Access Run Time Protocol

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## Revision Summary

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1 Introduction

The Access Run Time Protocol enables a protocol client to read, insert, update or delete data in a database application.

Sections 1.5, 1.8, 1.9, 2, and 3 of this specification are normative. All other sections and examples in this specification are informative.

1.1 Glossary

This document uses the following terms:

**alert**: A message that is passed to a protocol client to notify it when specific criteria are met.

**Augmented Backus-Naur Form (ABNF)**: A modified version of Backus-Naur Form (BNF), commonly used by Internet specifications. ABNF notation balances compactness and simplicity with reasonable representational power. ABNF differs from standard BNF in its definitions and uses of naming rules, repetition, alternatives, order-independence, and value ranges. For more information, see [RFC5234].

**caption**: One or more characters that can be used as a label for display purposes or as an identifier.

**database application**: A set of objects, including tables, queries, forms, reports, macros, and code modules, that are stored in a database structure.

**field**: A discrete unit of a record that has a name, a data type, and a value.

**Help topic identifier**: A unique identifier for an article that contains Help content.

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

**Hypertext Transfer Protocol Secure (HTTPS)**: An extension of HTTP that securely encrypts and decrypts web page requests. In some older protocols, "Hypertext Transfer Protocol over Secure Sockets Layer" is still used (Secure Sockets Layer has been deprecated). For more information, see [SSL3] and [RFC5246].

**JavaScript Object Notation (JSON)**: A text-based, data interchange format that is used to transmit structured data, typically in Asynchronous JavaScript + XML (AJAX) web applications, as described in [RFC7159]. The JSON format is based on the structure of ECMAScript (Jscript, JavaScript) objects.

**primary key**: A field or set of fields that uniquely identifies each record in a table. A primary key cannot contain a null value.

**record**: A group of related fields, which are sometimes referred to as columns, of information that are treated as a unit. Also referred to as row.

**Request-URI**: A URI in an HTTP request message, as described in [RFC2616].

**result set**: A list of records that results from running a stored procedure or query, or applying a filter. The structure and content of the data in a result set varies according to the implementation.

**row**: A collection of columns that contains property values that describe a single item in a set of items that match the restriction specified in a query.
**session**: A representation of application data in system memory. It is used to maintain state for application data that is being manipulated or monitored on a protocol server by a user.

**session identifier**: A key that enables an application to make reference to a session.

**site**: A group of related pages and data within a SharePoint site collection. The structure and content of a site is based on a site definition. Also referred to as SharePoint site and web site.

**Uniform Resource Identifier (URI)**: A string that identifies a resource. The URI is an addressing mechanism defined in Internet Engineering Task Force (IETF) Uniform Resource Identifier (URI): Generic Syntax [RFC3986].

**Uniform Resource Locator (URL)**: A string of characters in a standardized format that identifies a document or resource on the World Wide Web. The format is as specified in [RFC1738].

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

### 1.2 References

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

#### 1.2.1 Normative References

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

[MS-ADR] Microsoft Corporation, "Access Services Data Run Time Protocol".


#### 1.2.2 Informative References

None.
1.3 Overview

This protocol is used for manipulating data maintained by a protocol server. Communication is always initiated by the protocol client using different operations, the functionality of which is outlined following.

- Inserting, reading, updating and deleting data from the database application.
- Filtering, sorting data while reading it from the database application.
- Modeling hypothetical updates on the protocol server.
- Reading distinct values for a certain field in a result set.

A typical scenario for this protocol is opening a result set and updating or deleting data.

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. Applications are layered on top of this protocol and they interact directly with this protocol specification.

The messages that are sent from the protocol client to the protocol server are formatted as 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 JSON.

![Diagram](image)

**Figure 1** 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.

1.6 Applicability Statement

This protocol is applicable for the following scenarios:

- Inserting, reading, updating, or deleting data from the database application.
- Retrieving data from the database application in Pages (section 3.1.1). This applies only if the number of records exceeds a threshold specified by the protocol server.
- Filtering data by retrieving only the data matching given restrictions.
• Sorting data retrieved from the database application
• Retrieving only distinct values for certain **fields** in the result set from the database application
• Modeling hypothetical updates on the protocol server.

This protocol is not applicable for the following scenarios:
• Creating, updating or deleting objects on the database application.
• Acting as a data transfer channel between protocol client and protocol server. Instead the data sent to protocol client is intended to be rendered for end user viewing.

### 1.7 Versioning and Capability Negotiation

This document covers versioning issues in the area of supported transports. This protocol can use **HTTP** or **HTTPS** as a transport. For more information, see Transport (section 2.1).

### 1.8 Vendor-Extensible Fields

None.

### 1.9 Standards Assignments

None.
2 Messages

2.1 Transport

Protocol servers MUST support HTTP, as specified in [RFC2616]. Protocol servers SHOULD also additionally support HTTPS, as specified in [RFC2818], to help secure connections with protocol clients.

Protocol messages MUST be formatted as JSON as specified in [RFC4627]. Protocol clients MUST use the GET ([RFC2616] section 9.3) or POST ([RFC2616] section 9.5) method to send messages to the protocol servers.

2.2 Message Syntax

This section contains common definitions used by this protocol specification. The syntax of the definitions uses JavaScript Object Notation (JSON), as specified in [RFC4627], and the common JSON in ABNF, as specified by [RFC5234].
The following table defines the common JSON types used in this document.

<table>
<thead>
<tr>
<th>Common Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>JsonAnyValue</td>
<td>json-value</td>
</tr>
<tr>
<td>JsonStringValue</td>
<td>json-string</td>
</tr>
<tr>
<td>JsonArrayOfAnyType</td>
<td>json-array</td>
</tr>
<tr>
<td>JsonArrayOfString</td>
<td>json-begin-array [ json-string *( json-value-separator json-string) ] json-end-array</td>
</tr>
<tr>
<td>JsonArrayOfInt</td>
<td>json-begin-array [ json-int *( json-value-separator json-int) ] json-end-array</td>
</tr>
<tr>
<td>JsonArrayOfArrayOfAnyType</td>
<td>json-begin-array [JsonArrayOfAnyType *( json-value-separator JsonArrayOfAnyType) ] json-end-array</td>
</tr>
</tbody>
</table>

2.2.1 Complex Types

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

<table>
<thead>
<tr>
<th>Complex Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ClientMessage</td>
<td>Specifies an error or informative message to return from the protocol server. See section 2.2.1.1 for more details.</td>
</tr>
<tr>
<td>FieldSchema</td>
<td>Specifies all metadata information about a field of a Source ([MS-ADR] section 3.1.1.1).</td>
</tr>
<tr>
<td>Complex Type</td>
<td>Description</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Complex Type</td>
<td>See section 2.2.1.3 for more details.</td>
</tr>
<tr>
<td>FilterInfo</td>
<td>Specifies how to filter a result set. See section 2.2.1.4 for more details.</td>
</tr>
<tr>
<td>FixupRecord</td>
<td>Specifies the values for the fields of the records that are to be used for the modeling a hypothetical update on the protocol server. See section 2.2.1.5 for more details.</td>
</tr>
<tr>
<td>FormatInfo</td>
<td>Specifies all metadata information about a field of a Source ([MS-ADR] section 3.1.1.1). See section 2.2.1.6 for more details.</td>
</tr>
<tr>
<td>PagingInfo</td>
<td>Specifies which records of data from the Source (section 3.1.1) are requested by the protocol client. See section 2.2.1.7 for more details.</td>
</tr>
<tr>
<td>ParameterValue</td>
<td>Specifies a container for the name of a CT_Parameter ([MS-AXL2] section 2.2.3.12) and its associated value. See section 2.2.1.8 for more details.</td>
</tr>
<tr>
<td>RecordSet</td>
<td>A complex type that is output by all the protocol operations. See section 2.2.1.9 for more details.</td>
</tr>
<tr>
<td>ServiceError</td>
<td>Specifies information about an alert (2) sent from protocol server to the protocol client. See section 2.2.1.10 for more details.</td>
</tr>
<tr>
<td>ServiceResult</td>
<td>Specifies the result of the protocol operation. See section 2.2.1.11 for more details.</td>
</tr>
<tr>
<td>SharedDataBaseInfo</td>
<td>Specifies information about the Source (section 3.1.1) on which protocol operations are to be performed. See section 2.2.1.12 for more details.</td>
</tr>
<tr>
<td>UpdateRecord</td>
<td>Specifies information about original values and new values of fields in a record that is to be inserted or updated in database application. See section 2.2.1.13 for more details.</td>
</tr>
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### 2.2.1.1 ClientMessage

The meaning of ClientMessage is specified by [MS-ADR] section 2.2.4.24. The format of the ClientMessage complex type is specified by this section. The following ABNF references types specified by section 2.2.

```
ClientMessage = json-object
MessageID = json-annotation-mark "MessageID" json-annotation-mark json-name-
separator ClientMessageID
Context = json-annotation-mark "Context" json-annotation-mark json-name-separator
JsonArrayOfAnyType
```

The meanings of Context and MessageID are specified by [MS-ADR] section 2.2.4.24.

ClientMessage MUST contain exactly two json-member instances, and each instance MUST be different. Each instance MUST be one of the following: Context and MessageID.

### 2.2.1.2 CurrentUserPermissions

The meaning of CurrentUserPermissions is specified by [MS-ADR] section 3.1.4.45.3.11. The format of the CurrentUserPermissions complex type is specified by this section. The following ABNF references types specified by section 2.2.

```
CurrentUserPermissions = json-object
```

[MS-ART] - v20181001
Access Run Time Protocol
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Release: October 1, 2018
The meanings of Read, Write, Author, and IsAuthenticated are specified by [MS-ADR] section 3.1.4.45.3.11.

CurrentUserPermissions MUST contain exactly four json-member instances, and each instance MUST be different. Each instance MUST be one of the following: Read, Write, Author, and IsAuthenticated.

2.2.1.3 FieldSchema

The meaning of FieldSchema is specified by [MS-ADR] section 2.2.4.25. The format of the FieldSchema complex type is specified by this section. The following ABNF references types specified by section 2.2.

FieldSchema = json-object
ColumnSchema = json-quotation-mark "ColumnName" json-quotation-mark json-name-separator json-string
DataType = json-quotation-mark "DataType" json-quotation-mark json-name-separator json-string
DefaultValue = json-quotation-mark "DefaultValue" json-quotation-mark json-name-separator json-string
IsKey = json-quotation-mark "IsKey" json-quotation-mark json-name-separator json-bool
Required = json-quotation-mark "Required" json-quotation-mark json-name-separator json-bool
ReadOnly = json-quotation-mark "ReadOnly" json-quotation-mark json-name-separator json-bool
MaxLength = json-quotation-mark "MaxLength" json-quotation-mark json-name-separator json-int
DefaultExpression = json-quotation-mark "DefaultExpression" json-quotation-mark json-name-separator json-string
ValidationScript = json-quotation-mark "ValidationScript" json-quotation-mark json-name-separator json-string
ValidationMessage = json-quotation-mark "ValidationMessage" json-quotation-mark json-name-separator ClientMessage
KeyIndex = json-quotation-mark "KeyIndex" json-quotation-mark json-name-separator json-int
SourceObject = json-quotation-mark "SourceObject" json-quotation-mark json-name-separator json-string
DependentFields = json-quotation-mark "DependentFields" json-quotation-mark json-name-separator JsonArrayOfInt
AllowMultipleValues = json-quotation-mark "AllowMultipleValues" json-quotation-mark json-name-separator json-bool
FormatString = json-quotation-mark "FormatString" json-quotation-mark json-name-separator json-string
CurrencySymbol = json-quotation-mark "CurrencySymbol" json-quotation-mark json-name-separator json-string
DecimalPlaces = json-quotation-mark "DecimalPlaces" json-quotation-mark json-name-separator json-int
The meanings of ColumnName, DataType, DefaultValue, IsKey, Required, Readonly, MaxLength, DefaultExpression, ValidationScript, ValidationMessage, KeyIndex, SourceObject, DependentFields, AllowMultipleValues, FormatString, CurrencySymbol, DecimalPlaces, TextType, IsTableQueryLookup, LookupSource, LookupBoundField, and LookupDisplayField are specified by [MS-ADR] section 2.2.4.25.

FieldSchema MUST contain at least one and no more than twenty two json-member instances, and each instance MUST be different. Each instance MUST be one of the following: ColumnName, DataType, DefaultValue, IsKey, Required, Readonly, MaxLength, DefaultExpression, ValidationScript, ValidationMessage, KeyIndex, SourceObject, DependentFields, AllowMultipleValues, FormatString, CurrencySymbol, DecimalPlaces, TextType, IsTableQueryLookup, LookupSource, LookupBoundField, and LookupDisplayField.

