DS 2.0 Architecture

Candidate Version 2.0 – 12 Feb 2009

Open Mobile Alliance

OMA-AD-DS-V2_0-20080212-C

Contents

Figures

1. Scope (Informative)

The scope of this document is to define the architecture for the OMA DS Enabler.

This document details the functional description and architecture for data synchronization within OMA specifications.

This document fulfils the functional capabilities needed to support this service enabler as described in the DS 2.0 Requirements document [DS-RD].

2. References

2.1 Normative References

[DS-RD] “OMA Data Synchronization Requirements”, Open Mobile Alliance™, OMA-RD-DS-V2_0, URL:http://www.openmobilealliance.org/

[RFC2119] “Key words for use in RFCs to Indicate Requirement Levels”, S. Bradner, March 1997, URL:http://www.ietf.org/rfc/rfc2119.txt

2.2 Informative References

[3GPP-SMS] “Technical Realization of the Short Message Service (SMS)”, 3GPP TS23.040, URL:http://www.3gpp.org/

[OMA-DICT] “OMA Dictionary”, Open Mobile Alliance™, OMA-Dictionary-V2_4, URL:http://www.openmobilealliance.org/

[OMA-DM] “OMA Device Management Enabler”, Version 1.2, Open Mobile Alliance™ OMA-ERELD-DM-V1_2, URL:http://www.openmobilealliance.org/

[OMA-EMN] “OMA Email Notification”, Open Mobile Alliance™,OMA-Push-EMN-V1_0, URL:http://www.openmobilealliance.org/

[OMA-PUSH-OTA] “Push Over The Air”, Open Mobile Alliance™, OMA-WAP-TS-PushOTA-V2_1, URL:http://www.openmobilealliance.org/

[OMA-PUSH-PPG] “Push Proxy Gateway Service”, Open Mobile Alliance™, OMA-WAP-TS-PPGService-V2_1, URL:http://www.openmobilealliance.org/

[RFC3265] “SIP Event Notification”, June 2002, URL:http://www.ietf.org/rfc/rfc3265.txt

3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Data Sync Client A device, user agent, or other entity that acts as the receiver of data synchronization services.

Data Sync Server An entity that provides resources to clients in response to data synchronization requests.

Data Synchronization The act of establishing an equivalence between two data collections, where each data element in one item maps to a data item in the other, and their data is equivalent.

Device See [OMA-DICT]

Message Atomic unit that contains the SyncML Commands, as well as the related data and meta-information.

Package A conceptual set of commands that could be spread over multiple messages.

User See [OMA-DICT]

3.3 Abbreviations

DS	Data Synchronization
HTTP	Hyper Text Transport Protocol
OBEX	Object Exchange Protocol
OMA	Open Mobile Alliance
XML	Extensible Markup Language

4. Introduction (Informative)

With the emergence of mobile computing and communications devices, users have access to their personal or professional information and applications, from multiple places (home, work, travel, …) and devices (mobile phones, PDA, computers, network, …). But, on one hand, the information they want may not always be on the device they carry, and on the other hand, they cannot be permanently connected to network to access their data.

The OMA DS Enabler provides a common data synchronization framework and XML-based format, or representation protocol, for synchronizing data on networked devices. The OMA DS Enabler is designed for use between mobile devices that are intermittently connected to the network and network services that are continuously available on the network. The OMA DS Enabler is specifically designed to handle the case where the network services and the device store the data they are synchronizing in different formats or use different software systems.

4.1 Planned Phases

The DS 2.0 enabler release is expected to meet all the requirements defined in [DS-RD] and no additional phases are planned at this stage.

4.2 Security Considerations

An objective of OMA DS is to provide a framework for secure operation. The OMA DS enabler itself does not define any new security schemes. Instead, it provides the framework to challenge authentication, authorization and inclusion of encrypted data in an OMA DS Package. The OMA DS Enabler will support a list of common protocol layer encryption/decryption techniques to ensure secure data transmission. In addition, the originator and recipient MAY use the security mechanisms of the underlying transport to authenticate each other and to provide a secure transport for the exchange of OMA DS Packages.

