

[MS-ESREST]: Excel Services REST Protocol

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Revision Summary

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Date	Revision History	Revision Class	Comments
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1 Introduction

The Excel Services REST Protocol extensions to the Atom Publishing Protocol (AtomPub) [\[RFC5023\]](#) and its extensions specified in the Open Data Protocol (ODATA) Specification [\[MS-ODATA\]](#) enable applications to expose spreadsheet data, using common Web technologies, as a data service that can be consumed by clients within corporate networks and across the Internet.

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

1.1 Glossary

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

XML
XML namespace

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

atom feed
cell
data culture
formula
Hypertext Markup Language (HTML)
JavaScript Object Notation (JSON)
list
named range
PivotTable
published item
range
row
site
slicer
table
UI culture
Uniform Resource Locator (URL)
Web Services Description Language (WSDL)
workbook
workbook file
worksheet
XML schema

The following terms are specific to this document:

cell error value: Any of a number of special values that are returned as a result of an unsuccessful formula calculation.

HTML fragment: Lines of text that adhere to HTML tag rules, as described in [HTML], but do not have processing instructions or any other type of header information.

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 Specification documents do not include a publishing year because links are to the latest version of the 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.

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

[MS-DPRDL] Microsoft Corporation, "[Report Definition Language Data Portability Overview](#)".

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

[MS-RDL] Microsoft Corporation, "[Report Definition Language \(RDL\) File Format Structure Specification](#)".

[RFC1766] Alvestrand, H., "Tags for the Identification of Languages", RFC 1766, March 1995, <http://www.ietf.org/rfc/rfc1766.txt>

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

[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>

[RFC4287] Nottingham, M., and Sayre, E.R., "The Atom Syndication Format", RFC 4287, December 2005, <http://www.ietf.org/rfc/rfc4287.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., Beech, D., Maloney, M., and Mendelsohn, N., Eds., "XML Schema Part 1: Structures", W3C Recommendation, May 2001, <http://www.w3.org/TR/2001/REC-xmlschema-1-20010502/>

[XMLSCHEMA2] Biron, P.V., and Malhotra, A., Eds., "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-GLOS] Microsoft Corporation, "[Windows Protocols Master Glossary](#)".

[MS-OFCGLOS] Microsoft Corporation, "[Microsoft Office Master Glossary](#)".

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

[RFC5023] Gregorio, J. Ed., and de hOra, B., Ed., "The Atom Publishing Protocol", RFC 5023, October 2007, <http://www.ietf.org/rfc/rfc5023.txt>

1.3 Overview

This protocol enables protocol clients to access information stored in **workbooks** maintained by a protocol server using common Web technologies. Various types of resources within spreadsheets can be retrieved, such as **ranges**, **tables**, charts, **slicers**, timelines, interactive reports and **PivotTable** reports. The information returned by the protocol can be in one of several formats, such as **HTML**, image, **JavaScript Object Notation (JSON)**, and as an **Atom feed**. This protocol client also allows for values to be inserted into **cells** of the workbook.

A typical scenario for using this protocol is a custom application where workbook data is used as a data source that is connected to other processes that act on that data, such as displaying it in a novel way or taking specific action based on the contents of that data. Another typical scenario for this protocol is in embedding of workbook data into applications that support common Web standards.

1.4 Relationship to Other Protocols

This protocol uses the AtomPub messaging protocol for formatting requests and responses as described in [\[RFC5023\]](#) and URI and Payload extensions to the AtomPub protocol as described in [\[MS-ODATA\]](#). It transmits these messages using the HTTP protocol as described in [\[RFC2616\]](#) or the HTTPS protocol as described in [\[RFC2818\]](#).

The following diagram shows the underlying messaging and transport stack that the protocol uses:

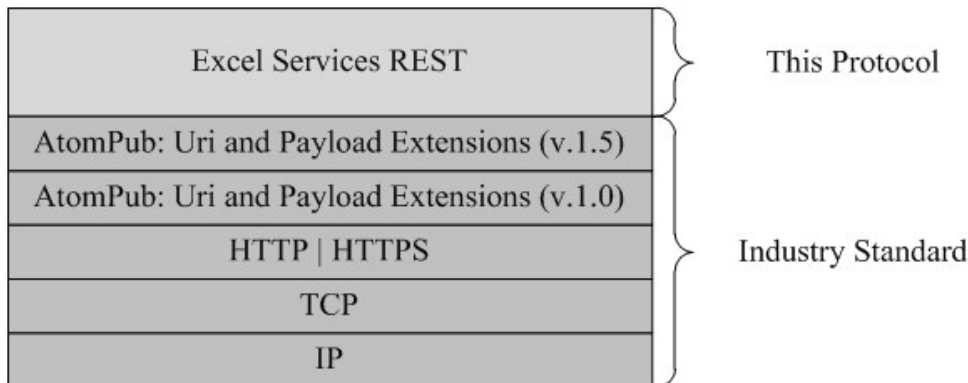


Figure 1: This protocol in relation to other protocols

1.5 Prerequisites/Preconditions

This protocol operates against a **site (1)** that is identified by a **URL** that is known by protocol clients. It is a prerequisite that the client obtain a URL to the server before these extensions can be used.

1.6 Applicability Statement

AtomPub, as described in [\[RFC5023\]](#), in combination with the extensions defined in this document, is appropriate for use in Web services that need a uniform, flexible, general purpose interface for exposing retrieve operations on a data model to clients.

1.7 Versioning and Capability Negotiation

This document covers versioning issues in the following areas:

- **Supported transports:** This document can be implemented on top of the Atom Publishing Protocol as described in section [2.1](#).
- **Protocol versions:** Servers specify the protocol version by using the **X-XLSVersion** response header.

The **X-XLSVersion** response header is present on any response message.

The syntax of the **X-XLSVersion** header is defined as follows:

```
X-XLSVersion= "X-XLSVersion:" VersionNum
```

```
VersionNum= DIGIT *DIGIT "." DIGIT *DIGIT "." DIGIT *DIGIT
```

The **VersionNum** section of the header value states the version of the protocol server.

- **Localization:** This document does not specify any localization-dependent behavior.
- **Capability negotiation:** The protocol that is defined in this document enables limited capability negotiation using the **X-XLSVersion** response header.

On a response from the server to the client, the **X-XLSVersion** header needs to be specified. The value states the version of the protocol the server used to generate the response.

1.8 Vendor-Extensible Fields

None.

1.9 Standards Assignments

None.

2 Messages

2.1 Transport

No new transports are required except for those specified in [\[MS-ODATA\]](#) section 2.1.

2.2 Common Message Syntax

This section contains common definitions that are used by this protocol. The syntax of the definitions uses **XML schema**, as specified in [\[XMLSCHEMA1\]](#) and [\[XMLSCHEMA2\]](#), and **WSDL**, as specified in [\[WSDL\]](#).

2.2.1 Namespaces

This specification defines and references various **XML namespaces** by 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
tns	http://schemas.microsoft.com/office/excel/server/webservices	
xs	http://www.w3.org/2001/XMLSchema	[XMLSCHEMA1] [XMLSCHEMA2]
atom	http://www.w3.org/2005/Atom	[RFC4287]

2.2.2 Messages

This specification does not define any common WSDL message definitions.

2.2.3 Elements

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

2.2.4 Complex Types

The following table summarizes the set of common XML schema 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
Range	A range of cells in a worksheet.
Row	Represents a row (2) in a worksheet .
Cell	Represents a cell in a worksheet.
JSONReference	Represents a reference to an Entity Set.
JSONCollection	Represents a collection of Entities.

2.2.4.1 Range

Represents a range of cells in a worksheet.

2.2.4.1.1 Range XML Value

If **Range** value is used in response **XML**, it MUST conform to the following XML schema.

```
<xs:complexType name="Range">
  <xs:element name="row" type="Row" minOccurs="0" maxOccurs="unbounded"/>
  <xs:attribute name="name" type="string" use="required"/>
</xs:complexType>
```

row: Represents a row (2) from the spreadsheet.

name: Contains the name of the range

2.2.4.1.2 Range JSON Value

If **Range** value is used in response XML, it is represented as a JSON object. It has the JSON members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of the range. This member MUST be present.
rows	A JSON array representing a collection of row (2) in a worksheet. This member MUST be present.

