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BSI Standards Publication

Information technology — Open Connectivity Foundation (OCF) Specification

Part 6: Resource to AllJoyn interface mapping specification

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National foreword

This British Standard is the UK implementation of ISO/IEC 30118-6:2021. It supersedes BS ISO/IEC 30118-6:2018, which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ICT/1, Information systems co-ordination.

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2021-10

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Part 6: Resource to AllJoyn interface mapping specification

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

Partie 6: Spécification du mapping entre les ressources et l'interface AllJoyn

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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).

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) or the IEC list of patent declarations received (see 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. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by the Open Connectivity Foundation (OCF) (as OCF Resource to AllJoyn Interface Mapping 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*.

This second edition cancels and replaces the first edition (ISO/IEC 30118-6:2018), which has been technically revised.

The main changes compared to the previous edition are as follows:

— AllJoyn text moved from the bridging specification to this document;

— addition of clarifications throughout.

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.

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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

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- 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

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Information technology — Open Connectivity Foundation (OCF) —

Part 6:
Resource to AllJoyn interface mapping specification

1 Scope

This document provides detailed mapping information to provide equivalency between AllJoyn defined Interfaces and OCF defined Resources.

This document provides mapping for Device Types (AllJoyn to/from OCF), identifies equivalent OCF Resources for both mandatory and optional AllJoyn interfaces and for each interface defines the detailed Property by Property mapping using OCF defined extensions to JSON schema to programmatically define the mappings.

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 30118-4 *Information technology -- Open Connectivity Foundation (OCF) Specification -- Part 4: Resource type specification*
https://www.iso.org/standard/74241.html
Latest version available at:
https://openconnectivity.org/specs/OCF_Resource_Type_Specification.pdf

ISO/IEC 30118-5 *Information technology – Open Connectivity Foundation (OCF) Specification – Part 5: Smart home device specification*
https://www.iso.org/standard/74242.html
Latest version available at: https://openconnectivity.org/specs/OCF_Device_Specification.pdf

JSON Hyper-Schema, *JSON Hyper-Schema: A Vocabulary for Hypermedia Annotation of JSON*, October 2016
http://json-schema.org/latest/json-schema-hypermedia.html

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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

IETF RFC 4122, *A Universally Unique Identifier (UUID) URN Namespace*, July 2005
https://www.rfc-editor.org/info/rfc4122

IETF RF 4648, *The Base16, Base32 and Base64 Data Encodings*, October 2006
https://www.rfc-editor.org/info/rfc4648

IETF RFC 6973, *Privacy Considerations for Internet Protocols*, July 2013
https://www.rfc-editor.org/info/rfc6973

IETF RFC 7159, *The JavaScript Object Notation (JSON) Data Interchange Format*, March 2014
https://www.rfc-editor.org/info/rfc7159

AllJoyn Common Data Model Interface Definitions
https://wiki.alljoyn.org/cdm

AllJoyn About Interface Specification, *About Feature Interface Definitions*, Version 14.12
https://allseenalliance.org/framework/documentation/learn/core/about-announcement/interface

AllJoyn Configuration Interface Specification, *Configuration Interface Definition*, Version 14.12
https://allseenalliance.org/framework/documentation/learn/core/configuration/interface

D-Bus Specification, *D-Bus Specification*
https://dbus.freedesktop.org/doc/dbus-specification.html

3 Terms and definitions

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

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.

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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 behaviour 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 behaviour 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 AllJoyn defined interfaces and OCF defined Resource Types is modelled using the derived model syntax described in Derived Models for Interoperability between IoT Ecosystems. Determination of the minimum set of AllJoyn interfaces for which equivalency is required within the OCF data model was done by listing the set of interfaces required for each of the device

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types defined by the CDM Project inside of AllJoyn. Where the AllJoyn interface supports methods then an actuation design pattern is applied.

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 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.

When the same name is used by both OCF and the derived ecosystem for semantically equivalent values then the name of the OCF defined Property is prepended by the ecosystem designator "ocf" to avoid ambiguity (e.g. "ocf.step").

5.2.5 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. If an entire array is being referenced then no index is included, e.g. selectablehumiditylevels[].

