



White Paper on Data Objects

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Open Mobile Alliance

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Contents

1. SCOPE.....	4
2. REFERENCES	5
3. TERMINOLOGY AND CONVENTIONS.....	6
3.1 CONVENTIONS	6
3.2 DEFINITIONS.....	6
3.3 ABBREVIATIONS	6
4. INTRODUCTION	7
5. DATA AGNOSTIC.....	8
6. SYNCABLE OBJECTS	10
7. NEW DATA OBJECTS	12
8. KNOWN ISSUES OF EXISTING DATA OBJECTS	13
8.1 KNOWN ISSUES OF EXISTING DATA OBJECTS.....	13
8.1.1 Minimum Field Sets.....	13
8.1.2 Issues with vCard.....	13
8.1.3 Issues with iCalendar	14
8.2 DEALING WITH THE KNOWN ISSUES.....	14
9 CONCLUSIONS AND RECOMMENDATIONS.....	15
9.1 CONCLUSIONS	15
9.2 RECOMMENDATIONS	15
APPENDIX A. CHANGE HISTORY (INFORMATIVE).....	16

1. Scope

This white paper will provide a set of documented proposals for dealing with the issues surrounding data objects and the OMA DS Enabler, which will cover data object related activities, interoperability problems, possible solutions and potential new requirements. The implementation of the proposals is considered outside the scope of this whitepaper.

2. References

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- [DataObjFile] “File data object specification”, Open Mobile Alliance™,
OMA-TS-DS_DataObjFile-V1_2,
URL: <http://www.openmobilealliance.org/>
- [DataObjFolder] “Folder data object specification”, Open Mobile Alliance™,
OMA-TS-DS_DataObjFolder-V1_2,
URL: <http://www.openmobilealliance.org/>

3. Terminology and Conventions

3.1 Conventions

This is an informative document, which is not intended to provide testable requirements to implementations.

3.2 Definitions

Data	A unit of information exchange, encoded for transmission over a network.
Data Store	A logical storage of data elements. For example, client data store is used for store client-side data, such as vCard, vCalendar, etc.
Data Sync Client	An entity refers to the protocol role when the application issues SyncML request messages. For example in data synchronization, the 'Sync' SyncML Command in a SyncML Message.
Data Sync Server	An entity refers to the protocol role when an application issues SyncML response messages. For example in the case of data synchronization, a 'Results' Command in a SyncML Message.
Device	Equipment which is normally used by users for communications and related activities.
Implementer	Manufacturer of the device, or a software company, producing data sync client and/or server.
Message	Atomic unit that contains the SyncML Commands, as well as the related data and meta-information.
Network Operator	An entity providing network connectivity for a Device.
Package	A conceptual set of commands that could be spread over multiple messages.
Server Alerted Sync	Data Synchronization usage of Server Alerted Notification.
Service Provider	An entity that combines content from various sources into a service or an application to be consumed on a mobile device by an end user.
User	An entity which uses services. Example: a person using a data synchronization service.

3.3 Abbreviations

DS	Data Synchronization
DTD	Document Type Definition
EMS	Enhanced Messaging Service
IOP	Interoperability
MIME	Multipurpose Internet Mail Extensions
MMS	Multimedia Messaging Service
OMA	Open Mobile Alliance
PIM	Personal Information Manager
SIP	Session Initiation Protocol
SMS	Short Message Service
TLS	Transport Layer Security
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
XML	Extensible Mark-up Language

4. Introduction

The goal of the OMA DS Enabler is to provide the capability to effectively synchronize data objects using the OMA DS protocol and to optimize the synchronization operation by utilizing the advanced features of the protocol (e.g. filtering, field level changes, etc.). To be effective the protocol must not require an update to accommodate a given data object's features. Additionally, the Enabler should provide a strategy to reconcile data object implementation differences (i.e. IOP issues).

Previous versions of the OMA DS Specification (1.2 and prior versions) failed to achieve the goal of being data agnostic. The specification does depend significantly on the data type being synchronized. Unfortunately, the data type dependencies deviate from the original goals and restrict the usage and popularity of the OMA DS Enabler.