### 2.2.1.4 FilterInfo

The meaning of FilterInfo is specified by [MS-ADR] section 2.2.4.10. The format of the FilterInfo complex type is specified by this section. The following ABNF references types specified by section 2.2.

```
FilterInfo = json-object
  Culture = json-quotaction-mark "Culture" json-quotaction-mark json-name-separator json-string
  Expression = json-quotaction-mark "Expression" json-quotaction-mark json-name-separator json-string
  Fields = json-quotaction-mark "Fields" json-quotaction-mark json-name-separator json-string
  Text = json-quotaction-mark "Text" json-quotaction-mark json-name-separator json-string
```

The meanings of Culture, Expression, Fields, and Text are specified by [MS-ADR] section 2.2.4.10.

FilterInfo MUST contain at least one and no more than four json-member instances, and each instance MUST be different. Each instance MUST be one of the following: Culture, Expression, Fields, and Text. If one of the json-member instances is Text, then an instance of Fields and an instance of Culture MUST also be present.

### 2.2.1.5 FixupRecord

The FixupRecord type specifies the values for the fields of Updatable Source (section 3.1.1) which are used for modeling a hypothetical update on the protocol server. These values are only used for the hypothetical update, and are not updated in the database application.

The FixupRecord type is an input for the FixupRow operation (section 3.1.5.1.6).

The following ABNF references types specified by section 2.2 and applies to the FixupRecord, unless extended or overridden by an operation specification.
FixupRecord = json-object
Key = json-quotation-mark "Key" json-quotation-mark json-name-separator json-string
SupportingFieldIndexes = json-quotation-mark "SupportingFieldIndexes" json-quotation-mark json-name-separator JsonArrayOfInt
SupportingFieldValues = json-quotation-mark "SupportingFieldValues" json-quotation-mark json-name-separator JsonArrayOfString

FixupRecord MUST contain three json-member instances, and each instance MUST be different. Each instance MUST be one of the following: Key, SupportingFieldIndexes and SupportingFieldValues.

Key: A json-string (section 2.2) that specifies a value that uniquely identifies the record on which a FixupRow operation (section 3.1.5.1.6) is to be performed. MUST be present. MUST NOT be json-null.

SupportingFieldIndexes: A JsonArrayOfInt (section 2.2), that specifies the indexes of the fields whose values are used for performing FixupRow operation. MUST be present. MUST have at least one element.

SupportingFieldValues: A JsonArrayOfString (section 2.2) that specifies the values of SupportingFieldIndexes. MUST be present. MUST have at least one element.

2.2.1.6 FormatInfo

The FormatInfo complex type specifies the format for a field in a Source (section 3.1.1). The format is used by the protocol server to verify the value of the field sent by the protocol client and also to convert the value of field to its format before returning the value to the protocol client.

The FormatInfo complex type is an input as well as output used by some protocol operations.

The following ABNF references types specified by section 2.2 and applies to the FormatInfo, unless extended or overridden by an operation specification.

FormatInfo = json-object
Currency = json-quotation-mark "Currency" json-quotation-mark json-name-separator json-string
Format = json-quotation-mark "Format" json-quotation-mark json-name-separator json-string
Precision = json-quotation-mark "Precision" json-quotation-mark json-name-separator json-int

FormatInfo MUST contain three json-member instances, and each instance MUST be different. Each instance MUST be one of the following: Currency, Format, and Precision.

Currency: A json-string (section 2.2) that specifies the currency symbol for the value of a field of a Source (section 3.1.1) in the database application. MUST be set to json-null (section 2.2) when the Format of the value of the field is not "currency".

Format: A json-string (section 2.2) that specifies the format for the value of a field of a Source (section 3.1.1) in the database application. MUST either be json-null (section 2.2) or MUST have one of the following values.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;general date&quot;</td>
<td>The field is formatted as general date. For example, 01/02/2011 01:20:30 PM.</td>
</tr>
<tr>
<td>Value</td>
<td>Meaning</td>
</tr>
<tr>
<td>----------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>&quot;long date&quot;</td>
<td>The field is formatted as long date. For example, Monday, Jan 01, 2011.</td>
</tr>
<tr>
<td>&quot;short date&quot;</td>
<td>The field is formatted as short date. For example, 01/01/11.</td>
</tr>
<tr>
<td>&quot;long time&quot;</td>
<td>The field is formatted as long time. For example, 5:34:45 PM.</td>
</tr>
<tr>
<td>&quot;medium time&quot;</td>
<td>The field is formatted as medium time. For example, 5:34.</td>
</tr>
<tr>
<td>&quot;short time&quot;</td>
<td>The field is formatted as short time. For example, 17.</td>
</tr>
<tr>
<td>&quot;general number&quot;</td>
<td>The number format is general. For example, 123,456.</td>
</tr>
<tr>
<td>&quot;standard&quot;</td>
<td>The number format applied is standard. For example, 1234,567.89.</td>
</tr>
<tr>
<td>&quot;fixed&quot;</td>
<td>The number format applied is fixed. For example, 1234.56.</td>
</tr>
<tr>
<td>&quot;scientific&quot;</td>
<td>The number format applied is scientific. For example, 123E+03.</td>
</tr>
<tr>
<td>&quot;percent&quot;</td>
<td>The number format applied is percentage. For example, 12.3%.</td>
</tr>
<tr>
<td>&quot;currency&quot;</td>
<td>The number format applied is currency. For example, $12.34.</td>
</tr>
</tbody>
</table>

**Precision:** A json-int (section 2.2) that specifies the maximum number of digits present after the decimal point in the value of a field of a Source (section 3.1.1) in the database application. MUST be a number between 0 and 15 and MUST only be present when Format is one of the following:

- "general number"
- "standard"
- "fixed"
- "scientific"
- "percent"
- "currency"

### 2.2.1.7 PagingInfo

The PagingInfo complex type specifies which Page (section 3.1.1) of data from the cached result set or from the Source (section 3.1.1) is requested by the protocol client.

The PagingInfo complex type is used as an input as well as output by the some protocol operations.

The following ABNF references types specified by section 2.2, and applies to the PagingInfo complex type unless extended or overridden by an operation specification.

```
PagingInfo = json-object
FirstRow = json-quotation-mark "FirstRow" json-quotation-mark json-name-separator json-int
PageSize = json-quotation-mark "PageSize" json-quotation-mark json-name-separator json-int
```
PagingInfo MUST contain at least one and no more than nine json-member instances, and each instance MUST be different. Each instance MUST be one of the following: CacheCommands, Filter, FirstRow, Moniker, PageSize, SessionId, SortExpression, TotalRows, or UseCache.

CacheCommands: A CacheCommands (section 2.2.1) that specifies the operations to perform on the result set.

Filter: A FilterInfo (section 2.2.4) that specifies how to filter the result set.

FirstRow: A json-int (section 2.2) that specifies the index of the first record to return from the Source (section 3.1.1) specified by the SelectCommand element of the SharedDataBaseInfo (section 2.2.1.12).

- MUST be present.
- MUST be non-negative.
- MUST be less than total records in Source.

Moniker: A json-string (section 2.2) that specifies the identifier for a result set that was specified by the protocol client. If a Moniker is specified in the session then it MUST be used as the moniker element for the input to all GetData service operations (section 3.1.5.1.1) within the same session.

PageSize: A json-int (section 2.2) that specifies the maximum number of records to return. MUST be non-negative.

SessionId: A SessionIdentifier, as specified by [MS-ADR] section 3.1.1.2, that specifies a unique identifier for the current session that was previously received from the protocol server in the response of the first GetData service operation (section 3.1.5.1.1).

SortExpression: A json-string (section 2.2) that specifies the sort order to apply to the result set. If the CacheCommands contains ApplySort:

- MUST be present.
- MUST contain a CT_AdhocOrdering, as specified in [MS-AXL2] section 2.2.3.5.

TotalRows: A json-int (section 2.2) that specifies the total number of records in the Source. This element is populated by the protocol server, and sent as a part of PagingInfo, in the response body of all protocol operations. MUST be present when included in a paging response.
UseCache: MUST be ignored.

RetrieveExactRowCount: A json-bool (section 2.2) that specifies whether the protocol server retrieves the exact number of records or an approximation of the number of records in the Source. The protocol server retrieves the exact number of records if the value of RetrieveExactRowCount is json-true. If this element is not specified, a default value of json-false is used.

RowKey: A json-int (section 2.2) that specifies the value of the primary key field of the record to return from the Source (section 3.1.1) specified by the SelectCommand element of the SharedDataBaseInfo (section 2.2.1.12).
  - MUST be non-negative.

2.2.1.8 ParameterValue

The ParameterValue complex type is an input used by all protocol operations.

The following applies to the ParameterValue complex type, unless extended or overridden by an operation specification.

The ParameterValue type serves as a container for the name of a CT_Parameter ([MS-AXL2] section 2.2.3.12) and its associated value. Some Sources (section 3.1.1) in a database application are parameterized, and need parameter values to open them. Hence, this complex type is sent along with SelectCommand in a SharedDataBaseInfo (section 2.2.1.12) in the request body of all protocol operations. The following ABNF references types specified by section 2.2.

```
ParameterValue = json-object
    Name = json-quotation-mark "Name" json-quotation-mark json-name-separator json-string
    Value = json-quotation-mark "Value" json-quotation-mark json-name-separator json-value

ParameterValue MUST contain two json-member instances that are not json-null, and each instance MUST be different. Each instance MUST be one of the following: Name and Value.

Name: A json-string (section 2.2) that specifies a value that uniquely identifies the ParameterValue within a collection.

Value: A json-value (section 2.2) that specifies data associated with the given Name.

2.2.1.9 RecordSet

The RecordSet is a complex type that is output by all the protocol operations. The RecordSet is specified by the Result element of the ServiceResult complex type (section 2.2.1.11).

The following ABNF references types specified by section 2.2 and applies to the RecordSet, unless extended or overridden by an operation specification.

```
RecordSet = json-object
    Values = json-quotation-mark "Values" json-quotation-mark json-name-separator json-boolean
    JsonArrayOfArrayOfAnyType
    Localized = json-quotation-mark "Localized" json-quotation-mark json-name-separator json-boolean
    JsonArrayOfArrayOfArrayOfString
    Paging = json-quotation-mark "Paging" json-quotation-mark json-name-separator json-boolean
    PagingInfo
RecordSet MUST contain at least one json-member instance from the following json-member instances. All json-member instances MUST be unique.

Values: A JsonArrayOfArrayOfAnyType (section 2.2) that specifies a record array. Each record is an array of values for the fields (3). Each field value at an ordinal in a record array is the value of the FieldSchema (section 2.2.1.3) at the same ordinal in the Fields array RecordSet, returned in the Result element of the ServiceResult element from a previous call to the GetData operation (section 3.1.5.1.1). MUST be present.

Localized: A JsonArrayOfArrayOfArrayOfString (section 2.2) that specifies the formatted value for each value in the Values array at the same ordinal in the FormatInfos element in SharedDataBaseInfo (section 2.2.1.12). MUST be present.

Paging: A PagingInfo, as specified by section 2.2.7. MUST be present.

Fields: A json-array of FieldSchema ([MS-ADR] section 2.2.4.19) that specifies the schema of the fields of the Source (section 3.1.1), which is specified by the SelectCommand of the SharedDataBaseInfo complex type (section 2.2.1.12). MUST be present.

FormatInfos: A json-array of FormatInfo (section 2.2.1.6) that specifies the format information for the fields in the Source. MUST be present.

AutoSumValues: A JsonArrayOfAnyType (section 2.2) that specifies the results of aggregate functions, which are specified by the AutoSumFunctions of the SharedDataBaseInfo complex type (section 2.2.1.12), when applied to the fields specified by the AutoSumFields of the SharedDataBaseInfo.

CurrentUserPermissions: A CurrentUserPermissions (section 2.2.1.2) that specifies the permissions the user has for the database application.

RelatedFieldInfos: A json-array of FieldSchema ([MS-ADR] section 3.1.4.7.3.1) that specifies the schema of the related fields of the Source (section 3.1.1), which is specified by the SelectCommand of the SharedDataBaseInfo complex type (section 2.2.1.12).

2.2.1.10 ServiceError

The ServiceError complex type is an output used by all protocol operations. It is used to return alert (2) information to the protocol client.

