

1 **OCF “Essen” – Core Spec Split Move Sections into Device Spec – Core Technology WG CR**
2 **2907**

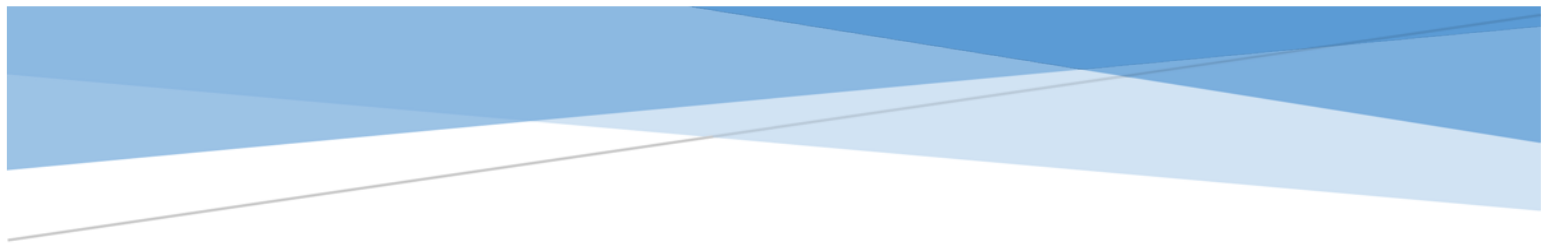
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OCF Device Specification

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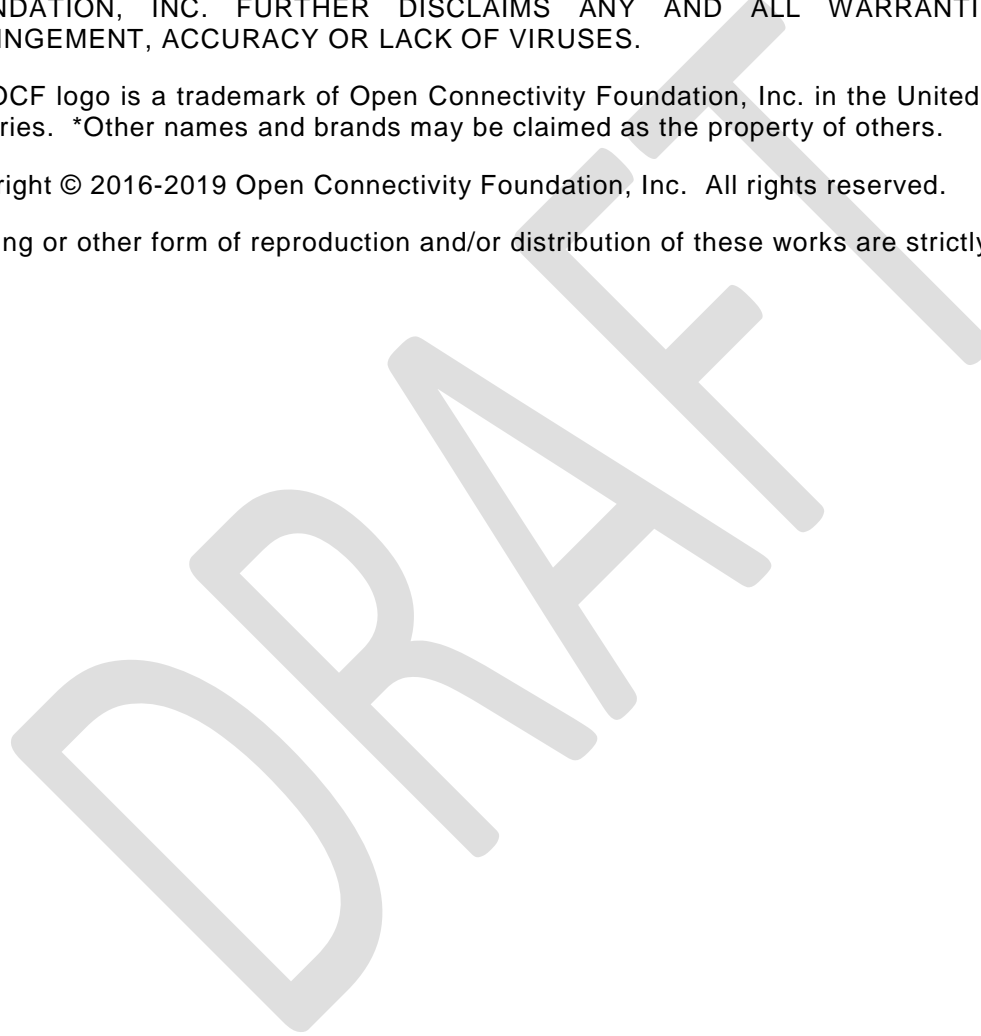
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CONTENTS

49
50

51	1	Scope	1
52	2	Normative references	1
53	3	Terms, definitions, and abbreviated terms	1
54	3.1	Terms and definitions	1
55	3.2	Abbreviated terms	2
56	4	Document conventions and organization	2
57	4.1	Conventions	2
58	4.2	Notation	2
59	4.3	Data types	3
60	4.4	Document structure	3
61	5	Operational scenarios	4
62	5.1	Document version	4
63	6	Core resource model	4
64	6.1	Introduction	4
65	6.2	Device type	4
66	6.3	Profile of ISO/IEC 30118-1:2018	5
67	6.4	Third (3 rd) party specified extensions	5
68	7	Modelling of multiple logical devices	6
69	7.1	Introduction	6
70	7.2	Single platform model	7
71	7.3	Multi-platform model	7
72	7.4	Composite device model	7
73	8	Discovery	9
74	8.1	Endpoint discovery	9
75	8.2	Resource discovery	9
76	9	Security	10
77		Annex A (normative) Device categories and device types	11
78	A.1	Device categories	11
79	A.2	Device types	11
80		Annex B (normative) Smart home device types	16
81	B.1	Smart home required resources per device type	16
82	B.2	Standardized enumeration values	18
83	B.2.1	Introduction	18
84	B.2.2	Alphabetical list of standardized enumeration types	19
85	B.2.3	Standardized list of supported values for mode resource type (oic.r.mode)	22
86	B.2.4	Standardized list of supported values for operational state resource type (oic.r.operational.state)	24
87			
88	B.2.5	Standardized list of supported values for consumable and consumable collection resource types (oic.r.consumable, oic.r.consumablecollection)	26
89			
90	B.3	Camera media format (oic.r.media)	27
91	B.4	Additional requirements per device type	27

92	Annex C (normative) Healthcare device types	28
93	C.1 Scope	28
94	C.2 Introduction to OCF healthcare devices	28
95	C.3 Operational scenarios	28
96	C.4 Standardized device types	29
97	C.4.1 Introduction	29
98	C.4.2 Blood pressure monitor.....	30
99	C.4.3 Glucose meter	31
100	C.4.4 Body scale.....	32
101	C.4.5 Body thermometer	33
102	Annex D (normative) Industrial device types	34
103	D.1 Operational scenarios	34
104	D.2 Industrial required resources per device type.....	37
105		

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106		Figures	
107	Figure 1 – Device building blocks.....		4
108	Figure 2 – Example composite device model		8
109	Figure 3 – RETRIEVE response to example door from composite device model.....		9
110	Figure B.1 – Example of mode transitions of a dryer		24
111	Figure B.2 – Example of job state transitions of a printer		26
112	Figure C.1 – Schematic diagram of healthcare usages.....		29
113	Figure D.1 – Normal process scheme of optical augmented RFID in smart factory		
114	environment.....		35
115	Figure D.2 – Abnormal process scheme of optical augmented RFID in smart factory		
116	environment.....		36
117			

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Tables

118		
119	Table 1 – Required resources for devices	5
120	Table 2 – Required properties in resource	5
121	Table 17 – 3rd party defined Resource elements	6
122	Table A.1 – List of device categories	11
123	Table A.2 – Per category list of device types	11
124	Table B.1 – Alphabetical list of device types ("rt"), including required resources for smart	
125	home	16
126	Table B.2 – List of required oic.r.mode supported values per Device Type ("rt").....	22
127	Table B.3 – List of required oic.r.operational.state supported values per Device Type ("rt") ..	24
128	Table B.4 – List of defined enumeration values for oic.r.consumable,	
129	oic.r.consumablecollection	27
130	Table B.5 – Recommended media profiles	27
131	Table C.1 – Alphabetical list of healthcare device types.....	29
132	Table C.2 – Commonly used resource types of healthcare device types.....	30
133	Table C.3 – Healthcare device type of blood pressure monitor	30
134	Table C.4 – Atomic measurement of blood pressure monitor.....	31
135	Table C.5 – Healthcare device type of glucose meter.....	31
136	Table C.6 – Atomic measurement of glucose meter	31
137	Table C.7 – Healthcare device type of body scale	32
138	Table C.8 – Atomic measurement type of body scale	32
139	Table C.9 – Healthcare device type of body thermometer	33
140	Table C.10 – Atomic measurement type of body thermometer.....	33
141	Table D.1 – Alphabetical list of device types ("rt"), including required resources for	
142	Industrial.....	37
143		

