# Open Connection Manager API Architecture

Candidate Version 1.1 – 04 Jun 2013

**Open Mobile Alliance**

OMA-AD-OpenCMAPI-V1_1-20130604-C

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# 1. Scope (Informative)

This document provides the architecture for the OpenCMAPI 1.1 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 the 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.

# 2. References

## 2.1 Normative References


**[RFC2119]** "Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997, URL:http://www.ietf.org/rfc/rfc2119.txt

**[OpenCMAPI-RD]** "Open Connection Manager API Requirements, Version 1.1", Open Mobile Alliance™, OMA-RD-OpenCMAPI-V1_1
URL:http://www.openmobilealliance.org/

**[OpenCMAPI-TS]** "Open Connection Manager API Technical Specification, Version 1.1", Open Mobile Alliance™, OMA-TS-OpenCMAPI-V1_1
URL:http://www.openmobilealliance.org/


## 2.2 Informative References


**[OMADICT]** "Dictionary for OMA Specifications", Version 2.9, Open Mobile Alliance™, OMA-ORG-Dictionary-V2_9, 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

| | |
|---|---|
| **Asynchronous Interface** | Is an interface that allows transfer of information, i.e. requests and responses, between entities e.g. applications and OpenCMAPI 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 OpenCMAPI connection management component, may respond to the caller usually immediately but anyway before the requested action is complete. |
| **HotSpot 2.0** | Is a set of specifications from Wi-Fi Alliance. Key features include Wi-Fi roaming and support of seamless connectivity to Wi-Fi Networks. |
| **RESTful** | Is a Web Service design model that exploits the existing Web technologies and protocols, HTTP and XML to manage the Web content and application behaviour. |
| **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 OpenCMAPI 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 |
| D2D | Device to Device |
| GNSS | Global Navigation Satellite System |
| LTE | Long Term Evolution |
| OMA | Open Mobile Alliance |
| OpenCMAPI | Open Connection Manager (CM) Application Programming Interface (API) |
| P2P | Peer to Peer |
| PIN | Personal Identification Number |
| PLMN | Public Land Mobile Network |
| PUK | Pin Unlocking Key |
| SIM | Subscriber Identity Module |
| SMS | Short Message Service |
| TDD | Time Division Duplex |
| UICC | Universal Integrated Circuit card |
| USSD | Unstructured Supplementary Service Data |
| UTRAN | UMTS Terrestrial Access Network |

| | |
|---|---|
| WCDMA | Wideband Code Division Multiple Access |
| WLAN | Wireless Local Area Network |

# 4. Introduction (Informative)

This document defines the architecture of the OpenCMAPI 1.1 Enabler based on the OpenCMAPI Requirement Document [OpenCMAPI-RD].

The focus of the OpenCMAPI 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

Version 1.0 of this architecture document covers 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

## 4.2 Version 1.1

In addition to Version 1.0, Version 1.1 of this architecture document covers architectural aspects related to the interfaces for the following areas:

- WebAPI (HTTP protocol binding of the interfaces using the RESTful architectural style)
- Phone Book /Contacts management
- WLAN connection management according to Hotspot 2.0
- P2P Direct connection management (for both Wi-Fi and LTE)
- Cellular Network Connection Management of UTRAN Network type (WCDMA TDD)

However, this release of the AD does not address the requirements that were deferred for future release.

# 5. Architectural Model

The OpenCMAPI 1.1 architecture is based on the requirements defined in [OpenCMAPI-RD].

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

## 5.1 Dependencies

There are no dependencies.

