OCF Resource to UPlus Mapping Specification

VERSION 2.2.2 | February 2021

CONTACT admin@opencommunity.org
Copyright Open Connectivity Foundation, Inc. © 2021. All Rights Reserved.
NOTHING CONTAINED IN THIS DOCUMENT SHALL BE DEEMED AS GRANTING YOU ANY KIND OF LICENSE IN ITS CONTENT, EITHER EXPRESSLY OR IMPLIEDLY, OR TO ANY INTELLECTUAL PROPERTY OWNED OR CONTROLLED BY ANY OF THE AUTHORS OR DEVELOPERS OF THIS DOCUMENT. THE INFORMATION CONTAINED HEREIN IS PROVIDED ON AN "AS IS" BASIS, AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, THE AUTHORS AND DEVELOPERS OF THIS SPECIFICATION HEREBY DISCLAIM ALL OTHER WARRANTIES AND CONDITIONS, EITHER EXPRESS OR IMPLIED, STATUTORY OR AT COMMON LAW, INCLUDING, BUT NOT LIMITED TO, IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. OPEN CONNECTIVITY FOUNDATION, INC. FURTHER DISCLAIMS ANY AND ALL WARRANTIES OF NON-INFRINGEMENT, ACCURACY OR LACK OF VIRUSES.

The OCF logo is a trademark of Open Connectivity Foundation, Inc. in the United States or other countries. *Other names and brands may be claimed as the property of others.

Copyright © 2019-2021 Open Connectivity Foundation, Inc. All rights reserved.

Copying or other form of reproduction and/or distribution of these works are strictly prohibited.
Figures

Figure 1 – OCF U+ Bridge Platform and Components ............................................................. 4
Figure 2 – U+ Bridging Use Case ......................................................................................... 4
Figure 3 – Mapping of RETRIEVE operation ...................................................................... 10
Figure 4 – Mapping of UPDATE operation .......................................................................... 10
Figure 5 – Mapping of NOTIFICATION operation .............................................................. 11
Tables

Table 1 – Translation Rule between U+ and OCF Data Model...........................................5
Table 2 – Example of Translation between U+ and OCF Data Model................................5
Table 3 – Mapping between U+ Device and Property and OCF Device and Resource........6
Table 4 – "oic.wk.d" Resource Type definition .................................................................6
Table 5 – "oic.wk.p" Resource Type definition ..................................................................8
Table 6 – oic.wk.con Resource Type definition ..................................................................9
Table 7 – Mapping of operations between U+ and OCF ...................................................9
Table 8 – U+ to OCF Device Type Mapping......................................................................11
Table 9 – U+ Property to OCF Resource Type Mapping...................................................12
Table 10 – The Property mapping for "uplus.device.airconditioner".................................12
Table 11 – The Properties of "uplus.device.airconditioner" .............................................13
Table 12 – The Property mapping for "uplus.device.airpurifier" .......................................14
Table 13 – The Properties of "uplus.device.airpurifier" .....................................................14
Table 14 – The Property mapping for "uplus.device.waterheater" .....................................15
Table 15 – The Properties of "uplus.device.waterheater" .................................................16
1 Scope
This document provides detailed mapping information between UPlus (U+) 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.

https://www.iso.org/standard/53238.html
Latest version available at: https://openconnectivity.org/specs/OCF_Core_Specification.pdf

https://www.iso.org/standard/74239.html

https://www.iso.org/standard/74240.html

Derived Models for Interoperability between IoT Ecosystems, Stevens & Merriam, March 2016

3 Terms, definitions symbols and abbreviations

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

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.

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 UPlus (U+) 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 U+ Translation

6.1 Operational Scenarios
6.1.1 Introduction
The goal is to make Bridged U+ Servers appear to OCF Clients as if they were native OCF Servers. "Deep translation" between specific U+ properties and OCF resources is specified in clause 9.
Figure 1 shows an overview of OCF U+ Bridge Platform and its general topology. The U+ Translator supports asymmetric bridging. It exposes U+ Servers to OCF Clients. Each Bridged U+ Server is represented as a Virtual OCF Server.

