000046

NameSize: 0x14

Name: TestProp2

4.1.2 Server Response to Client Request

```
0000: 56 00 00 00 00 00 02 00-3e 86 3f 86
```

The first six bytes of the response buffer contain the *RopId*, *InputHandleIndex*, and *ReturnValue* described in [MS-OXCROPS].

```
0000: 56 00 00 00 00 00
```

RopId: 0x56 (RopGetPropertyIdsFromNames)

InputHandleIndex: 0x00

ReturnValue: 0x00000000 (Success [MS-OXCDATA])

The next two bytes is for the *PropertyIdCount* of property IDs that are packed in the buffer as described in section 2.2.12.2.1.

PropertyIdCount: 0x0002 (2 properties in the property tag array)

The remaining is *PropertyIds* where each entry in the array is four byte property ID as described in section 2.2.12.2.2.

```
0009: 3e 86 3f 86
```

property ID: 0x863e

property ID: 0x863f

4.2 Setting Properties

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopSetProperties operation as described in section 2.2.5.

4.2.1 Client Request Buffer

In this example, the client is setting values for 2 properties on a Message object.

A complete ROP request buffer is a variable length sequence, with seven required bytes and followed by property value array. An example of the request buffer follows.

```
0000: 0A 00 00 24 00 02 00 1F 00 3D 00 00 00 1F 00 1D
0010: 0E 48 00 65 00 6C 00 6C 00 6F 00 20 00 57 00 6F
0020: 00 72 00 6C 00 64 00 00 00
```


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The first three bytes of the buffer refer to the *RopId*, *LogonId*, and *InputHandleIndex* fields of RopSetProperties as defined in [MS-OXCROPS].

```
0000: 0a 00 00
```

RopId: 0x0a (RopSetProperties)

LogonId: 0x00

InputHandleIndex: 0x00

The next four bytes refer to the *PropertyValueSize* and *PropertyValueCount* fields of RopSetProperties defined in section 2.2.5.1. For more details on property buffer format, see [MS-OXCDATA].

```
0003:          24 00 02 00
```

PropertyValueSize: 0x0024. Size of Count and Array that follows.

PropertyValueCount: 0x0002. Two properties in the property array.

The remaining bytes constitute *PropertyValues*, where each row in array consists of PropertyTag and Value. A property tag is a 32-bit number that contains a property type in bits 0 through 15 and a unique property ID in bits 16 through 31 as shown in the following illustration.

```
0007:                      1F 00 3D 00 00 00 1F 00 1D
0010: 0E 48 00 65 00 6C 00 6C 00 6F 00 20 00 57 00 6F
0020: 00 72 00 6C 00 64 00 00 00
```

Property 1 (0008: 1f 00 3d 00 00 00)

PropertyTag: 0x003D001F (PropertyID: 0x003D->PidTagSubjectPrefix, PropertyType: 0x001F-> PtypString)

PropertyValue: 0x0000 (Empty String)

property 2 (000D: 1f 00 1d 0e 48 00 65 00 6c 00 6c 00 6f 00 20 00 57 00 6f 00 72 00 6c 00 64 00 00 00)

PropertyTag: 0x0E1D001F (PropertyID: 0x0E1D->PidTagNormalizedSubject, PropertyType: 0x001F-> PtypString)

PropertyValue: 48 00 65 00 6c 00 6c 00 6f-00 20 00 57 00 6f 00 72 00 6c 00 64 00 00 00 (Hello World)

4.2.2 Server Response to Client Request

```
0000: 0a 00 00 00 00 00 00 00
```

The first six bytes of the ROP response buffer contain the *RopId*, *InputHandleIndex*, and *ReturnValue* fields.

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RopId: 0x0a (RopSetProperties)

InputHandleIndex: 0x00

ReturnValue: 0x00000000. (ecNone: Success)

The final two bytes in the ROP response buffer is the *PropertyProblemCount* field described in section section 2.2.5.2.1.

```
0006: 00 00
```

PropertyProblemCount: 0x0000. Count of Problem property that follows. 0 indicates that all properties were set successfully.