144 **1 Scope**

145 ISO/IEC 30118-5 is an Application Profile specification.

146 The Device definitions use Resource definitions from the ISO/IEC 30118-4:2018.

147 This document is built on top of ISO/IEC 30118-1:2018. ISO/IEC 30118-1:2018 specifies the core
148 architecture, interfaces protocols and services to enable the implementation of profiles for IoT
149 usages and ecosystems. ISO/IEC 30118-1:2018 also defines the main architectural components of
150 network connectivity, discovery, data transmission, device & service management and ID & security.
151 The core architecture is scalable to support simple devices (constrained devices) and more capable
152 devices (smart devices).

153 **2 Normative references**

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

158 ISO/IEC 30118-1:2018 Information technology -- Open Connectivity Foundation (OCF)
159 Specification -- Part 1: Core specification
160 <https://www.iso.org/standard/53238.html>
161 Latest version available at: https://openconnectivity.org/specs/OCF_Core_Specification.pdf

162 ISO/IEC 30118-2:2018 Information technology -- Open Connectivity Foundation (OCF)
163 Specification -- Part 2: Security specification
164 <https://www.iso.org/standard/74239.html>
165 Latest version available at: https://openconnectivity.org/specs/OCF_Security_Specification.pdf

166 ISO/IEC 30118-4:2018 Information technology -- Open Connectivity Foundation (OCF)
167 Specification -- Part 4: Resource type specification
168 <https://www.iso.org/standard/74241.html>
169 Latest version available at:
170 https://openconnectivity.org/specs/OCF_Resource_Type_Specification.pdf

171 OpenAPI specification, fka *Swagger RESTful API Documentation Specification*, Version 2.0
172 <https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md>

173 IETF RFC 4566, SDP: Session Description Protocol, July 2006
174 <https://tools.ietf.org/html/rfc4566>

175 Draft Report: A Basic Classification System for Energy-Using Products--Universal Device
176 Classification, December 2013
177 <https://eta-intranet.lbl.gov/sites/default/files/lbnl-classification-v1.pdf>

178 **3 Terms, definitions, and abbreviated terms**

179 **3.1 Terms and definitions**

180 For the purposes of this document, the terms and definitions given in ISO/IEC 30118-1:2018 and
181 ISO/IEC 30118-2:2018 and the following apply.

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

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

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

186 **3.1.1**

187 **Actuator**

188 resource with support of the UPDATE operation.

189 **3.1.2**

190 **Sensor**

191 resource without support of the UPDATE operation.

192 **3.1.3**

193 **Healthcare Device**

194 a Device that is conformant to the normative requirements contained in Annex C of this document.

195 **3.2 Abbreviated terms**

196 **3.2.1**

197 **CRUDN**

198 Create Retrieve Update Delete Notify

199 This is an acronym indicating which operations are possible on the Resource.

200 **3.2.2**

201 **CSV**

202 Comma Separated Value

203 Comma Separated Value is a construction to have more fields in 1 string separated by commas. If
204 a value itself contains a comma then the comma can be escaped by adding "\" in front of the comma.

205 **3.2.3**

206 **Representational State Transfer**

207 **REST**

208 REST is an architecture style for designing networked applications that relies on a stateless, client-
209 server, cacheable communications protocol.

210 **3.2.4**

211 **SDP**

212 Session Description Protocol

213 SDP describes multimedia sessions for the purposes of session announcement, session invitation,
214 and other forms of multimedia session initiation. It is fully defined in IETF RFC 4566.

215 **3.2.5**

216 **UDC**

217 Universal Device Classification

218 An enumeration of device types published as A Basic Classification System for Energy-Using
219 Products--Universal Device Classification

220 **4 Document conventions and organization**

221 **4.1 Conventions**

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

226 **4.2 Notation**

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

229 Required (or shall or mandatory).

230 These basic features shall be implemented. The phrases "shall not", and "PROHIBITED"
231 indicate behaviour that is prohibited, i.e. that if performed means the implementation is not in
232 compliance.

233 Recommended (or should).

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

240 Allowed (or allowed).

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

243 Conditionally allowed (CA).

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

246 Conditionally required (CR).

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

250 DEPRECATED

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

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

258 Words that are emphasized are printed in *italic*.

259 **4.3 Data types**

260 See ISO/IEC 30118-1:2018.

261 **4.4 Document structure**

262 This document describes specific requirements governing the indication of Device Types on
263 Devices and the requirements that are associated with specific Device Types themselves. The
264 document makes use of functionality defined in the ISO/IEC 30118-1:2018 and ISO/IEC 30118-
265 4:2018.

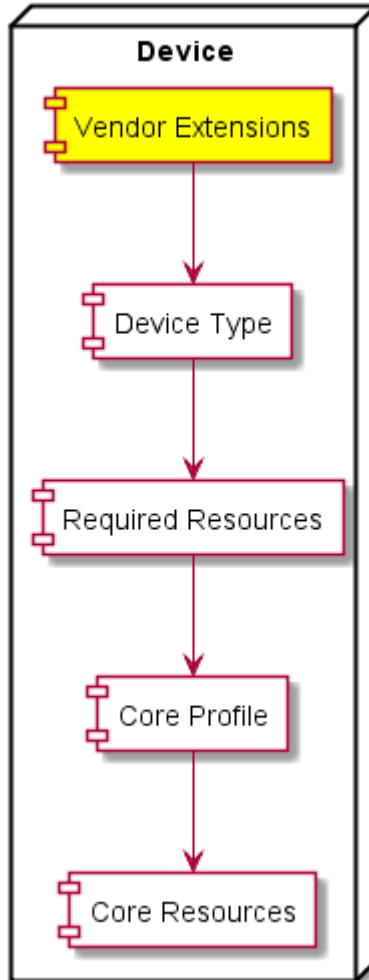
266 Annex A specifies the Device Types that shall be used by an OCF Device.

267 Annex B specifies the profiles that shall be used by an OCF Device that is part of the Smart
268 Home vertical.

269 Annex C specifies the profiles that shall be used by an OCF Device that is part of the Healthcare
270 vertical.

271 Annex D specifies the profiles that shall be used by an OCF Device that is part of the Industrial
272 vertical.

273 This document further describes which constructs are used for a Device and which Resources are
274 mandated to be implemented for each Device. A typical Device consisting of data elements defined
275 in the referenced documents is depicted in Figure 1.



276
277 **Figure 1 – Device building blocks**

276

277

278 **5 Operational scenarios**

279 **5.1 Document version**

280 All Devices conformant to this document shall add the string "ocf.sh.1.3.0" to the dmV Property in
281 oic.wk.d. This Property is for legacy Device support only and will no longer be revised in alignment
282 with document versions.

283 **6 Core resource model**

284 **6.1 Introduction**

285 The Core Resource model is described in ISO/IEC 30118-1:2018.

286 **6.2 Device type**

287 The Device Types of all devices shall have a Resource Type name ("rt") prefixed with "oic.d."

288 Examples of Device Types are:

- 289 – oic.d.fan
- 290 – oic.d.thermostat

291 The full list of defined Device names and types are in Table A.2, Annex B and Annex C detail the
292 minimal Resource(s) that a Device shall implement for a specific Device Type where required by a
293 vertical. A Device may expose additional OCF and 3rd party defined Resources other than those
294 indicated in these Annexes.

295 ISO/IEC 30118-1:2018 defines a Device Resource with a URI of "/oic/d". A Device shall include in
296 the "Resource type" Property of "/oic/d" the Device Type (or Device Types) from Table A.2 of the
297 physical device hosting the Server; the inclusion of the Device Type shall be done using one of the
298 methods provided by clause 11.3.4 of ISO/IEC 30118-1:2018 (i.e. add to the array of values).

