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**LEMONADE Architecture - Supporting OMA Mobile Email (MEM) using Internet Mail**  
**draft-ietf-lemonade-architecture-02.txt**

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**Abstract**

This document specifies the architecture for mobile email, as described by the OMA, using Internet Mail protocols. This architecture is the basis of the work of the LEMONADE WG and is a guideline for the LEMONADE Profile.

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## 1. Introduction

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This document describes the architecture of OMA mobile email (MEM) using Internet Mail protocols defined by the IETF. The LEMONADE work group has enhanced many of these protocols for use in the mobile environment and are summarized in the [LEMONADE profile \(Maes, S. and A. Melnikov, "Internet Email to Support Diverse Service Environments \(Lemonade\) Profile," June 2006.\)](#) [PROFILE] and its revision [LEMONADE profile bis \(Cridland, D., Melnikov, A., and S. Maes, "The Lemonade Profile," February 2008.\)](#) [PROFILE-bis]. This document shows how the [OMA MEM Requirement document \(Open Mobile Alliance, "Mobile Email Requirements Document," Oct 2005.\)](#) [MEM-req], [OMA MEM Architecture \(Open Mobile Alliance, "Mobile Email Architecture Document," June 2007.\)](#) [MEM-arch], and [OMA MEM Technical Specification \(Open Mobile Alliance, "Mobile Email Technical Specification," Oct 2007.\)](#) [MEM-ts] relate to the work of LEMONADE.

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## 2. OMA Mobile Email (MEM)

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The OMA Mobile Email (MEM) sub-working group has spent some time studying the requirements and architecture of mobile email. IETF LEMONADE has been liaising with them and has based much of our Internet Mail enhancements based on their input. This section summarizes the output of the OMA.

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## 2.1. OMA MEM Requirements

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The OMA MEM activity collected a set of use cases and derived requirements for a mobile email enabler (MEM). The [OMA MEM Requirements \(Open Mobile Alliance, "Mobile Email Requirements Document," Oct 2005.\)](#) [MEM-req] summarizes this work. Some requirements relates to email protocols, some involve other OMA technologies outside the scope of IETF and some relate to implementations and normative interoperability statements for clients and servers.

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## 2.2. OMA MEM Architecture

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This section introduces the OMA MEM Architecture.

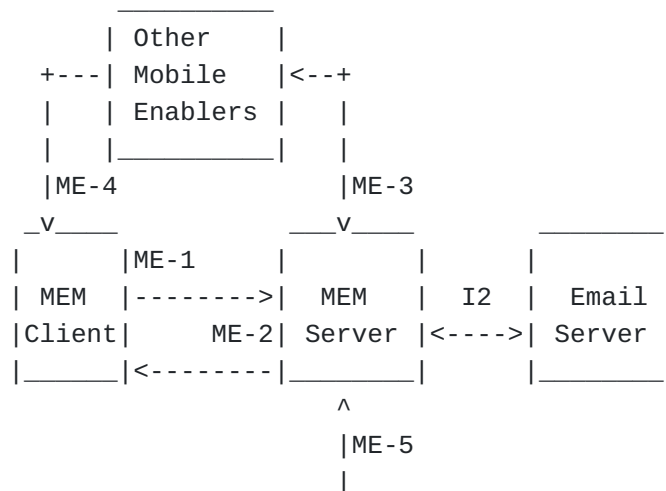
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### 2.2.1. OMA MEM logical Architecture

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The OMA MEM activity has derived a logical architecture from the requirements and use cases described in [\[MEM-req\] \(Open Mobile Alliance, "Mobile Email Requirements Document," Oct 2005.\)](#). A simplification for illustrative purposes is shown in [Figure 1 \(Basic OMA MEM logical architecture\)](#), where arrows indicate content flows.

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**Figure 1: Basic OMA MEM logical architecture**

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[Figure 1 \(Basic OMA MEM logical architecture\)](#) identifies the following elements:

- \*The MEM client that implements the client-side functionality of the OMA Mobile Email Enabler. It is also responsible for providing the mobile email user experience and interface to the user and storing the email and data to be sent to the MEM server when not connected.
- \*The MEM server that implements the server-side functionality of the OMA Mobile Email Enabler (MEM).
- \*The MEM protocol between the MEM Client and MEM Server. It is responsible for all the in-band data exchanges that take place between the MEM client and server in order to update the MEM client with email server changes, the email server with changes in the MEM client and to send new email from the email server.
- \*Other OMA enablers are needed to directly support the mobile email enabler. They are out of scope of IETF but they may include support for:
  - Client provisioning and management for over the air installation of the MEM client on the device, provisioning of its settings and revocation, and
  - Messaging enablers for out-of-band notification, where out-of-band notifications that are server to client event exchanges not transported by the MEM protocol but via other channels.