The following ABNF references types specified by section 2.2 and applies to the ServiceError, unless extended or overridden by an operation specification.

```
ServiceError = json-object
Message = json-quotation-mark "Message" json-quotation-mark json-name-separator
ClientMessage
Caption = json-quotation-mark "Caption" json-quotation-mark json-name-separator
(json-string / json-null)
```
HelpText = json-quotate-mark "HelpText" json-quotate-mark json-name-separator (json-string / json-null)
HelpId = json-quotate-mark "HelpId" json-quotate-mark json-name-separator (json-string / json-null)
Severity = json-quotate-mark "Severity" json-quotate-mark json-name-separator MessageSeverity
Number = json-quotate-mark "Number" json-quotate-mark json-name-separator json-value

**ServiceError** MUST contain at least five and no more than six **json-member** instances, and each instance MUST be different. Each instance MUST be one of the following: **Caption**, **HelpId**, **HelpText**, **Message**, **Number**, and **Severity**.

**Caption**: A **json-string** (section 2.2) that specifies the **caption** for the **alert**. MUST be present.

**HelpId**: A **json-string** (section 2.2) that specifies the **Help topic identifier**.

**HelpText**: A **json-string** (section 2.2) that specifies a **description** of the help topic. MUST be present.

**Message**: A **ClientMessage** (section 2.2.1.1) that specifies a **description** of the alert. MUST be present. MUST NOT be empty.

**Number**: A **json-value** (section 2.2) that specifies an **error code** that is associated with this alert. MUST either be **json-null** or **json-int**.

**Severity**: A **MessageSeverity** (section 2.2.2.3) that specifies the severity of the alert. MUST be present.

### 2.2.1.11 ServiceResult

The **ServiceResult** complex type is an output used by all protocol operations.

The following **ABNF** references types specified by section 2.2 and applies to the **ServiceResult**, unless extended or overridden by an operation specification.

```
ServiceResult = json-object
   Result = json-quotate-mark "Result" json-quotate-mark json-name-separator json-value
   Error = json-quotate-mark "Error" json-quotate-mark json-name-separator json-value
ServiceError
```

**ServiceResult** MUST contain at least one and no more than two **json-member** instances, and each instance MUST be different. Each instance MUST be one of the following: **Error**, and **Result**.

**Error**: A **ServiceError**, as specified in section 2.2.1.10.

**Result**: A **json-value** (section 2.2) that specifies the result of the protocol operation.

After the protocol server has finished the execution of the protocol operation, it creates the **ServiceResult** object, and then sends it in the Response body of the protocol operation. The **Result** element of the **ServiceResult** contains the result of the protocol operation, if it finished successfully, otherwise the **Error** element will contain the error information.

### 2.2.1.12 SharedDataBaseInfo

The **SharedDataBaseInfo** complex type specifies the **Source**, the **fields** from this **Source**, the sort order and restriction criteria of the **records** that are retrieved from **database application**.

---

[MS-ART] - v20181001
Access Run Time Protocol
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Release: October 1, 2018
The **SharedDataBaseInfo** complex type is an input used by all protocol operations.

The following **ABNF** references types specified by section 2.2, and applies to the **SharedDataBaseInfo** unless extended or overridden by an operation specification.

```json
SharedDataBaseInfo = json-object
SessionId = json-quotation-mark "SessionId" json-quotation-mark json-name-separator
  (json-string | json-null)
SelectCommand = json-quotation-mark "SelectCommand" json-quotation-mark json-name-separator
  (json-string | json-null)
ParameterValues = json-quotation-mark "ParameterValues" json-quotation-mark json-name-separator
  json-begin-array [ParameterValue *( json-value-separator ParameterValue) ]
  json-end-array
OriginalCommand = json-quotation-mark "OriginalCommand" json-quotation-mark json-name-separator
  (json-string | json-null)
AggregateExpressions = json-quotation-mark "AggregateExpressions" json-quotation-mark
  json-name-separator (json-string | json-null)
AggregateFormatInfos = json-quotation-mark "AggregateFormatInfos" json-quotation-mark
  json-name-separator json-begin-array [FormatInfo *( json-value-separator FormatInfo) ]
  json-end-array
Restriction = json-quotation-mark "Restriction" json-quotation-mark json-name-separator
  (json-string | json-null)
Ordering = json-quotation-mark "Ordering" json-quotation-mark json-name-separator
  (json-string | json-null)
AllowEdits = json-quotation-mark "AllowEdits" json-quotation-mark json-name-separator
  (json-string | json-null)
AllowAdditions = json-quotation-mark "AllowAdditions" json-quotation-mark json-name-separator
  (json-string | json-null)
AllowDeletions = json-quotation-mark "AllowDeletions" json-quotation-mark json-name-separator
  (json-string | json-null)
DataEntry = json-quotation-mark "DataEntry" json-quotation-mark json-name-separator
  json-bool
FieldNames = json-quotation-mark "FieldNames" json-quotation-mark json-name-separator
  (json-string | json-null)
FormatInfos = json-quotation-mark "FormatInfos" json-quotation-mark json-name-separator
  json-begin-array [FormatInfo *( json-value-separator FormatInfo) ]
  json-end-array
DataLevelFormat = json-quotation-mark "DataLevelFormat" json-quotation-mark json-name-separator
  json-bool
ShowHeaders = json-quotation-mark "ShowHeaders" json-quotation-mark json-name-separator
  json-bool
InitialPage = json-quotation-mark "InitialPage" json-quotation-mark json-name-separator
  (json-string | json-null)
FetchSchema = json-quotation-mark "FetchSchema" json-quotation-mark json-name-separator
  json-bool
FetchKeyFields = json-quotation-mark "FetchKeyFields" json-quotation-mark json-name-separator
  json-bool
FetchDisplayFields = json-quotation-mark "FetchDisplayFields" json-quotation-mark json-name-separator
  json-bool
DoNotPrefetchImages = json-quotation-mark "DoNotPrefetchImages" json-quotation-mark
  json-name-separator json-bool
AutoSumFields = json-quotation-mark "AutoSumFields" json-quotation-mark json-name-separator
  jsonArrayOfString
AutoSumFunctions = json-quotation-mark "AutoSumFunctions" json-quotation-mark json-name-separator
  jsonArrayOfString
```

**SharedDataBaseInfo** MUST contain at least one **json-member** instance from the following **json-member** instances. All **json-member** instances MUST be unique.
AggregateExpressions: MUST NOT be used.
AggregateFormatInfos: MUST NOT be used.
AllowAdditions: MUST NOT be used.
AllowDeletions: MUST NOT be used.
AllowEdits: MUST NOT be used.
DataEntry: MUST NOT be used.
DataLevelFormat: MUST NOT be used.

FetchSchema: A json-bool (section 2.2) that specifies whether the protocol server fetches the schema information of the SelectCommand element. The protocol server fetches the schema information if the value of FetchSchema is json-true; otherwise, the protocol server does not fetch schema information. If this element is not specified, a default value of json-true is used.

FieldNames: The fields from the SelectCommand for which data is to be fetched.

FormatInfos: A json-array of FormatInfo instances, as specified in section 2.2.1.6.

InitialPage: MUST NOT be used.

Ordering: A json-string (section 2.2) that specifies the sort order. If present, the protocol server applies this sort order to the data and returns the sorted data. This element MUST contain a CT_AdHocOrdering complex type, as specified in [MS-AXL2] section 2.2.3.5.

OriginalCommand: MUST NOT be used.

ParameterValues: The value of each parameter, as specified in [MS-AXL2] section 2.2.3.17, required in the SelectCommand element. This element MUST be present for every parameter defined in SelectCommand.

Restriction: A CT_Expression complex type, as specified in [MS-AXL2] section 2.2.3.1. Only records in SelectCommand that return "true" for this restriction expression are included in the Result Set (section 3.1.1).

SelectCommand: A json-string (section 2.2) that specifies the Source (section 3.1.1) from which data is to be retrieved.

SessionId: A json-string (section 2.2) that specifies a unique identifier for the session as specified in [MS-ADR] section 3.1.1.2.

ShowHeaders: MUST NOT be used.

FetchKeyFields: A json-bool (section 2.2) that specifies whether the protocol server fetches the values of the primary key fields of the SelectCommand element. The protocol server fetches the values of the primary key fields if the value of FetchKeyFields is json-true; otherwise, the protocol server does not fetch the values of the primary key fields. If this element is not specified, a default value of json-false is used.

FetchDisplayFields: A json-bool (section 2.2) that specifies whether the protocol server fetches the display values of the foreign key fields of the SelectCommand element. The protocol server fetches the display values of the foreign key fields if the value of FetchDisplayFields is json-true;
otherwise, the protocol server does not fetch the display values of the foreign key fields. If this element is not specified, a default value of json-false is used.

**DoNotPrefetchImages**: A json-bool (section 2.2) that specifies whether the protocol server fetches and caches the values of the image fields of the SelectCommand element. The protocol server does not fetch and cache the values of the image fields if the value of DoNotPrefetchImages is json-true; otherwise, the protocol server fetches and caches the values of the image fields. If this element is not specified, a default value of json-false is used.

**AutoSumFields**: A JsonArrayOfString (section 2.2) that specifies the names of fields for which the protocol server applies the AutoSumFunctions.

**AutoSumFunctions**: A JsonArrayOfString (section 2.2) that specifies the aggregate functions to be applied to the AutoSumFields. The number of elements in AutoSumFunctions MUST be exactly equal to the number of elements in the AutoSumFields.

2.2.1.13 **UpdateRecord**

The UpdateRecord complex type specifies the new values and original values for fields in an Updatable Source (section 3.1.1) that are used for insert, update, and delete operations.

The UpdateRecord type is an input used by some protocol operations.

The following ABNF references types specified by section 2.2 and applies to UpdateRecord, unless extended or overridden by an operation specification.

```
UpdateRecord = json-object
OriginalValues = json-quotation-mark "OriginalValues" json-quotation-mark json-name-separator JsonArrayOfArrayOfAnyType
NewValues = json-quotation-mark "NewValues" json-quotation-mark json-name-separator JsonArrayOfArrayOfString
Paging = json-quotation-mark "Paging" json-quotation-mark json-name-separator PagingInfo
ReturnDataMacroIds = json-quotation-mark "ReturnDataMacroIds" json-quotation-mark json-name-separator json-bool
```

**UpdateRecord** MUST contain at least one and no more than four json-member instances, and each instance MUST be different. Each instance MUST be one of the following: NewValues, OriginalValues, Paging, and ReturnDataMacroIds.

**NewValues**: A JsonArrayOfArrayOfString (section 2.2) that specifies the new values of a collection of records which need to be inserted, updated, or deleted. The protocol server will insert, update, or delete the records in a Source (section 3.1.1) with the values that are provided by this element.

**OriginalValues**: A JsonArrayOfArrayOfAnyType (section 2.2) that specifies the existing values of a collection of records in a Source (section 3.1.1), which need to be inserted, updated, or deleted.

**Paging**: A PagingInfo complex type, as specified in section 2.2.1.7. MUST be present.

**ReturnDataMacroIds**: MUST NOT be used.

2.2.2 **Simple Types**

The following table summarizes the set of common JSON simple type definitions defined by this specification. JSON simple type definitions that are specific to a particular operation are described with the operation.
<table>
<thead>
<tr>
<th>Simple Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CacheCommands</td>
<td>The CacheCommands simple type as specified in [MS-ADR] section 2.2.5.5. See section 2.2.2.1 for more details.</td>
</tr>
<tr>
<td>ClientMessageID</td>
<td>A ClientMessageID simple type, as specified in [MS-ADR] section 2.2.5.6. See section 2.2.2.2 for more details.</td>
</tr>
<tr>
<td>MessageSeverity</td>
<td>Specifies the severity of a ServiceError (section 2.2.1.10) sent from protocol server to protocol client. See section 2.2.2.3 for more details.</td>
</tr>
</tbody>
</table>

2.2.2.1 CacheCommands

The meaning of CacheCommands is specified by [MS-ADR] section 2.2.5.5. The format of the CacheCommands simple type is specified by this section. The following ABNF references types specified by section 2.2.

```
CacheCommands = json-int;
```

The value of CacheCommands MUST be one of the values in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0x01</td>
<td>RefreshData, See [MS-ADR] section 2.2.5.</td>
</tr>
<tr>
<td>0x02</td>
<td>ApplyFilter, See [MS-ADR] section 2.2.5.</td>
</tr>
<tr>
<td>0x04</td>
<td>ClearFilter, See [MS-ADR] section 2.2.5.</td>
</tr>
<tr>
<td>0x08</td>
<td>ApplySort, See [MS-ADR] section 2.2.5.</td>
</tr>
<tr>
<td>0x10</td>
<td>RetrieveImage, See [MS-ADR] section 2.2.5.</td>
</tr>
</tbody>
</table>

2.2.2.2 ClientMessageID

The meaning of ClientMessageID is specified by [MS-ADR] section 2.2.5.6. The format of the ClientMessageID simple type is specified by this section. The following ABNF references types specified by section 2.2.

```
ClientMessageID = json-string;
```