299 ISO/IEC 30118-1:2018 supports the inclusion of a Device Type as part of the Resource Type of a
300 Collection (see also clause 7.4), in such cases the Collection shall include the Resource Types
301 defined as mandatory for the Device Type by this document. For example, if a Collection Resource
302 has an "rt" value of ["oic.d.light"], the Collection includes an instance of "oic.r.switch.binary" which
303 is mandatory for an "oic.d.light" as per clause B.1.

304 Therefore a Device may be discovered by adding a query for the "rt" of the Device Type itself (e.g.
305 "?rt=oic.d.fan") to the multicast Endpoint discovery method (see 8.1).

306 **6.3 Profile of ISO/IEC 30118-1:2018**

307 This clause describes the profiling of the Core Resources and transport mechanisms and functions
308 that are defined in ISO/IEC 30118-1:2018.

309 The required ISO/IEC 30118-1:2018 Resources are also required for a profile implementation.

310 In addition to the required Resources the optional ISO/IEC 30118-1:2018 Resources in Table 1
311 shall be required.

312 **Table 1 – Required resources for devices**

Resource ("rt")	Required in Profile
Intentionally left blank	Intentionally left blank

313 For each of the Resources listed in Table 1, Table 2 details the Properties within those Resources
314 that shall be required.

315 **Table 2 – Required properties in resource**

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

316 A Device shall support CoAP based endpoint discovery as defined in clause 10.3 of ISO/IEC 30118-
317 1:2018.

318 The messaging protocol for a Device shall be CoAP (see ISO/IEC 30118-1:2018).

319 A Device shall support a network layer as defined in clause 9 of ISO/IEC 30118-1:2018 including
320 any necessary defined bridging functions that ensure inter-operability with IPv6.

321 **6.4 Third (3rd) party specified extensions**

322 This clause describes how a 3rd party may add Device Types, Resource Types, 3rd party defined
323 Properties to an existing or 3rd party defined Resource Type, 3rd party defined enumeration values
324 to an existing enumeration and 3rd party defined Parameters to an existing defined Property.

325 A 3rd party may specify additional (non-OCF) Resources within an OCF Device. A 3rd party may
 326 also specify additional Properties within an existing OCF defined Resource Type. Further a 3rd
 327 party may extend an OCF defined enumeration with 3rd party defined values.

328 A 3rd party defined Device Type may expose both 3rd party and OCF defined Resource Types. A
 329 3rd party defined Device Type must expose the mandatory Resources for all OCF Devices defined
 330 within this document.

331 A 3rd party defined Resource Type shall include any mandatory Properties defined in this document
 332 and also any vertical specified mandatory Properties. All Properties defined within a 3rd party
 333 defined Resource Type that are part of the OCF namespace that are not Common Properties as
 334 defined in this document shall follow the 3rd party defined Property rules in Table 3.

335 The following table defines the syntax rules for 3rd party defined Resource Type elements. Within
 336 the table the term "Domain_Name" refers to a domain name that is owned by the 3rd party that is
 337 defining the new element.

338 **Table 3 – 3rd party defined Resource elements**

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

339
 340 With respect to the use of the Domain_Name in this scheme the labels are reversed from how they
 341 appear in DNS or other resolution mechanisms. The 3rd party defined Device Type and Resource
 342 Type otherwise follow the rules defined in ISO/IEC 30118-1:2018. 3rd party defined Resource Types
 343 should be registered in the IANA Constrained RESTful Environments (CoRE) Parameters registry.

344 For example:

345 x.com.samsung.galaxyphone.accelerator
 346 x.com.cisco.ciscorouterport
 347 x.com.hp.printerhead
 348 x.org.allseen.newinterface.newproperty

349 **7 Modelling of multiple logical devices**

350 **7.1 Introduction**

351 A physical Device may be modelled as a single Platform and Device, a single Platform with multiple
 352 Devices, multiple separately discoverable discrete Platforms and Devices, or as a single Platform
 353 and Device where the Device is represented as a composition of other Devices.

354 For example, a door that includes the functionality of a contact sensor, a lock and a camera may
 355 be modeled as a single-Platform, a multi-Platform, or a Composite Device. Each of these three
 356 options will be detailed in clauses 7.2, 7.3, and 7.4.

357 **7.2 Single platform model**

358 The physical Device exposes one or more logical Devices that are independently discoverable (i.e.
359 they separately respond to multicast discovery request messages as defined in clause 11.3 of
360 ISO/IEC 30118-1:2018). Given the door example there could be a single discovery response with
361 an instance of "/oic/d" that exposes a single Device Type (such as "oic.d.door") or multiple
362 discovery responses, each response having a single Device Type in the "rt" of "/oic/d" that
363 represents the logical Device. The common denominator being that for all discovered logical
364 Devices the Properties of "/oic/p" have the same values.

365 **7.3 Multi-platform model**

366 Just like the single-Platform model, one or more logical Devices that make up a physical Device
367 respond independently to multicast discovery request messages and expose their own Resources.
368 Like the single-platform model, each logical Device exposes a single Device Type in the "rt" value
369 of "/oic/d". The difference from the single-platform model is that each logical Device does not have
370 the same values for the Properties of "oic/p".

371 **7.4 Composite device model**

372 When modelling a Server as a Composite Device there shall be a single Platform which represents
373 the Composite Device. The Resource Type Property Value of "/oic/d" exposed should contain all
374 of the Device Types of the Devices that compose the Composite Device. For each Device that is
375 part of the Composite Device when using this approach there shall exist a Collection that represents
376 one of the distinct Devices in the composition. Further each Collection shall have a Resource Type
377 that at a minimum includes the Device Type that the Collection represents (e.g. ["oic.d.door"]).

378 Figure 2 illustrates the response to a discovery request using the baseline Interface on "/oic/res"
379 for a Composite Device modeled as described in this clause. Figure 3 illustrates the response to a
380 unicast RETRIEVE request using the baseline Interface to the Collection that represents the door
381 Device.

382

```

[
  {
    "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"}
      ]
    }
  ]
}

```

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

386 **8 Discovery**

387 **8.1 Endpoint discovery**

388 Clients may discover Servers by using the mechanisms defined by ISO/IEC 30118-1:2018 clause
 389 10. A Client may populate an "rt" query parameter with the Device Types that the Client wants to
 390 discover, or if no "rt" query parameter is provided then the search is for all available Device Types
 391 irrespective.

392 Devices may be discovered by Device Type or implemented Resource Type. This difference is
 393 conveyed by the population of any "rt" query parameter included as part of discovery (see clause
 394 11.3 of ISO/IEC 30118-1:2018).

395 The values that may be used for discovering a specific Device Type are listed in Table A.2. The
 396 values that may be used to discover a specific Resource Type are listed in clause 6 of ISO/IEC
 397 30118-4:2018.

398 The discovery process provides the base URI of the Device that is acting as a Server to the Client.
 399 The structure of the detected Device can then be retrieved by Resource Discovery.

400 **8.2 Resource discovery**

401 Clause intentionally left blank

402

403 **9 Security**

404 A Device shall implement the mandated Security Virtual Resources specified in the ISO/IEC 30118-
405 2:2018. Additionally, all exposed ISO/IEC 30118-4:2018 defined Resources shall be accessible
406 via at least one secure Endpoint (i.e. use of a "coaps" or "coaps+tcp" scheme locator within the
407 "eps" Parameter exposed by /oic/res; see ISO/IEC 30118-1:2018 clause 10.2.4). A Device shall
408 not expose ISO/IEC 30118-4:2018 defined Resources using unsecured Endpoints (i.e. "coap" or
409 "coap+tcp" scheme locator in the "eps" Parameter).

410 With the exception of those Resources related to Discovery that are explicitly identified by the
411 ISO/IEC 30118-1:2018 as not requiring secured access (see ISO/IEC 30118-1:2018 clause 11.3.4),
412 all other Resources defined in ISO/IEC 30118-1:2018 implemented in the Smart Home Device shall
413 be accessible via at least one secure Endpoint (i.e. use of a "coaps" or "coaps+tcp" scheme locator
414 within the "eps" Parameter exposed by /oic/res). Similarly, any Resources defined in ISO/IEC
415 30118-1:2018 that do not require unsecured access that are not listed in /oic/res shall also be
416 accessible via "coaps" or "coaps+tcp".

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Annex A
(normative)

Device categories and device types

A.1 Device categories

Devices are grouped into Device Categories based on the Universal Device Classification (UDC) (see A Basic Classification System for Energy-Using Products--Universal Device Classification), all Device Categories are listed in Table A.1.