OMA identifies different interfaces:

- \*ME-1: MEM client interface to interact via the MEM protocol with the MEM server
- \*ME-2: Corresponding interface of the MEM server
- \*ME-3: Out-of-band MEM server interfaces, for example to support generation of server to client notifications.
- \*ME-4: Out-of-band MEM client interfaces (e.g. to receive server to client notifications).
- \*ME-5: Interface for management of MEM enabler server settings, user preferences, and filters, globally and per account.

The MEM server enables an email server. In a particular implementation, the email server may be packaged with (internal to it) the MEM server or be a separate component. In such cases, interfaces to the email

server are out of scope of the OMA MEM specifications. In the present document, we focus on the case where the backend consists of IETF IMAP and Submit servers. However, we also discuss the relationship to other cases. The I2 interface is an OMA notation to designate protocol / interfaces that are not specified by the MEM enabler but may be standardized elsewhere.

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### 2.2.2. OMA MEM Deployment Issues

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The [OMA MEM Architecture document \(Open Mobile Alliance, "Mobile Email Architecture Document," June 2007.\)](#) [MEM-arch] further identifies deployment models.

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#### 2.2.2.1. OMA MEM proxy

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The [OMA MEM Architecture document \(Open Mobile Alliance, "Mobile Email Architecture Document," June 2007.\)](#) [MEM-arch] identifies OMA MEM server proxies as server components that may be deployed ahead of firewalls to facilitate firewall traversal.

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#### 2.2.2.2. OMA MEM deployment cases

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OMA MEM identifies that each component (MEM client, MEM servers, other enablers, and the email server) may be deployed in different domains, possibly separated by firewalls and other network intermediaries. MEM proxies may be involved in front of firewall that protects the MEM server domain.

OMA MEM targets support of configurations where:

- \*All components are within a same domain, such as in a mobile operator
- \*MEM client and other enablers are in the mobile operator domain, there is a MEM proxy, and the MEM server and email server are in the domain of the email service provider
- \*MEM client and other enablers as well as a MEM proxy are in the mobile operator domain, MEM server and email server are in the domain of the email service provider
- \*MEM client and other enablers are in the mobile operator domain, a MEM proxy is in a third party service provider domain and MEM

server and email server are in the domain of the email service provider

\*MEM client, other enabler and MEM server are in the mobile operator domain and email server is in the domain of the email service provider

\*MEM client and other enablers are in the mobile operator domain, MEM server is in a third party service provider domain and the email server is in the domain of the email service provider

The e-mail service provider can be either a third-party service provider, a network service provider, or an enterprise e-mail service.

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## 2.3. OMA MEM Technical Specification

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The OMA MEM activity will conclude with a specification for a mobile email enabler (MEM). The ongoing work is in [OMA MEM Technical Specification \(Open Mobile Alliance, "Mobile Email Technical Specification," Oct 2007.\)](#) [MEM-ts]. LEMONADE is a basis for the mechanism. However, some additional details that are outside the scope of IETF will also be included.

OMA provides ways to perform provisioning via OMA client provisioning and device management. Other provisioning specifications are available (e.g., SMS based).

OMA provides enablers to support out-of-band notification mechanisms, as well as filter specifications (such as XDM), remote device deactivation, and other, non-Internet activities.