2.2.4.2 Row

Represents a row(2) in a worksheet.

2.2.4.2.1 Row XML Value

If **Row** value is used in response XML, it MUST conform to the following XML schema.

```
<xs:complexType name="Row">
  <xs:element name="c" type="Cell" minOccurs="0" maxOccurs="unbounded"/>
</xs:complexType>
```

c: Represents a cell in the worksheet. The number of **c** elements inside a **row** element MUST be the same for all **row** elements inside the same **range** element

2.2.4.2.2 Row JSON Value

If **Row** value is used in response JSON text, it MUST conform to JSON array representation format. The JSON array representing the **Row** SHOULD contain **Cell** objects.

2.2.4.3 Cell

Represents a cell in a worksheet.

2.2.4.3.1 Cell XML Value

If **Cell** value is used in response XML, it MUST conform to the following XML schema.

```
<xs:complexType name="Cell">
  <xs:element name="fv" xsi:type="xs:string" minOccurs="0" maxOccurs="1"/>
  <xs:element name="v" xsi:type="xs:anyType" minOccurs="0" maxOccurs="1"/>
</xs:complexType>
```

fv: Represents a cell formatted using a **number format** according to how the worksheet cell is number formatted in the workbook value in a cell. If the **v** element is present and the **xsi:type** attribute on it is set to "string" then this element MUST NOT be present. MUST NOT be present if the cell is empty.

v: Represents the value of the cell. The **xsi:type** attribute MUST be set to either "double" (as the default), "Boolean", "String" or "Error". If the **xsi:type** attribute is set to "Error", the value of the cell MUST be one of values defined in Error type (section [2.2.5.1](#)). MUST be present if the cell is not empty

2.2.4.3.2 Cell JSON Value

If **Cell** value is used in response JSON text, it MUST conform to JSON object value representation format. It has the JSON members listed in the following table.

Member Name	Member Value
v	A JSON value representing the value of the cell. The type of the JSON value is one of the intrinsic JSON types – string, number or boolean. MUST NOT be present if the cell is empty or the cell is an error.
fv	A JSON string value representing a cell formatted using a number format according to how the worksheet cell is number formatted in the workbook value in a cell. MUST NOT be present if the type of v member is JSON string.
t	A JSON string value representing the type of data in a cell. MUST be present and set to "error" if the cell is an error. MUST NOT be present if the cell is empty.

2.2.4.4 JSONReference

Represents a reference to an Entity Set in a workbook.

If **JSONReference** value is used in response JSON text, it MUST conform to JSON object value representation format. It has the JSON member listed in the following table.

Member Name	Member Value
baseUri	A JSON string value representing the URL that is used to access the Entity Set using the default Entity Set representation. The default representation is XML for Entity Sets accessed in the context of Model Entity Set . The default representation is JSON for Entity Sets accessed in the context of Session Entity Set .
jsonUri	A JSON string value representing the URL that is used to access the Entity Set using the

Member Name	Member Value
	JSON representation.

2.2.4.5 JSONCollection

Represents a collection of Entities.

If **JSONCollection** value is used in response JSON text, it MUST conform to JSON object value representation format. It has the JSON member listed in the following table.

Member Name	Member Value
items	A JSON array representing a collection of objects of the same type.

2.2.5 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
Error	An enumeration of the set of cell error values that a worksheet cell can contain.

2.2.5.1 Error

The **Error** type is an enumeration of the set of cell error values that a worksheet cell can contain.

This simple type is defined as follows.

```
<xs:simpleType name="Error">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Div0"/>
    <xs:enumeration value="Name"/>
    <xs:enumeration value="Num"/>
    <xs:enumeration value="Value"/>
    <xs:enumeration value="NotApplicable"/>
    <xs:enumeration value="Null"/>
    <xs:enumeration value="Ref"/>
  </xs:restriction>
</xs:simpleType>
```

The following table specifies the allowable values for Error:

Value	Meaning
Div0	Worksheet cell contains a number that is divided by 0.
NotApplicable	Worksheet cell contains a value not available to a formula .
Name	Worksheet cell contains text not recognized by a formula.

Value	Meaning
Null	Worksheet cell contains an empty intersection of two areas.
Num	Worksheet cell contains invalid numeric values in a formula.
Ref	Worksheet cell contains a reference that is not valid.
Value	Worksheet cell contains a formula that includes worksheet cells that contain different data types.

2.2.6 Attributes

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

2.2.7 Groups

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

2.2.8 Attribute Groups

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

2.2.9 Common Data Structures

This specification does not define any common XML schema data structures.

3 Protocol Details

3.1 Server 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.

The relationship between the Excel Services REST Protocol data model and the Entity Data Model defined in [\[MC-CSDL\]](#) are described as follows. The mapping between Entity Data Model concepts and those of the AtomPub specification is described in [\[MS-ODATA\]](#) section 2.2.1. 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 the behavior described in [\[MS-ODATA\]](#) and [\[MC-CSDL\]](#).

Spreadsheet data structure	Description	Entity Data Model term
Model	Information about the spreadsheet.	EntitySet
Session	Information about a view session to be created on the protocol server.	EntitySet
Ranges	The list of ranges that are exposed by the spreadsheet.	EntitySet
Charts	The list of charts that are exposed by the spreadsheet.	EntitySet
Tables	The list of tables that are exposed by the spreadsheet.	EntitySet
PivotTables	The list of pivot tables that are exposed by the spreadsheet.	EntitySet
Range	A range from the spreadsheet.	Entity
Table	A table from the spreadsheet.	Entity
PivotTable	A PivotTable from the spreadsheet.	Entity
Chart	A chart from the spreadsheet.	None. Returned as a binary response to the request.
OData	The OData service document, as specified in [MS-ODATA] .	None. This is the OData service document, as specified in [MS-ODATA] .
Sessions	The entry point for creating a view session on the protocol server.	EntitySet
Slicers	The list of slicers that are exposed by the spreadsheet.	EntitySet

Spreadsheet data structure	Description	Entity Data Model term
Slicer	A slicer from the spreadsheet.	Entity
Timelines	The list of timelines that are exposed by the spreadsheet.	EntitySet
Timeline	A timeline from the spreadsheet.	Entity
_unsupported_InteractiveReports	The list of interactive reports that are exposed by the workbook.	EntitySet
Store	The Store data of interactive reports exposed by the workbook.	Entity
ConnectionInfo	The ConnectionInfo data of interactive reports exposed by the workbook.	Entity
State	The sort operations on PivotTables that are exposed by the workbook.	Entity

When the **\$format** (as specified in [\[MS-ODATA\]](#) section 2.2.3.6.1.5) Uniform Resource Locator (URL) parameter is specified, it overrides the logic specified in [\[MS-ODATA\]](#) with relation to the ACCEPT HTTP header. When there are multiple response formats that satisfy the ACCEPT HTTP header, if one of the content types corresponds to the default format for the **EntityType** or **EntitySet**, that is the one that will be returned. If none of the content types specified in the ACCEPT HTTP header is the default one, the protocol server MUST return the supported format with the highest priority in the ACCEPT HTTP header.

Requests can contain a URL parameter where the key starts with "Ranges(" and ends with ")" (case insensitive), between these two strings, the key will contain a string that refers to a range. When such a parameter is passed, the protocol server MUST place the value associated with the parameter in the spreadsheet range specified by the parameter and recalculate the spreadsheet before returning the result from the same spreadsheet. The range specified in the parameter MUST correspond to a single cell in the spreadsheet.

Model and **Session** Entities Sets are also used as contexts for other entities in the workbook. An entities is said to be "in the context" of **Model** or **Session** if the URL path used to access the entities is respectively using the /Model or /Session URL path part.

Unless specified otherwise, all access to the above entities MUST use HTTP GET verb. Whenever PUT or DELETE verbs are specified, calling these verbs needs to be implemented through the usage of HTTP tunneling technique. Such technique requires that HTTP POST verb is used with **X-HTTP-Method** request header with the value of "PUT" or "DELETE" respectively.

