

OCF Devic e Specifi c ation

**VERSION 2.2.2 | February 2021**

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160 Introduction

1. This document, and all the other parts associated with this document, were developed in response
2. to worldwide demand for smart home focused Internet of Things (IoT) devices, such as appliances,
3. door locks, security cameras, sensors, and actuators; these to be modelled and securely controlled,
4. locally and remotely, over an IP network.
5. While some inter-device communication existed, no universal language had been developed for
6. the IoT. Device makers instead had to choose between disparate frameworks, limiting their market
7. share, or developing across multiple ecosystems, increasing their costs. The burden then falls on
8. end users to determine whether the products they want are compatible with the ecosystem they
9. bought into, or find ways to integrate their devices into their network, and try to solve interoperability
10. issues on their own.
11. In addition to the smart home, IoT deployments in commercial environments are hampered by a
12. lack of security. This issue can be avoided by having a secure IoT communication framework, which
13. this standard solves.
14. The goal of these documents is then to connect the next 25 billion devices for the IoT, providing
15. secure and reliable device discovery and connectivity across multiple OSs and platforms. There
16. are multiple proposals and forums driving different approaches, but no single solution addresses
17. the majority of key requirements. This document and the associated parts enable industry
18. consolidation around a common, secure, interoperable approach.

## 1 Scope

The Device definitions use Resource definitions from [ISO/IEC 30118-4.](#_bookmark5)

This document is built on top of [ISO/IEC 30118-1. ISO/IEC 30118-1](#_bookmark3) specifies the core architecture,

interfaces protocols and services to enable the implementation of profiles for IoT usages and

ecosystems. [ISO/IEC 30118-1](#_bookmark3) also defines the main architectural components of network

connectivity, discovery, data transmission, device & service management and ID & security. The

core architecture is scalable to support simple devices (constrained devices) and more capable

devices (smart devices).

## 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 61850-7-1, Communication networks and systems for power utility automation --Part 7-1:

Basic communication structure -- Principles and models

https://webstore.iec.ch/publication/6014

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

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

IETF RFC 4566, SDP: Session Description Protocol, July 2006

<https://tools.ietf.org/html/rfc4566>

Draft Report: A Basic Classification System for Energy-Using Products--Universal Device

Classification, December 2013

https://eta-intranet.lbl.gov/sites/default/files/lbnl-classification-v1.pdf

## 3 Terms, definitions, and abbreviated terms

### 3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in [ISO/IEC 30118-1](#_bookmark3) and [ISO/IEC](#_bookmark4)

[30118-2](#_bookmark4) and the following apply.

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

addresses:

– ISO Online browsing platform: available at <https://www.iso.org/obp>

– IEC Electropedia: available at <http://www.electropedia.org/>

**3.1.1**

### Actuator

Resource with support of the UPDATE operation.

**3.1.2**

### Sensor

Resource without support of the UPDATE operation.

**3.1.3**

### Healthcare Device

Device that is conformant to the normative requirements contained in [Annex C](#_bookmark68) of this document.

### 3.2 Symbols and Abbreviated terms

1. CGM Continuous Glucose Monitor
2. CRUDN Create Retrieve Update Delete Notify
3. CSV Comma Separated Value
4. NREM Non Rapid Eye Movement
5. REM Rapid Eye Movement
6. REST Representational State Transfer
7. SDP Session Description Protocol
8. UDC Universal Device Classification

## 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. 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 a Device and should be implemented.

Recommended features take advantage of the capabilities a Device, 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 a Device, 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*.

### 4.3 Data types

See [ISO/IEC 30118-1.](#_bookmark3)

### 4.4 Структура документа

В этом документе описаны конкретные требования, регулирующие указание типов устройств на устройствах, а также требования, которые связаны с самими конкретными типами устройств. В документе используются функциональные возможности, определенные в ISO / IEC 30118-1 и ISO / IEC 30118-4.

Приложение A определяет типы устройств, которые должны использоваться устройством OCF.

Приложение B определяет профили, которые должны использоваться устройством OCF, которое является частью вертикали умного дома.

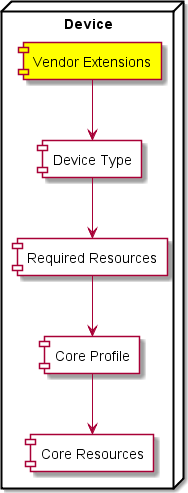
Приложение C определяет профили, которые должны использоваться устройством OCF, которое является частью вертикали здравоохранения.

Приложение D определяет профили, которые должны использоваться устройством OCF, которое является частью промышленной вертикали.

Этот документ дополнительно описывает, какие конструкции используются для устройства и какие ресурсы должны быть реализованы для каждого устройства. Типичное Устройство, состоящее из элементов данных, определенных в ссылочных документах, изображено на Рисунке 1..

## Operational scenarios

### Document version

**Figure 1 – Device building blocks**

Все устройства, соответствующие этому документу, должны добавить строку «ocf.sh.1.3.0» к свойству dmv в oic.wk.d. Это свойство предназначено только для поддержки устаревших устройств и больше не будет пересматриваться в соответствии с версиями документов.

# 6 Core resource model

## 6.1 Introduction

The Core Resource model is described in [ISO/IEC 30118-1.](#_bookmark3)

## 6.2 Тип устройства

Тип устройства - это специализация имени типа ресурса, он используется для заполнения свойства «rt» в «/oic/d» и, таким образом, обеспечивает индикатор типа физического устройства, моделируемого сервером. Все типы устройств, определенные в этом документе, имеют имя типа ресурса («rt») с префиксом «oic.d.»

Примеры типов устройств:

– oic.d.fan

– oic.d.thermostat

Полный список определенных имен и типов устройств приведен в таблице A.2, приложении B, приложении C, приложении D и приложении E, в котором подробно описаны минимальные ресурсы, которые Устройство должно реализовать для определенного типа устройства, если это требуется по вертикали. . Устройство может предоставлять дополнительные ресурсы OCF и сторонних разработчиков, кроме указанных в этих Приложениях.

ISO / IEC 30118-1 определяет ресурс устройства с URI «/oic/d». Устройство должно включать в Свойство «rt» элемента «/oic/d» Тип устройства (или Типы устройств) из Таблицы A.2 или Тип устройства, указанный Третьей стороной (см. Пункт 6.4) физического устройства, на котором размещается Сервер; включение типа устройства должно быть выполнено с использованием одного из методов, предусмотренных пунктом 11.3.4 ИСО / МЭК 30118-1 (т. е. добавление к массиву значений).

ИСО / МЭК 30118-1 поддерживает включение типа устройства как части типа ресурса коллекции (см. Также пункт 7.4), в таких случаях коллекция должна включать типы ресурсов, определенные в этом документе как обязательные для типа устройства. Например, если ресурс коллекции имеет значение «rt», равное [«oic.d.light»], коллекция включает в себя экземпляр «oic.r.switch.binary», который является обязательным для «oic.d.light». "согласно пункту B.1.

Следовательно, Устройство может быть обнаружено путем добавления запроса для «rt» самого типа устройства (например, «? Rt = oic.d.fan») в метод обнаружения конечной точки многоадресной рассылки (см. Пункт 8.1).

## 6.3 Profile of [ISO/IEC 30118-1](#_bookmark3)

В этом разделе описывается профилирование основных ресурсов, а также транспортных механизмов и функций, определенных в ИСО / МЭК 30118-1.

Требуемые ресурсы ISO / IEC 30118-1 также требуются для реализации профиля.

В дополнение к требуемым ресурсам должны потребоваться дополнительные ресурсы ISO / IEC 30118-1 из таблицы 1.

### Table 1 – Required resources for devices

|  |  |
| --- | --- |
| **Resource ("rt")** | **Required in Profile** |
| Умышленно оставлено пустым | Умышленно оставлено пустым |

Для каждого из ресурсов, перечисленных в Таблице 1, в Таблице 2 подробно описаны свойства в тех ресурсах, которые должны потребоваться.

### Table 2 – Required properties in resource

|  |  |  |
| --- | --- | --- |
| **Resource ("rt")** | **Property name** | **Required in Profile** |
| Intentionally left blank | Intentionally left blank | Intentionally left blank |

Устройство должно поддерживать обнаружение конечных точек на основе CoAP, как определено в пункте 10.3 ISO / IEC 30118-1.

Протокол обмена сообщениями для Устройства должен быть CoAP (см. ИСО / МЭК 30118-1).

Устройство должно поддерживать сетевой уровень, как определено в пункте 9 ISO / IEC 30118-1, включая любые необходимые определенные функции моста, которые обеспечивают взаимодействие с IPv6.

## 6.4 Third (3rd) party specified extensions

В этом пункте описывается, как третья сторона может добавлять типы устройств, типы ресурсов, свойства, определенные третьей стороной, к существующему или определенному третьей стороной типу ресурса, значения перечисления, определенные третьей стороной, в существующее перечисление и параметры, определенные третьей стороной, к существующему определенному свойству.

Третья сторона может указать дополнительные (не-OCF) ресурсы в устройстве OCF. Третья сторона может также указать дополнительные свойства в рамках существующего типа ресурса, определенного OCF. Кроме того, третья сторона может расширить перечисление, определяемое OCF, значениями, определяемыми третьей стороной.

Тип устройства, определенный третьей стороной, может предоставлять типы ресурсов как сторонней организации, так и типы ресурсов, определенные OCF. Тип устройства, определенный третьей стороной, должен предоставлять обязательные ресурсы для всех устройств OCF, определенных в этом документе.

Тип ресурса, определенный третьей стороной, должен включать любые обязательные Свойства, определенные в этом документе, а также любые определенные обязательные свойства по вертикали. Все свойства, определенные в определенном сторонним типе ресурса, которые являются частью пространства имен OCF, но не являются общими свойствами, как определено в этом документе, должны соответствовать правилам свойств, определенным третьей стороной в таблице 3.

В таблице 3 определены правила синтаксиса для элементов типа ресурса, определенных сторонними организациями. В таблице термин «имя\_домена» относится к имени домена, принадлежащему третьей стороне, определяющей новый элемент.

### Table 3 – 3rd party defined Resource elements

|  |  |  |
| --- | --- | --- |
|  | **Resource Element** | **Vendor Definition Rules** |
| New 3rd party defined Device Type | "rt" Property Value of "/oic/d" | "x.<Domain\_Name>.<Resource identification>" |
| New 3rd party defined Resource Type | "rt" Property Value | "x.<Domain\_Name>.<Resource identification>" |
| New 3rd party defined Property within the OCF namespace | Property Name | "x.<Domain\_Name>.<Property>" |
| Additional 3rd party defined values in an OCF specified enumeration | Enumeration Property Value | "x.<Domain\_Name>.<enum value>" |
| Additional 3rd party defined  Parameter in an OCF specified Property | Parameter key word | x.<Domain\_Name>.<parameter keyword> |

Что касается использования Domain\_Name в этой схеме, метки инвертированы по сравнению с тем, как они отображаются в DNS или других механизмах разрешения. Тип устройства и тип ресурса, определенные третьей стороной, в остальном подчиняются правилам, определенным в ISO / IEC 30118-1. Типы ресурсов, определенные третьей стороной, должны быть зарегистрированы в реестре параметров IANA Constrained RESTful Environments (CoRE).

Например:

x.com.samsung.galaxyphone.accelerator

x.com.cisco.ciscorouterport

x.com.hp.printerhead

x.org.allseen.newinterface.newproperty

## 6.5 Семантические теги

### 6.5.1 Введение

Семантические теги - это метаинформация, связанная с конкретным экземпляром ресурса, которая представлена как параметрами ссылки, так и свойствами ресурса, которые обеспечивают механизм, посредством которого ресурс аннотируется дополнительными контекстными метаданными, которые помогают описать ресурс.

Требования определены в ИСО / МЭК 30118-1, но пункты 6.5.2 и 6.5.3 определяют дополнительные специфические требования к Устройству.

### 6.5.2 "tag-pos-desc" или описание позиции Семантический тег

В дополнение к требованиям, определенным в ISO / IEC 30118-1, будут применяться следующие требования:

- Этот семантический тег не должен содержать каких-либо значений, определенных третьей стороной (см. Пункт 6.4).– This Semantic Tag should not contain any 3rd party defined values (see clause [6.4](#_bookmark26)).

|  |  |
| --- | --- |
|  | |
|  |  |
|  |  |
| **6.5.3** | **"tag-func-desc" or function description Semantic Tag** |

В дополнение к требованиям, определенным в ISO / IEC 30118-1, будут применяться следующие требования:

- Этот семантический тег при отображении должен быть заполнен значением из поддерживаемого в настоящее время набора стандартизованных значений перечисления, определенного в пункте B.2.2.

- Этот семантический тег не должен содержать каких-либо значений, определенных третьей стороной (см. Пункт 6.4).

# 7 Моделирование нескольких логических устройств

## 7.1 Введение

Физическое Устройство может быть смоделировано как одна Платформа и Устройство, одна Платформа с несколькими Устройствами, несколько отдельно обнаруживаемых дискретных Платформ и Устройств или как одна Платформа и Устройство, где Устройство представлено как состав других Устройств.

Например, дверь, которая включает в себя функции датчика контакта, замка и камеры, может быть смоделирована как одноплатформенное, многоплатформенное или составное устройство. Каждый из этих трех вариантов будет подробно описан в пунктах 7.2, 7.3 и 7.4.

## 7.2 Модель с одной платформой

Физическое Устройство предоставляет одно или несколько логических Устройств, которые могут быть обнаружены независимо (т. Е. Они по отдельности отвечают на многоадресные сообщения запроса на обнаружение, как определено в пункте 11.3 ИСО / МЭК 30118-1). В примере с дверью может быть один ответ обнаружения с экземпляром «/ oic / d», который предоставляет один тип устройства (например, «oic.d.door») или несколько ответов обнаружения, каждый ответ имеет один тип устройства. в «rt» из «/ oic / d», который представляет логическое устройство. Общим знаменателем является то, что для всех обнаруженных логических устройств свойства «/ oic / p» имеют одинаковые значения.

## 7.3 Мультиплатформенная модель

Как и в модели с одной платформой, одно или несколько логических Устройств, составляющих физическое Устройство, независимо отвечают на многоадресные сообщения запроса на обнаружение и предоставляют свои собственные Ресурсы. Как и в одноплатформенной модели, каждое логическое Устройство предоставляет один Тип устройства в значении «rt» в «/ oic / d». Отличие от одноплатформенной модели состоит в том, что каждое логическое Устройство не имеет одинаковых значений свойств «oic / p».

## 7.4 Составная модель устройства

При моделировании Сервера как Составного устройства должна быть одна Платформа, которая представляет Составное Устройство. Значение свойства типа ресурса "/ oic / d" должно содержать все типы устройств для устройств, составляющих составное устройство. Для каждого Устройства, которое является частью Составного Устройства при использовании этого подхода, должна существовать Коллекция, которая представляет одно из отдельных Устройств в составе. Кроме того, каждая Коллекция должна иметь Тип ресурса, который как минимум включает Тип устройства, который представляет Коллекция (например, ["oic.d.door"]).

На рисунке 2 показан ответ на запрос обнаружения с использованием базового интерфейса на «/ oic / res» для составного устройства, смоделированного, как описано в этом пункте. На рисунке 3 показан ответ на одноадресный запрос RETRIEVE с использованием базового интерфейса для Коллекции, представляющего дверное Устройство.