Table A.1 – List of device categories

Device Category Name	Description
Space Conditioning	Heating and cooling systems
Lighting	
Appliance	Also known as "white goods"; covers major appliances only.
Electronics	Personal electronics
Miscellaneous	Small appliances, other
Infrastructure	Physical building and infrastructure
Transportation	Vehicles, fixed devices that provide movement (e.g. Escalators)
Fitness	Includes lifestyle
Medical	
Personal Health	
Other	

A.2 Device types

The complete Universal Device Classification with Device Types per Device Category is provided in Table A.2. Note that not all Devices within the UDC classification have equivalent OCF defined Device Types. All defined Device Types are of the form "oic.d.<thing>" where <thing> is a single alphanumeric string (lower case [a..z],[0..9] only) no more than 24 characters in length giving a total maximum length of the Device Type of 32 characters. Where an abbreviated form of the Device Type is required (applicable only to population of a Wi-Fi beacon IE) then the "oic.d." portion of the Device Type may be omitted.

Table A.2 does not specify the mandatory resources that are implemented by an instance of such a Device Type; the set of applicable mandatory Resources is dependent on the application domain. In this document the following domains are specified: Smart Home, Healthcare. The "Reference" column in the table references vertical specific annexes where the Device Type is further refined (e.g. mandatory Resources).

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
	Boiler	Water Heater	oic.d.waterheater	B.1
	Furnace	Furnace	oic.d.furnace	

	Pump	Pump	oic.d.pump	
	Fan	Fan	oic.d.fan	B.1
	Condensing Unit	Condensing Unit	oic.d.condensingunit	
	Condenser	Condenser	oic.d.condenser	
	Humidifier	Humidifier	oic.d.humidifier	B.1
	Dehumidifier	Dehumidifier	oic.d.dehumidifier	B.1
	HVAC – Control	Thermostat	oic.d.thermostat	B.1
	HVAC - Other	HVAC	oic.d.hvac	
		Air Purifier	oic.d.airpurifier	B.1
		Air Quality Monitor	oic.d.airqualitymonitor	B.1
Lighting	Lighting - Controls	Lighting Controls	oic.d.lightingcontrol	
	Lighting - Other	Light	oic.d.light	B.1
Appliance	Clothes Dryer	Dryer (Laundry)	oic.d.dryer	B.1
	Clothes Washer	Washer (Laundry)	oic.d.washer	B.1
		Clothes Washer Dryer	oic.d.washerdryer	B.1
	Dishwasher	Dishwasher	oic.d.dishwasher	B.1
	Freezer	Freezer	oic.d.freezer	B.1
	Ice Machine	Ice Machine	oic.d.icemachine	
	Oven	Oven	oic.d.oven	B.1
	Range	Range	oic.d.range	
	Refrigerator	Refrigerator	oic.d.refrigerator	B.1
	Water Heater	Water Heater	oic.d.waterheater	B.1
	Appliance - Other	Cooker Hood	oic.d.cookerhood	B.1
		Cooktop	oic.d.cooktop	B.1
		Steam Closet	oic.d.steamcloset	B.1
Electronics	Audio System	Audio System	oic.d.audiosystem	
	A/V Player	AV Player	oic.d.avplayer	
	Camera	Camera	oic.d.camera	B.1
	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
		Printer	oic.d.printer	B.1
		Printer Multi-Function	oic.d.multifunctionprinter	B.1
		Scanner	oic.d.scanner	B.1
	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
	Set Top Box	Set Top Box	oic.d.stb	B.1
	Telephony	Telephony	oic.d.telephonydevice	
	Television	Television	oic.d.tv	B.1
	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
	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
	Kitchen	Coffee Machine	oic.d.coffeemachine	B.1
		Food Probe	oic.d.foodprobe	B.1
		Grinder	oic.d.grinder	B.1

		Kettle	oic.d.kettle	B.1
	Lighting – Decorative	Decorative Lighting	oic.d.lightdecorative	
	Lighting – Emergency	Emergency Lighting	oic.d.lightemergency	
	Microwave Oven	Microwave Oven	oic.d.microwave	B.1
	Vending Machine	Vending Machine	oic.d.vendingmachine	
	Water Dispenser	Water Dispenser	oic.d.waterdispenser	
		Battery	oic.d.battery	B.1
Infrastructure	Breakers	Water Valve	oic.d.watervalve	B.1
	Doors/Windows	Blind	oic.d.blind	B.1
		Door	oic.d.door	B.1
		Garage Door	oic.d.garagedoor	B.1
		Smart Lock	oic.d.smartlock	B.1
		Window	oic.d.window	B.1
	Fireplace	Fireplace	oic.d.fireplace	
	Pump	Pump	oic.d.pump	
	Power - Portable	Energy Generator	oic.d.energygenerator	B.1
		Smart Plug	oic.d.smartplug	B.1
	Power - Fixed	Switch	oic.d.switch	B.1
	Security	Security Panel	oic.d.securitypanel	B.1
	Sensors	Generic Sensor	oic.d.sensor	B.1
	Meter	Electric Meter	oic.d.electrictmeter	B.1
		Energy Monitor	oic.d.energymonitor	B.1
Transportation	Transport - Other	Electric Vehicle Charger	oic.d.electricvehiclecharger	B.1
Fitness		Fitness Device	oic.d.fitnessdevice	
		Blood Pressure Monitor	oic.d.bloodpressuremonitor	C.4
		Body Thermometer	oic.d.bodythermometer	C.4
Medical		Medical Device	oic.d.medicaldevice	
		Blood Pressure Monitor	oic.d.bloodpressuremonitor	C.4
		Glucose Meter	oic.d.glucosemeter	C.4
		Body Scale	oic.d.bodyscale	C.4
		Body Thermometer	oic.d.bodythermometer	C.4

Personal Health		Personal Health Device	oic.d.personalhealthdevice	
		Blood Pressure Monitor	oic.d.bloodpressuremonitor	C.4
		Glucose Meter	oic.d.glucosemeter	C.4
		Body Scale	oic.d.bodyscale	C.4
		Body Thermometer	oic.d.bodythermometer	C.4
Other	Other		oic.d.unknown	
		Access Management Service	oic.d.ams	
		Credential Management Service	oic.d.cms	
		Device Ownership Transfer Service	oic.d.dots	

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440 **Annex B**
 441 (normative)

442 **Smart home device types**

443 **B.1 Smart home required resources per device type**

444 Device Types may mandate that specific Resources be implemented. The required Resource per
 445 Device Type where mandated is listed in Table B.1. Additionally, specific Resources that use
 446 enumeration values to indicate supported states or modes may mandate usage of standardized
 447 enumeration values. The mandated allowed values are indicated for each applicable Resource
 448 Type, the Property of interest on that Resource Type and to which Device Type it applies.
 449

450 Per Table B.1, some Device types support two instances of the same Resource Type. When this is
 451 the case, the Resources shall support different CRUDN actions, e.g. one Resource acts as a
 452 Sensor (CRUDN action write not supported) and the other Resource acts as an Actuator (CRUDN
 453 actions read and write supported at a minimum) unless otherwise specified.

454 **Table B.1 – Alphabetical list of device types ("rt"), including required resources for smart**
 455 **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
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
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
		Mode	oic.r.mode
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.electrictmeter	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
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
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.automaticdocumentfeeder ^b
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	Binary Switch	oic.r.switch.binary
		Mode	oic.r.mode
		Operational State	oic.r.operational.state
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 Valve	oic.d.watervalve	Open Level	oic.r.openlevel
Window	oic.d.window	Open Level	oic.r.openlevel
<p>^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).</p> <p>^b A Multi-Function Printer shall only expose an Automatic Document Feeder resource if the device has the Automatic Document Feeder capability.</p>			

456 **B.2 Standardized enumeration values**

457 **B.2.1 Introduction**

458 Resource Types may have a list of supported enumeration values. The supported enumeration
459 values may differ when applied in different devices. In this clause the affected Resource Types are
460 described by:

- 461 – Generic list of supported values
- 462 – Mandated list of supported values when applied to a specific Device

463 **B.2.2 Alphabetical list of standardized enumeration types**

464 This clause lists the standardized enumeration types that are used in the oic.r.mode,
465 oic.r.operational.state, and oic.r.consumable Resources.