5.2.6 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. The default map is indicated by the prepending of an "otherwise:" modifier to the assignment. (e.g. "otherwise: step = 1").

5.2.7 Conditional mapping

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

if "condition", "mapping".

Is applied.

E.g. if step >0, ocf.step = step.

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5.2.8 Loops

When a mapping can be represented by a repeated loop governed by some condition then the syntax:

for "initialize", "condition", "increment": "mapping"

Where:

"initialize" is an initial local loop control variable setting.

"condition" is the loop controller, the loop repeats until the condition evaluates to "false".

"increment" allows for update of the control variable, if omitted an increment of "1" is assumed.

Is applied.

E.g. for x=0, x < sizeof(supportedmodes): ocf.supportedmodes[x] = modearray[supportedmodes[x]]

5.2.9 Method invocation

The invocation of a method or remote procedure call (RPC) 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 method or RPC name. The method name always includes trailing parentheses which would include any parameters should they be passed.

For example, when dealing with the switchon() method from AllJoyn this gives a complete method invocation as: operation.oncontrol::switchon().

6 AllJoyn translation

6.1 Operational scenarios

The overall goals are to:

1) make Bridged Servers appear to OCF clients as if they were native OCF servers, and

2) make OCF servers appear to Bridged Clients as if they were native non-OCF servers.

6.2 Requirements specific to an AllJoyn bridging function

6.2.1 Introduction

The Bridge Platform shall be an AllJoyn Router Node. (This is a requirement so that users can expect that a certified Bridge will be able to talk to any AllJoyn device, without the user having to buy some other device.)

The requirements in clause 6.2 apply when using algorithmic translation, and by default apply to deep translation unless the relevant clause for such deep translation specifies otherwise.

6.2.2 Use of introspection

Whenever possible, the translation code should make use of metadata available that indicates what the sender and recipient of the message in question are expecting. For example, devices that are AllJoyn Certified are required to carry the introspection data for each object and interface they expose. When the metadata is available, Bridging Functions should convert the incoming payload to exactly

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the format expected by the recipient and should use information when translating replies to form a more useful message.

For example, for an AllJoyn specific Bridging Function, the expected interaction list is presented in Table 1.

Table 1 – AllJoyn Bridging Function Interaction List

Message Type	Sender	Receiver	Metadata
Request	AllJoyn 16.10	OCF 1.0	Available
Request	OCF 1.0	AllJoyn 16.10	Available
Response	AllJoyn 16.10	OCF 1.0	Available
Response	OCF 1.0	AllJoyn 16.10	Available

6.2.3 Stability and loss of data

Round-tripping through the translation process specified in this document is not expected to reproduce the same original message. The process is, however, designed not to lose data or precision in messages, though it should be noted that both OCF and AllJoyn payload formats allow for future extensions not considered in this document.

However, a third round of translation should produce the same identical message as was previously produced, provided the same information is available. That is, in the chain shown in Figure 1, payloads 2 and 4 as well as 3 and 5 should be identical.

Figure 1 – Payload Chain

6.2.4 Exposing AllJoyn producer devices to OCF clients

6.2.4.1 Virtual OCF devices and resources

As specified in ISO/IEC 30118-2 the value of the "di" property of OCF Devices (including VODs) shall be established as part of Onboarding of that VOD.

Each AllJoyn object shall be mapped to one or more Virtual OCF Resources. If all AllJoyn interfaces can be translated to resource types on the same resource, there should be a single Virtual OCF Resource, and the path component of the URI of the Virtual OCF Resource shall be the AllJoyn object path, where each "_h" in the AllJoyn object path is transformed to "-" (hyphen), each "_d" in the AllJoyn object path is transformed to "." (dot), each "_t" in the AllJoyn object path is transformed to "~" (tilde), and each "_u" in the AllJoyn object path is transformed to "_" (underscore). Otherwise, a Resource with that path shall exist with a Resource Type of ["oic.wk.col", "oic.r.alljoynobject"] which is a Collection of links, where "oic.r.alljoynobject" is defined in clause 10.2 and the items in the collection are the Resources with the translated Resource Types.

