

[MS-CSOMREST]: SharePoint Client Query OData Protocol Specification

Intellectual Property Rights Notice for Open Specifications Documentation

- **Technical Documentation.** Microsoft publishes Open Specifications documentation for protocols, file formats, languages, standards as well as overviews of the interaction among each of these technologies.
- **Copyrights.** This documentation is covered by Microsoft copyrights. Regardless of any other terms that are contained in the terms of use for the Microsoft website that hosts this documentation, you may make copies of it in order to develop implementations of the technologies described in the Open Specifications and may distribute portions of it in your implementations using these technologies or your documentation as necessary to properly document the implementation. You may also distribute in your implementation, with or without modification, any schema, IDL's, or code samples that are included in the documentation. This permission also applies to any documents that are referenced in the Open Specifications.
- **No Trade Secrets.** Microsoft does not claim any trade secret rights in this documentation.
- **Patents.** Microsoft has patents that may cover your implementations of the technologies described in the Open Specifications. Neither this notice nor Microsoft's delivery of the documentation grants any licenses under those or any other Microsoft patents. However, a given Open Specification may be covered by Microsoft [Open Specification Promise](#) or the [Community Promise](#). If you would prefer a written license, or if the technologies described in the Open Specifications are not covered by the Open Specifications Promise or Community Promise, as applicable, patent licenses are available by contacting iplg@microsoft.com.
- **Trademarks.** The names of companies and products contained in this documentation may be covered by trademarks or similar intellectual property rights. This notice does not grant any licenses under those rights.
- **Fictitious Names.** The example companies, organizations, products, domain names, e-mail addresses, logos, people, places, and events depicted in this documentation are fictitious. No association with any real company, organization, product, domain name, email address, logo, person, place, or event is intended or should be inferred.

Reservation of Rights. All other rights are reserved, and this notice does not grant any rights other than specifically described above, whether by implication, estoppel, or otherwise.

Tools. The Open Specifications do not require the use of Microsoft programming tools or programming environments in order for you to develop an implementation. If you have access to Microsoft programming tools and environments you are free to take advantage of them. Certain Open Specifications are intended for use in conjunction with publicly available standard specifications and network programming art, and assumes that the reader either is familiar with the aforementioned material or has immediate access to it.

Revision Summary

Date	Revision History	Revision Class	Comments
01/20/2012	0.1	New	Released new document.
04/11/2012	0.1	No change	No changes to the meaning, language, or formatting of the technical content.
07/16/2012	0.1	No change	No changes to the meaning, language, or formatting of the technical content.
09/12/2012	0.1	No change	No changes to the meaning, language, or formatting of the technical content.
10/08/2012	1.0	Major	Significantly changed the technical content.

Table of Contents

1 Introduction	5
1.1 Glossary	5
1.2 References	6
1.2.1 Normative References	6
1.2.2 Informative References	6
1.3 Overview	7
1.4 Relationship to Other Protocols	7
1.5 Prerequisites/Preconditions	8
1.6 Applicability Statement	8
1.7 Versioning and Capability Negotiation	8
1.8 Vendor-Extensible Fields	9
1.9 Standards Assignments	9
2 Messages	10
2.1 Transport	10
2.2 Message Syntax	10
2.2.1 Namespaces	10
2.2.2 Custom HTTP Methods	10
2.2.3 Custom HTTP Headers	11
2.2.4 Elements	11
2.2.5 Complex Types	11
2.2.5.1 CSOM Array	12
2.2.5.2 CSOM Dictionary	12
2.2.5.3 CSOM Null	12
2.2.5.4 CSOM Object	12
2.2.5.5 CSOM Value Object	13
2.2.5.6 CSOM Stream	13
2.2.5.7 CSOM Error	13
2.2.6 Simple Types	13
2.2.6.1 CSOM binary	15
2.2.6.2 CSOM Boolean	15
2.2.6.3 CSOM Byte	15
2.2.6.4 CSOM Char	15
2.2.6.5 CSOM DateTime	15
2.2.6.6 CSOM Decimal	16
2.2.6.7 CSOM Double	16
2.2.6.8 CSOM Enum	16
2.2.6.9 CSOM GUID	16
2.2.6.10 CSOM Int16	16
2.2.6.11 CSOM Int32	16
2.2.6.12 CSOM Int64	16
2.2.6.13 CSOM SByte	17
2.2.6.14 CSOM Single	17
2.2.6.15 CSOM String	17
2.2.6.16 CSOM TimeSpan	17
2.2.6.17 CSOM UInt16	17
2.2.6.18 CSOM UInt32	17
2.2.6.19 CSOM UInt64	17
2.2.7 Attributes	17
2.2.8 Groups	18

2.2.9	Attribute Groups	18
3	Protocol Details	19
3.1	Server Details	19
3.1.1	Abstract Data Model	19
3.1.2	Timers	20
3.1.3	Initialization	20
3.1.4	Higher-Layer Triggered Events	20
3.1.5	Message Processing Events and Sequencing Rules	20
3.1.5.1	ProcessRestQuery	21
3.1.5.1.1	Message.....	22
3.1.5.1.1.1	Request Body.....	22
3.1.5.1.1.2	Response Body.....	22
3.1.5.1.2	Elements.....	22
3.1.5.1.3	Complex Types	22
3.1.5.1.3.1	SP.KeyValue	22
3.1.5.1.3.2	SP.SimpleDataRow	23
3.1.5.1.3.3	SP.SimpleDataTable.....	23
3.1.5.1.4	Simple Types.....	23
3.1.5.1.5	Attributes.....	23
3.1.5.1.6	Attribute Groups	23
3.1.6	Timer Events	23
3.1.7	Other Local Events	23
4	Protocol Examples.....	24
4.1	Retrieve Book Information	27
4.2	Retrieve Books by a Specific Author	27
4.3	Update Book Information	28
4.4	Add a Book to a Catalog	29
4.5	Unsuccessfully Add a Book to a Catalog	29
4.6	Retrieve Book Sample Content	30
4.7	Update Book Sample Content	31
4.8	Check out a Book.....	31
5	Security.....	32
5.1	Security Considerations for Implementers.....	32
5.2	Index of Security Parameters	32
6	Appendix A: Full CSDL	33
7	Appendix B: Product Behavior	34
8	Change Tracking.....	35
9	Index	38

1 Introduction

The SharePoint Client Query OData Protocol allows a protocol client to use common web technologies to send Open Data protocol (OData) request to access data on a protocol server when the protocol server implements SharePoint Client Query Protocol. The OData requests to be executed are sent by a protocol client, and the OData responses are returned by a protocol server.

Sections 1.8, 2, and 3 of this specification are normative and can contain the terms MAY, SHOULD, MUST, MUST NOT, and SHOULD NOT as defined in RFC 2119. Sections 1.5 and 1.9 are also normative but cannot contain those terms. All other sections and examples in this specification are informative.

1.1 Glossary

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

Hypertext Transfer Protocol (HTTP)
Hypertext Transfer Protocol over Secure Sockets Layer (HTTPS)
XML

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

CSOM array
CSOM binary
CSOM Boolean
CSOM Byte
CSOM Char
CSOM DateTime
CSOM dictionary
CSOM Double
CSOM GUID
CSOM Int16
CSOM Int32
CSOM Int64
CSOM method
CSOM Object
CSOM Object type
CSOM property
CSOM SByte
CSOM Single
CSOM String
CSOM type name
CSOM UInt16
CSOM UInt32
CSOM UInt64
CSOM value object
CSOM value object type
JavaScript Object Notation (JSON)
Request-URI
website
XML schema

The following terms are specific to this document:

Open Data Protocol (OData): A web protocol for querying and updating data specified in [MS-ODATA].