The value of the ClientMessageID string MUST be one of the values in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>PassthroughMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>WebServiceUnavailableMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>WebServiceCanceledMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>Value</td>
<td>Meaning</td>
</tr>
<tr>
<td>--------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>DataMacroStopWaiting</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>GenericError</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NotifyRecordUpdated</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NotifyRecordsDeleted</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NotifyCannotDelete</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NotifyCannotSave</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NotifyCannotSaveDescription</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>SubFormNestingLimitExceededError</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>DivisionByZero</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TypeMismatch</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NoCurrentRecord</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>RecordNotUpdatable</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>WhereConditionTooLong</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidArgument</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidContainerControlName</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ActionArgumentNotFound</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>FormCannotClose</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>AttachmentMustSave</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidExpression</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>AttachmentUploadSucceed</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>AttachmentDeleted</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>FormOrReportNotBound</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidPropertyOrMethod</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidUrl</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>UserInterfaceMacroLoadFailure</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CannotFindMacroObject</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CannotGoToSpecifiedRecord</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidConditionExpression</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CannotGoToSubformOrTabpage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidControl</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CannotFocusOnControl</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidControlValue</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>Value</td>
<td>Meaning</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>NoControlName</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CannotFindErrorHandlingMacro</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidSetPropertyControl</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>LocalVarNameNotSpecified</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>LocalVarExpressionNotSpecified</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>LocalVariableNameInvalid</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TempVarNameNotSpecified</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TempVariableNameInvalid</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>CommandNotAvailable</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ExpressionErrorCannotSet</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TooManyRunMacros</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidBrowseToPathArgument</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidObjectReference</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>FormNotFoundRep</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ControlDoesNotSupportRequery</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ReadOnlyNote</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TooMuchParameterData</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>OperationNotSupportedOnSubReports</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ExpressionErrorInfo</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidPropertyValue</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>AutocompleteWaitingForValidationMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>AutocompleteInvalidDataMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>TooManyTermsInFilter</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidValueForFieldMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>InvalidValueForControlMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>ImageUploadFailureNotificationMessage</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
<tr>
<td>NoResultsFromFilter</td>
<td>See [MS-ADR] section 2.2.5.6</td>
</tr>
</tbody>
</table>

### 2.2.2.3 MessageSeverity

The **MessageSeverity** simple type is used to specify the severity of a **ServiceError** (section 2.2.1.10) sent to the protocol client. The following [ABNF](https://www.rfc-editor.org/rfc/rfc5231#section-2) references types specified by section 2.2.
The value of the `MessageSeverity` string MUST be one of the values in the following table.

<table>
<thead>
<tr>
<th>Value</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Info</td>
<td>The <code>ServiceError</code> indicates that an informational message has been sent from the protocol server.</td>
</tr>
<tr>
<td>Warn</td>
<td>The <code>ServiceError</code> indicates that a warning has been sent from the protocol server.</td>
</tr>
<tr>
<td>Error</td>
<td>The <code>ServiceError</code> indicates that an error has occurred.</td>
</tr>
</tbody>
</table>
3 Protocol Details

3.1 Server Details

The protocol server receives request messages from the protocol client in JSON format. The request messages can be either to retrieve, insert, update or delete data from the database application. The protocol server processes the request, and then returns the result set and alert in the Result and Error elements of ServiceResult (section 2.2.1.11) object to the protocol client. The protocol server never initiates communication with other endpoints of the protocol.

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.

This protocol includes the following Abstract Data Model elements, which are directly accessed from Access Services Data Run Time protocol as specified in [MS-ADR] section 3.1.1:

- Session
- Request
- Source
- Updatable Source

The following elements are specific to this protocol:

- **Page**: A partial result set, which is part of a sequence of partial result sets of the same size.

3.1.2 Timers

No new timers are required beyond those specified in [MS-ADR] section 3.1.2.

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 in this protocol.

<table>
<thead>
<tr>
<th>Resources</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AccessPortal</td>
<td>Specifies a resource which operates against a site that contains the database application. See section 3.1.5.1 for more details.</td>
</tr>
</tbody>
</table>
The responses to all the operations can result in the following status codes.

<table>
<thead>
<tr>
<th>Status code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>This status code indicates that operation finished successfully.</td>
</tr>
</tbody>
</table>

### 3.1.5.1 AccessPortal

This resource operates against a **site** that is identified by a **URL** that is known by protocol clients. The protocol server endpoint is formed by appending "/_vti_bin/accsvc/accessportal.json" to the URL of the site, for example: http://www.example.com/Repository/_vti_bin/accsvc/accessportal.json.

The operation path is obtained by appending the operation name to the endpoint, for example, "http://www.example.com/Repository/_vti_bin/accsvc/accessportal.json/<serviceName>"

The URL parameters are defined by the following **ABNF** syntax:

```plaintext
serviceName = STRING
```

**serviceName**: The unique name of the hosted service operation.

<table>
<thead>
<tr>
<th>Operation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GetData</td>
<td>Retrieves a subset of <strong>rows</strong> from a <strong>Source</strong> (section 3.1.1) in a <strong>database application</strong>. See section 3.1.5.1.1 for more details.</td>
</tr>
<tr>
<td>InsertRecords</td>
<td>Inserts <strong>records</strong> into an <strong>Updatable Source</strong> (section 3.1.1) in a database application. See section 3.1.5.1.2 for more details.</td>
</tr>
<tr>
<td>UpdateRecords</td>
<td>Updates records into an <strong>Updatable Source</strong> (section 3.1.1) in a database application. See section 3.1.5.1.3 for more details.</td>
</tr>
<tr>
<td>DeleteRecords</td>
<td>Deletes records from an <strong>Updatable Source</strong> (section 3.1.1) in a database application. See section 3.1.5.1.4 for more details.</td>
</tr>
<tr>
<td>GetDistinctValues</td>
<td>Retrieves distinct values for a <strong>field</strong> from a <strong>Source</strong> (section 3.1.1) in a database application. See section 3.1.5.1.5 for more details.</td>
</tr>
<tr>
<td>FixupRow</td>
<td>Performs modeling of a hypothetical update for an <strong>Updatable Source</strong> (section 3.1.1) in a database application. See section 3.1.5.1.6 for more details.</td>
</tr>
<tr>
<td>GetSearchData</td>
<td>Retrieves records from <strong>Source</strong> (section 3.1.1). See section 3.1.5.1.7 for more details.</td>
</tr>
</tbody>
</table>

#### 3.1.5.1.1 GetData

This operation fetches a subset of **rows** from a **Source** (section 3.1.1), which is passed in as **SelectCommand** element of **SharedDataBaseInfo** (section 2.2.1.12).

This operation is transported by an **HTTP POST**.

The **serviceName** as specified in section 3.1.5.1 MUST be "GetData".

The operation can be invoked through the following **URI**:
During this operation, the protocol server receives a JSON request that contains the `SharedDataBaseInfo` (section 2.2.1.12) and `PagingInfo` (section 2.2.1.7) objects. The protocol server then processes the request, and then responds with a JSON response that contains `ServiceResult` (section 2.2.1.11). The `Values` element of `RecordSet` (section 2.2.1.9), which is returned as the `Result` element of the `ServiceResult` contains the rows of data which protocol client had requested.

In the event of an application error on the protocol server during this operation, the `ServiceError`, as specified in section 2.2.1.10, MUST be present in `ServiceResult` (section 2.2.1.11).

The processing details for this operation are specified by section 3.1.5.1.3.

### 3.1.5.1.1 Request Body

The `SharedDataBaseInfo` (section 2.2.1.12) and `PagingInfo` (section 2.2.1.7) objects in Request Body determine which records are fetched from a `Source` (section 3.1.1), which is specified by the `SelectCommand` element of the `SharedDataBaseInfo`. The following ABNF references types specified by section 2.2.

```
GetDataRequest = dataBaseInfo-member pagingInfo-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
pagingInfo-member = json-quotation-mark "pagingInfo" json-quotation-mark json-name-separator PagingInfo
```

dataBaseInfo: A `SharedDataBaseInfo` (section 2.2.1.12) that specifies the `Source`, the fields from this `Source`, the sort order and restriction criteria of the records that are retrieved from the database application.

pagingInfo: A `PagingInfo` (section 2.2.1.7) that specifies which records are retrieved from the database application. MUST be present.

### 3.1.5.1.2 Response Body

The records from the `Source` (section 3.1.1) which is specified by the `SelectCommand` element of `SharedDataBaseInfo` (section 2.2.1.12) are returned to the protocol client in the `Values` element of `RecordSet` (section 2.2.1.9), which is returned as the `Result` element of the `ServiceResult` (section 2.2.1.11) in the Response Body. If there is any error on the protocol server, a `ServiceError` (section 2.2.1.10) is returned in the `Error` element of `ServiceResult`. The following ABNF references types specified by section 2.2.

```
GetDataResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult
```

GetDataResult: A `ServiceResult` (section 2.2.1.11) that specifies the records returned by protocol server to the protocol client. MUST be present.

### 3.1.5.1.3 Processing Details

The protocol client sends a request message, and the protocol server responds as specified in [MS-ADR] section 3.1.4.4, except as follows:
The protocol server retrieves data from the given **Source** (section 3.1.1) which is supplied as the **SelectCommand** element of the **SharedDataBaseInfo** (section 2.2.1.12), which is an input element of the Request Body (section 3.1.5.1.1.1).

Only the **fields** that are specified by **FieldNames** input element of **SharedDataBaseInfo** are retrieved.

If the **FetchSchema** element of **SharedDataBaseInfo** is true, the protocol server also returns the schema information about the fields in **Source**, which are specified by **Fields** element of **SharedDataBaseInfo**. This schema information is returned via the **Fields** element of the **RecordSet** (section 2.2.1.9).

If the request sent to the protocol server is the first GetData request in the **session**, then the protocol server MUST return the **SessionIdentifier** ([MS-ADR] section 3.1.1.2) in the **SessionId** element of the **PagingInfo** (section 2.2.1.7). The **PagingInfo** type is returned as an element in the **RecordSet**, which is returned as the **Result** element of the **ServiceResult** (section 2.2.1.11) complex type.

In the event of an application error on the protocol server during this operation, the **ServiceError**, as specified in section 2.2.1.10, MUST be present in **ServiceResult** (section 2.2.1.11).

### 3.1.5.1.2 InsertRecords

This operation inserts **records** into an **Updatable Source** (section 3.1.1) specified in the **SelectCommand** element of the **SharedDataBaseInfo** element in the request body (section 2.2.1.12).

The protocol server receives a **JSON** request that contains the **SharedDataBaseInfo** and **UpdateRecord** (section 2.2.1.13) objects. The protocol server processes the request and responds with a JSON response that contains the **ServiceResult** (section 2.2.1.11). The **Values** element of **RecordSet** (section 2.2.1.9) returned as the **Result** element of the **ServiceResult** contains the records of data which the protocol server inserted.

In the event of an application error on the protocol server, the **ServiceError** element (section 2.2.1.10) MUST be present in **ServiceResult** (section 2.2.1.11).

This operation is transported by an **HTTP POST**.

The **serviceName** as specified in section 3.1.5.1 MUST be "InsertRecords".

The processing details for this operation are specified by section 3.1.5.1.2.3.

#### 3.1.5.1.2.1 Request Body

The **SharedDataBaseInfo** (section 2.2.1.12) and **UpdateRecord** (section 2.2.1.13) objects in Request Body determine the values for the **fields** of the **records** to be inserted into the **Updatable Source** (section 3.1.1). The **Updatable Source** is specified by the **FieldSchema** elements in **RecordSet** (section 2.2.1.9) returned as the **Result** element in the Response Body of a prior **GetData** operation (section 3.1.5.1.1.2).

The values to be inserted are specified by the **NewValues** element of **UpdateRecord**. These values MUST be formatted according to the **FormatInfo** element of **SharedDataBaseInfo**. The **SessionId** element of **SharedDataBaseInfo** MUST be the same as the **SessionId** element of the **PagingInfo** which is an element of **RecordSet** (section 2.2.1.9) returned as the **Result** element in Response Body of the first **GetData** operation.

```plaintext
InsertRecordsRequest = databaseInfo-member updateRecord-member
dataBaseInfo-member = json-quotation-mark "databaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
```
updateRecord-member - json-quotiation-mark "updateRecord" json-quotiation-mark json-name-separator UpdateRecord

dataBaseInfo: A SharedDataBaseInfo (section 2.2.1.12) that specifies information about the Updatable Source (section 3.1.1) into which records are to be inserted.

updateRecord: An UpdateRecord (section 2.2.1.13) that specifies the values for the fields of the records to be inserted.

