Mobile Email Architecture

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Open Mobile Alliance

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Contents

Figures

1. Scope (Informative)

This document describes the logical architecture of the OMA mobile email enabler to guide the technical specification work.

While mobile email is defined in the requirement document [MEM-RD] as access to email from a mobile device, the focus of this document is to describe an architecture that provides an improved user experience over alternate means of access to email like browsing, email notification or message / voice based access. The goal of the MEM Enabler is to provide quasi-instantaneous and secure updates of the MEM Client with new emails and server changes, optimized online and off-line usage and capability to securely send email from the appropriate server.

2. References

2.1 Normative References

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URL: http://www.openmobilealliance.org

[RFC2045] "Multipurpose Internet Mail Extensions (MIME) Part One: Format of Internet Message Bodies", November 1996
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[RFC2119] "Key words for use in RFCs to Indicate Requirement Levels", March 1997,
URL: http://www.ietf.org/rfc/rfc2119.txt

[RFC2183] "Communicating Presentation Information in Internet Messages: The Content-Disposition Header Field", August 1997
URL: http://www.ietf.org/rfc/rfc2183.txt

[RFC5322] "Internet Message Format", October 2008
URL: http://www.ietf.org/rfc/rfc5322.txt

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

2.2 Informative References

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[ARCH-PRINC] "OMA Architecture Principles", Version 1.2, Open Mobile Alliance™, OMA-ArchitecturePrinciples-V1_1_1,
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[ARCH-REVIEW] "OMA Architecture Review Process", Version 1.4, Open Mobile Alliance™, OMA-ORG-ARCHReviewProcess-V1_4,
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[LEMONADE PROFILE] "Lemonade Profile bis", Stephane H. Maes, Alexey Melnikov and Dave Cridland,
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[OMA-CP] "OMA Client Provisioning", Version 1.1, Open Mobile Alliance™, OMA-ERP-ClientProvisioning-V1_1
URL: http://www.openmobilealliance.org

[OMA-DM] "OMA Device Management", Version 1.2, Open Mobile Alliance™, OMA-ERP-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-STI] "OMA Standard Transcoding Interface", Version 1.0, Open Mobile Alliance™, OMA-ERP-STI-V1_0
URL: http://www.openmobilealliance.org

[OMA-UAProf] "OMA User Agent Profile", Version 2.0, Open Mobile Alliance™, OMA-ERP-UAProf-V2_0
URL: http://www.openmobilealliance.org

[OMA-DS] "OMA Data Synchronisation", Version 1.2.1, Open Mobile Alliance™, OMA-ERP-DS-V1_2_1
URL: http://www.openmobilealliance.org

[OMA-DICT] "Dictionary for OMA Specifications", Version 2.5, Open Mobile Alliance™, OMA-ORG-Dictionary-V2_5,
URL: http://www.openmobilealliance.org

[RFC5321] "Simple Mail Transfer Protocol", October 2008
URL: http://www.ietf.org/rfc/rfc5321.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.

General conventions for all figures within this document:

- A bracket “( )” around a component name indicates that the component is optional – missing brackets on the other hand do not indicate the opposite.
- Blue colour-coded components in figures are out of scope of the MEM Enabler.
- Red colour-coded circles/ovals in figures indicate components within the same domain.

3.2 Definitions

Attachment	A body part can be designated "attachment to indicate that it is separate from the main body of the Email Message, and that its display should not be automatic, but contingent upon some further action of the user. Attachments can be displayed in-line or separately based on the indicated presentation semantic, e.g. graphics or word processing files. See section 2.2 in [RFC 2183].
Authorization, **Authorize**	(1.) An "authorization" is a right or a permission that is granted to a system entity to access a system resource. (2.) An "authorization process" is a procedure for granting such rights. (3.) To "authorize" means to grant such a right or permission. [RFC 2828]
Body	A body consists of one or more parts that follow the header. A body could include a combination of some or all of the following: [RFC5322] defined plain text parts [RFC2045] defined MIME parts, e.g. multimedia content (e.g. SMIL, HTML) and other attachment(s) (e.g. word document, PDF, GIF, JPEG etc…)
Email Account	Email Account is a set of rules and credentials that allow a user to access and manage email user preferences and email messages.
Email Data	Email Data is a general expression to summarize all data related to email messaging; it includes Email Messages, Email Events, Filtering Rules, and user preferences.
Email Event	Change to the status of an email (e.g. read/unread, moved, flagged, deleted, etc…) that results, for example, from performing an operation (e.g., reading, moving, deleting, etc.) on an email message. The event may be considered as server or client side events depending on where the change takes place. A new email is also considered as an event.
Email Message	A sequence of data containing a Header (including Meta Data) and optionally a Body. Email Message Headers and Bodies are defined in [RFC2822] “Internet Message Format”.
Email Session	The session that exists between an email client and an email server where operations on the mailbox are updated between the two entities. For the purposes of this document this session will exist between the MEM Server and the Email Server.
Email Server	The email server is a component that provides the user with data storage, access and means of email submission. In a particular implementation, the Email Server may be packaged within the MEM Server or be in a separate component.

Event Filters	Filtering rules that determine which email events may trigger notification (e.g. new email received, read, deleted).
Filtering Rules	A set of actions and conditions where the conditions are evaluated to determine which new email events and what email notifications should be sent from the client to the server or from the server to the client. They also include rules to select what new emails should be delivered from the server to the Mobile Email Client. This may be based on several criteria like subject, date, sender, folder where it is located etc…
Header	A sequence of lines of characters whose syntax includes a field name followed by a colon (":") and followed by a field body. Mandatory Headers included in emails are 'To:' and 'From:'. Headers can also include additional custom end-to-end message headers Source: IETF [RFC5322] "Internet Message Format".
In-band Notification	Server to client notifications of email server events, which are transported via the MEM Protocol
MEM Alignment	The process and mechanisms by which the MEM Client is updated to an appropriate view of the MEM Server and the MEM Server is updated to an appropriate view of the MEM Client where appropriate view means a subset of the corresponding data filtered based on configuration and user preferences.
MEM Protocol	Protocol that allows the exchange of messages between the MEM Client and MEM Server, that includes control of mobile operations, notifications, etc.
MEM Proxy	A proxy which provides Mobile Email proxy service. It allows the MEM Protocol to go through the firewalls in front of the MEM Server. The role of such a proxy is to allow the MEM Server to be located in the same domain as the Email Server in some deployment models and therefore alleviate the confidentiality and other security constraints that may be imposed on MEM Server implementations.
MEM Session	The session that exists between the MEM Client and the MEM Server that reflects the status of the data that has been exchanged as part of the Email Session.
Meta Data	Machine-generated attributes applied by the server at delivery time appearing in [RFC5322] header fields. Examples include "Resent" header field, Message Context (voicemail, email, MMS, SMS) and Processing Rules results.
Notification Filters	Filtering rules that determine for a particular email message whether or not a notification is sent to the MEM Client (e.g. only email from John to be notified).
Mobile Email	Enabling technologies that facilitate end-to-end application level interoperable email transactions (e.g. submission, retrieval, notification etc) to and from mobile devices.
Other Mobile Enabler	Any enabler utilized by the MEM Server or the MEM Client to provide additional MEM functionality, e.g. provisioning/device management etc
Out-band Notification	Server to client notifications of email server events, which are transported via channels other than the MEM Protocol such as: SMS, MMS, WAP Push, SIP Push, etc.
Server to Client Notification	A means by which the MEM Server informs the MEM Client of Email Events such as the arrival of a new email message
Suspend and Resume	Mechanism that allows resuming data exchange roughly where they were voluntarily or involuntarily interrupted/suspended without requiring to send most of the data than as previously exchanged.
View Filters	Filtering rules that determine which email messages are visible or not to the MEM Client. Email messages ruled not visible are hidden from the MEM Client by the MEM Server. Email messages ruled visible are presented to the MEM Client by the MEM Server.

3.3 Abbreviations

CP	Client Provisioning
DM	Device Management
DMZ	Demilitarized Zone
DS	Data Synchronization
EMN	Email Notification

ESMTP	Extended SMTP
HTML	Hyper Text Markup Language
IETF	Internet Engineering Task Force
IMAP	Internet Message Access Protocol
IP	Internet Protocol
MEM	Mobile Email Enabler
MMS	Multimedia Messaging Service
MTA	Mail Transfer Agent
MUA	Mail User Agent
MIME	Multipurpose Internet Mail Extensions
OMA	Open Mobile Alliance
POP3	Post Office Protocol 3
SAN	Server Alerted Notification
SAS	Server Alerted Sync
SIP	Session Initiation Protocol
SMIL	Synchronous Multimedia Integration Language
SMS	Short Message Service
SMTP	Simple Mail Transfer Protocol
SSL	Secure Socket Layer
STI	Standard Transcoding Interface
UAProf	User Agent Profile
UDP	User Datagram Protocol
WAP	Wireless Access Protocol
WDP	Wireless Datagram Protocol

4. Introduction (Informative)

The Mobile Email (MEM) Enabler aims to support efficient access to email from a mobile device. Email may be personal email provided by an email service provider or corporate email.

4.1 Planned Phases

At this time, no phasing is planned. All requirements and use cases are expected to be supported by the MEM Enabler. See the appendices for the technology realizations envisaged for the MEM Enabler.

4.2 Security Considerations

The MEM Enabler supports security between the MEM Client and MEM Server. Special attention must be paid when MEM Server and Email Server are in different domains.

The security requirements and features are discussed in [MEM-RD] and section 5.3 of this document. Deployment considerations are discussed in section B.3.

5. Architectural Model

5.1 Dependencies

The dependencies for OMA MEM are listed here.

