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**Information technology — Open  
Connectivity Foundation (OCF)  
Specification —**

**Part 9:  
Core optional specification**

*Technologies de l'information — Specification de la Fondation pour la  
connectivité ouverte (Fondation OCF) —*

*Partie 9: Spécification facultative du cœur*

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## Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted (see [www.iso.org/directives](http://www.iso.org/directives) or [www.iec.ch/members\\_experts/refdocs](http://www.iec.ch/members_experts/refdocs)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)) or the IEC list of patent declarations received (see [patents.iec.ch](http://patents.iec.ch)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html). In the IEC, see [www.iec.ch/understanding-standards](http://www.iec.ch/understanding-standards).

This document was prepared by the Open Connectivity Foundation (OCF) (as OCF Core Optional Specification, version 2.2.0) and drafted in accordance with its editorial rules. It was adopted, under the JTC 1 PAS procedure, by Joint Technical Committee ISO/IEC JTC 1, *Information technology*.

A list of all parts in the ISO/IEC 30118 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html) and [www.iec.ch/national-committees](http://www.iec.ch/national-committees).

## Introduction

This document, and all the other parts associated with this document, were developed in response to worldwide demand for smart home focused Internet of Things (IoT) devices, such as appliances, door locks, security cameras, sensors, and actuators; these to be modelled and securely controlled, locally and remotely, over an IP network.

While some inter-device communication existed, no universal language had been developed for the IoT. Device makers instead had to choose between disparate frameworks, limiting their market share, or developing across multiple ecosystems, increasing their costs. The burden then falls on end users to determine whether the products they want are compatible with the ecosystem they bought into, or find ways to integrate their devices into their network, and try to solve interoperability issues on their own.

In addition to the smart home, IoT deployments in commercial environments are hampered by a lack of security. This issue can be avoided by having a secure IoT communication framework, which this standard solves.

The goal of these documents is then to connect the next 25 billion devices for the IoT, providing secure and reliable device discovery and connectivity across multiple OSs and platforms. There are multiple proposals and forums driving different approaches, but no single solution addresses the majority of key requirements. This document and the associated parts enable industry consolidation around a common, secure, interoperable approach.

ISO/IEC 30118 consists of eighteen parts, under the general title Information technology — Open Connectivity Foundation (OCF) Specification. The parts fall into logical groupings as described herein:

- Core framework
  - Part 1: Core Specification
  - Part 2: Security Specification
  - Part 13: Onboarding Tool Specification
- Bridging framework and bridges
  - Part 3: Bridging Specification
  - Part 6: Resource to Alljoyn Interface Mapping Specification
  - Part 8: OCF Resource to oneM2M Resource Mapping Specification
  - Part 14: OCF Resource to BLE Mapping Specification
  - Part 15: OCF Resource to EnOcean Mapping Specification
  - Part 16: OCF Resource to UPlus Mapping Specification
  - Part 17: OCF Resource to Zigbee Cluster Mapping Specification
  - Part 18: OCF Resource to Z-Wave Mapping Specification
- Resource and Device models
  - Part 4: Resource Type Specification
  - Part 5: Device Specification
- Core framework extensions
  - Part 7: Wi-Fi Easy Setup Specification
  - Part 9: Core Optional Specification
- OCF Cloud
  - Part 10: Cloud API for Cloud Services Specification
  - Part 11: Device to Cloud Services Specification
  - Part 12: Cloud Security Specification



# Information technology — Open Connectivity Foundation (OCF) Specification —

## Part 9: Core optional specification

### 1 Scope

The OCF Core specifications are divided into a series of documents:

- Core specification: The Core specification document specifies the Framework, i.e., the OCF core architecture, interfaces, protocols and services to enable OCF profiles implementation for Internet of Things (IoT) usages and ecosystems. This document is mandatory for all Devices to implement.
- Core optional specification (this document): The Core optional specification document specifies the Framework, i.e., the OCF core architecture, interfaces, protocols and services to enable OCF profiles implementation for Internet of Things (IoT) usages and ecosystems that can optionally be implemented by any Device.
- Core extension specification(s): The Core extension specification(s) document(s) specifies optional OCF Core functionality that are significant in scope (e.g., Wi-Fi easy setup, Cloud).