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The value of the "piid" property of "/oic/d" for each VOD shall be the value of the OCF-defined AllJoyn field "org.openconnectivity.piid" in the AllJoyn About Announce signal, if that field exists, else it shall be calculated by the Bridging Function as follows:

– If the AllJoyn device supports security, the value of the "piid" property value shall be the peer GUID.

– If the AllJoyn device does not support security but the device is being bridged anyway (see 10.2), the "piid" property value shall be derived from the DeviceId and AppId properties (in the About data), by concatenating the DeviceId value (not including any null termination) and the AppId bytes and using the result as the "name" to be used in the algorithm specified in IETF RFC 4122 clause 4.3, with SHA-1 as the hash algorithm, and 8f0e4e90-79e5-11e6-bdf4-0800200c9a66 as the name space ID. (This is to address the problem of being able to de-duplicate AllJoyn devices exposed via separate OCF Bridge Devices.)

A Bridging Function implementation is encouraged to listen for AllJoyn About Announce signals matching any AllJoyn interface name. It can maintain a cache of information it received from these signals, and use the cache to quickly handle "/oic/res" queries from OCF Clients (without having to wait for Announce signals while handling the queries).

A Bridging Function implementation is encouraged to listen for other signals (including EmitsChangedSignal of properties) only when there is a client subscribed to a corresponding resource on a Virtual AllJoyn Device.

There are multiple types of AllJoyn interfaces, which shall be handled as follows.

1) If the AllJoyn interface is in a well-defined set (defined in 6.2.4.2) of interfaces where standard forms exist on both the AllJoyn and OCF sides, the Bridging Function shall either:

   a) follow the requirements for translating that interface specially, or

   b) not translate the AllJoyn interface.

2) If the AllJoyn interface is not in the well-defined set, the Bridging Function shall either:

   a) not translate the AllJoyn interface, or

   b) algorithmically map the AllJoyn interface as specified in 6.3 to custom/vendor-defined Resource Types by converting the AllJoyn interface name to OCF resource type name(s).

An AllJoyn interface name shall be converted to a Device Type or a set of one or more OCF Resource Types as follows:

3) If the AllJoyn interface has any members, append a suffix ".<seeBelow>" where <seeBelow> is described in this clause.

4) For each upper-case letter present in the entire string, replace it with a hyphen followed by the lower-case version of that letter (e.g., convert "A" to "-a").

5) If an underscore appears followed by a (lower-case) letter or a hyphen, for each such occurrence, replace the underscore with two hyphens (e.g., convert "_a" to "--a", "_-a" to "---a").

6) For each underscore remaining, replace it with a hyphen (e.g., convert "_1" to "-1").

7) Prepend the "x." prefix.

Some examples are shown in Table 2. The first three are normal AllJoyn names converted to unusual OCF names. The last three are unusual AllJoyn names converted (perhaps back) to normal OCF names. ("xn--" is a normal domain name prefix for the Punycode-encoded form of an Internationalized Domain Name, and hence can appear in a normal vendor-specific OCF name.)

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Table 2 – AllJoyn to OCF Name Examples

From AllJoyn name	To OCF name
example.Widget	x.example.-widget
example.my__widget	x.example.my----widget
example.My_Widget	x.example.-my---widget
xn_p1ai.example	x.xn--p1ai.example
xn__90ae.example	x.xn--90ae.example
example.myName_1	x.example.my-name-1

Each AllJoyn interface that has members and is using algorithmic mapping shall be mapped to one or more Resource Types as follows:

– AllJoyn Properties with the same EmitsChangedSignal value are mapped to the same Resource Type where the value of the <seeBelow> label is the value of EmitsChangedSignal. AllJoyn Properties with EmitsChangedSignal values of "const" or "false", are mapped to Resources that are not Observable, whereas AllJoyn Properties with EmitsChangedSignal values of "true" or "invalidates" result in Resources that are Observable. The Version property in an AllJoyn interface is always considered to have an EmitsChangedSignal value of "const", even if not specified in introspection XML. The name of each property on the Resource Type shall be "<ResourceType>.<AllJoynPropertyName>", where each "_d" in the <AllJoynPropertyName> is transformed to "." (dot), and each "_h" in the <AllJoynPropertyName> is transformed to "-" (hyphen).