The detailed security mechanism will be defined in the technical specifications at the later stage.

5. Architectural Model

5.1 Architectural Diagram

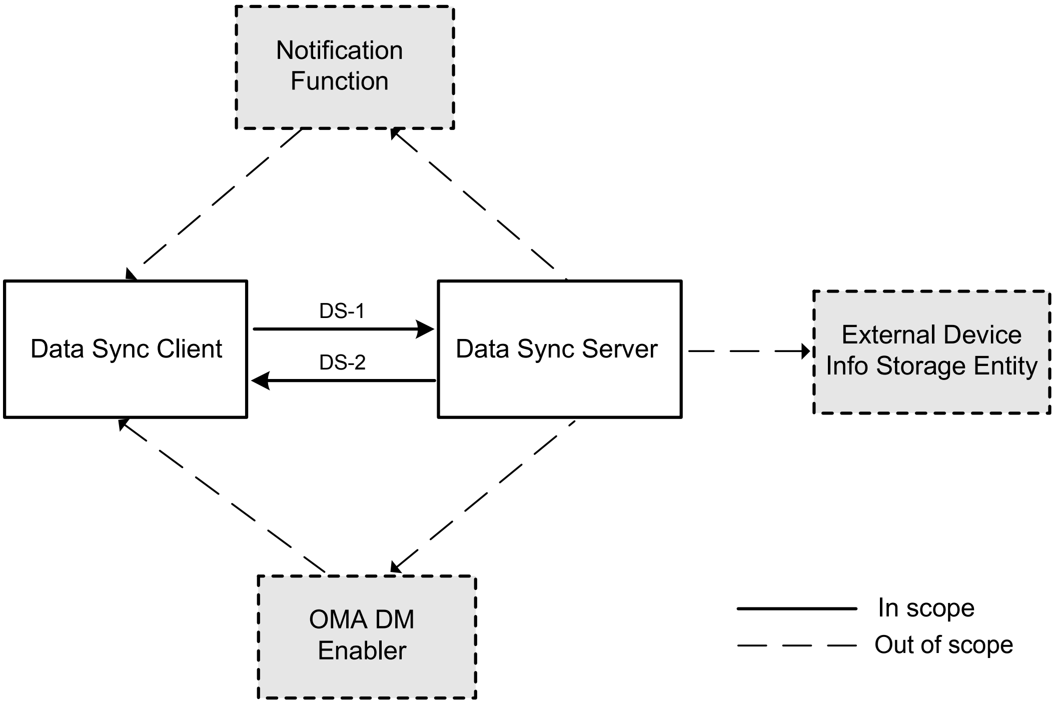

Figure 1: OMA DS logical Architecture Diagram

5.2 Functional Components and Interfaces

5.2.1 Components Specified by this Enabler

5.2.1.1 Data Sync Client

The Data Sync Client is the entity that sends the data synchronization related commands, possibly including payload data to the Data Sync Server. It SHALL also be able to receive responses from the Data Sync Server and to receive some data synchronization commands from the server side.

The Data Sync Client can initiate a session with the Data Sync Server directly.

5.2.1.2 Data Sync Server

The Data Sync Server is the entity that receives the data synchronization messages (operations) possibly including payload data from the Data Sync Client. The Data Sync Server SHALL also be able to send the responses to the commands if needed and to send some data synchronization messages as commands to the client.

The Data Sync Server does not have a defined mechanism in the protocol to directly initiate a session with the Data Sync Client. The Data Sync Server needs to send notification message to the Data Sync Client first, then the Data Sync Client can initiate a session back to the Data Sync Server.

In most of the cases, compared with Data Sync Client, Data Sync Server has some additional functions, for example, conflict resolution, determine appropriate data synchronization mechanism, and maintain the mapping table for data items.