3.1.1.1 Model Entity Set

The Model entity set represents the spreadsheet as a whole.

The protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "workbook" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#), fits one of the following content types: "application/vnd.openxmlformats-officedocument.spreadsheetml.sheet", "application/vnd.ms-excel.sheet.binary.macroEnabled.12" or "application/vnd.ms-excel.sheet.macroEnabled.12", then the protocol server will return a **workbook file**.

- If a URL parameter with a key of "\$format" and value of "json" is passed, accessing **Model** Entity Set will result in JSON text returned. This JSON text represents the list of other Entity Sets supported by the spreadsheet. The following table lists the JSON members.

Member Name	Member Value
Ranges	A JSONReference object representing ranges in the worksheet and referencing the corresponding Ranges Entity Set .
Charts	A JSONReference object representing charts in the worksheet and referencing the corresponding Charts Entity Set .
Tables	A JSONReference object representing tables in the worksheet and referencing the corresponding Tables Entity Set .
pivotTables	A JSONReference object representing PivotTables in the worksheet and referencing the corresponding PivotTables Entity Set .

- Otherwise, accessing The Model Entity Set as an entity set as specified in [\[MS-ODATA\]](#) will result in the list of other entity sets supported by the spreadsheet. The protocol server returns an **EntitySet** containing 4 entity sets, as follows:
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Ranges" which represents the ranges in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Charts" which represents the charts in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Tables" which represents the tables in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.PivotTables" which represents the PivotTables in the workbook.

3.1.1.2 Session Entity Set

The Session entity set represents a view session that was created as described in section [3.1.1.10](#). All requests to a Session entity set, or other entities accessed in the context of Session, **MUST** specify a URL parameter "\$sid" with the value set to the session identifier returned by the protocol server for a Sessions request.

When accessing the entity using HTTP GET verb, the protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "json" is passed, accessing **Session** Entity Set will result in JSON text returned. This JSON text represents the list of other Entity Sets supported by the spreadsheet. It has the JSON members listed in the following table.

Member Name	Member Value
Ranges	A JSONReference object representing ranges in the worksheet and referencing the corresponding Ranges Entity Set .

Member Name	Member Value
Charts	A JSONReference object representing charts in the worksheet and referencing the corresponding Charts Entity Set .
Tables	A JSONReference object representing tables in the worksheet and referencing the corresponding Tables Entity Set .
pivotTables	A JSONReference object representing PivotTables in the worksheet and referencing the corresponding PivotTables Entity Set .
Slicers	A JSONReference object representing slicers in the worksheet and referencing the corresponding Slicers Entity Set .
Timelines	A JSONReference object representing timelines in the worksheet and referencing the corresponding Timelines Entity Set .
_unsupported_InteractiveReports	A JSONReference object representing interactive reports in the workbook and referencing the corresponding _unsupported_InteractiveReports Entity Set .

- Otherwise, accessing The Session Entity Set as an entity set as specified in [\[MS-ODATA\]](#) will result in the list of other entity sets supported by the spreadsheet. The protocol server returns an **EntitySet** containing 4 entity sets, as follows:
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Ranges" which represents the ranges in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Charts" which represents the charts in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Tables" which represents the tables in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.PivotTables" which represents the PivotTables in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Slicers" which represents the slicers in the workbook.
 - An entity set with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, with the **term** attribute set to "ExcelServices.Timelines" which represents the timelines in the workbook.

When accessing the entity using HTTP DELETE verb, the protocol server will close the view session and all subsequent attempts to access the same session will fail.

3.1.1.3 Ranges Entity Set

Ranges in the spreadsheet are represented as an **EntitySet**, which contains **Entities** of a single **EntityType** as specified in section [3.1.1.4](#). The **Ranges** entity set represents the list of ranges exposed by the spreadsheet. The protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "atom" is passed, or is accessed in the context of **Model** Entity Set then the protocol server returns an entity with the category **element** present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, and the **term** attribute set to "ExcelServices.Range" for every **published item** in the workbook that represents a **named range**.
- If a URL parameter with a key of "\$format" and value of "json" is passed, or is accessed in the context of **Session** Entity Set then the protocol server returns JSON text containing **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a named range. Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of a named range.

3.1.1.4 Range Entity

The Range entity represents a range in the spreadsheet.

The protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "html" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "text/html" then the protocol server will return an **HTML fragment** corresponding to the requested range.
- Accessing the Range Entity as an entity as specified in [\[MS-ODATA\]](#) (or with a URL parameter with a key of "\$format" and value of "atom") will result in a single Entity Type containing the complex type **Range** as defined in section [2.2.4.1.1](#) in a **content** element with a **type** attribute set to "application/xml", as specified in [\[MS-ODATA\]](#).
- Accessing the Range Entity with a URL parameter with a key of "\$format" and value of "json" will result in a JSON text containing the complex type **Range** as defined in section [2.2.4.1.2](#).
- Accessing the Range Entity with a URL parameter with a key of "\$format" and value of "image" will result in a PNG image of the requested range. Also, the protocol server supports cropping and scaling the resulting image when optional URL parameters are specified. These parameters are described in the following table:

Parameter Name	Description
\$cropw	An unsigned integer representing the width in pixels used to limit the number of columns of the range of the returned image. The cumulative pixel width of all visible columns in the requested range will be compared with \$cropw . If the cumulative width of a column is equal or exceeds \$cropw , then that column will be last one rendered into the returned image.
\$croph	An unsigned integer representing the height in pixels used to limit the number of rows of the range of the returned image. The cumulative pixel height of all visible columns in the requested range will be compared with \$croph . If the cumulative height of a column is equal or exceeds \$croph , then that row will be last one rendered into the returned image.
\$width	An unsigned integer representing the width in pixels the returned image needs to scale to. The protocol server only provides scaling down and preserves the aspect ratio of the original image and that can cause that the width of the resulting image is smaller than \$width .

Parameter Name	Description
\$height	An unsigned integer representing the height in pixels the returned image needs to scale to. The protocol server only provides scaling down and preserves the aspect ratio of the original image and that can cause that the height of the resulting image is smaller than \$height .

3.1.1.5 Tables Entity Set

Tables in the spreadsheet are represented as an **EntitySet**, which contains **Entities** of a single **EntityType** as specified in section [3.1.1.6](#). The Tables entity set represents the list of tables exposed by the spreadsheet. The protocol server will return a value as follows:

- If a URL parameter with a key "\$format" and value of "atom" is passed, or is accessed in the context of Model Entity Set then the protocol server returns an entity with the category **element** present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, and the **term** attribute set to "ExcelServices.Table" for every published item in the workbook that represents a **list (2)**.
- If a URL parameter with a key of "\$format" and value of "json" is passed, or is accessed in the context of Session Entity Set then the protocol server returns JSON text containing a **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a list (2). Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of a list (2).

3.1.1.6 Table Entity

The Table entity represents a table in the spreadsheet.

The protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "html" is passed, or the ACCEPT HTTP header (as specified in [\[RFC2616\]](#)) fits the content type: "text/html", the protocol server will return an HTML fragment representing the requested table.
- Accessing the Table Entity as an entity as specified in [\[MS-ODATA\]](#) (or with a URL parameter with a key of "\$format" and value of "atom") will result in a single **Entity** containing the complex type **Range** as defined in section [2.2.4.1.1](#) in a **content** element with a **type** attribute set to "application/xml", as specified in [\[MS-ODATA\]](#).
- Accessing the Table Entity with a URL parameter with a key of "\$format" and value of "json" will result in a JSON text containing the complex type **Range** as defined in section [2.2.4.1.2](#).

3.1.1.7 PivotTables Entity Set

PivotTables in the spreadsheet are represented as an **EntitySet**, which contains **Entities** of a single **EntityType** as specified in section [3.1.1.8](#). The **PivotTables** entity set represents the list of PivotTables exposed by the spreadsheet. The protocol server will return a value as follows:

- If a URL parameter with a key "\$format" and value of "atom" is passed, or is accessed in the context of Model Entity Set then the protocol server returns an entity with the category **element**

present (as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1) and the **term** attribute set to "ExcelServices.PivotTable" for every published item in the workbook that represents a PivotTable.