4.3 Getting Properties

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopGetPropertiesSpecific operation as described in section 2.2.2.

4.3.1 Client Request Buffer

In this example client is requesting property values for specific properties from the server. The first two are named properties and third one is standard property. The PropertyIds for the named properties were gotten from server by calling RopGetPropertyIdsFromNames, see section 4.1 for details.

A complete ROP request buffer is a variable length sequence, with nine required bytes and followed by property tag array. An example of the request buffer follows:

```
0000: 07 00 00 00 00 01 00 03-00 0b 00 3e 86 03 00 3f
0010: 86 02 01 e2 65
```

The first three bytes refer to the *RopId*, *LogonId*, and *InputHandleIndex* fields described in [MS-OXCROPS].

```
0000: 07 00 00
```

RopId: 0x07 (RopGetPropertiesSpecific)

LogonId: 0x00

InputHandleIndex: 0x00

The next six bytes of the request buffer are the *PropertySizeLimit*, *WantUnicode*, and *PropertyTagCount* fields described in section 2.2.2.1.

```
0003: 00 00 01 00 03-00
```

PropertySizeLimit: 0x0000. No prop size set; maximum limit is default

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WantUnicode: 0x0001. Non-zero means Unicode

PropertyTagCount: 0x0003. 3 properties tags in array

The remaining bytes constitute *PropertyTags* as described in section 2.2.2.1.4.

```
0009: 0b 00 3e 86 03 00 3f 86 02 01 e2 65
```

PropertyTag1: 0x863E000B(PropertyID: 0x863E->TestProp1,PropertyType: 0x000B-> PtypBoolean)

PropertyTag2: 0x863F0003 (PropertyID: 0x863F->TestProp2,PropertyType: 0x0003-> PtypInteger32)

PropertyTag3: 0x65E20102 (PropertyID: 0x65E2->PidTagChangeKey,PropertyType: 0x0102-> PtypBinary)

4.3.2 Server Response to Client Request

```
0000: 07 00 00 00 00 00 01 00-00 00 62 00 00 00 0a 0f
0010: 01 04 80
```

The first six bytes of the ROP response buffer contain the *RopId*, *InputHandleIndex*, and *ReturnValue* fields.

```
0000: 07 00 00 00 00 00
```

RopId: 0x07 (RopGetPropertiesSpecific)

InputHandleIndex: 0x00

ReturnValue: 0x00000000 (Success [MS-OXCDATA])

The remaining bytes in the ROP response buffer are for the *RowData* field, which contains a **PropertyRow** structure. The first byte of the *RowData* field is the **Flag** field of the **PropertyRow** structure. This is followed by three **FlaggedPropertyValues** ([MS-OXCDATA]), each consisting of a **Flag** and a **PropertyValue** ([MS-OXCDATA]). The order of properties is the same as in the request buffer.

```
0006: 00 00 01 00 62 00 00 00-0a 0f 01 04 80
```

Flag: 0x01 (Non-zero indicates there was an error in at least one of the property values)

Property 1:

Flag: 0x00

PropertyValue: 0x00 (False)

Property 2:

Flag: 0x00

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PropertyValue: 0x00000062 (98 in decimal)

Property 3:

Flag: 0x0a (Indicates that the PropertyValue field will be an error code)

PropertyValue: 0x8004010f (NotFound [MS-OXCDATA])

4.4 Working with Streams

The following sections give examples of how to set value for a property using streams. The ROPs covered are RopOpenStream, RopSetStreamSize, RopWriteStream and RopCommitStream.

4.4.1 Opening a Stream

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopOpenStream as described in section 2.2.14.