5.2.2 Other Enablers and Components

5.2.2.1 Notification Function

The Notification Function is used to send notification message to the Data Sync Client. Based on the notification message information, the Data Sync Client can initiate a connection to the Data Sync Server. The notification message can be transported over various channels. It can be PUSH, SMS, EMN, SIP PUSH etc.

5.2.2.2 OMA DM Enabler

The OMA DM Enabler is used to provision synchronization settings for Data Sync Client.

5.2.2.3 External Device Info Storage Entity

The External Device Info Storage Entity is used as an optional external storage for device information. This entity is used for the Data Sync Server to retrieve Data Sync Client's device information. OMA DS Enabler will provide methods to negotiate device information between Data Sync Client and Server. One of the possibilities is as following: During the sync initialization, the Data Sync Client MAY send a URI which points to its device information for retrieval. The method how to retrieve it is out of scope of OMA DS Enabler.

5.2.3 Interfaces Specified in this Enabler

5.2.3.1 The DS-1 Interface

The DS-1 interface is exposed by the Data Sync Server for data synchronization requests or responses.

The DS-1 interface can be used to request/receive server device information, or to request/receive the data items from the Data Sync Server.

Also, the DS-1 interface can be used for the Data Sync Client to initiate a session with the Data Sync Server.

5.2.3.2 The DS-2 Interface

The DS-2 interface is exposed by the Data Sync Client for data synchronization requests or responses.

The DS-2 interface can be used to request/receive client device information, or to request/receive the data items from the Data Sync Client.

5.3 Flows

5.3.1 Data synchronization Flow

This flow describes the two-way data synchronization. In normal case, the DS Client and the DS Server will exchange information about their modified data. For the one-way data synchronization, the flow is similar.

Figure 2 shows the normal flow for this scenario:

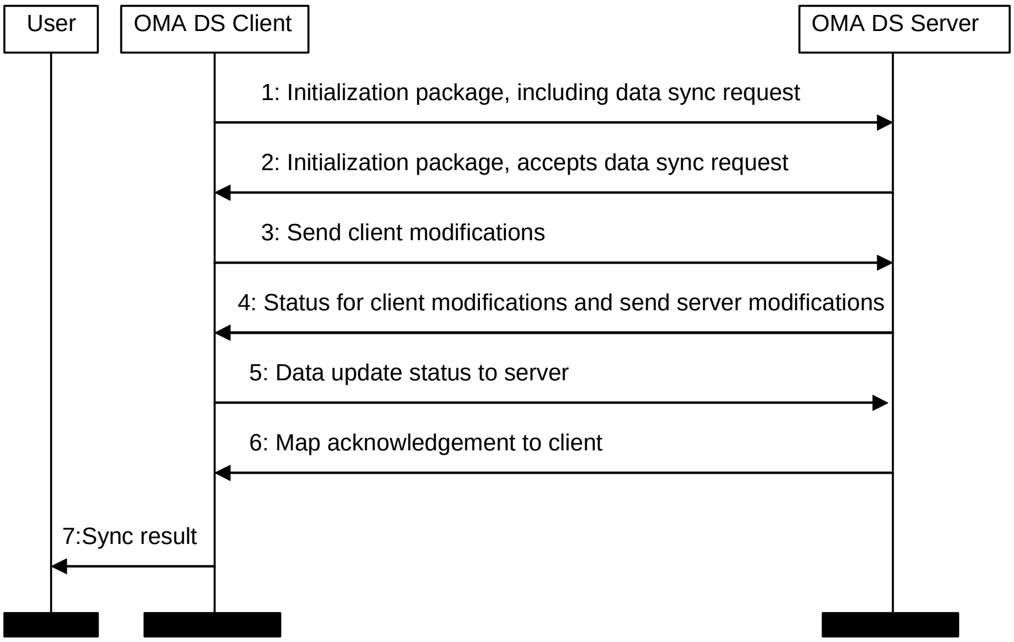
User
OMA DS Client
OMA DS Server
1: Initialization package, including data sync request
2: Initialization package, accepts data sync request
3: Send client modifications
4: Status for client modifications and send server modifications
5: Data update status to server
6: Map acknowledgement to client
7:Sync result

Figure 2: Normal Two-way Data Synchronization Flow

The detailed flow is as the following:

Step 1: The client sends the initialization package to the server, including authentication information, device information and data sync request. The request includes data sync mechanism negotiation parameters, for example, direction, change log valid information, ID valid information.