- If a URL parameter with a key of "\$format" and value of "json" is passed, or is accessed in the context of Session Entity Set then the protocol server returns JSON text containing **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a PivotTable. Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
Name	A JSON string value representing the name of a PivotTable.

3.1.1.8 PivotTable Entity

The **PivotTable** entity represents a PivotTable in the spreadsheet. The protocol server will return a value as follows:

- If a URL parameter with a key of "\$format" and value of "html" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "text/html" then the protocol server will return an HTML fragment representing the requested PivotTable.
- Accessing the PivotTable Entity as an entity as specified in [\[MS-ODATA\]](#) (or with a URL parameter with a key of "\$format" and value of "atom") will result in a single Entity Type containing the complex type **Range** as defined in section [2.2.4.1.1](#) in a **content** element with a **type** attribute set to "application/xml", as specified in [\[MS-ODATA\]](#).
- Accessing the PivotTable Entity with a URL parameter with a key of "\$format" and value of "json" will result in a JSON text containing the complex type **Range** as defined in section [2.2.4.1.2](#).

3.1.1.9 Charts Entity Set

Charts in the spreadsheet are represented as an **EntitySet**. The protocol server will return a value as follows:

- If a URL parameter with a key "\$format" and value of "json" is passed, or is accessed in the context of Model Entity Set then the protocol server returns an **entry** element with the **category** element present, as specified in [\[MS-ODATA\]](#) section 2.2.6.2.1, and the **term** attribute set to "ExcelServices.Chart" for every published item in the workbook that represents a chart. Each **entry** element has a **content** element with the **type** attribute set to "image/png" and the **src** attribute set to a URL that will return the image representing the requested chart.
- If a URL parameter with a key of "\$format" and value of "json" is passed, or is accessed in the context of Session Entity Set then the protocol server returns JSON text containing **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a Chart. Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of a Chart.

When requesting an individual Chart a PNG image is returned. This image can be scaled from its original size by optionally specifying width or height or both. The scaling maintains the original aspect ratio, except both width and height is specified. In case when both width and height is

specified, the protocol server MUST fit the image into the rectangular area defined by those constraints. The protocol server recognizes URL parameters listed in the following table.

Parameter Name	Description
\$width	An unsigned integer representing, in pixels, the desired width of the returned image.
\$height	An unsigned integer representing, in pixels, the desired height of the returned image.

3.1.1.10 Sessions Entity Set

A view session is opened on the protocol server when a request is made to the Sessions Entity Set using a POST. The protocol server recognizes URL parameters listed in the following table.

Parameter Name	Description
\$uc	A language tag, as specified in in [RFC1766] , Section 2. Specifies the UI culture .
\$dc	A language tag, as specified in in [RFC1766] , Section 2. Specifies the data culture .

- If a URL parameter with a key of "\$format" and value of "atom" is passed the content of the Entity Set result is single entity that represents the session. Making a request to the entity URL will return a result as described in section [3.1.1.1](#).
- If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header , as specified in [\[RFC2616\]](#) fits the content type: "application/json" then the protocol server will return a JSON text. It has the JSON members listed in the following table.

Member Name	Member Value
sessionId	A JSON string value representing the session id of the view session created by protocol server.
baseUri	A URL representing the Session Entity.
itemViewerUri	A URL representing an interactive item view for the view session created by the protocol server.

3.1.1.11 Slicers

Slicers in the spreadsheet are represented as an **EntitySet**, which contains **Entities** of a single **EntityType** as specified in section [3.1.1.12](#). The Slicers entity set represents the list of Slicers exposed by the spreadsheet. Slicers can only be accessed in the context of Session Entity Set. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "application/json" the protocol server returns JSON text containing a **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a Slicer. Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of a Slicer.
caption	A JSON string value representing the caption of a Slicer.

Member Name	Member Value
updatesAllowed	A JSON boolean value representing whether the protocol server allows modifying the state of the Slicer as defined in section 3.1.1.12 .
connectedPublishedObjects[]	A JSON array containing JSON string values representing the names of published items whose state would be affected if the selection state of the Slicer is modified.

3.1.1.12 Slicer

The **Slicer** entity represents a Slicer in the spreadsheet. The protocol server supports retrieving the Slicer through HTTP GET verb as well as applying changes to the current state of the slicer through HTTP POST and PUT verbs.

When a request is made using a GET:

- If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [RFC2616](#) fits the content type: "application/json" then the protocol server will return a JSON text representing the items in the requested Slicer. The protocol server recognizes URL parameters listed in the following table.

Parameter Name	Description
\$skip	An unsigned integer representing the index of the first slicer item that is to be returned by the protocol server. If not specified, the default value is 0.
\$top	An unsigned integer representing the maximum number of slicer items that are to be returned by the protocol server. If not specified, the default value is 100. The maximum number of slicer items returned is 100.

The JSON object returned by protocol server has members listed in the following table.

Member Name	Member Value
totalItemCount	A JSON number value representing the total number of items in a Slicer. MUST be present.
ItemOffset	A JSON number value representing the 0-based index of the first item returned in the items array. MUST be present
hasEffectiveSelection	A JSON boolean value representing some of the slicer items are in unselected state. MUST be present.
NextOffset	A JSON number.
Items[]	A JSON array containing data about slicer items.
Items[].displayName	The JSON string value representing the display name of the slicer item.
Items[].uniqueName	The JSON string value representing the unique name of the slicer item. This name MUST be used when programmatic referencing the slicer item in the slicer update operation.
items[].unselected	The JSON boolean value representing that this item has been unselected. Present only when true.

Member Name	Member Value
items[].noData	The JSON boolean value representing that this item has no data. Present only when true.

When a request is made using PUT or POST:

If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "application/json" then the protocol server interprets the body of the HTTP request as a JSON text. The JSON object expected by protocol server has members listed in the following table.

Member Name	Member Value
parameters	A JSON nested object representing the operation parameters passed to the protocol server. MUST be present.
parameters.selectionMode	A JSON string value representing the way the slicer state needs to be modified. Supports the following string values: <ul style="list-style-type: none"> ▪ cumulative ▪ clearFilter ▪ selectedOnly (this is the default)
parameters.selected[]	A JSON array of JSON string values representing unique names of slicer items that are to be selected. MUST be ignored if the value of selectionMode is set to clearFilter .
parameters.unselected[]	A JSON array of JSON string values representing unique names of slicer items that are not to be selected. MUST be ignored if the value of selectionMode is set to clearFilter or selectedOnly .

3.1.1.13 Timelines

Timelines in the spreadsheet are represented as an **EntitySet**, which contains **Entities** of a single **EntityType** as specified in section [3.1.1.14](#). The Timelines entity set represents the list of timelines exposed by the spreadsheet. The content of the Entity Set result is a JSON formatted array of **Entities** for every published item in the workbook that represents a Timeline. Timelines can only be accessed in the context of Session Entity Set. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "application/json" the protocol server returns JSON text containing a **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of entities for every published item in the workbook that represents a Timeline. Each entry in the JSONCollection has members listed in the following table.

Member Name	Member Value
name	A JSON string value representing the name of a Timeline.
caption	A JSON string value representing the caption of a Timeline.
connectedPublishedObjects[]	A JSON array containing JSON string values representing the names of published items whose state would be affected if the state of the Timeline is modified.

3.1.1.14 Timeline

The **Timeline** entity represents a timeline in the spreadsheet.

The protocol server supports retrieving the timeline through HTTP GET verb as well as applying changes to the current state of the timeline through HTTP POST and PUT verbs.

When a request is made using a GET:

- If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "application/json" then the protocol server will return a JSON text representing the items in the requested Timeline. The JSON object returned by protocol server has members listed in the following table.