- A MEM Protocol. Discussion of technology realizations are presented in the appendices
- OMA CP [OMA-CP] or OMA DM [OMA-DM] support for MEM parameters
- OMA CP [OMA-CP] or OMA DM [OMA-DM] support to bootstrap installation of MEM Client over the air
- OMA DM [OMA-DM] for life cycle management of MEM Client and parameters
- OMA DM [OMA-DM] for revocation of the MEM Client.
- OMA enabler to support Out-band Notification such as OMA EMN [OMA-EMN], SIP Push [SIP-Push], WAP Push [WAP-Push], etc.
- Non-intrinsic parameters required to support policy enforcement on mobile email exchanges (e.g. charging, privacy/ spam protection, …), as described in [OSE]
- OMA STI to support transcoding when desired via external server(s).
- OMA UAProf [OMA-UAProf] support for device capability information.

5.2 Architectural Diagram

The MEM Enabler logical architecture is illustrated in Figure 1.

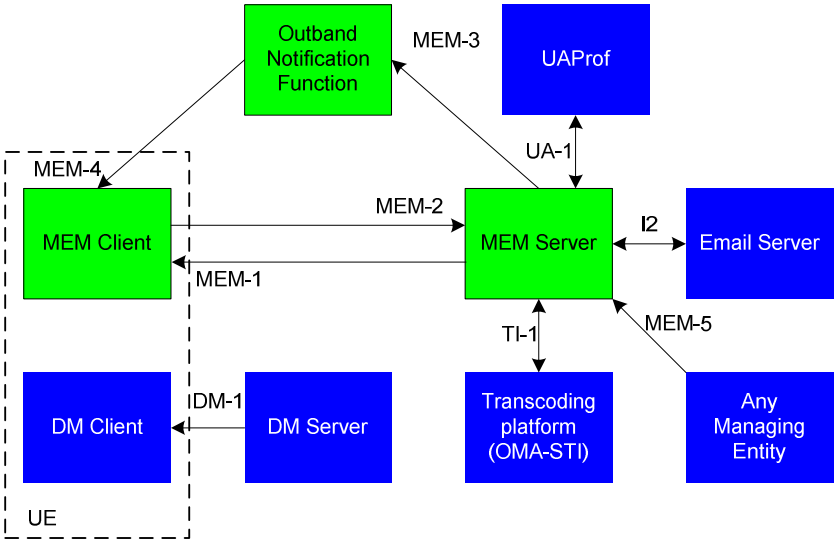

Figure 1 – Logical architecture for OMA MEM Enabler.

Figure 1 shows all of the external enablers. For simplicity, the rest of the figures within this document combine these external enablers into a single logical component labelled Other Enablers with their own interfaces (I0').

5.3 Functional Components and Interfaces

This section describes the components and interfaces that the OMA MEM architecture identifies. Each and every one of these components is shown on Figure 1.

5.3.1 Components

The following components are required for the operation of the OMA MEM Enabler:

- The MEM Client component. Its role and the client-side functionality are described in detail in section 5.3.3.
- The MEM Server component. Its role and the server-side functionality are described in detail in section 5.3.4.
- The Email Server component implements the functionalities required to store, access and manage emails as well as any related user preferences or settings. An implementation may combine the Email Server and the MEM Server together. The Email Server is not in the scope of the OMA MEM Enabler.

The following components are optional:

- The Outband Notification Function component implements the Out-Band Notification functionality of the OMA MEM Enabler.

Additional intermediary components may be introduced. See B.2 Proxies and firewalls and B.3 Deployment cases.

5.3.1.1 Other Enablers and Elements

The OMA MEM architecture identifies a list of Other Enablers (that are out of the scope of the MEM Enabler), each of which may be additionally deployed, in order to enhance the individual service deployments. It is up to the service provider to decide which additional enablers are deployed. The list provided herein captures those Other Enablers and Elements that have been explicitly mentioned as possible candidates; the individual service deployments may utilize any Other Enablers or technologies as well that are not explicitly included in the following list – as long as they do not introduce any interoperability problems with OMA MEM:

- OMA DM or OMA CP to support over the air installation of the MEM Client on the device, provisioning of its settings and revocation, as described in [OMA-CP] and [OMA-DM].
- OMA STI and UAProf to support transcoding of email message parts (body and attachments), as described in [OMA-STI] and [OMA-UAProf].
- Messaging enablers for Out-band Notification, where Out-band Notifications – those that are server to client event exchanges – are not transported by the MEM Protocol but via other channels. Such channels may involve:
  - SMS including GSMSMS or WAP WDP a la EMN
  - MMS
  - WAP Push
  - Additional Out-band Notifications like SIP push (SIP NOTIFY [RFC3265]) or UDP might also be used considered.
- The Any Managing Entity component implements the functionalities required to manage the MEM Server configuration. The Any Managing Entity is not in the scope of the OMA MEM Enabler. For more information, see 5.3.4.2 Administrative interface.

According to the OSE [OSE], non-intrinsic functions can be provided by other enablers to enforce various policies of the service provider, such as:

- Charging for traffic and other applicable costs.

- Privacy and spam protection

These policies however are not in the scope of this Enabler.

5.3.2 Interfaces

The OMA MEM architecture identifies a number of interfaces that allow communication between various components. All of these interfaces are shown on Figure 1. The labels on the figures indicate the interfaces, while the arrows indicate the data flow. The identified interfaces are:

- MEM-1: MEM Client interface to interact via the MEM Protocol with the MEM Server [see 5.3.2.1.1.2 MEM Protocol].
- MEM-2: MEM Server interface to interact via the MEM Protocol with the MEM Client [see 5.3.2.1.1.2 MEM Protocol].
- MEM-3: Out-band Notification interface for the MEM Server to generate server to client notifications [see 5.3.2.1.2.2 Out-band Notifications].
- MEM-4: Out-band Notification interface for the MEM Client to receive server to client notifications [see 5.3.2.1.2.2 Out-band Notifications].
- MEM-5: Interface for management of MEM Server settings (globally and per account) [see 5.3.4.2 Administrative interface].
- I0': Interfaces to/from other enablers (e.g. DM, CP, messaging). The I0' interfaces are not in the scope of the OMA MEM Enabler, they are always provided by the referenced enabler [see 5.3.1.1 Other Enablers].
- I2: Interface(s) between MEM Server and Email Server. The I2 interface is not in the scope of OMA MEM Enabler [see 5.3.2.1.1.1 Email Protocol].

The role of the MEM Protocol is described in detail in Section5.3.2.1.1.2.

5.3.2.1 Interface Usage

This section describes what protocols and notifications utilize the identified interfaces in order to provide MEM service. The following sections also describe the general expectations regarding:

- Protocols - Email and MEM Protocols
- Notifications - In-band and Out-band Notifications

5.3.2.1.1 Protocols

5.3.2.1.1.1. Email Protocol

The Email Protocol is used over the I2 interface for communication between the MEM Server and the Email Server. Because the Email Server and the I2 interface are not in the scope of the OMA MEM Enabler, the Email Protocol is out of the scope as well - and as such, exact details cannot be provided. As a guideline however, any existing protocols capable of providing email exchanges can be utilized as Email Protocol; examples of such protocols include (but not limited to) SMTP, IMAP, POP, WebDAV, etc.

When the I2 interface is internal to the implementation [see 5.3.2 Interfaces], the Email Protocol is not applicable.

5.3.2.1.1.2. MEM Protocol

Typically the MEM Client and the MEM Server uses the MEM Protocol for communication between MEM-1 and MEM-2, however the architecture model allows utilizing the I0' interface for such purpose as well. The MEM Protocol can be utilized only while the MEM Client is online: the MEM Protocol conveys all Email Data exchanges and In-band Notifications from the MEM Client to the MEM Server and vice versa.

The MEM Architecture defines the responsibilities of the MEM Protocol. Since the MEM Protocol is the "core" of the MEM Enabler, it has a wide range of responsibilities. For this reason these responsibilities are described separately in the following sections:

- **MEM Alignment**; to update the MEM Client/MEM Server to an appropriate view of the other.
- **Management and Use of Filtering Rules**; to configure and maintain filtering rules.
- **Management and Use of Settings and User Preferences**; to configure and maintain various settings.
- **Media conversion**; to perform various types of media conversions.

5.3.2.1.1.2.1. MEM Alignment

Generally, the MEM Alignment includes mechanisms to align, fetch and update Email Events between the MEM Client and the Email Server via the MEM Server in both directions:

- To reflect client side email events on the MEM Server.
- To reflect server side email events on the MEM Client according to settings/filter rules.

For the exact definition of MEM Alignment please refer to section 3.2 Definitions.

In order to manage connectivity, optimize bandwidth usage, cover additional deployment models and also enhance security, the MEM Alignment includes the following mechanisms as well:

- Mechanisms to support remote message assembly on the MEM Server based on email parts (body and attachments) that may not have been downloaded and others that may have been locally created or may have been downloaded and edited. It may be desirable to support just uploading the differences of the body parts (e.g. address fields).
- Mechanisms to optimize bandwidth usage on any data exchange, including (but not limited to):
  - Data exchanges to utilize compression
  - Reduced number of roundtrips
  - Minimize data exchange duplication during Suspend and Resume.
- Mechanisms for encryption of the email data exchanged between the Email Server and the MEM Client.
  - The Email Data shall remain encrypted at all times even if the MEM Server is deployed outside the email server domain.
  - Notifications shall also be encrypted whenever they carry information worth protecting.
- Mechanisms to allow configuration and settings exchange between the MEM Client and the MEM Server in band or out-band:
  - Server to client: e.g. server ID, account name, policies, server capability, etc.
  - Client to server: e.g. filtering rules, vacation notices, notification channel, client capability, etc.
- Mechanisms to support different deployment models described in section B.3.
  - Mobile Email must be usable in presence of firewalls and other intermediaries found in the fixed and mobile networks.
- Mechanisms to ensure integrity of the email data exchanged between the Email Server and the MEM Client.
- Mechanisms for mutual authentication of the MEM Client and the MEM Server
- Mechanism to allow the MEM Client to send recall request to the Email Server via the MEM Server [MEM-RD].