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

1.2 References

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

1.2.1 Normative References

We conduct frequent surveys of the normative references to assure their continued availability. If you have any issue with finding a normative reference, please contact dochelp@microsoft.com. We will assist you in finding the relevant information. Please check the archive site, <http://msdn2.microsoft.com/en-us/library/E4BD6494-06AD-4aed-9823-445E921C9624>, as an additional source.

[MC-CSDL] Microsoft Corporation, "[Conceptual Schema Definition File Format](#)".

[MS-CSOM] Microsoft Corporation, "[SharePoint Client Query Protocol Specification](#)".

[MS-ODATA] Microsoft Corporation, "[Open Data Protocol \(OData\) Specification](#)".

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

[RFC2616] Fielding, R., Gettys, J., Mogul, J., et al., "Hypertext Transfer Protocol -- HTTP/1.1", RFC 2616, June 1999, <http://www.ietf.org/rfc/rfc2616.txt>

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

[RFC4627] Crockford, D., "The application/json Media Type for Javascript Object Notation (JSON)", RFC 4627, July 2006, <http://www.ietf.org/rfc/rfc4627.txt>

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

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

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

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

1.2.2 Informative References

[MS-CSOMSPT] Microsoft Corporation, "[SharePoint Client-Side Object Model Protocol Specification](#)".

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

1.3 Overview

This protocol enables a protocol client to send an **OData** request to a protocol server using common web technologies when the protocol server implements SharePoint Client Query Protocol, [\[MS-CSOM\]](#).

This protocol defines a system for locating instances of types, calling methods that are defined by those types, and performing read/write operations for properties of those types. This protocol defines two roles: protocol client and protocol server. A protocol client initiates communication by generating an OData request. The protocol client then sends that OData request to the protocol server for processing. The protocol server locates the instances of types, performs action and then returns the OData response.

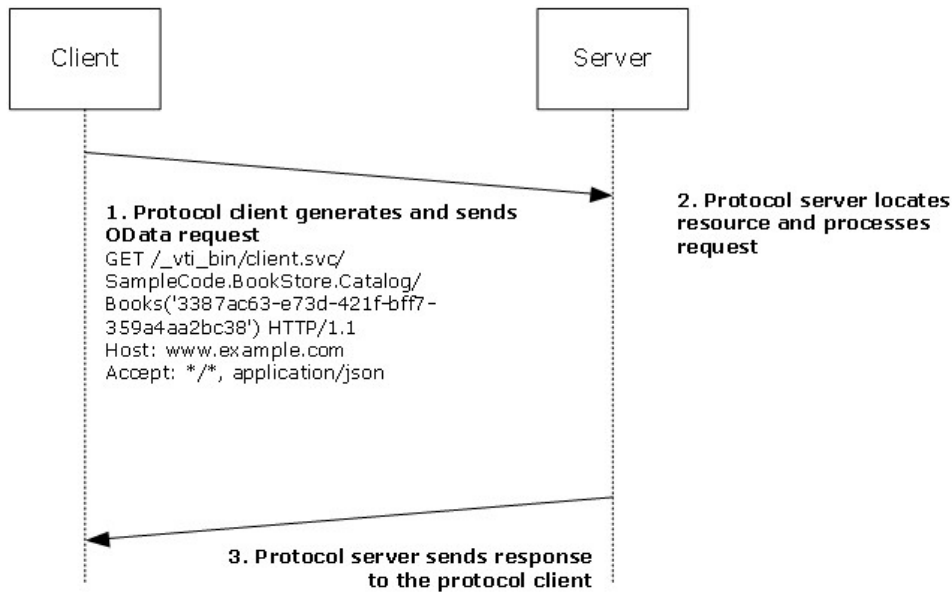


Figure 1: Overview of a request/response sequence

1.4 Relationship to Other Protocols

This protocol enables a protocol client to send a request that calls methods and accesses data on a protocol server, and then receive a corresponding response from the protocol server. This protocol depends on other structures and protocols to transport messages. Additional protocols, such as the SharePoint Client-Side Object Model Protocol described in [\[MS-CSOMSPT\]](#), define the properties and methods that are exposed to protocol clients through this protocol. Applications are layered on top of this protocol, in combination with related protocols that define sets of logical types and related methods and properties.

The messages that are sent from the protocol client to the protocol server are formatted as OData format as described in [\[MS-ODATA\]](#), either as **XML** or **JSON**. It transmits those messages by using **HTTP**, as described in [\[RFC2616\]](#), or **HTTPS**, as described in [\[RFC2818\]](#). Responses from the protocol server are formatted as OData format as described in [\[MS-ODATA\]](#), either as XML or JSON.

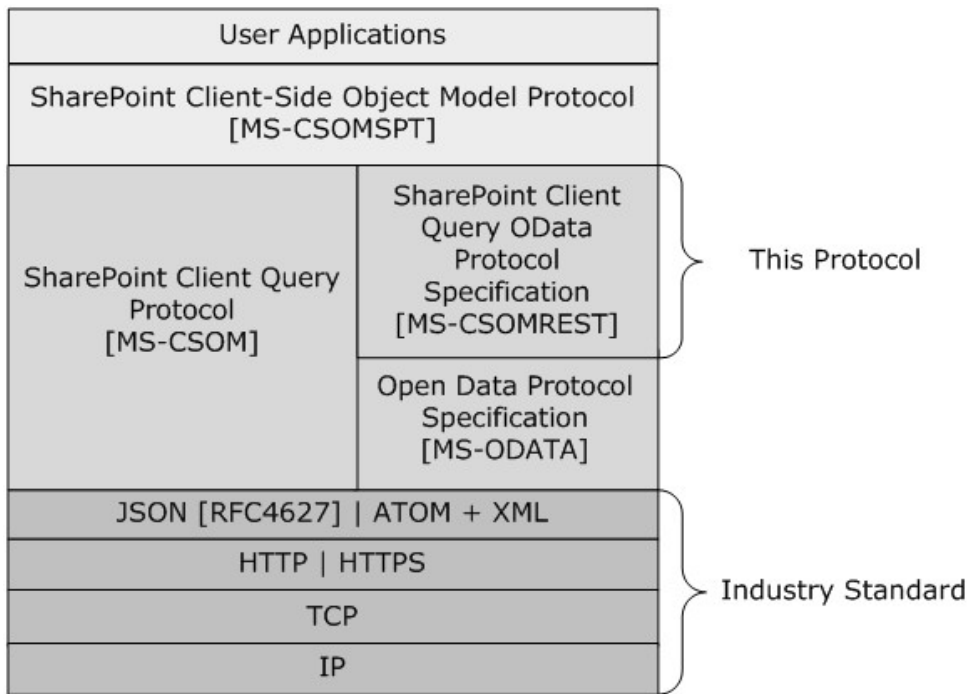


Figure 2: This protocol in relation to other protocols

1.5 Prerequisites/Preconditions

This protocol operates against a protocol server that is configured to listen for HTTP or HTTPS requests and a protocol client that knows the **Request-URI** of the protocol server.

This protocol assumes that the protocol server implements SharePoint Client Query Protocol as described in [\[MS-CSOM\]](#).