This whitepaper will investigate the known and potential issues surrounding data objects and the OMA DS Enabler. To be more specific, the goal of this whitepaper will be to provide answers to four main questions:

1. How can the OMA DS Enabler be made data object agnostic in order to fulfil the original goal of SyncML?
2. What is the nature of a data object that makes an object syncable?
3. Should the OMA DS working group consider the definition of new data objects within its scope? If not, how should it proceed in situations where a new data object format is required?
4. How should the OMA DS working group deal with known issues within the data objects the OMA DS enabler already makes use of?

To address these questions, this whitepaper will enumerate data object related issues, interoperability problems, possible solutions and potential new requirements. The intention is to investigate the issues outlined by the data object WID ([OMA-WID-0111-DS-DO-V1_0_0-20050429-D.doc](#)) and build a roadmap for an optimal solution. The implementation of any proposals is outside the scope of this whitepaper.

5. Data Agnostic

When the SyncML Initiative (what would later become the OMA DS working group) was initiated the SyncML protocol (now OMA DS) was intended to be data type agnostic. Unfortunately, theory and practice soon collided and as a result the OMA DS Specification does have a dependency on the data type being synchronized – especially in DevInf. As a result adding new data types is a non-trivial undertaking.

For example, if an implementation intended to synchronize SMS text messages using the vMessage content type, it could be a simple matter of wording a document that references OMA DS which explains the implementation – for IOP purposes; however, because of inter-dependencies between the protocol and the data type it would currently require changes to several documents which make up the OMA DS Enabler Release Definition (ERELD).

In order to fulfil the original goal of SyncML, Future releases of the OMA DS Enabler should be reorganized such that changes for a particular data type or the introduction of a new data type can be accomplished without the need for a new release of the OMA DS enabler.

To achieve this, the following steps should be undertaken:

1. Release a core DS Enabler that contains no data object usage descriptions.

For the DS Enabler data agnosticism can best be achieved by relaxing the normative requirements of DevInf, Protocol, and Syntax to allow more flexibility when specifying supported properties and parameters.

Specifically, data type specific sections should be removed from the DS DevInf Technical Specification ([OMA-TS-DS_DevInfo-V1_2-20060710-A](#)) and moved to data type usage documents not considered part of the core enabler.

The benefits of migrating these normative requirements to data type usage documents include:

- Allowing modifications made to the various content types by the owning fora to be incorporated into OMA DS documents without requiring changes to the specification itself.
- Allowing extensions to the various content types to be incorporated into OMA DS documents without requiring changes to the specification.
- Allowing other content types to be synchronized and documented (for IOP purposes) without requiring changes to the specification.

Additionally, some other DS protocol specification documents with normative references to the various content types should also be updated.

2. Release a set of data type usage documents that rely upon the core DS Enabler.

Previously, the data object definitions (that is, DataObjEmail, DataObjFile, DataObjFolder) were combined within the DS Enabler and information specific to data formats such as vCard and iCalendar were placed directly within DevInf.

A core DS enabler would not contain such descriptions; instead a set of data usage documents should be released containing the information removed from the core enabler. The following initial set of usage documents would be required

- Synchronizing Calendar information using OMA DS
- Synchronizing Contact information using OMA DS
- Synchronizing Email using OMA DS
- Synchronizing Files using OMA DS

Each data type usage document will define the data type or make reference to existing data types that can be used and document how DevInf should be used with such a data type. In addition implementation guidance on how best to use the core DS Enabler can be given. For example, how best to do field level replacements or filtering, etc.

With such an approach a usage document explaining how to synchronize SMS text message could be released without the need for a new release of the core OMA DS Enabler.

If the IETF were to release new versions of iCalendar or vCard the usage documents for calendaring and contact information could be updated to indicate the preference that such new versions be used.

6. Syncable Objects

The purpose of this document is to investigate how the OMA DS protocol can be adapted to the idea of synchronizing arbitrary data objects. Part of this investigation must explore the larger question of what data objects or what type of data objects can be supported by the protocol.