- 466 – aborted
- 467 – An internal device, communication or security error
- 468 – active
- 469 – Unit is active
- 470 – airDry
- 471 – unit is air drying
- 472 – armedAway
- 473 – unit is armed for away
- 474 – armedInstant
- 475 – unit is armed instantly
- 476 – armedMaximum
- 477 – unit is armed at maximum level
- 478 – armedNightStay
- 479 – unit is armed in night stay
- 480 – armedStay
- 481 – unit is armed in stay mode
- 482 – aroma
- 483 – unit is armed in aroma mode
- 484 – artificialintelligence
- 485 – unit is in artificial intelligence mode
- 486 – auto
- 487 – unit is in auto mode or state
- 488 – boiling
- 489 – unit is in boiling state or mode
- 490 – brewing
- 491 – unit is in brewing state or mode
- 492 – cancelled
- 493 – the job was cancelled either by the remote client or by the user
- 494 – circulating
- 495 – unit is in circulating model or state
- 496 – cleaning
- 497 – unit is in cleaning mode or state
- 498 – clothes
- 499 – unit is in clothes mode
- 500 – completed
- 501 – job finished successfully
- 502 – cool

- 503 – unit is in cooling mode or state
- 504 – delicate
- 505 – unit is in delicate mode or state
- 506 – disabled
- 507 – unit’s current operational mode is disabled
- 508 – down
- 509 – unit is unavailable
- 510 – dual
- 511 – unit is in dual mode
- 512 – dry
- 513 – unit is dry mode
- 514 – enabled
- 515 – unit’s current operational mode is enabled
- 516 – extended
- 517 – unit is in extended mode or state
- 518 – fan
- 519 – unit is in fan mode or state
- 520 – fast
- 521 – unit is in fast mode or state
- 522 – filterMaterial
- 523 – filter material that is used by a device
- 524 – focused
- 525 – unit is in focused mode or state
- 526 – grinding
- 527 – unit is in grinding state or mode
- 528 – heating
- 529 – unit is in heating mode or state
- 530 – heavy
- 531 – unit is in heavy mode or state
- 532 – idle
- 533 – new jobs can start processing without waiting
- 534 – ink
- 535 – generic ink cartridge for a device
- 536 – inkBlack
- 537 – black ink cartridge for a device
- 538 – inkCyan
- 539 – cyan ink cartridge for a device
- 540 – inkMagenta
- 541 – magenta ink cartridge for a device
- 542 – inkTricolour

- 543 – tricolour ink cartridge for a device
- 544 – inkYellow
- 545 – yellow ink cartridge for a device
- 546 – keepwarm
- 547 – unit is in keep warm state or mode
- 548 – normal
- 549 – unit is in a normal operational state
- 550 – notsupported
- 551 – ability to set a specific operational mode by a client is not supported
- 552 – pause
- 553 – unit is paused (by user)
- 554 – pending
- 555 – job initiated, engine is preparing
- 556 – pendingHeld
- 557 – job is not a candidate for processing for any number of reasons, will return to pending state
- 558 if reasons are solved.
- 559 – permapress
- 560 – unit is in permanent press mode or state
- 561 – preWash
- 562 – unit is pre wash mode
- 563 – processing
- 564 – processing the job
- 565 – pure
- 566 – unit is in pure mode or state
- 567 – quick
- 568 – unit is in quick mode or state
- 569 – quiet
- 570 – unit is in quiet mode
- 571 – rinse
- 572 – unit is rinse mode
- 573 – sectored
- 574 – unit is in sectored mode or state
- 575 – silent
- 576 – unit is in silent mode or state
- 577 – sleep
- 578 – unit is in sleep mode or state
- 579 – smart
- 580 – unit is in smart mode or state
- 581 – spot
- 582 – unit is in spot mode or state

- 583 – steam
- 584 – unit is in steam mode or state
- 585 – stopped
- 586 – error condition occurred
- 587 – spin
- 588 – unit is in spin mode
- 589 – testing
- 590 – calibrating, preparing the unit
- 591 – toner
- 592 – generic toner cartridge for a device
- 593 – tonerBlack
- 594 – black toner cartridge for a device
- 595 – tonerCyan
- 596 – cyan toner cartridge for a device
- 597 – tonerMagenta
- 598 – magenta toner cartridge for a device
- 599 – tonerYellow
- 600 – yellow toner cartridge for a device
- 601 – warm
- 602 – unit is in warm mode
- 603 – wash
- 604 – unit is in wash mode
- 605 – wet
- 606 – unit is in wet mode or state
- 607 – wind
- 608 – unit is in wind mode
- 609 – wrinklePrevent
- 610 – unit is in wrinkle prevent mode
- 611 – zigzag
- 612 – unit is in zigzag mode or state

613 **B.2.3 Standardized list of supported values for mode resource type (oic.r.mode)**

614 Table B.2 lists the enumeration values that apply to both the supportedModes and modes
 615 Properties within the Mode Resource Type.

616 **Table B.2 – List of required oic.r.mode supported values per Device Type ("rt")**

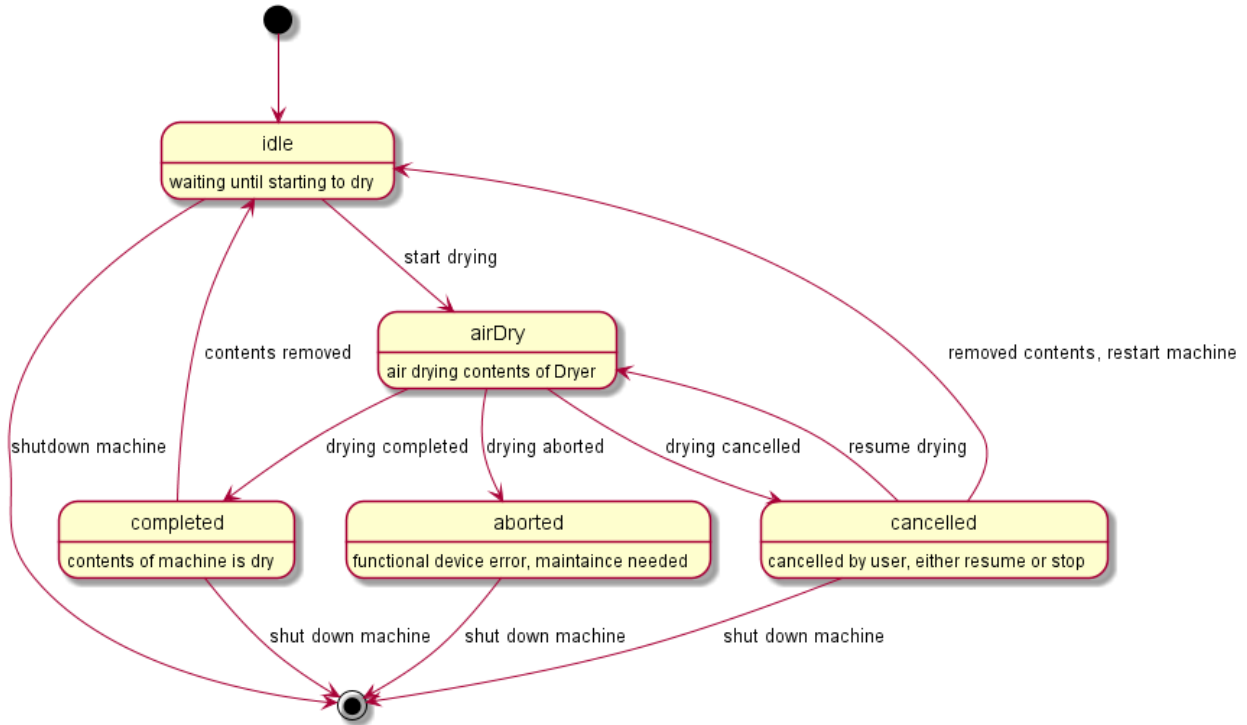
Device Name (informative)	Device Type (rt) (Normative)	Required enumeration value
Security Panel	oic.d.securityPanel	active
		armedAway
		armedInstant
		armedMaximum