4.4.1.1 Client Request Buffer

A complete ROP request buffer is nine bytes in length. An example of the request buffer follows:

```
0000: 2b 01 00 01 02 01 9a 0e-01
```

The first four bytes of the buffer refer to the *RopId*, *LogonId*, *InputHandleIndex* and *OutputHandleIndex* fields of RopOpenStream as defined in [MS-OXCROPS].

```
0000: 2b 01 00 01
```

RopId: 0x2b (RopOpenStream)

LogonId: 0x01

InputHandleIndex: 0x00

OutputHandleIndex: 0x01. Index in the **Server object handle table** for the object created by this ROP.

The next five bytes refer to the *PropertyTag* and *OpenModeFlags* fields defined in section 2.2.14.1.

```
0004: 02 01 9a 0e-01
```

PropertyTag: 0x0e9a0102 (PidTagExtendedRuleMessageCondition ([MS-OXPROPS]))

OpenModeFlags: 0x01. ReadWrite Mode

4.4.1.2 Server Response to Client Request

```
0000: 2b 01 00 00 00 00 15 2e-00 00
```


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The first six bytes of the ROP response buffer contain the *RopId*, *OutputHandleIndex*, and *ReturnValue* fields.

```
0000: 2b 01 00 00 00 00
```

RopId: 0x2b (RopOpenStream)

OutputHandleIndex: 0x01

ReturnValue: 0x00000000 (Success [MS-OXCDATA])

The last four bytes in the ROP response buffer is the *StreamSize* field as described in section 2.2.14.2.

```
0006: 15 2e-00 00
```

StreamSize: 0x00002e15 (11797)

4.4.2 Writing to the stream

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopWriteStream operation as described in section 2.2.16.

4.4.2.1 Client Request Buffer

A complete ROP request buffer is a variable length buffer, formatted as follows:

```
0000: 2d 01 01 15 2e 00 00 61-6e 20 61 6c 77 61 79 73
0010: 20 72 65 73 74 6f 72 65-20 74 68 65 20 6c 6f 6f
0020: 6b 20 6f 66 20 79 6f 75-72 20 64 6f 63 75 6d 65
```

The first three bytes of the buffer refer to the *RopId*, *LogonId*, and *InputHandleIndex* fields of RopWriteStream as defined in [MS-OXCROPS].

```
0000: 2d 01 01
```

RopId: 0x2d (RopWriteStream)

LogonId: 0x01

InputHandleIndex: 0x01

The next two bytes in the ROP response buffer is the *DataSize* field as described in section 2.2.16.1.1.

```
0006: 15 2e
```

DataSize: 0x2e15 (11797)

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The remaining bytes constitute the *Data* field. The buffer shown above is truncated and all of the stream data is not shown.

Data: 00 00 61-6e 20 61 6c 77 61 79 73 20 72 65 73 74 6f 72 65-20 74 68 65 20 6c 6f 6f 6b 20 6f 66 20 79 6f 75-72 20 64 6f 63 75 6d 65.....

4.4.2.2 Server Response to Client Request

```
0000: 2d 01 00 00 00 00 15 2e
```

The first six bytes of the ROP response buffer contain the *RopId*, *InputHandleIndex*, and *ReturnValue* fields.

```
0000: 2d 01 00 00 00 00
```

RopId: 0x2d (RopWriteStream)

InputHandleIndex: 0x01

ReturnValue: 0x00000000 (Success [MS-OXCDATA])

The last two bytes contain the *WrittenSize* field described in section 2.2.16.2.1.

```
0006: 15 2e
```

WrittenSize: 0x2e15 (11797)

4.4.3 Committing a Stream

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopCommitStream operation as described in section 2.2.17.

4.4.3.1 Client Request Buffer

For the purposes of this example, it is assumed that there is a stream open before this ROP is called. A complete ROP request buffer for RopCommitStream is a three byte sequence formatted as follows:

```
0000: 5d 01 01
```

The three bytes refer to the *RopId*, *LogonId*, and *InputHandleIndex* fields described in [MS-OXCROPS].