– Resource Types mapping AllJoyn Properties with access "readwrite" shall support the "oic.if.rw" OCF Interface. Resource Types mapping AllJoyn Properties with access "read" shall support the "oic.if.r" OCF Interface. Resource Types supporting both the "oic.if.rw" and "oic.if.r" OCF Interfaces shall choose "oic.if.r" as the default Interface.

– Each AllJoyn Method is mapped to a separate Resource Type, where the value of the <seeBelow> label is the AllJoyn Method name. The Resource Type shall support the "oic.if.rw" OCF Interface. Each argument of the AllJoyn Method shall be mapped to a separate Property on the Resource Type, where the name of that Property is prefixed with "<ResourceType>arg<#>", where <#> is the 0-indexed position of the argument in the AllJoyn introspection xml, in order to help get uniqueness across all Resource Types on the same Resource. Therefore, when the AllJoyn argument name is not specified, the name of that property is "<ResourceType>arg<#>", where <#> is the 0-indexed position of the argument in the AllJoyn introspection XML. In addition, that Resource Type has an extra "<ResourceType>validity" property that indicates whether the rest of the properties have valid values. When the values are sent as part of an UPDATE response, the validity property is true, and any other properties have valid values. In a RETRIEVE (GET or equivalent in the relevant transport binding) response, the validity property is false, and any other properties can have meaningless values. If the validity property appears in an UPDATE request, its value shall be true (a value of false shall result in an error response).

– Each AllJoyn Signal (whether sessionless, sessioncast, or unicast) is mapped to a separate Resource Type on an Observable Resource, where the value of the <seeBelow> label is the AllJoyn Signal name. The Resource Type shall support the "oic.if.r" OCF Interface. Each argument of the AllJoyn Signal is mapped to a separate Property on the Resource Type, where the name of that Property is prefixed with "<ResourceType>arg<#>", where <#> is the 0-indexed position of the argument in the AllJoyn introspection xml, in order to help get uniqueness across all Resource Types on the same Resource. Therefore, when the AllJoyn argument name is not specified, the name of that property is "<ResourceType>arg<#>", where <#> is the 0-indexed position of the argument in the AllJoyn introspection XML. In addition, that Resource Type has an extra "<ResourceType>validity" property that indicates whether the rest of the properties have valid values. When the values are sent as part of a NOTIFY response, the validity property is true, and any other properties have valid values. In a RETRIEVE (GET or equivalent in the relevant transport binding) response, the validity property is false, and any other properties returned can have meaningless values. This is because in AllJoyn, the signals are instantaneous events, and the

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values are not necessarily meaningful beyond the lifetime of that message. Note that AllJoyn does have a TTL field that allows store-and-forward signals, but such support is not required in OCF 1.0. We expect that in the future, the TTL may be used to allow valid values in response to a RETRIEVE that is within the TTL.

When an algorithmic mapping is used, AllJoyn data types shall be mapped to OCF property types according to 6.3.

If an AllJoyn operation fails, the Bridging Function shall send an appropriate OCF error response to the OCF client. If an AllJoyn error name is available and does not contain the "org.openconnectivity.Error.Code" prefix, it shall construct an appropriate OCF error message (e.g., diagnostic payload if using CoAP) from the AllJoyn error name and AllJoyn error message (if any), using the form "<error name>: <error message>", with the <error name> taken from the AllJoyn error name field and the <error message> taken from the AllJoyn error message, and the CoAP error code set to an appropriate value (if CoAP is used). If an AllJoyn error name is available and contains the "org.openconnectivity.Error.Code" prefix, the OCF error message (e.g., diagnostic payload if using CoAP) should be taken from the AllJoyn error message (if any), and the CoAP error code (if CoAP is used) set to a value derived as follows; remove the "org.openconnectivity.Error.Code" prefix, and if the resulting error name is of the form "<#>" where <#> is an error code without a decimal (e.g., "404"), the CoAP error code shall be the error code indicated by the "<#>". Example: "org.openconnectivity.Error.Code404" becomes "404", which shall result in an error 4.04 for a CoAP transport.

6.2.4.2 Exposing an AllJoyn producer application as a virtual OCF server

Table 3 shows how OCF Device properties, as specified in Table 27 in ISO/IEC 30118-1 shall be derived, typically from fields specified in the ISO/IEC 30118-1 and AllJoyn Configuration Interface Specification.