		armedNightStay
		armedStay

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

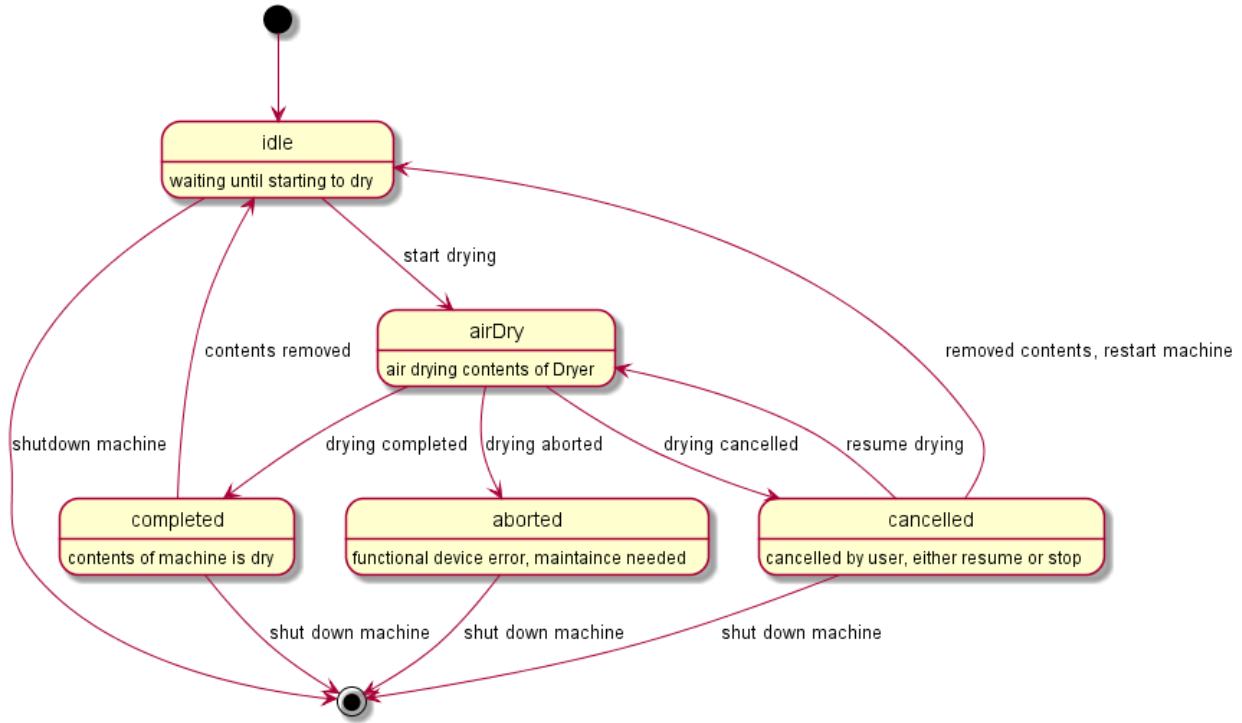
620 Figure B.1 provides an illustrative example of a possible set of modes and the transitions between
 621 them for a Dryer Device Type (oic.d.dryer).

An example mode transition diagram of a Dryer, not all mode transitions are listed.



622

An example mode transition diagram of an Dryer, not all mode transistions are listed.



623

624

Figure B.1 – Example of mode transitions of a dryer

625

626 **B.2.4 Standardized list of supported values for operational state resource type**
 627 **(oic.r.operational.state)**

628 Table B.3 lists the enumeration values that apply to the "jobStates" and "machineStates" Properties
 629 within the operational state Resource Type.

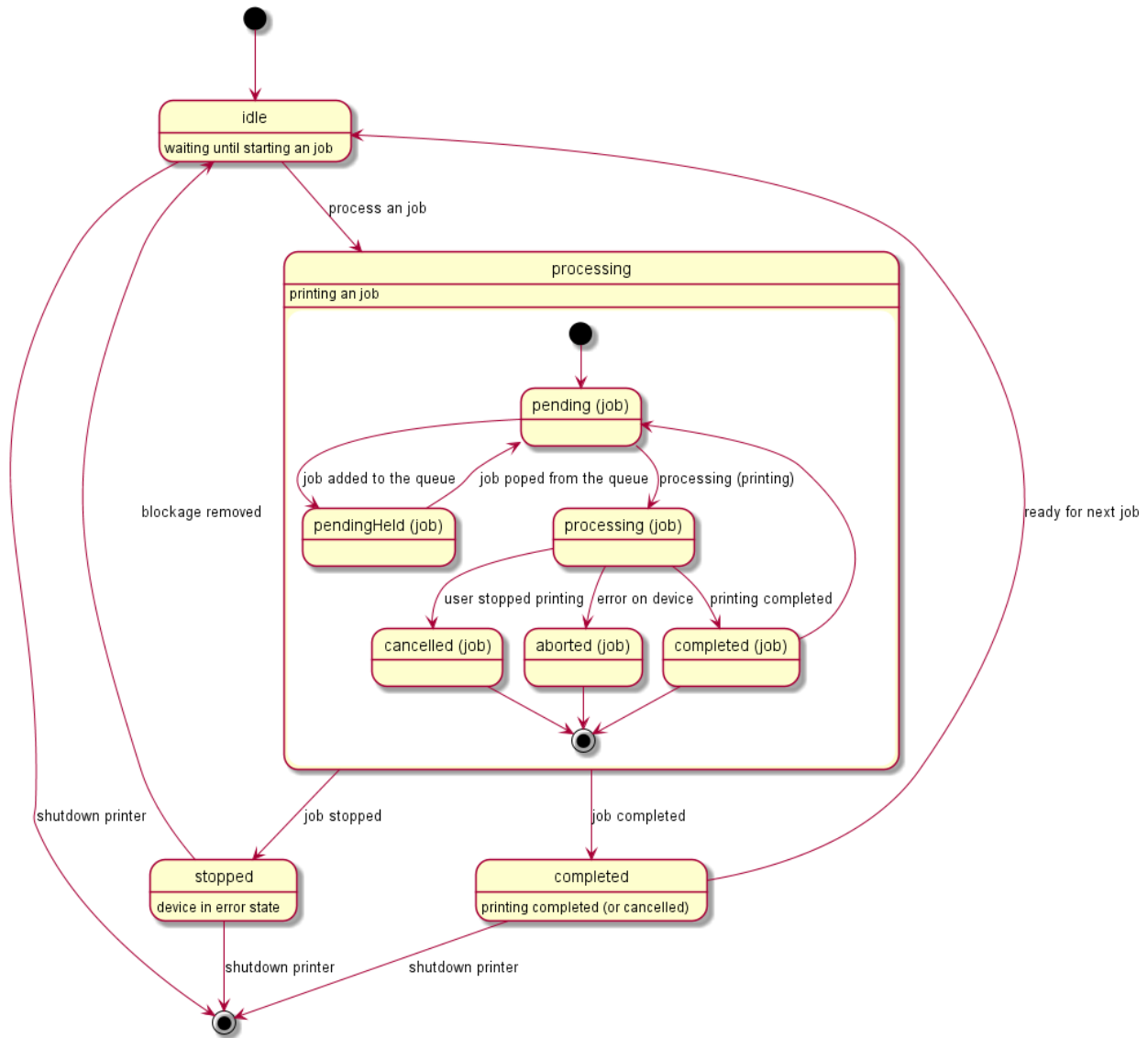
630 **Table B.3 – List of required oic.r.operational.state supported values per Device Type ("rt")**

Device Name (informative)	Device Type (rt) (Normative)	Required enumeration value machineStates	Required enumeration value jobStates
Printer	oic.d.printer	idle	pending
		processing	pendingHeld
		stopped	processing
			cancelled
			completed
Printer Multi-Function	oic.d.multifunctionPrinter	See printer	See printer
		See scanner	See scanner
scanner	oic.d.scanner	idle	cancelled
		processing	aborted
		testing	completed
		stopped	pending
		down	processing

631 The operational state can be viewed as state changes of the device that includes separate handling
 632 of jobs within the overall machine state. However, this document does not impose any relationship
 633 between the different machine or job states of a device. Hence all "machinestate" and or "jobStates"
 634 changes are expected to occur from a Client point of view.

635 Figure B.2 provides an illustrative example of a possible set of job states and the transitions
 636 between them for a Printer Device Type ("oic.d.printer").

An example machine and job states of a Printer, not all state transistions are listed.



637

An example machine and job states of a Printer, not all state transitions are listed.

