Connectivity Management Objects Architecture

Approved Version 1.0 – 24 Oct 2008

Open Mobile Alliance

OMA-AD-ConnMO-V1_0-20081024-A

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1. Scope (Informative)

This document describes the use of Connectivity Management Objects in combination with the OMA Device Management Enabler to provide a Device Management Authority the facility to provision and maintain connectivity settings in a mobile terminal used for data applications to access network services over a variety of bearer types.

2. References

2.1 Normative References

[ConnMO-RD] "OMA Device Management—Connectivity Management Object Requirements," Open Mobile Alliance™, OMA-RD-DM_ConMO-V1_0, URL: http://www.openmobilealliance.org/

[DM-TND] "SyncML Device Management Tree and Description, Version 1.1.2," Open Mobile Alliance™, OMA-SyncML-DMStdObj-V1_1_2, URL: http://www.openmobilealliance.org/

[OMA-DM] *OMA Device Management, Version 1.1.2*, 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

2.2 Informative References

[ARCH-PRINC] *OMA Architecture Principles V1.2*, OMA-ArchitecturePrinciples-V1_2, Open Mobile Alliance™, 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

Device Description Framework	A markup language used to describe OMA DM object schema; may be used in a standardized specification to describe the characteristics of conformant implementations or published by a vendor to describe a particular device impelementation
Device Management Authority	Any legal entitity authorized, either directly or through delegation, to perform management operations on a terminal using the OMA Device Management protocol through a set of management objects.
Management Object	A schema for configuration settings that an OMA DM client exposes to OMA DM servers for management operations defined in the OMA DM Enabler [OMA-DM]

3.3 Abbreviations

DDF	Device Description Framework
DM	Device Management
DMA	Device Management Authority
DMS	Device Management Server
MO	Management Object
OMA	Open Mobile Alliance

4. Introduction (Informative)

Device management is the generic term used for technology that allows third parties to carry out the difficult procedures of configuring mobile devices on behalf of the end user (customer). Third parties would typically be wireless operators, service providers or corporate information management departments.

Through device management, an external party can remotely set parameters, conduct troubleshooting servicing of terminals, install or upgrade software. In broad terms, device management consists of three parts:

- Protocol and mechanism: The protocol used between a management server and a mobile device
- Data model: The data made available for remote manipulation, for example browser and mail settings
- Policy: The policy decides who can manipulate a particular parameter, or update a particular object in the device

In a wireless environment, the crucial element for device management protocol is the need to efficiently and effectively address the characteristics of mobile devices including low bandwidth and high latency and to provide for support of these management operations remotely, over-the-air.

The specifications in the Connectivity Management Object reference release address the second part of device management above, the data model. More particularly, this reference release addresses the management of wireless data connectivity by specifying a set of data management object schema that may be exposed by an OMA DM client and targeted by an OMA DM server.

The architecture of the management objects anticipates the needs of the market actors to differentiate their products through vendor-specific extensions while providing a core parameter set that can be relied upon in all terminals exposing this standardized interface.

The design of the architecture follows the OMA architecture principle [ARCH-PRINC] of Network Technology Independence by separating the bearer-neutral requirements from bearer-specific bindings. The described architecture also anticipates additional bearer and proxy types, as any are identified, without requiring a respecification of previously released documents. This preserves vendor and customer investment while supporting the scaling required by future innovations.

There are three parts to the object schema that provide break-points between more general and more specific parameters:

- A top level management object which is bearer-neutral;
- A set of bearer-specific parameters;
- A sub-tree for exposing vendor-specific parameters.

By composing the management objects in this way, it becomes possible for a device management authority to:

- Target generic requirements that span all implementations;
- Focus on bearer-specific idiosyncracies of a given networking environment;
- Activate terminal-specific behaviour by adjusting vendor-specific parameters.

In the sections that follow, we have attempted to explain the specific management object architecture as captured by the Connectivity Management Object specifications in this reference release, while keeping an eye on the best practices for all OMA DM management objects.

4.1 Planned Phases

This present reference release is intended as the complete release of the core connectivity management objects. It is however anticipated that the model used for these standardized objects may be used in other OMA enablers, specifications developed by other fora, and in proprietary implementations on both server and client. Specifically, it is anticipated that additional bearer-specific parameters may be standardized and released to augment those bearers covered by this reference release. It

should not be necessary to revise this reference release to describe additional bearers—the specifications have been structured in such a way that such additional bearers are anticipated and may be published separately.

Such separation of additional bearers is not necessary, this reference release may be republished in further release versions to include additional bearer-specific parameters. But separate publication of additional bearers may prove to be a useful release planning tool and may serve to reduce fragmentation in the market by requiring early implementers to anticipate new bearer types that are as yet unknown.

4.2 Security Considerations

The management objects defined in this reference release are dependent on the security mechanisms and protections provided by the DM enabler. No new security issues are introduced by these management objects. Readers are encouraged to review the DM enabler security specifications for more information regarding these mechanisms.

5. Architectural Model

5.1 Dependencies

OMA Device Management [OMA-DM]

The described architecture for managing connectivity parameters 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 V1.1.2 Enabler Release unless otherwise specified.

OMA DM Device Description Framework – [DM-TND]

This reference release utilizes the DDF (Device Description Framework) to describe management object schema. It further uses the descriptive methodology from the core OMA DM specifications for standardized objects. See [DM-TND] where further information on these methods and the DDF markup are required.

General Note on Referenced Versions:

As is the normal case for standardized specifications, the OMA DM specifications have undergone revision and have been republished in a later version than the one referenced here. Many editorial changes have been made in later releases to improve the clarity of the specifications. Readers are encouraged to refer to more recent releases to improve their understanding of the referenced material. The version-specific references listed here are of architectural significance only to define the baseline functions that are depended on for implementation.