- Mechanisms to sign data exchanged between MEM Client and MEM Server.
- Mechanisms to allow the MEM Client to work offline, in intermittent connectivity , or with limitations of mobile device:
  - Store email and client email event
  - Detect network availability
  - Send email and client email event when network connectivity is available
  - Recover and resume interrupted sending or receiving process
- Mechanisms to support multiple accounts usage, such as:
  - Configure multiple email accounts individually
  - Receive e-mail from multiple email accounts
  - Send email from the selected email account

The MEM Alignment relies on notifications to convey Email Events. Hence, the definition of the MEM Protocol must include In-band and should include Out-band Notification mechanisms as described in [5.3.2.1.2 Notifications]. The [Mobile email RD] requires that In-band and Out-band Notifications assure the followings:

- To minimize the latency observed for email events on the Email Server to be reflected in the MEM Client.
- To avoid unnecessary requests – including polling – from the MEM Client.
- The MEM Client can identify and handle delayed notifications, and can cope with lost notifications as well.
- Out-band Notifications are specified to be network and transport independent by addressing various bindings to individual notification channels (e.g. SMS binary, WAP Push, SIP Notification, etc).

5.3.2.1.1.2.2. Management and Use of Filtering Rules

The MEM Protocol describes the get, create, update, and delete functionality for the Filtering Rules.

The Filtering Rules can also be managed by authorized principles as described in section 5.3.4.2 Administrative interface.

5.3.2.1.1.2.3. Management and Use of Settings and User Preferences

The MEM Protocol describes the get, create, update and delete functionality for these settings and user preferences.

These settings and user preferences can also be managed by authorized principles as described in section 5.3.4.2 Administrative interface.

5.3.2.1.1.2.4. Media conversion

The MEM Client can request media conversion from the MEM Server as described in [5.3.4.6 Media conversion]. The responsibilities of the MEM Protocol regarding media conversion are:

- Allow the MEM Client to request media conversion – including transcoding – of a message part including attachment(s) from the MEM Server when the email message part is fetched from the Email Server.
  - The MEM Client may request conversion to a specific format, size or both format and size, or alternatively
  - The MEM Client may request conversion to a server-selected format/size - where the MEM Server decides the format/size credentials based on any knowledge (e.g. client capabilities, user preferences) it may have.
- The media conversion does not permanently alter messages once they are stored.

5.3.2.1.2 Notifications

Notifications are always sent from the server to the client. The notifications are used to convey information from the MEM Server to the MEM Client without requiring the MEM Client to poll for changes periodically. Based on the connection state of the MEM Client, two types of notifications are defined:

- In-band Notifications
- Out-band Notifications

In-band and Out-band Notifications are mutually exclusive for a mailbox.

Both notification types are subject to Filtering Rules.

5.3.2.1.2.1. In-band Notifications

As long as the MEM Client is online, the MEM Server will use In-band Notifications to inform the MEM Client about Email Events. The In-band Notifications are transported over the MEM Protocol [5.3.2.1.1.2 MEM Protocol].

It is required that the In-band Notifications carry all information necessary to maintain MEM Alignment.

The MEM Client is required to process and act upon the information in the In-band Notifications.

5.3.2.1.2.2. Out-band Notifications

While the MEM Client is offline, the MEM Server can use Out-band Notifications to inform the MEM Client about Email Events based on user settings and service provider policies. Typically the Out-band Notifications are transported over the Outband Notification Function component [see 5.3.1 Components] using the MEM-3 and MEM-4 interfaces [see 5.3.2 Interfaces].

It is not required to carry all information necessary to maintain MEM Alignment while the MEM Client is offline. The amount of details included in the Out-band Notification is up to the MEM Server implementation. If the goal is to minimize the amount of data sent within the Out-band Notification, all details can be left out indicating only the fact that an Email Event has taken place. If the goal is to save the MEM Client from connecting, detailed information about the Email Event can be included. Additionally, the MEM Server implementation can also provide basic flow control by buffering Email Events and sending them out in batches instead of flooding the MEM Client with them one-by-one – e.g. one Out-band Notification might contain several Email Events. In any case: if sensitive information is included (e.g. the notification payload is worth protecting) in the Out-band Notification, it shall be encrypted.

5.3.3 MEM Client

The MEM Client is responsible for implementing the client-side functionality for the following features of the OMA MEM Enabler:

The client-side functionality includes the following features:

- Interfaces for other components [see 5.3.3.1]
- User Interface [see 5.3.3.2]
- Session Management [see 5.3.3.3]
- Management of Email Data [see 5.3.3.4]
- Event handling [see 5.3.3.5]

5.3.3.1 Interfaces for other components

All interfaces are identified in section 5.3.2 Interfaces.

The MEM Client can provide the following interface:

- MEM-1 – for the MEM Protocol, see 5.3.2.1.1.2 MEM Protocol.
- MEM-4 – for the Out-band Notifications, see 5.3.2.1.2.2 Out-band Notifications.
- I0' – for Other Enablers, see 5.3.1.1 Other Enablers.

5.3.3.2 User Interface

The user interface allows the end-user to take advantage of the mobile email service, which generally means receiving, sending and organizing emails.

OMA does not provide any guidelines regarding user interfaces, thus the user interface is up to the implementations.

5.3.3.3 Session Management

The MEM Client communicates with the MEM Server using MEM Sessions. MEM Sessions are established using the MEM Protocol. The responsibilities of the MEM Client regarding these sessions are:

- Establishing and maintaining MEM Sessions (including Suspend and Resume).
- Cope with intermittent connectivity.
- Secure traffic during the MEM Sessions.

5.3.3.4 Management of Email Data

Management of Email Data for a MEM Client generally means providing and executing a set of features and functions that allow viewing, creating, updating, processing, storing and removing the Email Data either locally, remotely or both. The MEM Client responsibilities regarding Email Data management include:

- Client-side support for managing user preferences.
- Client-side implementation of local behaviour (local vs. remote delete and any other mailbox changes).
- Mechanism to support usage of email, including:
  - Read
  - Compose
  - Save
  - Send
  - Forward / reply with or without download
  - Message deleting features:
    - Local delete: Ability to delete email message from the MEM Client view while retaining the message on the Email Server. Some information may be passed to the MEM Server.
    - Attachment local delete: Ability to delete from the MEM Client the attachment while maintaining the view that an attachment is available for download from the Email Server.
    - Remote delete: Ability to delete email messages both on the MEM Client and on the Email Server.
  - Manage downloading features (e.g. only headers, only a certain size, only body, selected attachments or all attachments.)

  - Utilize metrics provided by the MEM Server to provide an estimation of the download time that is needed to complete the download of the email message and/or its attachments.
  - Allowing the user to create, update, delete, activate/deactivate auto-reply messages and store them onto the server.
- Client-side download and storage user preferences:
  - Manage which of the accessible messages are maintained on MEM Client
  - Manage which parts of accessible messages are downloaded and maintained on MEM Client
  - These preferences are configurable by the user
  - Encryption and protection of the locally stored messages.
- Client-side security, including:
  - Password protection
  - Local message store encryption
  - Management of local encryption/decryption keys

5.3.3.5 Event handling

The MEM Client is responsible for handling Email Events. Email Events may originate from the MEM Client, the MEM Server or the Email Server. Email Events are handled differently while the MEM Client is connected to the MEM Server and while the MEM Client is offline – these issues are discussed in the following sections.

5.3.3.5.1 Email events while MEM Client is online

The MEM Client is required to convey all client-originated Email Events to the MEM Server using the MEM Protocol [see 5.3.2.1.1.2 MEM Protocol].

As long as the MEM Client is online, the MEM Server uses In-band Notifications to convey Email Events to the MEM Client [see 5.3.2.1.2.1 In-band Notifications].

5.3.3.5.2 Email events while MEM Client is offline

The MEM Client can queue up any client-originated Email Events until the next MEM Alignment: it is not required to perform MEM Alignment immediately.

While the MEM Client is offline, the MEM Server can use Out-band Notification to convey Email Events to the MEM Client [see 5.3.2.1.2.2 Out-band Notifications]. Based on the content of the Out-band Notification the MEM Client can choose to perform MEM Alignment. The Out-band Notification can describe the exact changes that took place in the user's mailbox; this allows the MEM Client to apply the exact same changes locally – without having to perform MEM Alignment at all – however the MEM Client is not required to do so. On the other hand, there might be changes that are not described in Out-band Notifications; consequently these changes cannot be applied locally without performing MEM Alignment. While the MEM Client is not required to perform MEM Alignment immediately, it is recommended to perform MEM Alignment whenever the MEM Client detects that an Out-band Notification has been lost or delayed.

5.3.4 MEM Server

The MEM Server is responsible for implementing the server-side functionality of the OMA MEM Enabler.

The primary role of the MEM Server is to provide a logical entity in front of the Email Server that:

- Enhances the Email Server with features that allow mobile clients to access email services more efficiently, and

- To provide access to Email Servers that use Email Protocols that are not explicitly supported by the MEM Client.

Due to the wide range of deployment models, the variations in types of clients, usage profiles and Email Servers, the MEM Server needs to be configurable to support different email protocols, feature sets, levels of security, and logical flows. The configuration should also take into account the various characteristics of the deployment model as described in section B.3.

The server-side functionality includes the following features:

- Interfaces for other components [see 5.3.4.1].
- Administrative interface [see 5.3.4.2].
- Session Management [see 5.3.4.3].
- Management of Email Data [see 5.3.4.4].
- Event handling [see 5.3.4.5].
- Media conversion [see 5.3.4.6]

5.3.4.1 Interfaces for other components

All interfaces are identified in section 5.3.2 Interfaces.