Member Name	Member Value
minDate	JSON string value representing the minimum date the timeline is defined on (YYYY-MM-DD format). MUST be present.
maxDate	JSON string value representing the maximum date the timeline is defined on (YYYY-MM-DD format). MUST be present.
selectionBeginDate	JSON string value representing the begin date of timeline selected range (YYYY-MM-DD format). MUST not be present if selectionState value is equal to "clearFilter".
selectionEndDate	JSON string value representing the end date of timeline selected range (YYYY-MM-DD format). MUST not be present if selectionState value is equal to "clearFilter".
displayLevel	A JSON string value representing timeline's display level. MUST be present and be set to one of the following string values: <ul style="list-style-type: none">▪ years▪ quarters▪ months▪ days
selectionState	A JSON string value representing timeline's selection state. MUST be present and be set to one of the following string values: <ul style="list-style-type: none">▪ between▪ clearFilter▪ unsupported
displayLabel	The JSON string value representing the descriptive label of the timeline.

When a request is made using PUT or POST:

If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#) fits the content type: "application/json" then the protocol server interprets the body of the HTTP request as a JSON text. The JSON object expected by protocol server has members listed in the following table.

Member Name	Member Value
Parameters	A JSON nested object representing the operation parameters passed to the protocol server. MUST be present.
parameters.selectionType	A JSON string value representing the requested selection Type. MUST be present and be set to one of the following string values: <ul style="list-style-type: none"> ▪ between ▪ clearFilter
parameters.selectionBeginDate	A JSON string value representing the selection begin date. Ignored if the value of selectionType is set to clearFilter .
parameters.selectionEndDate	A JSON string value representing the selection end date. Ignored if the value of selectionType is set to clearFilter .

3.1.1.15 _unsupported_InteractiveReports

_unsupported_InteractiveReports in the workbook are represented as an **EntitySet**, which contains items representing each interactive report exposed in the workbook. The content of the Entity Set result is a JSON formatted array of items for every published interactive report in the workbook. _unsupported_InteractiveReports can only be accessed in the context of a Session Entity Set. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#), fits the content type: "application/json", then the protocol server returns JSON text containing a **JSONCollection** as defined in section [2.2.4.5](#). The **JSONCollection** represents a list of interactive reports for every published item in the workbook that represents an interactive report. Each entry in the **JSONCollection** has members listed in the following table.

Member Name	Member Value
sheetName	A JSON string value representing the name (spreadsheet name) of an interactive report.
slideId	A JSON string value representing the identifier of an interactive report slide.

3.1.1.16 Store

Store contains data for interactive reports exposed in the workbook. The content result is a JSON formatted object consisting of properties for every published interactive report in the workbook. Store can only be accessed in the context of _unsupported_InteractiveReports as a sub-resource. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#), fits the content type: "application/json", then the protocol server returns a JSON object. The JSON object contains properties for interactive reports in the workbook. The JSON object has properties listed in the following table.

Member Name	Member Value
correlationId	A GUID representing the correlation identifier.
dataConnectionsInfo	A JSON object containing information about data connections in the workbook.

Member Name	Member Value
dataConnectionsInfo.dataConnectionInfo[]	A JSON array of data connection information.
dataConnectionsInfo.dataConnectionInfo[].connectionName	A JSON string value representing the data connection's connection name.
dataConnectionsInfo.dataConnectionInfo[].connectionString	A JSON string value representing the data connection's connection string.
dataConnectionsInfo.dataConnectionInfo[].dataSourceName	A JSON string value representing the data connection's data source name.
dataConnectionsInfo.dataConnectionInfo[].isEmbedded	A JSON boolean value representing whether the data connection is embedded.
dataConnectionsInfo.dataConnectionInfo[].refreshTimestamp	A JSON string timestamp in ISO 8601 format representing the data connection's last refresh date and time.
dataConnectionsInfo.dataConnectionInfo[].securityToken	A JSON string value representing the data connection's security token.
dataConnectionsInfo.dataConnectionInfo[].slidesIds[]	A JSON array of slide identifiers associated with this data connection.
dataConnectionsInfo.dataConnectionInfo[].sourceIndex	A JSON string value representing the data connection's source index.
dataConnectionsInfo.dataConnectionInfo[].state	A JSON string value representing the data connection state. MUST be set to one of the following string values: <ul style="list-style-type: none"> ▪ Failed ▪ Streaming ▪ Succeeded
dataConnectionsInfo.dataSources	A JSON string value representing the data sources in the workbook.
reportData	A JSON string value representing the report data as specified in [MS-DPRDL] and [MS-RDL] .

3.1.1.17 ConnectionInfo

ConnectionInfo contains data for interactive reports exposed in the workbook. The difference between ConnectionInfo and Store is that ConnectionInfo does not contain reportData for optimization purposes. The content result is a JSON formatted object consisting of properties for every published interactive report in the workbook. ConnectionInfo can only be accessed in the context of `_unsupported_InteractiveReports` as a sub-resource. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#), fits the content type: "application/json", then the protocol server returns a JSON object. The JSON object contains properties for interactive reports in the workbook. The JSON object has properties listed in the following table.

Member Name	Member Value
correlationId	A GUID representing the correlation identifier.
dataConnectionsInfo	A JSON object containing information about data connections in the workbook.
dataConnectionsInfo.dataConnectionInfo[]	A JSON array of data connection information.
dataConnectionsInfo.dataConnectionInfo[].connectionName	A JSON string value representing the data connection's connection name.
dataConnectionsInfo.dataConnectionInfo[].connectionString	A JSON string value representing the data connection's connection string.
dataConnectionsInfo.dataConnectionInfo[].dataSourceName	A JSON string value representing the data connection's data source name.
dataConnectionsInfo.dataConnectionInfo[].isEmbedded	A JSON boolean value representing whether the data connection is embedded.
dataConnectionsInfo.dataConnectionInfo[].refreshTimestamp	A JSON string timestamp in ISO 8601 format representing the data connection's last refresh date and time.
dataConnectionsInfo.dataConnectionInfo[].securityToken	A JSON string value representing the data connection's security token.
dataConnectionsInfo.dataConnectionInfo[].slidesIds[]	A JSON array of slide Ids associated with this data connection.
dataConnectionsInfo.dataConnectionInfo[].sourceIndex	A JSON string value representing the data connection's source index.
dataConnectionsInfo.dataConnectionInfo[].state	A JSON string value representing the data connection state. MUST be set to one of the following string values: <ul style="list-style-type: none"> ▪ Failed ▪ Streaming ▪ Succeeded
dataConnectionsInfo.dataSources	A JSON string value representing the data sources in the workbook.

3.1.1.18 State

State contains data for PivotTables stored in the workbook. The content result is a JSON formatted object representing a PivotTable in the workbook. If a URL parameter with a key of "\$format" and value of "json" is passed, or the ACCEPT HTTP header, as specified in [\[RFC2616\]](#), fits the content type "application/json", then the protocol server returns a JSON object. The JSON object represents a PivotTable in the workbook. The JSON object has properties listed in the following table.

Member Name	Member Value
Name	A JSON string value representing the current rest resource.

Member Name	Member Value
Parent	A JSON string value representing parent level rest resource.
Index	A JSON string value representing rest resource index
ValidatedParameters	A JSON string value representing the name collection of validated parameters.
VerifyMethodsCalled	A JSON boolean value representing whether verified methods are invoked.

3.1.2 Timers

None.

3.1.3 Initialization

None.

3.1.4 Message Processing Events and Sequencing Rules

None.

3.1.5 Timer Events

None.

3.1.6 Other Local Events

None.

4 Protocol Examples

The examples in this section use the following sample data and configuration:

- A site at <http://www.contoso.com> exists.
- A workbook with the title Sales.xlsx exists on the site. The workbook contains the following resources:
 - A table named "SalesProjections".
 - A chart named "CommissionChart".
 - A range named "CommissionRate_Bikes".

4.1 Retrieve the Entity Container for the Content of a Workbook

The following example illustrates the exchange of messages required for a client to retrieve the entity container for the content of the Sales.xlsx workbook.