[

{

"rt": ["oic.wk.res"],

"if": ["oic.if.baseline", "oic.if.ll" ], "links":

[

{

"anchor": "ocf://dc70373c-1e8d-4fb3-962e-017eaa863989", "href": "/oic/d",

"rt": ["oic.wk.d","oic.d.door","oic.d.sensor","oic.d.lock","oic.d.camera"], "if": ["oic.if.r","oic.if.baseline"],

"p": {"bm": 3},

"eps": [{"ep": "coap://[fe80::b1d6]:1111"}]

},

{

"anchor": "ocf://dc70373c-1e8d-4fb3-962e-017eaa863989", "href": "/mydevice/mydoor",

"rt": ["oic.d.door"],

"if": ["oic.if.ll","oic.if.baseline","oic.if.r"], "p": {"bm": 3},

"eps": [{"ep": "coaps://[fe80::b1d6]:1111"}]

},

{

"anchor": "ocf://dc70373c-1e8d-4fb3-962e-017eaa863989", "href": "/mydevice/mysensor",

"rt": ["oic.d.sensor"],

"if": ["oic.if.ll","oic.if.baseline","oic.if.r"], "p": {"bm": 3},

"eps": [{"ep": "coaps://[fe80::b1d6]:1111"}]

},

{

"anchor": "ocf://dc70373c-1e8d-4fb3-962e-017eaa863989", "href": "/mydevice/mylock",

"rt": ["oic.d.lock"],

"if": ["oic.if.ll","oic.if.baseline","oic.if.r"], "p": {"bm": 3},

"eps": [{"ep": "coaps://[fe80::b1d6]:1111"}]

},

{

"anchor": "ocf://dc70373c-1e8d-4fb3-962e-017eaa863989", "href": "/mydevice/mycamera",

"rt": ["oic.d.camera"],

"if": ["oic.if.ll","oic.if.baseline","oic.if.r"], "p": {"bm": 3},

"eps": [{"ep": "coaps://[fe80::b1d6]:1111"}]

}

]

}

]

### Figure 2 – Example composite device model

{

"rt": ["oic.d.door"],

"if": ["oic.if.ll","oic.if.r","oic.if.baseline"], "id": "unique\_example\_id",

"di": "dc70373c-1e8d-4fb3-962e-017eaa863989",

"icv": "ocf.1.3.0",

"dmv": "ocf.res.1.3.0, ocf.sh.1.3.0",

"piid": "6F0AAC04-2BB0-468D-B57C-16570A26AE48",

"links": [

{

"href": "/mydoor/openlevel", "rt": ["oic.r.openlevel"],

"if": ["oic.if.a", "oic.if.baseline"],

"p": {"bm": 2},

"eps": [

{"ep": "coaps://[fe80::b1d6]:1122"}

]

}

]

}

**Figure 3 – RETRIEVE response to example door from composite device model**

# 8.Открытие

## 8.1 Обнаружение конечной точки

Клиенты могут обнаруживать Серверы с помощью механизмов, определенных в пункте 10 стандарта ISO / IEC 30118-1. Клиент может заполнить параметр запроса «rt» Типами устройств, которые Клиент хочет обнаружить, или если не указан параметр запроса «rt». то поиск выполняется для всех доступных типов устройств независимо.

Устройства могут быть обнаружены по типу устройства или реализованному типу ресурса. Это различие выражается заполнением любого параметра запроса «rt», включенного как часть обнаружения (см. Пункт 439 11.3 ИСО / МЭК 30118-1).

Значения, которые могут использоваться для обнаружения определенного типа устройства, перечислены в таблице A.2. Значения, которые могут использоваться для обнаружения определенного типа ресурса, перечислены в разделе 6 ISO / IEC 442 30118-4.

Процесс обнаружения предоставляет базовый URI устройства, которое выступает в качестве сервера для клиента. 44 Структура обнаруженного устройства затем может быть получена с помощью Resource Discovery.

## 8.2 Обнаружение ресурсов

Пункт намеренно оставлен пустым

447

# 9 Безопасность

Устройство должно реализовывать обязательные виртуальные ресурсы безопасности, указанные в ISO / IEC 30118-2. Кроме того, все открытые ресурсы, определенные ИСО / МЭК 30118-4, должны быть доступны по крайней мере через одну безопасную конечную точку (т. Е. Использование указателя схемы «coaps» или «coaps + tcp» в параметре «eps», предоставляемом / oic / res; см. ИСО / МЭК 30118-1, пункт 10.2.4). Устройство не должно предоставлять ресурсы, определенные ИСО / МЭК 30118-4, с использованием незащищенных конечных точек (т. Е. Указатель схемы «coap» или «coap + tcp» в параметре «eps»).

За исключением тех Ресурсов, связанных с обнаружением, которые явно определены в ИСО / МЭК 30118-1 как не требующие защищенного доступа (см. ИСО / МЭК 30118-1, пункт 11.3.4), все другие Ресурсы, определенные в ИСО / МЭК 30118- 1, реализованный в устройстве «умный дом», должен быть доступен по крайней мере через одну защищенную конечную точку (т. Е. Использование локатора схемы «coaps» или «coaps + tcp» в параметре «eps», предоставляемом / oic / res). Точно так же любые ресурсы, определенные в ИСО / МЭК 30118-1, которые не требуют незащищенного доступа, не перечисленные в / oic / res, также должны быть доступны через «coaps» или «coaps + tcp».

462 **Annex A**

463 (normative)

464

# 465 Device categories and device types

## A.1 Device categories

Устройства сгруппированы по категориям устройств на основе Универсальной классификации устройств (UDC) (см. Базовая система классификации энергопотребляющих продуктов - Универсальная классификация устройств), все категории устройств перечислены в таблице A.1.

### Table A.1 – List of device categories

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Category Name** |  | **Description** |  |
| Space Conditioning | Кондиционирование помещений | Heating and cooling systems | Системы отопления и охлаждения |
| Lighting | Освещение |  |  |
| Appliance | Прибор | Also known as "white goods"; covers major appliances only. | Также известен как «бытовая техника»; распространяется только на основные приборы. |
| Electronics | Электроника | Personal electronics | Персональная электроника |
| Miscellaneous | Разное | Small appliances, other | Мелкая бытовая техника, прочее |
| Infrastructure | Инфраструктура | Physical building and infrastructure | Физическое здание и инфраструктура |
| Transportation | Транспорт | Vehicles, fixed devices that provide movement (e.g. Escalators) | Транспортные средства, стационарные устройства, обеспечивающие движение (например, эскалаторы) |
| Fitness | Фитнес | Includes lifestyle | Включает образ жизни |
| Medical | Медицинское |  |  |
| Personal Health | Личное здоровье |  |  |
| Other | Другой |  |  |

**A.2 Device types**

Полная классификация универсальных устройств с типами устройств по категориям устройств приведена в таблице A.2. Обратите внимание, что не все Устройства в классификации UDC имеют эквивалентные типы устройств, определенные OCF. Все определенные типы устройств имеют форму «oic.d. <thing>», где <thing> - это одиночная буквенно-цифровая строка (только строчные буквы [a..z], [0..9]) не более 24 символов в длина, обеспечивающая общую максимальную длину типа устройства 32 символа. Если требуется сокращенная форма типа устройства (применима только к заполнению IE маяка Wi-Fi), тогда "oic.d." часть Типа устройства может быть опущена.

В таблице A.2 не указаны обязательные ресурсы, которые реализуются экземпляром такого типа устройства; набор применимых обязательных ресурсов зависит от домена приложения. В этом документе указаны следующие домены: Smart Home, Healthcare. Столбец «Ссылка» в таблице ссылается на конкретные вертикальные приложения, в которых тип устройства уточняется (например, обязательные ресурсы).

### Table A.2 – Per category list of device types

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Device  Category Name | UDC Device Name | Device Name | Device Type (Normative) | Reference |
| Space  Conditioning | Unitary System | Air Conditioner | oic.d.airconditioner | [B.1](#_bookmark49) |
|  | Boiler | Water Heater | oic.d.waterheater | [B.1](#_bookmark49) |
|  | Furnace | Furnace | oic.d.furnace |  |
|  | Pump | Pump | oic.d.pump |  |
|  | Fan | Fan | oic.d.fan | [B.1](#_bookmark49) |
|  | Condensing Unit | Condensing Unit | oic.d.condensingunit |  |
|  | Condenser | Condenser | oic.d.condenser |  |
|  | Humidifier | Humidifier | oic.d.humidifier | [B.1](#_bookmark49) |
|  | Dehumidifier | Dehumidifier | oic.d.dehumidifier | [B.1](#_bookmark49) |
|  | HVAC –Control | Thermostat | oic.d.thermostat | [B.1](#_bookmark49) |
|  | HVAC - Other | HVAC | oic.d.hvac |  |
|  |  | Air Purifier | oic.d.airpurifier | [B.1](#_bookmark49) |
|  |  | Air Quality Monitor | oic.d.airqualitymonitor | [B.1](#_bookmark49) |
|  |  |  |  |  |
| Lighting | Lighting - Controls | Lighting Controls | oic.d.lightingcontrol |  |
|  | Lighting - Other | Light | oic.d.light | [B.1](#_bookmark49) |
|  |  |  |  |  |
| Appliance | Airer | Airer | oic.d.airer | [B.1](#_bookmark49) |
|  | Clothes Dryer | Dryer (Laundry) | oic.d.dryer | [B.1](#_bookmark49) |
|  | Clothes Washer | Washer (Laundry) | oic.d.washer | [B.1](#_bookmark49) |
|  | Clothes Washer Dryer | oic.d.washerdryer | [B.1](#_bookmark49) |
|  | Dishwasher | Dishwasher | oic.d.dishwasher | [B.1](#_bookmark49) |
|  | Freezer | Freezer | oic.d.freezer | [B.1](#_bookmark49) |
|  | Ice Machine | Ice Machine | oic.d.icemachine |  |
|  | Indoor Garden | Indoor Garden | oic.d.indoorgarden | [B.1](#_bookmark49) |
|  | Mattress | Mattress | oic.d.mattress | [B.1](#_bookmark49) |
|  | Oven | Oven | oic.d.oven | [B.1](#_bookmark49) |
|  | Range | Range | oic.d.range |  |
|  | Refrigerator | Refrigerator | oic.d.refrigerator | [B.1](#_bookmark49) |
|  | Water Heater | Water Heater | oic.d.waterheater | [B.1](#_bookmark49) |
|  | Water Purifier | Water Purifier | oic.d.waterpurifier | [B.1](#_bookmark49) |
|  | Appliance – Other | Cooker Hood | oic.d.cookerhood | [B.1](#_bookmark49) |
|  | Cooktop | oic.d.cooktop | [B.1](#_bookmark49) |
|  | Steam Closet | oic.d.steamcloset | [B.1](#_bookmark49) |
|  |  |  |  |  |
| Electronics | Audio System | Audio System | oic.d.audiosystem |  |
|  | A/V Player | AV Player | oic.d.avplayer |  |
|  | Camera | Camera | oic.d.camera | [B.1](#_bookmark49) |
|  | Computer – Desktop | Desktop PC | oic.d.desktoppc |  |
|  | Computer - Notebook | Notebook PC | oic.d.notebookpc |  |
|  | Computer - Server | Server | oic.d.server |  |
|  | Computer – Other | Computer | oic.d.pc |  |
|  | Data Storage | Data Storage Unit | oic.d.datastorageunit |  |
|  | Display | Display | oic.d.display |  |
|  | Electronics - Portable | Portable Electronics | oic.d.portableelectronics |  |
|  | Game Console | Game Console | oic.d.gameconsole |  |
|  | Imaging Equipment | 3D Printer | oic.d.3dprinter | [B.1](#_bookmark49) |
|  | Printer | oic.d.printer | [B.1](#_bookmark49) |
|  | Printer Multi- Function | oic.d.multifunctionprinter | [B.1](#_bookmark49) |
|  | Scanner | oic.d.scanner | [B.1](#_bookmark49) |
|  | Musical Instrument | Musical Instrument | oic.d.musicalinstrument |  |
|  | Networking Equipment | Networking Equipment | oic.d.networking |  |
|  | Phone Handset | Handset | oic.d.handset |  |
|  | Receiver | Receiver | oic.d.receiver | [B.1](#_bookmark49) |
|  | Set Top Box | Set Top Box | oic.d.stb | [B.1](#_bookmark49) |
|  | Telephony | Telephony | oic.d.telephonydevice |  |
|  | Television | Television | oic.d.tv | [B.1,](#_bookmark49) [B.4.1](#_bookmark67) |
|  | A/V - Other | Active Speaker | oic.d.speaker |  |
|  | Electronics – Other | Electronics | oic.d.smallelectrical |  |
|  |  |  |  |  |
| Miscellaneous | Air Compressors | Air Compressor | oic.d.aircompressor |  |
|  | Bathroom Device | Bathroom General | oic.d.bathroomdevice |  |
|  | Battery Charger | Battery Charger | oic.d.batterycharger |  |
|  | Business Equipment | Business Equipment | oic.d.businessequipment |  |
|  | Cleaning Equipment | Robot Cleaner | oic.d.robotcleaner | [B.1](#_bookmark49) |
|  | Cooking – Portable | Portable Stove | oic.d.portablestove |  |
|  | Exercise Machine | Exercise Machine | oic.d.exercisemachine |  |
|  | HVAC –Portable | Portable HVAC | oic.d.hvacportable |  |
|  | Industrial | Optical augmented RFID Reader | oic.d.orfid | [D.1](#_bookmark117) |
|  | Kitchen | Coffee Machine | oic.d.coffeemachine | [B.1](#_bookmark49) |
|  | Food Probe | oic.d.foodprobe | [B.1](#_bookmark49) |
|  | Grinder | oic.d.grinder | [B.1](#_bookmark49) |
|  | Kettle | oic.d.kettle | [B.1](#_bookmark49) |
|  | Lighting – Decorative | Decorative Lighting | oic.d.lightdecorative |  |
|  | Lighting – Emergency | Emergency Lighting | oic.d.lightemergency |  |
|  | Microwave Oven | Microwave Oven | oic.d.microwave | [B.1](#_bookmark49) |
|  | Vending Machine | Vending Machine | oic.d.vendingmachine |  |
|  | Water Dispenser | Water Dispenser | oic.d.waterdispenser |  |
|  | Miscellaneous  - Other | Battery | oic.d.battery | [B.1,](#_bookmark49) [E.3](#_bookmark128) |
|  |  |  |  |  |
| Infrastructure | Breakers | Water Valve | oic.d.watervalve | [B.1](#_bookmark49) |
|  | Doors/Window s | Blind | oic.d.blind | [B.1](#_bookmark49) |
|  | Door | oic.d.door | [B.1](#_bookmark49) |
|  | Garage Door | oic.d.garagedoor | [B.1](#_bookmark49) |
|  | Smart Lock | oic.d.smartlock | [B.1](#_bookmark49) |
|  | Window | oic.d.window | [B.1](#_bookmark49) |
|  | Fireplace | Fireplace | oic.d.fireplace |  |
|  | Pump | Pump | oic.d.pump |  |
|  | Power - Portable | Energy Generator | oic.d.energygenerator | [B.1](#_bookmark49) |
|  | Smart Plug | oic.d.smartplug | [B.1](#_bookmark49) |
|  | Power - Fixed | Arc Fault Circuit Interrupter | oic.d.afci | [B.1](#_bookmark49) |
|  | Circuit Breaker | oic.d.circuitbreaker | [E.3](#_bookmark128) |
|  | Ground Fault Circuit Interrupter | oic.d.gfci | [B.1](#_bookmark49) |
|  | Inverter | oic.d.inverter | [E.3](#_bookmark128) |
|  | PV Array System | oic.d.pvarraysystem | [E.3](#_bookmark128) |
|  | Switch | oic.d.switch | [B.1](#_bookmark49) |
|  | Security | Security Panel | oic.d.securitypanel | [B.1](#_bookmark49) |
|  | Sensors | Generic Sensor | oic.d.sensor | [B.1](#_bookmark49) |
|  | Meter | Electric Meter | oic.d.electricmeter | [B.1](#_bookmark49) |
|  | Energy Monitor | oic.d.energymonitor | B.1 |
|  |  |  |  |  |
| Transportation | Transport - Other | Electric Vehicle Charger | oic.d.electricvehiclecharger | [B.1](#_bookmark49) |
|  |  |  |  |  |
| Fitness |  | Fitness Device | oic.d.fitnessdevice |  |
|  |  | Activity Tracker | oic.d.activitytracker | [C.4](#_bookmark74) |
|  |  | Blood Pressure Monitor | oic.d.bloodpressuremonitor | [C.4](#_bookmark74) |
|  |  | Body Thermometer | oic.d.bodythermometer | [C.4](#_bookmark74) |
|  |  | Cycling Power Meter | oic.d.cyclingpowermeter | [C.4](#_bookmark74) |
|  |  | Cycling Speed Sensor | oic.d.cyclingspeedsensor | [C.4](#_bookmark74) |
|  |  | Cycling Cadence Sensor | oic.d.cyclingcadencesensor | [C.4](#_bookmark74) |
|  |  | Heart Rate Monitor | oic.d.heartratemonitor | [C.4](#_bookmark74) |
|  |  | Muscle Oxygen Monitor | oic.d.muscleoxygenmonitor | [C.4](#_bookmark74) |
|  |  |  |  |  |
| Medical |  | Blood Pressure Monitor | oic.d.bloodpressuremonitor | [C.4](#_bookmark74) |
|  |  | Body Scale | oic.d.bodyscale | [C.4](#_bookmark74) |
|  |  | Body Thermometer | oic.d.bodythermometer | [C.4](#_bookmark74) |
|  |  | CGM | oic.d.cgm | [C.4](#_bookmark74) |
|  |  | Glucose Meter | oic.d.glucosemeter | [C.4](#_bookmark74) |
|  |  | Heart Rate Monitor | oic.d.heartratemonitor | [C.4](#_bookmark74) |
|  |  | Medical Device | oic.d.medicaldevice |  |
|  |  | Pulse Oximeter | oic.d.pulseoximeter | [C.4](#_bookmark74) |
|  |  | Sleep Monitor | oic.d.sleepmonitor | [C.4](#_bookmark74) |
|  |  |  |  |  |
|  |  |  |  |  |
| Personal Health |  | Activity Tracker | oic.d.activitytracker | [C.4](#_bookmark74) |
|  |  | Blood Pressure Monitor | oic.d.bloodpressuremonitor | [C.4](#_bookmark74) |
|  |  | Body Composition Analyser | oic.d.bodycompositionanalys er | [C.4](#_bookmark74) |
|  |  | Body Scale | oic.d.bodyscale | [C.4](#_bookmark74) |
|  |  | Body Thermometer | oic.d.bodythermometer | [C.4](#_bookmark74) |
|  |  | CGM | oic.d.cgm | [C.4](#_bookmark74) |
|  |  | Glucose Meter | oic.d.glucosemeter | [C.4](#_bookmark74) |
|  |  | Heart Rate Monitor | oic.d.heartratemonitor | [C.4](#_bookmark74) |
|  |  | Personal Health Device | oic.d.personalhealthdevice |  |
|  |  | Pulse Oximeter | oic.d.pulseoximeter | [C.4](#_bookmark74) |
|  |  | Sleep Monitor | oic.d.sleepmonitor | [C.4](#_bookmark74) |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
| Other | Other |  | oic.d.unknown |  |
|  |  | Access Management Service | oic.d.ams |  |
|  |  | Credential Management Service | oic.d.cms |  |
|  |  | Device Ownership Transfer Service | oic.d.dots |  |

