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Information technology — Open Connectivity Foundation (OCF) —

Part 18: OCF Resource to Z-wave mapping specification

PROOF/ÉPREUVE

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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 or www.iec.ch/members_experts/refdocs).

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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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by the Open Connectivity Foundation (OCF) (as OCF Resource to Z-Wave Mapping, 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 and 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) —

Part 18:
OCF Resource to Z-wave mapping specification

1 Scope

This document provides detailed mapping information between Z-Wave and OCF defined Resources.

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 30118-1 Information technology – Open Connectivity Foundation (OCF) Specification – Part 1: Core specification
https://www.iso.org/standard/53238.html
Latest version available at: https://openconnectivity.org/specs/OCF_Core_Specification.pdf

ISO/IEC 30118-2 Information technology – Open Connectivity Foundation (OCF) Specification – Part 2: Security specification
https://www.iso.org/standard/74239.html
Latest version available at: https://openconnectivity.org/specs/OCF_Security_Specification.pdf

ISO/IEC 30118-3 Information technology – Open Connectivity Foundation (OCF) Specification – Part 3: Bridging specification
https://www.iso.org/standard/74240.html
Latest version available at: https://openconnectivity.org/specs/OCF_Bridging_Specification.pdf

Derived Models for Interoperability between IoT Ecosystems, Stevens & Merriam, March 2016
https://www.iab.org/wp-content/IAB-uploads/2016/03/OCF-Derived-Models-for-Interoperability-Between-IoT-Ecosystems_v2-examples.pdf

Z-Wave Plus Device and Command Class Types Specification
https://www.silabs.com/documents/login/miscellaneous/SDS11847-Z-Wave-Plus-Device-Type-Specification.pdf

Z-Wave Plus v2 Device Type Specification
https://www.silabs.com/documents/login/miscellaneous/SDS14224-Z-Wave-Plus-v2-Device-Type-Specification.pdf

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions given in ISO/IEC 30118-1, ISO/IEC 30118-2, and ISO/IEC 30118-3 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 Terms and definitions

3.1.1
Command Class
collection of commands used for controlling, querying, and reporting information corresponding to specific function supported by a Z-Wave device.

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).

> These basic features shall be implemented to comply with the Mapping Specification. The phrases "shall not", and "PROHIBITED" indicate behavior that is prohibited, i.e. that if performed means the implementation is not in compliance.

Recommended (or should).

> These features add functionality supported by the Mapping Specification and should be implemented. Recommended features take advantage of the capabilities the Mapping Specification, 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 behavior that is permitted but not recommended.

Allowed (or allowed).

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

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.

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.

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

Words that are emphasized are printed in *italic*.

5 Theory of operation

5.1 Interworking approach

The interworking between Z-Wave defined Command Classes and OCF defined Resources is modelled using the derived model syntax described in Derived Models for Interoperability between IoT Ecosystems.

5.2 Mapping syntax

5.2.1 Introduction

Within the defined syntax for derived modelling used by this document there are two blocks that define the actual Property-Property equivalence or mapping. These blocks are identified by the keywords "x-to-ocf" and "x-from-ocf". Derived Models for Interoperability between IoT Ecosystems does not define a rigid syntax for these blocks; they are free form string arrays that contain pseudo-coded mapping logic.

Within this document we apply the rules in defined in clause 5.2 to these blocks to ensure consistency and re-usability and extensibility of the mapping logic that is defined.

5.2.2 General

All statements are terminated with a carriage return.

5.2.3 Value assignment

The equals sign (=) is used to assign one value to another. The assignee is on the left of the operator; the value being assigned on the right.

5.2.4 Property naming

All Property names are identical to the name used by the original model; for example, from the OCF Temperature Resource the Property name "temperature" is used whereas when referred to the derived ecosystem then the semantically equivalent Property name is used.

The name of the OCF defined Property is prepended by the ecosystem designator "ocf" to avoid ambiguity (e.g. "ocf.step")

5.2.5 Range

The range on the OCF side is fixed.

5.2.6 Arrays

An array element is indicated by the use of square brackets "[]" with the index of the element contained therein, e.g. range [1]. All arrays start at an index of 0.

5.2.7 Default mapping

There are cases where the specified mapping is not possible as one or more of the Properties being mapped is optional in the source model. In all such instances a default mapping is provided. (e.g. "transitiontime = 1")

5.2.8 Conditional mapping

When a mapping is dependent on the meeting of other conditions then the syntax:

If "condition", then "mapping".

is applied.

E.g. if onoff = false, then ocf.value = false

5.2.9 Method invocation

The invocation of a command from the derived ecosystem as part of the mapping from an OCF Resource is indicated by the use if a double colon "::" delimiter between the applicable resource, service, interface or other construct identifier and the command name. The command name always includes trailing parentheses which would include any parameters should they be passed.

6 Z-Wave translation

6.1 Operational scenarios

6.1.1 Introduction

The overall goals are to:

– make Bridged Z-Wave Servers appear to OCF Clients as if they were native OCF Servers in the local network or cloud environment

“Deep translation” between a specific Z-Wave device and an OCF Device is specified in clause 9. “On-the-fly” translation is out of scope (refer to clause 5.1 “Deep translation” vs. “on-the-fly” of ISO/IEC 30118-3).