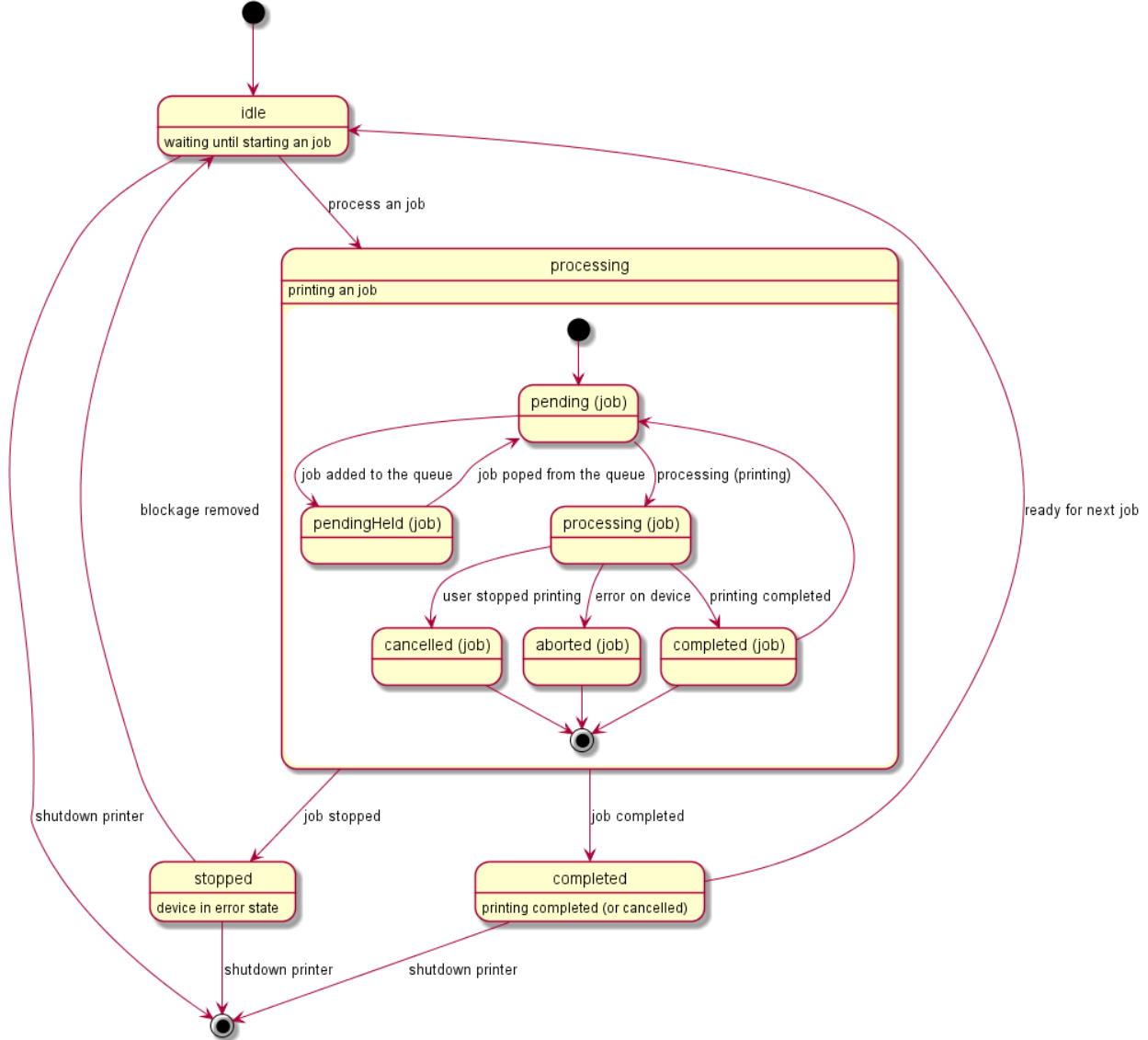


Figure B.2 – Example of job state transitions of a printer

B.2.5 Standardized list of supported values for consumable and consumable collection resource types (oic.r.consumable, oic.r.consumablecollection)

Table B.4 lists the enumeration values that may be populated in both the supportedconsumables (in oic.r.consumablecollection) and typeofconsumable (in oic.r.consumable) Properties within the Consumable and Consumable Collection Resource Types. The typeofconsumable Property shall only be populated with a value exposed within the supportedconsumables Property in a specific instance of the Consumable Collection Resource Type.

This constitutes the known set of possible values for these Properties in the Consumable and Consumable Collection Resources. A vendor may extend this set by providing vendor defined enumerations following the convention defined in ISO/IEC 30118-4:2018.

650
651

Table B.4 – List of defined enumeration values for oic.r.consumable, 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.

652

653 **B.3 Camera media format (oic.r.media)**

654 The supported camera media formats can be discovered by looking at the SDP (see IETF RFC
655 4566) list of the media Resource Type. The recommended list of supported media formats are listed
656 in Table B.5.

657

Table B.5 – Recommended media profiles

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

658

659 **B.4 Additional requirements per device type**

660 This clause is intentionally left blank

661 **Annex C**
662 (normative)

663 **Healthcare device types**
664

665 **C.1 Scope**

666 This Annex defines Device Types for use in the healthcare and fitness vertical, and describes
667 general use cases to which OCF Healthcare Devices apply, along with common functional
668 requirements.

669 Although some common requirements are defined in this document, implementation is responsible
670 for checking appropriate security, safety, environmental, and health practices, and applicable
671 regulatory requirements from national health authorities.

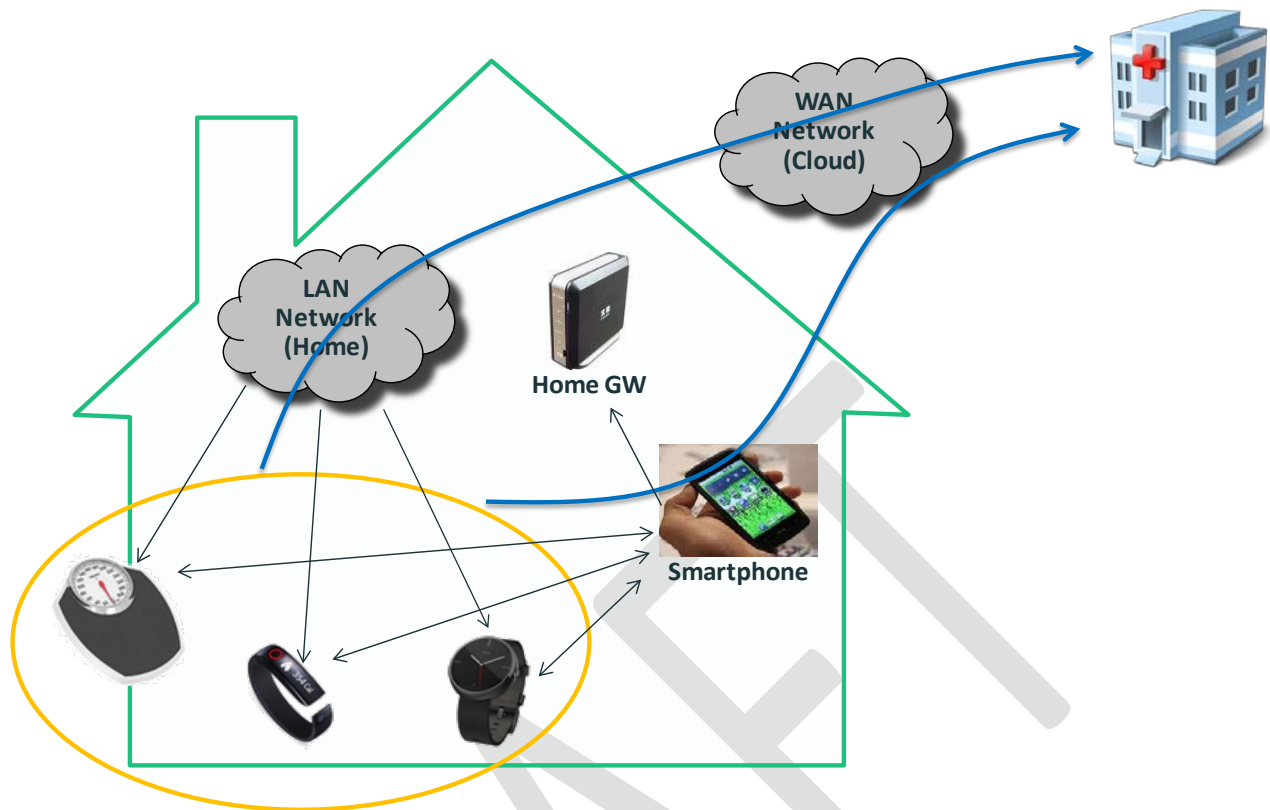
672 **C.2 Introduction to OCF healthcare devices**

673 This Annex references and inherits data models defined in the ISO/IEC 30118-4:2018, to define
674 OCF Healthcare Device Types in clause C.4.