Request

```
GET /_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/ HTTP/1.1
Accept: application/atom+xml
Host: www.contoso.com
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: application/atom+xml;charset=utf-8
Server: Microsoft-IIS/7.5
SPRequestGuid: 63c0d5ca-8b6e-43bf-92a5-d6ed45210f5b
X-SharePointHealthScore: 4
X-AspNet-Version: 2.0.50727
X-Powered-By: ASP.NET
MicrosoftSharePointTeamServices: 14.0.0.4732
Date: Wed, 20 Jan 2010 19:48:13 GMT
Content-Length: 3158

<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<feed xmlns="http://www.w3.org/2005/Atom"
xmlns:x="http://schemas.microsoft.com/office/2008/07/excelservices/rest"
xmlns:d="http://schemas.microsoft.com/ado/2007/08/dataservice"
xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata">
  <title type="text">Model</title>
  <id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/</id>
  <updated>2010-01-20T19:48:13Z</updated>
  <author>
    <name />
  </author>
  <link rel="self"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/" title="Model"
/>
  <entry>
    <category term="ExcelServices.Ranges"
scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" />
```

```

<title>Ranges</title>
<id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges</id>
<updated>2010-01-20T19:48:13Z</updated>
<author>
  <name />
</author>
<link rel="alternate"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges?$format=atom" title="Ranges" />
  <content type="application/atom+xml;charset=utf-8"
src="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges?$format=atom" />
</entry>
<entry>
  <category term="ExcelServices.Charts"
scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" />
  <title>Charts</title>
  <id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Charts</id>
  <updated>2010-01-20T19:48:13Z</updated>
  <author>
    <name />
  </author>
  <link rel="alternate"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Charts?$format=atom" title="Charts" />
    <content type="application/atom+xml;charset=utf-8"
src="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Charts?$format=atom" />
  </entry>
<entry>
  <category term="ExcelServices.Tables"
scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" />
  <title>Tables</title>
  <id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Tables</id>
  <updated>2010-01-20T19:48:13Z</updated>
  <author>
    <name />
  </author>
  <link rel="alternate"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Tables?$format=atom" title="Tables" />
    <content type="application/atom+xml;charset=utf-8"
src="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Tables?$format=atom" />
  </entry>
<entry>
  <category term="ExcelServices.PivotTables"
scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" />
  <title>PivotTables</title>

<id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/PivotTables</id>
<updated>2010-01-20T19:48:13Z</updated>
<author>
  <name />
</author>
<link rel="alternate"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/PivotTables?$format=atom" title="PivotTables" />
  <content type="application/atom+xml;charset=utf-8"
src="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/PivotTables?$format=atom" />
</entry>

```

```
</entry>
</feed>
```

4.2 Retrieve a Table from a Workbook as HTML

The following example illustrates the exchange of messages required for a client to retrieve the HTML representation of a table called SalesProjections within the Sales.xlsx workbook.

Request

```
GET /_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Tables('SalesProjections')?$format=html
HTTP/1.1
Accept: text/html
Host: www.contoso.com
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: text/html; charset=utf-8
Last-Modified: Wed, 20 Jan 2010 11:49:08 GMT
Vary: Accept-Encoding
Server: Microsoft-IIS/7.5
SPRequestGuid: eaelc496-30f7-4263-92aa-3a31fb2d8c89
X-SharePointHealthScore: 4
X-AspNet-Version: 2.0.50727
X-Powered-By: ASP.NET
MicrosoftSharePointTeamServices: 14.0.0.4732
Date: Wed, 20 Jan 2010 19:49:08 GMT
Content-Length: 18625
```

```
<div style="overflow:hidden"><table cellpadding="0" cellspacing="0" class="ewr-sheettable
tnov rnov bnov lnov" style="border-collapse:collapse;margin-left:-2px;margin-top:-
2px;"><tr><td style="border-bottom:1px solid transparent;width:1px;font-
size:1px;height:1px;line-height:1px;"><div class="clp">&nbsp;</div></td><td style="font-
size:1px;height:1px;line-height:1px;width:97px;"><div class="clp"
style="width:97px;">&nbsp;</div></td><td style="font-size:1px;height:1px;line-
height:1px;width:78px;"><div class="clp" style="width:78px;">&nbsp;</div></td><td
style="font-size:1px;height:1px;line-height:1px;width:62px;"><div class="clp"
style="width:62px;">&nbsp;</div></td><td style="font-size:1px;height:1px;line-
height:1px;width:62px;"><div class="clp" style="width:62px;">&nbsp;</div></td><td
style="font-size:1px;height:1px;line-height:1px;width:69px;"><div class="clp"
style="width:69px;">&nbsp;</div></td><td style="font-size:1px;height:1px;line-
height:1px;width:83px;"><div class="clp" style="width:83px;">&nbsp;</div></td></tr><tr><td
style="border-bottom:1px solid transparent;width:1px;"><div class="clp"
style="height:19px;">&nbsp;</div></td><td data-range="B9" style="text-align:left;vertical-
align:bottom;font:bold 11pt 'Calibri';color:#000000;text-decoration:none;border-top:solid 1px
#F79646;border-left:solid 1px #F79646;"><div class="cv-nw1" style="width:95px;max-
height:18px;">Salesperson</div></td><td data-range="C9" style="text-align:left;vertical-
align:bottom;font:bold 11pt 'Calibri';color:#000000;text-decoration:none;border-top:solid 1px
#F79646;border-left:solid 1px #F79646;"><div class="cv-nw1" style="width:76px;max-
height:18px;">Accessories</div></td><td data-range="D9" style="text-align:left;vertical-
align:bottom;font:bold 11pt 'Calibri';color:#000000;text-decoration:none;border-top:solid 1px
#F79646;border-left:solid 1px #F79646;"><div class="cv-nw1" style="width:60px;max-
height:18px;">Bikes</div></td><td data-range="E9" style="text-align:left;vertical-
align:bottom;font:bold 11pt 'Calibri';color:#000000;text-decoration:none;border-top:solid 1px
#F79646;border-left:solid 1px #F79646;"><div class="cv-nw1" style="width:60px;max-
height:18px;">Clothing</div></td><td data-range="F9" style="text-align:left;vertical-
```


Request

```
GET /_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges('C17%7CE17')?$format=atom
HTTP/1.1
Accept: application/atom+xml
Host: www.contoso.com
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: application/atom+xml;charset=utf-8
Server: Microsoft-IIS/7.5
SPRequestGuid: a8fecc3b-a7ef-48e5-a988-b6152207fad1
X-SharePointHealthScore: 4
X-AspNet-Version: 2.0.50727
X-Powered-By: ASP.NET
MicrosoftSharePointTeamServices: 14.0.0.4732
Date: Wed, 20 Jan 2010 19:50:23 GMT
Content-Length: 1183

<?xml version="1.0" encoding="utf-8"?>
<entry xmlns:x="http://schemas.microsoft.com/office/2008/07/excelservices/rest"
xmlns:d="http://schemas.microsoft.com/ado/2007/08/dataservice"
xmlns:m="http://schemas.microsoft.com/ado/2007/08/dataservices/metadata"
xmlns="http://www.w3.org/2005/Atom">
  <title type="text">C17:E17</title>

  <id>http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges('C17%7CE17')</id>
  <updated>2010-01-20T19:50:23Z</updated>
  <author>
    <name />
  </author>
  <link rel="self"
href="http://www.contoso.com/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Ranges('C17%7CE17')?$format=atom" title="C17:E17" />
  <category term="ExcelServices.Range"
scheme="http://schemas.microsoft.com/ado/2007/08/dataservices/scheme" />
  <content type="application/xml">
    <x:range name="C17:E17">
      <x:row>
        <x:c>
          <x:v>18167</x:v>
          <x:fv> $18,167 </x:fv>
        </x:c>
        <x:c>
          <x:v>14500</x:v>
          <x:fv> $14,500 </x:fv>
        </x:c>
        <x:c>
          <x:v>15408</x:v>
          <x:fv> $15,408 </x:fv>
        </x:c>
      </x:row>
    </x:range>
  </content>
</entry>
```

4.4 Retrieve a Chart from a Workbook After Setting a Value in the Workbook

The following example illustrates the exchange of messages required for a client to change the value of a range named `CommissionRate_Bikes` in the `Sales.xlsx` workbook while also retrieving a chart named `CommissionChart` from the same workbook. Note the chart is returned as an image. The binary image data is represented here in hexadecimal.

