



Open Connection Manager API Architecture

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Open Mobile Alliance
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1. Scope

(Informative)

This document provides the architecture for the OpenCMAPI 1.1 Enabler.

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, non CM applications and Web 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](http://www.ietf.org/rfc/rfc2119.txt)
- [OpenCMAPI_TS
WebAPI] “Open Connection Manager WebAPI”, Open Mobile Alliance™, OMA-TS-OpenCMAPI_Web_V1_1,
[URL: http://www.openmobilealliance.org/](http://www.openmobilealliance.org/)
- [OpenCMAPI-RD] “Open Connection Manager API Requirements, Version 1.1”, Open Mobile Alliance™, OMA-RD-
OpenCMAPI-V1_1
[URL:http://www.openmobilealliance.org/](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/](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/](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

For the purpose of this AD, all definitions from the OMA Dictionary apply [OMADICT].

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	Please refer to [OpenCMAPI-RD].
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
D2D	Device to Device
GNSS	Global Navigation Satellite System
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)

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:

- 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)

Additionally this version of OpenCMAPI provides the specified functionality via a WebAPI to Web applications.

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

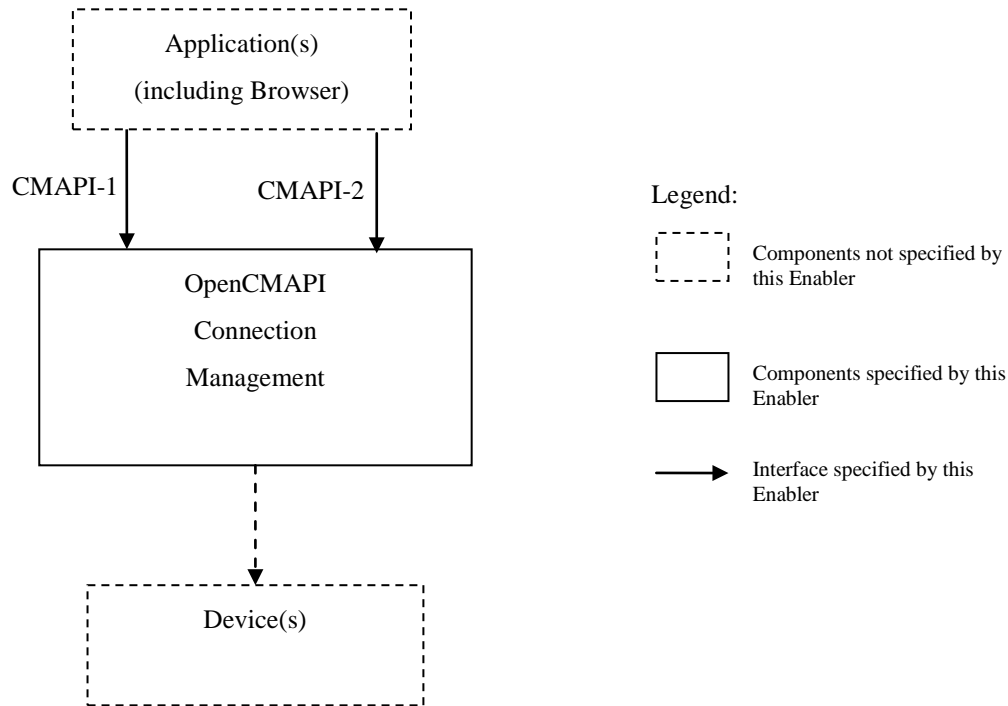


Figure 1: OpenCMAPI Architectural Diagram

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)

This component exposes the CMAPI-1 and CMAPI-2 interfaces. These interfaces are specified as both native API [OpenCMAPI-TS] and WebAPI [OpenCMAPI_TS WebAPI].

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.

Three 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.
- Web applications using the WebAPI binding of the interfaces.

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 only support the generic return code indicating the WLAN and GNSS functions are not supported.

5.3.2 Interfaces

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.

5.4 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] and [OpenCMAPI_TS WebAPI].

