DM List of supported Management Object (ListMO)
Approved Version 1.0 – 12 Feb 2013

Open Mobile Alliance
OMA-ER-ListMO-V1_0-20130212-A
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1. Scope

To enhance the adoption of OMA DM Management Objects and facilitate their management, this enabler proposes to define a standardized Management Object called List of supported Management Objects (ListMO) that lists the Management Objects supported by the OMA DM Client resident on the device and exposed by the device. It would allow a Device Management Server to easily retrieve the list of the supported MOs and specific details. Management Authorities can use this information for various management operations, for example provisioning services to capable devices through creating or updating DM Tree based on MO information.
2. References

2.1 Normative References

[ISO8601]  Data elements and interchange formats -- Information interchange -- Representation of dates and times
URL: http://www.iso.org/

[OMA-DM]  OMA Device Management, Version 1.2,
Open Mobile Alliance™,
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

[SCRRULES]  “SCR Rules and Procedures”, Open Mobile Alliance™, OMA-ORG-SCR_Rules_and_Procedures,
URL: http://www.openmobilealliance.org/

2.2 Informative References

[DMDICT]  "OMA Device Management Dictionary", Draft Version 1.0, Open Mobile Alliance™,
URL: http://www.openmobilealliance.org/

[OMADICT]  “Dictionary for OMA Specifications”, Version 2.8, Open Mobile Alliance™,
OMA-ORG-Dictionary-V2_8,
URL: http://www.openmobilealliance.org/
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

Kindly consult [DMDICT] and [OMADICT] for all definitions used in this document.

3.3 Abbreviations

Kindly consult [DMDICT] and [OMADICT] for all abbreviations used in this document.
4. Introduction

4.1 Version 1.0

This enabler provides a list of supported Management Objects in the Device. This list consists of the Management Object ID with specific information such as the list of URIs of the Management Object instances.

In addition, ListMO provides information such as what entity can create nodes for the listed MOIDs and the date of the MO specification.
5. Requirements (Normative)

5.1 High-Level Functional Requirements

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>ListMO-HLF-1</td>
<td>The ListMO enabler SHALL list all the Management Objects supported by the DM Client</td>
<td>1.0</td>
</tr>
<tr>
<td>ListMO-HLF-2</td>
<td>The ListMO enabler SHALL list all of the instantiated Management Objects in the DM Client, subject to ACL rules</td>
<td>1.0</td>
</tr>
<tr>
<td>ListMO-HLF-3</td>
<td>The ListMO enabler SHALL ensure ListMO is up-to-date at all times</td>
<td>1.0</td>
</tr>
</tbody>
</table>
6. Architectural Model

6.1 Dependencies

The ListMO architecture diagram indicates dependencies on the OMA DM architecture.

6.1.1 OMA Device Management [OMA-DM]

The described architecture depends upon the OMA Device Management enabler. While nothing in this architecture presupposes a particular version of that enabler, for clarity and ease of reference, assume all references to [OMA-DM] are to the Approved OMA Device Management v1.2 Enabler Release unless otherwise specified.

6.2 Architectural Diagram

![ListMO Architecture Diagram]

Figure 1: ListMO Architecture

6.3 Functional Components and Interfaces/reference points definition

6.3.1 Management Object

6.3.1.1 List of supported Management Object

Standardized interface to a device’s list of supported Management Objects Management Object. Exposed through the {DM Client} for authorized access by {Management Authorities} utilizing {DM Servers} communicating over {DM-1} using the OMA Device Management Protocol [OMA-DM].
6.3.2 Protocol Endpoints

6.3.2.1 DM Client
The DM Client is the abstract software component that conforms to the requirements for DM Clients specified in the OMA Device Management Enabler.

6.3.2.2 DM Server
The DM Server is the abstract software component that conforms to the requirements for DM Servers specified in the OMA Device Management Enabler.

6.3.3 Interfaces

6.3.3.1 DM-1 Device Management Client-Server Protocol
This provides an interface over which DM Servers may send device management commands to DM Clients and DM Clients may return status to DM Servers. This is an interface that is bearer neutral and offers many standardized bindings including HTTP and HTTPS.

6.3.3.2 DM-5 DM Exposes Management Objects
The MO schemas are exposed by the {DM Client} through its device management tree.

6.3.3.3 DM-Func DM Functions
The {Standard Management Objects} represent interfaces to the Device’s {DM Client} configuration and the Device's DM-related information which may be targeted by a {Device Management Authority} to perform Device Management Functions. The functions available depend upon the DM Standard Object specifications (e.g. Get, Replace, Add, Delete, Atomic, and Sequence), the access rights assigned to specific parameters for a given Device Management Authority, and on the specific device implementation.

6.3.3.4 DMA-DMS Interface
The interfaces between a Device Management Authority’s line-of-business systems and a Device Management Server are out of scope. For purposes of illustration, this interface allows the Device Management Authority to submit device management requests to the DM Server and to be apprised of results and device-generated alerts received by the server from the DM Client. For purposes of this reference architecture description, readers should assume that an implementation-specific interface to the DM Server is used by the Device Management Authority to submit DM commands and analyze results returned by the DM Client.