The MEM Server provides the following interfaces:

- MEM-2 – for the MEM Protocol, see 5.3.2.1.1.2 MEM Protocol.
- MEM-3 – for the Out-band Notifications, see 5.3.2.1.2.2 Out-band Notifications.
- MEM-5 – for the administrative purposes, see 5.3.4.2 Administrative interface.

The MEM Server supports the following interfaces that are provided by entities outside of the scope of the MEM Enabler:

- I2 – for the Email Protocol, see 5.3.2.1.1.1 Email Protocol.
- I0' – for Other Enablers, see 5.3.1.1 Other Enablers.

5.3.4.2 Administrative interface

The purpose of the administrative interface is to allow authorized principles to configure or update various settings on the MEM Server. The OMA MEM architecture identifies MEM-5 for this purpose.

The managed settings typically change behaviour of the MEM Server itself (MEM Server settings), or they are related to various user settings (user preferences, Filtering Rules) either globally or on a per-user basis.

5.3.4.3 Session Management

Typically, the MEM Server needs to manage two sessions: a MEM Session and an Email Session. It might be necessary to manage additional sessions as well, depending on the implementation choice regarding MEM-3, MEM-5, and I0', however management of these additional sessions is up to the MEM Server implementation.

The MEM Session is established and maintained by the MEM Client [see 5.3.3.3 Session Management]. The MEM Client will attempt to establish a MEM Session using the MEM-1 and MEM-2 interfaces from time to time, whenever necessary.

The MEM Server communicates with the Email Server using Email Sessions. The MEM Server is responsible for establishing and maintaining the Email Session. Email Sessions are established over the I2 interface using for example IMAP, POP, or SMTP protocols.

The responsibilities of the MEM Server are common for both MEM Sessions and Email Sessions. These responsibilities include:

- Resolution of address for recipient of events.
- Providing sessions (including Suspend and Resume) for several MEM Clients simultaneously
- Providing multiple sessions for the same mailbox for different MEM Clients simultaneously
- Provide multiple MEM Sessions towards different mailboxes simultaneously from the same MEM Client.
- Maintain connectivity to Email Server session even when the MEM Client's connectivity is intermittent.
  - Maintain state of session and update client when session reconnected.
- Cope with possible lack of connectivity (e.g. queue and store the events).

5.3.4.4 Management of Email Data

Management of such Email Data for a MEM Server generally means providing and executing a set of features and functions that allow retrieving, processing, storing and removing the Email Data between MEM Clients and their Email Servers. The MEM Server responsibilities regarding Email Data management include:

- Maintaining security of the message contents and the interchanges between the MEM Client and the Email Server.
  - Authentication of the Email Server
  - Authentication and authorization of the MEM Client
  - Authentication and authorization of originator (MEM Client) of submitted messages
- Applying user preferences/filtering rules/settings to the email information obtained from Email Server to perform or delegate:
  - Applying event and message filtering rules – based on header information, recipient's location (e.g., roaming), and folder information
  - Content screening – based on spam/virus-prevention information
  - Mechanisms to apply the following filters:
    - View Filtering.
    - Notification Filters.
    - Event Filters.
- Sending of events to the client when requested (i.e. explicit in-band request, not notifications)
- Allow the user to use multiple MEM Clients sequentially or simultaneously
- Support definition and activation/deactivation of auto-reply messages for each filtered message
  - Avoid any mail loops in an auto reply functionality
- Support of extended mailing services
  - Forward without download – by re-assembling a new email message based on edited message parts, additional content, or attached content.
  - Reply without download – by re-assembling a new email message based on edited message parts or additional content.
  - Estimated download time - Provide metrics of the email message and its attachments for the MEM Client prior to retrieval of the actual email message content(s)
  - Content adaptation
- Identify the source Email Server & account for each message/event, to allow client to handle the messages/events according to source, e.g., different "logical folders" for different accounts, different "icons" for different accounts.
- Collect metering information for per-unit metering schemes
- Notify MEM Client of any processing errors.

5.3.4.5 Event handling

Email Events can originate from the Email Server or the MEM Client. The MEM Server can receive Email Events from the MEM Client only while the MEM Client is online. Similarly, the MEM Server can receive Email Events from the Email Server while the Email Server is online.

In general each Email Event is reflected to the other end: client-originated Email Events to the Email Server, server-originated Email Events to the MEM Client. However, the server-originated Email Events are subject to Filtering Rules – which can prevent notification of Email Events.

The MEM Server uses In-band and Out-band Notifications to convey the Email Events to the MEM Client as described in [5.3.2.1.2 Notifications].

5.3.4.6 Media conversion

From time to time the MEM Client can encounter attachments that it might prefers converting before downloading it. The MEM Client can do this either because it is unable to handle the attachment due to its limited capabilities (memory, missing codec, display size, etc) or, because it simply prefers converting the attachment.

The MEM Server may perform the requested conversions itself, however it is not required to do so – it may invoke an Other Enabler [see 5.3.1.1 Other Enablers] to perform the conversion, however such conversions are not in the scope of the OMA MEM Enabler. The OMA MEM Enabler provides a way for the client to request media conversion, as described in 5.3.2.1.1.2.4 **Media conversion**.

5.4 Flows

This section describes the high level logical flows associated with using MEM Enabler:

5.4.1 Before using the MEM service

Before the end-user starts using the MEM service, the service provider can perform various operations that help the user taking the service into use – ultimately allowing the user to use the service without modifying any settings. These operations include (but are not limited to):

- Set up basic settings for the user on the MEM Server:
  - Initial set of Filtering Rules
  - Initial set of user preferences
  - Initial mailbox layout
- Configure the user's client remotely:
  - With MEM Server, Email Server and proxy settings according to the deployment model in use:
    - Username/password
    - Address/port settings
  - Out-band Notification settings
    - Available bearers
    - Supported payload types
    - Encryption key

5.4.2 Using the service

Using the MEM service typically consists of the followings:

- Setting up the MEM Session
- Using the MEM service
- Suspending the MEM service

5.4.2.1 Setting up the MEM Session

In order to use the MEM service the MEM Client needs to set up a MEM Session. The MEM Session is established and maintained using the MEM Protocol [see 5.3.2.1.1.2 MEM Protocol] between the MEM Client and the MEM Server. The communication between the MEM Client and the MEM Server takes place using the MEM Protocol as well. The MEM Client is responsible for maintaining the MEM Session [see 5.3.3.3 Session Management].

The MEM Server accepts the MEM Client request. The MEM Server needs to establish a connection with the appropriate Email Server [see 5.3.4.3 Session Management]. The MEM Server communicates with the Email Server using the Email Protocol [see 5.3.2.1.1.1 Email Protocol]. When the connection between the MEM Server and the Email Server is available, the MEM Server creates the MEM Session requested by the MEM Client and informs the MEM Client about it.

5.4.2.2 Using the MEM service

The MEM Client and MEM Server use the established MEM Session to exchange Email Events and Email Data, which generally means a continuous MEM Alignment [see 5.3.2.1.1.2.1 **MEM Alignment**] that is provided by the MEM Protocol. However, typically MEM Alignment is performed only once per MEM Session – right after establishing the MEM Session – and the new Email Events are conveyed from the MEM Server to the MEM Client using notifications [see 5.3.2.1.2 Notifications], and from the MEM Client to the MEM Server using the MEM Protocol [see 5.3.2.1.1.2 MEM Protocol] itself.

The MEM service can be used either online or offline – the only difference is that while the MEM Client is offline the new Email Events are not reflected to the other end – except those that are notified using Out-band Notifications [see 5.3.2.1.2.2 Out-band Notifications]. In any case, the MEM Client handles Email Events as described in 5.3.3.5 Event handling and the MEM Server handles Email events as described in 5.3.4.5 Event handling.

Client-originated Email Events are generated when the user is managing his/her Email Data [see 5.3.3.4 Management of Email Data]. Server-originated Email Events are generated whenever the MEM Server detects a change in the mailbox of the user – this typically means the availability of new email messages in the mailbox, however it may also mean that Email Data is being managed from another MEM Client in the same mailbox.

5.4.2.3 Suspending the MEM service

The MEM Client will want to switch between online/offline modes during its operation to save over-the-air time and traffic, battery life, etc. Therefore, the MEM Client will suspend the session after a period of inactivity. During this time the connection to the MEM Server will be disconnected. When the MEM Client detects activity again (either local Email Events require a connection or important remote Email Events have been notified), it will re-establish the connection to the MEM Server and perform MEM Alignment to get an up-to-date view of the mailbox.

Ultimately – most likely when the user is not interested anymore in emails – the MEM Client disconnects without suspending the session.

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
OMA-AD-Mobile_Email-V1_0-20110802-A	02 Aug 2011	Status changed to Approved by TP: OMA-TP-2011-0273-INP_Mobile_Email_V1_0_ERP_for_final_Approval

Appendix B. Implementation considerations

In all the figures in this appendix, no colour coding is used to indicate items in scope or out of scope of OMA.

B.1 Implementation of the MEM Server

MEM Server implementations may wish to delegate transcoding to the OMA STI enabler [OMA-STI]. It is an implementation choice and it may not be appropriate for certain deployments.

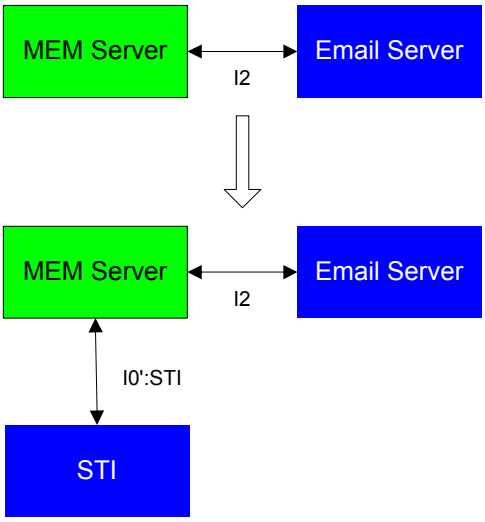

Figure 2 - Particular implementation case where MEM Server relies on OMA STI enabler for transcoding.