Synchronization is about exchanging information about what has changed and how. Historically, the protocol presumed opaque representations of the data being synced, i.e. changes are exchanged in the form of objects – *object-oriented*. However, new protocol features optimize the data exchange and allow transferring the exact changes inside the object without transferring the object itself – *changes oriented*. Orientation to changes requires the protocol to have access to the object structure at the lower level – field level. This, in turn, requires the object to be accessible to that level.

It is easy to surmise that any data object that can be expressed in an understandable content format can be arbitrarily synchronized between two data sources if:

1. It is an object that has an identifier. This identifier must be perennial and unique within a Datastore.
2. It is an object for which a format has been defined (it must be able to be represented as a structure comprised of separate fields).
3. It is an object that can be viewed as synchronised after a synchronisation. That is to say: an object which can be recognized by the end-user on several devices as the same even if its physical content is not exactly the same on these devices.
4. Within the object Datastore it is possible to know that modifications have happened between 2 moments.

In order for a data object to be synchronized effectively and optimally using the advanced features of the OMA DS protocol however, there are certain additional requirements to be aware of:

5. For the synchronization of large objects the object Datastore must be able to report the size of the object before the synchronization takes place.
6. For field level replacement the Data Object structure should be granular enough to allow for the sync participants to send field level changes with the desired level of granularity.

Example: data object supports address field, including zip code, country, county, city and street address. It must be possible to identify the separate parts of the address field to transfer changes to e.g. country only.

7. For filtering the Data Object structure should be granular enough to allow for the sync participants to specify a filter to obtain any subset data it needs based only on the object structure.

Example: OMA DS E-mail data object must be able to be filtered out by TO or CC fields without the use of keywords.

In addition the following needs to be considered:

8. Several Data Object IOP problems are conditioned by the variability of support for one particular Data Object on a particular device. As such current sync solutions have become data and even device dependent, it is important that the Data Object structure be granular enough to allow for the implementation to specify the exact level of data object support (a.k.a. Content Type Capabilities).

9. For the purposes of globalization the Data Object must allow for specifying the character set for particular fields.
10. In order to ensure data validity the Datastore must be able to maintain Object validity during the synchronization process.

Example: During the synchronization of a large object it should not be possible to alter the server side representation.

As such defining what makes an object syncable is a complex task and no doubt could include numerous more requirements.

Any date type usage document should carefully consider all of the requirements listed above.

7. New Data Objects

As previously stated, the goal of OMA DS protocol is to allow and facilitate synchronization of arbitrary data objects. The changes outlined previously will remove the definition of supported data objects from the normative requirements of the protocol. This change will make it easier to add support for arbitrary data objects. The definition and usage explanation will be sufficient to allow implementation and ensure interoperability.

The aforementioned changes lead to another question: who is responsible for defining new data objects for synchronization? Should the OMA DS working group consider the definition of new data objects within its scope? If not, how should it proceed in situations where a new data object format is required?

The previously suggested changes to the protocol relax the impact of this issue significantly. If the definition of such data objects remained part of the normative specification then the definition and usage guidelines of new data objects would remain a significant section of the protocol.

Nevertheless, new object definition must be addressed and explained by the OMA DS working group.

The current version of the OMA DS Enabler – 1.2 – supports synchronization of contact data (vCard2.1, vCard 3.0), calendar data (vCal, iCalendar), Files data (OMA DS File format), and Email messages (OMA DS Email format) and folders (OMA DS Folder format). The content format of vCard, vCal and iCalendar are produced by external fora. The content format of files, email and folders are OMA DS specific formats.

New content formats may come from several sources:

- OMA DS may define and control OMA DS specific formats
- OMA (the larger parent organization) may define and control formats
- External fora may define and control formats
- Implementers may define implementation specific formats

Each alternative has its own set of advantages and disadvantages, but the benefit of the proposed changes is that any alternative may be chosen on a case by case basis. For instance, it was beneficial for the OMA DS working group to define a content format for folders. On the other hand, external fora may have more meaningful knowledge and experience better facilitating their role in defining content formats. For instance, the IETF has more knowledge of calendar data and is likely better qualified to define a content format dealing with calendar data. Further, an implementation specific format may be sufficient for some arbitrary data synchronized by some end-to-end solution.

