[MS-ASDTYPE]:
ActiveSync Data Types

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Revision Summary

Date	Revision History	Revision Class	Comments
12/03/2008	1.0.0	Major	Initial Release.
03/04/2009	1.0.1	Editorial	Revised and edited technical content.
04/10/2009	2.0.0	Major	Updated technical content and applicable product releases.
07/15/2009	3.0.0	Major	Revised and edited for technical content.
11/04/2009	4.0.0	Major	Updated and revised the technical content.
02/10/2010	5.0.0	Major	Updated and revised the technical content.
05/05/2010	6.0.0	Major	Updated and revised the technical content.

Table of Contents

1 Introduction

This document specifies the required format of each data type used by the Exchange ActiveSync **XML schema definitions (XSDs)** definitions.

The Exchange ActiveSync protocol sends and receives data in **Wide Area Protocol (WAP) Binary XML (WBXML)** format. In order to ensure that both the client and the server have the same expectations about the format of the element data, the Exchange ActiveSync commands and **classes** use XSDs to define the data type of each element.

1.1 Glossary

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

ASCII
class
Coordinated Universal Time (UTC)
organizer
Unicode
WAP Binary XML (WBXML)
XML
XML schema definition (XSD)

The following terms are specific to this document:

Base64: A binary-to-text encoding scheme whereby an arbitrary sequence of bytes is converted to a sequence of printable **ASCII** characters.

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

1.2 References

1.2.1 Normative References

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

[ISO-8601] International Organization for Standardization, "Data elements and interchange formats -- Information interchange -- Representation of dates and times", ISO 8601:2004, December 2004, http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=40874

[MS-ASAIRS] Microsoft Corporation, "ActiveSync AirSyncBase Namespace Protocol Specification", December 2008.

[MS-ASCAL] Microsoft Corporation, "ActiveSync Calendar Class Protocol Specification", December 2008.

[MS-ASCMD] Microsoft Corporation, "ActiveSync Command Reference Protocol Specification", December 2008.

[MS-ASCNTC] Microsoft Corporation, "ActiveSync Contact Class Protocol Specification", December 2008.

[MS-ASDOC] Microsoft Corporation, "ActiveSync Document Class Protocol Specification", December 2008.

[MS-ASEMAIL] Microsoft Corporation, "ActiveSync E-Mail Class Protocol Specification", December 2008.

[MS-ASTASK] Microsoft Corporation, "ActiveSync Tasks Class Protocol Specification", December 2008.

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

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

[RFC822] Crocker, D., "STANDARD FOR THE FORMAT OF ARPA INTERNET TEXT MESSAGES", RFC 822, August 1982, http://www.ietf.org/rfc/rfc0822.txt

[W3C-XSD2] Biron, P., and Malhotra, A., Eds., "XML Schema Part 2: Datatypes Second Edition", W3C Recommendation, October 2004, http://www.w3.org/TR/xmlschema-2/

[WBXML] Martin, B., and Jano, B., Eds., "WAP Binary XML Content Format", W3C Note, June 1999, http://www.w3.org/TR/wbxml/

1.2.2 Informative References

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

1.3 Overview

The data types specified in this document are divided into two categories:

- Types specified by the XML Schema data types definition [W3C-XSD2]. Most of the types specified by this document conform to this description.
- Structured string types, in which the value of the element is a string data type that conforms to a specified format. The **byte array** structure (section 2.11) is an example of a structured string type.

1.4 Relationship to Protocols and Other Structures

The data types are used by the ActiveSync content classes, as specified in [MS-ASCAL], [MS-ASCNTC], [MS-ASCON], [MS-ASDOC], [MS-ASEMAIL], [MS-ASMS], [MS-ASNOTE], and [MS-ASTASK], and by the AirSyncBase namespace, as specified in [MS-ASAIRS].

1.5 Applicability Statement

The data types specified in this document are applicable to all Exchange ActiveSync schemas.

1.6 Versioning and Capability Negotiation

None.

1.7 Vendor-Extensible Fields

None.

2 Structure

The following sections describe data types used by the Exchange ActiveSync protocols. All data sent by the Exchange ActiveSync protocol is text, but some of the text values adhere to the following text style data types, as specified by the schemas.

2.1 String

A **string** is a chunk of **Unicode** text, as specified in [W3C-XSD2] section 3.2.1. Elements with a **String** data type MUST be encoded and transmitted as [WBXML] inline strings.