![Diagram of OCF U+ Bridge Platform and Components](image)

**Figure 1 – OCF U+ Bridge Platform and Components**

6.1.2 Use case for U+ Bridging

Figure 2 shows a use case for U+ bridging. U+ washer air conditioner is installed in the user’s house. The user uses OCF Client application on the smartphone to control the washer. OCF U+ Bridge Platform can reside in different physical platforms, for example, the smartphone, the washer or the gateway device.

![Diagram of U+ Bridging Use Case](image)

**Figure 2 – U+ Bridging Use Case**

6.2 Requirements specific to U+ Translator

6.2.1 General

OCF U+ Bridge Platform shall satisfy the normative requirements from ISO/IEC 30118-3:2019.

6.2.2 Requirements specific to U+

This document refers to version 5.0.0 or higher of U+ SDK.
### 6.2.3 Exposing U+ servers to OCF Clients

#### 6.2.3.1 General

Table 1 shows translation rule between U+ and OCF data model. One U+ Device Type is mapped to one OCF Device Type or one OCF Composite Device. One or more U+ Properties are mapped to one OCF Resource Type.

**Table 1 – Translation Rule between U+ and OCF Data Model**

<table>
<thead>
<tr>
<th>From U+</th>
<th>mapping count</th>
<th>To OCF</th>
<th>mapping count</th>
</tr>
</thead>
<tbody>
<tr>
<td>U+ Device Type</td>
<td>1</td>
<td>OCF Device Type</td>
<td>1</td>
</tr>
<tr>
<td>U+ Property</td>
<td>n</td>
<td>OCF Resource</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>OCF Property</td>
<td>n</td>
</tr>
</tbody>
</table>

Table 2 shows an example of the translation rule, which maps U+ air conditioner to OCF air conditioner.

- U+ Property "onOffStatus" is mapped to OCF Resource Property "value" which belongs to OCF Resource "oic.r.switch.binary".
- U+ Property "targetTemperature" is mapped to OCF Resource Property "temperature" and "units" combined which both belong to OCF Resource "oic.r.temperature".
- U+ Property "indoorTemperature", "windDirectionVertical", "windDirectionHorizontal" and "windSpeed" together are mapped to OCF Resource Property "supportedDirections", "direction", "speed" and "automode" combined which all belong to OCF Resource "oic.r.airflow".
- U+ Property "operationMode" and "healthMode" together are mapped to OCF Resource Property "supportedModes" and "modes" combined which both belong to OCF Resource "oic.r.mode".

**Table 2 – Example of Translation between U+ and OCF Data Model**

<table>
<thead>
<tr>
<th>From U+ Air Conditioner</th>
<th>To OCF Air Conditioner</th>
</tr>
</thead>
<tbody>
<tr>
<td>U+ Property</td>
<td>OCF Resource</td>
</tr>
<tr>
<td>&quot;onOffStatus&quot;</td>
<td>&quot;oic.r.switch.binary&quot;</td>
</tr>
<tr>
<td>&quot;targetTemperature&quot;</td>
<td>&quot;oic.r.temperature&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;indoorTemperature&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;windDirectionVertical&quot;</td>
<td>&quot;oic.r.airflow&quot;</td>
</tr>
<tr>
<td>&quot;windDirectionHorizontal&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;windSpeed&quot;</td>
<td></td>
</tr>
<tr>
<td>&quot;operationMode&quot;</td>
<td>&quot;oic.r.mode&quot;</td>
</tr>
<tr>
<td>&quot;healthMode&quot;</td>
<td></td>
</tr>
</tbody>
</table>