- The number of fields in each record MUST be the same for all the records, and MUST match the number and ordering of fields in the FieldNames element ofDataBaseInfo.
- The value of primary key fields in NewValues element MUST be "null".
- Each field value at an ordinal in a record array from the NewValues element MUST be formatted according to the FormatInfo at the same ordinal in the FormatInfos array of the databaseInfo.
- The OriginalValues element of the UpdateRecord MUST be ignored.
- The field value at an ordinal in a record array from the NewValues element MUST be "null" if the ReadOnly element of the FieldSchema element at the same ordinal in the Fields array of the RecordSet (section 2.2.1.9), returned in the Result element of the ServiceResult element from a previous call to the GetData operation (section 3.1.5.1.1) is "true".

3.1.5.1.2.2 Response Body

Returns the values of the successfully inserted records in the Values element of the RecordSet (section 2.2.1.9) returned in the Result element of the ServiceResult (section 2.2.1.11) in the Response Body. In the event of an error on the protocol server, a ServiceError (section 2.2.1.10) is returned in the Error part of ServiceResult.

- The Paging element of the RecordSet MUST be the same as the Paging element of the UpdateRecord (section 2.2.1.13) which is passed in as an input element in the Request Body (section 3.1.5.1.2.1) of the protocol operation.

3.1.5.1.2.3 Processing Details

The protocol server processes SharedDataBaseInfo (section 2.2.1.12) and UpdateRecord (section 2.2.1.13) and inserts a collection of records in the Updatable Source (section 3.1.1), which is specified by SelectCommand of SharedDataBaseInfo.

The protocol server responds as specified in [MS-ADR] section 3.1.4.8, except as follows:

- The values for the fields of the new records are retrieved from the NewValues property of UpdateRecord.
The protocol server retrieves the values of all fields of the newly inserted records from the Updatable Source and returns them in the Values element of RecordSet (section 2.2.1.9), which is the Result element of ServiceResult (section 2.2.1.11) in Response Body.

In the event of an application error on the protocol server during this operation, the ServiceError, as specified in section 2.2.1.10, MUST be present in ServiceResult (section 2.2.1.11).

3.1.5.1.3 UpdateRecords

This operation updates records in an Updatable Source (section 3.1.1), specified in the SelectCommand element of SharedDataBaseInfo (section 2.2.1.12) in the request body of the operation (section 3.1.5.1.3.1).

The protocol server receives a JSON request that contains the SharedDataBaseInfo (section 2.2.1.12) and UpdateRecord (section 2.2.1.13) objects. The protocol server processes the request and responds with a JSON response that contains ServiceResult (section 2.2.1.11). The Values element of RecordSet (section 2.2.1.9) returned as the Result element of the ServiceResult contains the records which the protocol server updated.

In the event of an application error on the protocol server during this operation, the ServiceError element (section 2.2.1.10) MUST be present in ServiceResult (section 2.2.1.11).

This operation is transported by an HTTP POST.

The serviceName as specified in section 3.1.5.1 MUST be "UpdateRecords".

The processing details for this operation are specified by section 3.1.5.1.3.3.

3.1.5.1.3.1 Request Body

The SharedDataBaseInfo (section 2.2.1.12) and UpdateRecord (section 2.2.1.13) objects in Request Body determine the original and new values for the fields of the records to be updated into the Updatable Source. The Updatable Source is specified by the FieldSchema elements in RecordSet (section 2.2.1.9) returned as the Result element in the Response Body of a prior GetData operation (section 3.1.5.1.1.2).

The original values and new values are specified by the OriginalValues and NewValues elements of the UpdateRecord, respectively. These values MUST be formatted according to the FormatInfo element of SharedDataBaseInfo. The SessionId element of the SharedDataBaseInfo MUST be same as the SessionId element of the PagingInfo element of RecordSet (section 2.2.1.9) returned in the Result element in Response Body of the first GetData operation.

```
dataBaseInfo: A SharedDataBaseInfo (section 2.2.1.12) that specifies information about the Updatable Source to be updated.
updateRecord: An UpdateRecord (section 2.2.1.13) that specifies the values for the fields of the records to be updated.
  ▪ The number of records in NewValues element and OriginalValues element MUST be the same.
  ▪ The number of fields in each record MUST be same for all the records, and MUST match the number and ordering of fields in FieldNames element of databaseInfo.
```

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- The fields value at an ordinal in a record array from the **OriginalValues** element MUST be of the same data type as specified by the **DataType** element of the **FieldSchema** element at the same ordinal in the **Fields** array of **RecordSet** (section 2.2.1.9), returned in the **Result** element of **ServiceResult** element of a prior call to **GetData** operation (section 3.1.5.1.1).

- Each field value at an ordinal in a record array from the **NewValues** element MUST be formatted according to the **FormatInfo** (section 2.2.1.6) at the same ordinal in the **FormatInfos** array of the **dataBaseInfo**.

- Each primary key fields value at an ordinal in a record array from the **NewValues** element, when converted to a number MUST be equal to the value of field at the same ordinal in a record array from the **OriginalValues** element.

- If value of any field in **OriginalValues** element is "null", that field is ignored by the protocol server and is not updated in the **Updatable Source**.

- The field value at an ordinal in a record array from the **NewValues** and **OriginalValues** elements MUST be "null" if the **ReadOnly** element of the **FieldSchema** element at the same ordinal in the **Fields** array of the **RecordSet** (section 2.2.1.9), returned in the **Result** element of the **ServiceResult** element from a prior call to the **GetData** operation (section 3.1.5.1.1) is "true".

### 3.1.5.1.3.2 Response Body

Returns the values of the successfully updated records in the **Values** element of the **RecordSet** (section 2.2.1.9) returned in the **Result** element of the **ServiceResult** (section 2.2.1.11) in the Response Body. In the event of an error on the protocol server, a **ServiceError** (section 2.2.1.10) is returned in the **Error** part of **ServiceResult**.

```
UpdateRecordsResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult
```

**UpdateRecordsResult**: A **ServiceResult** (section 2.2.1.11) that specifies the records which are updated by the protocol server. MUST be present.

- The **Paging** element of the **RecordSet** MUST be same as the **Paging** element of the **UpdateRecord** (section 2.2.1.13) which is passed in as an input element in the **Request Body** (section 3.1.5.1.3.1) of the protocol operation.

### 3.1.5.1.3.3 Processing Details

The protocol server processes the **SharedDataBaseInfo** (section 2.2.1.12) and **UpdateRecord** (section 2.2.1.13) and updates a record in the **Updatable Source** (section 3.1.1), specified by **SelectCommand** of **SharedDataBaseInfo**.

The protocol server responds as specified in [MS-ADR] section 3.1.4.12, except as follows:

- The new values for the **fields** of the records to be updated are retrieved from the **NewValues** property of **UpdateRecord**.

- The original values for the fields of the records to be updated are retrieved from the **OriginalValues** property of **UpdateRecord**.

- The protocol server retrieves the newly updated records from the **Updatable Source** and returns them in the **Values** element of **RecordSet** (section 2.2.1.9) which is returned as the **Result** element of **ServiceResult** (section 2.2.1.11) in Response Body.
3.1.5.1.4 DeleteRecords

This operation deletes records from an **Updatable Source** (section 3.1.1), specified in the **SelectCommand** element of **SharedDataBaseInfo** (section 2.2.1.12) in the request body of the operation (section 3.1.5.1.4.1).

The protocol server receives a JSON request that contains the **SharedDataBaseInfo** (section 2.2.1.12) and **UpdateRecord** (section 2.2.1.13) objects. The protocol server processes the request and responds with a JSON response that contains **ServiceResult** (section 2.2.1.11). The **Values** element of **RecordSet** (section 2.2.1.9) returned as the **Result** element of the **ServiceResult** contains a subset of the remaining records from the **Updatable Source**, after the requested records have been deleted.

In the event of an application error on the protocol server during this operation, the **ServiceError** element (section 2.2.1.10) MUST be present in **ServiceResult** (section 2.2.1.11).

This operation is transported by an **HTTP POST**.

The **serviceName** as specified in section 3.1.5.1 MUST be "DeleteRecords".

The processing details for this operation are specified by section 3.1.5.1.4.3.

3.1.5.1.4.1 Request Body

The **SharedDataBaseInfo** (section 2.2.1.12) and **UpdateRecord** (section 2.2.1.13) objects in Request Body determine the records to be deleted from **Updatable Source**. The **Updatable Source** is specified by the **FieldSchema** elements in **RecordSet** (section 2.2.1.9) returned as the **Result** element in the Response Body of a prior **GetData** operation (section 3.1.5.1.1.2).

The **SessionId** element of the **SharedDataBaseInfo** MUST be same as the **SessionId** element of the **PagingInfo** element of **RecordSet**, which is returned in the **Result** element in Response Body of the first **GetData** operation.

```
DeleteRecordsRequest = dataBaseInfo-member updateRecord-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
updateRecord-member = json-quotation-mark "updateRecord" json-quotation-mark json-name-separator UpdateRecord
```

**dataBaseInfo:** A **SharedDataBaseInfo** (section 2.2.1.12) that specifies information about the **Updatable Source** from which records are to be deleted.

**updateRecord:** An **UpdateRecord** (section 2.2.1.13) that specifies the original values for the **fields** of the records to be deleted.

- The number of fields in each record from **OriginalValues** element of **UpdateRecord** MUST be the same for all the records, and MUST match the number and ordering of fields in the **FieldNames** element of **dataBaseInfo**.
- The value of primary key fields in **OriginalValues** element MUST NOT be "null".
- The values of fields which are not primary key, are ignored.
- The **NewValues** element of the **UpdateRecord** MUST be ignored.

3.1.5.1.4.2 Response Body
Returns the values of a subset of remaining records from the Updatable Source (section 3.1.1) in the Values element of the RecordSet (section 2.2.1.9) returned by the Result element of the ServiceResult (section 2.2.1.11) in the Response Body. In the event of an error on the protocol server, a ServiceError (section 2.2.1.10) is returned in the Error part of ServiceResult.

DeleteRecordsResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

**DeleteRecordsResult**

A ServiceResult (section 2.2.1.11) that specifies a subset of the remaining records from Updatable Source after the requested records have been deleted by protocol server. MUST be present.

- The Paging element of the RecordSet MUST be same as the Paging element of the UpdateRecord (section 2.2.1.13) which is passed in as an input element in the Request Body (section 3.1.5.1.2.1) of the protocol operation.

### 3.1.5.1.4.3 Processing Details

The protocol server processes the **SharedDataBaseInfo** (section 2.2.1.12) and **UpdateRecord** (section 2.2.1.13) and then deletes a collection of records from the Updatable Source (section 3.1.1), which is specified by **SelectCommand** of **SharedDataBaseInfo**.

The protocol server responds as specified in [MS-ADR] section 3.1.4.2, except as follows:

- The values of the primary key fields of each records are retrieved from the OriginalValues element of UpdateRecord.
- The protocol server returns a subset of the remaining records retrieved according to the FirstRow and the PageSize elements of the PagingInfo element of the UpdateRecord.

### 3.1.5.1.5 GetDistinctValues

This operation retrieves records with distinct values for a field from Source (section 3.1.1), specified in the SelectCommand element of **SharedDataBaseInfo** (section 2.2.1.12) in the request body of the operation (section 3.1.5.1.5.1).

The protocol server receives a JSON request that contains the **SharedDataBaseInfo** and PagingInfo (section 2.2.1.7) objects. The request also contains a columnName for which distinct values are requested. The protocol server processes the request and responds with a JSON response that contains ServiceResult (section 2.2.1.11). The Values element of RecordSet (section 2.2.1.9) returned as the Result element of the ServiceResult contains the records from the Source, which contain distinct values for the requested columnName.

In the event of an application error on the protocol server during this operation, the ServiceError element (section 2.2.1.10) MUST be present in ServiceResult (section 2.2.1.11).

This operation is transported by an HTTP POST.

The serviceName as specified in section 3.1.5.1 MUST be "GetDistinctValues".

The processing details for this operation are specified by section 3.1.5.1.5.3.

### 3.1.5.1.5.1 Request Body
The **SharedDataBaseInfo** (section 2.2.1.12) and **PagingInfo** (section 2.2.1.7) objects and the **columnName** element in Request Body determine which records are to be fetched from a **Source** (section 3.1.1), which is specified by the **SelectCommand** element of the **SharedDataBaseInfo**.

```
GetDistinctValuesRequest = dataBaseInfo-member columnName-member pagingInfo-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
columnName-member = json-quotation-mark "columnName" json-quotation-mark json-name-separator json-string
pagingInfo-member = json-quotation-mark "pagingInfo" json-quotation-mark json-name-separator PagingInfo
```

dataBaseInfo: A **SharedDataBaseInfo** (section 2.2.1.12) that specifies the **Source**, the **fields** from this **Source**, the sort order and restriction criteria of the records that are retrieved from the database application.

columnName: A **json-string** (section 2.2) that specifies the field in the **Source** for which distinct values are retrieved.

pagingInfo: A **PagingInfo** (section 2.2.1.7) that specifies which records are retrieved from the database application.