RopId: 0x5d (RopCommitStream)

LogonId: 0x01

InputHandleIndex: 0x01

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4.4.3.2 Server Response to Client Request

```
0000: 5d 01 00 00 00 00
```

The six bytes of the ROP response buffer contain the *RopId*, *InputHandleIndex*, and *ReturnValue* fields.

RopId: 0x5d (RopCommitStream)

InputHandleIndex: 0x00

ReturnValue: 0x00000000 (Success [MS-OXCDATA])

4.5 Asynchronous Progress

The following example describes the contents of the ROP request buffer and ROP response buffer for a successful RopProgress as described in section 2.2.22. In this example user is trying to empty a Folder object, which has 729 items in it and RopEmptyFolder will represent the asynchronous operation that RopProgress reports progress for.

The sequence in which ROPs get passed between client and server is shown in Figure 1.

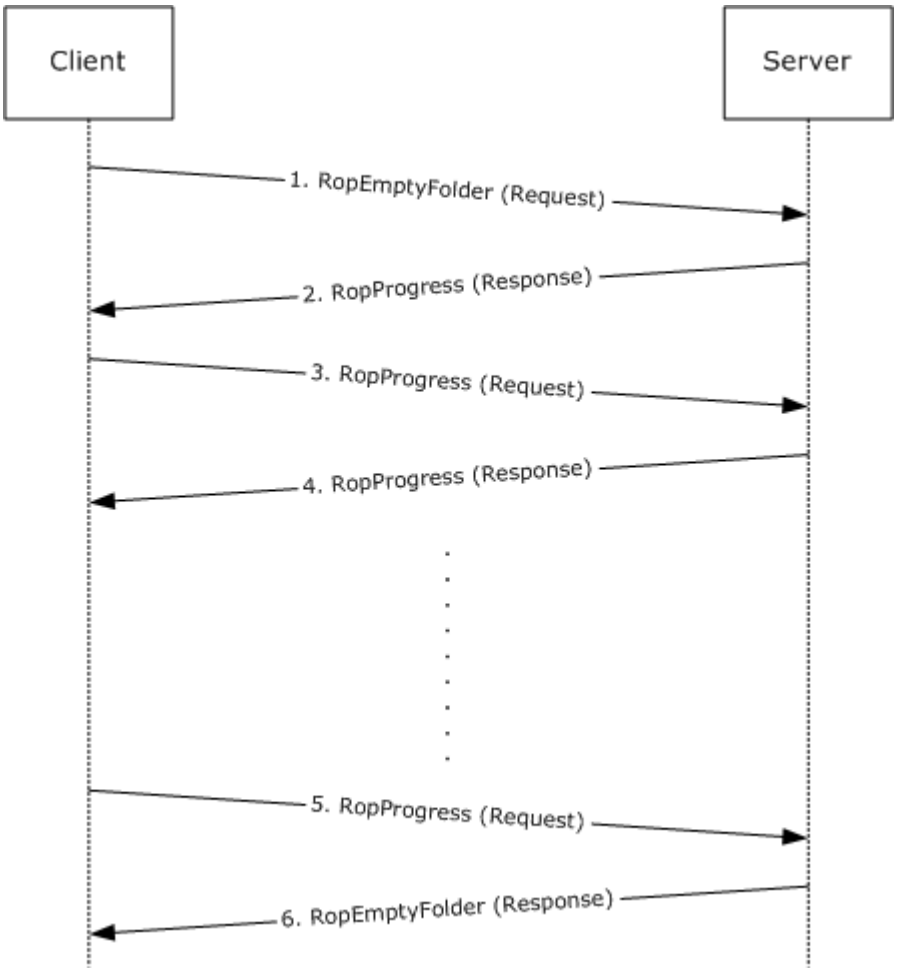

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Figure 1: Sequence in which ROP are passed between client and server

1. Client sends a RopEmptyFolder request to the server as described in [MS-OXCROPS]. The request buffer is formatted as follows:

   ```
   0000: 58 00 00 01 00
   ```

   RopId: 0x58 (RopEmptyFolder)

   LogonId: 0x00

   InputHandleIndex: 0x00

   WantAsynchronous: 0x01 (TRUE)

   WantDeleteAssociated: 0x00 (FALSE)

2. Server responds to request by sending RopProgress ROP response buffer. The ROP response buffer is formatted as follows:

   ```
   0000: 50 00 00 00 00 00 00 1d-00 00 00 d9 02 00 00
   ```

   RopId: 0x50 (RopProgress)

   InputHandleIndex: 0x00

   ReturnValue: 0x00000000 (Success [MS-OXCDATA])

   LogonId: 0x00

   CompletedTaskCount: 0x0000001d (29 in decimal)

   TotalTaskCount: 0x000002d9 (729 in decimal)

3. Now client sends a RopProgress request buffer asking server for the how much progress has been made. The ROP response buffer is formatted as follows:

   ```
   0000: 50 00 00 00
   ```

   RopId: 0x50 (RopProgress)

   LogonId: 0x00

   InputHandleIndex: 0x00

   WantCancel: 0x00 (FALSE)

4. Server responds to request by sending RopProgress ROP response buffer. The ROP response buffer is formatted as follows:

   ```
   0000: 50 00 00 00 00 00 00 3b-00 00 00 d9 02 00 00
   ```


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RopId: 0x50 (RopProgress)

InputHandleIndex: 0x00

ReturnValue: 0x00000000 (ecNone: Success)

LogonId: 0x00

CompletedTaskCount: 0x0000003b (59 in decimal)

TotalTaskCount: 0x000002d9 (729 in decimal)

5. Client keeps sending RopProgress requests and server keeps sending RopProgress ROP response buffer telling client the current progress status.

   Finally when server has completed the RopEmptyFolder operation, then instead of sending a RopProgress ROP response buffer, it sends RopEmptyFolder ROP response buffer back. The following is last RopProgress request that client makes:

```
0000: 50 00 00 00
```

   RopId: 0x50 (RopProgress)

   LogonId: 0x00

   InputHandleIndex: 0x00

   WantCancel: 0x00 (FALSE)

6. Server responds by sending RopEmptyFolder ROP response buffer back formatted as follows:

```
0000: 58 00 00 00 00 00 00
```

   RopId: 0x58 (RopEmptyFolder)

   InputHandleIndex: 0x00

   ReturnValue: 0x00000000 (Success [MS-OXCDATA])

   ParitalCompletion: 0x00 (FALSE)

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5 Security

5.1 Security Considerations for Implementers

There are no special security considerations specific to the Property and Stream object protocol. General security considerations pertaining to the underlying RPC-based transport apply (see [MS-OXCROPS]).

5.2 Index of Security Parameters

None.

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6 Appendix A: Product Behavior

The information in this specification is applicable to the following Microsoft products:

- Microsoft® Office Outlook® 2003
- Microsoft® Exchange Server 2003
- Microsoft® Office Outlook® 2007
- Microsoft® Exchange Server 2007
- Microsoft® Outlook® 2010
- Microsoft® Exchange Server 2010
- Microsoft® Exchange Server 2010 Service Pack 1 (SP1)

Exceptions, if any, are noted below. If a service pack number appears with the product version, behavior changed in that service pack. 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 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 product does not follow the prescription.

<1> Section 3.2.5.18: The initial release version of Exchange 2010 does not implement this ROP.

<2> Section 3.2.5.20: Exchange 2010 does not implement this ROP.

<3> Section 3.2.5.21: Exchange 2010 does not implement this ROP.

<4> Section 3.2.5.22: Exchange 2010 does not implement this ROP.

<5> Section 3.2.5.23: Exchange 2010 does not implement this ROP.

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7 Change Tracking

This section identifies changes that were made to the [MS-OXCPRPT] protocol document between the May 2010 and August 2010 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.