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

A.2 Draft Version 1.1 History

Document Identifier	Date	Sections	Description
Draft Versions OMA-AD-OpenCMAPI-V1_1	22 Nov2012	Baseline	Incorporates the baseline AD based on the AD version 1.0: OMA-CD-OpenCMAPI-2012-0001R01-INP_Architecture_Baseline
	22 Feb 2013	All	Incorporated the following CRs: OMA-CD-OpenCMAPI-2013-0025R01-CR_ADRR_Editorial OMA-CD-OpenCMAPI-2013-0026R01-CR_ADRR_WebAPI 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: OMA-CD-OpenCMAPI-2013-0030-CR_Resolution_of_ADRR_comment_A016 OMA-CD-OpenCMAPI-2013-0029R01-CR_AppendixC_CMAPI3
	25 Apr 2013	5	Incorporated the following CR: OMA-CD-OpenCMAPI-2013-0039-CR_Descriptions_for_additional_functional_compenents_in_CMAPI_1_1_AD
Candidate Version OMA-AD-OpenCMAPI-V1_1	04 Jun 2013	All	Status changed to Candidate by TP #: OMA-TP-2013-0159- INP_OpenCMAPI_1_1_AD_for_Candidate_approval
Draft Versions OMA-AD-OpenCMAPI-V1_1	17 Feb 2014	All	Status changed to draft by incorporating the resolutions of the following comments of the CONRR: B001, B002, B003, B004, B006, B007, B008, B009, B017, B020
	24 Feb 2014	1, 2.1, 3.2, 4.2, 5.2, 5.3.1.1, 5.3.1.2, 5.3.2, 5.3.2.3, C.2	Incorporated CR: OMA-CD-OpenCMAPI-2014-0016R01-CR_AD_CONR_comments_resolution Editorial changes
	21 May 2014	5.4	Incorporated CR: OMA-CD-OpenCMAPI-2014-0044-CR_Resolution_of_last_AD_comment
Candidate Version OMA-AD-OpenCMAPI-V1_1	17 Feb 2015	n/a	Status changed to Candidate by TP TP Ref # OMA-TP-2015-0059- INP_OpenCMAPI_V1_1_ERP_and_ETR_for_Candidate_approval

Appendix B. Flows (informative)

Not applicable for OpenCMAPI

Appendix C. Deployment Examples (Informative)