485 **Annex B**

486 (normative)

487

# 488 Smart home device types

## B.1 Smart home required resources per device type

Типы устройств могут требовать реализации определенных Ресурсов. Требуемый ресурс для каждого типа устройства, если требуется, указан в таблице B.1. Кроме того, определенные ресурсы, которые используют значения перечисления для обозначения поддерживаемых состояний или режимов, могут требовать использования стандартизованных значений перечисления. Обязательные разрешенные значения указаны для каждого применимого типа ресурса, интересующего свойства для этого типа ресурса и для какого типа устройства он применяется.

Согласно таблице B.1, некоторые типы устройств поддерживают два экземпляра одного и того же типа ресурса. В этом случае ресурсы должны поддерживать различные действия CRUDN, например один ресурс действует как датчик (запись действия CRUDN не поддерживается), а другой ресурс действует как исполнительный элемент (операции чтения и записи CRUDN поддерживаются как минимум), если не указано иное.

### Table B.1 – Alphabetical list of device types ("rt"), including required resources for smart

1. **home**

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Name (informative)** | **Device Type ("rt") (Normative)** | **Required Resource name** | **Required Resource Type** |
| 3D Printer | oic.d.3dprinter | Binary Switch | oic.r.switch.binary |
| 3D Printer | oic.r.printer.3d |
| Operational State | oic.r.operational.state |
| Temperature | oic.r.temperature |
| Print Queue | oic.r.printer.queue |
| Active Speaker | oic.d.speaker | Binary Switch | oic.r.switch.binary |
| Audio Controls | oic.r.audio |
| Airer | oic.d.airer | Binary Switch | oic.r.switch.binary |
| Linear Movement Controls | oic.r.movement.linear |
| Air Conditioner | oic.d.airconditioner | Binary Switch | oic.r.switch.binary |
| Temperature | oic.r.temperature |
| Air Purifier | oic.d.airpurifier | Binary Switch | oic.r.switch.binary |
| Air Quality Monitor | oic.d.airqualitymonitor | Air Quality Collection | oic.r.airqualitycollection |
| Arc Fault Circuit Interrupter | oic.d.afci | Fault Interrupter Switch | oic.r.switch.fault |
| Battery | oic.d.battery | Battery | oic.r.battery |
| Blind | oic.d.blind | Open Level | oic.r.openlevel |
| Camera | oic.d.camera | Media | oic.r.media |
| Clothes Washer Dryer | oic.d.washerdryer | Binary Switch | oic.r.switch.binary |
|  |  | Operational State | oic.r.operational.state |
| Coffee Machine | oic.d.coffeemachine | Binary Switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Cooker Hood | oic.d.cookerhood | Airflow Control | oic.r.airflowcontrol |
|  |  | Binary Switch | oic.r.switch.binary |
|  |  | Mode | oic.r.mode |
| Cooktop | oic.d.cooktop | Heating Zone Collection | oic.r.heatingzonecollection |
| Dehumidifier | oic.d.dehumidifier | Binary Switch | oic.r.switch.binary |
|  |  | Humidity | oic.r.humidity |
| Dishwasher | oic.d.dishwasher | Binary Switch | oic.r.switch.binary |
| Mode | oic.r.mode |
| Door | oic.d.door | Open Level | oic.r.openlevel |
| Dryer (Laundry) | oic.d.dryer | Binary switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Electric Vehicle Charger | oic.d.electricvehiclecharger | Binary Switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Battery | oic.r.battery |
| Vehicle Connector | oic.r.vehicleconnector |
| Electric Meter | oic.d.electricmeter | Energy Consumption | oic.r.energy.consumption |
| Energy Generator | oic.d.energygenerator | Energy Generation | oic.r.energy.generation |
| Energy Monitor | oic.d.energymonitor | One of: Energy  Consumption, Gas Consumption | oic.r.energy.consumption or oic.r.gas.consumption |
| Fan | oic.d.fan | Binary Switch | oic.r.switch.binary |
| Food Probe | oic.d.foodprobe | Temperature (Sensor) | oic.r.temperature |
| Freezer | oic.d.freezer | Temperature(2)(1 Sensor and 1 Actuator) | oic.r.temperature |
| Garage Door | oic.d.garagedoor | Door | oic.r.door |
| Generic Sensor | oic.d.sensor | Any Resource Type that supports and  exposes in "/oic/res" the oic.if.s interface. | oic.r. <x>  Where this equates to any Resource Type that supports the oic.if.s  Interface. |
| Grinder | oic.d.grinder | Operational State | oic.r.operational.state |
| Grinder Settings | oic.r.grinder |
| Ground Fault Circuit  Interrupter | oic.d.gfci | Fault Interrupter Switch | oic.r.switch.fault |
| Humidifier | oic.d.humidifier | Binary Switch | oic.r.switch.binary |
| Kettle | oic.d.kettle | Binary Switch | oic.r.switch.binary |
| Light | oic.d.light | Binary Switch | oic.r.switch.binary |
| Indoor Garden | oic.d.indoorgarden | Binary Switch | oic.r.switch.binary |
| Mattress | oic.d.mattress | Binary Switch | oic.r.switch.binary |
| Mode | oic.r.mode |
| Oven | oic.d.oven | Binary Switch | oic.r.switch.binary |
| Temperature (2) (1 Sensor and 1  Actuator) | oic.r.temperature |
| Printer | oic.d.printer | Binary Switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Printer Multi- Function | oic.d.multifunctionprinter | Binary switch | oic.r.switch.binary |
| Operational State (2)a | oic.r.operational.state |
| Automatic Document Feeder | oic.r.automaticdocumentfeederb |
| Receiver | oic.d.receiver | Binary Switch | oic.r.switch.binary |
| Audio Controls | oic.r.audio |
| Media Source List (2) | oic.r.media.input, oic.r.media.output |
| Refrigerator | oic.d.refrigerator | Temperature (2) (1 Sensor and 1  Actuator) | oic.r.temperature |
| Robot Cleaner | oic.d.robotcleaner | Binary Switch | oic.r.switch.binary |
| Mode | oic.r.mode |
| Scanner | oic.d.scanner | Binary Switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Automatic Document Feeder | oic.r.automaticdocumentfeeder |
| Security Panel | oic.d.securitypanel | Mode | oic.r.mode |
| Set Top Box | oic.d.stb | Binary Switch | oic.r.switch.binary |
| Smart Lock | oic.d.smartlock | Lock Status | oic.r.lock.status |
| Smart Plug | oic.d.smartplug | Binary Switch | oic.r.switch.binary |
| Steam Closet | oic.d.steamcloset | Operational State | oic.r. operational.state |
| Time Period | oic.r.time.period |
| Switch | oic.d.switch | Binary Switch | oic.r.switch.binary |
| Television | oic.d.tv | Binary Switch | oic.r.switch.binary |
| Audio Controls | oic.r.audio |
| Media Source List | oic.r.media.input |
| Thermostat | oic.d.thermostat | Temperature (2) (1 Sensor and 1  Actuator) | oic.r.temperature |
| Washer (Laundry) | oic.d.washer | Binary Switch | oic.r.switch.binary |
| Operational State | oic.r.operational.state |
| Water Heater | oic.d.waterheater | Binary Switch | oic.r.switch.binary |
| Temperature(2) (1 Sensor and 1 Actuator) | oic.r.temperature |
| Water Purifier | oic.d.waterpurifier | Operational State | oic.r.operational.state |
| Water Info | oic.r.waterinfo |
| Water Valve | oic.d.watervalve | Open Level | oic.r.openlevel |
| Window | oic.d.window | Open Level | oic.r.openlevel |
| a A Multi-Function Printer shall expose two instances of an Operational State resource; each in discrete  Collections, one for the Printer specific operational state information and one for the Scanner specific operational state information. The friendly name for the Collections should indicate the device modality (printer or scanner). | | | |

Automatic Document Feeder capability.

A Multi-Function Printer shall only expose an Automatic Document Feeder resource if the device has the

b

## B.2 Standardized enumeration values

### B.2.1 Introduction

### Типы ресурсов могут иметь список поддерживаемых значений перечисления. Поддерживаемые значения перечисления могут отличаться при применении на разных устройствах. В этом пункте затронутые типы ресурсов описаны следующим образом:

### - список поддерживаемых значений

### - список рекомендуемых значений применительно к определенному типу устройства

### B.2.2 Alphabetical list of standardized enumeration types

### В таблице B.2 перечислены стандартизованные типы перечисления, которые могут присутствовать в свойствах ресурса, где свойство определяется как содержащее значения из этого пункта. Перечисления также применяются к семантическим тегам (см. ИСО / МЭК 30118-1), где тег определяется как содержащий значения из этого пункта.

### Table B.2 – The defined set of standardized enumerations

|  |  |
| --- | --- |
| Enumeration | Description |
| aborted | An internal device, communication or security error |
| active | Unit is active |
| after | unit is in a mode that is waiting for another trigger (after which) |
| airClean | unit is in air clean mode or state |
| airDry | unit is air drying |
| airfilterconsumable | identifies the main air filter consumable  ("oic.r.consumable") Resource of the Device |
| airflow | Identifies the main airflow ("oic.r.airflow") Resource of the Device |
| airpurifierswitch | identifies that the switch ("oic.r.switch.binary") can turn on/off the air purifying function of the Device |
| airqualityairpollution | identifies the air quality ("oic.r.airquality") Resource measuring (total) AirPollution |
| airqualitych20 | identifies the air quality ("oic.r.airquality") Resource measuring measuring Methanol (also known as  Formaldehyde): (CH2O) |
| airqualityco | identifies the air quality ("oic.r.airquality") Resource measuring carbon monoxide (CO) |
| airqualityco2 | identifies the air quality ("oic.r.airquality") Resource measuring carbon dioxide (CO2) |
| airqualityno2 | identifies the air quality ("oic.r.airquality") Resource measuring nitrogen dioxide (NO2) |
| airqualityo3 | identifies the air quality ("oic.r.airquality") Resource measuring ozone (O3) |
| airqualityodor | identifies the air quality ("oic.r.airquality") Resource measuring Odor |
| airqualityso2 | identifies the air quality ("oic.r.airquality") Resource measuring sulphur dioxide (SO2) |
| airqualitypm1 | identifies the air quality ("oic.r.airquality") Resource measuring particulate matter (pm1) |

|  |  |
| --- | --- |
| airqualitypm10 | identifies the air quality ("oic.r.airquality") Resource measuring particulate matter (pm10) |
| airqualitypm2.5 | identifies the air quality ("oic.r.airquality") Resource measuring particulate matter (pm2.5) |
| airqualitysmoke | identifies the air quality ("oic.r.airquality") Resource measuring smoke |
| airqualityvoc | identifies the air quality ("oic.r.airquality") Resource measuring volatile organic compounds (VOC) |
| alarm | unit is in an alarm mode or state |
| alarmtimeperiod | identifies the duration time for an alarm ("oic.r.time.period") |
| ambient | unit is in ambient mode or state |
| armedAway | unit is armed for away |
| armedInstant | unit is armed instantly |
| armedMaximum | unit is armed at maximum level |
| armedNightStay | unit is armed in night stay |
| armedStay | unit is armed in stay mode |
| aroma | unit is armed in aroma mode |
| artificialintelligence | unit is in artificial intelligence mode |
| auto | unit is in auto mode or state |
| awning | identifies that the instance of "oic.r.windowcovering" represents an awning |
| babyCare | unit is in baby care mode or state |
| baking | unit is in baking mode or state |
| battery | identifies the main battery ("oic.r.battery") Resource of the Device |
| boiling | unit is in boiling state or mode |
| brewing | unit is in brewing state or mode |
| cancelled | the job was cancelled either by the remote client or by the user |
| changeCondition | the unit has experienced a change in condition, mode or state |
| charging | the unit is in charging mode or state |
| checkingTurbidity | unit is in checking turbidity state |
| circulating | unit is in circulating model or state |
| cleaning | unit is in cleaning mode or state |
| clearVoice | type is in sound mode |
| clothes | unit is in clothes mode |
| completed | job finished successfully |
| contactsensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of contact sensor |
| convenientroomdoor | identifies the convenient room door ("oic.r.door") of the refrigerator ("oic.d.refrigerator") |
| convertible | unit is for a convertible part (among compartments of a refrigerator). User can configure the parts as desired |
| convBake | unit is in convection bake mode |

|  |  |
| --- | --- |
| convRoast | unit is in convection roast mode |
| cool | unit is in cooling mode or state |
| coolClean | unit is in cool-clean mode or state |
| coolingtargettemperature | identifies the target cooling temperature  ("oic.r.temperature") Resource of the air conditioner ("oic.d.airconditioner") |
| coolerdoor | identifies the cooler door ("oic.r.door") of the Device |
| coolermeasuredtemperature | identifies the measured cooler temperature ("oic.r.temperature") Resource of the Device |
| coolertargettemperature | identifies the target cooler temperature  ("oic.r.temperature") Resource of the Device |
| cosensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of carbon monoxide sensor |
| currenttemperature | identifies the current measured temperature ("oic.r.temperature") Resource of the Device |
| custom | type is in sound mode |
| delicate | unit is in delicate mode or state |
| deodorization | identifies the main deodorization ("oic.r.deodorization") Resource of the Device |
| diagnosis | unit is in diagnosis mode or state; when an error occurs, a Device is in diagnosis mode (state) for identifying  causes and finding solutions |
| disabled | unit's current operational mode is disabled |
| dishwasherdoor | identifies the main door ("oic.r.door") Resource of the Dish Washer ("oic.d.dishwasher") |
| down | unit is unavailable |
| downWard | identifies that the instance of "oic.r.movement.linear" represents downward |
| drapery | identifies that the instance of "oic.r.windowcovering" represents drapery |
| dry | unit is dry mode |
| dryClean | unit is in dry-clean mode or state |
| dual | unit is in dual mode |
| dynamic | type is in picture mode |
| ecomode | identifies the main (overall) ecomode ("oic.r.ecomode") Resource of the Device |
| edge | unit is edge mode or state |
| enabled | unit's current operational mode is enabled |
| express | unit is in express mode or state |
| extended | unit is in extended mode or state |
| fan | unit is in fan mode or state |
| fast | unit is in fast mode or state |
| filterMaterial | filter material that is used by a Device |
| firesensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of fire sensor |
| focused | unit is in focused mode or state |
| foot | unit is in foot mode or state, typically seen as a mode on a Smart Mattress |