#### 6.2.3.2 Deep translation for U+ property

All U+ devices are well defined. Table 3 is the mapping between U+ devices and their properties and OCF Devices and Resources. Table 3 includes a full list of U+ devices to be mapped to OCF. Table 4, Table 5, and Table 6 define the mapping between OCF core Resources and U+ properties.
<table>
<thead>
<tr>
<th>U+ Device</th>
<th>U+ Property</th>
<th>OCF Resource Type</th>
<th>OCF Device Name</th>
<th>OCF Device Type (&quot;rt&quot;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>&quot;onOffStatus&quot;</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>Air Conditioner</td>
<td>&quot;oic.d.airconditioner&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;targetTemperature&quot;</td>
<td>&quot;oic.r.temperature&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;windSpeed&quot;</td>
<td>&quot;oic.r.selectablelevels&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;operationMode&quot;</td>
<td>&quot;oic.r.mode&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Water Heater</td>
<td>&quot;onOffStatus&quot;</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>Water Heater</td>
<td>&quot;oic.d.waterheater&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;targetTemperature&quot;</td>
<td>&quot;oic.r.temperature&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Air Purifier</td>
<td>&quot;onOffStatus&quot;</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>Air Purifier</td>
<td>&quot;oic.d.airpurifier&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;mode&quot;</td>
<td>&quot;oic.r.operational.state&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>&quot;windSpeed&quot;</td>
<td>&quot;oic.r.selectablelevels&quot;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4 shows the mapping between the properties of "oic.wk.d" Resource Type (see ISO/IEC 30118-1:2018) and the properties of U+ device.

**Table 4 – "oic.wk.d" Resource Type definition**

<table>
<thead>
<tr>
<th>Property title</th>
<th>OCF Property name</th>
<th>OCF Description</th>
<th>OCF Mandatory</th>
<th>From U+ Property value</th>
<th>U+ Description</th>
<th>U+ Mandatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Device) Name</td>
<td>&quot;n&quot;</td>
<td>Human friendly name defined by the vendor. In the presence of &quot;n&quot; Property of &quot;oic/con&quot;, both have the same Property Value. When &quot;n&quot; Property Value of &quot;oic/con&quot; is modified, it shall be reflected to &quot;n&quot; Property Value of &quot;oic/d&quot;.</td>
<td>Yes</td>
<td>&quot;deviceId&quot;</td>
<td>An unique ID of the Device</td>
<td>Yes</td>
</tr>
<tr>
<td>Spec Version</td>
<td>&quot;icv&quot;</td>
<td>Spec version of the core specification to which this Device is implemented. The syntax is &quot;ocf.&lt;major&gt;,&lt;minor&gt;,&lt;sub-version&gt;&quot; where &lt;major&gt;, &lt;minor, and &lt;sub-version&gt; are the major, minor and sub-version numbers of the specification respectively. The string value shall be set to the version of the Core Specification on which the implementation is built (e.g. &quot;ocf.2.0.6&quot;).</td>
<td>Yes</td>
<td>(none)</td>
<td>Translator returns its own value.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Device ID</strong></td>
<td>&quot;di&quot;</td>
<td>Unique identifier for Device. This value shall be the same value (i.e. mirror) as the doxm.deviceuuid Property as defined in ISO/IEC 30118-2:2019.</td>
<td>Yes</td>
<td>(none)</td>
<td>As defined in ISO/IEC 30118-2:2019</td>
<td>No</td>
</tr>
<tr>
<td>----------------</td>
<td>---------</td>
<td>---------------------------------------------------------------</td>
<td>------</td>
<td>----------</td>
<td>-----------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td><strong>Data Model Version</strong></td>
<td>&quot;dmv&quot;</td>
<td>Spec version of the Resource Specification to which this Device data model is implemented; if implemented against a Vertical specific Device specification(s), then the Spec version of the vertical specification this Device model is implemented to.</td>
<td>Yes</td>
<td>&quot;specVersion&quot;</td>
<td>Data model version of the Device</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Permanent Immutable ID</strong></td>
<td>&quot;piid&quot;</td>
<td>A unique and immutable Device identifier. A Client can detect that a single Device supports multiple communication protocols if it discovers that the Device uses a single Permanent Immutable ID value for all the protocols it supports. Handling privacy-sensitivity for the &quot;piid&quot; Property, refer to ISO/IEC 30118-2:2019</td>
<td>Yes</td>
<td>(none)</td>
<td>Translator returns its own value.</td>
<td>No</td>
</tr>
<tr>
<td><strong>Localized Descriptions</strong></td>
<td>&quot;Id&quot;</td>
<td>Detailed description of the Device, in one or more languages. This property is an array of objects where each object has a &quot;language&quot; field (containing an IETF RFC 5646 language tag) and a &quot;value&quot; field containing the Device description in the indicated language.</td>
<td>No</td>
<td>(none)</td>
<td>(none)</td>
<td>No</td>
</tr>
<tr>
<td><strong>Software Version</strong></td>
<td>&quot;sv&quot;</td>
<td>Version of the Device software.</td>
<td>No</td>
<td>&quot;swver&quot;</td>
<td>Software version of the Device</td>
<td>Yes</td>
</tr>
<tr>
<td>Property</td>
<td>Value</td>
<td>Description</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>-----------------------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Platform ID</td>
<td>&quot;pi&quot;</td>
<td>Unique identifier for the physical platform (UUID); 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. Handling privacy-sensitivity for the &quot;pi&quot; Property, refer to ISO/IEC 30118-2:2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer Name</td>
<td>&quot;mnmn&quot;</td>
<td>Name of manufacturer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Model Number</td>
<td>&quot;mmno&quot;</td>
<td>Model number as designated by manufacturer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5 shows the mapping between the properties of "oic.wk.p" Resource Type (see ISO/IEC 30118-1:2018) and the properties of U+ device.