## 5.2 Architectural Diagram

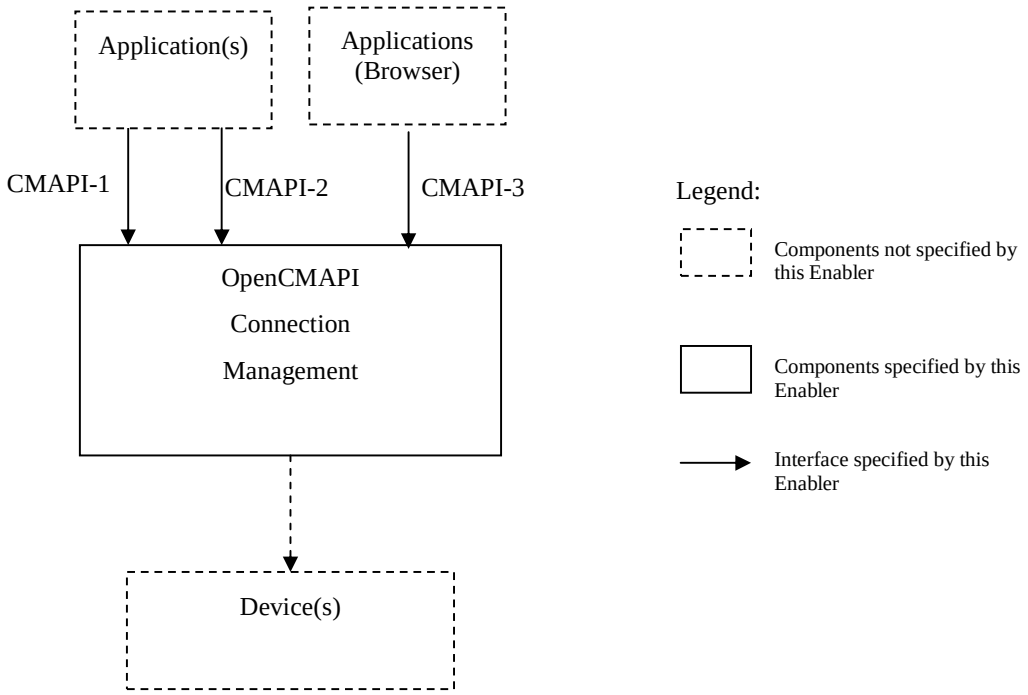


**Figure 1: OpenCMAPI Architectural Diagram**

## 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 (including UTRAN Network type (WCDMA TDD))
- WLAN connection management (including Hotspot 2.0),
- Statistics handling

- Information Status handling
- GNSS handling
- Power management
- SMS&USSD management
- PIN/PUK handling
- UICC Interaction
- Push Data service management
- Phone Book /Contacts management
- P2P Direct connection management (Wi-Fi and LTE)
- WebAPI functions

Furthermore, on a given host, only one instance 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 instance.

This component exposes the CMAPI-1, CMAPI-2 and CMAPI-3 interfaces.

#### 5.3.1.2 Entities external to the OpenCMAPI enabler (Informative)

##### 5.3.1.2.1 Application(s)

The application(s) use the functional representations defined by the OpenCMAPI enabler.

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

- The CM application with the capability to access to all APIs provided by the OpenCMAPI enabler.
- The non-CM application is an external entity that has the capability to access to only a subset of APIs provided by the OpenCMAPI enabler.

In the case of a browser application, it will use CMAPI-3 interface.

##### 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).

In general, 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 (including UTRAN Network type (WCDMA TDD)),
- WLAN connection management (including Hotspot 2.0),
- 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,
- Phone Book /Contacts management,
- P2P Direct connection management (Wi-Fi and LTE).

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.

#### 5.3.2.3 CMAPI-3

This interface is exposed by OpenCMAPI Connection Management component across a WebAPI (i.e. a HTTP protocol binding using the RESTful architectural style).

A subset of functions exposed through CMAPI-1 and CMAPI-2 are supported.

## 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 |
|---|---|---|
| n/a | n/a | No prior version –or- No previous version within OMA |

## A.2 Draft Version 1.1 History

| Document Identifier | Date | Sections | Description |
|---|---|---|---|
| Draft Versions<br>OMA-AD-OpenCMAPI-V1_1 | 22 Nov2012 | Baseline | Incorporates the baseline AD based on the AD version 1.0:<br>OMA-CD-OpenCMAPI-2012-0001R01-INP_Architecture_Baseline |
| | 22 Feb 2013 | All | Incorporated the following CRs:<br>OMA-CD-OpenCMAPI-2013-0025R01-CR_ADRR_Editorial<br>OMA-CD-OpenCMAPI-2013-0026R01-CR_ADRR_WebAPI<br>And updated according to resolution of ADRR comments closed on 20130221: A001, A002, A003, A004, A005, A006, A008, A009, A010, A011, A012, A013, A014, A015 |
| | 25 Mar 2013 | 5.6, App C | Incorporated:<br>OMA-CD-OpenCMAPI-2013-0030-CR_Resolution_of_ADRR_comment_A016<br>OMA-CD-OpenCMAPI-2013-0029R01-CR_AppendixC_CMAPI3 |
| | 25 Apr 2013 | 5 | Incorporated the following CR:<br>OMA-CD-OpenCMAPI-2013-0039-CR_Descriptions_for_additional_functional_compenents_in_CMAPI_1.1_AD |
| Candidate Version<br>OMA-AD-OpenCMAPI-V1_1 | 04 Jun 2013 | All | Status changed to Candidate by TP #:<br>OMA-TP-2013-0159-INP_OpenCMAPI_1_1_AD_for_Candidate_approval |
| | | | |

# Appendix B. Flows (informative)

Flows can be found in [OpenCMAPI-TS].