|  |  |
| --- | --- |
| freezePrevent | unit is in freeze prevent mode or state |
| freezePreventPending | unit is pending freeze prevent mode |
| freezePreventPause | unit is in the paused state while in freeze prevent mode |
| freezer | unit is for a freezer part (among compartments of a refrigerator |
| freezerdoor | identifies the freezer room door ("oic.r.door") Resource of the Device |
| freezermeasuredtemperature | identifies the measured freezer temperature ("oic.r.temperature") of the Device |
| freezertargettemperature | identifies the target freezer temperature ("oic.r.temperature") of the Device |
| fridge | unit is for a fridge part (among compartments of a refrigerator |
| glassbreaksensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of glass break sensor |
| grinding | unit is in grinding state or mode |
| healing | unit is in healing mdoe or state |
| heating | unit is in heating mode or state |
| heatingtargettemperature | identifies the target heating temperature ("oic.r.temperature") of the Device |
| heavy | unit is in heavy mode or state |
| homing | unit is in homing state, Device produces a special signal so that it can be found using electronic equipment |
| hot | unit is in hot mode or state |
| humidify | unit is in humidify mode or state |
| humidity | identifies the main humidity ("oic.r.humidity") Resource of the Device |
| ice | unit is in ice mode or state |
| idle | new jobs can start processing without waiting |
| initializing | unit is in initializing state, a Device resets its values set by a Client to initial values set by manufacturer |
| ink | generic ink cartridge for a Device |
| inkBlack | black ink cartridge for a Device |
| inkCyan | cyan ink cartridge for a Device |
| inkMagenta | magenta ink cartridge for a Device |
| inkTricolour | tricolour ink cartridge for a Device |
| inkYellow | yellow ink cartridge for a Device |
| invalid | unit is in an invalid mode, state, or setting |
| keepwarm | unit is in keep warm state or mode |
| keyfob | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of key fob |
| keypad | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of keypad |
| localtime | identifies the clock ("oic.r.clock") time representing the local time zone |
| macro | unit is in macro mode or state, Client manually inputs a rule or pattern of operation |

|  |  |
| --- | --- |
| main | unit is part of the main device or is the main device |
| manual | unit is in manual mode or state |
| map | unit is in mapping mode or state |
| mineral | unit is in mineral mode |
| monitoring | unit is in monitoring mode or state; such as security functions detecting unusual movements in an empty place for a camera-mounted Device |
| monitoringInitializing | unit is in initializing state in monitoring mode; a Device resets its values of monitoring mode to initial values set by manufacturer |
| monitoringMoving | unit is in moving state in monitoring mode; following a specific target that client select while the Device is in monitoring mode |
| monitoringPreparation | unit is in preparation state in monitoring mode; a Device is getting ready for its monitoring operation |
| morning | unit is in morning mode or state |
| motionsensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of motion sensor |
| movie | type is in picture mode |
| moving | unit is in moving state; the action of going to a different place |
| music | type is in sound mode |
| natural | type is in picture mode |
| night | unit is in night-time mode or state |
| nightDry | unit is in night-time drying mode or state |
| none | unit is in an undefined mode or state |
| normal | unit is in a normal operational state |
| notsupported | ability to set a specific operational mode by a Client is not supported |
| onedoorfridgedoor | identifies the single door ("oic.r.door") of the Device |
| operationalstate | identifies the main (overall) operational state ("oic.r.operational.state") of the Device |
| operationalmode | identifies the main (overall) mode ("oic.r.mode") of the Device |
| part | unit is in part mode or state, typically seen on a robot cleaner, analogous to spot cleaning |
| pause | unit is paused (by user) |
| ped | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of personal emergency device |
| pending | job initiated, engine is preparing |
| pendingHeld | job is not a candidate for processing for any number of reasons, will return to pending state if reasons are  solved |
| permapress | unit is in permanent press mode or state |
| point | unit is at a defined or specific point (with respect to movement) |
| powerOff | unit is powered off (standby) |
| powerswitch | identifies the Resource that is the main power switch ("oic.r.switch.binary"), e.g. on/off of the Device |

|  |  |
| --- | --- |
| preHeat | unit is in pre-heat mode or state |
| preparation | unit is in preparation mode or state; a Device is getting ready for its operation |
| preSteam | unit is in pre-steam mode or state |
| preWash | unit is pre wash mode |
| processing | processing the job |
| projectorscreen | identifies that the instance of "oic.r.windowcovering" represents a projector screen |
| pure | unit is in pure mode or state |
| quick | unit is in quick mode or state |
| quiet | unit is in quiet mode |
| refresh | unit is in refresh mode or state |
| refrigeration | identifies the main ("oic.r.refrigeration") Resource of the Device |
| relativeremainingtimeperiod | identifies the Resource as (overall) relative remaining time period ("oic.r.time.period") |
| relax | unit is in relax mode or state |
| remainingtimeperiod | identifies the Resource as (overall) absolute remaining time period ("oic.r.time.period") |
| remotecontrol | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of remote control |
| remotecontrolenable | identifies the Resource for remote control enable  ("oic.r.switch.binary"), e.g. remote enablement of the Device |
| repeat | unit is in repeat mode or state |
| reserve | unit is in reserve mode or state |
| reserving | unit is in reserving state |
| restart | unit is in re-start mode or state |
| ringing | unit is in ringing state to indicate alarm, emergency, caution, and so on |
| rinse | unit is in rinse mode or state |
| rollershade | identifies that the instance of "oic.r.windowcovering" represents a roller shade |
| rollershade2 | identifies that the instance of "oic.r.windowcovering" represents a two motor roller shade |
| rollershadeext | identifies that the instance of "oic.r.windowcovering" represents an exterior roller shade |
| rollershadeext2 | identifies that the instance of "oic.r.windowcovering" represents an exterior two moto roller shade |
| sectored | unit is in sectored mode or state |
| select | unit is in select mode or state |
| securityrepeater | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of security repeater |
| setOption | unit is in a state whereby device options may be set |
| shake | unit is in shake mode or state |
| shoesDry | unit is in shoes dry mode or state |
| shutter | identifies that the instance of "oic.r.windowcovering" represents a shutter |

|  |  |
| --- | --- |
| silent | unit is in silent mode or state |
| sleep | unit is in sleep mode or state |
| sleepreservationtimeperiod | identifies the Resource ("oic.r.time.period") as sleep reservation time |
| smart | unit is in smart mode or state |
| soaking | unit is in soaking mode or state |
| soda | unit is in soda mode |
| spin | unit is in spin mode or state |
| spot | unit is in spot mode or state |
| spray | unit is in spray mode or state |
| standard | type is in picture or sound mode |
| standardcie | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of standard control and indicator equipment |
| start | unit is in start mode or state |
| startreservationtimeperiod | identifies the Resource ("oic.r.time.period") as start of reservation time |
| steam | unit is in steam mode or state |
| steamSoftening | unit is in steam softening mode or state, whereby the fabric is softened using only water and no softening additives |
| sterilize | unit is in sterilize mode or state |
| stop | identifies that the instance of "oic.r.movement.linear" represents stop |
| stopreservationtimeperiod | identifies the Resource ("oic.r.time.period") as stop of reservation time |
| stopped | error condition occurred |
| stretching | unit is in stretching mode or state |
| subDevice | unit is for a sub-device that makes up part of a main device |
| swd | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of standard warning device |
| targettemperature | identifies the target (setpoint) temperature ("oic.r.temperature") of the Device |
| testing | calibrating, preparing the unit |
| tiltblind | identifies that the instance of "oic.r.windowcovering" represents a tilt only tilt blind |
| tiltblind2mode | identifies that the instance of "oic.r.windowcovering" represents a tilt and lift tilt blind |
| toner | generic toner cartridge for a Device |
| tonerBlack | black toner cartridge for a Device |
| tonerCyan | cyan toner cartridge for a Device |
| tonerMagenta | magenta toner cartridge for a Device |
| tonerYellow | yellow toner cartridge for a Device |
| turbo | unit is in turbo mode or state |
| update | unit is in update mode or state |
| upWard | identifies that the instance of "oic.r.movement.linear" represents upward |

|  |  |
| --- | --- |
| vendorspecific | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type that is specific to the manufacturer |
| vibrationsensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of vibration sensor |
| waiting | unit is in waiting mode or state |
| wakeup | unit is in wakeup state just after sleep mode |
| warm | unit is in warm mode or state |
| wash | unit is in wash mode or state |
| waterinfo | identifies the main water information ("oic.r.waterinfo") of the Device |
| waterfilterconsumable | identifies the main water filter consumable ("oic.r.consumable") of the Device |
| waterproofing | unit is in waterproofing mode or state |
| watersensor | identifies an "Intruder Alert Zone" ("oic.r.iaszoneinfo") type of water sensor |
| wet | unit is in wet mode or state |
| wind | unit is in wind mode |
| wrinklePrevent | unit is in winkle prevent mode |
| zigzag | unit is in zigzag mode or state |

1. **B.2.3 Standardized list of supported values for mode resource type (oic.r.mode)**
2. [Table B.3](#_bookmark56) lists per Device Type the enumeration values that should be exposed by the
3. “supportedModes” Property and by extension allowed within the “modes” Property of the
4. "oic.r.mode" Resource Type. A Device shall not expose any value not defined in Table B.3 unless
5. that value follows the requirements in clause [6.4.](#_bookmark26)

### Table B.3 – List of supported "oic.r.mode" values per Device Type ("rt")

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Name (informative)** | **Device Type (rt) (Normative)** | **Supported enumeration value** | **Description** |
| Air Conditioner | oic.r.airconditioner | airClean | This removes contaminants from the indoor air. |
| airDry | This removes moisture from the inside of the device to prevent mould after cooling air. |
| aroma | This adds a deodorizing scent to make the air fresher. |
| auto | This automatically selects and operates cooling and/or heating based on the current temperature condition. |
| cool | This cools the indoor air. |
| coolClean | This removes contaminants while also cooling |
| dry | This reduces indoor humidity |
| dryClean | This removes contaminants while also reducing humidity |
| energySaving | This saves energy (electricity) by restricting some functions. |
| fan | This circulates the inside air without cool and inflow of outside air. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | wind | This circulates the air with a stronger current or flow |
| Air Purifier | oic.d.airpurifier | auto | This is continuously checking the air quality and operating as needed to maintain good air  quality. |
| babyCare | This removes contaminants from indoor air and discharges clean air in a downward flow for  babies and children. |
| circulating | This circulates the inside air by using the fan inside the device. |
| cleaning | This removes contaminants from the indoor air. In the case where the device consists of lower and upper sections, this function is operated  only in the lower section. |
| dual | This removes contaminants from the indoor air. In the case where the device consists of lower and upper sections, this function operates in  both of sections. |
| humidity | This increases moisture in the indoor air. |
| silent | This reduces noise during the operation. |
| sleep | This is a low power mode for the device to lower electrical consumption on standby. |
| Airer | oic.d.airer | airDry | This dries wet materials by using forced air (no heat). |
| Dry | This dries wet materials by using hot air. |
| none | This is an undefined mode. |
| Dishwasher | oic.d.dishwasher | auto | This senses the soiled amount and soiled  toughness and is optimized to achieve the best cleaning. |
| cleaning | This means cleaning the inside of the device when there are no dishes. |
| delicate | This is to clean delicate items (e.g., fine china, small plates, long cutlery, cups, glasses, and so on). |
| energySaving | This saves energy by reducing the wash and rinsing temperature. |
| express | This cleans lightly soiled dishes faster than “quick” mode. |
| fast | This focuses on cleaning soiled dishes quickly. |
| heavy | This cleans heavily soiled dishes with the strongest spray intensity. |
| normal | This cleans soiled dishes for everyday use based on basic setting from manufacturers. |
| quick | This quickly cleans the lightly soiled dishes used that were used recently. |
| refresh | This is to freshen up and warm dishes that have been unused for a long time. |
| rinse | This rinses dishes with water. |
| spray | This provides selectable options for spray  intensity. (For example, the options could be soft, medium, and strong) |
| steam | This adds steam at the beginning of the cycle to improve the wash performance. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | turbo | This cleans heavily soiled dishes by using slightly more energy and water. |
| update | This downloads a dedicated cycle via Wi-Fi, NFC, and so on. |
| Oven | oic.d.oven | baking | This cooks by dry heat in an oven |
| convBake | This is a baking mode of a convection oven |
| convRoast | This is a roasting mode of a convection oven |
| Robot Cleaner | oic.d.robotcleaner | after | unit is in a mode that is waiting for another trigger (after which) |
| alarm | The unit is in an alarm mode |
| auto | This is in automatic cleaning mode |
| charging | This is when the Device is charging at the home station |
| cleaning | This is standard cleaning mode |
| edge | This is cleaning the outside perimeter of the area. |
| homing | The Device is returning to its charging station, or producing a special signal so it can be found |
| idle | This is when the unit is idle |
| macro | This is cleaning specific areas manually selected by a client. |
| manual | The unit is under direct manual control |
| map | The unit is performing its mapping function (creating a 2D map of the space) |
| part | This is handling a portion of the cleaning cycle |
| point | The unit is at a defined or specific point (with respect to movement) |
| powerOff | The unit is in a power off or standby mode |
| repeat | This is repeating the previous set cycle |
| reserve | The unit is in a reserve mode that can be user defined |
| sectored | This is cleaning complex areas by dividing the cleaning area into sections. |
| select | This is cleaning areas selected by a client among divided sections of the indoor. |
| spot | This is cleaning a small area within the radius of the manufacturer’s default set. |
| stop | The Device has encountered an error or is otherwise stationary |
| zigzag | This is cleaning each spot of indoor by moving zigzag. |
| Security Panel | oic.d.securityPanel | active |  |
| armedAway |  |
| armedInstant |  |
| armedMaximum |  |
| armedNightStay |  |
| armedStay |  |

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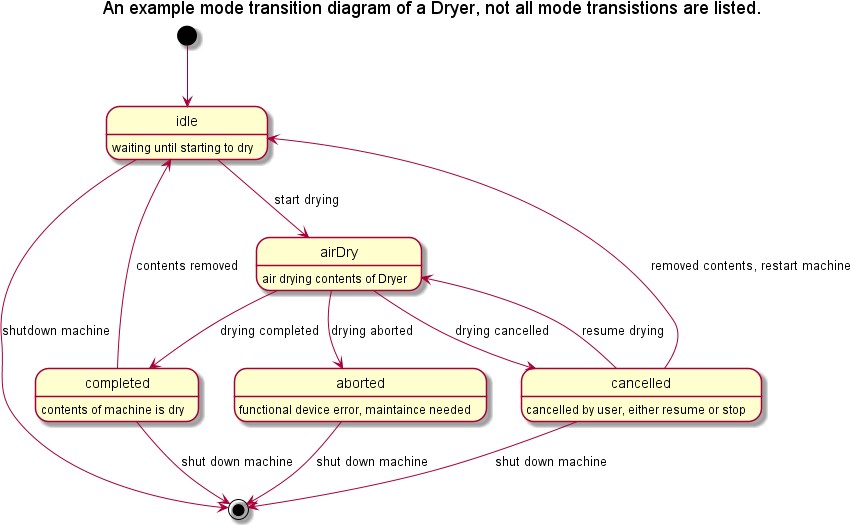
|  |  |  |
| --- | --- | --- |
| 526  527 |  | |
| 528 |  | **Figure B.1 – Example of mode transitions of a dryer** |
| 529 |  |  |
| 530 | **B.2.4** | **Standardized list of supported values for operational state resource type** |
| 531 |  | **(oic.r.operational.state)** |

533

534

The modes can be viewed upon as mode changes of the device. However, this document does not impose any relationship between the different modes of a Device. Hence all mode changes are expected to occur from a Client point of view.

[Figure B.1](#_bookmark58) provides an illustrative example of a possible set of modes and the transitions between them for a Dryer Device Type (oic.d.dryer).



[Table B.4](#_bookmark59) lists the supported enumeration values per Device Type for the Property “machineStates” of the operational state Resource Type.