If the AllJoyn About or Config data field has a mapping rule defined (as in Table 3, Table 4, Table 5, and Table 6), the field name shall be translated based on that mapping rule; else if the AllJoyn About or Config data field has a fully qualified name (with a <domain> prefix (such as "com.example", "org.alljoyn"), the field name shall be translated based on the rules specified in 6.2.4 for mapping AllJoyn fields; else, the field shall not be translated as it may be incorrect (error) or it has no valid mapping (such as daemonRealm and passCode).

Table 3 – oic.wk.d resource type definition

To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
(Device) Name	n	Human friendly name For example, "Bob's Thermostat"	Y	AppName (no exact equivalent exists)	Application name assigned by the app manufacturer (developer or the OEM).	Y
Spec Version	icv	Spec version of ISO/IEC 30118-1 this device is implemented to, the syntax is "core.major.minor"]	Y	(none)	Bridge Platform should return its own value	N
Device UUID	di	Unique identifier for Device. This value shall be as defined in ISO/IEC 30118-2 for DeviceID.	Y	(none)	Use as defined in ISO/IEC 30118-2	N

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To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
Protocol-Independent ID	piid	Unique identifier for OCF Device (UUID)	Y	org.openconnectivity.piid if it exists, else "Peer GUID" (not in About, but exposed by protocol) if authenticated, else Hash(DeviceId,AppId) where the Hash is done by concatenating the Device UUID (not including any null terminator) and the AppId and using the algorithm in IETF RFC 4122 clause 4.3, with SHA-1. This means that the value of di may change if the resource is read both before and after authentication, in order to mitigate privacy concerns discussed in RFC 6973.	Peer GUID: The peer GUID is the only persistent identity for a peer. Peer GUIDs are used by the authentication mechanisms to uniquely identify a remote application instance. The peer GUID for a remote peer is only available if the remote peer has been authenticated. DeviceId: Device identifier set by platform-specific means. AppId: A 128-bit globally unique identifier for the application. The AppId shall be a universally unique identifier as specified in **IETF RFC 4122**.	Per GUID: conditionally Y DeviceId: Y AppId: Y
Data Model Version	dmv	Spec version(s) of the vertical specifications this device data model is implemented to. The syntax is a comma separated list of "<vertical>.major.minor"]. <vertical> is the name of the vertical (i.e. sh for Smart Home)	Y	Comma separated list of the Version property values of each interface listed in the objectDescription argument of the Announce signal of About. In addition to the mandatory values specified in ISO/IEC 30118-1, additional values are formatted as "x.<interface name>.<Version property value>".	This document assumes that the value of the Version property is the same as the value of the "org.gtk.GDBus.Since" annotation of the interface in the AllJoyn introspection XML, and therefore the value of the Version property may be determined through introspection alone. Note that AllJoyn specifies that the default value is 1 if the "org.gtk.GDBus.Since" annotation is absent.	N, but required by IRB for all standard interfaces, and absence can be used to imply a constant (e.g., 0)

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To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
Localized Descriptions	ld	Detailed description of the Device, in one or more languages. This property is an array of objects where each object has a "language" field (containing an RFC 5646 language tag) and a "value" field containing the device description in the indicated language.	N	Description	Detailed description expressed in language tags as in RFC 5646.	Y
Software Version	sv	Version of the device software.	N	SoftwareVersion	Software version of the app.	Y
Manufacture r Name	dmn	Name of manufacturer of the Device, in one or more languages. This property is an array of objects where each object has a "language" field (containing an RFC 5646 language tag) and a "value" field containing the manufacturer name in the indicated language.	N	Manufacturer	The manufacturer's name of the app.	Y
Model Number	dmno	Model number as designated by manufacturer.	N	ModelNumber	The app model number.	Y

In addition, any additional vendor-defined fields in the AllJoyn About data shall be mapped to vendor-defined properties in the OCF Device resource "/oic/d" (which implements the "oic.wk.d" resource type), with a property name formed by prepending "x." to the AllJoyn field name.