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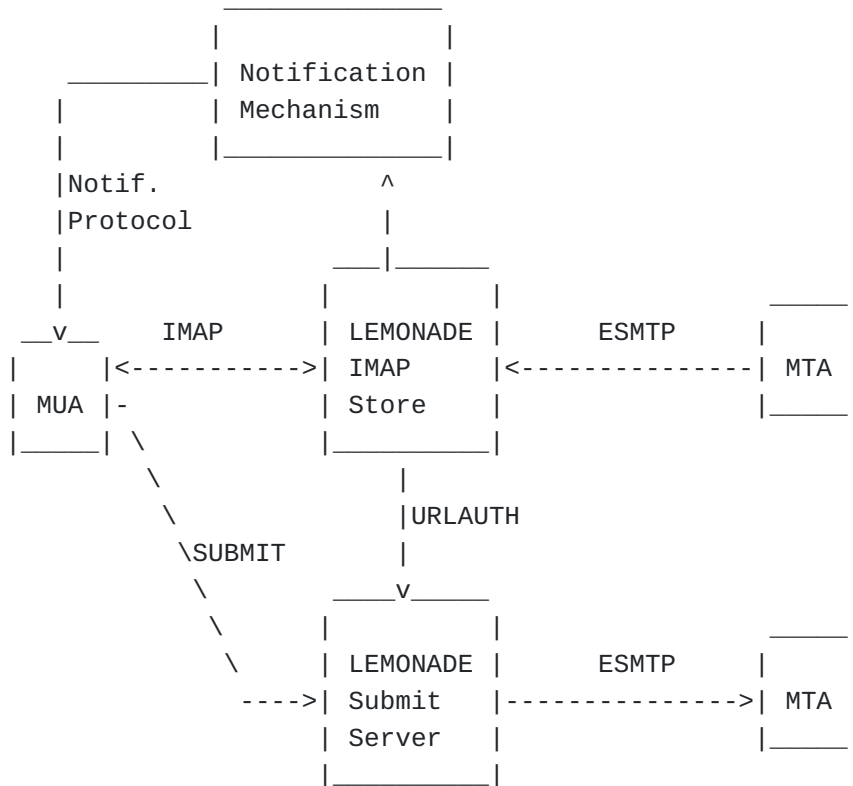
## 3. IETF LEMONADE Architecture

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This section introduces the LEMONADE Architecture.

The IETF LEMONADE activity has derived a [LEMONADE profile \(Cridland, D., Melnikov, A., and S. Maes, "The Lemonade Profile," February 2008.\)](#) [PROFILE-bis] with the logical architecture represented in [Figure 2 \(LEMONADE logical architecture\)](#), where arrows indicate content flows.

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**Figure 2: LEMONADE logical architecture**

The [LEMONADE profile](#) (Maes, S. and A. Melnikov, "Internet Email to Support Diverse Service Environments (Lemonade) Profile," June 2006.) [PROFILE] assumes:

- \*[IMAP protocol](#) (Crispin, M., "INTERNET MESSAGE ACCESS PROTOCOL - VERSION 4rev1," March 2003.) [RFC3501] including [LEMONADE profile extensions](#) (Maes, S. and A. Melnikov, "Internet Email to Support Diverse Service Environments (Lemonade) Profile," June 2006.) [PROFILE]

- \*[SUBMIT protocol](#) (Gellens, R. and J. Klensin, "Message Submission for Mail," April 2006.) [RFC4409], including LEMONADE profile extensions

- \*LEMONADE profile compliant IMAP store connected to MTA (Mail Transfer Agent) via [ESMTP](#) (Gwinn, R., "Simple Network Paging Protocol - Version 3 -Two-Way Enhanced," October 1995.) [RFC1861]

- \*LEMONADE profile compliant Submit server connected to MTA via ESMTP

\*Lemonade profile message store / submit server protocols (URLAUTH, BURL, CATENATE) (see [lemonade Profile \(Maes, S. and A. Melnikov, "Internet Email to Support Diverse Service Environments \(Lemonade\) Profile," June 2006.\)](#) [PROFILE]).

\*Out-of-band server to client notifications relying on external notification mechanisms (and notification protocols) that may be out of scope of the LEMONADE profile.

\*A LEMONADE aware MUA (Mail User Agent). While use of out-of-band notification is described in the LEMONADE profile, support for the underlying notifications mechanisms/protocols is out of scope of the LEMONADE specifications.

