



Open Connection Manager API Architecture

Approved Version 1.0 – 26 Jan 2016

Open Mobile Alliance
OMA-AD-OpenCMAPI-V1_0-20160126-A

Use of this document is subject to all of the terms and conditions of the Use Agreement located at <http://www.openmobilealliance.org/UseAgreement.html>.

Unless this document is clearly designated as an approved specification, this document is a work in process, is not an approved Open Mobile Alliance™ specification, and is subject to revision or removal without notice.

You may use this document or any part of the document for internal or educational purposes only, provided you do not modify, edit or take out of context the information in this document in any manner. Information contained in this document may be used, at your sole risk, for any purposes. You may not use this document in any other manner without the prior written permission of the Open Mobile Alliance. The Open Mobile Alliance authorizes you to copy this document, provided that you retain all copyright and other proprietary notices contained in the original materials on any copies of the materials and that you comply strictly with these terms. This copyright permission does not constitute an endorsement of the products or services. The Open Mobile Alliance assumes no responsibility for errors or omissions in this document.

Each Open Mobile Alliance member has agreed to use reasonable endeavors to inform the Open Mobile Alliance in a timely manner of Essential IPR as it becomes aware that the Essential IPR is related to the prepared or published specification. However, the members do not have an obligation to conduct IPR searches. The declared Essential IPR is publicly available to members and non-members of the Open Mobile Alliance and may be found on the “OMA IPR Declarations” list at <http://www.openmobilealliance.org/ipr.html>. The Open Mobile Alliance has not conducted an independent IPR review of this document and the information contained herein, and makes no representations or warranties regarding third party IPR, including without limitation patents, copyrights or trade secret rights. This document may contain inventions for which you must obtain licenses from third parties before making, using or selling the inventions. Defined terms above are set forth in the schedule to the Open Mobile Alliance Application Form.

NO REPRESENTATIONS OR WARRANTIES (WHETHER EXPRESS OR IMPLIED) ARE MADE BY THE OPEN MOBILE ALLIANCE OR ANY OPEN MOBILE ALLIANCE MEMBER OR ITS AFFILIATES REGARDING ANY OF THE IPR'S REPRESENTED ON THE “OMA IPR DECLARATIONS” LIST, INCLUDING, BUT NOT LIMITED TO THE ACCURACY, COMPLETENESS, VALIDITY OR RELEVANCE OF THE INFORMATION OR WHETHER OR NOT SUCH RIGHTS ARE ESSENTIAL OR NON-ESSENTIAL.

THE OPEN MOBILE ALLIANCE IS NOT LIABLE FOR AND HEREBY DISCLAIMS ANY DIRECT, INDIRECT, PUNITIVE, SPECIAL, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OF DOCUMENTS AND THE INFORMATION CONTAINED IN THE DOCUMENTS.

© 2016 Open Mobile Alliance Ltd. All Rights Reserved.

Used with the permission of the Open Mobile Alliance Ltd. under the terms set forth above.

Contents

- 1. SCOPE (INFORMATIVE)4
- 2. REFERENCES5
 - 2.1 NORMATIVE REFERENCES.....5
 - 2.2 INFORMATIVE REFERENCES.....5
- 3. TERMINOLOGY AND CONVENTIONS6
 - 3.1 CONVENTIONS.....6
 - 3.2 DEFINITIONS.....6
 - 3.3 ABBREVIATIONS.....6
- 4. INTRODUCTION (INFORMATIVE).....7
 - 4.1 VERSION 1.07
- 5. ARCHITECTURAL MODEL.....8
 - 5.1 DEPENDENCIES.....8
 - 5.2 ARCHITECTURAL DIAGRAM8
 - 5.3 FUNCTIONAL COMPONENTS AND INTERFACES8
 - 5.3.1 OpenCMAPI Enabler Functional Components8
 - 5.3.2 Interfaces.....9
 - 5.4 SECURITY CONSIDERATIONS10
 - 5.5 CHARGING CONSIDERATIONS.....10
- APPENDIX A. CHANGE HISTORY (INFORMATIVE).....11
 - A.1 APPROVED VERSION HISTORY11
- APPENDIX B. FLOWS (INFORMATIVE)12
- APPENDIX C. DEPLOYMENT EXAMPLE (INFORMATIVE)13

Figures

- Figure 1: OpenCMAPI Architectural Diagram8
- Figure 2: OpenCMAPI Deployment Example13

1. Scope

(Informative)

This document provides the architecture for the OpenCMAPI Enabler. This architecture is based on the requirements as listed in the OpenCMAPI Requirement Document [OpenCMAPI-RD].

The objective of the OpenCMAPI Enabler is to define the OpenCMAPI Connection Management component and the interfaces exposed by this component to applications (CM applications or non CM applications) that rely on OpenCMAPI Enabler to work or to provide additional functionalities.