MEM implementation may wish to delegate managing information about the capabilities of a device to the OMA UAProf enabler [OMA-UAProf].

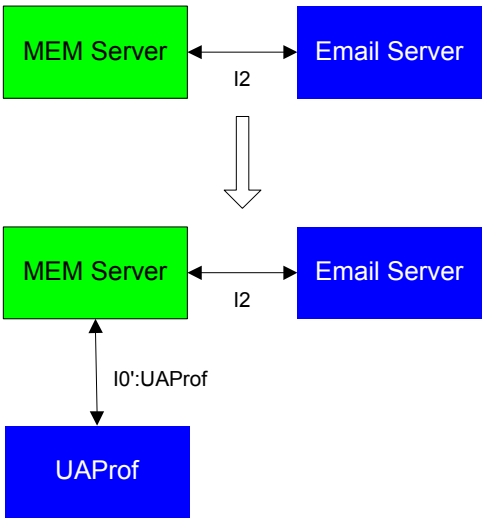

Figure 3 - Particular implementation case where MEM Server relies on OMA UAProf for managing information about the capabilities of a device.

B.2 Proxies and firewalls

The MEM Enabler must be functional in the presence of firewalls. Figure 4 illustrates where firewalls may be present.

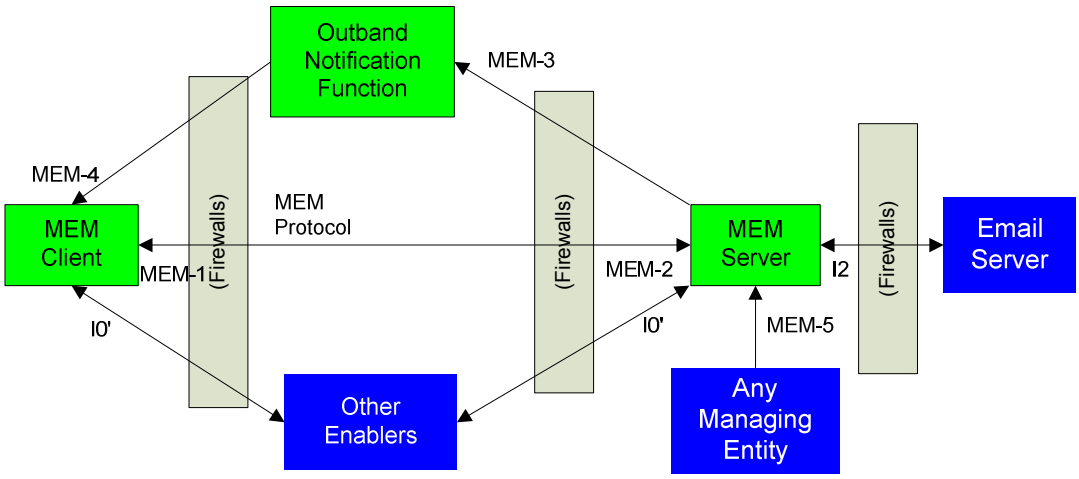

Figure 4 – MEM Enabler logical architecture and possible firewalls

To maintain functionality in the presence of firewalls and to support different deployment models, the MEM Enabler can be deployed via a MEM Proxy between MEM-1 and MEM-2. The proxy channels all MEM-1 and MEM-2 communications to and from the MEM Server.

The proxy allows the MEM Protocol through the firewalls in front of the MEM Server. The role of such a proxy is to allow the MEM Server to be located in the same domain as the Email Server in some deployment models and therefore alleviate the confidentiality and other security constraints that may be imposed on MEM Server implementations. In such case the proxy function conveys all MEM-1, MEM-2, MEM-3 and I0' communications to and from the MEM Server.

The proxy might reside in various locations in the network. Figure 5 and Figure 6 show two possibilities.

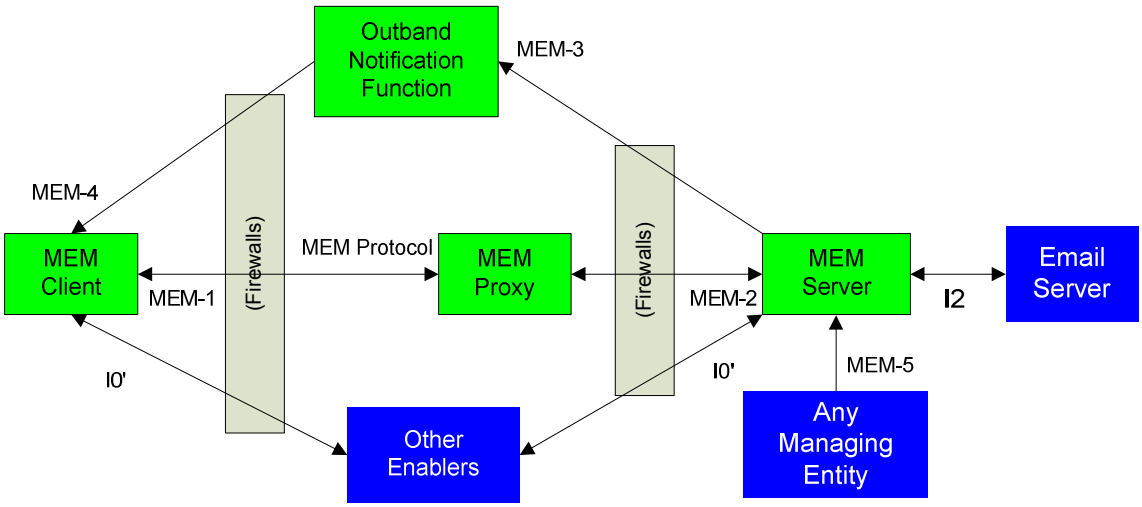

Figure 5 – MEM Protocol proxy

If the Out-band Notifications and provisioning are used, the following deployment model may also be needed, otherwise the other mobile enablers may require more resources.

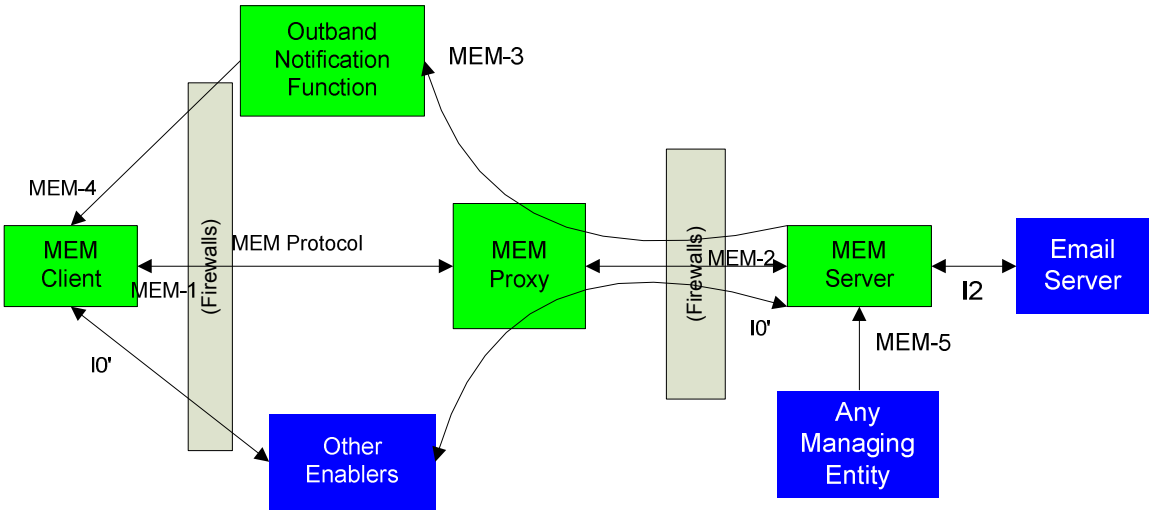

Figure 6- Logical Usage Model with Proxy also for other enablers

B.3 Deployment cases

The logical architecture for the MEM Enabler supports a rich set of deployment models illustrated in the following figures. This covers all the deployment cases that have been envisaged to date. However, there may be additional deployment models such as those where Outband Notification Function and Other Enablers are within different domains. Note that the cases of Figure 11 and Figure 12 imply that the MEM Enabler deployment supports end to end encryption between the Email Server and MEM Client. The Email Server could announce such end-to-end encryption schemes via I2 to the MEM Server and via MEM-2 to the MEM Client.

There could be additional security considerations when emails or portions of emails are processed outside of the Email Server domain (the IP domain where the Email Server resides).

In Figure 7 through Figure 10, proxy can exist with both variations described in Figure 5 and Figure 6.

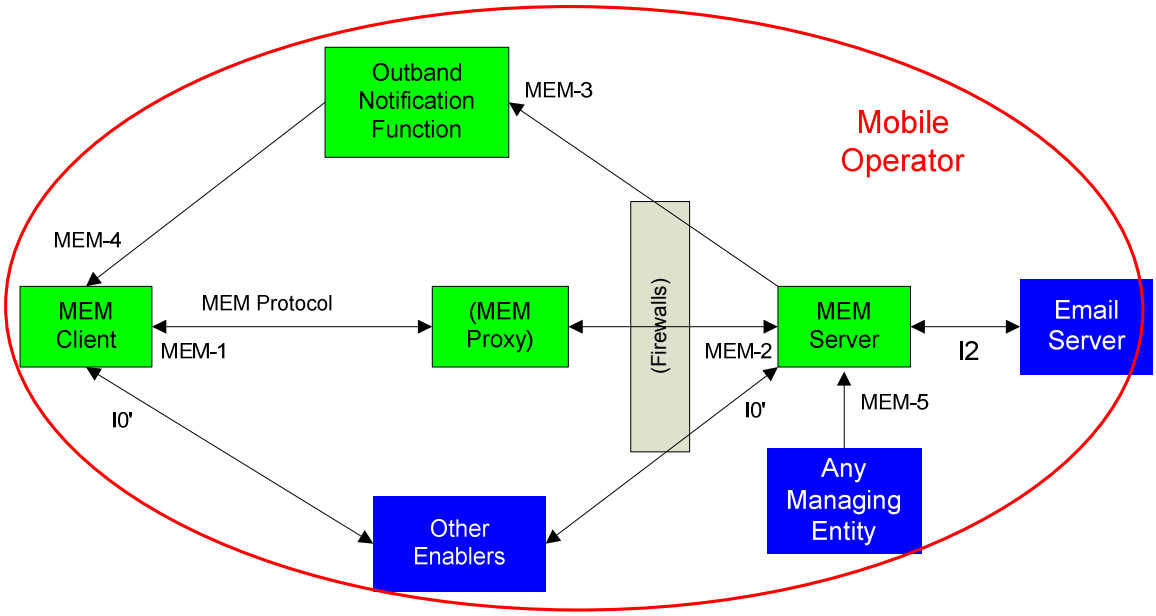

Figure 7 – Deployment within a mobile operator domain for an operator hosted email service.