1.6 Applicability Statement

This protocol can be used as a protocol for a protocol client to perform create, retrieve, update and delete operations using common web technologies against a protocol server that implements SharePoint Client Query protocol as described in [\[MS-CSOM\]](#). It is not suitable for a protocol client to perform batch operations against the protocol server.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- **Supported Transports:** This protocol can use HTTP or HTTPS as a transport. For more information, see Transport (section [2.1](#)).
- **Protocol Versions:** The protocol client specifies the OData protocol version by using **DataServiceVersion** HTTP header as described in [\[MS-ODATA\]](#) section 2.2.5.3 and **MaxDataServiceVersion** HTTP header as describe in [\[MS-ODATA\]](#) section 2.2.5.7.
- **Capability Negotiation:** Capability negotiation is performed as described in [\[MS-ODATA\]](#) section 1.7.

1.8 Vendor-Extensible Fields

This protocol supports custom HTTP headers, as specified in [\[RFC2616\]](#) section 4.2.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

Protocol servers MUST support HTTP, as specified in [\[RFC2616\]](#). Protocol servers SHOULD additionally support HTTPS, as specified in [\[RFC2818\]](#), to help secure communications with protocol clients. Messages that a protocol client sends to a protocol server MUST be formatted as **ProcessRestQueryIn** messages, as specified in section [3.1.5.1.1.1](#). Protocol clients MUST use the DELETE, GET, MERGE, PATCH, POST, or PUT method to send messages to protocol servers. Messages that a protocol server sends to a protocol client MUST be formatted as **ProcessRestQueryOut** messages, as specified in section [3.1.5.1.1.2](#).

2.2 Message Syntax

This section contains common definitions used by this protocol. The syntax of the definitions uses the XML Schema as specified in [\[XMLSCHEMA1\]](#) and [\[XMLSCHEMA2\]](#), Web Services Description Language as specified in [\[WSDL\]](#), and JavaScript Object Notation (JSON) as specified in [\[RFC4627\]](#).

2.2.1 Namespaces

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

Prefix	Namespace URI	Reference
mstns	http://schemas.microsoft.com/sharepoint/clientquery/2009	
xs	http://www.w3.org/2001/XMLSchema	[XMLSCHEMA1]
wsu	http://docs.oasis-open.org/wss/2004/01/oasis-200401-wss-wssecurity-utility-1.0.xsd	
wsp	http://schemas.xmlsoap.org/ws/2004/09/policy	
wsaw	http://www.w3.org/2006/05/addressing/wSDL	
tns	http://schemas.microsoft.com/sharepoint/soap/	
xsd	http://www.w3.org/2001/XMLSchema	
http	http://schemas.microsoft.com/ws/06/2004/policy/http	
wsdl	http://schemas.xmlsoap.org/wsdl/	
(none)	http://schemas.microsoft.com/sharepoint/clientquery/2009	

In addition, this protocol supports the namespaces as described in [\[MS-ODATA\]](#) section 2.2.6.

2.2.2 Custom HTTP Methods

This protocol supports all HTTP Methods as defined in [\[MS-ODATA\]](#) section 2.2.4.

2.2.3 Custom HTTP Headers

This protocol supports all HTTP Headers as defined in [\[MS-ODATA\]](#) section 2.2.5.

2.2.4 Elements

This specification does not define any common **XML schema** element definitions.

2.2.5 Complex Types

The following table summarizes the set of complex type definitions defined by this specification. XML schema complex type definitions that are specific to a particular operation are described with the operation.

Complex type	Description
CSOM array	A CSOM array complex type as specified in [MS-CSOM] section 2.2.4.1.
CSOM dictionary	A CSOM dictionary complex type as specified in [MS-CSOM] section 2.2.4.2.
CSOM null	A CSOM null complex type as specified in [MS-CSOM] section 2.2.4.3.
CSOM Object	A CSOM Object complex type as specified in [MS-CSOM] section 2.2.4.4.
CSOM value object	A CSOM value object complex type as specified in [MS-CSOM] section 2.2.4.5.
CSOM Stream	A CSOM Stream complex type as specified in [MS-CSOM] section 2.2.4.6.
CSOM Error	A CSOM error as specified in [MS-CSOM] section 3.1.4.1.8.1.2.

The following table summarizes the mapping between the complex types as specified in [\[MS-CSOM\]](#) and the types as specified in [\[MS-ODATA\]](#).

CSOM complex type	OData type
CSOM array	Collection of Complex Type Instances as specified in [MS-ODATA] section 2.2.6.3.5 and [MS-ODATA] section 2.2.6.5.2. Collection of EDMSimpleType Values as specified in [MS-ODATA] section 2.2.6.3.7 and [MS-ODATA] section 2.2.6.5.4. Entity Set as specified in [MS-ODATA] section 2.2.6.2.1 and [MS-ODATA] section 2.2.6.3.2.
CSOM dictionary	Collection of Complex Type Instances as specified in [MS-ODATA] section 2.2.6.3.5 and [MS-ODATA] section 2.2.6.5.2.
CSOM null	null as specified in [MS-ODATA] section 2.2.2.
CSOM Object	Entity Type as specified in [MS-ODATA] section 2.2.6.2.2 and [MS-ODATA] section 2.2.6.3.3. Entity Set as specified in [MS-ODATA] section 2.2.6.2.1 and [MS-ODATA] section 2.2.6.3.2.
CSOM value object	Complex Type as specified in [MS-ODATA] section 2.2.6.2.3 and [MS-ODATA] section 2.2.6.3.4.
CSOM Stream	Edm.Stream as specified in [MS-ODATA] section 2.2.2.

CSOM complex type	OData type
CSOM error	Error Response as specified in [MS-ODATA] section 2.2.8.1.

2.2.5.1 CSOM Array

The CSOM array type, which conforms to the **CSOM Array** complex type as specified in [\[MS-CSOM\]](#) section 2.2.4.1, is used in OData formats as Collection of Complex Type Instances, Collection of EDMSimple Type Values or Entity Set as specified in [\[MS-ODATA\]](#).

If the elements in the CSOM array are **EDM complex types**, the CSOM array formats as Collection of Complex Type Instances as specified in [\[MS-ODATA\]](#) section 2.2.6.3.5 and [\[MS-ODATA\]](#) section 2.2.6.5.2.

If the elements in the CSOM array are **EDM simple types**, the CSOM array formats as Collection of EDMSimpleType Values as specified in [\[MS-ODATA\]](#) section 2.2.6.3.7 and [\[MS-ODATA\]](#) section 2.2.6.5.4.

If the elements in the CSOM array are **EDM entity types**, the CSOM array formats as Entity Set as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1 and [\[MS-ODATA\]](#) section 2.2.6.3.2.

2.2.5.2 CSOM Dictionary

The CSOM dictionary complex type, which conforms to the **CSOM dictionary** complex type as specified in [\[MS-CSOM\]](#) section 2.2.4.2, is a collection of **EDM complex types**. When it is used in OData, it formats as Collection of Complex Type Instances as specified in [\[MS-ODATA\]](#) section 2.2.6.3.5 and [\[MS-ODATA\]](#) section 2.2.6.5.2. The elements in the collection of **EDM complex types** are of type **SP.KeyValue** as specified in section [3.1.5.1.3.1](#), where the **SP.KeyValue** represents the key value pair in the CSOM dictionary. The value of the property key in **SP.KeyValue** type is the value of the key in the key value pair. The value of the property value in the **SP.KeyValue** type is the string representation of the value in the key value pair. The value of property **ValueType** in the **SP.KeyValue** type is the type name of the value in the key value pair.