### 3.1.5.1.5.2 Response Body

Returns the values of **field** specified by **columnName** from the **Source** (section 3.1.1) in the **Values** element of the **RecordSet** (section 2.2.1.9) returned by the **Result** element of the **ServiceResult** (section 2.2.1.11) in the Response Body. In the event of an error on the protocol server, a **ServiceError** (section 2.2.1.10) is returned in the **Error** part of **ServiceResult**.

```
GetDistinctValuesResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult
```

**GetDistinctValuesResult**: A **ServiceResult** (section 2.2.1.11) that specifies the **rows** containing distinct values for the field specified by **columnName** element. MUST be present.

### 3.1.5.1.5.3 Processing Details

The protocol server processes the **SharedDataBaseInfo** (section 2.2.1.12) and **PagingInfo** (section 2.2.1.7) objects and returns a subset of **records** from the **Source** (section 3.1.1), which contains distinct values for the **field**, specified by **columnName** in the Request Body.

The protocol server responds as specified in [MS-ADR] section 3.1.4.5, except as follows:

- The protocol server retrieves data from the given **Source** passed in as the **SelectCommand** element of the **SharedDataBaseInfo** (section 2.2.1.12), an input element of the Request Body (section 3.1.5.1.5.1).

- Values are retrieved only for the field that is specified by **columnName** input element of the Request Body.

### 3.1.5.1.6 FixupRow

This operation returns the resulting values of modeling a hypothetical update on one of the **records** in an **Updatable Source** (section 3.1.1), specified in the **SelectCommand** element of **SharedDataBaseInfo** (section 2.2.1.12) in the request body of the operation (section 3.1.5.1.6.1).
The protocol server receives a JSON request that contains the **SharedDataBaseInfo** (section 2.2.1.12) and **FixupRecord** (section 2.2.1.5) objects. The protocol server processes the request and responds with a JSON response that contains **ServiceResult** (section 2.2.1.11). The **Values** element of **RecordSet** (section 2.2.1.9) returned as **Result** element of the **ServiceResult** contains the record from the **Updatable Source**, which contains resulting values of hypothetical update on that record.

In the event of an application error on the protocol server during this operation, the **ServiceError** element (section 2.2.1.10) MUST be present in **ServiceResult** (section 2.2.1.11).

This operation is transported by an HTTP POST.

The **serviceName** as specified in section 3.1.5.1 MUST be "FixupRow".

The processing details for this operation are specified by section 3.1.5.1.6.3.

### 3.1.5.1.6.1 Request Body

The **SharedDataBaseInfo** (section 2.2.1.12) and **FixupRecord** (section 2.2.1.13) objects in Request Body determine the values for the **fields** of the **record** for which an update is to be modeled in the **Updatable Source** (section 3.1.1). The **Updatable Source** is specified by the **FieldSchema** elements in **RecordSet** (section 2.2.1.9), returned as the **Result** element in the Response Body of a prior **GetData** operation (section 3.1.5.1.1.2). This operation just returns the result of the hypothetical update. The fields in **Updatable Source** are not updated.

```
FixupRowRequest = dataBaseInfo-member fixupRecord-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
fixupRecord-member = json-quotation-mark "fixupRecord" json-quotation-mark json-name-separator FixupRecord
```

dataBaseInfo: A **SharedDataBaseInfo** (section 2.2.1.12) that specifies information about **Updatable Source** on which hypothetical update is to be performed.

- The **SessionId** element of **SharedDataBaseInfo** MUST be same as the **SessionId** element of the **PagingInfo** element of **RecordSet** (section 2.2.1.9), which is returned in the **Result** element in Response Body of the first **GetData** operation (section 3.1.5.1.1.2).

fixupRecord: A **FixupRecord** (section 2.2.1.5) that specifies the values for the fields of the records which are to be used for the hypothetical update.

- The values to be updated are specified by the **SupportingFieldValues** element of **FixupRecord**.
- These values are for the fields whose indexes in **Fields** array of **RecordSet** (section 2.2.1.9), returned in the **Result** element of **ServiceResult** element of a previous call to **GetData** operation (section 3.1.5.1.1) are specified by **SupportingFieldIndexes** element.
- These values MUST be formatted according to the **FormatInfo** element of **SharedDataBaseInfo**.
- The number of values in **SupportingFieldValues** element and **SupportingFieldIndexes** element MUST be the same.
- The value of the **primary key** field of the **Updatable Source** is specified by the **Key** element of the **FixupRecord**.

### 3.1.5.1.6.2 Response Body

Returns the resulting values of the successful hypothetical update in the **Values** element of the **RecordSet** (section 2.2.1.9) returned in the **Result** element of the **ServiceResult** (section 2.2.1.11).
in the Response Body. In the event of an error on the protocol server, a ServiceError (section 2.2.1.10) is returned in the Error part of ServiceResult.

\[
\text{FixupRowResult} = \text{json-null} \mid \text{serviceResult-member}
\]
\[
\text{serviceResult-member} = \text{json-quotation-mark} \ "d" \text{json-quotation-mark} \text{json-name-separator} \text{ServiceResult}
\]

FixupRowResult: A ServiceResult (section 2.2.1.11) that specifies the row that is the result of hypothetical update. MUST be present.

3.1.5.1.6.3 Processing Details

The protocol server processes the SharedDataBaseInfo (section 2.2.1.12) and FixupRecord (section 2.2.1.5) objects and returns a record from the Updatable Source (section 3.1.1), which is specified by the SelectCommand element of SharedDataBaseInfo (section 2.2.1.12). The values contain the resulting values of a hypothetical update performed on that record.

The protocol server responds as specified in [MS-ADR] section 3.1.4.3, except as follows:

- The original record is retrieved from Updatable Source (section 3.1.1). The primary key of the record MUST match the Key element from FixupRecord (section 2.2.1.5).

- In the event of an application error on the protocol server during this operation, the ServiceError, as specified in section 2.2.1.10, MUST be present in ServiceResult (section 2.2.1.11).

3.1.5.1.7 GetSearchData

This operation retrieves records from Source (section 3.1.1), specified in the SelectCommand element of SharedDataBaseInfo (section 2.2.1.12) in the request body of the operation (section 3.1.5.1.7.1).

The protocol server receives a JSON request that contains the SharedDataBaseInfo object. The protocol server processes the request and responds with a JSON response that contains ServiceResult (section 2.2.1.11). The Values element of RecordSet (section 2.2.1.9) returned as the Result element of the ServiceResult contains the records from the Source, which matches the following conditions.

- A maximum of 9 records are retrieved.

- In each record, the combination of values of fields whose indexes in FieldNames are 0 and 1 MUST be distinct.

- Only records where value of the field whose index in FieldNames is 1, contains the Restriction element of SharedDataBaseInfo are retrieved.

In the event of an application error on the protocol server during this operation, the ServiceError element (section 2.2.1.10) MUST be present in ServiceResult (section 2.2.1.11).

This operation is transported by an HTTP POST.

The serviceName as specified in section 3.1.5.1 MUST be "GetSearchData".

The processing details for this operation are specified by section 3.1.5.1.7.3.

3.1.5.1.7.1 Request Body
The SharedDataBaseInfo (section 2.2.1.12) object in Request Body determines fields to be retrieved from a Source (section 3.1.1), which is specified by the SelectCommand element of the SharedDataBaseInfo.

```
GetSearchDataRequest = dataBaseInfo-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
```

dataBaseInfo: A SharedDataBaseInfo (section 2.2.1.12) that specifies information about Source from which records are to be retrieved from database application.

- The fields for which data is to be retrieved are specified by the FieldNames element of the SharedDataBaseInfo.
- At least two fields MUST be present in the FieldNames element.
- At most three fields MUST be present in the FieldNames element.
- Restriction element of SharedDataBaseInfo MUST NOT be empty.

3.1.5.1.7.2 Response Body

Returns the values of field specified by the FieldNames element of SharedDataBaseInfo (section 2.2.1.12) from the Source (section 3.1.1) in the Values element of the RecordSet (section 2.2.1.9) returned by the Result element of the ServiceResult (section 2.2.1.11) in the Response Body. In the event of an error on the protocol server, a ServiceError (section 2.2.1.10) is returned in the Error part of ServiceResult.

```
GetSearchDataResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult
```

GetSearchDataResult: A ServiceResult (section 2.2.1.11) that specifies the rows containing values for field specified by FieldNames element of SharedDataBaseInfo. MUST be present.

3.1.5.1.7.3 Processing Details

The protocol server processes the SharedDataBaseInfo (section 2.2.1.12) object and returns at most 9 records from the Source (section 3.1.1), which contains distinct values for the combination of fields, with indexes 0 and 1 in the FieldNames element of SharedDataBaseInfo element in the Request Body.

The processing is done as follows.

- The protocol server retrieves data from the given Source passed in as the SelectCommand element of the SharedDataBaseInfo (section 2.2.1.12), an input element of the Request Body (section 3.1.5.1.5.1).
- Values are retrieved only for the first three fields specified by the FieldNames element of the SharedDataBaseInfo input element of the Request Body.
- In each record, the combination of values of fields whose indexes in FieldNames are 0 and 1 MUST be distinct.
- Only records where value of the field whose index in FieldNames is 1, contains the Restriction element of SharedDataBaseInfo are retrieved.
3.1.6 Timer Events

3.1.6.1 Session Timeout

Session Timeout, as specified by [MS-ADR] section 3.1.5.1.

3.1.7 Other Local Events

None.
4 Protocol Examples

4.1 GetData Service Operation

This example shows fetching a subset of rows from a Source (section 3.1.1).

The protocol client sends the following message to the protocol server to perform a GetData operation.

```
{ "dataBaseInfo" : { "AllowAdditions" : true,
                     "AllowDeletions" : true,
                     "AllowEdits" : true,
                     "FetchSchema" : true,
                     "SelectCommand" : "Employees"
                   },
    "pagingInfo" : { "CacheCommands" : 8,
                     "FirstRow" : 0,
                     "PageSize" : 50,
                     "SortExpression" : "<Ordering
xmlns="http://schemas.microsoft.com/office/accessservices/2010/12/application">
  <Order Name="FirstName" Direction="Ascending" />
</Ordering>",
                     "UseCache" : false
    }
}
```