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC DIS 20924, *Information Technology – Internet of Things – Vocabulary*, June 2018  
<https://www.iso.org/standard/69470.html>

ISO/IEC 30118-1, *Information technology – Open Connectivity Foundation (OCF) Specification – Part 1: Core specification*  
<https://www.iso.org/standard/53238.html>

ISO/IEC 30118-2, *Information technology – Open Connectivity Foundation (OCF) Specification – Part 2: Security specification*  
<https://www.iso.org/standard/74239.html>

IETF RFC 3339, *Date and Time on the Internet: Timestamps*, July 2002  
<https://www.rfc-editor.org/info/rfc3339>

IETF RFC 5234, *Augmented BNF for Syntax Specifications: ABNF*, January 2008  
<https://www.rfc-editor.org/info/rfc5234>

IETF RFC 5424, *The Syslog Protocol*, March 2009  
<https://tools.ietf.org/html/rfc5424>

IETF RFC 5646, *Tags for Identifying Languages*, September 2009  
<https://www.rfc-editor.org/info/rfc5646>

IANA ifType-MIB Definitions  
<https://www.iana.org/assignments/ianaiftype-mib/ianaiftype-mib>

IANA Media Types Assignment, March 2017

<http://www.iana.org/assignments/media-types/media-types.xhtml>

OpenAPI specification, *fka Swagger RESTful API Documentation Specification*, Version 2.0

<https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md>

## 3 Terms, definitions and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 30118-1, ISO/IEC 30118-2, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1.1

##### **Alert**

information provided by the Device by means of a specialised Resource Type that provides details with regard to potential problems, issues, or Device status of interest on which action can be taken

#### 3.1.2

##### **Rule**

Resource that implements autonomous decision logic according to a condition-action pattern

#### 3.1.3

##### **Rule Action**

Resource that is actuated with a defined value when the *Rule Result* (3.1.6) holds "true"

#### 3.1.4

##### **Rule Expression**

definition of the *Rule* (3.1.1) logic in terms of the defined *Rule Inputs* (3.1.5), and which evaluates to a boolean *Rule Result* (3.1.6), for which "true" means that the *Rule* (3.1.1) has been triggered

#### 3.1.5

##### **Rule Input**

Resources that contain the Properties whose values are evaluated as part of the *Rule Expression* (3.1.4)

#### 3.1.6

##### **Rule Result**

Property which reflects the result of the evaluation of the *Rule Expression* (3.1.4)

#### 3.1.7

##### **Scene**

static entity that stores a set of defined Property values for a Collection of Resources

Note 1 to entry: A *Scene* (3.1.3) is a prescribed setting of a set of Resources with each having a predetermined value for the Property that has to change.

#### 3.1.8

##### **Scene Collection**

Collection that contains an enumeration of possible *Scene Values* (3.1.10) and the current *Scene Value* (3.1.10)

Note 1 to entry: The member values of the *Scene Collection* (3.1.8) are *Scene Members* (3.1.9).



**3.1.9****Scene Member**

Resource that contains mappings of *Scene Values* (3.1.10) to values of a Property in the Resource

**3.1.10****Scene Value**

*Scene* (3.1.3) enumerator representing the state in which a Resource can be

**4 Document conventions and organization****4.1 Conventions**

In this document a number of terms, conditions, mechanisms, sequences, parameters, events, states, or similar terms are printed with the first letter of each word in uppercase and the rest lowercase (e.g., Network Architecture). Any lowercase uses of these words have the normal technical English meaning.

In this document, to be consistent with the IETF usages for RESTful operations, the RESTful operation words CRUDN, CREATE, RETRIVE, UPDATE, DELETE, and NOTIFY will have all letters capitalized. Any lowercase uses of these words have the normal technical English meaning.

**4.2 Notation**

In this document, features are described as required, recommended, allowed or DEPRECATED as follows:

Required (or shall or mandatory)(M).