Table 5 – "oic.wk.p" Resource Type definition

<table>
<thead>
<tr>
<th>To OCF Property title</th>
<th>OCF Property name</th>
<th>OCF Description</th>
<th>OCF Mandatory</th>
<th>From U+ Property value</th>
<th>U+ Description</th>
<th>U+ Mandatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platform ID</td>
<td>&quot;pi&quot;</td>
<td>Unique identifier for the physical platform (UUID); 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. Handling privacy-sensitivity for the &quot;pi&quot; Property, refer to ISO/IEC 30118-2:2019</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer Name</td>
<td>&quot;mnmn&quot;</td>
<td>Name of manufacturer</td>
<td>Yes</td>
<td>(none)</td>
<td>Translator generates a UUID as &quot;pi&quot; value.</td>
<td>No</td>
</tr>
<tr>
<td>Model Number</td>
<td>&quot;mmno&quot;</td>
<td>Model number as designated by manufacturer</td>
<td>No</td>
<td>&quot;modelNumber&quot;</td>
<td>The value of property &quot;modelNumber&quot; indicates the model number of the Device.</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 6 shows the mapping between the properties of "oic.wk.con" Resource Type (see ISO/IEC 30118-1:2018) and the properties of U+ device.
Table 6 – oic.wk.con Resource Type definition

<table>
<thead>
<tr>
<th>To OCF Property title</th>
<th>OCF Property name</th>
<th>OCF Description</th>
<th>OCF Mandatory</th>
<th>From U+ Property value</th>
<th>U+ Description</th>
<th>U+ Mandatory</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Device) Name</td>
<td>&quot;n&quot;</td>
<td>Human friendly name configurable by the end user (e.g. Bob's thermostat). The &quot;n&quot; Common Property of the oic.wk.con Core Resource and the &quot;n&quot; Common Property of the &quot;/oic/d&quot; Core Resource shall have the same Value. When the &quot;n&quot; Common Property Value of the oic.wk.con Core Resource is modified, it shall be reflected to the &quot;n&quot; Common Property of &quot;/oic/d&quot; Core Resource.</td>
<td>Yes</td>
<td>&quot;deviceld&quot;</td>
<td>An unique ID of the device</td>
<td>Yes</td>
</tr>
</tbody>
</table>

6.2.3.3 On-the-fly Translation

If a U+ device is not in the well-defined set, the U+ Translator does not translate it.

6.2.3.4 Protocol translation between U+ and OCF

U+ framework is based on the CoAP protocol. There are three operations defined for handling the properties on U+ device. Table 7 shows the mapping between U+ operations and OCF CRUDN operations.

If a U+ translator receives CREATE or DELETE Request from OCF Client, it shall return an error response indicating "Method Not Allowed" due to no corresponding operation in U+ framework.