6.4 Flows

The List of supported Management Objects Management Object described in this architecture document is schematic in nature and does not imply any particular protocol or data flow. The OMA Device Management Enabler [OMA-DM] specifies the protocol and data flows that are expected for client-server communication. These object schemas are utilized by and incorporated into the normal flow descriptions in that enabler and readers are referred to the OMA Device Management Enabler for further understanding.
7. ListMO Management Object

The ListMO Management Object is at the root of the DM Tree.

**Protocol Compatibility:** This object is compatible with OMA Device Management protocol specifications, version 1.2 and above.

Only the ListMO Client MUST update the ListMO data. The ListMO Server MUST only send Get command to the ListMO Client. The ListMO data MUST always be up-to-date.

7.1 Tree Structure

ListMO tree has a well-defined structure, with designated Ext nodes to allow non-standard extension nodes.

7.2 Figure of the Management Object (Informative)

![Figure 2: ListMO Management Object](image)

7.3 List of supported Management Objects Parameters

List of supported Management Objects Management Object consists of the following parameters:

<table>
<thead>
<tr>
<th>ListMO</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
</tr>
<tr>
<td>Required</td>
</tr>
</tbody>
</table>

This interior node groups together the parameters of a List of supported Management Objects Management Object. This node MUST be located at the root of the DM Tree.

The type of this node MUST be the ListMO Management Object ID “urn:oma:mo:oma-listmo:1.0”.

<table>
<thead>
<tr>
<th>ListMO/&lt;x&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Status</strong></td>
</tr>
<tr>
<td>Required</td>
</tr>
</tbody>
</table>

This placeholder node groups together the parameters of one supported Management Object.
### ListMO/<x>/MOID

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>One</td>
<td>chr</td>
<td>Get, No Replace, No Add, No Delete</td>
</tr>
</tbody>
</table>

This value of leaf node MUST contain the Management Object ID of the listed Management Object.

### ListMO/<x>/Instances

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>One</td>
<td>node</td>
<td>Get, No Replace, No Add, No Delete</td>
</tr>
</tbody>
</table>

This node holds all the instances of a specific MOID that the DM Server has Get access to.

### ListMO/<x>/Instances/<x>

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>ZeroOrMore</td>
<td>chr</td>
<td>Get, No Replace, No Add, No Delete</td>
</tr>
</tbody>
</table>

The value of this leaf node specifies the Uniform Resource Identifier (URI) of the root of an instance of the MOID.

### ListMO/<x>/SubnodeCreator

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required</td>
<td>One</td>
<td>int</td>
<td>Get, No Replace, No Add, No Delete</td>
</tr>
</tbody>
</table>

This leaf node indicates how nodes for this MOID will be created on the DM Client. Valid values for this node are:

<table>
<thead>
<tr>
<th>Integer Value</th>
<th>Status</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Client</td>
<td>The DM Client will create any necessary nodes.</td>
</tr>
<tr>
<td>2</td>
<td>Server</td>
<td>The DM Server will create any necessary nodes.</td>
</tr>
<tr>
<td>3</td>
<td>Server And Client</td>
<td>A hybrid situation where the DM Server will create some nodes and the DM Client will create other nodes.</td>
</tr>
</tbody>
</table>

### ListMO/<x>/MODate

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional</td>
<td>One</td>
<td>chr</td>
<td>Get, No Replace, No Add, No Delete</td>
</tr>
</tbody>
</table>

This optional leaf node specifies the date of the MO specification. It is particularly useful for non-OMA specifications that did not update the version number in the MOID with subsequent publications (for example, 3GPP’s ANDSF MO has several different documents describing their MO with different structure and data but with the same MOID). The date MUST be encoded per the UTC based [ISO8601] basic format.
ListMO/<x>/Ext

<table>
<thead>
<tr>
<th>Status</th>
<th>Tree Occurrence</th>
<th>Format</th>
<th>Min. Access Types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optional</td>
<td>ZeroOrOne</td>
<td>node</td>
<td>Get</td>
</tr>
</tbody>
</table>

This optional interior node designates a branch of the MOID sub-tree into which platform or vendor extensions MAY be added, permanently or dynamically. Ext sub trees, such as this one, are included at various places in the ListMO Management Object to provide flexible points of extension for platform or implementation-specific parameters. However, vendor extensions MUST NOT be defined outside of this Ext sub-tree.
8. Release Information

8.1 Supporting File Document Listing

<table>
<thead>
<tr>
<th>Doc Ref</th>
<th>Permanent Document Reference</th>
<th>Description</th>
</tr>
</thead>
</table>

Table 1: Listing of Supporting Documents in ListMO V1.0 Release

8.2 OMNA Considerations

The OMNA registry needs to add and maintain the following in the MO registry:

<table>
<thead>
<tr>
<th>MO Identifier</th>
<th>Description</th>
<th>Owner</th>
<th>Version</th>
<th>MO DDF</th>
<th>MO Spec</th>
</tr>
</thead>
<tbody>
<tr>
<td>urn:oma:mo:oma-listmo:1.0</td>
<td>List of supported MOs</td>
<td>DM WG</td>
<td>1.0</td>
<td>ListMO-V1_0.ddf</td>
<td>OMA-ER-ListMO-V1_0-20111019-C</td>
</tr>
</tbody>
</table>
# Appendix A. Change History

## A.1 Approved Version History

<table>
<thead>
<tr>
<th>Reference</th>
<th>Date</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMA-ER-ListMO-V1_0-20130212-A</td>
<td>12 Feb 2013</td>
<td>Status changed to Approval by TP TP ref# OMA-TP-2013-0036-INP_ListMO_V1_0_ERP_for_Final_Approval</td>
</tr>
</tbody>
</table>
Appendix B. Use Cases (Informative)

B.1 List of supported Management Objects retrieval

A Device Management Server (DMS) wants to know what Management Objects are being managed/supported by the Device Management Client on the device. For example, a DMS might want to deploy a service that requires a MO. ListMO is the central placeholder to easily retrieve a list containing the device supported MO and associated MO details. The authorized DMS would simply get this new MO and thus retrieve the required information.

B.1.1 Short Description

The DMS retrieves the ListMO subtree. ListMO provides an up-to-date list of the DM Client’s supported Management Objects. The DM Client’s supported Management Objects are indexed by Management Object instances.

B.1.2 Market benefits

Thanks to ListMO, DM Servers can easily and efficiently identify what Management Objects are supported by the DM Client. The DMS can also find out what MO are instantiated.

B.2 Dynamic and automatic update of ListMO

More and more Management Objects are specified and can be dynamically created on a device’s DM Tree. The DM Tree used to be static and this acceleration of MO definition by multiple organizations will make the DM Tree more and more dynamic. In addition, multiple authorities can manage different instances of the same Management Object. It is the reason why ListMO must be dynamically and automatically updated.

B.2.1 Short Description

A new Management Object is installed on a device (either through new firmware or new application). The support of this MO will be automatically/dynamically added to ListMO. Thus it allows DM Management Authorities (i.e. DM Servers) to easily and efficiently obtain this information if required. It would be the same if a new instance of an existing MO is created.

B.2.2 Market benefits

Thanks to ListMO, DM Servers can easily and efficiently identify what Management Objects are supported by the DM Client as ListMO is up-to-date at all times.
Appendix C. Static Conformance Requirements (Normative)

The notation used in this appendix is specified in [SCRRULES].

C.1 ERDEF for ListMO - Client Requirements

This section is normative.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature / Application</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMA-ERDEF-ListMO-C-001-M</td>
<td>DM Client</td>
<td>ListMO-HLF-1</td>
</tr>
<tr>
<td>OMA-ERDEF-ListMO-C-003-M</td>
<td>DM Client</td>
<td>ListMO-HLF-3</td>
</tr>
</tbody>
</table>

Table 2: ERDEF for ListMO Client-side Requirements

C.2 ERDEF for ListMO - Server Requirements

This section is normative.

<table>
<thead>
<tr>
<th>Item</th>
<th>Feature / Application</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>OMA-ERDEF-ListMO-S-001-M</td>
<td>DM Server</td>
<td>Support for the List of Supported Management Objects (ListMO)</td>
</tr>
</tbody>
</table>

Table 3: ERDEF for ListMO Server-side Requirements

C.3 SCR for ListMO Tree Structure

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ListMO-T-001-M</td>
<td>Use of appropriate management object identifier for the ListMO root node</td>
<td>Section 7.3</td>
<td></td>
</tr>
<tr>
<td>ListMO-T-002-M</td>
<td>Support for Required nodes</td>
<td>Section 7.3</td>
<td></td>
</tr>
<tr>
<td>ListMO-T-003-O</td>
<td>Support for Optional nodes</td>
<td>Section 7.3</td>
<td></td>
</tr>
</tbody>
</table>

C.4 SCR for DM Client

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ListMO-C-001-M</td>
<td>Support for an always up-to-date ListMO</td>
<td>Section 7.3</td>
<td></td>
</tr>
<tr>
<td>ListMO-C-002-M</td>
<td>Support listing all the DM Client supported MOs</td>
<td>Section 7.3</td>
<td></td>
</tr>
<tr>
<td>ListMO-C-003-M</td>
<td>Support listing all the instantiated MOs in the DM Client, subject to the ACL rules</td>
<td>Section 7.3</td>
<td></td>
</tr>
</tbody>
</table>

C.5 SCR for DM Server

<table>
<thead>
<tr>
<th>Item</th>
<th>Function</th>
<th>Reference</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>ListMO-S-001-M</td>
<td>Support for the List of</td>
<td>Section 7.3</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>Function</td>
<td>Reference</td>
<td>Requirement</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td></td>
<td>Supported Management Objects (ListMO)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>