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- 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	56811 Added glossary terms used within the document.	N	Content update.
1.2.1 Normative References	57597 Added [MS-DTYP] and [MS-OXCFXICS] to list of references.	N	Content update.
1.2.2 Informative References	55751 Added [MS-OXGLOS] to the list of informative references.	N	Content update.
2.2.2.1.1 PropertySizeLimit	56448 Changed reference for "NotEnoughMemory" error code.	N	Content update.
2.2.2.1.1 PropertySizeLimit	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
2.2.2.1.4 PropertyTags	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
2.2.2.2.1 RowData	56448 Changed reference for "NotEnoughMemory" error code.	N	Content update.
2.2.3.1.1	56448	N	Content

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Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
PropertySizeLimit	Changed reference for "NotEnoughMemory" error code.		update.
2.2.3.1.1 PropertySizeLimit	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
2.2.3.2.2 PropertyValues	56448 Changed reference for "NotEnoughMemory" error code.	N	Content update.
2.2.10.2.1 PropertyProblemCount	52881 Added requirement that field is not present when ReturnValue is NullDestinationObject.	N	Content update.
2.2.10.2.2 PropertyProblems	52881 Added requirement that field is not present when ReturnValue is NullDestinationObject.	N	Content update.
2.2.11.2.1 PropertyProblemCount	52881 Added requirement that field is not present when ReturnValue is NullDestinationObject.	N	Content update.
2.2.11.2.2 PropertyProblems	52881 Added requirement that field is not present when ReturnValue is NullDestinationObject.	N	Content update.
2.2.15.1.2 MaximumByteCount	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
2.2.15.2.1 DataSize	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
2.2.22 RopProgress	57597 Corrected reference for RopCopyTo and RopCopyProperties.	N	Content update.
3.1.1.1 Property Transactions	56472 Corrected ROP names and references.	N	Content update.
3.1.4.2 When Client Needs to Set Data	55017 Added guidance for read-only and calculated properties.	N	Content update.
3.1.4.3 When the Client Needs to Query Data Larger than Will Fit in a Single ROP	56448 Changed reference for "NotEnoughMemory" error code.	N	Content update.

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Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
3.1.5 Message Processing Events and Sequencing Rules	57597 Corrected reference for RopCopyTo and RopCopyProperties.	N	Content update.
3.2.5.1 Processing RopGetPropertiesSpecific	56448 Changed reference for "NotEnoughMemory" error code.	N	Content update.
3.2.5.18 Processing RopCopyToStream	55282 Added product behavior note to indicate the initial release version of Exchange 2010 does not implement this ROP.	N	New product behavior note added.
3.2.5.20 Processing RopLockRegionStream	57315 Revised guidance for processing RopLockRegionStream.	N	Content update.
3.2.5.21 Processing RopUnlockRegionStream	57315 Revised guidance for processing RopUnlockRegionStream.	N	Content update.
3.2.5.22 Processing RopWriteAndCommitStream	55499 Added new topic to provide guidance for processing RopWriteAndCommitStream.	N	New content added.
3.2.5.23 Processing RopCloneStream	55282 Added new section to provide guidance for processing RopWriteAndCommitStream.	N	New content added.
4.1 Getting PropertyIds	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.2.2 Server Response to Client Request	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.3.2 Server Response to Client Request	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.4.1 Opening a Stream	56447 Revised content.	N	Editorially updated.
4.4.1.2 Server Response to Client Request	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.4.2.1 Client Request Buffer	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.4.2.2 Server Response to Client	56447 Replaced "response buffer" with "ROP	N	Editorially updated.

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Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
Request	response buffer".		
4.4.3.2 Server Response to Client Request	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
4.5 Asynchronous Progress	56447 Replaced "response buffer" with "ROP response buffer".	N	Editorially updated.
6 Appendix A: Product Behavior	56121 Added Exchange Server SP1 to list of applicable products.	N	Content update.

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