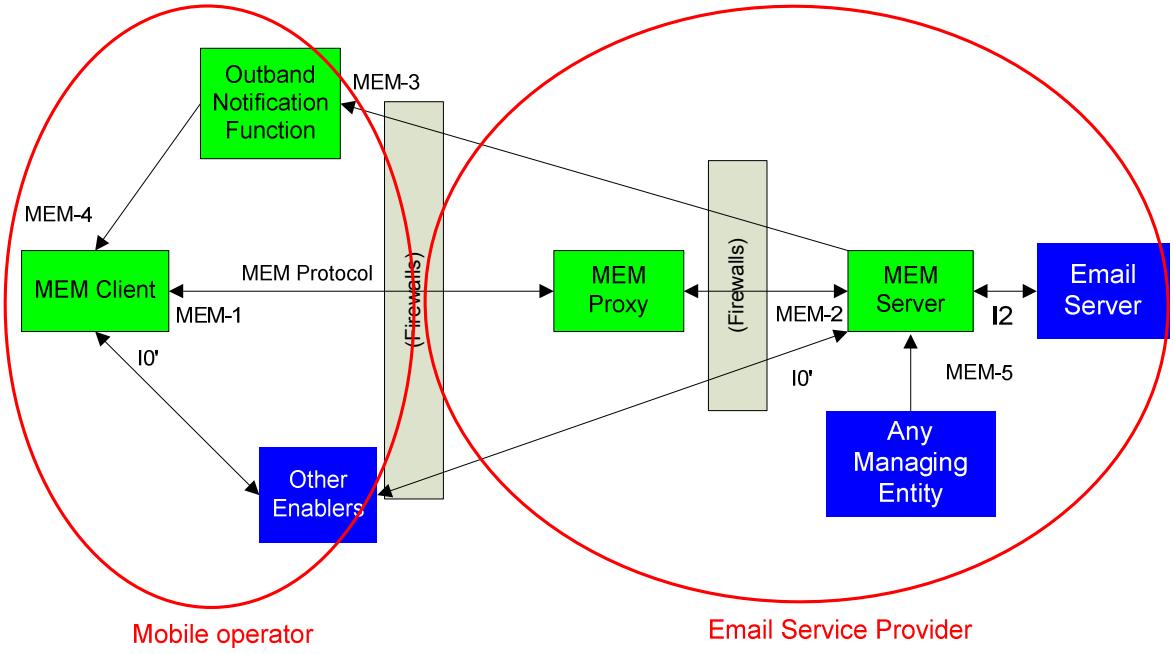

Figure 8 – Deployment by an email service provider (enterprise or ISP (e.g. personal email provider)). The proxy is deployed by the email service provider in the DMZ.

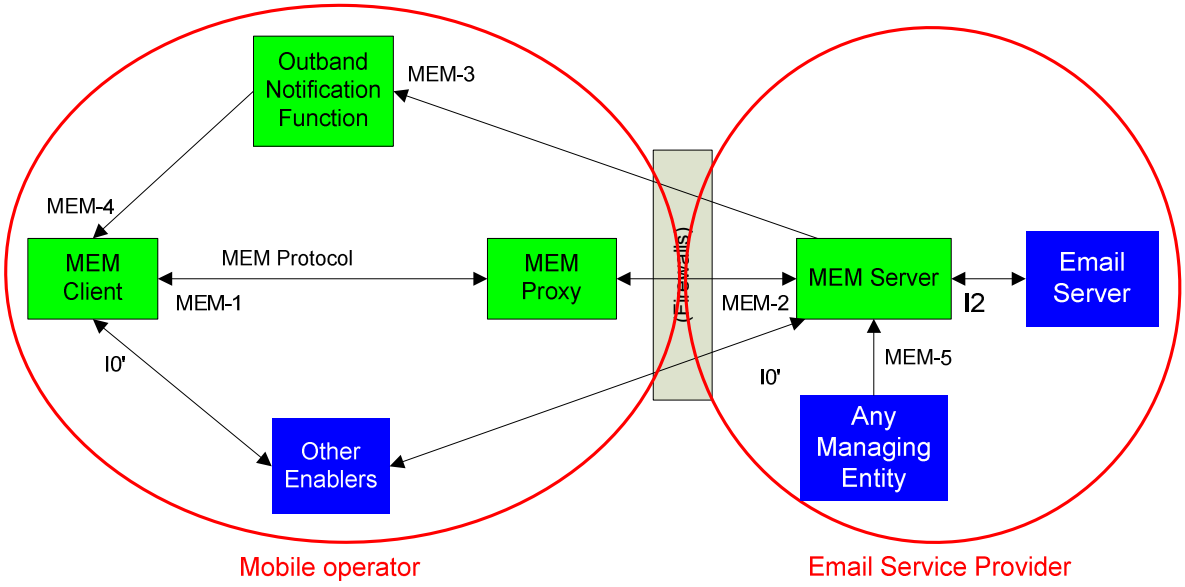

Figure 9 - Deployment by an email service provider (enterprise or ISP (e.g. personal email provider)). The proxy is provided as a service by the mobile operator.

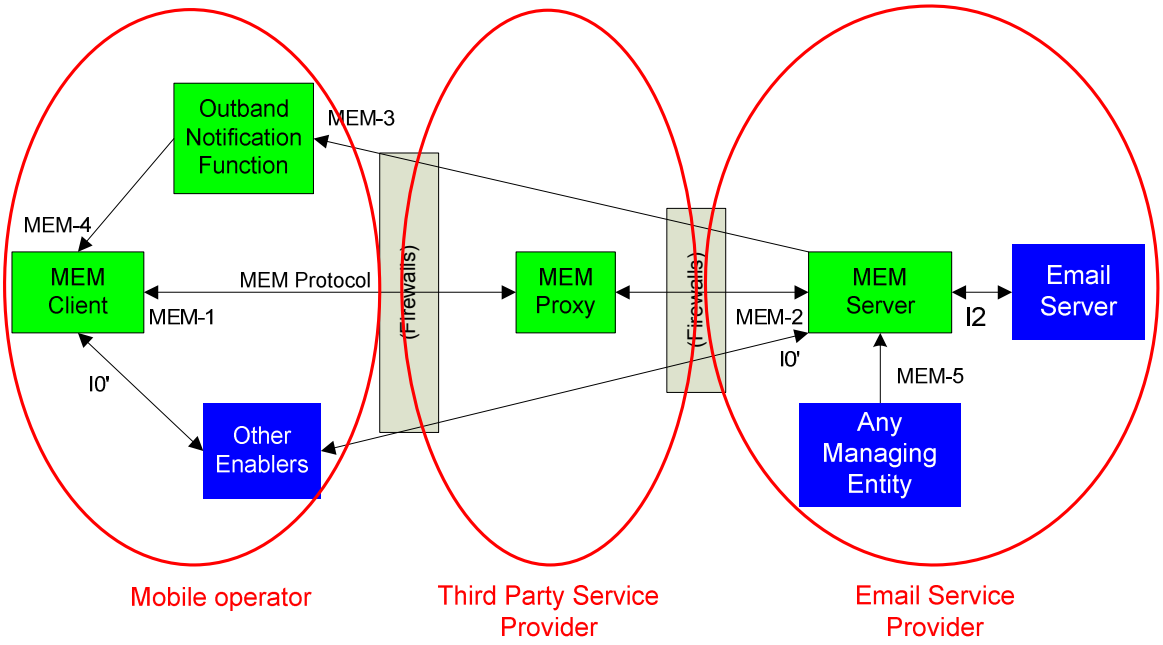

Figure 10 - Deployment by an email service provider (enterprise or ISP (e.g. personal email provider)). The proxy is provided as a service by a third party.