The OpenCMAPI Enabler architecture is designed to support the core functionalities related to connection management, in particular Cellular network connection management, WLAN management, PIN/PUK management, Information Status and call backs.

2. References

2.1 Normative References

- [OpenCMAPI-RD] “OpenCMAPI Requirements”, Open Mobile Alliance™, OMA-RD-OpenCMAPI-V1_0-20110630-D.doc, [URL:http://www.openmobilealliance.org/](http://www.openmobilealliance.org/)
- [OSE] “OMA Service Environment”, Open Mobile Alliance™, [URL:http://www.openmobilealliance.org/](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](http://www.ietf.org/rfc/rfc2119.txt)

2.2 Informative References

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

Asynchronous Interface Is an interface that allows transfer of information, i.e. requests and responses, between entities e.g. applications and OpenCM-API connection management component, without having to synchronize (e.g. with a controlling clock). The requested action may be started in a separate thread of execution and called party, in this case OpenCM-API connection management component, may respond to the caller usually immediately but anyway before the requested action is complete.

Synchronous Interface Is an interface which requires synchronization (e.g. with a controlling clock) and is dependent on the completion of the interaction. Called party, in this case OpenCM-API connection management component, will keep the caller waiting until the transaction is complete.

3.3 Abbreviations

API	Application Programming Interface
CM	Connection Manager
GNSS	Global Navigation Satellite System
OMA	Open Mobile Alliance
OpenCM-API	Open Connection Manager (CM) Application Programming Interface (API)
PIN	Personal Identification Number
PLMN	Public Land Mobile Network
PUK	Pin Unlocking Key
SIM	Subscriber Identity Module
SMS	Short Message Service
UICC	Universal Integrated Circuit card
WLAN	Wireless Local Area Network

4. Introduction (Informative)

This document defines the architecture of the OpenCMAPI Enabler based on the OpenCMAPI Requirement Document [OpenCMAPI-RD].

The focus of the OpenCMAPI v1.0 is the standardization of functional interfaces for access to connection management.

In this context, this Architecture Document defines functional component and interfaces related to the connection management aspects.

4.1 Version 1.0

This architecture document covers the requirements of OpenCMAPI 1.0 [OpenCMAPI-RD].

The document aims to cover architectural aspects related to the interfaces for the following areas:

- Security and concurrency control function , e.g. access control and authorization
- Cellular Network Connection Management,
- WLAN connection management,
- Statistics handling
- Information Status handling
- GNSS handling
- Power management
- SMS&USSD management
- PIN/PUK handling
- UICC Interaction
- Push Data service management,

5. Architectural Model

The OpenCMAPI architecture supports all function as specified in [OpenCMAPI-RD].

Following sections will describe OpenCMAPI architecture diagram, functional components and interfaces.

5.1 Dependencies

There are no dependencies.

5.2 Architectural Diagram

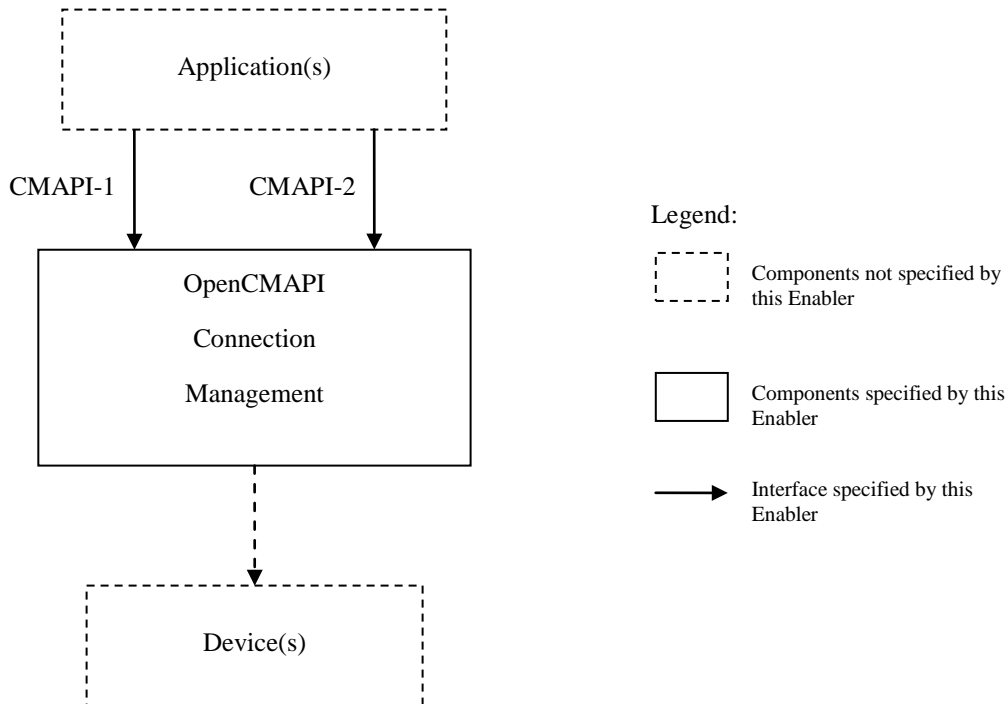


Figure 1: OpenCMAPI Architectural Diagram

5.3 Functional Components and Interfaces

5.3.1 OpenCMAPI Enabler Functional Components

5.3.1.1 OpenCMAPI Connection Management component

The OpenCMAPI Connection Management component supports the following functions:

- Security and concurrency control functions, e.g. access control and authorization
- Registration management for notifications (i.e. callbacks)
- Notifications (i.e. callbacks)
- Cellular Network Connection Management,
- WLAN connection management,

- Statistics handling
- Information Status handling
- GNSS handling
- Power management
- SMS&USSD management
- PIN/PUK handling
- UICC Interaction
- Push Data service management,

Furthermore, on a given host, only one implementation of the OpenCMAPI connection management component SHALL be running at a time. Therefore, all applications, using the OpenCMAPI connection management component, SHALL use and register with this unique implementation and all compliant devices SHALL be registered with this unique instance.

This component exposes the CMAPI-1 and CMAPI-2 interfaces.

5.3.1.2 Entities external to the OpenCMAPI enabler (Informative)

5.3.1.2.1 Application(s)

The application(s) use the functions exposed by the Open CMAPI.

Two types of applications will be able to use the OpenCMAPI enabler:

- The CM application with the capability to access to all functions provided by the OpenCMAPI enabler.
- The non-CM application is an external entity that has the capability to access to only a subset of functions provided by the OpenCMAPI enabler (information status and callback function).

5.3.1.2.2 Device(s)

The OpenCMAPI manages the network access connectivity through the device. The interface between the device and the OpenCMAPI Connection Management component is out of scope for the OpenCMAPI enabler and depends on what the device implementation provides (e.g. device driver calls, AT commands, messages).

When an application invokes an OpenCMAPI enabler function, the OpenCMAPI connection management component translates the function call into an operation on the device interface. The OpenCMAPI enabler facilitates the communication of information from the device to the application, such as success/failure codes, requested information, and asynchronous notifications.

It should be noted that the set of functions exposed by an implementation of the OpenCMAPI Connection Management component is subject to the capabilities of the device(s) being managed. For example, an implementation managing a device with only cellular connectivity and no WLAN and/or GNSS would support the OpenCMAPI APIs needed to manage the cellular connection, but would not support the APIs specific to WLAN and GNSS.

5.3.2 Interfaces

Applied to all interfaces stated below, all memory is caller allocated, the callee SHALL NOT modify any memory unless otherwise noted.

5.3.2.1 CMAPI-1

This interface is exposed by the OpenCMAPI Connection Management component and supports the following functions:

- Cellular Network Connection Management,
- WLAN connection management,

- Statistics handling,
- Information Status handling,
- GNSS handling,
- Power management,
- SMS&USSD management,
- PIN/PUK handling,
- UICC Interaction,
- Push Data service management
- Security and concurrency control function.

The CMAPI-1 interface is mainly a Synchronous Interface with maximum timeout and possibility of cancellation.

However, for long operations (typically more than 7 seconds) before the result is available, Asynchronous versions of the API functions are provided in addition to the Synchronous versions.

5.3.2.2 CMAPI-2

This interface is exposed by OpenCMAPI Connection Management component and supports the following:

- Registration to receive notifications (i.e. callbacks),
- Notifications (i.e. callbacks),
- Security and concurrency control function.

This interface is an Asynchronous Interface.

5.4 Security Considerations

The security considerations described in this section apply to any OpenCMAPI enabler implementation, and these considerations may result in different deployment models. Any particular security mechanism relevant to OpenCMAPI enabler is addressed in the [OpenCMAPI-TS].

Any deployment of OpenCMAPI enabler needs to ensure that all the applications requiring access to information provided via the specified API exposed by the OpenCMAPI connection management component are subject to the following security considerations:

- All applications should be authenticated and authorized
- OpenCMAPI implementation decides what level of access applications can have based on some policies, e.g. Service Provider policies.

5.5 Charging Considerations

Not applicable.

Appendix A. Change History

(Informative)

A.1 Approved Version History

Reference	Date	Description
OMA-AD-OpenCMAPI-V1_0-20160126-A	26 Jan 2016	Status changed to Approved by TP TP Ref # OMA-TP-2016-0009- INP_OpenCMAPI_V1_0_ERP_for_final_Approval

Appendix B. Flows (informative)

Flows can be found in [OpenCMAPI-TS].