5.2 Architectural Diagram

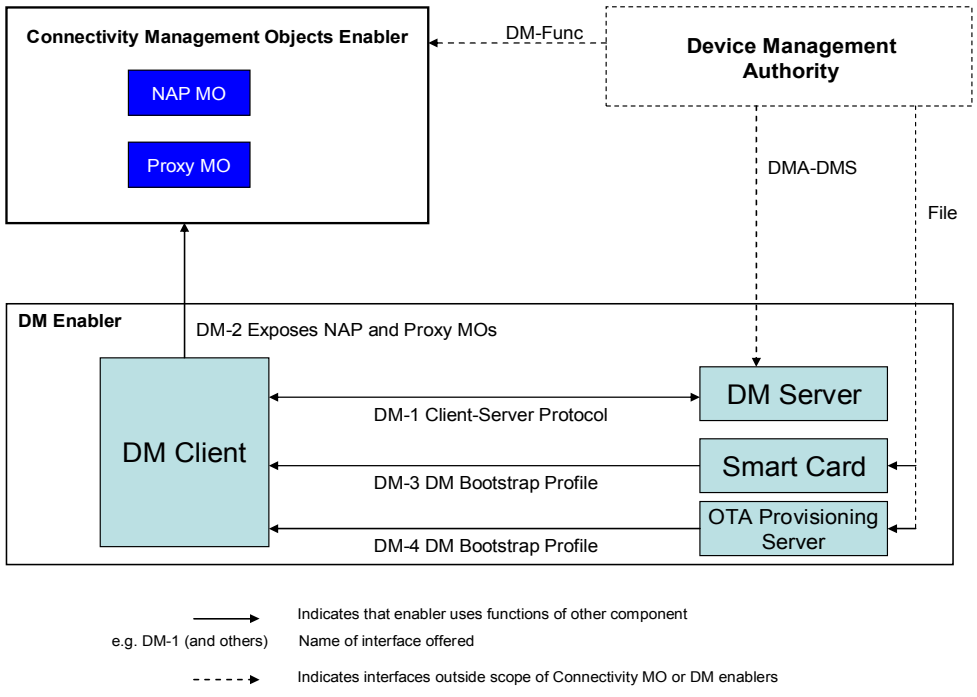

Figure 1: Device Management Component Architecture

5.3 Functional Components and Interfaces

5.3.1 Management Objects

5.3.1.1 NAP Management Object

Standardized interface to a device's Network Access Point configuration. 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].

5.3.1.2 Proxy Management Object

Standardized interface to a device's network Proxy configuration. 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].

5.3.2 Protocol Endpoints

5.3.2.1 DM Client

The DM Client is the abstract software component in a Device implementation that conforms to the OMA Device Management Enabler static conformance requirements specified for DM Clients. It servers as an end-point of the DM Client-Server Protocol defined in [OMA-DM].

5.3.2.2 DM Server

The DM Server is the abstract software component in a deployed Device Management infrastructure that conforms to the OMA Device Management Enabler static conformance requirements specified for DM Servers. It servers as an end-point of the DM Client-Server Protocol defined in [OMA-DM].

5.3.3 Interfaces

5.3.3.1 DM-1 Device Management Client-Server Protocol

This interface is defined in the OMA DM Enabler and is the subject of those specifications. It provides a formal interface over which Servers may send device management commands to Clients and Clients may return status and alerts to Servers. This is a layered interface that is bearer neutral and offers many standardized bindings including HTTP. This interface MAY be exposed over an airlink-based data bearer protocol (e.g. GPRS) to provide over-the-air device management capability.

5.3.3.2 DM-2 Connectivity Management Objects

The MO schema are exposed by the DM Client through its device management tree. The parameters exposed through the MO schema may be targeted by the DM Server through the Target LocURI element of the DM representation protocol in command messages.

5.3.3.3 DM-3 DM Bootstrap Profile

Connectivity MO may be targeted during bootstrapping by reading bootstrap commands directly from a file on the Smart Card (such as a (U)SIM, if the device is equipped with a smart card reader, such as a SIM slot). DM commands may be issued or complete objects may be provisioned using the TNDS serialization format. This is a one-way interface with no feedback from the DM Client.

5.3.3.4 DM-4 DM Bootstrap Profile

Connectivity MO may be targeted or provisioned directly from a provisioning server over-the-air, or through proprietary means such as during factory provisioning or removable media. DM commands may be provided using the DM Bootstrap Profile or complete objects may be provisioned using the TNDS serialization format by targeting the "Inbox". It is also

possible to combine the TNDS format with DM Add and Replace commands to target specific Mos. This is a one-way interface with no feedback from the DM Client.

5.3.3.5 DM-Func DM Functions

The NAP and Proxy Management Objects represent an interface to the Device's data connectivity configuration which may be targeted by a Device Management Authority to perform Device Management Functions. The functions available depend upon the DM 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. The formal definition of this interface is out of scope since it is provided by a vendor's DDF representation of the NAP and Proxy management objects for a particular model and version of device and in any vendor-specific documentation.

5.3.3.6 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.

5.4 Flows

The Connectivity Management Objects described in this architecture document are schematic in nature and do 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 schema 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.

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
OMA-AD-ConnMO-V1_0-20081024-A	24 Oct 2008	Approved by OMA Technical Plenary: Ref TP#: OMA-TP-2008-0405- INP_ConnMO_V1_0_RRP_for_Notification_and_Final_Approval