2.2.5.3 CSOM Null

The **CSOM Null** type, which conforms to the **CSOM Null** type as specified in [\[MS-CSOM\]](#) section 2.2.4.3, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This type MUST also conform to the **null** type, as specified in [\[MS-ODATA\]](#) section 2.2.2

2.2.5.4 CSOM Object

The CSOM Object type, which conforms to the **CSOM Object** complex type as specified in [\[MS-CSOM\]](#) section 2.2.4.4, is used in Open Data Protocol (OData) formats as Entity Type or Entity Set as specified in [\[MS-ODATA\]](#).

If the CSOM Object is a collection and its child elements are **EDM entity types**, the CSOM Object is an **EDM entity set** and it formats as Entity Set as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1 and [\[MS-ODATA\]](#) section 2.2.6.3.2.

Otherwise, the CSOM Object is an **EDM entity type** and it formats as Entity Type as specified in [\[MS-ODATA\]](#) section 2.2.6.2.2 and [\[MS-ODATA\]](#) section 2.2.6.3.3. The name of the **EDM entity type** for the CSOM Object is the **CSOM type name** of the CSOM Object. Each property in the CSOM Object is a property in the **EDM entity type**. In addition, if the CSOM Object is a collection and its child elements are **EDM complex types**, or its child elements are **EDM simple types**, the **EDM**

entity type of this CSOM Object has a property named "Items". When the child elements are **EDM complex types**, the type of the property "Items" is a collection of **EDM complex types**. When the child elements of this CSOM Object are **EDM simple types**, the type of property "Items" is a collection of **EDM simple types**.

2.2.5.5 CSOM Value Object

The CSOM value object type, which conforms to the **CSOM value object** complex type as specified in [\[MS-CSOM\]](#) section 2.2.4.5, is an **EDM complex type**. When it is used in OData, it formats as a complex type as specified in [\[MS-ODATA\]](#) section 2.2.6.2.3 and [\[MS-ODATA\]](#) section 2.2.6.3.4. The name of the **EDM complex type** for the CSOM value object is the CSOM type name of the CSOM value object. Each property in the CSOM value object is a property in the **EDM complex type**.

2.2.5.6 CSOM Stream

The **CSOM Stream** type, which conforms to the **CSOM Stream** complex type as specified in [\[MS-CSOM\]](#) section 2.2.4.6, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This **CSOM Stream** type MUST also conform to the **Edm.Stream** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.5.7 CSOM Error

The CSOM error, which conforms to CSOM Error JSON value as specified in [\[MS-CSOM\]](#) section 3.1.4.1.8.1.2, is sent to the protocol client by the protocol server when there is an error while the protocol server processes the OData request. It formats as an OData error response as specified in [\[MS-ODATA\]](#) section 2.2.8.1. The following is the map between the properties in the OData error response and the properties of CSOM Error JSON value.

Error Code: The error code property in the OData error response is the value of CSOM error code concatenated with CSOM error type name with separator comma (,). For example, if the CSOM error's error code is -2147024846 and the CSOM error type name is Microsoft.SharePoint.Client.ApiBlockedException, the error code in the OData error response is:

```
-2147024846,Microsoft.SharePoint.Client.ApiBlockedException
```

Error Message: The error message property in the OData error response is the value of CSOM error message.

Inner Error: The inner error property in the OData error response is the value of CSOM error call stack.

2.2.6 Simple Types

The following table summarizes the set of common XML schema simple type definitions defined by this specification. XML schema simple type definitions that are specific to a particular operation are described with the operation.

Simple type	Description
CSOM binary	A CSOM binary simple type as specified in [MS-CSOM] section 2.2.5.1.
CSOM Boolean	A CSOM Boolean simple type as specified in [MS-CSOM] section 2.2.5.2.
CSOM Byte	A CSOM Byte simple type as specified in [MS-CSOM] section 2.2.5.3.

Simple type	Description
CSOM Char	A CSOM Char simple type as specified in [MS-CSOM] section 2.2.5.4.
CSOM DateTime	A CSOM DateTime simple type as specified in [MS-CSOM] section 2.2.5.5.
CSOM Decimal	A CSOM Decimal simple type as specified in [MS-CSOM] section 2.2.5.18.
CSOM Double	A CSOM Double simple type as specified in [MS-CSOM] section 2.2.5.6.
CSOM Enum	A CSOM Enum simple type as specified in [MS-CSOM] section 2.2.5.7.
CSOM GUID	A CSOM GUID simple type as specified in [MS-CSOM] section 2.2.5.8.
CSOM Int16	A CSOM Int16 simple type as specified in [MS-CSOM] section 2.2.5.9.
CSOM Int32	A CSOM Int32 simple type as specified in [MS-CSOM] section 2.2.5.10.
CSOM Int64	A CSOM Int64 simple type as specified in [MS-CSOM] section 2.2.5.11.
CSOM SByte	A CSOM SByte simple type as specified in [MS-CSOM] section 2.2.5.12.
CSOM Single	A CSOM Single simple type as specified in [MS-CSOM] section 2.2.5.13.
CSOM String	A CSOM String simple type as specified in [MS-CSOM] section 2.2.5.14.
CSOM TimeSpan	A CSOM TimeSpan simple type as specified in [MS-CSOM] section 2.2.5.19.
CSOM UInt16	A CSOM UInt16 simple type as specified in [MS-CSOM] section 2.2.5.15.
CSOM UInt32	A CSOM UInt32 simple type as specified in [MS-CSOM] section 2.2.5.16.
CSOM UInt64	A CSOM UInt64 simple type as specified in [MS-CSOM] section 2.2.5.17.

The following table summarizes the mapping between the simple types as specified in [\[MS-CSOM\]](#) and the **Edm** types as specified in [\[MS-ODATA\]](#) section 2.2.2.

CSOM simple type	Edm type
CSOM binary	Edm.Binary
CSOM Boolean	Edm.Boolean
CSOM Byte	Edm.Byte
CSOM Char	Edm.String
CSOM DateTime	Edm.DateTime
CSOM Decimal	Edm.Decimal
CSOM Double	Edm.Double
CSOM Enum	Edm.Int16, Edm.Int32, or Edm.Int64
CSOM GUID	Edm.Guid
CSOM Int16	Edm.Int16
CSOM Int32	Edm.Int32

CSOM simple type	Edm type
CSOM Int64	Edm.Int64
CSOM SByte	Edm.SByte
CSOM Single	Edm.Single
CSOM String	Edm.String
CSOM TimeSpan	Edm.Time
CSOM UInt16	Edm.Int32
CSOM UInt32	Edm.Int64
CSOM UInt64	Edm.Int64

2.2.6.1 CSOM binary

The CSOM binary simple type, which conforms to the **CSOM binary** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.1, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Binary** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.2 CSOM Boolean

The CSOM Boolean simple type, which conforms to the **CSOM Boolean** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.2, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Boolean** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.3 CSOM Byte

The CSOM Byte simple type, which conforms to the **CSOM Byte** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.3, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Byte** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.4 CSOM Char

The CSOM Char simple type, which conforms to the **CSOM Char** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.4, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.String** type, as specified in [\[MS-ODATA\]](#) section 2.2.2. The length of the **Edm.String** value MUST be 1.