Some string values are constrained to a particular set of values, which is included in the description of the element.

2.2 Integer

An **integer** is a numeric value that can be provided in the **XML** body of a command or in a POST command **header**, as specified in [W3C-XSD2] section 3.3.13. Elements with an **Integer** data type MUST be encoded and transmitted as [WBXML] inline strings.

Some integer values are constrained to a fixed set (**enumeration**), which is specified in the description of the element. For more details about **enumeration**, see section 2.9.

2.3 Boolean

A **boolean** is an integer whose only valid values are 1 (TRUE) or 0 (FALSE), as specified in [W3C-XSD2] section 3.2.2. If the integer value is missing, then it is assumed to be 1 (TRUE). For examples, see section 3.3. Elements with a **Boolean** data type MUST be encoded and transmitted as [WBXML] inline strings.

2.4 Telephone Numbers

Telephone numbers are unconstrained **string** values that MAY include an area code and a country code.

2.5 E-Mail Addresses

E-mail addresses are unconstrained **string** values.

However, a valid individual **e-mail address** MUST have the following format: local-part@domain. For more information about e-mail address syntax, see [RFC822] section 6.

2.6 Date/Time

Date/time values are as specified in [ISO-8601].

All dates are given in **Coordinated Universal Time (UTC)** and are represented as a **string** in the following format:

YYYY-MM-DDTHH:MM:SS.MSSZ where

YYYY = Year (Gregorian **calendar** year)

MM = Month (01 - 12)

DD = Day (01 - 31)

HH = Number of complete hours since midnight (00 - 24)

MM = Number of complete minutes since start of hour (00 - 59)

SS = Number of seconds since start of minute (00 - 59)

MSS = Number of milliseconds

The T serves as a separator, and the Z indicates that this time is in UTC.

For example, 8:35 A.M. on December 25, 2000 would be represented as 2000-12-25T08:35:00.000Z.

Note Dates and times in calendar items MUST NOT include punctuation separators. For example: <A:StartTime>20021126T160000Z</A:StartTime>

Elements with a **Date/Time** data type MUST be encoded and transmitted as [WBXML] inline strings.

2.6.1 Time Zones and Daylight Saving Time

Dates and times can be very simple in calendars that are not shared. All times MAY be in device-local time, and there is no need for time zones or Daylight Savings Time (DST). If a **meeting** is scheduled for 10:00 A.M., it is in device time and, if the user of the device travels to another time zone, he or she adjusts the device time, but the meeting time remains at 10:00 A.M. If DST begins, the device time is adjusted again, but the meeting time remains at 10:00 A.M.

Dates and times become more complex when calendar **events** are shared by people who are in different time zones and are not all on DST. If Sean in Seattle schedules a 10:00 A.M. conference call with Annette in New York, the meeting will appear at 1:00 P.M. on Annette's calendar. If Jeff in Arizona is also on the call, he should see the meeting in his local time on his calendar. Because Arizona does not observe DST, the meeting is shown at 11:00 A.M. if it is the winter, but at 10:00 A.M. if it is the summer. If the meeting is recurring, then the dates and times are more complex during the transitions between DST and standard time. The following table lists the local and UTC times for a 10:00 A.M. meeting the weeks before and after the transition to DST.

Date	Seattle	Arizona	New York	UTC
4/4/03	10:00 Pacific Time (PT)	11:00 MST (Mountain Standard Time)	13:00 Eastern Standard Time (EST)	18:00 UTC
4/11/03	10:00 Pacific Daylight Time (PDT)	10:00 MST	13:00 Eastern Daylight Time (EDT)	17:00 UTC

The Seattle time remains the same before and after the transition to DST because the meeting **organizer** is in Seattle. If the organizer was Jeff in Arizona, then the meeting times before and after the DST transition would be different, as shown in the following table.

Date	Seattle	Arizona	New York	UTC
4/4/03	10:00 PT	11:00 MST	13:00 EST	18:00 UTC
4/11/03	11:00 PDT	11:00 MST	14:00 EDT	18:00 UTC

The shared **Meeting object** in the calendar application MUST **store** the following information. For a one-time meeting, the UTC time alone MAY be stored, and each device MAY translate to its local time by using its local time zone information. The time zone information includes a permanent time zone offset and, if appropriate, DST start and end dates, and time bias.