- These basic features shall be implemented to comply with Core Architecture. The phrases "shall not", and "PROHIBITED" indicate behaviour that is prohibited, i.e. that if performed means the implementation is not in compliance.

Recommended (or should)(S).

- These features add functionality supported by Core Architecture and should be implemented. Recommended features take advantage of the capabilities Core Architecture, usually without imposing major increase of complexity. Notice that for compliance testing, if a recommended feature is implemented, it shall meet the specified requirements to be in compliance with these guidelines. Some recommended features could become requirements in the future. The phrase "should not" indicates behaviour that is permitted but not recommended.

Allowed (may or allowed)(O).

- These features are neither required nor recommended by Core Architecture, but if the feature is implemented, it shall meet the specified requirements to be in compliance with these guidelines.

DEPRECATED.

- Although these features are still described in this document, they should not be implemented except for backward compatibility. The occurrence of a deprecated feature during operation of an implementation compliant with the current document has no effect on the implementation's operation and does not produce any error conditions. Backward compatibility may require that a feature is implemented and functions as specified but it shall never be used by implementations compliant with this document.

Conditionally allowed (CA).

- The definition or behaviour depends on a condition. If the specified condition is met, then the definition or behaviour is allowed, otherwise it is not allowed.

Conditionally required (CR).

- The definition or behaviour depends on a condition. If the specified condition is met, then the definition or behaviour is required. Otherwise the definition or behaviour is allowed as default unless specifically defined as not allowed.

Strings that are to be taken literally are enclosed in "double quotes".

Words that are emphasized are printed in *italic*.

In all of the Property and Resource definition tables that are included throughout this document the "Mandatory" column indicates that the item detailed is mandatory to implement; the mandating of inclusion of the item in a Resource Payload associated with a CRUDN action is dependent on the applicable schema for that action.

### 4.3 Data types

Resources are defined using data types derived from JSON values as defined in clause 4.3 in ISO/IEC 30118-1.

## 5 Functional interactions

### 5.1 Introduction

The functional interactions between a Client and a Server are described in 5.2 through 5.7 respectively. The functional interactions use CRUDN messages (clause 8 in ISO/IEC 30118-1) and include Discovery, Notification, and Device management. These functions require support of core defined Resources as defined in Table 1.

**Table 1 – List of optional Core Resources**

Pre-defined URI	Resource Name	Resource Type	Related Functional Interaction	Mandatory
(none)	Configuration	"oic.wk.con"	Device management	No
(none)	Configuration	"oic.wk.con.p"	Device management	No
"/oic/mnt"	Maintenance	"oic.wk.mnt"	Device management	No
(none)	Network monitoring	"oic.wk.nmon"	Device management	No
(none)	Software update	"oic.wk.softwareupdate"	Device management	No
(none)	Icon	"oic.r.icon"	Icons	No
(none)	Scene List	"oic.wk.scenelist"	Scenes	No
(none)	Scene Collection	"oic.wk.scenecollection"	Scenes	No
(none)	Scene Member	"oic.wk.scenemember"	Scenes	No
(none)	Alerts	"oic.r.alert"	Alerts	No
(none)	Alerts Collection	"oic.r.alertcollection"	Alerts	No

### 5.2 Onboarding, provisioning and configuration

Onboarding and provisioning are fully defined by ISO/IEC 30118-2.

Should a Device support Client update of configurable information it shall do so via exposing an "oic.wk.con" Core Resource (Table 2) in "/oic/res".

**Table 2 – Configuration Resource**

Example URI	Resource Type Title	Resource Type ID ("rt" value)	OCF Interfaces	Description	Related Functional Interaction
"/example/oic/con"	Device configuration	"oic.wk.con"	"oic.if.rw"	The Resource Type through which configurable information specific to the Device is exposed.	Configuration

				The Resource Properties exposed in "oic.wk.con" are listed in Table 3.	
<b>"/example/oic/con"</b>	Platform configuration	"oic.wk.con.p"	"oic.if.rw"	The optional Resource Type through which configurable information specific to the Platform is exposed. The Properties exposed in "oic.wk.con.p" are listed in Table 4.	Configuration

Table 3 defines the "oic.wk.con" Resource Type. Complete details are provided in annex A.2.