### Table B.4 – List of supported "oic.r.operational.state" values per Device Type ("rt")

|  |  |  |
| --- | --- | --- |
| **Device Name (informative)** | **Device Type (rt) (Normative)** | **Supported enumeration value machineStates** |
| Dishwasher | oic.d.dishwasher | start |
| stop |
| Dryer | oic.d.dryer | start |
| stop |
| Oven | oic.d.oven | completed |
| preHeat |
| start |

|  |  |  |
| --- | --- | --- |
| Printer | oic.d.printer | idle |
| processing |
| stopped |
| Printer Multi-Function | oic.d.multifunctionPrinter | See Printer |
| See Scanner |
| Robot Cleaner | oic.d.robotcleaner | homing |
| pause |
| restart |
| start |
| wakeUp |
| Scanner | oic.d.scanner | down |
| idle |
| processing |
| stopped |
| testing |
| Steam Closet | oic.d.steamcloset | start |
| stop |
| wakeUp |
| Washer | oic.d.washer | start |
| stop |
| wakeUp |

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1. [Table B.5](#_bookmark60) lists the supported enumeration values per Device Type for the Property “jobStates” of
2. the operational state Resource Type.

### Table B.5 – List of supported values per Device Type (“rt”) for jobStates of operational

1. **state resource type**

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Name (informative)** | **Device Type (rt) (Normative)** | **Supported**  **enumeration value jobStates** | **Description** |
| Dishwasher | oic.d.dishwasher | aborted | This is an internal device, communication, or security error. (e.g. power\_fail) |
| airDry | This dries wet materials by using forced air (no heat). |
| cancelled | This state is cancelled by (remote) user. |
| completed | This state is a job completed without any error. |
| down | This state is unavailable to operate a job due to some issues. (e.g. power\_off) |
| nightDry | This runs the ventilation fan periodically to vent the stream from the tub. Because the dishes are often left in the dishwasher  overnight after the cycle ends, this can result in the steam inside the tub condensing on  the dishes, leaving them wet. To prevent the above state, the device can provide this  state. |

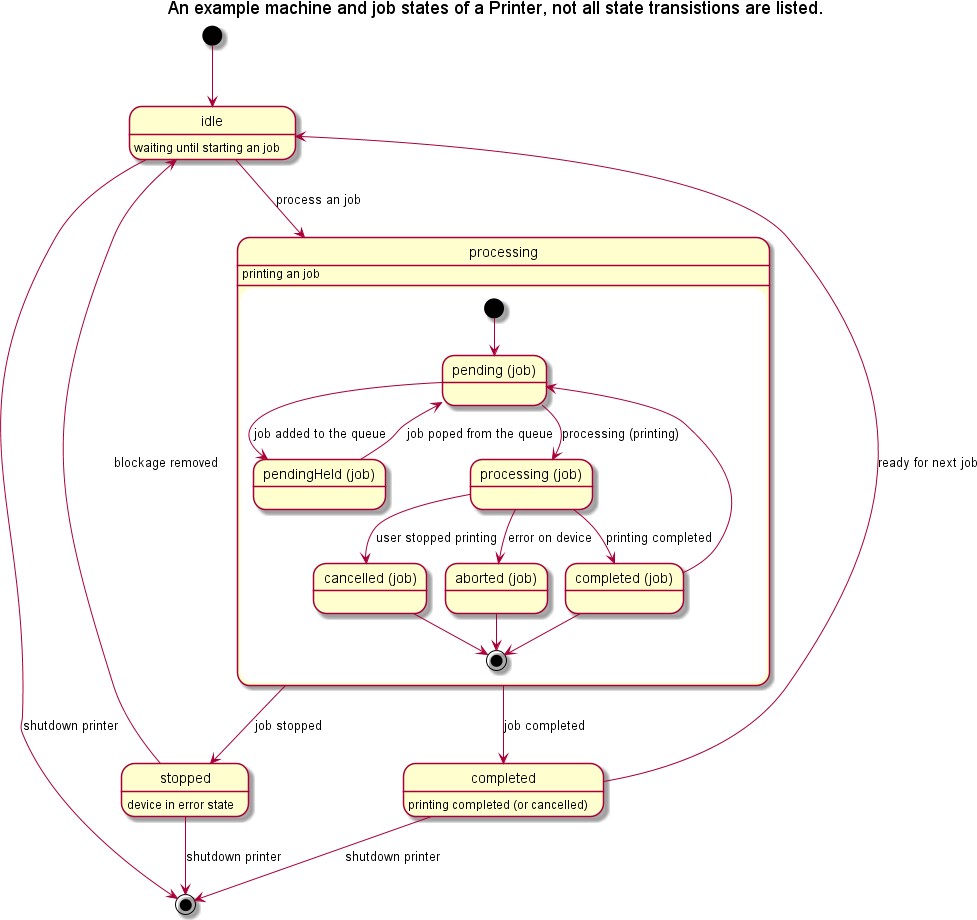
|  |  |  |  |
| --- | --- | --- | --- |
|  |  | pause | This state is paused by user. |
| pending | This state is waiting that the device prepares to initiate a job. |
| reserve | This state means that a client has finished setting the system for future use. |
| rinse | This is to rinse the dishes with water |
| wash | This is to clean the soiled dishes |
| Dryer | oic.d.dryer | aborted | This is an internal device, communication, or security error. |
| airDry | This dries the materials by using forced air (no heat). |
| completed | This state is a job completed without any error. |
| coolDown | This state is for the temperature cool down to reduce clothes temperature’ by spinning the interior drum without heat. |
| diagnosis | When an error occurs, the device enters this state to identify causes and find solutions. |
| down | This state is device unavailable to operate a job due issues. (e.g. power\_off) |
| pause | This state is paused by user. |
| pending | This state is waiting that the device prepares to initiate a job. |
| processing | This is working on a job executed by a client. |
| reserve | This state means that a client has finished setting the system for future use. |
| wrinklePrevent | This state runs the dryer periodically to help prevent wrinkles from forming. |
| Oven | oic.d.oven | cleaning | This is cleaning to remove the soiled inside and outside of the device. |
| completed | This state is job completed without any error. |
| cool | This is cooling the temperature inside and  outside of the device after finishing cooking. |
| down | This state is unavailable to operate a job due to issues. (e.g. power\_off) |
| idle | This means that new jobs can start  processing without waiting. (e.g., preheating is done) |
| pause | This state is paused by user. |
| pending | This state is waiting that the engine prepares to initiate a job. |
| preHeat | This is pre-heating the inside of the device prior to cooking. |
| processing | This is working on a job executed by a user. |
| setOption | This is in status while being set for the device’s options. |
| Printer | oic.d.printer | aborted | This is in internal device, communication, or security error. |
| cancelled | This state is cancelled by (remote) user. |
| completed | This state is job completed without any error. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | pending | This state is waiting that the device prepares to initiate a job. |
| pendingHeld | This state halts pending from processing for any number of reasons. This will return to  pending state if the issues are resolved. |
| processing | This is working on a job executed by a client. |
| Printer Multi- Function | oic.d.multifunction Printer | See printer | Refer to the supported enumeration values of a Printer (oic.d.printer). |
| See scanner | Refer to the supported enumeration values of a Scanner (oic.d.scanner). |
| Robot Cleaner | oic.d.robotcleaner | charging | This means that the device is charging. In  the case of robot cleaner, it can be charged by connecting with its home station. |
| cleaning | This is cleaning indoor floor with selected mode by a client. |
| diagnosis | When an error occurs, a device enters this state to identify causes and find solutions. |
| homing | This state means that the device is moving to its home station after finishing work or to charging its battery |
| idle | This means that new jobs can start processing without waiting. |
| initializing | This is resetting device to initial values set by manufacturer. |
| macro | This is controlled and cleaned by the client based on a remote controller. |
| mapping | At first use of the device, it scans the indoor area by moving to make a map. |
| monitoring | This is a security functions detecting strange movements in an empty place by using  mounted cameras. |
| monitoringInitializing | This is resetting device to initial values set by the manufacturer. |
| monitoringMoving | This is moving to follow a specific target that a user selects while the device is in  monitoring mode. |
| monitoringPreparation | This is in a state where a device is getting ready for its monitoring operation. |
| moving | This is moving to go to a different place. |
| pause | This state is paused by user. |
| preparation | This means that the device is getting ready for its operation. |
| reserving | This state means that a client is setting systems for future use. |
| setOption | This is the status while being set for the device’s options. |
| Scanner | oic.d.scanner | aborted | This is in internal device, communication, or security error. |
| cancelled | This state is cancelled by (remote) user. |
| completed | This state is completely finished the job without any error. |
| pending | This state is waiting that the device prepares to initiate a job. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | processing | This is working on a job executed by a client. |
| Steam Closet | oic.d.steamcloset | aborted | This is an internal device, communication, or security error. |
| airDry | This is in drying the materials by using wind. |
| completed | This state is job completed without any error. |
| diagnosis | When an error occurs, a device enters this state to identify causes and find solutions. |
| down | This state is unavailable to operate a job due to issues (e.g. power\_off) |
| idle | This means that new jobs can start  processing without waiting (e.g. washing is done). |
| initializing | This is resetting device to initial values set by manufacturer. |
| nightDry | This is a special sanitary care during the night, which runs heavy sanitary care and then dries periodically every hour for an  additional eight hours. |
| pause | This state is paused by user. |
| pending | This state is waiting that the device prepares to initiate a job. |
| preHeat | This is preheating the inside of the device. |
| preSteam | This is steaming the inside of the device to remove residual material at the beginning of the cleaning sequence. |
| processing | This is working on a job executed by a client. |
| reserve | This state means that a client has finished setting the system for future use. |
| shake | This is to quickly shake the hanger inside of the device to remove drops of water on  clothes after a steam cycle. |
| sleep | This is in low power state for the device to lower electrical consumption on standby. |
| steam | This sprays steam on the washable items to remove odors and wrinkles after preheat the inside of the device. |
| sterilize | This removes germs on items through high temperature and steam. |
| update | This downloads a dedicated cycle via Wi-Fi, NFC, and so on. |
| Washer | oic.d.washer | aborted | This is an internal device, communication, or security error. |
| changeCondition | After the washer checked the turbidity, the device could change condition progressing  state. For example, the washer can rinse the clothes one more time or finish washing it. |
| checkingTurbidity | The device automatically checks turbidity during rinsing the clothes to check if the detergent remains. |
| completed | This state is completely finished the job without any error. |
| coolDown | This state is temperature cool down to  reduce clothes temperature’ by spinning the |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | interior drum without heat only in case the washer supports a dry function. |
| diagnosis | When an error occurs, a device enters this state to identify causes and find solutions. |
| down | This state is unavailable to operate a job due to issues. (e.g. power\_off) |
| dry | This is to dry the washed clothes with heat. |
| freezePrevent | To prevent developing ice inside of the  device and pipe, the device takes special care of the device condition in the winter. |
| freezePreventPause | This is paused state in freeze prevent mode. |
| freezePreventPending | This is pending state in freeze prevent mode. |
| grinding | This is to grind debris to prevent drain pipes being clogged. |
| idle | This means that new jobs can start  processing without waiting. (e.g. rinsing clothes is done) |
| pause | This state is paused by user. |
| pending | This state is waiting that the device prepares to initiate a job. |
| preparation | This means that the device is getting ready  for its operation This state includes checking the amount of detergent, softener, water and so on. |
| preWash | This is to wash heavily soiled clothes in advance before starting the washing  process. |
| processing | This is working on a job executed by a client. |
| refresh | This removes wrinkles from slightly wrinkled clothes by using steam for if the washer  supports steam function |
| reserve | This state means that a client has finished setting the system for future use. |
| rinse | This is to rinse the dishes with water. |
| shoesDry | This is a special cycle for drying shoes. |
| sleep | This is in low power state for the device to lower electrical consumption on standby. |
| soaking | This makes clothes thoroughly wet by immersing them in liquid so dust and stains can easily be removed. |
| spin | This is spinning fast to remove the water after completely rinsing the clothes. |
| steam | This sprays steam on clothes to remove odors and wrinkles. |
| steamSoftening | This softens the fabric using 100% pure water and no chemicals with steam instead of chemical fabric softeners. |
| testing | This checks the amount of clothes inside the washer and displays the results. |
| update | This downloads a dedicated cycle via Wi-Fi, NFC, and so on. |
| wash | This is washing the clothes with selected cycle set by a client |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | waterproofing | This washes (sports) clothes with a dedicated liquid for waterproofing. |
| wrinklePrevent | This state can help prevent wrinkles from forming. |

1. The operational state can be viewed as state changes of the device that includes separate handling
2. of jobs within the overall machine state. However, this document does not impose any relationship
3. between the different machine or job states of a device. Hence all "machinestate" and or "jobStates"
4. changes are expected to occur from a Client point of view.
5. [Figure B.2](#_bookmark61) provides an illustrative example of a possible set of job states and the transitions
6. between them for a Printer Device Type ("oic.d.printer").

### Figure B.2 – Example of job state transitions of a printer

1. **B.2.5 Standardized list of supported values for consumable and consumable collection**
2. **resource types (oic.r.consumable, oic.r.consumablecollection)**
3. [Table B.6](#_bookmark63) lists the enumeration values that may be populated in both the supportedconsumables
4. (in oic.r.consumablecollection) and typeofconsumable (in oic.r.consumable) Properties within the
5. Consumable and Consumable Collection Resource Types. The typeofconsumable Property shall
6. only be populated with a value exposed within the supportedconsumables Property in a specific
7. instance of the Consumable Collection Resource Type.
8. This constitutes the known set of possible values for these Properties in the Consumable and
9. Consumable Collection Resources. A vendor may extend this set by providing vendor defined
10. enumerations following the convention defined in [ISO/IEC 30118-4.](#_bookmark5)

### Table B.6 – List of defined enumeration values for oic.r.consumable,

1. **oic.r.consumablecollection**

|  |  |  |
| --- | --- | --- |
| **Friendly Name (informative)** | **Enumeration Value (Normative)** | **Description (Informative)** |
| Toner Cartridge | toner | Generic toner cartridge. |
| Black Toner Cartridge | tonerBlack | Black toner cartridge |
| Cyan Toner Cartridge | tonerCyan | Cyan toner cartridge |
| Magenta Toner Cartridge | tonerMagenta | Magenta toner cartridge |
| Yellow Toner Cartridge | tonerYellow | Yellow toner cartridge |
| Filter Material | filterMaterial | Any replaceable or reusable filter material; such as water filters, air filters, dust filters etc. |
| Ink Cartridge | ink | Generic ink cartridge |
| Black Ink Cartridge | inkBlack | Black ink cartridge |
| Cyan Ink Cartridge | inkCyan | Cyan ink cartridge |
| Magenta Ink Cartridge | inkMagenta | Magenta ink cartridge |
| Yellow Ink Cartridge | inkYellow | Yellow ink cartridge |
| Tricolour Ink Cartridge | inkTricolour | Tri-colour ink cartridge; typically Cyan plus Magenta plus Yellow. |

1. **B.3 Camera media format (oic.r.media)**
2. The supported camera media formats can be discovered by looking at the SDP (see [IETF RFC](#_bookmark7)
3. [4566](#_bookmark7)) list of the media Resource Type. The recommended list of supported media formats are listed
4. in [Table B.7.](#_bookmark65)

### Table B.7 – Recommended media profiles

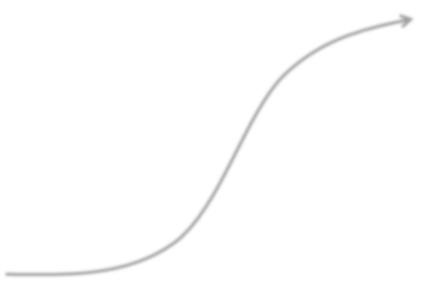
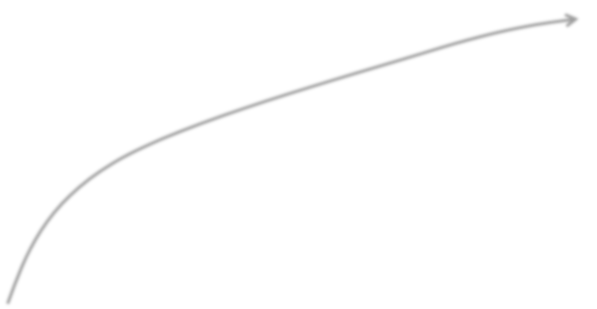
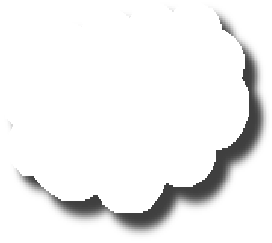
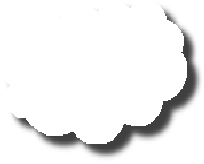
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| **Mediatype** | **codec** | **Content container format** | **transport** | **Additional information** |
| Audio | AAC |  | RTP |  |
| Video | H.264 |  | RTP | Recommended  minimal resolution 1920x1080 (width, height) |
| Video | H.264/AAC | MPEG-2 TS | RTP | Recommended  minimal resolution |