# Appendix C. Deployment Examples (Informative)

## C.1 Deployment example of OpenCMAPI

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

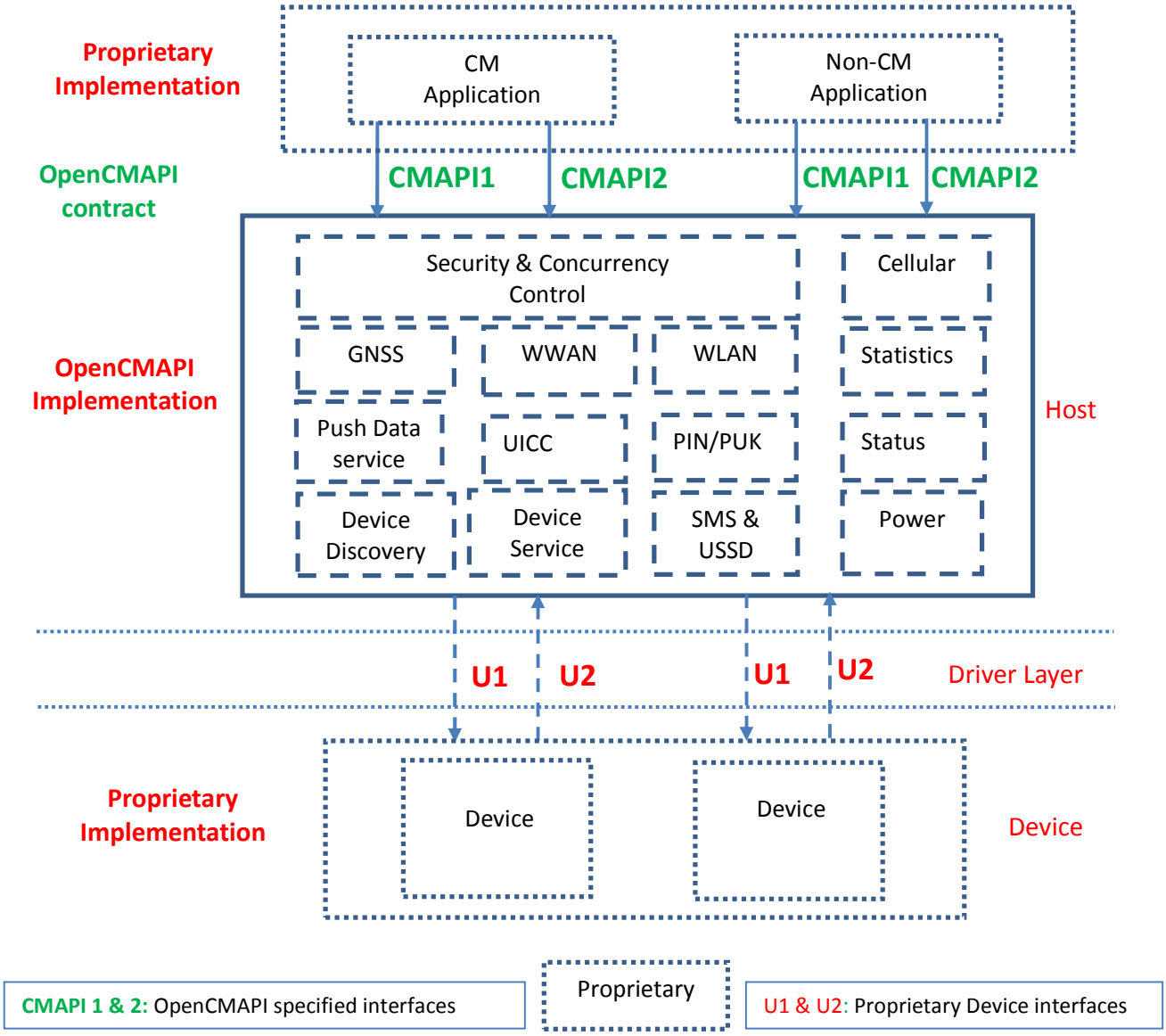


**Figure 2: OpenCMAPI Deployment Example**

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].