In any case, usage documents – not normative specifications – are sufficient to facilitate and ensure interoperability, if required.

To make a summarization, either DS or other groups or external fora can define new data objects.

New data object definitions can be done within the DS group, but it is not the responsibility of DS group to do so and the DS group should always look to external fora first before proceeding.

In cases where new data objects are defined in other groups or external fora, it is recommended that the DS group review the new data object definition, and provide guidance to ensure that the new data object satisfies the requirements of a syncable data object. It will be the responsibility for the DS group to then create a new usage document explaining how the new data type should be used with OMA DS.

8. Known issues of existing data objects

This section will list some known issues of existing data objects and also give some observations on how to deal with the known issues.

8.1 Known issues of existing data objects

The current version of the OMA DS Enabler makes use of vCard 2.1, vCard 3.0, vCal and iCalendar content formats. Limitations of these content formats have plagued OMA DS for some time, for example, minimum field sets.

8.1.1 Minimum Field Sets

One of the major features of the OMA DS 1.2 protocol is the ability to synchronize changes to objects by transmitting only the changed data – field level changes.

Some content types, e.g., vCard 2.1, specify a minimum set of fields required to instantiate a valid object.

A vCard 2.1 data object MUST contain several fields including N (name). Of course, this is contrary to the notion of only sending changed data. If only a telephone number changed in the data object then sending the name field is redundant – an unnecessary overhead.

Within OMA DS removing the minimum field set restriction(s) of the various data objects when communicating modifications can reduce this problem. When communicating an ADD operation the minimum field set specified for the content format must be specified however.

As field level modification is an OMA DS specific idea. The modification of the behaviour for this purpose relative to the various specifications should not cause problems.

8.1.2 Issues with vCard

Since Contact Synchronization uses vCard, problems with the underlying data object format effect the quality of the sync. Identified Issues with vCard:

1. Too Many Type combination possibilities.
2. No good way of knowing what a device can store or provide.
3. No support for enumerating contact methods.
4. Proper format for date time stamps not sufficiently defined.
5. Proper format for phone numbers not sufficiently defined.
6. Proper format for addresses not sufficiently defined.
7. Obsolete methods of communication supported while new methods are not.

For more information, please refer to the agreed contribution [OMA-DS-DS_DO-2007-0002R01-INP_vCard_workshop.ppt](#).

The IETF has approved a charter for a vCard Working Group and sent it to the IESG for approval, and work has begun on updating and republishing the existing vCard draft.

8.1.3 Issues with iCalendar

Since Calendar Synchronization uses iCalendar, problems with the underlying data object format effect the quality of the sync. Within the IETF the Calsify working group (<http://www.ietf.org/html.charters/calsify-charter.html>) is currently working on an updated version of iCalendar.

8.2 Dealing with the Known issues

How should the OMA DS working group deal with these known issues? Many of the issues are not new. There needs to be a more efficient manner for dealing with them.

The changes outlined previously will remove the definition of supported data objects from the normative requirements of the protocol and will introduce the concept of data type usage documents. With data type usage documents:

- It should be easier to introduce corrections or enhancements for data types controlled by the DS group (DataObjEmail, DataObjFile, DataObjFolder).
- It should be possible to document known issues with data types used from external fora and be possible to provide guidance on how best to deal with the issues.

For issues within data types from external fora the DS group should actively be working to help bring about new versions of the data types. The group should:

1. Collect the identified problems, and summarize them into contributions.
2. Establish liaison with the responsible groups who define data objects, and communicate with each other to exchange ideas about the synchronization problems.
3. Express the concerns to the responsible groups who define the data objects.
4. Work with experts in responsible groups to make corrections or updates to the data objects.