Table 4 shows how OCF Device Configuration properties, as specified in Table 22 in ISO/IEC 30118-1 shall be derived:

Table 4 – oic.wk.con resource type definition

To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
(Device) Name	n	Human friendly name For example, "Bob's Thermostat"	Y	AppName (no exact equivalent exists)	Application name assigned by the app manufacturer (developer or the OEM).	Y
Location	loc	Provides location information where available.	N	org.openconnectivity.loc (if it exists, else property shall be absent)		N
Location Name	locn	Human friendly name for location For example, "Living Room".	N	org.openconnectivity.locn (if it exists, else property shall be absent)		N
Currency	c	Indicates the currency that is used for any monetary transactions	N	org.openconnectivity.c (if it exists, else property shall be absent)		N

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To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
Region	r	Free form text Indicating the current region in which the device is located geographically. The free form text shall not start with a quote (").	N	org.openconnectivity.r (if it exists, else property shall be absent)		N
Localized Names	ln	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 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.	N	AppName	Application name assigned by the app manufacturer (developer or the OEM).	Y
Default Language	dl	The default language supported by the Device, specified as an RFC 5646 language tag. By default, clients can treat any string property as being in this language unless the property specifies otherwise.	N	DefaultLanguage	The default language supported by the device. Specified as an IETF language tag listed in RFC 5646.	Y

In addition, any additional vendor-defined fields in the AllJoyn Configuration data shall be mapped to vendor-defined properties in the OCF Configuration resource (which implements the "oic.wk.con" resource type and optionally the "oic.wk.con.p" resource type), with a property name formed by prepending "x." to the AllJoyn field name.

Table 5 shows how OCF Platform properties, as specified in Table 28 in ISO/IEC 30118-1 shall be derived, typically from fields specified in the AllJoyn About Interface Specification and AllJoyn Configuration Interface Specification.

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Table 5 – oic.wk.p resource type definition

To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
Platform ID	pi	Unique identifier for the physical platform (UIUID); this shall be a UUID in accordance with IETF RFC 4122. It is recommended that the UUID be created using the random generation scheme (version 4 UUID) specific in the RFC.	Y	DeviceId if it is a UUID, else generate a name-based UUID from the DeviceId using the DeviceId value (not including any null termination) as the "name" to be used in the algorithm specified in **IETF RFC 4122** clause 4.3, with SHA-1 as the hash algorithm, and 8f0e4e90-79e5-11e6-bdf4-0800200c9a66 as the name space ID.	Name of the device set by platform-specific means (such as Linux and Android).	Y
Manufacturer Name	mnmn	Name of manufacturer (not to exceed 16 characters)	Y	Manufacturer (in DefaultLanguage, truncated to 16 characters)	The manufacturer's name of the app.	Y
Manufacturer Details Link (URL)	mnml	URL to manufacturer (not to exceed 32 characters)	N	org.openconnectivity.mnml (if it exists, else property shall be absent)		N
Model Number	mnmo	Model number as designated by manufacturer	N	ModelNumber	The app model number.	Y
Date of Manufacture	mndt	Manufacturing date of device	N	DateOfManufacture	Date of manufacture using format YYYY-MM-DD (known as XML DateTime format).	N
Platform Version	mnpv	Version of platform – string (defined by manufacturer)	N	org.openconnectivity.mnpv (if it exists, else property shall be absent)		N
OS Version	mnos	Version of platform resident OS – string (defined by manufacturer)	N	org.openconnectivity.mnos (if it exists, else property shall be absent)		N
Hardware Version	mnhw	Version of platform hardware	N	HardwareVersion	Hardware version of the device on which the app is running.	N
Firmware version	mnfv	Version of device firmware	N	org.openconnectivity.mnfv (if it exists, else property shall be absent)		N
Support URL	mnsl	URL that points to support information from manufacturer	N	SupportUrl	Support URL (populated by the manufacturer)	N

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To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
SystemTime	st	Reference time for the device	N	org.openconnectivity.st (if it exists, else property shall be absent)		N
Vendor ID	vid	Vendor defined string for the platform. The string is freeform and up to the vendor on what text to populate it.	N	DeviceId	Name of the device set by platform-specific means (such as Linux and Android).	Y

Table 6 shows how OCF Platform Configuration properties, as specified in Table 23 in the ISO/IEC 30118-1 shall be derived:

Table 6 – oic.wk.con.p resource type definition

To OCF Property title	OCF Property name	OCF Description	OCF Mandatory	From AJ Field name	AJ Description	AJ Mandatory
Platform Names	mnpn	Platform Identifier	N	DeviceName	Name of the device set by platform-specific means (such as Linux and Android).	Device name assigned by the user. The device name appears on the UI as the friendly name of the device.