Further details on the IETF email protocol stack and architecture can be found in [\[MAIL\] \(Crocker, D., "Internet Mail Architecture," February 2008.\)](#)

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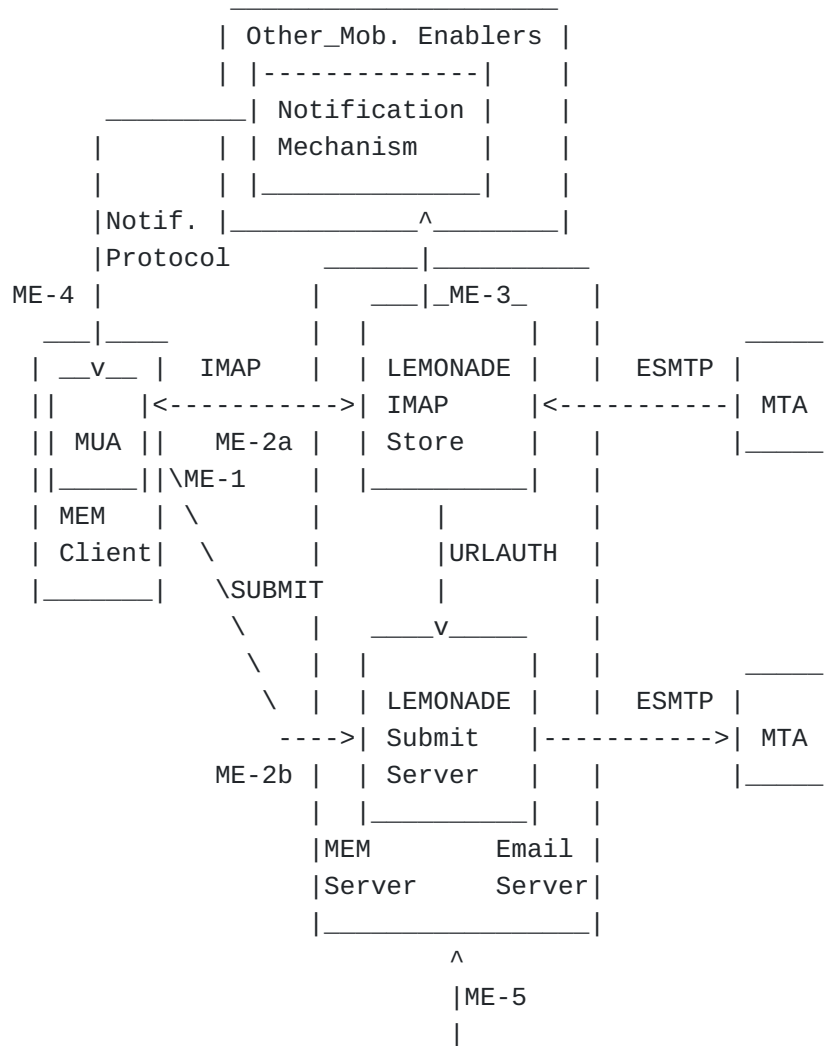
### 3.1. Relationship between the OMA MEM and LEMONADE logical architectures

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[Figure 3 \(Mapping of LEMONADE logical architecture onto the OMA MEM logical architecture\)](#) illustrates the mapping of the IETF LEMONADE logical architecture on the OMA MEM logical architecture.

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**Figure 3: Mapping of LEMONADE logical architecture onto the OMA MEM logical architecture**

As described in [Section 3 \(IETF LEMONADE Architecture\)](#), the LEMONADE profile assumes LEMONADE profile compliant IMAP stores and Submit servers. Because the LEMONADE profile extends the IMAP store and the submit server, the mobile enablement of email provided by the LEMONADE profile is directly provided in these servers. Mapping to the OMA MEM logical architecture, for the case considered and specified by the LEMONADE profile, we logically combine the MEM server and email server. However, in lemonade we split them logically into a distinct LEMONADE message store and a LEMONADE submit server. ME-2 consists of two interfaces. ME-2a is IMAP extended according to the LEMONADE profile. ME-2b is SUBMIT extended according to the LEMONADE profile. The MUA is part of the MEM client.

The external notifications mechanism is part of OMA enablers specified by the OMA.

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### **3.2. LEMONADE realization of OMA MEM with non-LEMONADE compliant servers**

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The OMA MEM activity is not limited to enabling Lemonade compliant servers. It explicitly identifies the need to support other back-ends. This is, of course, outside the scope of the IETF Lemonade activity.