If the meeting is recurring, however, the UTC time can change depending on whether daylight saving time is in effect at the originator's location for each occurrence. The constant is the time in the originator's time zone, which is the time that MUST be stored. In addition, the originator's time zone MUST be stored. To display a meeting time, the time MUST be converted to UTC by using the originator's time zone, and then it MUST be converted to local time by using the device's local time zone.

Note The UTC time MAY be stored instead of the originator's local time. But the originator's time zone MUST still be stored. This feature allows for the daylight saving time adjustment, although the calculation is somewhat less intuitive.

If this recurring meeting has an **exception**, then the exception contains the date and time of the **series instance** that is different. As with the series itself, the UTC of the exception varies based on DST. Therefore, the originator's time zone MUST be used to calculate the time of the exception. Because the originator's time zone is stored with the recurrence, the time zone MAY NOT be stored again for each exception.

2.6.2 Calculating Dates and Times

The ActiveSync Exchange protocols use the UTC time and the originator's time zone for all meetings. For single occurrences, the device converts the time to the local time zone. The originator's time zone is not important because the original conversion to UTC accounts for time zone and Daylight Savings Time (DST). However, for recurring meetings, the device MUST consider the possibility of a transition into or out of DST during the series. The stored UTC corresponds to the first occurrence of the series, but later meetings can have different corresponding UTC times. Therefore, to display the correct time, the device MUST perform one calculation that accounts for the originator's time zone, in addition to the device's local time zone.

The following table shows the time zone information for the earlier examples.

	Pacific Time	**Mountain Time (Arizona)**	**Eastern Time**
Time zone offset	UTC-8	UTC-7	UTC-5
Daylight start	4/6/03 02:00	None	4/6/03 02:00
Daylight end	10/26/03 02:00	None	10/26/03 02:00
Daylight bias	+1	0	+1

The calculation to display the local time of a meeting instance is as follows:

(Meeting time in UTC) + (local time zone offset) + (local daylight bias) – (original daylight bias)

Note: Daylight bias is a time zone's offset during DST. The local daylight bias comes from the local time zone information, and the original daylight bias comes from the originator's time zone information.

The weekly conference call repeats every Friday beginning 4/4/03. The start time of the first instance is 10:00 A.M. PT, or 18:00 UTC. Therefore, the stored time is 18:00 and the time zone is Pacific Time.

Date	Seattle	Arizona	New York
4/4/03	1800+(-8)+(0)-(0) = 1000	1800+(-7)+(0)-(0) = 1100	1800+(-5)+(0)-(0) = 1300
4/11/03	1800+(-8)+(+1)-(+1) = 1000	1800+(-7)+(0)-(+1) = 1000	1800+(-5)+(+1)-(+1) = 1300

Notice that both the local and original DST biases are the ones in effect on the date/time of the meeting instance.

The weekly conference call repeats every Friday beginning on 4/4/03. The originator was in Arizona, so the start time of the first instance is 11:00 MST (Arizona), or 18:00 UTC. The stored time is 18:00 and the time zone is MST (Arizona).

Date	Seattle	Arizona	New York
4/4/03	1800+(-8)+(0)-(0) = 1000	1800+(-7)+(0)-(0) = 1100	1800+(-5)+(0)-(0) = 1300
4/11/03	1800+(-8)+(+1)-(0) = 1100	1800+(-7)+(0)-(0) = 1100	1800+(-5)+(+1)-(0) = 1400

2.7 TimeZone

The TimeZone type is a **Base64**-encoded time zone structure with the following definition:

```
typedef struct {
  LONG Bias;
  WCHAR StandardName[32];
  SYSTEMTIME StandardDate;
  LONG StandardBias;
  WCHAR DaylightName[32];
  SYSTEMTIME DaylightDate;
  LONG DaylightBias;
};
```

The required values are **Bias**, which is the offset from UTC, in minutes, and the **StandardDate** and **DaylightDate**, which are needed when the biases take effect. For example, the bias for Pacific Time is 480.

Elements with a **TimeZone** data type MUST be encoded and transmitted as [WBXML] inline strings.

2.8 Container

A **container** is an XML element that encloses other elements but has no value of its own.

2.9 Enumeration

An **enumeration** is an **integer** value that has a fixed set of values. For more details about **integer** values, see section 2.2.

2.10 unsignedByte

The **unsignedByte** data type is an integer value between 0 to 255, as specified in [W3C-XSD2] section 3.3.24.