2.2.6.5 CSOM DateTime

A **CSOM DateTime** value specified by [\[MS-CSOM\]](#) section 2.2.5.5 used in OData formats specified by [\[MS-ODATA\]](#) section 2.2.6 MUST conform to the **Edm.DateTime** type as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.6 CSOM Decimal

A **CSOM Decimal** value specified by [\[MS-CSOM\]](#) section 2.2.5.18 used in OData formats specified by [\[MS-ODATA\]](#) section 2.2.6 MUST conform to the **Edm.Decimal** type as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.7 CSOM Double

The CSOM Double simple type, which conforms to the **CSOM Double** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.6, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Double** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.8 CSOM Enum

The **CSOM Enum** simple type, which conforms to the **CSOM Enum** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.7, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int16**; **Edm.Int32**; or **Edm.Int64** type, as specified in [\[MS-ODATA\]](#) section 2.2.2. When the integer value of the **CSOM Enum** can range from -32768 through 32767, the **CSOM Enum** MUST be represented as an **Edm.Int16**. When the integer value can range from -2147483648 through 2147483647, the **CSOM Enum** MUST be represented as an **Edm.Int32**. When the integer value can range from -9223372036854775808 through 9223372036854775807, the **CSOM Enum** MUST be represented as an **Edm.Int64**. The integer value of the **CSOM Enum** will correspond to the value of the **Edm.Int16**, **Edm.Int32**, or **Edm.Int64**, respectively.

2.2.6.9 CSOM GUID

The CSOM GUID simple type, which conforms to the **CSOM GUID** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.8, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Guid** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.10 CSOM Int16

The CSOM Int16 simple type, which conforms to the **CSOM Int16** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.9, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int16** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.11 CSOM Int32

The CSOM Int32 simple type, which conforms to the **CSOM Int32** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.10, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int32** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.12 CSOM Int64

The CSOM Int64 simple type, which conforms to the **CSOM Int64** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.11, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int64** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.13 CSOM SByte

The CSOM SByte simple type, which conforms to the **CSOM SByte** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.12, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.SByte** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.14 CSOM Single

The CSOM Single simple type, which conforms to the **CSOM Single** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.13, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Single** type, as specified in [\[MS-ODATA\]](#) section 2.2.2. The value of the corresponding **Edm.Single** MUST exist in the range of values for **CSOM Single** as specified in [\[MS-CSOM\]](#) section 2.2.5.13.

2.2.6.15 CSOM String

The CSOM String simple type, which conforms to the **CSOM String** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.14, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.String** type, as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.16 CSOM TimeSpan

A **CSOM TimeSpan** value specified by [\[MS-CSOM\]](#) section 2.2.5.19 used in OData formats specified by [\[MS-ODATA\]](#) section 2.2.6 MUST conform to the **Edm.Time** type as specified in [\[MS-ODATA\]](#) section 2.2.2.

2.2.6.17 CSOM UInt16

The CSOM UInt16 simple type, which conforms to the **CSOM UInt16** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.15, is used in OData formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int32** type, as specified in [\[MS-ODATA\]](#) section 2.2.2. The value of the corresponding **Edm.Int32** MUST exist in the range for **CSOM UInt16** as specified in [\[MS-CSOM\]](#) section 2.2.5.15.

2.2.6.18 CSOM UInt32

The CSOM UInt32 simple type, which conforms to the **CSOM UInt32** simple type as specified in [\[MS-CSOM\]](#) section 2.2.5.16, is used in Open Data Protocol (OData) formats as specified in [\[MS-ODATA\]](#) section 2.2.6. This simple type MUST also conform to the **Edm.Int64** type, as specified in [\[MS-ODATA\]](#) section 2.2.2. The value of the corresponding **Edm.Int64** MUST exist in the range for **CSOM UInt32** as specified in [\[MS-CSOM\]](#) section 2.2.5.16.

2.2.6.19 CSOM UInt64

A **CSOM UInt64** value specified by [\[MS-CSOM\]](#) section 2.2.5.17 used in OData formats specified by [\[MS-ODATA\]](#) section 2.2.6 MUST conform to the **Edm.Int64** type as specified in [\[MS-ODATA\]](#) section 2.2.2. When the **CSOM UInt64** value is greater than 9223372036854775807, the protocol server MUST return error.

2.2.7 Attributes

This specification does not define any common XML schema attribute definitions.

2.2.8 Groups

This specification does not define any common XML schema group definitions.

2.2.9 Attribute Groups

This specification does not define any common XML schema attribute group definitions.

3 Protocol Details

The client side of this protocol is simply a pass-through. That is, no additional timers or other state is required on the client side of this protocol. Calls made by the higher-layer protocol or application are passed directly to the transport, and the results returned by the transport are passed directly back to the higher-layer protocol or application.

3.1 Server Details

This protocol allows protocol servers to perform implementation specific authorization checks and to notify protocol clients of authorization faults by using either HTTP status codes or OData Error Response as specified in [\[MS-ODATA\]](#) section 2.2.8.1. Except where specified otherwise, protocol clients SHOULD interpret HTTP status codes as specified in [\[RFC2616\]](#) section 10 and OData Error Response as specified in [\[MS-ODATA\]](#) section 2.2.8.1.

3.1.1 Abstract Data Model

This section describes the relationship between the abstract data model specified in [\[MS-CSOM\]](#) section 3.1.1 and the abstract data model specified in [\[MS-ODATA\]](#) section 2.2.1. The abstract data model specified in [\[MS-ODATA\]](#) section 2.2.1 uses the Entity Data Model as its data modeling vocabulary, which is specified in [\[MC-CSDL\]](#) section 2. The described relationship 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 [\[MS-CSOM\]](#) and [\[MS-ODATA\]](#).

Data model as specified in [\[MS-CSOM\]](#) map to Entity Data Model terms as shown in the following table:

CSOM data model	Entity Data Model
CSOM value object type	EDM complex type
CSOM Object type	EDM entity type
CSOM array	A collection of EDM simple type values, or a collection of EDM complex type values, or EDM entity set
CSOM dictionary	A collection of EDM complex type values
CSOM null	The EDM simple type null
CSOM property	EDM property or EDM navigation property
CSOM method	EDM function import

CSOM Value Object Type

A CSOM value object type is mapped to an **EDM complex type**. The name of the **EDM complex type** is the CSOM type name of the CSOM value object type. For each CSOM property in the CSOM value object type, if the type of the CSOM property could be mapped to **EDM complex type**, **EDM simple type**, collection of **EDM complex type** or collection of **EDM simple type**, the CSOM property is mapped to an **EDM property** in the corresponding **EDM complex type**, otherwise, the CSOM property is not mapped to any **EDM property** in the corresponding **EDM complex type**.

CSOM Object Type

A CSOM Object type is mapped to an **EDM entity type**. The name of the **EDM entity type** is the CSOM type name of the CSOM Object type. For each CSOM property in the CSOM Object type, if the type of the CSOM property could be mapped to **EDM complex type**, **EDM simple type**, collection of **EDM complex type** or collection of **EDM simple type**, the CSOM property is mapped to an **EDM property** in the corresponding **EDM entity type**. If the type of the CSOM property is mapped to **EDM entity type**, the CSOM property is mapped to an **EDM navigation property** in the corresponding **EDM entity type**. Otherwise, the CSOM property is not mapped to any **EDM properties** or **EDM navigation properties** in the corresponding **EDM entity type**.

CSOM Array

A CSOM array is mapped to a collection of **EDM simple type** values, or a collection of **EDM complex type** values or **EDM entity set**.