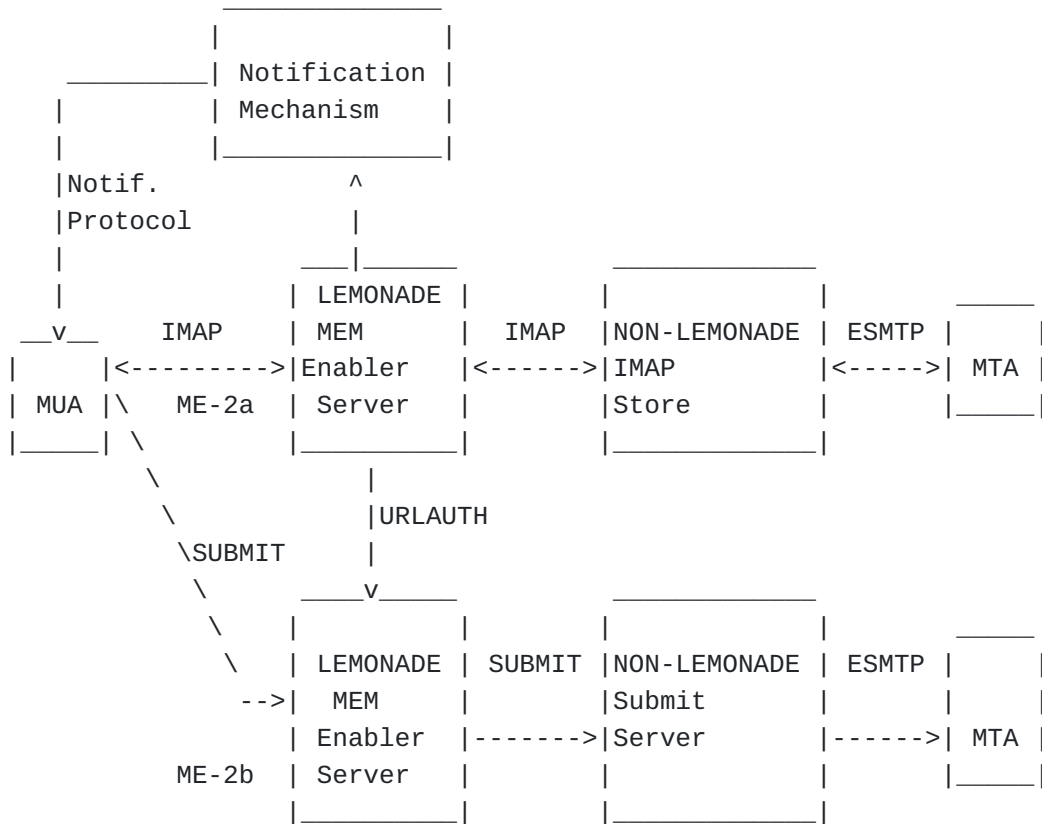
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#### **3.2.1. LEMONADE realization of OMA MEM with non-LEMONADE IMAP servers**

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[Figure 4 \(Architecture to support non-LEMONADE IMAP servers with a LEMONADE realization of an OMA MEM enabler\)](#) illustrates the case of IMAP servers that are not LEMONADE compliant. In such case, the I2 interface between the MEM server components and the IMAP store and submit server are IMAP and SUBMIT without Lemonade extensions.