The protocol server sends back the following response.

```
{ "d" : { "Error" : null,
          "Result" : { "AggregateLocalized" : null,
                       "AggregateValues" : null,
                       "AnonymousCanInsert" : false,
                       "AnonymousCanRead" : true,
                       "DataMacroInstanceIds" : null,
                       "Fields" : [ { "AllowMultipleValues" : false,
                                     "ColumnName" : "ID",
                                     "CurrencySymbol" : null,
                                     "DataType" : "Int",
                                     "DecimalPlaces" : -1,
                                     "DefaultExpression" : null,
                                     "DefaultValue" : "",
                                     "DependentFields" : null,
                                     "FormatString" : null,
                                     "IsKey" : true,
                                     "IsTableQueryLookup" : false,
                                     "KeyIndex" : -1,
                                     "LookupBoundField" : null,
                                     "LookupDisplayField" : null,
                                     "LookupSortType" : null,
                                     "LookupSource" : null,
                                     "MaxLength" : 4,
                                     "ReadOnly" : true,
                                     "Required" : true,
                                     "SourceObject" : null,
                                     "TextType" : null,
                                     "ValidationMessage" : null,
                                     "ValidationScript" : null
                       },
                       { "AllowMultipleValues" : false,
                         "ColumnName" : "Name",
                         "CurrencySymbol" : null,
                         "DataType" : "String",
                         "DecimalPlaces" : -1,
                         "DefaultExpression" : null,
                         "DefaultValue" : "",
                         "DependentFields" : null,
                         "FormatString" : null,
                         "IsKey" : true,
                         "IsTableQueryLookup" : false,
                         "KeyIndex" : -1,
                         "LookupBoundField" : null,
                         "LookupDisplayField" : null,
                         "LookupSortType" : null,
                         "LookupSource" : null,
                         "MaxLength" : 255,
                         "ReadOnly" : false,
                         "Required" : true,
                         "SourceObject" : null,
                         "TextType" : null,
                         "ValidationMessage" : null,
                         "ValidationScript" : null
                       },
                       { "AllowMultipleValues" : false,
                         "ColumnName" : "Age",
                         "CurrencySymbol" : null,
                         "DataType" : "Integer",
                         "DecimalPlaces" : -1,
                         "DefaultExpression" : null,
                         "DefaultValue" : "",
                         "DependentFields" : null,
                         "FormatString" : null,
                         "IsKey" : false,
                         "IsTableQueryLookup" : false,
                         "KeyIndex" : -1,
                         "LookupBoundField" : null,
                         "LookupDisplayField" : null,
                         "LookupSortType" : null,
                         "LookupSource" : null,
                         "MaxLength" : 4,
                         "ReadOnly" : true,
                         "Required" : false,
                         "SourceObject" : null,
                         "TextType" : null,
                         "ValidationMessage" : null,
                         "ValidationScript" : null
                       },
                       { "AllowMultipleValues" : false,
                         "ColumnName" : "Email",
                         "CurrencySymbol" : null,
                         "DataType" : "Email",
                         "DecimalPlaces" : -1,
                         "DefaultExpression" : null,
                         "DefaultValue" : "",
                         "DependentFields" : null,
                         "FormatString" : null,
                         "IsKey" : false,
                         "IsTableQueryLookup" : false,
                         "KeyIndex" : -1,
                         "LookupBoundField" : null,
                         "LookupDisplayField" : null,
                         "LookupSortType" : null,
                         "LookupSource" : null,
                         "MaxLength" : 255,
                         "ReadOnly" : false,
                         "Required" : true,
                         "SourceObject" : null,
                         "TextType" : null,
                         "ValidationMessage" : null,
                         "ValidationScript" : null
                       }
                    ]
          }
    }
```
"ColumnName" : "FirstName",
"CurrencySymbol" : null,
"DataType" : "NVarChar",
"DecimalPlaces" : -1,
"DefaultExpression" : null,
"DefaultValue" : "",
"DependentFields" : null,
"FormatString" : null,
"IsKey" : false,
"IsTableQueryLookup" : false,
"KeyIndex" : -1,
"LookupBoundField" : null,
"LookupDisplayField" : null,
"LookupSortType" : null,
"LookupSource" : null,
"MaxLength" : 220,
"ReadOnly" : false,
"Required" : false,
"SourceObject" : null,
"TextType" : "SingleLine",
"ValidationMessage" : null,
"ValidationScript" : null
},
{
"AllowMultipleValues" : false,
"ColumnName" : "LastName",
"CurrencySymbol" : null,
"DataType" : "NVarChar",
"DecimalPlaces" : -1,
"DefaultExpression" : null,
"DefaultValue" : "",
"DependentFields" : null,
"FormatString" : null,
"IsKey" : false,
"IsTableQueryLookup" : false,
"KeyIndex" : -1,
"LookupBoundField" : null,
"LookupDisplayField" : null,
"LookupSortType" : null,
"LookupSource" : null,
"MaxLength" : 220,
"ReadOnly" : false,
"Required" : false,
"SourceObject" : null,
"TextType" : "SingleLine",
"ValidationMessage" : null,
"ValidationScript" : null
}
],
"FormatInfos" : [ [ { "Currency" : null,
"Format" : null,
"Precision" : -1,
} ],
[ { "Currency" : null,
"Format" : null,
"Precision" : -1,
} ],
[ { "Currency" : null,
"Format" : null,
"Precision" : -1,
} ]}
4.2 InsertRecords Service Operation

This example describes how to use the InsertRecords Service Operation method (section 3.1.5.1.2) to insert an item into a table.

The protocol client sends the following message to the protocol server to insert an item into a table.

```json
{
    "IsAnonymous": false,
    "Localized": [
        null,
        null
    ],
    "Paging": {
        "CacheCommands": 8,
        "Filter": null,
        "FirstRow": 0,
        "Moniker": null,
        "PageSize": 50,
        "SessionId": "36.31b40d30-46c9-4850-9546-3ac936024abd163.1.V22.50DExMzSMML2xU1P7nWvjb95.0.en-US5.en-US73.+0480#0000-11-00-01T02:00:00:0000#0000-03-00-02T02:00:00:0000#-006036.00000000-0000-0000-0000-0000000000001.U",
        "SortExpression": "<Ordering xmlns="http://schemas.microsoft.com/office/accessservices/2010/12/application">";
        "ASCENDING"");
    "}

    "RecordStatuses": null,
    "Values": [
        [1,
            "Updated First Name",
            "Last Name"
        ]
    ],
}
```

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The protocol server sends back the following response.

```
{
  "d": {
    "Error": null,
    "Result": {
      "AggregateLocalized": null,
      "AggregateValues": null,
      "AnonymousCanInsert": false,
      "AnonymousCanRead": true,
      "DataMacroInstanceIds": null,
      "Fields": null,
      "FormatInfos": [
        {
          "Currency": null,
          "Format": null,
          "Precision": -1,
        },
        {
          "Currency": null,
          "Format": null,
          "Precision": -1,
        },
        {
          "Currency": null,
          "Format": null,
          "Precision": -1,
        }
      ],
      "IsAnonymous": false,
      "Localized": [
        null,
        null,
        null
      ],
      "Paging": {
        "CacheCommands": 0,
        "Filter": null,
        "FirstRow": 0,
        "Moniker": null,
        "PageSize": 1,
        "SessionId": null
      }
    }
  }
}
```

01T02:00:00:0000#000000-03-00-02T02:00:00:0000#-006036.00000000-0000-0000-0000-
0000000000001.U
4.3 UpdateRecords Service Operation

This example describes how to use the **UpdateRecords** Service Operation method (section 3.1.5.1.3) to update an item into a table.

The protocol client sends the following message to the protocol server to update an item into a table:

```json
{ "dataBaseInfo" : { "AggregateExpressions" : null,  
"AggregateFormatInfos" : [ ],  
"AllowAdditions" : true,  
"AllowDeletions" : true,  
"AllowEdits" : true,  
"FetchSchema" : false,  
"FieldNames" : [ "ID",  
  "FirstName",  
  "LastName"  
],  
"FormatInfos" : [ [ { "Currency" : null,  
  "Format" : null,  
  "Precision" : -1  
} ] ],  
"ParameterValues" : null,  
"SelectCommand" : "Employees",  
"SessionId" : "36.31b40d30-46c9-4850-9546-3ac93624abd163.1.V22.470NwJCV0bA0inRQRXCt3u90.5.en-US5.en-US73.+0480#0000-11-00-01T02:00:00:00000-006036.00000000-000-000-000-000-0000000000001.U"  
},  
"updateRecord" : { "NewValues" : [ [ "1",  
  "Updated First Name",  
  null  
] ],  
"OriginalValues" : [ [ 1,  
  "First Name",  
  null  
] ],  
"Paging" : { "CacheCommands" : 0,  
  "Filter" : null,  
  "FirstRow" : 0,  
  "Moniker" : null,  
  "PageSize" : 1,  
  "SessionId" : null,
```

```
The protocol server sends back the following response.

```
{ "d" : { "Error" : null,  
    "Result" : { "AggregateLocalized" : null,  
      "AggregateValues" : null,  
      "AnonymousCanInsert" : false,  
      "AnonymousCanRead" : true,  
      "DataMacroInstanceIds" : null,  
      "Fields" : null,  
      "FormatInfos" : [ [{ "Currency" : null,  
          "Format" : null,  
          "Precision" : -1,  
        } ] ],  
      [ { "Currency" : null,  
          "Format" : null,  
          "Precision" : -1,  
        } ] ],  
      [ { "Currency" : null,  
          "Format" : null,  
          "Precision" : -1,  
        } ] ] },  
    "IsAnonymous" : false,  
    "Localized" : [ [ null,  
        null,  
        null ] ],  
    "Paging" : { "CacheCommands" : 0,  
      "Filter" : null,  
      "FirstRow" : 0,  
      "Moniker" : null,  
      "PageSize" : 1,  
      "SessionId" : null,  
      "TotalRows" : 1,  
      "UseCache" : true,  
    },  
    "RecordStatuses" : null,  
    "Values" : [ [ 1,  
        "Updated First Name",  
        "Last Name"  
      ] ] }
```


4.4 DeleteRecords Service Operation

This example describes how to use the DeleteRecords Service Operation method (section 3.1.5.1.4) to delete an item from a table.

The protocol client sends the following message to the protocol server to delete an item from a table.