Table 7 – Mapping of operations between U+ and OCF

<table>
<thead>
<tr>
<th>U+ operation</th>
<th>OCF CRUDN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable</td>
<td>CREATE</td>
</tr>
<tr>
<td>GET</td>
<td>RETRIEVE</td>
</tr>
<tr>
<td>PUT</td>
<td>UPDATE</td>
</tr>
<tr>
<td>Not applicable</td>
<td>DELETE</td>
</tr>
<tr>
<td>GET (Option: COAP_OPTION_OBSERVE)</td>
<td>NOTIFY</td>
</tr>
</tbody>
</table>

The U+ translator shall translate RETRIEVE Request from OCF Client into GET Request to U+ server, and translate corresponding Response from U+ server into RETRIEVE Response back to OCF Client, as in Figure 3.
The U+ translator shall translate UPDATE Request from OCF Client into PUT Request to U+ server, and translate corresponding Response from U+ server into UPDATE Response back to OCF Client, as in Figure 4. The PUT Request shall update all properties needed in the payload, i.e. a full replacement.

The U+ translator shall translate RETRIEVE Request (Observe), i.e. Notification, from OCF Client into GET Request (Option: COAP_OPTION_OBSERVE) to U+ server, and translate corresponding Response from U+ server into RETRIEVE Response (Observe) back to OCF Client, as in Figure 5.
6.2.3.5 Error Handling

If a U+ operation fails, the translator sends an appropriate OCF error response to the OCF Client.

7 Device Type Mapping

7.1 Introduction

This clause contains the mappings from U+ Device Types to OCF Device Types.

7.2 U+ Device Types to OCF Device Types

Table 8 captures the equivalency mapping between U+ Device Types and OCF Device Types.

<table>
<thead>
<tr>
<th>U+ Device Type</th>
<th>OCF Device Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>&quot;oic.d.airconditioner&quot;</td>
</tr>
<tr>
<td>Air Purifier</td>
<td>&quot;oic.d.airpurifier&quot;</td>
</tr>
<tr>
<td>Water Heater</td>
<td>&quot;oic.d.waterheater&quot;</td>
</tr>
</tbody>
</table>

8 Resource to U+ Property Equivalence

8.1 Introduction

This clause lists the U+ Properties and provides the equivalent OCF Resource Type(s) to which the Properties map.

8.2 U+ Property to OCF Resources

Table 9 captures the equivalency mapping between U+ Properties and OCF Resource Types. U+ properties are device type-dependent. The properties with same name may be different within different device types.
Table 9 – U+ Property to OCF Resource Type Mapping

<table>
<thead>
<tr>
<th>U+ Device Type</th>
<th>U+ Property</th>
<th>OCF Resource Type Name</th>
<th>OCF Resource Type ID</th>
<th>OCF Interface(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Conditioner</td>
<td>&quot;onOffStatus&quot;</td>
<td>Binary Switch</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;targetTemperature&quot;</td>
<td>Temperature</td>
<td>&quot;oic.r.temperature&quot;</td>
<td>&quot;oic.if.a&quot;, &quot;oic.if.s&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;windSpeed&quot;</td>
<td>Selectable Levels</td>
<td>&quot;oic.r.selectablelevels&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;operationMode&quot;</td>
<td>Mode</td>
<td>&quot;oic.r.mode&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td>Air Purifier</td>
<td>&quot;onOffStatus&quot;</td>
<td>Binary Switch</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;windSpeed&quot;</td>
<td>Selectable Levels</td>
<td>&quot;oic.r.selectablelevels&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;operationMode&quot;</td>
<td>Mode</td>
<td>&quot;oic.r.mode&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td>Water Heater</td>
<td>&quot;onOffStatus&quot;</td>
<td>Binary Switch</td>
<td>&quot;oic.r.switch.binary&quot;</td>
<td>&quot;oic.if.a&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;targetTemperature&quot;</td>
<td>Temperature</td>
<td>oic.r.temperature</td>
<td>&quot;oic.if.s&quot;, &quot;oic.if.a&quot;</td>
</tr>
</tbody>
</table>

9 Detailed Mapping APIs

9.1 Introduction
This clause provides a Device Type mapping description (using JSON that aligns with the Derived Modelling syntax described in Derived Models for Interoperability between IoT Ecosystems) for all U+ Properties and OCF Resources that are within scope.

9.2 Air Conditioner Mapping

9.2.1 Derived model
The derived model: "uplus.device.airconditioner".

9.2.2 Property definition
Table 10 provides the detailed per Property mapping for "uplus.device.airconditioner".

Table 10 – The Property mapping for "uplus.device.airconditioner".