In addition, the "oic.wk.mnt" properties Factory_Reset ("fr") and Reboot ("rb") shall be mapped to AllJoyn Configuration methods FactoryReset and Restart, respectively.

6.2.5 Exposing OCF resources to AllJoyn consumer applications

6.2.5.1 Use of AllJoyn producer application

Unless specified otherwise, each OCF resource shall be mapped to a separate AllJoyn object.

Each OCF Server shall be exposed as a separate AllJoyn producer application, with its own About data. This allows platform-specific, device-specific, and resource-specific fields to all be preserved across translation. However, this requires that AllJoyn Claiming of such producer applications be solved in a way that does not require user interaction, but this is left as an implementation issue.

The AllJoyn producer application shall implement the "oic.d.virtual" AllJoyn interface. This allows Bridge Platforms to determine if a device is already being translated when multiple Bridge Platforms are present. The "oic.d.virtual" interface is defined as follows:

```
<interface name="oic.d.virtual"/>
```

The implementation may choose to implement this interface by the AllJoyn object at path "/oic/d".

The AllJoyn peer ID shall be the OCF Device UUID ("di").

Unless specified otherwise, the AllJoyn object path shall be the OCF URI path, where each "-" (hyphen) in the OCF URI path is transformed to "_h", each "." (dot) in the OCF URI path is transformed to "_d",

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each "~" (tilde) in the OCF URI path is transformed to "_t", and each "_" (underscore) in the OCF URI path is transformed to "_u".

The AllJoyn About data shall be populated per Table 8.

A Bridging Function implementation is encouraged to maintain a cache of OCF resources to handle the implementation of queries from the AllJoyn side, and emit an Announce Signal for each OCF Server. Specifically, the implementation could always Observe "/oic/res" changes and only Observe other resources when there is a client with a session on a Virtual AllJoyn Device.

There are multiple types of resources, which shall be handled as follows.

1) If the Resource Type is in a well-defined set (defined in 6.2.5.2) of resource types where standard forms exist on both the AllJoyn and OCF sides, the Bridging Function shall either:

   a) follow the requirements for translating that resource type specially, or

   b) not translate the Resource Type.

2) If the Resource Type is not in the well-defined set (but is not a Device Type), the Bridging Function shall either:

   a) not translate the Resource Type, or

   b) algorithmically map the Resource Type as specified in 6.3 to a custom/vendor-defined AllJoyn interface by converting the OCF Resource Type name to an AllJoyn Interface name.

An OCF Resource Type or Device Type shall be converted to an AllJoyn interface name as follows:

1) Remove the "x." prefix if present

2) For each occurrence of a hyphen (in order from left to right in the string):

   a) If the hyphen is followed by a letter, replace both characters with a single upper-case version of that letter (e.g., convert "-a" to "A").

   b) Else, if the hyphen is followed by another hyphen followed by either a letter or a hyphen, replace two hyphens with a single underscore (e.g., convert "--a" to "_a", "---" to "_-").

   c) Else, convert the hyphen to an underscore (i.e., convert "-" to "_").

Some examples are shown in the Table 7. The first three are unusual OCF names converted (perhaps back) to normal AllJoyn names. The last three are normal OCF names converted to unusual AllJoyn names. ("xn--" is a normal domain name prefix for the Punycode-encoded form of an Internationalized Domain Name, and hence can appear in a normal vendor-specific OCF name.)

Table 7 – Example name mapping

From OCF name	To AllJoyn name
x.example.-widget	example.Widget
x.example.my----widget	example.my__widget
x.example.-my---widget	example.My_Widget
x.xn--p1ai.example	xn_p1ai.example
x.xn--90ae.example	xn__90ae.example
x.example.my-name-1	example.myName_1

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