## C.2 Deployment Example WebAPI

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

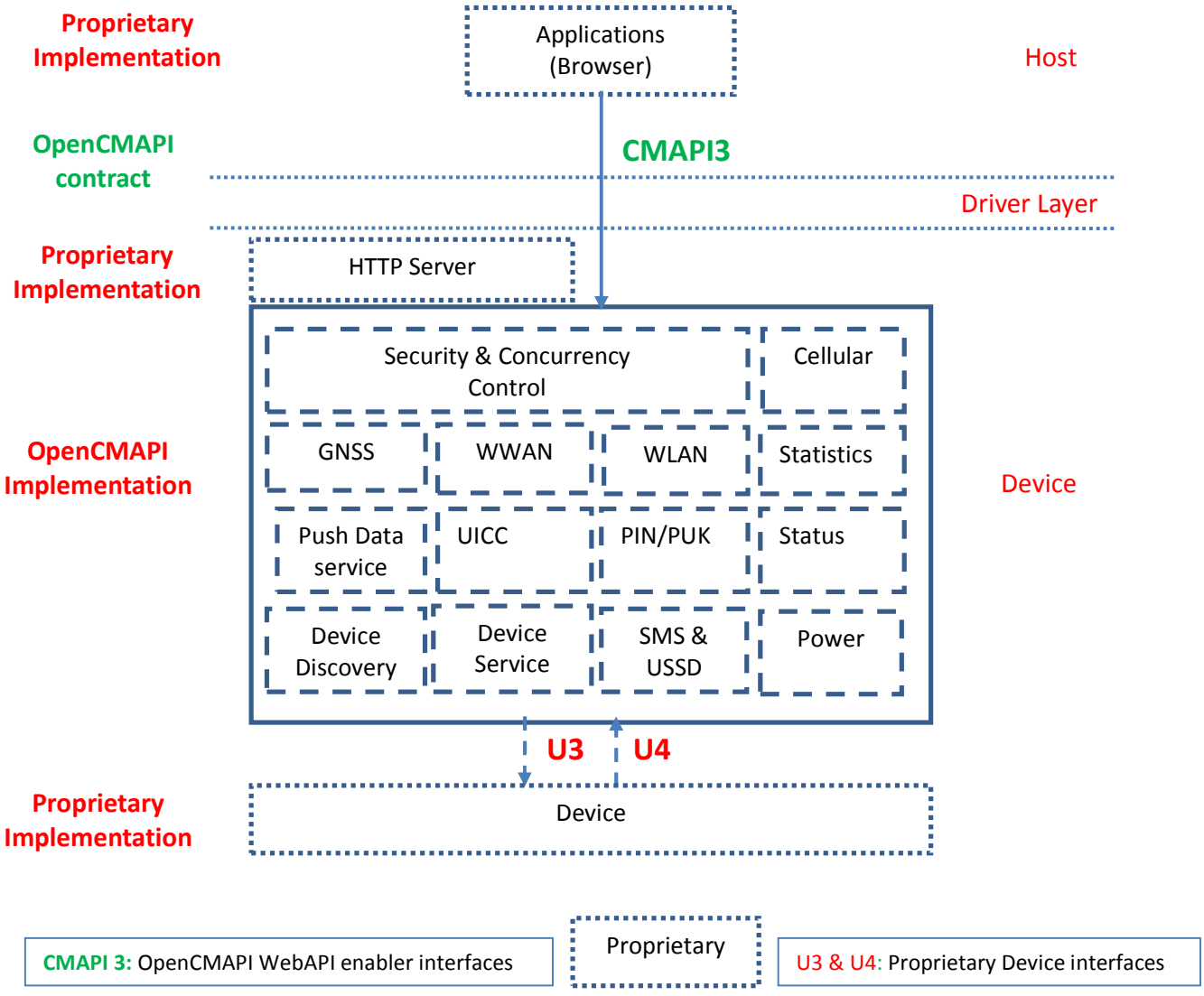


**Figure 3: OpenCMAPI WebAPI Deployment Example**

In the figure, an example is shown where an application within the context of a web browser interfaces with a device via CMAPI3. In this scenario, typically nothing is installed on the Host. The driver layer is an inbox operating system WLAN

driver. The OpenCMAPI implementation resides on the device itself and is provided via an embedded HTTP server. Below the OpenCMAPI implementation on the device there is an interface to proprietary firmware.

The functions in the OpenCMAPI implementation in Figure 3 may be a subset of functions provided via CMAPI1 and CMAPI2 but all functional components are illustrated here.