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>OCF Resource</th>
<th>To OCF</th>
<th>From OCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>oic.r.switch.binary.value</td>
<td>oic.r.switch.value = onOffStatus</td>
<td>onOffStatus=oic.r.switch.value</td>
</tr>
<tr>
<td>targetTemperature</td>
<td>oic.r.temperature.temperature</td>
<td>oic.r.temperature.temperature=targetTemperature</td>
<td>targetTemperature=oic.r.temperature.temperature</td>
</tr>
<tr>
<td>windSpeed</td>
<td>oic.r.selectablelevels</td>
<td>availablelevels=[1,2,3,4,5]targetlevel=windSpeed</td>
<td>windSpeed=targetlevel</td>
</tr>
<tr>
<td>operationMode</td>
<td>oic.r.mode</td>
<td>supportedModes=&quot;[&quot;Auto&quot;,&quot;Cool&quot;,&quot;Dry&quot;,&quot;Warm&quot;,&quot;Wind&quot;]</td>
<td>operationMode= supportedModes.indexof(mode)</td>
</tr>
</tbody>
</table>

Table 11 provides the details of the Properties that are part of "uplus.device.airconditioner".
Table 11 – The Properties of "uplus.device.airconditioner".

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>Type</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>boolean</td>
<td>yes</td>
<td>the switch of air conditioner</td>
</tr>
<tr>
<td>targetTemperature</td>
<td>number</td>
<td>yes</td>
<td>target temperature</td>
</tr>
<tr>
<td>windSpeed</td>
<td>integer</td>
<td>yes</td>
<td>wind speed</td>
</tr>
<tr>
<td>operationMode</td>
<td>integer</td>
<td>yes</td>
<td></td>
</tr>
</tbody>
</table>

9.2.3 Derived model definition

```json
{
  "id": "http://openinterconnect.org/uplusocfmapping/schemas/uplus.device.airconditioner.json#",
  "$schema": "http://json-schema.org/draft-04/schema#",
  "description": "Copyright (c) 2018 Open Connectivity Foundation, Inc. All rights reserved."
  "title": "AirConditioner Mapping",
  "definitions": {
    "uplus.device.airconditioner": {
      "type": "object",
      "properties": {
        "onOffStatus": {
          "type": "boolean",
          "description": "the switch of air conditioner",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.switch.binary.value",
            "x-to-ocf": [
              "oic.r.switch.value = onOffStatus"
            ],
            "x-from-ocf": [
              "onOffStatus=oic.r.switch.value"
            ]
        },
        "targetTemperature": {
          "type": "number",
          "description": "target temperature",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.temperature.temperature",
            "x-to-ocf": [
              "oic.r.temperature.temperature=targetTemperature"
            ],
            "x-from-ocf": [
              "targetTemperature=oic.r.temperature.temperature"
            ]
        },
        "windSpeed": {
          "type": "integer",
          "description": "wind speed",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.selectablelevels",
            "x-to-ocf": [
              "availablelevels=[1,2,3,4,5]",
              "targetlevel=windSpeed"
            ],
            "x-from-ocf": [
              "windSpeed=targetlevel"
            ]
        },
        "operationMode": {
          "type": "integer",
          "description": "",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.mode",
            "x-to-ocf": [
              "supportedModes= ["Auto"","Cool"","Dry"","Warm"","Wind"]",
            ]
        }
      }
    }
  }
}
```
"modes=supportedModes[operationMode]"
},
    "x-from-ocf": {
      "operationMode": supportedModes.indexOf(modes)
    }
  }
}
}
}
{
  "type": "object",
  "allOf": [
    {"$ref": "#/definitions/uplus.device.airconditioner"}
  ],
  "required": ["onOffStatus","targetTemperature","windSpeed","operationMode"]
}

9.3 Air Purifier Mapping

9.3.1 Derived model

The derived model: "uplus.device.airpurifier".

9.3.2 Property definition

Table 12 provides the detailed per Property mapping for "uplus.device.airpurifier".