Appendix C. Deployment Example (Informative)

The following diagram shows an example of a possible deployment of the OpenCMAPI.

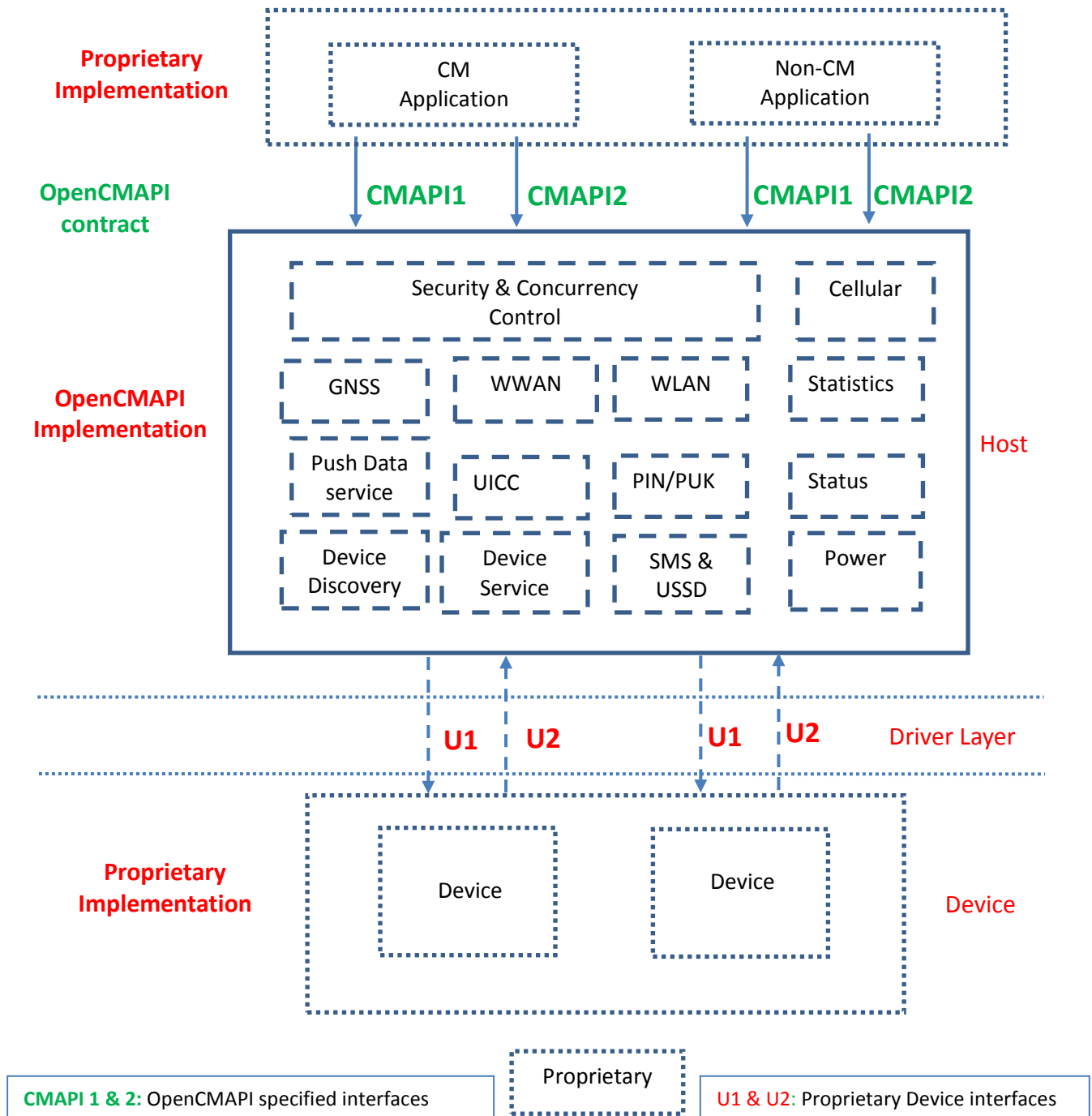


Figure 2: OpenCMAPI Deployment Example

In the diagram, the term “Device” could represent different types of devices (such as cellular, WLAN, USB modem, embedded modem ...) through which the CMAPI provides network connectivity to the “Host”.

The OpenCMAPI connection management component is the OpenCMAPI implementation on the device side.

The OpenCMAPI connection management component could be logically decomposed in two high level internal functions as follows:

- OpenCMAPI security and concurrency control function

The security and access control function controls the interaction between OpenCMAPI Functional layer and the application layer. It grants full access to connection manager applications and grants only (read only) access to a subset of functions to non-CM applications.

- OpenCMAPI sub functions

The OpenCMAPI sub functions include: cellular network connection management, WLAN management, PIN/PUK management, etc which can be derived from [OpenCMAPI-RD].