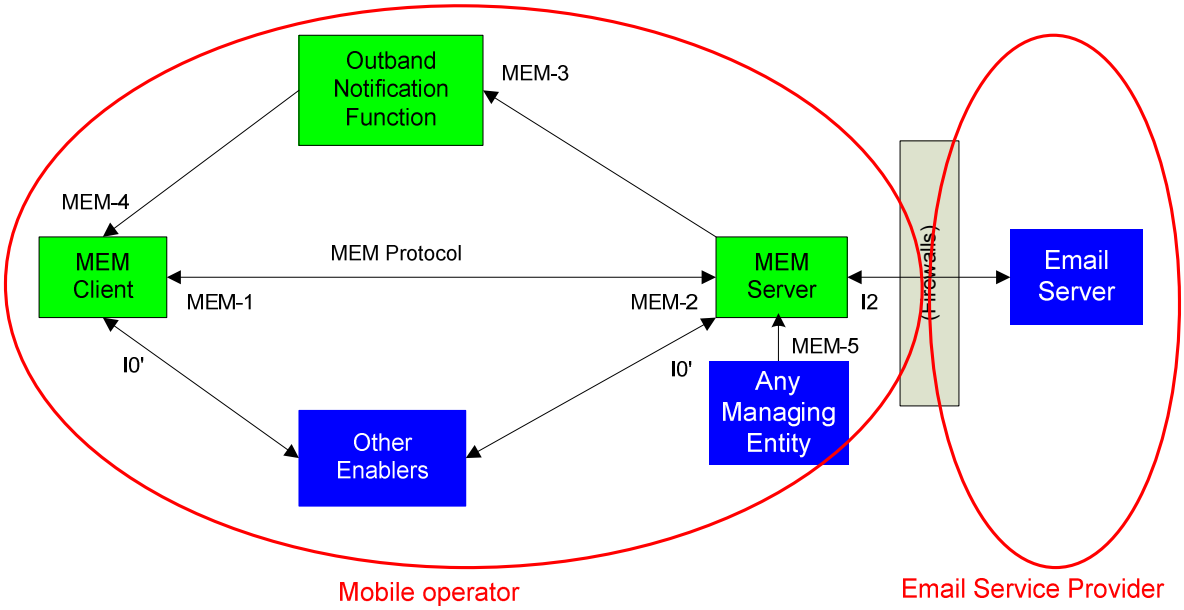

Figure 11 - Deployment by a mobile operator of a mobile email service offered to an email service provider (enterprise or ISP (e.g. personal email provider)). It is recommended that all data remain secure between the Email Server and MEM Client.

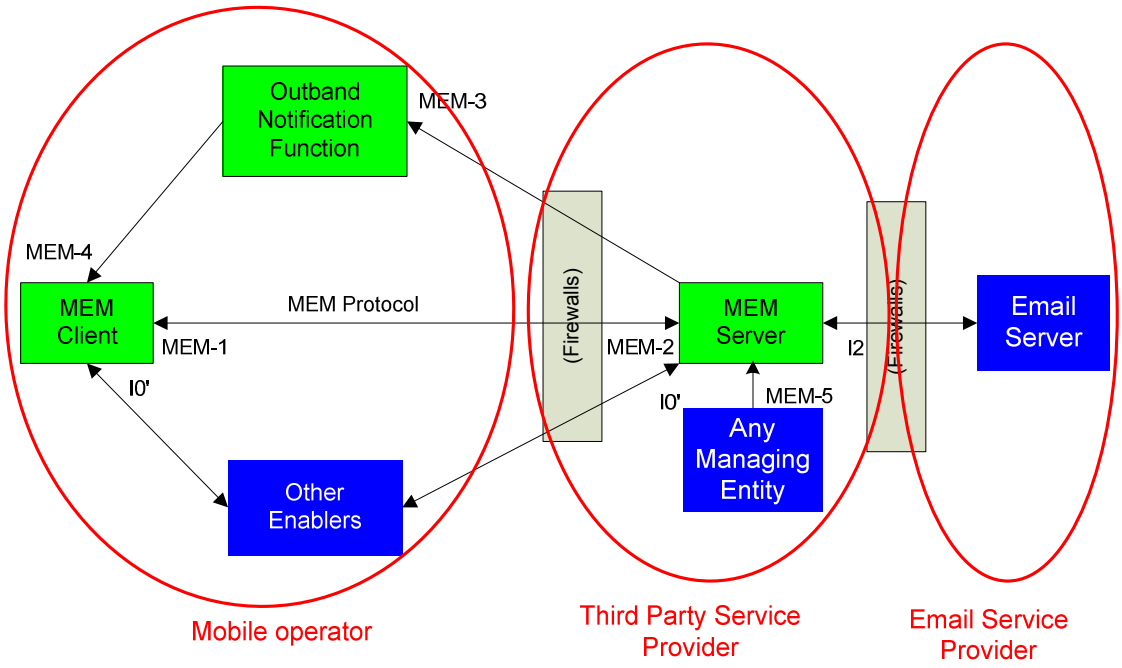

Figure 12 - Deployment by a third party service provider of a mobile email service offered to an email service provider (enterprise or ISP (e.g. personal email provider)). It is recommended that all data remain secure between the Email Server and MEM Client.

Appendix C. IETF Lemonade Realization

The IETF Lemonade Working Group defines IMAP, SUBMIT, and SIEVE extensions [LEMONADE PROFILE] (including the IMAP Store and SUBMIT Server) that can support the mobile email requirements and use cases [MEM-RD] addressable within the scope of IETF. These specifications are captured in the Lemonade profile [LEMONADE PROFILE]. The Lemonade profile references other specifications such as IMAP, SUBMIT and IMAP URLAUTH.

An example of OMA MEM realization using the Lemonade profile is illustrated in Figure 13.

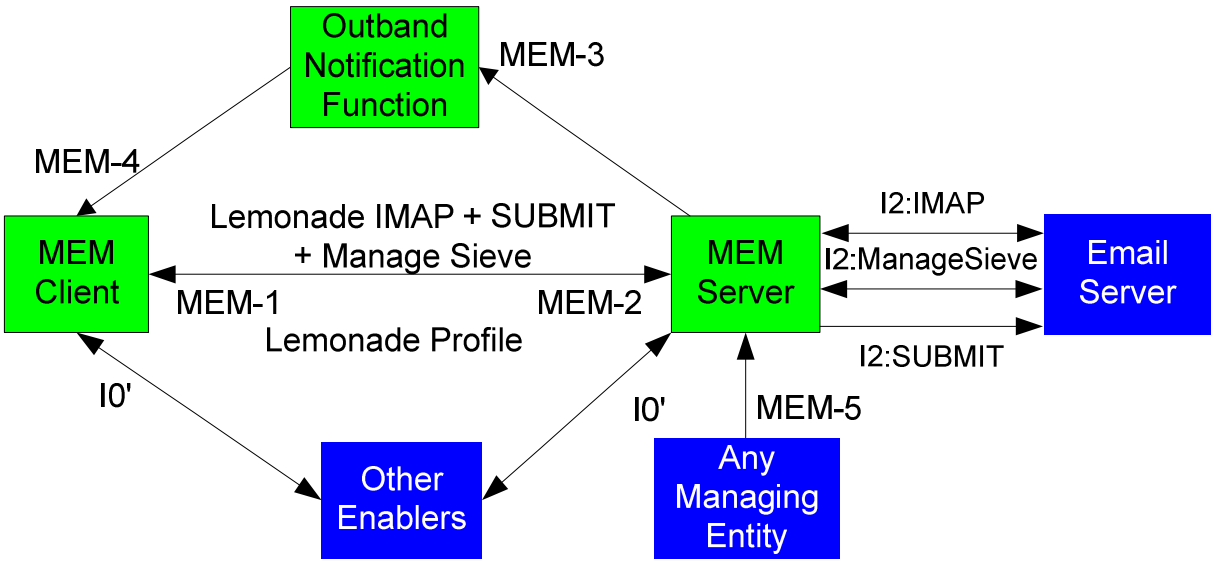

Figure 13 – Example of OMA MEM logical architecture using the Lemonade profile.

The IETF Lemonade addresses standard IMAP stores and SUBMIT servers.

C.1 Realization details

Realization of the OMA MEM Enabler based on the Lemonade profile is represented in Figure 14.

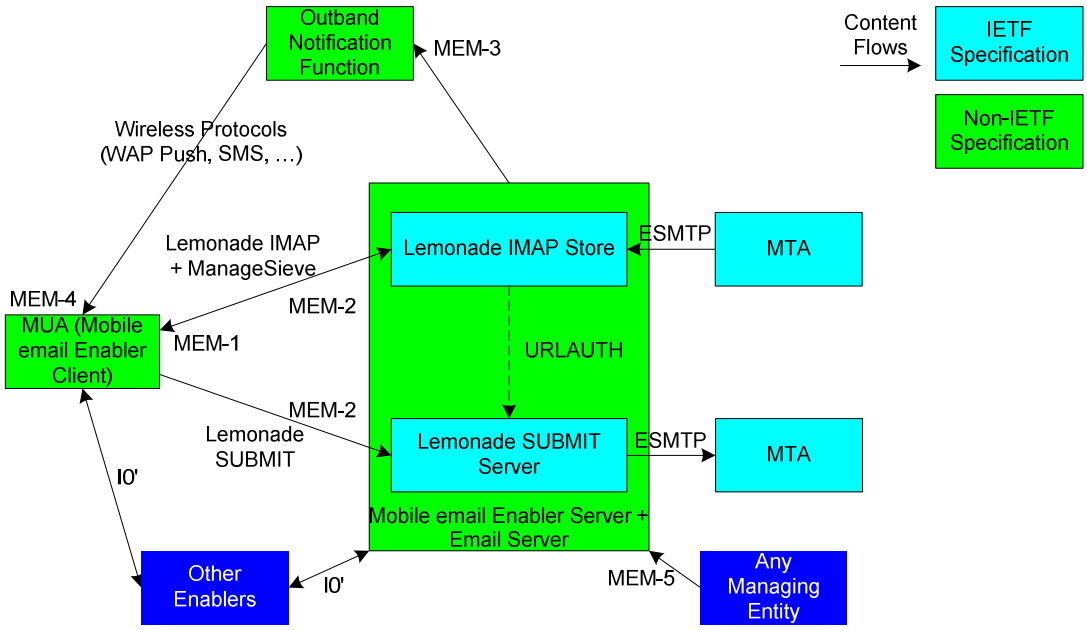

Figure 14 - OMA MEM Enabler realized using IETF Lemonade IMAP and SUBMIT serversLemonade .

In Figure 14, the MEM Server and Email Server components have collapsed into just two components specified by IETF Lemonade: the Lemonade IMAP Store and SUBMIT Server [RFC5321] plus mechanisms to support out band data exchanges. MEM-2 should support the Lemonade IMAP Store and Lemonade SUBMIT Server.