Type of Element in CSOM Array	Type of the CSOM Array
Edm simple type	Collection of EDM simple type values
Edm complex type	Collection of EDM complex type values
Edm entity type	EDM entity set

CSOM Dictionary

A CSOM dictionary is mapped to a collection of **EDM complex type** values. Each key value pair in the CSOM dictionary is mapped to an element in the collection. The type of the element in the collection is **SP.KeyValue** as specified in section [3.1.5.1.3.1](#).

CSOM Null

A **CSOM null** is mapped to the **EDM simple type null**.

CSOM Property

A CSOM property is mapped to an **EDM property** or **EDM navigation property**.

CSOM Method

A CSOM method is mapped to an **EDM function import**.

3.1.2 Timers

None.

3.1.3 Initialization

None.

3.1.4 Higher-Layer Triggered Events

None.

3.1.5 Message Processing Events and Sequencing Rules

The following table summarizes the operations of this protocol.

Operation	Description
ProcessRestQuery	Process the oData request message that contains resource path, oData query options and oData payload, and respond with oData response message.

3.1.5.1 ProcessRestQuery

During this operation, the protocol server receives an OData request that contains the resource path, OData query options (as specified in [\[MS-ODATA\]](#) section 2.2.3.6), and OData payload (as specified in [\[MS-ODATA\]](#) section 2.2.6); processes the request; and then responds with an OData response.

The protocol server endpoint for this operation is formed by appending `"/_vti_bin/client.svc"` or `"/_api"` to the URL of the **Web site (2)**, for example `"http://www.example.com/Repository/_vti_bin/client.svc"` or `"http://www.example.com/Repository/_api"`.

The resource path and OData query options are appended to the endpoint; for example, `"http://www.example.com/Repository/_vti_bin/client.svc/resourcePath?ODataQueryOptions"` or `"http://www.example.com/Repository/_api/resourcePath?ODataQueryOptions"`.

The resource path contained in the request message MUST conform to the following format:

```

resourcePath           = resourcePathAlias "/" resourceMembers /
                        resourceRoot "/" resourceMembers
resourcePathAliasValue = resourceRoot /
                        resourceRoot "/" resourceMembers
resourceRoot           = staticMethodInvoke /
                        staticPropertyGet /
                        constructorInvoke
staticMethodInvoke     = typeName "." staticMethodName [ "(" methodParameters ")" ]
staticPropertyGet      = typeName "." staticPropertyName
constructorInvoke      = typeName [ "(" methodParameters ")" ]
methodParameters       = parameterValue /
                        namedParameterValueList
parameterNameValuePair = parameterName "=" parameterValue
namedParameterValueList = parameterNameValuePair /
                        parameterNameValuePair "," namedParameterValueList
resourceMembers        = resourceMember /
                        resourceMember "/" resourceMembers
resourceMember         = instancePropertyGet /
                        instanceMethodInvoke
instancePropertyGet    = propertyName
instanceMethodInvoke   = methodName [ "(" methodParameters ")" ]
typeName               = *PCHAR ; CSOM type name
methodName             = *PCHAR ; CSOM method name
propertyName          = *PCHAR ; CSOM property name
parameterName          = *PCHAR ; CSOM parameter name
staticMethodName       = *PCHAR ; CSOM static method name
staticPropertyName     = *PCHAR ; CSOM static property name
resourcePathAlias      = *PCHAR ; resource path alias
parameterValue         = EdmPrimitiveLiteral ; MS-ODATA section 2.2.2

```

where the **resourcePathAlias** is a string whose value is **resourcePathAliasValue**.

The protocol client sends a **ProcessRestQueryIn** message, and the protocol server responds with a **ProcessRestQueryOut** message, as follows:

1. The protocol client sends a **ProcessRestQueryIn** request message that contains resource path, OData query options, and OData payload.
2. The protocol server receives the **ProcessRestQueryIn** request message, processes the resource path to locate the CSOM object, performs actions against the CSOM object, and responds to the protocol client with **ProcessRestQueryOut** response message. If an error occurs while the protocol server processes the request, the response contains an error message that provides details about the error.

The protocol server processes the resource path according to the following steps:

1. If the resource path starts with a resource path alias defined by the protocol server, the resource path alias is replaced with the value of the resource path alias and the protocol server gets the complete resource path.
2. The protocol server processes the complete resource path. From the **resourceRoot**, the protocol gets the first CSOM object by invoking a static CSOM method on a CSOM object type, getting the static property on a CSOM object type, or invoking the constructor of a CSOM object type.
3. The protocol server checks the next resource member. If there is a resource member, the protocol server invokes the CSOM method or CSOM property on the CSOM object from the previous step and repeats step 3. If there is no resource member, the protocol server continues with the following step.
4. The protocol server performs the action against the CSOM object from the previous step.

3.1.5.1.1 Message

The following message definitions are specific to this operation.

3.1.5.1.1.1 Request Body

The **ProcessRestQueryIn** message is the request message for the **ProcessRestQuery** Web service method. The message contains resource path, OData query options and OData payload.

3.1.5.1.1.2 Response Body

The **ProcessRestQueryOut** message is the OData response message for the **ProcessRestQuery** Web service method.

3.1.5.1.2 Elements

None.

3.1.5.1.3 Complex Types

3.1.5.1.3.1 SP.KeyValue

SP.KeyValue complex type represents a key value pair. It has the following properties:

Property	Property Type	Description
Key	Edm.String	The value of the key in the key value pair.
Value	Edm.String	The string representation of the value in the key value pair.
ValueType	Edm.String	The EDM type name of the value in the key value pair.

3.1.5.1.3.2 SP.SimpleDataRow

SP.SimpleDataRow complex type represents a row in a data table. It has the following property:

Property	Property Type	Description
Cells	Collection of SP.KeyValue	The cells in the data table row.

3.1.5.1.3.3 SP.SimpleDataTable

SP.SimpleDataTable complex type represents a data table. It has the following property:

Property	Property Type	Description
Rows	Collection of SP.SimpleDataRow	The rows in the data table.

3.1.5.1.4 Simple Types

None.

3.1.5.1.5 Attributes

None.

3.1.5.1.6 Attribute Groups

None.

3.1.6 Timer Events

None.

3.1.7 Other Local Events

None.

4 Protocol Examples

The following examples illustrate how a protocol client retrieves and updates data on a protocol server by using this protocol. The example scenario is a book store that has a catalog of books. Each book within that catalog has an identifier, title, author, and status.