C.1 Deployment example of OpenCMAPI

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

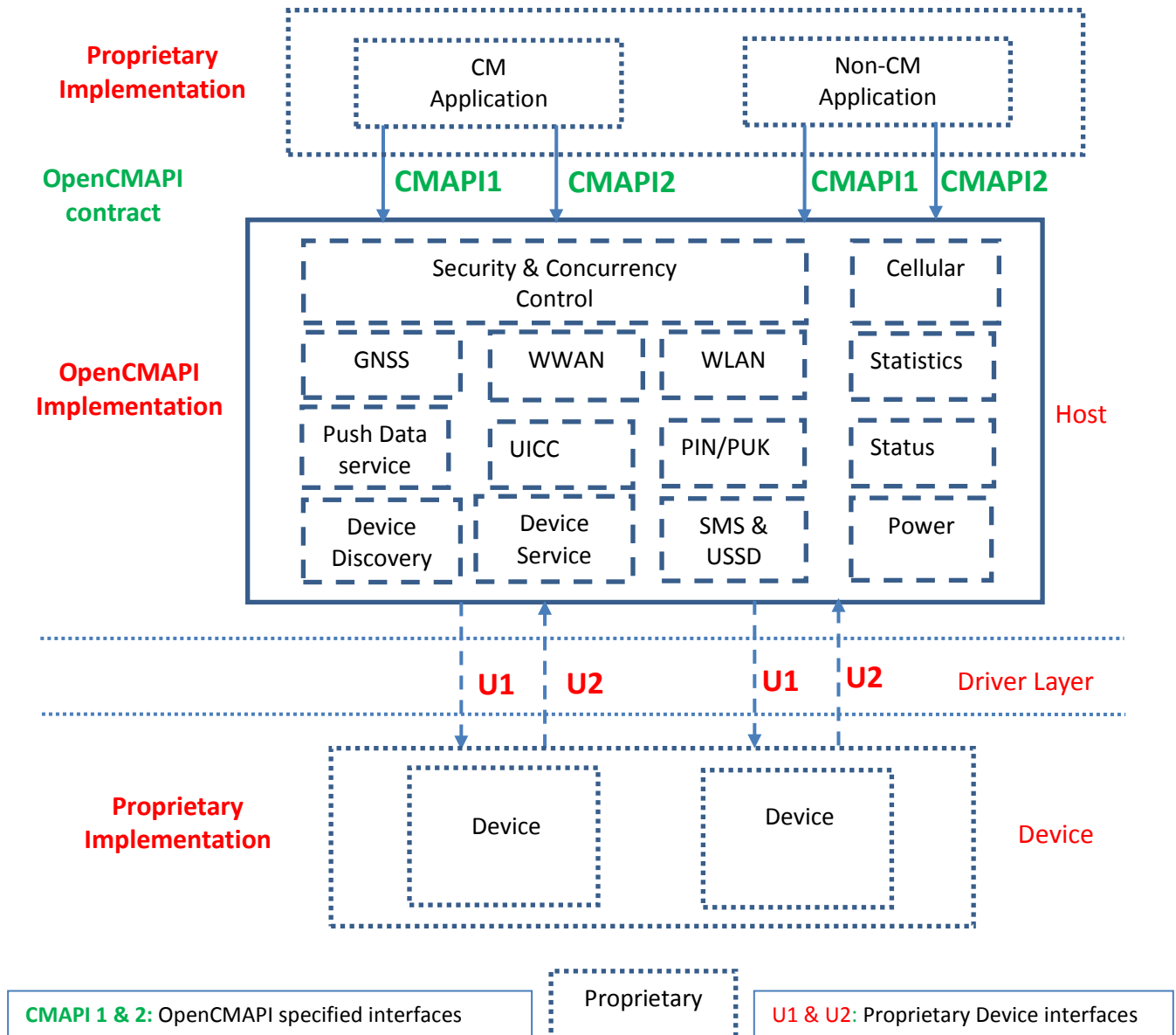


Figure 2: OpenCMAPI Deployment Example

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.

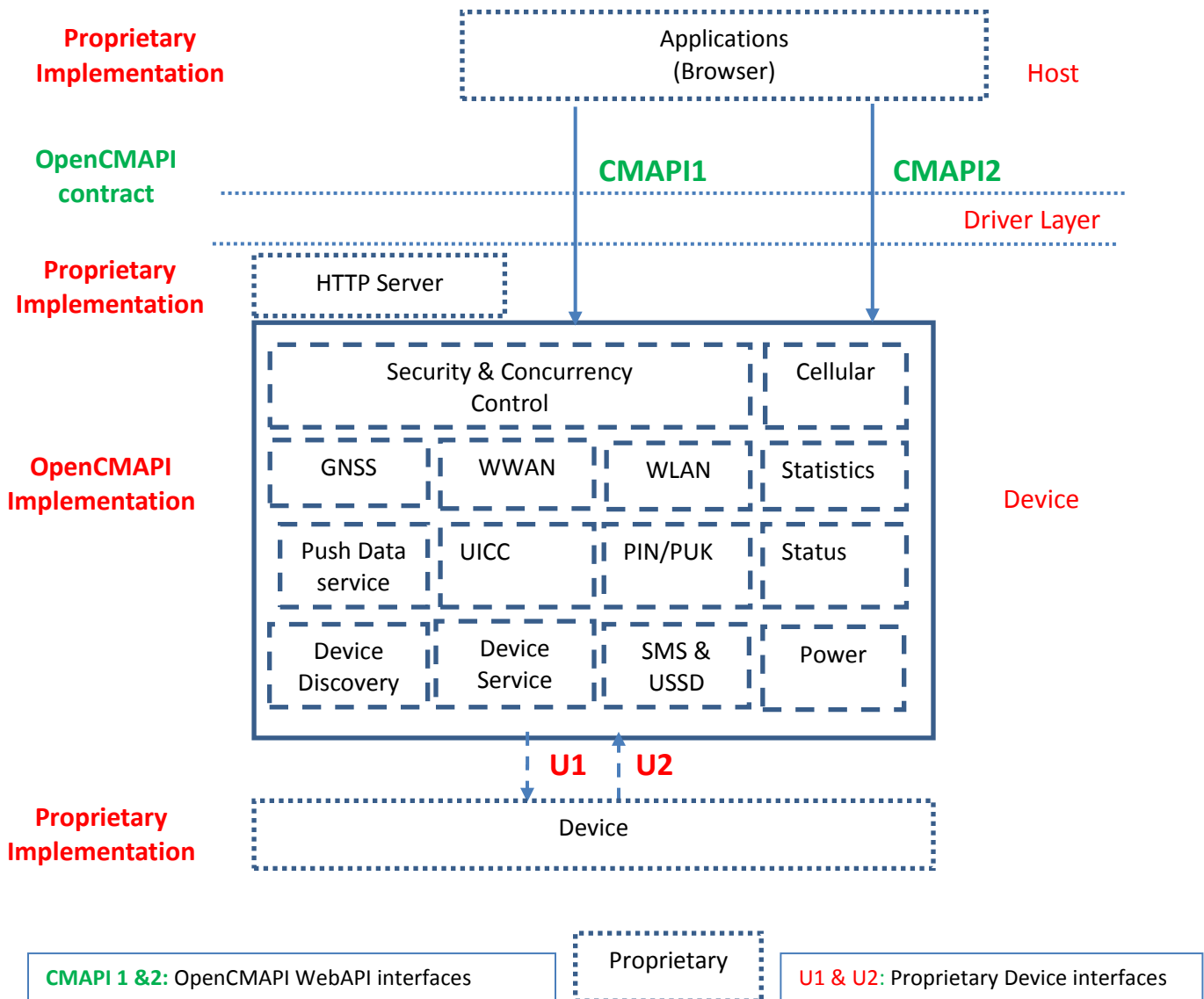


Figure 3: OpenCMAPI WebAPI Deployment Example

In the figure, an example is shown where an application within the context of a web browser interfaces with a device via CMAPI1 and CMAPI2. 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.