Step 2: The server authenticates the client, analyses the data sync request and determines an appropriate data sync mechanism. Then the server sends the initialization package to the client, including authentication information, device information and response for the data sync request.

Step 3: The client sends modified data to the server.

Step 4: The server compares the data and updates its database with the data from the client. Then the server returns status for the client modifications and sends server modifications to the client.

Step 5: The client updates its database with the data from the server, and sends the map status to the server.

Step 6: The server returns the map acknowledgement to the client.

Step 7: The client shows the sync result to the user.

5.3.1.1 Alternative flow 1

Optionally, to avoid conflict (that is, the client modifications also be modified in the server) and save the network resource, in step 1, the client can send the characteristic information of the modified data in the initialization package. In step2, According to the characteristic information from the client, the server can decide what part of data the client needs to send, and send back the response.

5.3.1.2 Alternative flow 2

Optionally, in case of continuous synchronization, between step 6 and step 7, the client and the server can synchronize additional data as desired, based upon user settings, or receipt of new data.

5.3.1.3 Alternative flow 3

Optionally, after step 7, the client and the server monitor for the receipt of additional data.

5.3.2 Device Information Negotiation Flow

This flow describes the device information negotiation flow. In case that the device has either been upgraded, or the user has selected additional data sections to synchronize, the DS Client and the DS Server can negotiation their device information without performing data synchronization.

Figure 3 shows the device information negotiation flow:

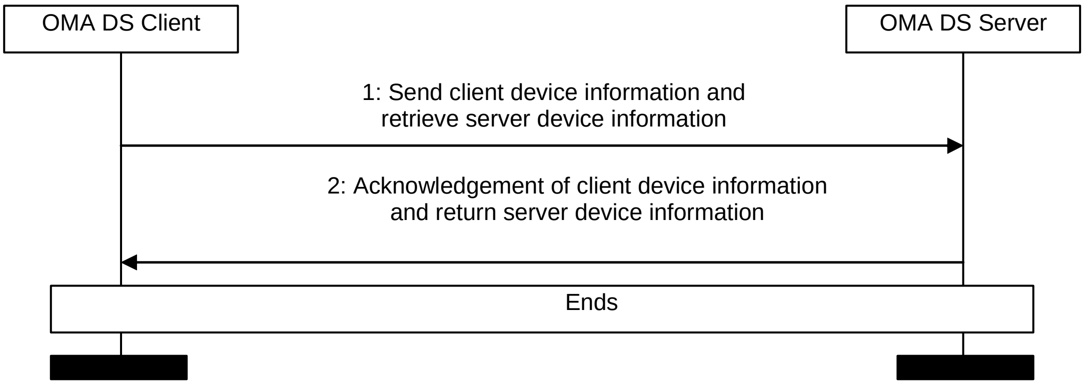
OMA DS Client
OMA DS Server
1: Send client device information and retrieve server device information
2: Acknowledgement of client device information and return server device information
Ends

Figure 3: Device Information Negotiation Flow

The detailed flow is as the following:

Step 1: The client sends its device information to the server, and retrieves the server device information.

Step 2: The server sends back acknowledgement of client device information and returns the server device information.

5.3.3 Notification Flow

This flow describes the notification flow.

Many devices cannot continuously listen for connections from a management server. Other devices simply do not wish to “open a port” (i.e. accept connections) for security reasons. However, most devices can receive unsolicited messages, sometimes called “notifications”. Some devices, for example, can receive SMS messages. Other devices may have the ability to receive other, similar datagram messages.