In this scenario, the following CSOM types are defined on the protocol server:

CSOM type	CSOM type name (identifier)	Description	Properties	Methods
BookStore	SampleCode.BookStore (acc57e47-24b0-4400-b1c7-aa1cf3c9542d)	A CSOM Object type that defines the book store, which contains a catalog.	Catalog – A Catalog type that contains a static property specifying a catalog of books.	None.
Catalog	SampleCode.Catalog (04a81e1b-a5b9-445d-97c0-681fe3f61189)	A CSOM Object type that defines the catalog, which contains a collection of books.	Books – A list of books.	None.
BookCollection	SampleCode.BookCollection (4c456811-3967-4021-8d9f-237ebd9c1170)	A CSOM Object type that defines a collection of books within a catalog.	None.	<p>Add – Returns a Book type and adds a book to the collection. The only parameter is a BookCreationInformation object, which contains the title, author, publish date, and status of a book.</p> <p>GetById – Returns a Book type that represents the book with the specified book identifier. If the book does not exist, the protocol server returns CSOM null. The only parameter is a CSOM GUID that contains the book identifier of the book.</p> <p>The BookCollection type supports OData InsertEntity request as specified in [MS-ODATA] section 2.2.7.1.1 to add a</p>

CSOM type	CSOM type name (identifier)	Description	Properties	Methods
				book to the collection.
Book	SampleCode.Book (030f9ac0-5f2b-4422-9e32-bcdfc1a0c93a)	A CSOM Object type that defines a specific book in a collection of books.	<p>Author – A CSOM String that contains the name of the author of the book.</p> <p>Id – A CSOM String value that contains the identification number for the book.</p> <p>PublishDate – A CSOM DateTime value that contains the date when the book was published.</p> <p>Status – A Status type that contains the status of the book.</p> <p>Title – A CSOM String that contains the title of the book.</p>	<p>Update – Updates information about the book by saving the property values that are currently set for the book. This method does not define any parameters.</p> <p>CheckOut – Checks out the book for a user. This method has only one parameter, which is the user's name. The return value of the CheckOut method is the date that the book is due.</p> <p>The Book type supports OData UpdateEntity Request as specified in [MS-ODATA] section 2.2.7.3.1 to update information about the book.</p>
BookCreationInformation	SampleCode.BookCreationInformation (dda98aeb-f87d-490f-9a61-be08644ad461)	A CSOM value object type that contains information about a book to be added to the catalog for the book store.	<p>Author – A CSOM String that contains the name of the author of the book.</p> <p>PublishDate – A CSOM DateTime value that contains the date when the book was published.</p>	None.

CSOM type	CSOM type name (identifier)	Description	Properties	Methods
			Status – A Status type that contains the status of the book. Title – A CSOM String that contains the title of the book.	
Status		A CSOM enumeration type that specifies whether a book is in stock. If a book is in stock, this value is "0" (zero). If a book is out of stock, this value is "1". If a book is on back order, this value is "2".	None.	None.

In the examples, the catalog contains the following books.

Identifier	Title	Author	Status	Publish date
3387ac63-e73d-421f-bff7-359a4aa2bc38	How to Cook Chinese Food	Soha Kamal	0	March 1, 2008
f6a265ab-86e5-4fbf-937c-49923604b91d	How to Cook Japanese Food	Soha Kamal	1	May 5, 2007
2e80eb25-b64a-4506-b87b-2fff6ddb3f57	Best Recipes	Lisa Andrews	0	January 3, 2009
704655a3-c136-469c-a578-f79652a93f9b	Family Recipes	Patrick Hines	0	December 1, 2005

4.1 Retrieve Book Information

In this example, a protocol client requests information about a book by using the book identifier "3387ac63-e73d-421f-bff7-359a4aa2bc38".

The protocol client sends the following message including some HTTP headers:

```
GET /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-359a4aa2bc38') HTTP/1.1
Host: www.example.com
Accept: */*, application/json
Content-Type: application/json
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 200 OK
Content-Type: application/json; charset=utf-8

{
  "d": {
    "_metadata": {
      "id": "56af5519-0604-4cb5-9ffc-d753bb314dbc",

      "uri": "http://www.example.com/_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-359a4aa2bc38')",
      "type": "SampleCode.Book"
    },
    "Author": "Soha Kamal",
    "Id": "3387ac63-e73d-421f-bff7-359a4aa2bc38",
    "PublishDate": "\\Date(1204329600000)\\",
    "Status": 0,
    "Title": "How to Cook Chinese Food"
  }
}
```

4.2 Retrieve Books by a Specific Author

In this example, a protocol client requests information about all of the books that are associated with the author named Soha Kamal.

The protocol client sends the following message including some HTTP headers:

```
GET
/_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books?$filter=Author%20eq%20'Soha%20Kamal'
HTTP/1.1
Host: www.example.com
Accept: */*, application/json
Content-Type: application/json
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 200 OK
Content-Type: application/json; charset=utf-8
```

```

{
  "d":{
    "results":[
      {
        "__metadata":{
          "id":"a2ac7976-b585-4217-850c-c18a273da35c",

"uri":"http://www.example.com/_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-359a4aa2bc38')",
          "type":"SampleCode.Book"
        },
        "Author":"Soha Kamal",
        "Id":"3387ac63-e73d-421f-bff7-359a4aa2bc38",
        "PublishDate":"\\/Date(1204329600000)\\/",
        "Status":0,
        "Title":"How to Cook Chinese Food"
      },{
        "__metadata":{
          "id":"1449675e-0d53-435f-9953-c23c36a15c4e",

"uri":"http://www.example.com/_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('f6a265ab-86e5-4fbf-937c-49923604b91d')",
          "type":"SampleCode.Book"
        },
        "Author":"Soha Kamal",
        "Id":"f6a265ab-86e5-4fbf-937c-49923604b91d",
        "PublishDate":"\\/Date(1178236800000)\\/",
        "Status":1,
        "Title":"How to Cook Japanese Food"
      }
    ]
  }
}

```

4.3 Update Book Information

In this example, a protocol client sends a request to update author and status information for the book that is associated with the identifier "2e80eb25-b64a-4506-b87b-2fff6ddb3f57"

The protocol client sends the following message including some HTTP headers:

```

POST /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('2e80eb25-b64a-4506-b87b-2fff6ddb3f57') HTTP/1.1
Host: www.example.com
Accept: */*, application/json
x-http-method: PATCH
Content-Type: application/json

{'__metadata': {'type': 'SampleCode.Book' }, 'Author': 'Lisa Andrews', 'Status': 1 }

```

The protocol server responds with the following message including some HTTP headers:

HTTP/1.1 204 No Content

4.4 Add a Book to a Catalog

In this example, the protocol client submits a request to add a book to the catalog.

The protocol client sends the following message:

```
POST /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books HTTP/1.1
Host: www.example.com
Accept: */*, application/json
Content-Type: application/json

{
  '__metadata': {'type': 'SampleCode.Book'},
  'Title': 'Simple Cookbook',
  'Author': 'Neil Black',
  'Status': 2,
  'PublishDate': '2009-08-01T00:00:00.0000000'
}
```

The protocol server responds with the following message:

```
HTTP/1.1 201 Created
Content-Type: application/json; charset=utf-8

{
  "d":{
    "__metadata":{
      "id":"fdda44df-a566-4df6-9b63-c3f8ac236377",
      "uri":"http://www.example.com/_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('63a687c6-921b-f898-4204-22f09533f28e')",
      "type":"SampleCode.Book"
    },
    "Author":"Neil Black",
    "Id":"63a687c6-921b-f898-4204-22f09533f28e",
    "PublishDate":"\\/Date(1249084800000)\\/\"",
    "Status":2,
    "Title":"Simple Cookbook"
  }
}
```

4.5 Unsuccessfully Add a Book to a Catalog

In this example, the protocol client submits a request to add a book to the catalog. The protocol server returns error because the book already exists in the catalog.

The protocol client sends the following message including some HTTP headers:

```
POST /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books HTTP/1.1
```

```
Host: www.example.com
Accept: */*, application/json
Content-Type: application/json

{
  '__metadata': {'type': 'SampleCode.Book'},
  'Title': 'Best Recipe',
  'Author': 'Lisa Andrews',
  'Status': 0,
  'PublishDate': '2006-07-20T00:00:00.0000000'
}
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 500 Internal Server Error
Content-Type: application/json; charset=utf-8

{
  "d":{
    "error":{
      "code":"-2147024809, System.ArgumentException","message":{
        "lang":"en-US","value":"The book with title 'Best Recipe' already exists in the book
store."
      }
    }
  }
}
```

4.6 Retrieve Book Sample Content

In this example, the protocol client submits a request to get the media resource of the book that is associated with the identifier 3387ac63-e73d-421f-bff7-359a4aa2bc38.