**Table 3 – "oic.wk.con" Resource Type definition**

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
(Device) Name	"n" (Common Property of "/example/oic/con")	"string"	N/A	N/A	R, W	Yes	Human friendly name configurable by the end user (e.g. Bob's thermostat). The "n" Common Property of the oic.wk.con Core Resource and the "n" Common Property of the "/oic/d" Core Resource shall have the same Value. When the "n" Common Property Value of the oic.wk.con Core Resource is modified, it shall be reflected to the "n" Common Property of "/oic/d" Core Resource.
Location	"loc"	array of float (has two elements, the first is latitude, the second is longitude)	N/A	Degrees	R, W	No	Provides location information where available.
Location Name	"locn"	"string"	N/A	N/A	R, W	no	Human friendly name for location For example, "Living Room".
Currency	"c"	"string"	N/A	N/A	R,W	no	Indicates the currency that is used for any monetary transactions
Region	"r"	"string"	N/A	N/A	R,W	no	Free form text Indicating the current region in which the Device is located geographically.
Localized Names	"ln"	"array"	N/A	N/A	R,W	no	Human-friendly name of the Device, in one or more languages. This Property is an array of objects where each object has a "language" field (containing an IETF RFC 5646 language tag) and a "value" field containing the Device name in the indicated language. If this Property and the Device Name (n) Property are both supported, the Device Name (n) value shall be included in this array.
Default Language	"dl"	"language-tag"	N/A	N/A	R,W	no	The default language supported by the Device, specified as an IETF RFC 5646 language tag. By default, clients can treat any string Property as being in this language unless the Property specifies otherwise.

Table 4 defines the "oic.wk.con.p" Resource Type. Complete details are provided in annex A.3.

**Table 4 – "oic.wk.con.p" Resource Type definition**

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Platform Names	"mnpn"	"array"	N/A	N/A	R,W	No	<p>Friendly name of the Platform. This Property is an array of objects where each object has a "language" field (containing an IETF RFC 5646 language tag) and a "value" field containing the platform friendly name in the indicated language.</p> <p>For example, [{"language": "en", "value": "Dave's Laptop"}]</p>

### 5.3 Device management

#### 5.3.1 Overview

Device management includes the following functions:

- Diagnostics and maintenance
- Network monitoring

#### 5.3.2 Diagnostics and maintenance Resource Type

The Diagnostics and Maintenance Resource Type is intended to enable the resolution of issues encountered with the Devices while operating in the field. If diagnostics and maintenance is supported by a Device, the Core Resource "/oic/mnt" shall be supported as described in Table 5.

**Table 5 – Optional diagnostics and maintenance Device management Core Resources**

Pre-defined URI	Resource Type Title	Resource Type ID ("rt" value)	OCF Interfaces	Description	Related Functional Interaction
"/oic/mnt"	Maintenance	"oic.wk.mnt"	"oic.if.rw"	<p>The Resource through which the Device is maintained and can be used for diagnostic purposes.</p> <p>The Properties exposed by "/oic/mnt" are listed in Table 6.</p>	Device management

Table 6 defines the "oic.wk.mnt" Resource Type. At least one of the Factory\_Reset, Reboot, or last error Properties shall be implemented. Complete details are provided in annex A.5.

**Table 6 – "oic.wk.mnt" Resource Type definition**

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Factory_Reset	"fr"	"boolean"	N/A	N/A	R, W	No	<p>When writing to this Property:</p> <p>false – No action (Default*)</p> <p>true – Start Factory Reset</p>

							When reading this Property, a value of true indicates a pending factory reset. Once the factory reset has been completed, the Device shall set the value back to false. This Property is functionally equivalent to a transition to a state of Hard Reset as defined in ISO/IEC 30118-2, clause 8.1
<b>Reboot</b>	"rb"	"boolean"	N/A	N/A	R, W	No	When writing to this Property: false – No action (Default) true – Start Reboot After Reboot, this value shall be changed back to the default value (i.e., false)
<b>Last error</b>	"err"	"integer"	HTTP error code	N/A	R	No	Last occurred error code, shall be cleared to 503 (service unavailable), when doing a Factory Reset or Reboot. All HTTP errors outside the 100, 200 or 300 range shall be stored.