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|  |  |  |  | 1920x1080 (width, height) |
| Still image | JPEG | JPEG | RTP | Recommended  minimal resolution 1920x1080 (width, height) |

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| 568 | **B.4 Additional requirements per device type** |
| 569 | **B.4.1 Additional requirements for Television Devices ("oic.d.tv")** |
| 570 | A set of Resource Types have been defined that are applicable should a Device of type "oic.d.tv" |
| 571 | need to expose behaviours typically found in "settings" menus or functions. A Device should expose |
| 572 | one or more of these Resource Types: |
| 573 | – accessibility settings ("oic.r.settings.accessibility") |
| 574 | – broadcast settings ("oic.r.settings.broadcast") |
| 575 | – picture settings ("oic.r.settings.picture") |
| 576 | – sound settings ("oic.r.settings.sound") |
| 577 | – support settings ("oic.r.settings.support") |
| 578 | – general system settings ("oic.r.settings.system") |
| 579 | – ecomode ("oic.r.ecomode") |
| 580 | A Device may additionally expose the following Resource Types: |
| 581 | – software update ("oic.r.softwareupdate") |
| 582 | – Wi-Fi configuration ("oic.r.wificonf") |
| 583 | Thus enabling a complete set of Client accessible information typically found within a television |
| 584 | system settings user interface. |

|  |  |
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| 585 | **Annex C**  (normative)  **Healthcare device types** C.1 Область применения В этом Приложении определены типы устройств для использования в сфере здравоохранения и фитнеса, а также описаны общие варианты использования, к которым применяются устройства OCF Healthcare, а также общие функциональные требования.  Несмотря на то, что в этом документе определены некоторые общие требования, реализация несет ответственность за проверку соответствующих мер безопасности, охраны окружающей среды и здоровья, а также применимых нормативных требований национальных органов здравоохранения. C.2 Введение в медицинские устройства OCF Это Приложение ссылается на модели данных, определенные в ИСО / МЭК 30118-4, и наследует их для определения типов медицинских устройств OCF в пункте С.4. C.3 Сценарии эксплуатации Персональная пригодность и / или медицинские данные считываются устройством мониторинга (роль клиента OCF) из устройств здравоохранения (роль сервера OCF), и устройство мониторинга запускает соответствующие действия на основе собранных данных. Многие из целевых применений предназначены для личного здоровья или фитнеса, хотя клинические варианты использования могут быть реализованы с помощью аналогичного моделирования.  Как показано на рисунке C.1, данные с различных устройств для фитнеса и здравоохранения могут быть собраны на смартфоне для мониторинга и могут быть переданы в службы здравоохранения через шлюз или через смартфон. Протокол, который будет использоваться для передачи, определен в ISO / IEC 30118-1. Собранные личные данные о пригодности и / или медицинские данные используются для мониторинга состояния или медицинских исследований, получения рекомендаций от тренера / врача или для запуска экстренного уведомления. |
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**WAN**

**Network (Cloud)**

**LAN**

**Network (Home)**

**Home GW**

**Smartphone**

### 610 Figure C.1 – Schematic diagram of healthcare usages

611 **C.4 Standardized device types**

612 **C.4.1 Introduction**

613 OCF Healthcare Device Types specify Devices in the healthcare and fitness domains of the OCF 614 ecosystem. The Device Type exposed by the "rt" value of /oic/d of all Healthcare Devices shall 615 have a Resource Type value (“rt”) prefixed with "oic.d." The Healthcare Device Types are listed in 616 [Table C.1.](#_bookmark76)

### 617 Table C.1 – Alphabetical list of healthcare device types

|  |  |  |
| --- | --- | --- |
| **Clause** | **Device Name** | **Device Type ("rt")** |
| C.4.9 | Activity Tracker | oic.d.activitytracker |
| C.4.2 | Blood Pressure Monitor | oic.d.bloodpressuremonitor |
| [C.4.15](#_bookmark113) | Body Composition Analyser | oic.d.bodycompositionanalyser |
| C.4.4 | Body Scale | oic.d.bodyscale |
| C.4.5 | Body Thermometer | oic.d.bodythermometer |
| C.4.10 | CGM(Continuous Glucose Monitor) | oic.d.cgm |
| C.4.11 | Cycling Power Meter | oic.d.cyclingpowermeter |
| C.4.12 | Cycling Speed Sensor | oic.d.cyclingspeedsensor |
| C.4.13 | Cycling Cadence Sensor | oic.d.cyclingcadencesensor |
| C.4.3 | Glucose Meter | oic.d.glucosemeter |
| C.4.6 | Heart Rate Monitor | oic.d.heartratemonitor |

|  |  |  |
| --- | --- | --- |
| C.4.14 | Muscle Oxygen Monitor | oic.d.muscleoxygenmonitor |
| C.4.7 | Pulse Oximeter | oic.d.pulseoximeter |
| C.4.8 | Sleep Monitor | oic.d.sleepmonitor |

618 The remainder of this Annex defines Resource Types for each Device Type, but for full definitions

619 of Resource Types, see [ISO/IEC 30118-4.](#_bookmark5)

620 Each Device Type defines a minimal set of Resource Types that are implemented by that Device 621 Type as required Resource Types. A Healthcare Device may expose additional OCF-defined 622 optional Resource Types. It should be noted that all Resource Types are commonly available for 623 all Device Types, but if a Device Type aims to implement optional Resource Types related to 624 healthcare, it shall expose such Resource Types using the definitions provided in this annex.

1. When a Resource Type is listed as Mandatory (M) in this Annex, the Device shall:
2. – expose that Atomic Measurement Resource Type in /oic/res
3. – expose that Resource Type as a Link in the Atomic Measurement
4. The mandatory Resource Types for an Atomic Measurement shall be listed in the "rts-m" Property
5. Value.
6. When a Resource Type is listed as Optional (O) in this Annex, a Device may expose that Resource 631 Type as a Link in the Atomic Measurement, or may also expose that Resource Type as a discretely 632 discoverable Resource outside of the Atomic Measurement. For example, if a blood pressure 633 monitor (i.e. "oic.d.bloodpressuremonitor") measures pulse rate and chooses to expose that feature 634 over OCF, it exposes the "oic.r.pulserate" Resource Type as a Link in the blood pressure monitor 635 Atomic Measurement ("oic.r.bloodpressuremonitor-am"). The allowed Resource Types for an 636 instance of an Atomic Measurement (which includes both the M and O Resource Types that are 637 implemented) shall be listed in the "rts" Property Value.

638 Some Resource Types are commonly used for all Healthcare Device Types; these are provided in 639 [Table C.2.](#_bookmark77) Users may want to associate timestamps to the measurements when they access their 640 healthcare information (in RFC3339 date and time format, oic.r.time.stamp). A Healthcare Device 641 may be used by different users, so identifying a specific user with an ID may be appropriate 642 ("oic.r.userid"). These Resource Types are exposed as Conditionally Required Resource Types of 643 an Atomic Measurement (as defined per clause 7.8.4 of [ISO/IEC 30118-1](#_bookmark3)) of a specific Healthcare 644 Device. The "rt" value of Resource Types that use Atomic Measurements are suffixed by -am 645 (Atomic Measurements). When present in an Atomic Measurement, "oic.r.time.stamp" and 646 "oic.r.userid" indicate the time when a sample of data is measured by a certain user.

### 647 Table C.2 – Commonly used resource types of healthcare device types

|  |  |  |
| --- | --- | --- |
| **Resource Type Name** | **Resource Type Value** | **Requirement (M, S, O, CA, CR)** |
| Observed Time | oic.r.time.stamp | O |
| User ID | oic.r.userid | O |

648 It should also be noted that Resource-level and Property-level requirements can be different. All 649 OCF Resource Types are specified using OpenAPI 2.0 and the Properties which are defined in a 650 specific schema can either be mandatory or optional. In other words, even if a Resource Type is 651 mandatory for a Device Type, some of its Properties may not be mandatory.

### C.4.2 Blood pressure monitor

1. **C.4.2.1 Introduction**
2. A blood pressure monitor measures blood pressure [i.e., systolic, diastolic, and mean arterial
3. pressure (MAP)]. Blood pressure is most frequently measured using the units of millimetres of
4. mercury (mmHg). Blood pressure is often denoted as 120/80 mmHg, which means systolic blood
5. pressure of 120 and diastolic blood pressure of 80.
6. [Table C.3](#_bookmark79) describes the Device Type for a blood pressure monitor. [Table C.4](#_bookmark80) describes the Atomic
7. Measurement that is present in all instances of a blood pressure monitor.

### Table C.3 – Healthcare device type of blood pressure monitor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.d.  bloodpressuremonitor | Blood pressure monitor Atomic Measurement | oic.r.bloodpressuremonitor- am | M |

1. **Table C.4 – Atomic measurement of blood pressure monitor**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.r.  bloodpressuremonitor-am | Blood pressure | oic.r.blood.pressure | M |
| Pulse rate | oic.r.pulserate | O |

1. **C.4.2.2 Required resource types**
2. A blood pressure monitor shall expose "oic.r.blood.pressure" to report the blood pressure (systolic
3. and diastolic) and optionally MAP.

### C.4.2.3 OCF-defined optional resource types

1. A blood pressure monitor measures pulse rate using the "oic.r.pulserate" Resource Type.
2. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.3 Glucose meter

1. **C.4.3.1 Introduction**
2. A glucose meter measures the concentration of glucose in the blood. Glucose, or blood sugar, is 672 the human body’s primary source of energy. The blood glucose level is a key parameter that 673 diabetics measure multiple times per day.

674 [Table C.5](#_bookmark82) describes the Device Type for a glucose meter. [Table C.6](#_bookmark83) describes the Atomic

675 Measurement that is present in all instances of a glucose meter.

### 676 Table C.5 – Healthcare device type of glucose meter

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.d.glucosemeter | Glucose meter Atomic Measurement | oic.r.glucosemeter-am | M |

677 **Table C.6 – Atomic measurement of glucose meter**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.r.glucosemeter-am | Glucose | oic.r.glucose | M |
| Context Carbohydrates | oic.r.glucose.carb | O |
| Context Exercise | oic.r.glucose.exercise | O |
| Hemoglobin Bound to Glucose A1c Form (HbA1c) | oic.r.glucose.hba1c | O |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Context Health | oic.r.glucose.health | O |
| Context Meal | oic.r.glucose.meal | O |
| Context Medication | oic.r.glucose.medication | O |
| Context Sample Location | oic.r.glucose.samplelocation | O |
| Context Tester | oic.r.glucose.tester | O |

678

### C.4.3.2 Required resource types

1. A glucose meter shall expose "oic.r.glucose" to report the blood glucose level in mg/dL or mmol/L.

### C.4.3.3 OCF-defined optional resource types

1. A glucose meter measures context carbohydrates, then it shall expose the context carbohydrates
2. using "oic.r.glucose.carb" Resource Type.
3. A glucose meter measures context exercise using the "oic.r.glucose.exercise" Resource Type.
4. A glucose meter measures Hemoglobin Bound to Glucose A1c Form (HbA1c) using the
5. "oic.r.glucose.hba1c" Resource Type.
6. A glucose meter measures context health using the "oic.r.glucose.health" Resource Type.
7. A glucose meter measures context meal using the "oic.r.glucose.meal" Resource Type.
8. A glucose meter measures context medication using the "oic.r.glucose.medication" Resource Type.
9. A glucose meter measures context sample location using the "oic.r.glucose.samplelocation"
10. Resource Type.
11. A glucose meter measures context tester using the "oic.r.glucose.tester" Resource Type.
12. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.4 Body scale

1. **C.4.4.1 Introduction**
2. A body scale measures the weight. The weight is most frequently measured using the units of
3. kilograms (kg) or pounds (lb).
4. [Table C.7](#_bookmark85) describes the Device Type for a body scale. [Table C.8](#_bookmark86) describes the Atomic
5. Measurement that is present in all instances of a body scale.

### Table C.7 – Healthcare device type of body scale

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.d.bodyscale | Body scale Atomic Measurement | oic.r.bodyscale-am | M |

1. **Table C.8 – Atomic measurement type of body scale**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.r.bodyscale-am | Weight | oic.r.weight | M |
| Body Mass Index (BMI) | oic.r.bmi | O |

|  |  |  |  |
| --- | --- | --- | --- |
|  | Height | oic.r.height | O |
| Body Fat | oic.r.body.fat | O |
| Body Water | oic.r.body.water | O |
| Body Soft Lean Mass | oic.r.body.slm | O |
| Body Fat Free Mass | oic.r.body.ffm | O |

1. **C.4.4.2 Required resource types**
2. A body scale shall expose "oic.r.weight" to report the body weight of a person.

### C.4.4.3 OCF-defined optional resource types

1. A body scale measures height using the "oic.r.height" Resource Type. Especially, a body scale 707 measures the height if BMI is also reported because the height is used when a body scale measures 708 BMI.

709 A body scale measures Body Mass Index (BMI) using the "oic.r.bmi" Resource Type.

710 A body scale measures body fat using the "oic.r.body.fat" Resource Type.

711 A body scale measures body water using the "oic.r.body.water" Resource Type.

712 A body scale measures body soft lean mass using the "oic.r.body.slm" Resource Type. 713 A body scale measures body fat free mass using the "oic.r.body.ffm" Resource Type. 714 See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### 715 C.4.5 Body thermometer

716 **C.4.5.1 Introduction**

717 A body thermometer measures the temperature at some point. In general, the body thermometer 718 is placed at the measurement site for sufficient time for the measuring probe to reach the same 719 temperature as the body site, and when stable, a direct digital reading of the probe temperature is 720 taken.

1. [Table C.9](#_bookmark88) describes the Device Type for a body thermometer. [Table C.10](#_bookmark89) describes the Atomic
2. Measurement that is present in all instances of a body thermometer.

### Table C.9 – Healthcare device type of body thermometer

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.d.bodythermometer | Body thermometer Atomic Measurement | oic.r.bodythermometer-am | M |

1. **Table C.10 – Atomic measurement type of body thermometer**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.r.bodythermometer- am | Temperature | oic.r.temperature | M |
|  | Body Location for temperature | oic.r.body.location.temperature | O |

1. **C.4.5.2 Required resource types**
2. A body thermometer shall expose "oic.r.body.temperature" to report the temperature level and the
3. unit of a measured temperature is reported either in C, F or K.

### C.4.5.3 OCF-defined optional resource types

1. A body thermometer measures temperature site using the "oic.r.body.location.temperature"
2. Resource Type.
3. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.6 Heart rate monitor

1. **C.4.6.1 Introduction**
2. A heart rate monitor measures heart rate. Heart rate is most frequently measured using the units 735 of beats per minute (bpm). While normal heart rate varies from person to person depending on the 736 individual, age, body size, heart conditions, posture, medication use, etc., normal resting heart rate 737 range for adults is from 60 to 100 according to the American Heart Association.
3. [Table C.11](#_bookmark91) describes the Device Type for a heart rate monitor. [Table C.12](#_bookmark92) describes the Atomic
4. Measurement that is present in all instances of a heart rate monitor.

### Table C.11 – Healthcare device type of heart rate monitor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.heartratemonitor | Heart Rate Monitor Atomic Measurement | oic.r.heartratemonitor -am | M |

1. **Table C.12 – Atomic measurement of heart rate monitor**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.heartratemonitor -am | Heart Rate | oic.r.heartrate | M |

1. **C.4.6.2 Required Resource Types**
2. A heart rate monitor shall expose "oic.r.heartrate" to report the heart rate of a person.

### C.4.6.3 OCF-defined Optional Resource Types

1. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.7 Pulse oximeter

1. **C.4.7.1 Introduction**
2. A pulse oximeter measures peripheral capillary oxygen saturation (SpO2), an estimate of the 749 amount of oxygen in the blood. Oxygen saturation is most frequently measured using percentage 750 (%). Normal oxygen saturation is 95% or above according to the World Health Organization (WHO).
3. [Table C.13](#_bookmark94) describes the Device Type for a pulse oximeter. [Table C.14](#_bookmark95) describes the Atomic
4. Measurement that is present in all instances of a pulse oximeter.