The protocol client sends the following message including some HTTP headers:

```
GET /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-
359a4aa2bc38')/$value HTTP/1.1
Host: www.example.com
Accept: */*, application/json
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 200 OK
Content-Type: application
Content-Length: 48

Sample Content of book How to Cook Chinese Food.
```

4.7 Update Book Sample Content

In this example, the protocol client submits a request to update the media resource of the book that is associated with the identifier 3387ac63-e73d-421f-bff7-359a4aa2bc38.

The protocol client sends the following message including some HTTP headers:

```
POST /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-359a4aa2bc38')/$value HTTP/1.1
Host: www.example.com
Accept: */*, application/json
Content-Length: 26

New Sample Content of book
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 204 No Content
```

4.8 Check out a Book

In this example, the protocol client submits a request to check out the book that is associated with the identifier 3387ac63-e73d-421f-bff7-359a4aa2bc38.

The protocol client sends the following message including some HTTP headers:

```
POST /_vti_bin/client.svc/SampleCode.BookStore.Catalog/Books('3387ac63-e73d-421f-bff7-359a4aa2bc38')/Checkout(user='Sam%20Bruce') HTTP/1.1
Host: www.example.com
Accept: */*, application/json
Content-Length: 0
```

The protocol server responds with the following message including some HTTP headers:

```
HTTP/1.1 200 OK
Content-Type: application/json; charset=utf-8

{
  "d": {
    "Checkout": "\Date(1322778642704)\/"
  }
}
```

5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

None.

6 Appendix A: Full CSDL

For ease of implementation, the following is the full CSDL schema for this protocol.

```
<?xml version="1.0" encoding="utf-8"?>
<edm:Edmx Version="3.0" xmlns:edm="http://schemas.microsoft.com/ado/2009/11/edm">
  <edm:DataServices m:DataServiceVersion="3.0"
    xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata">
    <Schema Namespace="SP" xmlns="http://schemas.microsoft.com/ado/2009/11/edm">
      <ComplexType Name="KeyValue">
        <Property Name="Key" Type="Edm.String" />
        <Property Name="Value" Type="Edm.String" />
        <Property Name="ValueType" Type="Edm.String" />
      </ComplexType>
      <ComplexType Name="SimpleDataRow">
        <Property Name="Cells" Type="MultiValue(SP.KeyValue)" />
      </ComplexType>
      <ComplexType Name="SimpleDataTable">
        <Property Name="Rows" Type="MultiValue(SP.SimpleDataRow)" />
      </ComplexType>
    </Schema>
  </edm:DataServices>
</edm:Edmx>
```

7 Appendix B: Product Behavior

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

- Microsoft® SharePoint® Foundation 2013

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

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

8 Change Tracking

This section identifies changes that were made to the [MS-CSOMREST] protocol document between the September 2012 and October 2012 releases. Changes are classified as New, Major, Minor, Editorial, or No change.

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

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

- A document revision that incorporates changes to interoperability requirements or functionality.
- An extensive rewrite, addition, or deletion of major portions of content.
- The removal of a document from the documentation set.
- Changes made for template compliance.

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

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

The revision class **No change** means that no new technical or language changes were introduced. The technical content of the document is identical to the last released version, but minor editorial and formatting changes, as well as updates to the header and footer information, and to the revision summary, may have been made.

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

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

- Protocol syntax updated due to protocol revision.
- Protocol syntax removed due to protocol revision.
- New content added for template compliance.
- Content updated for template compliance.
- Content removed for template compliance.
- Obsolete document removed.

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

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

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

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

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
1 Introduction	Updated all preliminary information in the document.	Y	Content updated.
1.3 Overview	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
1.4 Relationship to Other Protocols	Changed "XML" to "ATOM + XML" in the relationship diagram.	N	Content updated.
1.5 Prerequisites/Preconditions	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
2.2.5 Complex Types	Updated type "Edm.Null" to "null".	N	Content updated.
2.2.5 Complex Types	Updated the description for CSOM Error in OData mapping table.	N	Content updated.
2.2.5.3 CSOM Null	Updated type "Edm.Null" to "null".	N	Content updated.
2.2.5.7 CSOM Error	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
2.2.6.19 CSOM UInt64	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
3.1.1 Abstract Data Model	Updated type "Edm.Null" to "null".	N	Content updated.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Change type
3.1.5.1 ProcessRestQuery	Clarified language in step 4.	N	Content updated.
3.1.5.1 ProcessRestQuery	Added references for OData query options and OData payload.	N	New content added.
3.1.5.1 ProcessRestQuery	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
3.1.5.1.3.1 SP.KeyValue	Updated the description for complex type SP.KeyValue.	N	Content updated.
4 Protocol Examples	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.1 Retrieve Book Information	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.2 Retrieve Books by a Specific Author	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.3 Update Book Information	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.4 Add a Book to a Catalog	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.5 Unsuccessfully Add a Book to a Catalog	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.6 Retrieve Book Sample Content	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.7 Update Book Sample Content	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.
4.8 Check out a Book	Deleted all the glossary format for server (2) and the number (2).	N	Content updated.

9 Index

A

Abstract data model
[server](#) 19
[Add a Book to Catalog example](#) 29
[Applicability](#) 8

C

[Capability negotiation](#) 8
[Change tracking](#) 35
Client
[overview](#) 19
[Complex types](#) 11

D

Data model – abstract
[server](#) 19

E

Examples
[Add a Book to Catalog](#) 29
[Retrieve Books by Author](#) 27
Unsuccessfully Add a Book to Catalog ([section 4.5](#) 29, [section 4.6](#) 30, [section 4.7](#) 31, [section 4.8](#) 31)
[Update Book Information](#) 28

F

[Fields - vendor-extensible](#) 9

G

[Glossary](#) 5

I

[Implementer - security considerations](#) 32
[Index of security parameters](#) 32
[Informative references](#) 6
[Introduction](#) 5

M

Messages
[complex types](#) 11
[namespaces](#) 10
[simple types](#) 13
[syntax](#) 10
[transport](#) 10

N

[Namespaces](#) 10
[Normative references](#) 6

O

[Overview \(synopsis\)](#) 7

P

[Parameters - security index](#) 32
[Preconditions](#) 8
[Prerequisites](#) 8
[Product behavior](#) 34

R

References
[informative](#) 6
[normative](#) 6
[Relationship to other protocols](#) 7
[Retrieve Books by Author example](#) 27

S

Security
[implementer considerations](#) 32
[parameter index](#) 32
Server
[abstract data model](#) 19
[overview](#) 19
[Simple types](#) 13
[Standards assignments](#) 9
Syntax
[messages - overview](#) 10

T

[Tracking changes](#) 35
[Transport](#) 10

Types

[complex](#) 11
[simple](#) 13

U

Unsuccessfully Add a Book to Catalog example
([section 4.5](#) 29, [section 4.6](#) 30, [section 4.7](#) 31, [section 4.8](#) 31)
[Update Book Information example](#) 28

V

[Vendor-extensible fields](#) 9
[Versioning](#) 8