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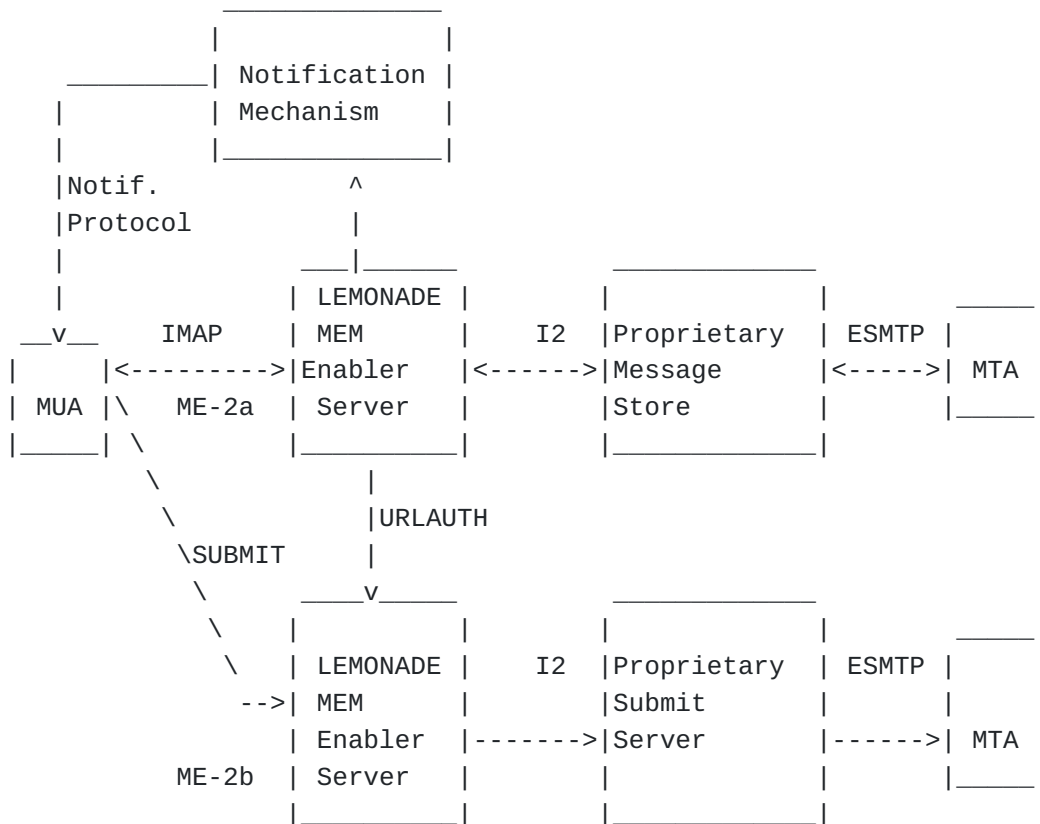


**Figure 4: Architecture to support non-LEMONADE IMAP servers with a LEMONADE realization of an OMA MEM enabler**

### 3.2.2. LEMONADE realization of OMA MEM with non-IMAP servers

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[Figure 5 \(Architecture to support non-IMAP servers with a LEMONADE realization of OMA MEM enabler.\)](#) illustrates the cases where the message store and submit servers are not IMAP store or submit servers. They may be POP3 servers or other proprietary message stores.



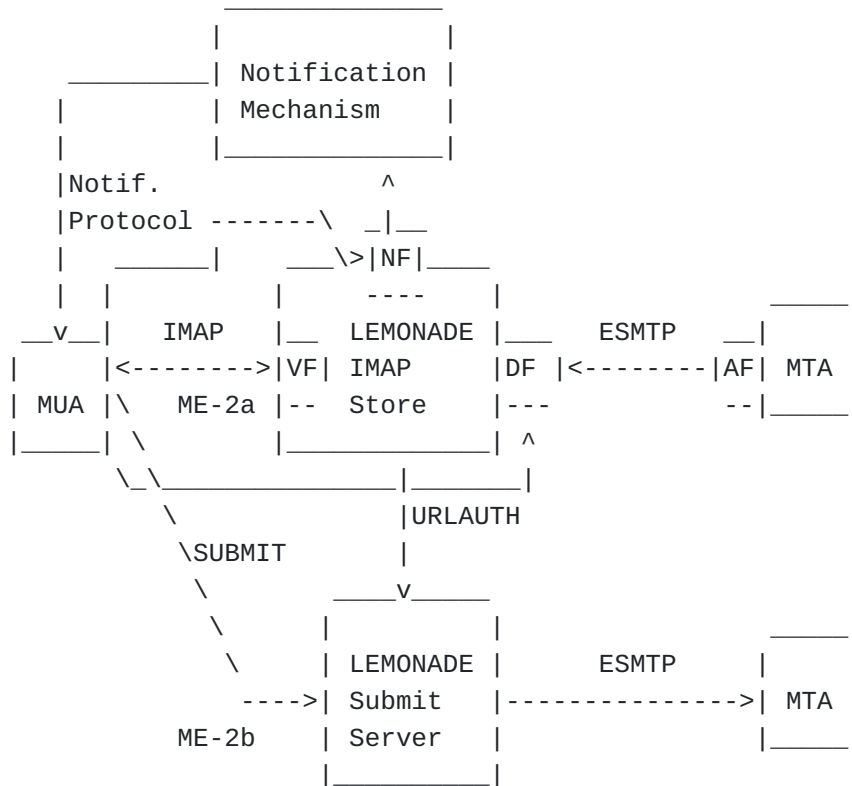
**Figure 5: Architecture to support non-IMAP servers with a LEMONADE realization of OMA MEM enabler.**

I2 designates proprietary adapters to the back-ends.