NOTE Default indicates the value of this Property as soon as the Device is rebooted or factory reset.

### 5.3.3 Core behaviours on Device maintenance state changes

#### 5.3.3.1 Overview

As defined in ISO/IEC 30118-2 a Device has a state machine through which it transitions during its operational lifetime.

ISO/IEC 30118-2 details actions on such state transitions for the Resources defined therein. This clause defines the actions to be taken on such state transitions for the Resources and functionality defined within this document.

The state transitions to be considered are:

- RFNOP to Soft Reset
- RFNOP to Hard Reset
- RFNOP to RFPRO
- RFPRO to RFNOP

Table 7 provides a summary of the actions to be taken in each case for functions defined in the ISO/IEC 30118-2 and this document, other extensions to these documents may define further behaviours.

**Table 7 – Actions on Device state change**

	Soft reset	Hard reset	RFNOP -> RFPRO	RFPRO -> RFNOP
<b>SVR</b>	As per ISO/IEC 30118-2 clause 8.5	As per ISO/IEC 30118-2 clause 8.1	As per ISO/IEC 30118-2 clause 8.3	As per ISO/IEC 30118-2 clause 8.4
<b>Mandatory Core Resources</b>	No change	Reset to defined defaults, see clause 5.3.3.3.3	No change	No change

<b>Optional Core Resources</b>	No change	Reset to defined defaults, see clause 5.3.3.3.4	No change	No change
<b>Vertical Resources</b>	No change	Reset to defined defaults; see clause 5.3.3.3	No change	No change
<b>Created Resources</b>	No change	Deleted	No change	No change
<b>Observe Transactions</b>	No change	Canceled; see clause 5.3.3.2	No change	Re-evaluate ACL; see clause 5.3.3.2
<b>OCF Cloud</b>	No change	See clause <b>Error! Reference source not found.</b>	No change	No change

### 5.3.3.2 Handling of Observe transactions

On a transition to hard reset all active Observe transactions shall be cancelled by the Server by sending a "Service Unavailable" response on each active Observe transaction.

On a state transition that allows for modification of the access controls that exist against a Resource (such as from RFPRO to RFNOP) it is possible that the access controls themselves as defined within the ISO/IEC 30118-2 are changed such that the original RETRIEVE operation that established the Observe would not have been allowed. In such instances the Server shall cancel the Observe by sending a "Service Unavailable" response on the Observe transaction.

### 5.3.3.3 Reset of Resource Properties to defined defaults

#### 5.3.3.3.1 Overview

On a hard or factory reset Resource Properties are reset to default values. These are commonly referred to as *manufacturer defaults* however it is not possible in all instances to revert to such values as they may not be known or be practicable.

The default values to be applied for the mandatory and optional Core Resources, plus any Vertical Resources are defined in clauses 5.3.3.3.2 through 5.3.3.3.4 respectively.

#### 5.3.3.3.2 Defaults for Vertical Resources

Default values for any Vertical Resources exposed by a Device are up to the implementation.

#### 5.3.3.3.3 Defaults for mandatory Core Resources

Table 8 and Table 9 capture default values that shall be set for mandatory Properties of the mandatory Core Resources where those Resources contain Properties that can be changed by a Client. This excludes "/oic/res" as that has no mutable Properties.

**Table 8 – Default values for "/oic/d"**

Property	Default	Notes
"n"	""	Empty string if "/oic/con" is also exposed, otherwise not mutable.
"di"	See ISO/IEC 30118-2 requirements	.
"icv"	Unchanged	Not mutable
"dmv"	Unchanged	Not mutable
"piid"	See ISO/IEC 30118-2 requirements.	