### Table C.13 – Healthcare device type of pulse oximeter

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.pulseoximeter | Pulse Oximeter Atomic Measurement | oic.r.pulseoximeter-am | M |

1. **Table C.14 – Atomic measurement of pulse oximeter**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.pulseoximeter-am | SpO2 | oic.r.spo2 | M |
| Pulse Rate | oic.r.pulserate | M |
| Pulsatile Occurrence | oic.r.pulsatileoccurrence | O |
| Pulsatile Characteristic | oic.r.pulsatilecharacteristic | O |

1. **C.4.7.2 Required Resource Types**
2. A pulse oximeter shall expose "oic.r.spo2" to report the oxygen saturation of a person.
3. A pulse oximeter shall expose "oic.r.pulserate" to report the pulse rate of a person.

### C.4.7.3 OCF-defined Optional Resource Types

1. A pulse oximeter measures pulsatile occurrence using the "oic.r.pulsatileoccurrence" Resource
2. Type.
3. A pulse oximeter measures pulsatile characteristic using the "oic.r.pulsatilecharacteristic"
4. Resource Type.
5. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.8 Sleep monitor

1. **C.4.8.1 Introduction**
2. A sleep monitor measures the duration of each one of the sleep stages, and can also compute a 768 “Sleep Score” from these data. The stages of sleep are: NREM stage 1 (Light Sleep stage 1), 769 NREM stage 2 (Light Sleep stage 2), NREM stage 3 (Deep Sleep stage 1), NREM stage 4 (Deep 770 Sleep stage 2), REM.

771 A night of sleep is composed of several sleep cycles, with each sleep cycle progressing from 772 Light Sleep to Deep Sleep, before reversing back from Deep Sleep to Light Sleep, ending with 773 REM.

774 The first cycle takes about 90 minutes. After that, the cycles average between 100 minutes and 775 120 minutes. Typically, an individual will go through 4 to 5 sleep cycles per night. Dreams occur 776 during REM stages.

1. NREM stage 4 is not recognized in every country: in 2007, the USA merged NREM stages 3 and
2. 4 into only one stage, NREM stage 3, thus effectively removing NREM stage 4.
3. Light Sleep consists of NREM stages 1 and 2. Deep Sleep consists of NREM stages 3 and 4.
4. [Table C.15](#_bookmark97) describes the Device Type for a sleep monitor. [Table C.16](#_bookmark98) describes the Atomic
5. Measurement that is present in all instances of a sleep monitor.

### Table C.15 – Healthcare device type of sleep monitor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.sleepmonitor | Sleep Monitor Atomic Measurement | oic.r.sleepmonitor-am | M |

1. **Table C.16 – Atomic measurement of sleep monitor**

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.sleepmonitor-am | Sleep | oic.r.sleep | M |
| Heart Rate | oic.r.heartrate | O |

1. **C.4.8.2 Required Resource Types**
2. A sleep monitor shall expose "oic.r.sleep" to report the time spent in the Awake, NREM1, 787 NREM2, NREM3 and REM stages, and optionally the time spent in the NREM4, Light Sleep, 788 Deep Sleep stages, and the sleep score.

### C.4.8.3 OCF-defined Optional Resource Types

1. A sleep monitor measures the heartrate using the "oic.r.heartrate" Resource Type.
2. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.9 Activity tracker

1. **C.4.9.1 Introduction**
2. An Activity Tracker measures a user’s activities. An Activity Tracker shows a user’s current activity 795 type, accumulated step counts per day since the beginning of the day (or last reset), consumed 796 calories per day since the beginning of the day (or last reset), and alarm status.

797 [Table C.17](#_bookmark100) describes the Device Type for an activity tracker. [Table C.18](#_bookmark101) describes the Atomic

798 Measurement that is present in all instances of an activity tracker.

### 799 Table C.17 – Healthcare device type of activity tracker

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.activitytracker | Activity Tracker Atomic Measurement | oic.r.activitytracker-am | M |
| Clock | oic.r.clock | O |
| Battery | oic.r.energy.battery | O |
| Alarm | oic.r.alarm | O |

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### Table C.18 – Atomic measurement of activity tracker

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.activitytracker-am | Activity | oic.r.activity | M |
| Heartrate | oic.r.heartrate | O |

1. **C.4.9.2 Required Resource Types**
2. An activity tracker shall expose "oic.r.activity" to report the activity of a person, and optionally the
3. number of steps per day or since last reset, plus the consumed calories per day or since last reset.

### C.4.9.3 OCF-defined Optional Resource Types

1. An activity tracker manages the alarm status using the "oic.r.alarm" Resource Type.
2. An activity tracker measures heart rate using the "oic.r.heartrate" Resource Type.
3. An activity tracker measures time using the "oic.r.clock" Resource Type.
4. An activity tracker measures battery status using the "oic.r.energy.battery" Resource Type.
5. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.10 CGM (Continuous Glucose Meter)

1. **C.4.10.1 Introduction**
2. A CGM is a device that measures the concentration of glucose in the blood, typically measured 814 from interstitial fluid (ISF). The glucose concentration is available on a continual basis at a periodic 815 interval from a sensor. Glucose, or blood sugar, is the human body’s primary source of energy. 816 Frequent measurements provided by a CGM give a patient greater insight as to the fluctuations in 817 blood glucose levels throughout the day, and in turn, can reduce the risk of developing diabetic 818 complications.

819 [Table C.19](#_bookmark103) describes the Device Type for a CGM. [Table C.20](#_bookmark104) describes the Atomic Measurement

820 that is present in all instances of a CGM.

### 821 Table C.19 – Healthcare device type of CGM

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.cgm | CGM Atomic Measurement | oic.r.cgm-am | M |
| CGM Sampling Interval | oic.r.cgm.samplinginterval | M |
| CGM Calibration | oic.r.cgm.calibrate | M |
| CGM Threshold | oic.r.cgm.threshold | M |
| CGM Status | oic.r.cgm.status | O |
| Battery | oic.r.energy.battery | O |

822

### 823 Table C.20 – Atomic measurement of CGM

|  |  |  |  |
| --- | --- | --- | --- |
| **Atomic Measurement Resource Type Value** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.cgm-am | Glucose | oic.r.glucose | M |
| CGM Sensor | oic.r.cgm.sensor | O |

824 **C.4.10.2 Required Resource Types**

825 A CGM shall expose "oic.r.glucose" to report the blood glucose level in mg/dL or mmol/L. 826 A CGM shall manage (RETRIEVE and UPDATE) the CGM Sampling Interval using the 827 "oic.r.cgm.samplinginterval" Resource Type.

1. A CGM shall manage (RETRIEVE and UPDATE) CGM Calibration using the "oic.r.cgm.calibrate"
2. Resource Type.
3. A CGM shall manage (RETRIEVE and UPDATE) CGM Threshold using the "oic.r.cgm.threshold"
4. Resource Type.

### C.4.10.3 OCF-defined Optional Resource Types

1. A CGM measures CGM sensor information using the "oic.r.cgm.sensor" Resource Type.
2. A CGM measures CGM Status using the "oic.r.cgm.status" Resource Type.
3. A CGM measures Battery using the "oic.r.energy.battery" Resource Type.
4. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.11 Cycling power meter

1. **C.4.11.1 Introduction**
2. A cycling power meter is a sensor that is mounted on a bicycle and that allows the cyclist to 840 measure his or her power output, which is used to move the bike forward and is measured in Watts. 841 The meter transmits the information to OCF Clients. A cycling power meter uses different 842 measurements to determine power:
3. – measure power directly
4. – measure torque and rotational velocity at the crank
5. – measure torque and rotational velocity at the wheel
6. Possible methods used by a cycling power meter for information updates include:
7. – Event-Synchronous Update e.g. the power information is updated each time the power sensor
8. detects a new crank rotation.
9. – Time-Synchronous Update e.g. the power information is updated at 1Hz.
10. [Table C.21](#_bookmark106) describes the Device Type for a cycling power meter.

### Table C.21 – Healthcare device type of cycling power meter

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.cyclingpowermeter | Cycling power | oic.r.cyclingpower | M |
| Torque | oic.r.torque | O |
| Cadence | oic.r.cadence | O |

1. **C.4.11.2 Required Resource Types**
2. A cycling power meter shall expose "oic.r.cyclingpower" to report the measured power output (which
3. is the power used to move the bike forward).

### C.4.11.3 OCF-defined Optional Resource Types

1. A cycling power meter measures the torque at the crank or the wheel using the "oic.r.torque"
2. Resource Type.
3. A cycling power meter measures the cadence, which is the number of revolutions of crank per
4. minute when cyclists pedal the pedals, at the crank or the wheel using the "oic.r.cadence"
5. Resource Type.
6. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.12 Cycling speed sensor

1. **C.4.12.1 Introduction**
2. Cycling speed sensors are devices mounted on a bicycle that measure the speed the bicycle is 865 travelling. This is typically done using a magnet mounted on the wheel spokes and a sensor on the 866 bicycle frame that senses the magnet passing.

867 [Table C.22](#_bookmark108) describes the Device Type for a cycling speed sensor.

868 Note: The notion ‘Sensor’ of the Device Name (Cycling Speed Sensor) is not associated with ‘sensor’, which is an OCF 869 standard OCF Interfaces defined in [ISO/IEC 30118-1.](#_bookmark3)

### 870 Table C.22 – Healthcare device type of cycling speed sensor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d. cyclingspeedsensor | Speed | oic.r.speed | M |

871

### C.4.12.2 Required Resource Types

1. A cycling speed sensor shall expose "oic.r.speed" to report the speed the bicycle is travelling.

### C.4.12.3 OCF-defined Optional Resource Types

1. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here

### C.4.13 Cycling cadence sensor

1. **C.4.13.1 Introduction**
2. Cycling cadence sensors measure the speed at which the user is pedaling, typically using a magnet
3. attached to the pedal shaft and a sensor mounted on the frame.
4. [Table C.23](#_bookmark110) describes the Device Type for a cycling speed sensor.
5. Note: The notion ‘Sensor’ of the Device Name (Cycling Cadence Sensor) is not associated with ‘sensor’, which is an OCF 882 standard OCF Interfaces defined in [ISO/IEC 30118-1.](#_bookmark3)

### 883 Table C.23 – Healthcare device type of cycling cadence sensor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d. cyclingcadencesensor | Cadence | oic.r.cadence | M |

884

### C.4.13.2 Required Resource Types

1. A cycling cadence sensor shall expose "oic.r.cadence" to report the cadence, which is the
2. number of revolutions of crank per minute when cyclists pedal the pedals.

### C.4.13.3 OCF-defined Optional Resource Types

1. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here

### C.4.14 Muscle oxygen monitor

1. **C.4.14.1 Introduction**
2. A muscle oxygen monitor provides an indication of the muscle oxygen saturation (SmO2) and is used by 893 athletes to monitor the intensity of their training, and by coaches and physiotherapists to identify which 894 and when muscles are being used.
3. SmO2 is a measure of the percentage of hemoglobin that is saturated with oxygen in the capillaries of a
4. muscle. SmO2 decreases as a muscle does work, for example, when a person is exercising. SmO2
5. increases when blood circulation brings new oxygen to the muscle. SmO2 varies from muscle to muscle
6. depending on which muscle is used to perform a particular action.
7. [Table C.24](#_bookmark112) describes the Device Type for a muscle oxygen monitor.

### Table C.24 – Healthcare Device Type of muscle oxygen monitor

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.d.muscleoxygenmonitor | Muscle Oxygen Saturation | oic.r.muscleoxygensaturation | M |

1. **C.4.14.2 Required Resource Types**
2. A muscle oxygen monitor shall expose "oic.r.muscleoxygensaturation" to report the muscle
3. oxygen saturation (SmO2).

### C.4.14.3 OCF-defined Optional Resource Types

1. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

### C.4.15 Body composition analyser

1. **C.4.15.1 Introduction**
2. A body composition analyser is a device that analyzes the composition of a human body including body 910 fat, body height, body weight, etc. A body composition analyser uses various techniques for measuring 911 the composition of a human body. For example, body impedance analysis measures the bioelectrical
3. impedance with electrical signals sent from pairs of probes (typically metal electrodes) applied at the feet
4. and/or hands and evaluates the body composition from these impedances.
5. [Table C.25](#_bookmark114) describes the Device Type for a body composition analyser. [Table C.26](#_bookmark115) describes the
6. Atomic Measurement that is present in all instances of a body composition analyser.

### Table C.25 – Healthcare device type of body composition analyser

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirement level** |
| oic.d.bodycompositionanalyser | Body composition analyser Atomic Measurement | oic.r.  bodycompositionanalyser- am | M |

1. **Table C.26 – Atomic measurement type of body composition analyser**

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Type (rt)** | **Resource Type Name** | **Resource Type Value** | **Requirem ent level** |
| oic.r.  bodycompositionanalyser-am | Body fat | oic.r.body.fat | M |
| Height | oic.r.height | M |
| Weight | oic.r.weight | M |
| Body Fat Free Mass | oic.r.body.ffm | O |
| Body Soft Lean Mass | oic.r.body.slm | O |
| Body Water | oic.r.body.water | O |
| Body Mass Index (BMI) | oic.r.bmi | O |

1. **C.4.15.2 Required Resource Types**
2. A body composition analyser shall expose "oic.r.body.fat" to report the body fat of a person.
3. A body composition analyser shall expose "oic.r.height" to report the height of a person. 923 A body composition analyser shall expose "oic.r.weight" to report the weight of a person. 924

### C.4.15.3 OCF-defined Optional Resource Types

1. A body composition analyser measures body fat free mass using the "oic.r.body.ffm" Resource
2. Type.
3. A body composition analyser measures body soft lean free mass using the "oic.r.body.slm"
4. Resource Type.
5. A body composition analyser measures body water using the "oic.r.body.water" Resource Type.
6. A body composition analyser measures Body Mass Index (BMI) using the "oic.r.bmi" Resource
7. Type.
8. See [Table C.2](#_bookmark77) for additional commonly used Resource Types that could be used here.

## D.1 Operational scenarios

**Annex D**

(normative)

**Industrial device types**

Типы ресурсов «Оптическая RFID-метка» и «Оптическая RFID-станция» описывают атрибуты, связанные с оптической расширенной RFID-системой интеллектуальной производственной среды для интеграции наблюдения и активации в производственных линиях предприятий.

Коммерческое наблюдение - это мониторинг в реальном времени для сбора обширных серий данных по каждому продукту на производственной линии и оборудованию в цехе. Эти собранные большие данные могут быть отправлены в облако OCF и / или во внутреннюю сеть OCF производителя, где они анализируются и используются для 945 оценки общего производственного потока, производительности и выявления неисправных частей.