```
{ "dataBaseInfo" : { "AggregateExpressions" : null,
    "AggregateFormatInfos" : [ ],
    "AllowAdditions" : true,
    "AllowDeletions" : true,
    "AllowEdits" : true,
    "FetchSchema" : false,
    "FieldNames" : [ "ID",
                    "FirstName",
                    "LastName"
                  ],
    "FormatInfos" : [ [ { "Currency" : null,
                        "Format" : null,
                        "Precision" : -1
                      } ] ],
    "ParameterValues" : null,
    "SelectCommand" : "Employees",
    "SessionId" : "36.31b40d30-46c9-4850-9546-3ac936024abd163.1.v22.51RMVPQFdeHSB2Ag5Mm53S90.5.en-US.en-US73.+0480#0000-11-00-01T02:00:00:0000#00000000-0000-0000-0000-0000000000001.U"
  },
  "updateRecord" : { "OriginalValues" : [ [ 2,
                                           "First Name 1",
                                           "Last Name 1"
                                         ] ],
                      "Paging" : { "CacheCommands" : 0,
                                   "Filter" : null,
                                   "FirstRow" : 1,
                                   "Moniker" : null,
                                   "PageSize" : 1,
                                   "SessionId" : null,
                                     <Order Name="FirstName" Direction="Ascending" /></Ordering>
                                   "TotalRows" : 2,
                                   "UseCache" : true,
                             },
                      "ReturnDataMacroIds" : false
  }
}]

```
{ "d" : { "Error" : null,

"Result" : { "AggregateLocalized" : null,

  "AggregateValues" : null,
  "AnonymousCanInsert" : false,
  "AnonymousCanRead" : true,
  "DataMacroInstanceIds" : null,
  "Fields" : null,
  "FormatInfos" : [ [ { "Currency" : null,

    "Format" : null,
    "Precision" : -1,
  } ],
  [ { "Currency" : null,

    "Format" : null,
    "Precision" : -1,
  } ],
  [ { "Currency" : null,

    "Format" : null,
    "Precision" : -1,
  } ]
  ],

  "IsAnonymous" : false,

  "Localized" : [ [ null,

    null,
    null
  ] ],

  "Paging" : { "CacheCommands" : 0,

    "Filter" : null,
    "FirstRow" : 0,
    "Moniker" : null,

  }

} }
"PageSize" : 1,
"SessionId" : "36.31b40d30-46c9-4850-9546-3ac936024bd163.1.V22.51RMVPQFdeHSB2Ag5Mm53390.5.en-US5.en-US73.+0480#0000-11-00-01T02:00:00:0000#+0000#0000-03-00-02T02:00:00:0000#-006036.00000000-0000-0000-0000-000000000000001.U",
"TotalRows" : 1,
"UseCache" : true,
"RecordStatuses" : null,
"Values" : [ [ 1,
   "First Name",
   "Last Name"
 ] ]
5 Security

5.1 Security Considerations for Implementers

In addition to the security considerations applicable to the underlying protocols, there are security risks associated with exposing session identifiers. If a session identifier is exposed, it is possible for an attacker to read information from, or modify data in, a session on the protocol server. An implementer of this protocol needs to consider keeping session identifiers protected. There could be some cases where it is desirable to expose a session identifier, however, an implementer is to use caution in how they expose session identifiers and consider the security risks.

5.2 Index of Security Parameters

None.
6 Appendix A: Full JSON ABNF

ClientMessage = json-object
MessageID = json-quotation-mark "MessageID" json-quotation-mark json-name-separator ClientMessageID
Context = json-quotation-mark "Context" json-quotation-mark json-name-separator
JsonArrayOfAnyType

CurrentUserPermissions = json-object
Read = json-quotation-mark "Read" json-quotation-mark json-name-separator json-bool
Write = json-quotation-mark "Write" json-quotation-mark json-name-separator json-bool
Author = json-quotation-mark "Author" json-quotation-mark json-name-separator json-bool
IsAuthenticated = json-quotation-mark "IsAuthenticated" json-quotation-mark json-name-separator json-bool
FieldSchema = json-object
ColumnName = json-quotation-mark "ColumnName" json-quotation-mark json-name-separator json-string
DataType = json-quotation-mark "DataType" json-quotation-mark json-name-separator json-string
DefaultValue = json-quotation-mark "DefaultValue" json-quotation-mark json-name-separator json-string
IsKey = json-quotation-mark "IsKey" json-quotation-mark json-name-separator json-bool
Required = json-quotation-mark "Required" json-quotation-mark json-name-separator json-bool
ReadOnly = json-quotation-mark "ReadOnly" json-quotation-mark json-name-separator json-bool
MaxLength = json-quotation-mark "MaxLength" json-quotation-mark json-name-separator json-int
DefaultExpression = json-quotation-mark "DefaultExpression" json-quotation-mark json-name-separator json-string
ValidationScript = json-quotation-mark "ValidationScript" json-quotation-mark json-name-separator json-string
ValidationMessage = json-quotation-mark "ValidationMessage" json-quotation-mark json-name-separator json-string
KeyIndex = json-quotation-mark "KeyIndex" json-quotation-mark json-name-separator json-int
SourceObject = json-quotation-mark "SourceObject" json-quotation-mark json-name-separator json-string
DependentFields = json-quotation-mark "DependentFields" json-quotation-mark json-name-separator JsonArrayOfInt
AllowMultipleValues = json-quotation-mark "AllowMultipleValues" json-quotation-mark json-name-separator json-bool
FormatString = json-quotation-mark "FormatString" json-quotation-mark json-name-separator json-string
CurrencySymbol = json-quotation-mark "CurrencySymbol" json-quotation-mark json-name-separator json-string
DecimalPlaces = json-quotation-mark "DecimalPlaces" json-quotation-mark json-name-separator json-int
TextType = json-quotation-mark "TextType" json-quotation-mark json-name-separator json-string
IsTableQueryLookup = json-quotation-mark "IsTableQueryLookup" json-quotation-mark json-name-separator json-bool
LookupSource = json-quotation-mark "LookupSource" json-quotation-mark json-name-separator json-string
LookupBoundField = json-quotation-mark "LookupBoundField" json-quotation-mark json-name-separator json-string
LookupDisplayField = json-quotation-mark "LookupDisplayField" json-quotation-mark
json-name-separator json-string

FilterInfo = json-object
Culture = json-quotation-mark "Culture" json-quotation-mark json-name-separator
json-string
Expression = json-quotation-mark "Expression" json-quotation-mark json-name-separator
json-string
Fields = json-quotation-mark "Fields" json-quotation-mark json-name-separator
JsonArrayOfStrings
Text = json-quotation-mark "Text" json-quotation-mark json-name-separator json-string

FixupRecord = json-object
Key = json-quotation-mark "Key" json-quotation-mark json-name-separator json-string
SupportingFieldIndexes = json-quotation-mark "SupportingFieldIndexes" json-quotation-mark
json-name-separator JsonArrayOfInt
SupportingFieldValues = json-quotation-mark "SupportingFieldValues" json-quotation-mark
json-name-separator JsonArrayOfString

FormatInfo = json-object
Currency = json-quotation-mark "Currency" json-quotation-mark json-name-separator
json-string
Format = json-quotation-mark "Format" json-quotation-mark json-name-separator json-string
Precision = json-quotation-mark "Precision" json-quotation-mark json-name-separator
json-int

PagingInfo = json-object
FirstRow = json-quotation-mark "FirstRow" json-quotation-mark json-name-separator
json-int
PageSize = json-quotation-mark "PageSize" json-quotation-mark json-name-separator
json-int
Moniker = json-quotation-mark "Moniker" json-quotation-mark json-name-separator
(json-string / json-null)
UseCache = json-quotation-mark "UseCache" json-quotation-mark json-name-separator
json-bool
CacheCommands = json-quotation-mark "CacheCommands" json-quotation-mark json-name-separator
CacheCommands
SortExpression = json-quotation-mark "SortExpression" json-quotation-mark json-name-separator
json-string
Filter = json-quotation-mark "Filter" json-quotation-mark json-name-separator
FilterInfo
TotalRows = json-quotation-mark "TotalRows" json-quotation-mark json-name-separator
json-int
SessionId = json-quotation-mark "SessionId" json-quotation-mark json-name-separator
json-string
RetrieveExactRowCount = json-quotation-mark "RetrieveExactRowCount" json-quotation-mark
json-name-separator json-bool
RowKey = json-quotation-mark "RowKey" json-quotation-mark json-name-separator json-int

ParameterValue = json-object
Name = json-quotation-mark "Name" json-quotation-mark json-name-separator json-string
Value = json-quotation-mark "Value" json-quotation-mark json-name-separator json-value

RecordSet = json-object
Values = json-quotation-mark "Values" json-quotation-mark json-name-separator
JsonArrayOfArrayOfType
Localized = json-quotatation-mark "Localized" json-quotatation-mark json-name-separator
JSONArrayOfArrayOfString
Paging = json-quotatation-mark "Paging" json-quotatation-mark json-name-separator
PagingInfo
Fields = json-quotatation-mark "Fields" json-quotatation-mark json-name-separator
json-begin-array [FieldSchema *( json-value-separator FieldSchema ) ] json-end-array
FormatInfos = json-quotatation-mark "FormatInfos" json-quotatation-mark json-name-separator
json-begin-array [FormatInfo *( json-value-separator FormatInfo ) ] json-end-array
AutoSumValues = json-quotatation-mark "AutoSumValues" json-quotatation-mark json-name-separator
JSONArrayOfAnyType
CurrentUserPermissions = json-quotatation-mark "CurrentUserPermissions" json-quotatation-mark json-name-separator
CurrentUserPermissions
RelatedFieldInfos = json-quotatation-mark "RelatedFieldInfos" json-quotatation-mark
json-name-separator json-begin-array [FieldSchema *( json-value-separator
FieldSchema ) ] json-end-array
ServiceError = json-object
Message = json-quotatation-mark "Message" json-quotatation-mark json-name-separator
ClientMessage
Caption = json-quotatation-mark "Caption" json-quotatation-mark json-name-separator
(json-string / json-null)
HelpText = json-quotatation-mark "HelpText" json-quotatation-mark json-name-separator
(json-string / json-null)
HelpId = json-quotatation-mark "HelpId" json-quotatation-mark json-name-separator
(json-string / json-null)
Severity = json-quotatation-mark "Severity" json-quotatation-mark json-name-separator
MessageSeverity
Number = json-quotatation-mark "Number" json-quotatation-mark json-name-separator json-
value
ServiceResult = json-object
Result = json-quotatation-mark "Result" json-quotatation-mark json-name-separator json-
value
Error = json-quotatation-mark "Error" json-quotatation-mark json-name-separator
ServiceError

SharedDataBaseInfo = json-object
SessionId = json-quotatation-mark "SessionId" json-quotatation-mark json-name-separator
(json-string | json-null)
SelectCommand = json-quotatation-mark "SelectCommand" json-quotatation-mark json-name-
separator (json-string | json-null)
ParameterValues = json-quotatation-mark "ParameterValues" json-quotatation-mark json-
name-separator json-begin-array [ParameterValue *( json-value-separator
ParameterValue ) ] json-end-array
OriginalCommand = json-quotatation-mark "OriginalCommand" json-quotatation-mark json-
name-separator (json-string | json-null)
AggregateExpressions = json-quotatation-mark "AggregateExpressions" json-quotatation-
mark json-name-separator (json-string | json-null)
AggregateFormatInfos = json-quotatation-mark "AggregateFormatInfos" json-quotatation-
mark json-name-separator json-begin-array [FormatInfo *( json-value-separator
FormatInfo ) ] json-end-array
Restriction = json-quotatation-mark "Restriction" json-quotatation-mark json-name-
separator (json-string | json-null)
Ordering = json-quotatation-mark "Ordering" json-quotatation-mark json-name-separator
(json-string | json-null)
AllowEdits = json-quotatation-mark "AllowEdits" json-quotatation-mark json-name-
separator (json-string | json-null)
AllowAdditions = json-quotatation-mark "AllowAdditions" json-quotatation-mark json-
name-separator (json-string | json-null)

[MS-ART] - v20181001
Access Run Time Protocol
Copyright © 2018 Microsoft Corporation
Release: October 1, 2018
AllowDeletions = json-quotatio-mark "AllowDeletions" json-quotatio-mark json-name-separator (json-string | json-null)

DataEntry = json-quotatio-mark "DataEntry" json-quotatio-mark json-name-separator json-null
FieldNames = json-quotatio-mark "FieldNames" json-quotatio-mark json-name-separator (json-string | json-null)
DataLevelFormat = json-quotatio-mark "DataLevelFormat" json-quotatio-mark json-name-separator json-null
ShowHeaders = json-quotatio-mark "ShowHeaders" json-quotatio-mark json-name-separator json-null
InitialPage = json-quotatio-mark "InitialPage" json-quotatio-mark json-name-separator (json-string | json-null)
FetchSchema = json-quotatio-mark "FetchSchema" json-quotatio-mark json-name-separator json-null
FetchKeyFields = json-quotatio-mark "FetchKeyFields" json-quotatio-mark json-name-separator json-null
FetchDisplayFields = json-quotatio-mark "FetchDisplayFields" json-quotatio-mark json-name-separator json-null
DoNotPrefetchImages = json-quotatio-mark "DoNotPrefetchImages" json-quotatio-mark json-name-separator json-null
AutoSumFields = json-quotatio-mark "AutoSumFields" json-quotatio-mark json-name-separator json-null
AutoSumFunctions = json-quotatio-mark "AutoSumFunctions" json-quotatio-mark json-name-separator json-null

UpdateRecord = json-object
OriginalValues = json-quotatio-mark "OriginalValues" json-quotatio-mark json-name-separator JsonArrayOfArrayOfAnyType
NewValues = json-quotatio-mark "NewValues" json-quotatio-mark json-name-separator JsonArrayOfArrayOfAnyType
Paging = json-quotatio-mark "Paging" json-quotatio-mark json-name-separator JsonArrayOfArrayOfAnyType
ReturnDataMacroIds = json-quotatio-mark "ReturnDataMacroIds" json-quotatio-mark json-name-separator json-null

CacheCommands = json-int
ClientMessageID = json-string
MessageSeverity = json-string

GetDataRequest = dataBaseInfo-member pagingInfo-member
dataBaseInfo-member = json-quotatio-mark "dataBaseInfo" json-quotatio-mark json-name-separator SharedDataBaseInfo
pagingInfo-member = json-quotatio-mark "pagingInfo" json-quotatio-mark json-name-separator PagingInfo

GetDataResult = json-null | serviceResult-member
serviceResult-member = json-quotatio-mark "d" json-quotatio-mark json-name-separator ServiceResult

InsertRecordsRequest = dataBaseInfo-member updateRecord-member
dataBaseInfo-member = json-quotatio-mark "dataBaseInfo" json-quotatio-mark json-name-separator SharedDataBaseInfo

InsertRecordsResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

UpdateRecordsRequest = dataBaseInfo-member updateRecord-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
updateRecord-member = json-quotation-mark "updateRecord" json-quotation-mark json-name-separator UpdateRecord

UpdateRecordsResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

DeleteRecordsRequest = dataBaseInfo-member updateRecord-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
updateRecord-member = json-quotation-mark "updateRecord" json-quotation-mark json-name-separator UpdateRecord

DeleteRecordsResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

GetDistinctValuesRequest = dataBaseInfo-member columnName-member pagingInfo-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
columnName-member = json-quotation-mark "columnName" json-quotation-mark json-name-separator json-string
pagingInfo-member = json-quotation-mark "pagingInfo" json-quotation-mark json-name-separator PagingInfo

GetDistinctValuesResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

FixupRowRequest = dataBaseInfo-member fixupRecord-member
dataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo
fixupRecord-member = json-quotation-mark "fixupRecord" json-quotation-mark json-name-separator FixupRecord

FixupRowResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult

GetSearchDataRequest = dataBaseInfo-member
DataBaseInfo-member = json-quotation-mark "dataBaseInfo" json-quotation-mark json-name-separator SharedDataBaseInfo

GetSearchDataResult = json-null | serviceResult-member
serviceResult-member = json-quotation-mark "d" json-quotation-mark json-name-separator ServiceResult
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 updates to those products.

- Microsoft Access 2013
- Microsoft SharePoint Server 2013
- Microsoft Access 2016
- Microsoft SharePoint Server 2016
- Microsoft Access 2019
- Microsoft SharePoint Server 2019

Exceptions, if any, are noted in this section. If an update version, service pack or Knowledge Base (KB) number appears with a product name, the behavior changed in that update. The new behavior also applies to subsequent updates unless otherwise specified. If a product edition appears with the product version, behavior is different in that product edition.

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

This section identifies changes that were made to this document since the last release. Changes are classified as Major, Minor, or None.

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.
- A document revision that captures changes to protocol functionality.

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 **None** means that no new technical changes were introduced. Minor editorial and formatting changes may have been made, but the relevant technical content is identical to the last released version.

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

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<th>Revision class</th>
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<tr>
<td>Appendix B: Product Behavior</td>
<td>Updated list of supported products.</td>
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