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>OCF Resource</th>
<th>To OCF</th>
<th>From OCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>oic.r.switch.binary</td>
<td>oic.r.switch.value = onOffStatus</td>
<td>onOffStatus = oic.r.switch.value</td>
</tr>
<tr>
<td>windSpeed</td>
<td>oic.r.selectablevels</td>
<td>availablelevels=[0,1,2,3,4]targetlevel=windSpeed</td>
<td>windSpeed=targetlevel</td>
</tr>
<tr>
<td>operationMode</td>
<td>oic.r.mode</td>
<td>supportedModes=[&quot;Auto&quot;,&quot;Quiet&quot;,&quot;Sleep&quot;]modes=supportedModes[operationMode]</td>
<td>operationMode= supportedModes.indexOf(modes)</td>
</tr>
</tbody>
</table>

Table 13 provides the details of the Properties that are part of "uplus.device.airpurifier".

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>Type</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>boolean</td>
<td>yes</td>
<td>the switch of air purifier</td>
</tr>
<tr>
<td>windSpeed</td>
<td>integer</td>
<td>yes</td>
<td>wind speed</td>
</tr>
<tr>
<td>operationMode</td>
<td>integer</td>
<td>yes</td>
<td></td>
</tr>
</tbody>
</table>

9.3.3 Derived model definition

{ "id": "http://openinterconnect.org/uplusocfmapping/schemas/uplus.device.airpurifier.json#", "schema": "http://json-schema.org/draft-04/schema#", "description": "Copyright (c) 2018 Open Connectivity Foundation, Inc. All rights reserved.", "title": "AirPurifier Mapping", "definitions": { "uplus.device.airpurifier": { "type": "object", "properties": { "onOffStatus": { "type": "boolean", "description": "the switch of air purifier" }, "x-ocf-conversion": { "type": "boolean", "description": "the switch of air purifier" }, "x-ocf-alias": "oic.r.switch.binary.value" } } } }
9.4 Water Heater Mapping

9.4.1 Derived model

The derived model: "uplus.device.waterheater".

9.4.2 Property definition

Table 14 provides the detailed per Property mapping for "uplus.device.waterheater".

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>OCF Resource</th>
<th>To OCF</th>
<th>From OCF</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>oic.r.switch.binary</td>
<td>oic.r.switch.binary.value = onOffStatus</td>
<td>onOffStatus = oic.r.switch.binary.value</td>
</tr>
<tr>
<td>targetTemperature</td>
<td>oic.r.temperature.temperature</td>
<td>oic.r.temperature.temperature=targetTemperature</td>
<td>targetTemperature=oic.r.temperature.temperature</td>
</tr>
</tbody>
</table>

Table 15 provides the details of the Properties that are part of "uplus.device.waterheater".
Table 15 – The Properties of “uplus.device.waterheater”.

<table>
<thead>
<tr>
<th>UPlus Property name</th>
<th>Type</th>
<th>Required</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>onOffStatus</td>
<td>boolean</td>
<td>yes</td>
<td>the switch of water heater</td>
</tr>
<tr>
<td>targetTemperature</td>
<td>number</td>
<td>yes</td>
<td>target temperature</td>
</tr>
</tbody>
</table>

9.4.3 Derived model definition

```json
{
  "id": "http://openinterconnect.org/uplusocfmapping/schemas/uplus.device.waterheater.json#",
  "$schema": "http://json-schema.org/draft-04/schema#",
  "description": "Copyright (c) 2018 Open Connectivity Foundation, Inc. All rights reserved.",
  "title": "WaterHeater Mapping",
  "definitions": {
    "uplus.device.waterheater": {
      "type": "object",
      "properties": {
        "onOffStatus": {
          "type": "boolean",
          "description": "the switch of water heater",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.switch.binary.value",
            "x-to-ocf": ["oic.r.switch.binary.value = onOffStatus"],
            "x-from-ocf": ["onOffStatus = oic.r.switch.binary.value"]
          }
        },
        "targetTemperature": {
          "type": "number",
          "description": "target temperature",
          "x-ocf-conversion": {
            "x-ocf-alias": "oic.r.temperature.temperature",
            "x-to-ocf": ["oic.r.temperature.temperature = targetTemperature"],
            "x-from-ocf": ["targetTemperature = oic.r.temperature.temperature"]
          }
        }
      },
      "type": "object",
      "allOf": ["#/definitions/uplus.device.warterheater"],
      "required": ["onOffStatus","targetTemperature"]
    }
  }
}
```