9 Conclusions and Recommendations

This whitepaper investigates the known and potential issues surrounding data objects and the OMA DS Enabler.

This section provides answers to the four main questions asked in the introduction and provides recommendations for future work that should be commenced within the OMA DS working group to deal with the issues discussed.

9.1 Conclusions

1. How can the OMA DS Enabler be made data object agnostic in order to fulfil the original goal of SyncML?

First, separate the data object specific information from the DS Enabler and release a core OMA DS enabler. Second, release separate data type usage documents that define how to synchronize the existing data objects using the core enabler.

2. What is the nature of a data object that makes an object syncable?

Defining what makes a syncable data object is extremely complex. Hopefully Section 6 will provide sufficient guidance for future requirements. The 10 requirements presented should be considered within all data type usage documents

3. Should the OMA DS working group consider the definition of new data objects within its scope? If not, how should it proceed in situations where a new data object format is required?

The definition of entirely new data objects is not the responsibility of the DS group but this does not prevent the OMA DS group from doing so if absolutely necessary. Ideally new data objects should be defined in more appropriate groups, and the DS group can help review the data object definition and provide guidance.

If there is a need, and there is not a more appropriate group in OMA to define how best to synchronize the data objects, the OMA DS group could be assigned to do so.

4. How should the OMA DS working group deal with known issues within the data objects the OMA DS enabler already makes use of?

For data types under its control the DS group should work quickly to resolve any known issues. For data types not under its control the DS group should provide implementers with guidance while in parallel work actively with the group's responsible to provide new releases with the issues addressed.

9.2 Recommendations

1. As part of ongoing White Paper work a set of white papers should be developed to give implementation guidance for those using the DS enabler to synchronize the data types presently supported. Known issues should be identified and guidance on possible work arounds should be provided.
2. As part of ongoing maintenance work the group should investigate more thoroughly work currently underway within the IETF with regards to iCalendar and vCard.
 - a. The work underway within the Calsify working group should be evaluated to ensure that all the issues currently experienced during calendar synchronization (that are truly the fault of the data type) are being addressed. If not the OMA DS group should liaison with Calsify to express our concerns.
 - b. The group should help support the commencement of the new vCard working group and should continue expressing our concerns with regards to the synchronization of contact information.
3. As part of ongoing DS 2.0 work the DS enabler should be reorganized as per the steps described in section 5. The white papers worked on as part of the 1st recommendation can act as the basis for DS 2.0 data type usage documents.

Appendix A. Change History (Informative)

Document Identifier	Date	Sections	Description
OMA-WP-Data_Object-20070601-D	01 Jun 2007	All	Initial version of WP as permanent doc
Draft Version: OMA-WP-Data_Object-V1_0	05 Dec 2007	All	Updated according to agreed CR: OMA-DS-DS_DO-2007-0003-CR_What_syncable_objects_are__ With the 2 modifications mentioned in OMA-DS-2007-0115-MINUTES_29Nov2007_DS_Conf_Call.doc
Draft Version: OMA-WP-Data_Object-V1_0	19 Dec 2007	5, 6, 7, 8 9	Updated according to agreed CR: OMA-DS-DS_DO-2007-0004- CR_Overall_Supplement_for_DS_DO_WP OMA-DS-DS_DO-2007-0005R01- CR_Conclusion_and_Recommendation_for_DS_DO_WP
Draft Version: OMA-WP-Data_Object-V1_0	17 Jan 2008	All	Updated according to agreed CR: OMA-DS-DS_DO-2008-0001-CR_DS_DO_WP_Completion
Candidate Version: OMA-WP-Data_Object-V1_0	06 May 2008	n/a	Status changed to Candidate by TP TP ref # OMA-TP-2008-0172- INP_Data_Object_V1_0_RRP_for_Candidate_Approval
Approved Version: OMA-WP-Data_Object-V1_0	16 Sep 2008	n/a	Approved by OMA TP TP ref # OMA-TP-2008-0331- INP_Data_Object_V1_0_RRP_for_Final_Approval