Request

```
GET
/_vti_bin/ExcelRest.aspx/Cycles/Sales.xlsx/Model/Charts('CommissionChart')?$format=image&range('CommissionRate_Bikes')=0.03 HTTP/1.1
Accept: image/png
Host: www.contoso.com
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: image/png
Server: Microsoft-IIS/7.5
SPRequestGuid: 976f5ad3-5748-4049-9471-eb2ad4035047
X-SharePointHealthScore: 4
X-AspNet-Version: 2.0.50727
X-Powered-By: ASP.NET
MicrosoftSharePointTeamServices: 14.0.0.4732
Date: Wed, 20 Jan 2010 19:51:32 GMT
Content-Length: 9325
```

```
89504e47 0d0a1a0a 0000000d 49484452
000001b5 00000120 08060000 003301ed
2d000000 01735247 4200aece 1ce90000
00046741 4d410000 b18f0bfc 61050000
00097048 59730000 0ec30000 0ec301c7
6fa86400 00240249 44415478 5eed9ddd
91f320b2 8627a08d 600238a1 f862a3f1
d58964d7 496c0813 c8a9da1b 1f21091b
6124a3e6 bff54cd5 d4379f2d 24f5db0d
8f1a10fc 3cf94101 14400114 4001250a
fc28b103 33500005 50000550 e009d408
02144001 14400135 0a003535 aec41014
40011440 01a0460c a0000aa0 000aa851
00a8a971 2586a000 0aa0000a 00356200
05500005 50408d02 404d8d2b 31040550
00055000 a8110328 80022880 026a1410
42edef79 ffb3d1f 6a64c010 14400114
40010d0a 9c86dadf fdf7f9f3 f3b3fefe
3eef7f9e 0c8fdbfc ddc227de fab92dfb
eb163cfa 4e83cad8 80022880 02285045
817350fb bb3f7f7f 9c0c6d82 910ba7c7
6d82dd44 33f3ef16 6a8fe7ed c701e0e6
3ca1ef02 b0ac2207 17410114 40011418
598134a8 ed587e0a 6a264bf3 d23a537e
93c98dac 30f78e02 28800228 504d8173
509b6e6b cec64cf7 e3effde9 f73cdabb
fe84daf4 cd9c9dd9 6ecb77b6 3777677a
50339f01 b56a31c0 85500005 50408d02
```

a7a1662d b7636b21 f884a0b6 1c3fc1cc
c26d0559 0ea8bdc7 f82c34f9 174d8801
62801818 3906feef 7fff4704 5a31d4e6
ab99aec3 40c6f601 b58fe3cc ecc965dc
2d04b5d4 ee47e348 2308bf68 400c1003
c4c0b831 20a1da39 a8791343 662089a0
662687ac 9349e6cc cd9f4492 365104a8
8d1bc434 40f88e18 20066c0c 9487daf4
669a81d1 3ba5ddbe abf61a6f 0b4cf9f7
bf3b9ad2 fff13ac0 49cb801a 95828691
182006c6 8f81934d ff7cf8b9 4c6dbdc2
e3969649 496ef44c 19a0367e 30d320e1
43628018 38d3eedb 630550eb 7f3511a0
4665a041 24068881 f163a012 d42497a9
5b06a88d 1fcc3448 f8901820 0624e410
646a92cb d42d03d4 a80c3488 c4003130
7e0c48c8 01d498fa cfab0fc4 0031400c
74190340 6d55804c 6dfc2734 9eb2f121
31400c00 35a0d6e5 d3168d13 8d133140
0c486200 a80135a0 46371231 400ca889
01a006d4 d404b3e4 a98e3264 03c480ae
18006a40 0da8f194 4e0c1003 6a6200a8
013535c1 cc13b7ae 276efc89 3f253150
116a7daf 2ac2ec47 2a90a402 5186b821
06fa8a81 2a50b3fb a82d8b1a 07d68034
dbccd815 f8bd3bda 2e6aec2c 86bc96b1
0b25a76e 100ad4fa 0a4c1a0a fc410c10
03921828 0fb5799b 982d8c5c 00cdd09a
96d80f6d 126abffb bc49b3f2 3f5bcf48
1c4e191a 0a628018 d01c03f5 a1b673c5
4fa81970 6db7a979 1535599a b7d70c9b
84525135 57d42bd9 f6ef7ffe e359e2f7
4a1a5ed9 d6f2509b aef0ea42 0c6c0e6a
6fe0036a 26c3fbfd 9db23c67 2fb61564
a19dafcd 67295d90 743f02c5 2b37043d
d96e80f6 dffffc2b ebaf3967 4f36722f
e5da9b2a 50b317b1 636b21f8 04a1b6c9
d4de3b5f e780da7b d3527703 53fe4617
62a0750c 94825a6b bbb87ef9 ba651e16
243f690b 1a9baec3 40c6f61d 6a4bc667
92b510d4 e87e2cf7 e4c35325 dad68c81
5250ab69 03d76a57 67ca436d 82989b99
cd408a81 dad3bc02 b0406cfe 99279cac
9343dcbf fdef2416 4d65e87e 6c178434
0068efc6 0050231e 52da0409 024e666a
4bb7e13b f5de4efe d84ed9f7 a6fccff0
7a97ddcc 0df1a6f4 7bf3464e db05d4a8
48291589 b2f9e207 a8e5d3f2 8a7179ba
f137498d a4d0e316 783f4d72 a2426580
1a15e98a 0d408f36 03b531ea 628919aa
3926f448 1021805a dfab8918 1180da18
15a9c746 987bca1b 3b402daf 9ea5e2b3
573f5582 9ae43275 cb00b531 2a52a90a
ca79fbf1 7faf8d25 31b28d91 5efd2421
87205393 5ca66e19 a0d64fa3 46e3716d
5ff4da58 129740ad 2e9512af 06d4aedd
90d260f5 e37fa0d6 8f2f8eea 45af7e92
a0804c8d bd97589d 81182816 03bd3696
3cf890a9 4980d9ac 0c99da18 4f87342c

fafd04d4 c6f071af 7e924084 4c8da7f4
624fe9a5 a1d5eb34 e4d2768f 74fe5e1b
cb9134ac 71afbdfa 09a8ad0a 90a98df1
74985a59 7bad88a9 76692a8f 8fc6a88b
bdfa09a8 01b561b3 2e4943de 6b4594d8
a2b50c3e 026a29b1 0dd4801a 504bdce6
24c72a08 2995585b 59a006d4 5262ba22
d4fa5e55 84eec731 2a524ab0 9bb23498
fdfb191f f5efa39e eb5215a8 d97dd496
458d036b 40ae8b13 ef2d4a6c cb1f2d68
9cb24128 cb648d51 895281d6 7345cc61
9b967300 b531ea63 af7e2a0f b579a57d
67657e6f 2b9a7995 fe89561f fba9d93b
9b77c0be 3fefeb5e 6acbc766 e57f078e
fe563402 abc8d4c6 a848a90d 77af1531
d52e4de5 f1d11875 b1573f09 9aff93ab
f4fb50db b962186a a6cb7281 d7e67b93
d979691d 9b848e51 115a37be bd56c4d6
baf4747d 7c34465d eed54fe5 a166f22a
938d99ae c7c0e6a0 f6064250 33dd8eb6
5bd1fd3e b4f3b57b acc8a8e9 fe7aaad8
dc4b998a dd6b45c4 df6f7fe3 a332b19f
3bc67af5 93a8fd97 143265ec d85868fc
eb036a5e 86971b6a ef4d4bdd 0d4cf95b
bb2ea52a a276dd6a da878fc6 68877af4
9301b7e4 276d4511 d37518c8 d83ea0e6
ed6c6d2b 95016228 53a3fb71 8ca7bbdc
4f8b67cf 57aa229e bd0f8edf 8f577c34
465deed5 4fe5a1e6 4d0c9981 140335ef
ce36d0f3 27863051 84aed3c8 a5cb7aad
88408eee c7d162a0 d7ba541e 6af34c45
379d7666 42bae36d af630253 fed7e38e
a6f4efbd 0e106b20 b31fc778 3a4cadf8
bd56c454 bb3495c7 4763d4c5 5efd14db
e6bbc789 ba1f1fb7 30ac2437 50a20c50
1ba322a5 36deb56 c454bb34 95c74763
d4c55efd 24e18300 6a7daf26 c2cbd763
54a21c0d 77af1531 876d5ace 818fc6a8
8fbdfaa9 12d42497 a95b864c 6d8c8a94
da70f75a 1153edd2 541e1f8d 51177bf5
93841c82 4c4d7299 ba6580da 181529b5
f1eeb522 a6daa5a9 3c3e1aa3 2ef6ea27
0939805a e44c3b4d 0d8d165b 7aad885a
f4cd6107 3e026a29 7104d456 05c8d4c6
a84829c1 6ecad260 f6ef677c d4bf8f7a
ae4b400d a85dea1d 371accfe 1b4c7cd4
bf8f809a 049d95cb 90a98d51 91c8d4f4
fb09a88d e1e35efd 24410763 6a8ca90d
9bddf55a 115361ad a9bc461f 199b4afc
b6f47baf 7e026a74 3f0e0b28 4985eeb5
224a6cd1 5a46a38f b0e95fcf fffee7fb
afd12935 ae811a50 4b0ea2d4 20ac595e
63e35253 bf1ad7d2 e8236cfa 0e3403bd
c1a0d6f7 aa228ca9 8dd18f9f daa86a6c
5c5235e9 adbc461f 619332a8 d97dd496
ed63026b 40aedbcc 7c2c4aec 6e3fe3af
ecef6d4d 13daa3ed 4c1a0ad4 3ea15662
0c20c793 584a23ac b17149d1 a3c7b21a
7d844d9a a0e66df6 396d83fd dacdda40