#### 4. Filters and server to client notifications and LEMONADE

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OMA MEM [RD](#) (Open Mobile Alliance, "Mobile Email Requirements Document," Oct 2005.) [MEM-req] and [AD](#) (Open Mobile Alliance, "Mobile Email Architecture Document," June 2007.) [MEM-arch] emphasize the need to provide mechanisms for server to client notifications of email events and filtering. [Figure 6](#) (Filtering mechanism defined in LEMONADE architecture) illustrates how notification and filtering works in the LEMONADE profile (Maes, S. and A. Melnikov, "Internet Email to Support Diverse Service Environments (Lemonade) Profile," June 2006.) [PROFILE].



**Figure 6: Filtering mechanism defined in LEMONADE architecture**

In [Figure 6 \(Filtering mechanism defined in LEMONADE architecture\)](#), we define four categories of filters:

- \*AF: Administrative Filters - The e-mail service provider usually sets administrative filters. The user typically does not configure AF. AF applies policies covering content filtering, virus protection, spam filtering, etc.
- \*DF: Deposit Filters - Filters that are executed on deposit of new emails. They can be defined as [SIEVE filters \(Guenther, P. and T. Showalter, "Seive: An Email Filtering Language," January 2008.\) \[SIEVE\]](#). They can include vacation notices.
- \*VF: View Filters - Filters that define which emails are visible to the MUA. View filters can be performed via IMAP using the facilities described in [\[NOTIFICATIONS\] \(Gellens, R. and S. Maes, "Lemonade Notifications Architecture," April 2008.\)](#).
- \*NF: Notification Filters - Filters that define for what email server event an out-of-band notification is sent to the client,

as described in [\[NOTIFICATIONS\] \(Gellens, R. and S. Maes, "Lemonade Notifications Architecture," April 2008.\)](#).

The MUA can manage the NF and DF filters using the SIEVE management protocol.

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## 5. Security Considerations

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We note there are security risks associated with:

- \*Out-of-band notifications
- \*Server configuration by client
- \*Client configuration by server
- \*Presence of MEM proxy servers
- \*Presence of MEM servers as intermediaries
- \*Measures to address the need to traverse firewalls

We refer the reader to the relevant Internet Mail, IMAP, SUBMIT, and Lemonade documents for how we address these issues.

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## 6. IANA considerations

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None.

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## 7. Acknowledgements

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The authors acknowledge and appreciate the work and comments of the IETF LEMONADE working group and the OMA MEM working group. We extracted the contents of this document from sections of draft-ietf-lemonade-profile-bis-05.txt by Stephane Maes, Alexey Melnikov and Dave Cridland, as well as sections of draft-ietf-lemonade-notifications-04.txt by Stephane Maes and Ray Cromwell.

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## 8. Informative References

[TOC](#)

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[MEM-ts]	Open Mobile Alliance, " <a href="#">Mobile Email Technical Specification</a> ," OMA (Work in Progress), <a href="http://www.openmobilealliance.org/">http://www.openmobilealliance.org/</a> , Oct 2007.
[PROFILE]	Maes, S. and A. Melnikov, " <a href="#">Internet Email to Support Diverse Service Environments (Lemonade) Profile</a> ," RFC 4550, June 2006 ( <a href="#">TXT</a> ).
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[RFC1861]	<a href="#">Gwinn, R.</a> , " <a href="#">Simple Network Paging Protocol - Version 3 -Two-Way Enhanced</a> ," RFC 1861, October 1995 ( <a href="#">TXT</a> ).
[RFC4409]	Gellens, R. and J. Klensin, " <a href="#">Message Submission for Mail</a> ," RFC 4409, April 2006 ( <a href="#">TXT</a> ).
[SIEVE]	Guenther, P. and <a href="#">T. Showalter</a> , " <a href="#">Seive: An Email Filtering Language</a> ," RFC 5528, January 2008.
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[MAIL]	Crocker, D., " <a href="#">Internet Mail Architecture</a> ," draft-crocker-email-arch-10 (work in progress), February 2008 ( <a href="#">TXT</a> ).

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