As discussed in section B.2, proxies may be involved.

In general, message stores and bindings are not limited to the IETF specifications as shown in Figure 15.

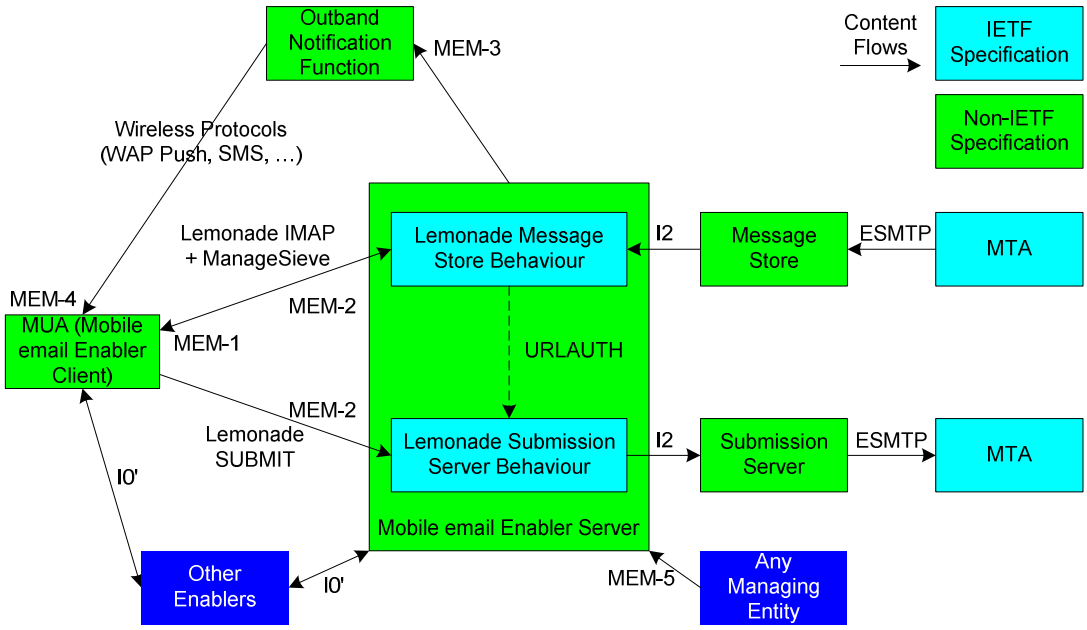

Figure 15 - OMA MEM Enabler realized based on IETF Lemonade specifications using non-IETF message store and submission server.

Appendix D. OMA DS Realization

The OMA DS Working Group defines OMA DS [OMA-DS] that can be used to support the mobile email requirements and use cases [MEM-RD] addressable within the scope of OMA DS. OMA DS includes SAN and Email Object specifications.

An example of OMA MEM realization using OMA DS is illustrated in Figure 16.

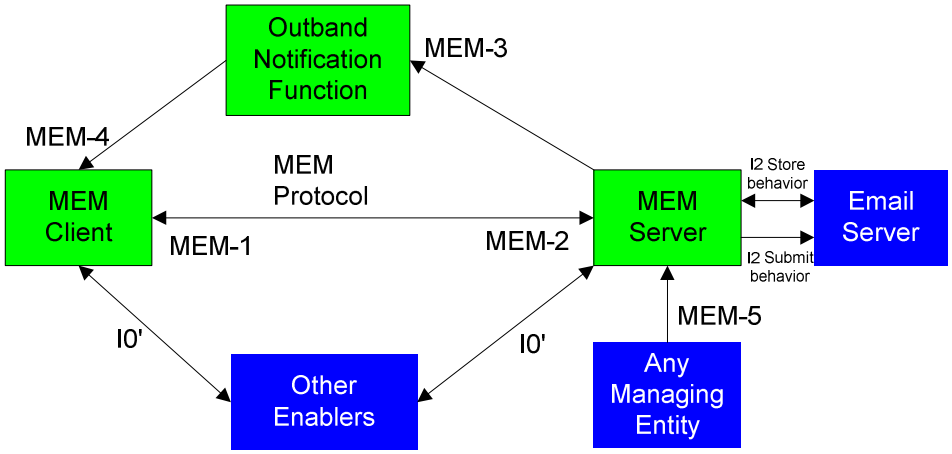

Figure 16 – Example of OMA MEM logical architecture using OMA DS.

D.1 Realization details

An example of MEM realization based on OMA DS enabler is presented in Figure 17. Generally, the OMA DS enabler is used to synchronize data between clients and servers. In the case of the MEM Enabler, the client and server are MEM Client and MEM Server respectively. The email data is exchanged as email objects.

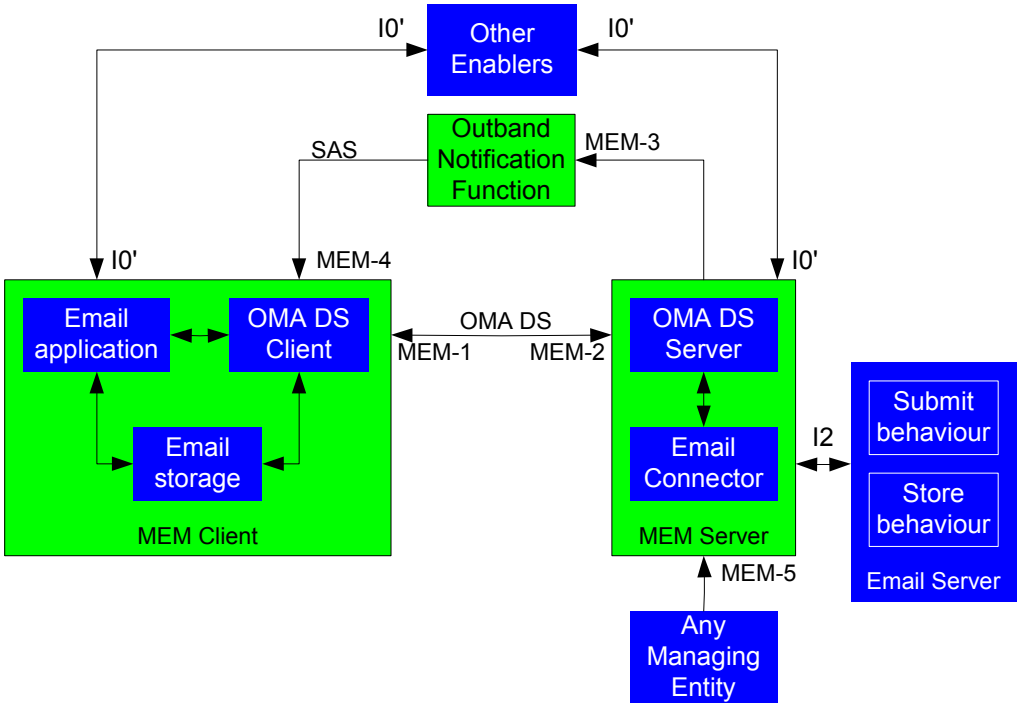

Figure 17 – An example of mobile email enabler realization using the OMA DS and OMA DM standard

Intermediaries (proxies, firewalls) are supported and are described in section B.3.

The following sections provide short description of the components and interfaces, their roles and responsibilities. In real implementations the described components will be most likely:

- Broken into smaller units
- Combined together to achieve better processing efficiency.
- Replaced by other components.

D.2 Email Server component

The Email Server deployment cases are described in section B.3. In some cases the Email Server can actually be a combination of indirectly related systems each of which is responsible for specific behaviour realization (e.g.: POP3 for email reception, SMTP for email submission and a MEM vendor proprietary implementation for email data storage).

D.2.1 Store behaviour

The Email Server component provides access to the user email. Typically it supports the hierarchical organization of email using folders however other means of organizing email exist and must be kept in mind.

D.2.2 Submit behaviour

The Email Server component provides the means to submit messages. The MEM Server relays email submission requests to the Email Server.

D.3 MEM Client component

The client realization consists of the following:

- Email storage
- Email application
- Client-side implementation of OMA DS protocol
- Client-side implementation of OMA DM protocol

D.3.1 DM reception behaviour

OMA DM provides continuous configuration management for devices and various applications. The MEM Client application configuration is managed using OMA DM configuration messages. The DM reception behaviour means receiving OMA DM notifications to update the MEM Client application configuration with the newly received settings.

D.3.2 SAS reception behaviour

OMA DS provides server alerted sync (SAS) for Out-band Notifications. The SAS reception behaviour means receiving SAS notifications to inform the MEM Client about server-side events and changes.

D.3.3 MEM Email application sub-component

The MEM email application sub-component interacts with the email storage sub-component. It can request the OMA DS client sub-component to query the MEM Server for new messages, deliver emails that are pending submission, retrieve more content for “partially-stored” items, etc.

Depending on the MEM Client implementation this sub-component may also contain the user interface that allows users to view/manage the received messages, reply, forward, compose new and carry out other email activities as defined in [MEM-RD].

D.3.4 Email storage sub-component

The OMA MEM Client email storage holds email data items. It contains such data as received items, draft messages being composed, outbound messages that are pending delivery, etc.

D.3.5 OMA DS client sub-component

This is the client-side implementation of OMA DS layer. It is responsible for communications and data interchange with the corresponding component on the MEM Server.

D.4 OMA MEM Server component

The OMA MEM Server maintains user account information, allows installing, provisioning and managing client configuration and performs other activities are defined in [MEM-RD].

D.4.1 OMA DS Server sub-component

This is the server-side implementation of OMA DS layer. It is responsible for communications and data interchange with the corresponding component on the MEM Client.

D.4.2 MEM Connector sub-component

The MEM connector provides a level of abstraction between the OMA DS Server sub-component and any email server implementations. It translates the abstract OMA DS data item operations (such as “delete an item”) into email server API or protocol-specific calls (such as “initiate the message recall”).