A DS Server can use this notification capability to cause the DS Client to initiate a connection back to the synchronization server. The result of receiving such a notification would be for the client to initiate a connection to the synchronization server specified in the notification. For example, the client can initiate a data synchronization or device information negotiation with the server.

Figure 4 shows the notification flow:

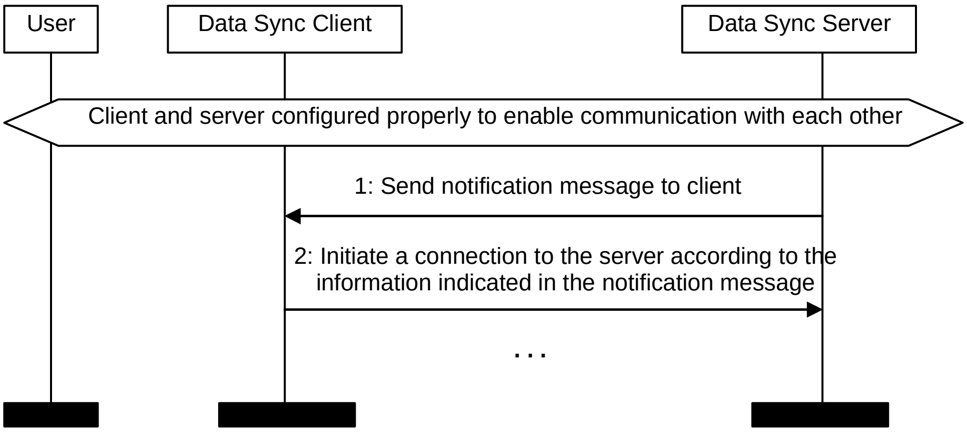
User
Data Sync Client
Data Sync Server
Client and server configured properly to enable communication with each other
1: Send notification message to client
2: Initiate a connection to the server according to the information indicated in the notification message
. . .

Figure 4. Notification Flow

The detailed flow is as the following:

Step 1: The server sends notification message to the client.

Step 2: According to the information indicated in the notification message, the client initiates a connection with the server.

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No previous version within OMA

A.2 Draft Version 2.0 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-DS-V2_0	12 Jul 2005		Initial Draft
	19 Aug 2005	All	Incorporated comments from DS WG review, updated references, definitions and abbreviations.
	23 Aug 2005	All	Incorporated changes from DS WG review: remove template directions text from each section; add client and server datastores to architecture diagram and description
	09 Feb 2006	2,1, 2.2, 3.2, 3.3	Changed to new AD template Made terms consistent across document based on definition section Implemented the following agreed CRs: OMA-DS-2006-0012 OMA-DS-2006-0013R02
	05 Apr 2006	All	Implemented the following agreed CRs: OMA-DS-2006-0131R01 OMA-DS-2006-0132R01 OMA-DS-2006-0133 OMA-DS-2006-0112R01 OMA-DS-2006-0094R01 OMA-DS-2006-0134 OMA-DS-2006-0135 Deleted SyncML Common based on the following agreed CR. OMA-DS-2006-0124R02
	11 Oct 2006	All	Incorporation of agreed CR: OMA-DS-DS_2_0-2006-0053R01
	20 Jun 2007	All	Incorporation of agreed CRs: OMA-DS-DS_2_0-2007-0021 OMA-DS-DS_2_0-2007-0022 OMA-DS-DS_2_0-2007-0024R01
	12 July 2007	Section 5	Incorporation of agreed CR: OMA-DS-DS_2_0-2007-0023R04
	12 Dec 2008	Footer	Update the footer from 2006, 2007 to 2008
Candidate Version OMA-AD-DS-V2_0	12 Feb 2009	n/a	Status changed to Candidate by TP TP ref # OMA-TP-2009-0074R01-INP_DS_V2_0_ERP_for_Candidate_Approval Editorial clean-up of sections 2 and 3 before publication.