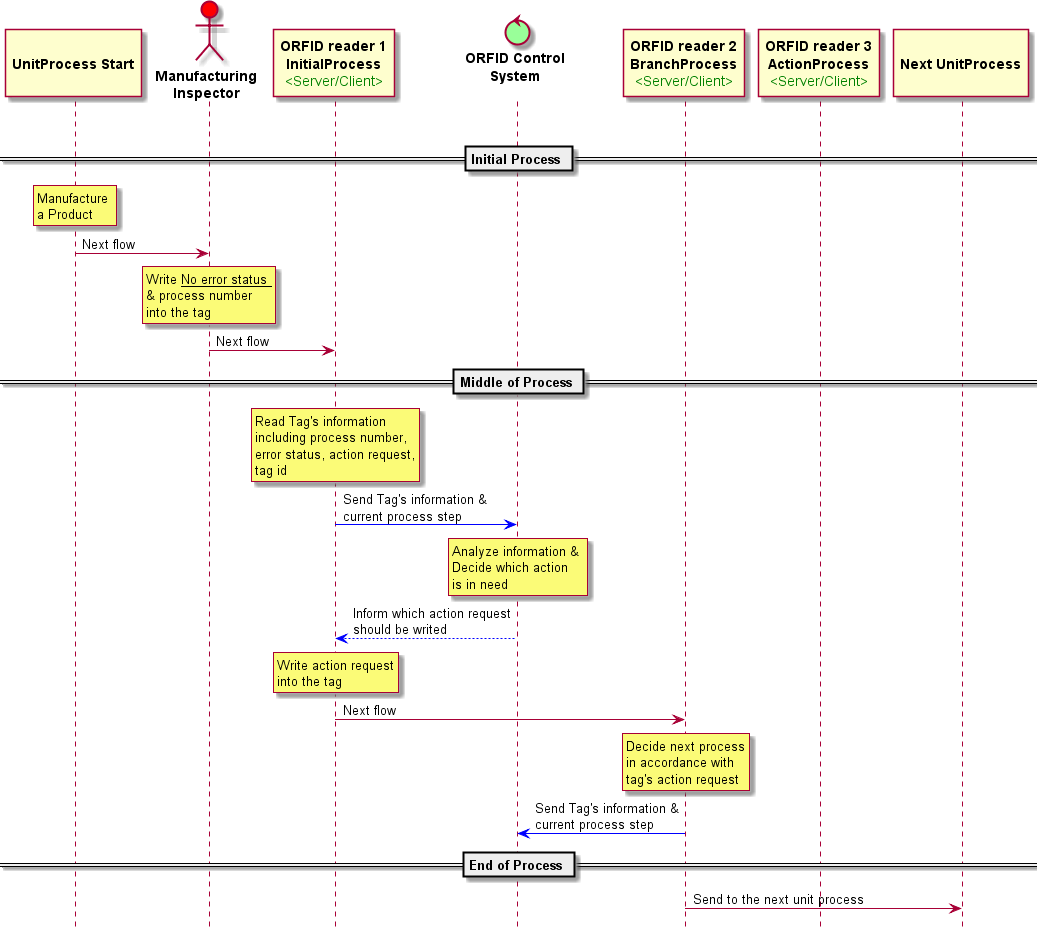
Коммерческая активация - это взаимодействие в режиме реального времени для принятия мер при сбоях системы, таких как изоляция дефектного продукта, возможная отправка продукта на ремонтную линию, тревожные сигналы, такие как состояние производственной линии, панели дисплея и проблемы опасности, такие как пожар и наводнение коммерческого среды, отправляя запросы срабатывания исполнительным механизмам напрямую и / или клиенту (ам).

Оптический расширенный считыватель RFID и метка помогают в управлении производственной линией с использованием экосистемы OCF для интеллектуальной производственной среды. Оптический расширенный считыватель RFID представлен типом ресурса станции RFID, метка - типом ресурса метки RFID.

В типе ресурса метки RFID tagid является целым числом, показывающим идентификационную информацию считываемой в данный момент оптической расширенной метки RFID.

В типе ресурса станции RFID процесс представляет собой этап продукта в линейке продуктов, который имеет оптическую метку RFID на корпусе. Событие представлено логическим значением, установленным на «Истина» или «Ложь», которое сигнализирует о проблеме, когда запрашиваются дополнительные действия для помеченного продукта. actionrequest представляет собой необходимые действия, такие как изоляция продукта, чтобы отправить продукт обратно в другую конкретную линию для изменения или исправления проблемы.

На рисунке D.1 показан нормальный процесс без ошибок на умной фабрике. Линии синей стрелки - это места, где существует связь OCF. Идентификатор тега ORFID доступен для чтения только для обеспечения согласованной идентичности.

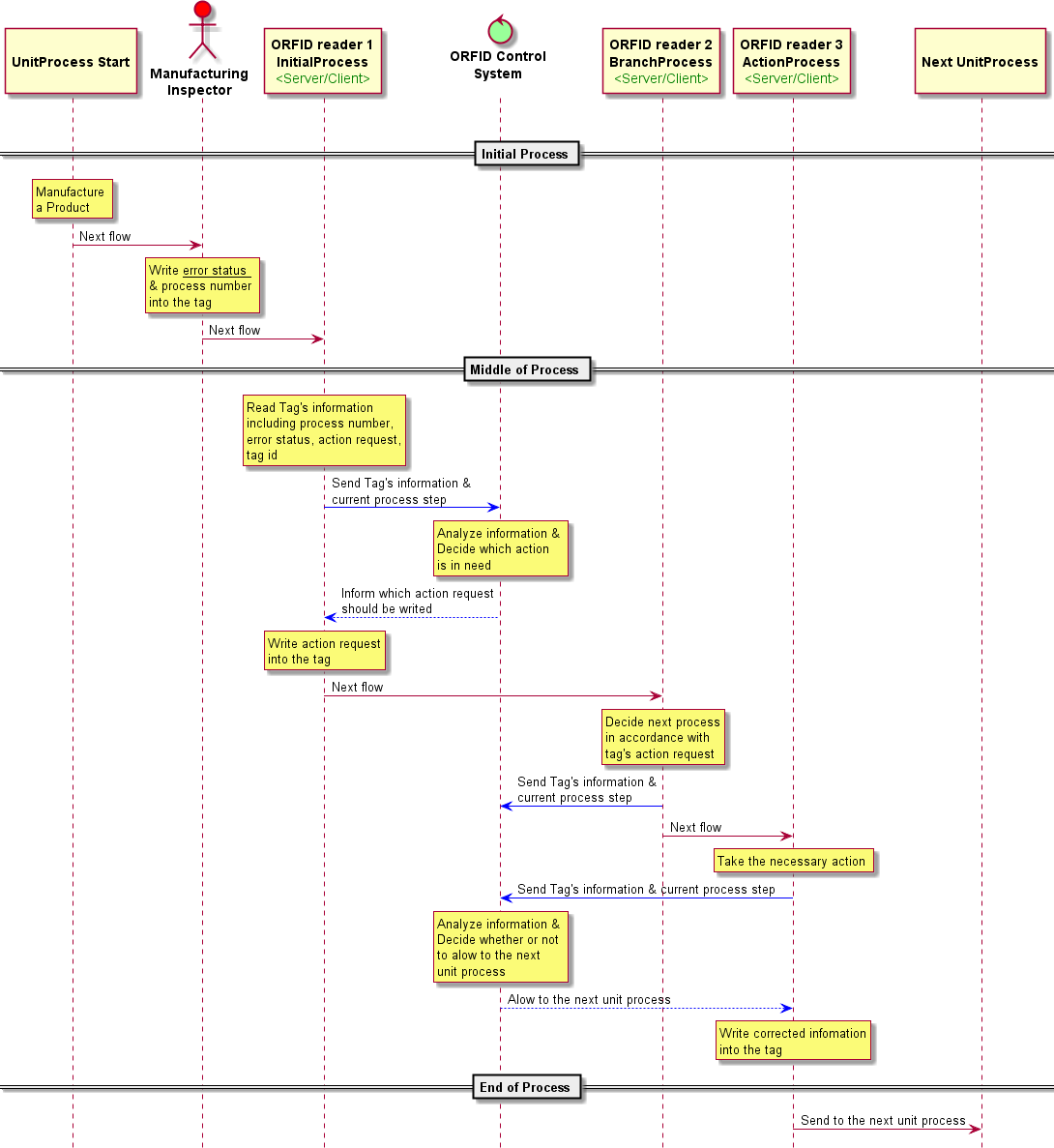
962

### 963 Figure D.1 – Normal process scheme of optical augmented RFID in smart factory

964 **environment**

965 [Figure D.2](#_bookmark119) shows product error control scheme in the smart factory. Blue arrow lines are where

966 OCF communication exists. ORFID tag ID is only readable to maintain consistent identity.

967

### 968 Figure D.2 – Abnormal process scheme of optical augmented RFID in smart factory

969 **environment**

970 Manufacturing Inspector writes "error status" and "process number" into the tag after manufacturing 971 a product. ORFID reader1 reads Tag's information and sends the information including current 972 process step to ORFID Control System. Then ORFID reader1 waits until ORFID Control System 973 replies. When ORFID reader1 receives "action request" from ORFID Control System. ORFID 974 reader1 writes "action request" into the tag.

975 ORFID reader2 located at the "BranchProcess" line decides next flow in accordance with tag's 976 "action request" information then it sends Tag's information and current process step to ORFID 977 Control System, and sends the product to the right flow.

978 If the product has an error, the product gets necessary action at "ActionProcess" line. Then ORFID 979 reader3 sends repaired product's information. Then ORFID reader3 waits until ORFID Control 980 System replies. When ORFID reader3 receives instruction from ORFID Control System for the next 981 flow, ORFID reader3 sends the product according to instruction.

## D.2 Industrial required resources per device type

1. Device Types may mandate that specific Resources be implemented. The required Resource per
2. Device Type where mandated by the Industrial vertical is listed in [Table B.1.](#_bookmark50)

### Table D.1 – Alphabetical list of device types ("rt"), including required resources for

1. **Industrial**

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Name (informative)** | **Device Type ("rt") (Normative)** | **Required Resource name** | **Required Resource Type** |
| Optical augmented RFID Reader | oic.d.orfid | Optical RFID Tag | oic.r.orfid.tag |
| Optical RFID Station | oic.r.orfid.station |

**E.1 Scope**

**Annex E**

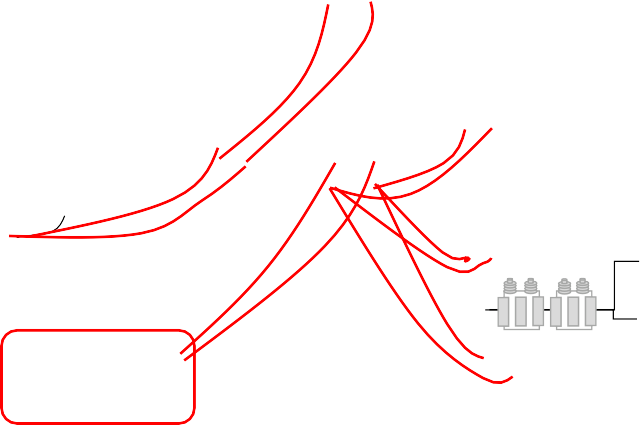
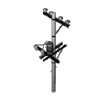
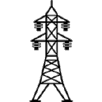
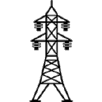
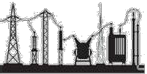
**(normative)**

**PV (Photovoltaic) system device types**

1. This Annex defines Device Types for use in PV (Photovoltaic) systems and describes general use 994 cases to which OCF PV system Devices apply, along with common functional requirements. This 995 Annex considers one of the typical PV system configurations, which is composed of one or more 996 PV array systems, battery systems, inverters, and circuit breakers.

## 997 E.2 Operational scenarios

|  |  |
| --- | --- |
| 998 | An electrical grid facility can be classified into utility side and customer sides. The utility side facility |
| 999 | includes electricity generation, transmission, and distribution. The customer side facility includes |
| 1000 | high and low voltage equipment, distributed renewable energy equipment, and so on. [Figure E.1](#_bookmark125) |
| 1001 | shows the overall classification of an electrical grid facility. The utility side facility is generally |
| 1002 | managed by using IEC 61850 (Communication networks and systems for power utility automation) |
| 1003 | series standards. Especially, [ISO/IEC 61850-7-1](#_bookmark6) defines the data models for electrical equipment |
| 1004 | for the utility side. OCF defines the data models for devices in the residential environment, so |
| 1005 | electrical equipment in the customer side of the electrical grid facility also needs to be defined. |
| 1006 | Since electrical equipment in the utility side uses data models defined in IEC 61850 standards, |
| 1007 | customer side equipment also needs to be defined with consideration to IEC 61850 data models. |



**Utility Side**

**346kV, 154kV**

**Large Large**

**Factory Apartment**

**Complex Complex**

**Generation**

**Transmission Line**

**22.9kV**

**Customer Premise (High Voltage. More than 1kV)**

**154kV,**

**345kV,**

**765kV**

**22.9kV**

**Customer Premise (Low Voltage. Less than 1kV)**

**Renewable Energy Equipment**

**Railway Substation**

**High-speed rail: AC 25kV**

**Transmission**

**22.9kV,**

**25kV**

**Distribution Line**

**Subway: DC 15kV**

**Distribution**

**380V, 220V, 60Hz**

**Customer Premise (Low Voltage. Less than 1kV)**

**Utility Pole**

**Renewable Energy Equipment**

**Customer Side**

|  |  |
| --- | --- |
| 1008 |  |
| 1009 | **Figure E.1 – Classification of electrical grid facility** |
| 1010 | [Figure E.2](#_bookmark126) depicts a typical PV system configuration. As shown in the figure, a PV system consists |
| 1011 | of one or more PV array systems, DC (Direct Current)/AC (Alternating Current) inverters, battery |
| 1012 | systems, and circuit breakers. A PV array system converts the sun's rays into electricity and the |
| 1013 | generated DC current is converted into AC current by a DC/AC inverter. A battery system may be |
| 1014 | used to store generated electricity and discharge it to the electrical grid later. A circuit breaker is |

|  |  |
| --- | --- |
| 1015 | installed in order to disconnect the circuit between the PV system and the internal distribution grid. |
| 1016 | In this use case, the PV array system, battery system, DC/AC inverter, and circuit breaker are |
| 1017 | considered. |



**PV Array System (Photovoltaics)**

**DC/AC**

**Inverter**

**Circuit Breaker**

**Circuit Breaker**

**Electrical Load**

**Battery System**

Target devices

1018

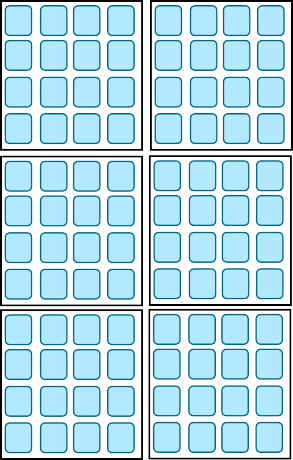
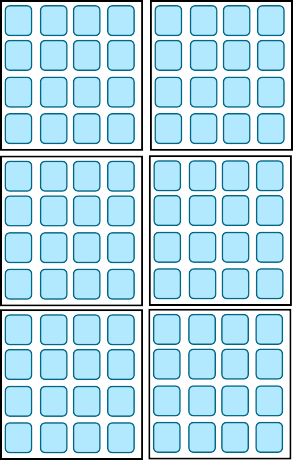
1019

**Electrical Grid**

### Figure E.2 – Typical PV system configuration

|  |  |
| --- | --- |
| 1020 | [Figure E.3](#_bookmark127) shows the detailed configuration of the PV array system. The PV panel is composed of |
| 1021 | a durable glass panel (array) and a rigid frame made up of durable units (modules) after the unit |
| 1022 | cells are integrated and electrically connected. The PV array is connected through the connection |
| 1023 | terminal and the connection terminal monitors the status of each PV array. The connection terminal |
| 1024 | passes through the inverter before passing AC current to the electrical grid. |

Inverter



PV array’s status is monitored

Connection Terminal

Cell

Module

DC/ AC

1025

1026

Array

### Figure E.3 – Detailed configuration of PV array system

1027

1028

1029

1030

1031

1032

1033

## E.3 Standard device types

[Table E.1](#_bookmark129) lists the brief explanation of the function and required resources of PV system Devices. [Table E.2](#_bookmark130) lists PV system Device Types. The Device Type exposed by the "rt" value of /oic/d of all PV system Devices shall have a Resource Type value (“rt”) prefixed with "oic.d.".

### Table E.1 – Function and required resources for PV system device types

|  |  |  |
| --- | --- | --- |
| **Device Name** | **Roles of Device** | **Required Resource and Function** |
| Circuit Breaker | Functions for the control and monitoring of circuit breakers | Circuit breaker: describes circuit  breakers used in the protection of the PV system |
| Battery System | Functions required to store excess energy  produced by the PV system. Energy storage in PV systems is usually done with batteries | Battery: battery if needed for energy storage |
| Inverter | Functions for the control and monitoring of the DC/AC inverter | Inverter: converts DC to AC |
| PV Array System | Functions to maximize the power output of the PV array | PV Connection Terminal: PV array(s) is connected and status is monitored |

**Table E.2 – List of PV system device types**

|  |  |  |  |
| --- | --- | --- | --- |
| **Device Name** | **Device Type (rt)** | **Required Resource Name** | **Required Resource Type** |
| Circuit Breaker | oic.d.circuitbreaker | circuit breaker | oic.r.circuitbreaker |
| Battery System | oic.d.battery | battery | oic.r.energy.battery |
| Inverter | oic.d.inverter | inverter | oic.r.inverter |

|  |  |  |  |
| --- | --- | --- | --- |
| PV Array System | oic.d.pvarraysystem | PV connection terminal | oic.r.pvconnectionterminal |