2.11 Byte Array

A **byte array** is a structure inside of an element of the **String** type (section 2.1), where the first entry of the element value is the length of the array, followed by that many bytes of data. Elements with a **byte array** structure MUST be encoded and transmitted as [WBXML] opaque data.

3 Data Type Examples

3.1 String Examples

```
<CompanyName>Adventure Works</CompanyName>
<BusinessPhoneNumber>(800) 555-0100</BusinessPhoneNumber>
<A:MessageClass>IPM.NOTE</A:MessageClass>
```

3.2 Integer Examples

```
<BodySize>456</BodySize>
<FilterType>3</FilterType>
<Status>1</Status>
```

3.3 Boolean Examples

Note in the following examples that the short form <Tag /> is equivalent to <Tag>1</Tag>.

```
<Read>0</Read>
<AllDayEvent>1</AllDayEvent>
<AllDayEvent />
```

3.4 Telephone Number Examples

```
<Home>3605551212</Home>
<Overseas>+011(73)5551212</Overseas>
```

3.5 E-Mail Address Examples

```
<Recipient>amy@nowhere.com</Recipient>
<Sender>j.smith@nowhere.com</Sender>
```

3.6 Date/Time Examples

```
<A:DateReceived>2009-11-12T00:45:06.000Z</A:DateReceived>
<A:StartTime>2009-11-21T19:30:00.000Z</A:StartTime>
```

3.7 Time Zone Example

```
<TimeZone>
4AEAACgARwBNAFQALQAwADgAOgAwADAAKQAgAFAAYQBjAGkAZgBpAGMAIABUAGkAbQBlACAAKABVAFMAIAAmACAAQwAAA
AsAAAABAAIAAAAAAAAAAAAAAACgARwBNAFQALQAwADgAOgAwADAAKQAgAFAAYQBjAGkAZgBpAGMAIABUAGkAbQBlACAAKA
BVAFMAIAAmACAAQwAAAAMAAAACAAIAAAAAAAAAxP///w==
</TimeZone>
```

3.8 Container Example

In the following example, <AddOne> is a container.

```
<AddOne>
   <ServerId>1</ServerId>
   <ParentId>0</ParentId>
   <DisplayName>Calendar</DisplayName>
   <Type>8</Type>
</AddOne>
```

3.9 Enumeration Example

The allowed enumeration values are defined in the schema.

```
<EnumExample>3</EnumExample>
```

3.10 Unsigned Byte Example

```
<ByteValue>120</ByteValue>
```

3.11 Byte Array Example

In this example, the first byte indicates that 4 data bytes follow.

```
04 00 01 02 03
```

4 Security Considerations

In most cases, all communication between the client and server happens across an **HTTP** connection secured by the **Secure Sockets Layer (SSL)** protocol, as specified in [RFC2616]. The SSL connection is assumed to be secure enough to transmit confidential data, such as user credentials and sensitive e-mail. The SSL certificate on the server is assumed to be trusted by the client application.

5 Appendix A: Product Behavior

The information in this specification is applicable to the following product versions. References to product versions include released service packs.

- Microsoft® Exchange Server 2007
- Microsoft® Exchange Server 2010

Exceptions, if any, are noted below. If a service pack number appears with the product version, behavior changed in that service pack. The new behavior also applies to subsequent service packs of the product unless otherwise specified.

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

6 Change Tracking

This section identifies changes made to [MS-ASDTYPE] protocol documentation between February 2010 and May 2010 releases. Changes are classed as major, minor, or editorial.

Major changes affect protocol interoperability or implementation. Examples of major changes are:

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

Minor changes do not affect protocol interoperability or implementation. Examples are updates to fix technical accuracy or ambiguity at the sentence, paragraph, or table level.

Editorial changes apply to grammatical, formatting, and style issues.

No changes means that the document is identical to its last release.

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

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

- Content removed for template compliance.
- Obsolete document removed.

Editorial changes always have the revision type "Editorially updated."

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

Protocol syntax refers to data elements (such as packets, structures, enumerations, and methods) as well as interfaces.

Protocol revision refers to changes made to a protocol that affect the bits that are sent over the wire.

Changes are listed in the following table. If you need further information, please contact protocol@microsoft.com.

Section	Tracking number (if applicable) and description	Major change (Y or N)	Revision Type
1.3 Overview	Updated the section title.	N	Content updated for template compliance.
3.6 Date/Time Examples	54341 Added required punctuation separators to date/time examples.	Y	Content update.

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