6.1.2 Overview of OCF-Z-Wave bridging

An OCF Z-Wave Bridge Platform provides the bridging function between an OCF Client and a Bridged Z-Wave Server. The asymmetric bridging is applied to Z-Wave Bridging Function. Z-Wave Bridging Function is performing the translation to or from the Z-Wave Protocol. The Z-Wave Bridge Platform exposes Bridged Z-Wave Servers to OCF Clients and any OCF Cloud. A Bridged Z-Wave Server provides Z-Wave specific data via the Z-Wave protocol for a Virtual Bridged Z-Wave Client. Figure 1 presents the overview of an OCF Z-Wave Bridge Platform and its general topology.

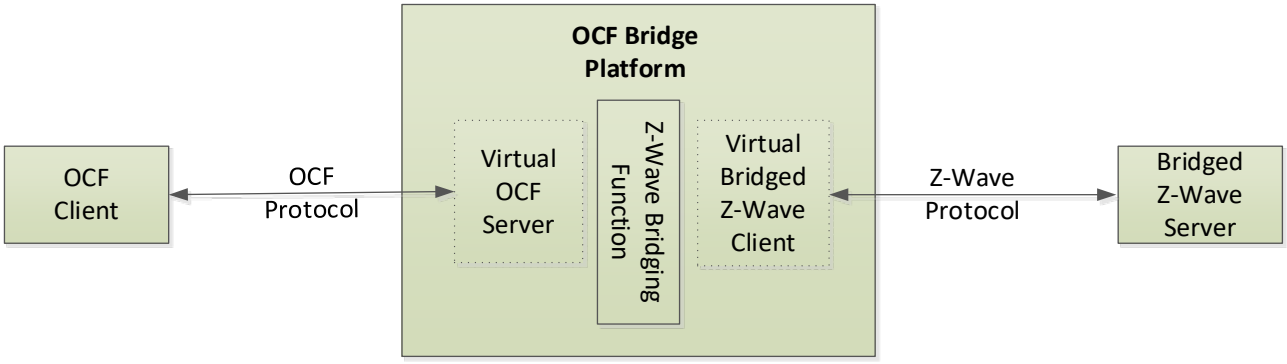

Figure 1 – OCF Z-Wave Bridge Platform and Components

6.1.3 Use case for OCF Client and Z-Wave server

A use case for an OCF Client and Z-Wave Server is presented in Figure 2. A smartphone device acting as the OCF Client is allowed to send commands for controlling, querying and reporting the information of Z-Wave devices via an OCF Z-Wave Bridge Platform. For that, Z-Wave Server devices such as door locks with a keypad and light dimmer switch are represented as virtual OCF Z-Wave server devices on an OCF Z-Wave Bridge Platform. Any connectivity that OCF supports is used to communicate between OCF Client and an OCF Z-Wave Bridge. Furthermore, an OCF Client can also communicate with an OCF Z-Wave Bridge Platform via an OCF Cloud.

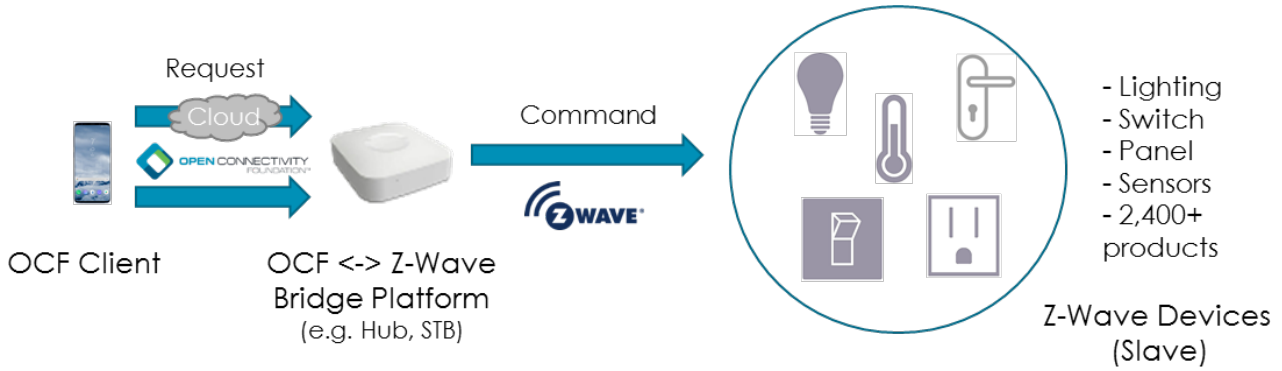

Figure 2 – OCF Client and Z-Wave Server

6.2 Requirements specific to Z-Wave bridging function

6.2.1 Requirements specific to Z-Wave

The version of Z-Wave device type for OCF Z-Wave Bridging shall be Z-Wave Plus or Z-Wave Plus v2. The Z-Wave Bridging Function shall act as Z-Wave Controller which sets up and performs maintenance operations such as inclusion and exclusion of devices in a Z-Wave network.