67de157b a2d9e7ce d7d3eafe 2f90992c
efc72967 56fe77e0 c8d63345 ba10a988
f52a628f 7069754f c4dd1871 d7ab9fce
2433f6d8 73b31f7d a8ed5cf1 136adb03
4db6f7ca c64c96e6 a5756c12 9abffbb0
d7a04d69 6c35da94 a2478f65 35fa089b
ea81ba3c d46c3666 ba1e039b 83da1b38
86da92a9 598e8576 bede404f 6015dd8f
e1eec798 194b678e a1fb31ff c3478f60
4ab92700 500f001a fd2468fe 9fe73235
e70a766c 2d34fe75 04351f62 39a0b68c
eff17ba4 41a9c6a5 a5ee1a6d 6aa96789
6b6bf411 36c5833a 25a60ca4 253f62a8
cd17335d 87818c6d 0f6a33c0 bce34350
a3fb317f 0650aa22 a63c1da6 96d56853
aa26bd95 d7e8236c 8a875a6a 3c96879a
37312404 293b61c4 9ffd6827 917cdca4
3f318489 224c1489 5ce54563 e392da08
f4565ea3 8fb04913 d49e66a6 a2dbcd77
9b3e79ff cce0da7c bfce6a9c 41e57fe7
94f5a6f4 7fbc0e70 12d78ca9 31a67666
6cd03db6 f538616f 504abd1f 00500f00
29beead5 4f279bfe f97051f7 e3e31678
3f4d72f5 4265801a 50036af9 bbb0258d
66af8da5 c4165b06 9bea815a 820801d4
fa5e4d64 26f59415 a604adc6 b254c47a
155163fc 486d22ee c688bb5e fd54096a
92cbd42d 03d4c8d4 c8d4c8d4 a420fe56
ae57007c bbefa3ef 7bb54942 0e41a626
b94cdd32 a950330e 2ef19b12 74a9657b
0dda14bb 34da94a2 478f6535 fa089bea
659f1272 00b5c04c 3b82b65e d0a634c4
1afd94a2 478f6535 fa089bea b50f406d
552047a6 26edbeda 2bd77a56 1d15b15e
45ec112e adee89b8 1b23ee7a f5135003
6abb1364 7a0dda94 c656a34d 297af458
56a38fb0 a91ea881 1a50036a 113bf21e
65e1ad33 ea1ec194 724f00a0 1e0034fa
09a80135 a006d4ba 7a9d05a8 01b514d8
0235a006 d4801a50 8b5c664d dad802ea
7aa0066a 400da801 35a006d4 4ec740af
a0ae08b5 be571561 f6232f5f 4b67af32
a696f7a5 ed5e1b4b 699666ca 6193b24c
cdeea3b6 2c5c1c58 03725d9c f8635162
6fd1e2cd 3e6c47df 09500dd4 801a50cb
0b272904 00403d00 487dd433 a805cdfd
c9058de7 d5f6b7ab ebbb70b2 dbcb7cee
a76656f7 7700b8d9 5ee6e83b 8949e96b
3f5211a9 88290d04 65df40a5 2e519752
ea838400 e75614f1 a1b673c5 0fa8994c
cc4bdd5e 1b811e7d 27b128c3 82c65444
2a624a45 a42c503b db53d0ba dbbbd736
4f828073 509baef0 da332db0 e3b5bd01
1f6aa1dd adcd6726 cb3bfa4e 62902943
f723dd8f 671b157b 7cebc645 1b107b6d
2c5374c6 a67a0fbd 12069c86 9abd881d
5bdb8c8d ad5fd686 da766352 7f33d2f3
ff2f15b4 b9eff3cc f9b029be 229ed195
638feb17 713746dc f5e827f3 e021f911

436dbe98 e93a0c64 6c3150b3 dd8fa14c
edd53529 b1884c2d 389db754 d0a63cf1
a696d568 53aa26bd 95d7e823 6c8a0775
6a3c4a10 700e6a13 c4dccc6c 065204d4
a63ec669 82c9ce44 91a3ef24 160135a0
96f0ae1a dd8f7967 4d02807a 00480148
af7e9220 e01cd49e 66a6a2db dde0cc84
74c7db5e c73820f3 a6ed6fe6 8d1c7d27
b08a3135 c6d41853 cb0b2769 83d96b63
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4.5 Retrieve the OData service document for a workbook

The following example illustrates the exchange of messages required for a client to request the OData service document.

Request

```
GET
http://office/15/teams/DBI/xlservices/_vti_bin/ExcelRest.aspx/Users/adean/DatesAndTimes.xlsx/
OData HTTP/1.1
Accept: text/html, application/xhtml+xml, */*
Accept-Language: en-US
User-Agent: Mozilla/5.0 (compatible; MSIE 9.0; Windows NT 6.1; WOW64; Trident/5.0)
Accept-Encoding: gzip, deflate
Connection: Keep-Alive
Host: office
```

Response

```
HTTP/1.1 200 OK
Cache-Control: private
Content-Type: application/xml;charset=utf-8
Server: Microsoft-IIS/7.5
X-SharePointHealthScore: 0
DataServiceVersion: 1.0;
X-AspNet-Version: 4.0.30319
SPRequestGuid: 7cab629b-4882-d026-23a5-2bd43a07d980
X-Powered-By: ASP.NET
MicrosoftSharePointTeamServices: 15.0.0.3407
X-Content-Type-Options: nosniff
```

Date: Tue, 18 Oct 2011 19:38:41 GMT
Content-Length: 461
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<service
xml:base="http://office_vti_bin/ExcelRest.aspx/Users/adean/DatesAndTimes.xlsx/OData/"
xmlns:atom="http://www.w3.org/2005/Atom" xmlns:app="http://www.w3.org/2007/app"
xmlns="http://www.w3.org/2007/app">
 <workspace>
 <atom:title>Default</atom:title>
 <collection href="DatesTextFormatted">
 <atom:title>DatesTextFormatted</atom:title>
 </collection>
 </workspace>
</service>

5 Security

5.1 Security Considerations for Implementers

None.

5.2 Index of Security Parameters

None.

6 Appendix A: Full WSDL

None.

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 Server 2010
- Microsoft SharePoint Server 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

No table of changes is available. The document is either new or has had no changes since its last release.

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