675 **C.3 Operational scenarios**

676 Personal fitness and/or medical data are read by a monitoring Device (OCF Client role) from
677 Healthcare Devices (OCF Server role), and the monitoring Device triggers appropriate actions
678 based on the data collected. Many of the target usages are for personal health or fitness, although
679 clinical use cases can be realized with similar modelling.

680 As shown in Figure C.1, data from various fitness and healthcare devices can be gathered on a
681 smart phone for monitoring and can be transmitted to the healthcare services through a gateway
682 or through the smartphone. The protocol to be used for transmission is defined in ISO/IEC 30118-
683 1:2018. Collected personal fitness and/or medical data are used for condition monitoring or medical
684 research, receiving advice from a trainer/doctor, or triggering an emergency notification.



685
686 **Figure C.1 – Schematic diagram of healthcare usages**

687 **C.4 Standardized device types**

688 **C.4.1 Introduction**

689 OCF Healthcare Device Types specify Devices in the healthcare and fitness domains of the OCF
690 ecosystem. The Device Type exposed by the "rt" value of /oic/d of all Healthcare Devices shall
691 have a Resource Type value ("rt") prefixed with "oic.d." The Healthcare Device Types are listed in
692 Table C.1.

693 **Table C.1 – Alphabetical list of healthcare device types**

Clause	Device Name	Device Type ("rt")
C.3.1	Blood Pressure Monitor	oic.d.bloodpressuremonitor
C.3.2	Glucose Meter	oic.d.glucosemeter
C.3.3	Body Scale	oic.d.bodyscale
C.3.4	Body Thermometer	oic.d.bodythermometer

694 The remainder of this Annex defines Resource Types for each Device Type, but for full definitions
695 of Resource Types, see ISO/IEC 30118-4:2018.

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

701 When a Resource Type is listed as Mandatory (M) in this Annex, the Device shall:

702 – expose that Atomic Measurement Resource Type in /oic/res
 703 – expose that Resource Type as a Link in the Atomic Measurement
 704 The mandatory Resource Types for an Atomic Measurement shall be listed in the "rts-m" Property
 705 Value.

706 When a Resource Type is listed as Optional (O) in this Annex, the Device uses that Resource Type
 707 as a Link in the Atomic Measurement if the Device makes that feature available via OCF. For
 708 example, if a blood pressure monitor (i.e. oic.d.bloodpressuremonitor) measures pulse rate and
 709 chooses to expose that feature over OCF, it exposes the oic.r.pulserate Resource Type as a Link
 710 in the blood pressure monitor Atomic Measurement (oic.r. bloodpressuremonitor-am). The allowed
 711 Resource Types for an instance of an Atomic Measurement (which includes both the M and O
 712 Resource Types that are implemented) shall be listed in the "rts" Property Value.

713 Some Resource Types are commonly used for all Healthcare Device Types; these are provided in
 714 Table C.2. Users may want to associate timestamps to the measurements when they access their
 715 healthcare information (in RFC3339 date and time format, oic.r.time.stamp). A Healthcare Device
 716 may be used by different users, so identifying a specific user with an ID may be appropriate
 717 (oic.r.userid). These Resource Types are exposed as Conditionally Required Resource Types of
 718 an Atomic Measurement (as defined per clause 7.8.4 of ISO/IEC 30118-1:2018) of a specific
 719 Healthcare Device. The "rt" value of Resource Types that use Atomic Measurements are suffixed
 720 by -am (Atomic Measurements). When present in an Atomic Measurement, oic.r.time.stamp and
 721 oic.r.userid indicate the time when a sample of data is measured by a certain user.

722 **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

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

727 **C.4.2 Blood pressure monitor**

728 **C.4.2.1 Introduction**

729 A blood pressure monitor measures blood pressure [i.e., systolic, diastolic, and mean arterial
 730 pressure (MAP)]. Blood pressure is most frequently measured using the units of millimetres of
 731 mercury (mmHg). Blood pressure is often denoted as 120/80 mmHg, which means systolic blood
 732 pressure of 120 and diastolic blood pressure of 80.

733 Table C.3 describes the Device Type for a blood pressure monitor. Table C.4 describes the Atomic
 734 Measurement that is present in all instances of a blood pressure monitor.

735 **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

736

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

737

C.4.2.2 Required resource types

739 A blood pressure monitor shall expose oic.r.blood.pressure to report the blood pressure (systolic
740 and diastolic) and optionally MAP.

C.4.2.3 OCF-defined optional resource types

742 A blood pressure monitor measures pulse rate using the oic.r.pulserate Resource Type.

743 See Table C.2 for additional commonly used Resource Types that could be used here.

C.4.3 Glucose meter**C.4.3.1 Introduction**

746 A glucose meter measures the concentration of glucose in the blood. Glucose, or blood sugar, is
747 the human body's primary source of energy. The blood glucose level is a key parameter that
748 diabetics measure multiple times per day.

749 Table C.5 describes the Device Type for a glucose meter. Table C.6 describes the Atomic
750 Measurement that is present in all instances of a glucose meter.

751

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

752

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.testers	O

753

C.4.3.2 Required resource types

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

756 **C.4.3.3 OCF-defined optional resource types**

757 A glucose meter measures context carbohydrates, then it shall expose the context carbohydrates
758 using oic.r.glucose.carb Resource Type.

759 A glucose meter measures context exercise using the oic.r.glucose.exercise Resource Type.

760 A glucose meter measures Hemoglobin Bound to Glucose A1c Form (HbA1c) using the
761 oic.r.glucose.hba1c Resource Type.

762 A glucose meter measures context health using the oic.r.glucose.health Resource Type.

763 A glucose meter measures context meal using the oic.r.glucose.meal Resource Type.

764 A glucose meter measures context medication using the oic.r.glucose.medication Resource Type.

765 A glucose meter measures context sample location using the oic.r.glucose.samplelocation
766 Resource Type.

767 A glucose meter measures context tester using the oic.r.glucose.testers Resource Type.

768 See Table C.2 for additional commonly used Resource Types that could be used here.

769 **C.4.4 Body scale**

770 **C.4.4.1 Introduction**

771 A body scale measures the weight. The weight is most frequently measured using the units of
772 kilograms (kg) or pounds (lb).

773 Table C.7 describes the Device Type for a body scale. Table C.8 describes the Atomic
774 Measurement that is present in all instances of a body scale.

775 **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

776

777 **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.ffmpeg	O

778 **C.4.4.2 Required resource types**

779 A body scale shall expose oic.r.weight to report the body weight of a person.

780 **C.4.4.3 OCF-defined optional resource types**

781 A body scale measures height using the oic.r.height Resource Type. Especially, a body scale
 782 measures the height if BMI is also reported because the height is used when a body scale measures
 783 BMI.

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

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

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

787 A body scale measures body soft lean mass using the oic.r.body.slm Resource Type.

788 A body scale measures body fat free mass using the oic.r.body.ffm Resource Type.

789 See Table C.2 for additional commonly used Resource Types that could be used here.

790 **C.4.5 Body thermometer**

791 **C.4.5.1 Introduction**

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

796 Table C.9 describes the Device Type for a body thermometer. Table C.10 describes the Atomic
 797 Measurement that is present in all instances of a body thermometer.

798 **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

799 **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

800 **C.4.5.2 Required resource types**

801 A body thermometer shall expose oic.r.body.temperature to report the temperature level and the
 802 unit of a measured temperature is reported either in C, F or K.

803 **C.4.5.3 OCF-defined optional resource types**

804 A body thermometer measures temperature site using the oic.r.body.location.temperature
 805 Resource Type.

806 See Table C.2 for additional commonly used Resource Types that could be used here.

807 **Annex D**
808 (normative)

809 **Industrial device types**
810

811 **D.1 Operational scenarios**

812 The Optical RFID Tag and Optical RFID Station Resource Types describe the attributes associated
813 with an optical augmented RFID system of a smart factory environment for integrating the
814 observation and the actuation in production lines of plants.

815 Commercial observation is the real-time monitoring to collect broad series of data from each
816 product on the production line and machineries from the plant floor. This collected big data can be
817 sent to OCF cloud and/or manufacturer's internal OCF network where it is analysed and used to
818 estimate overall production flow, productivity and identify failure parts.

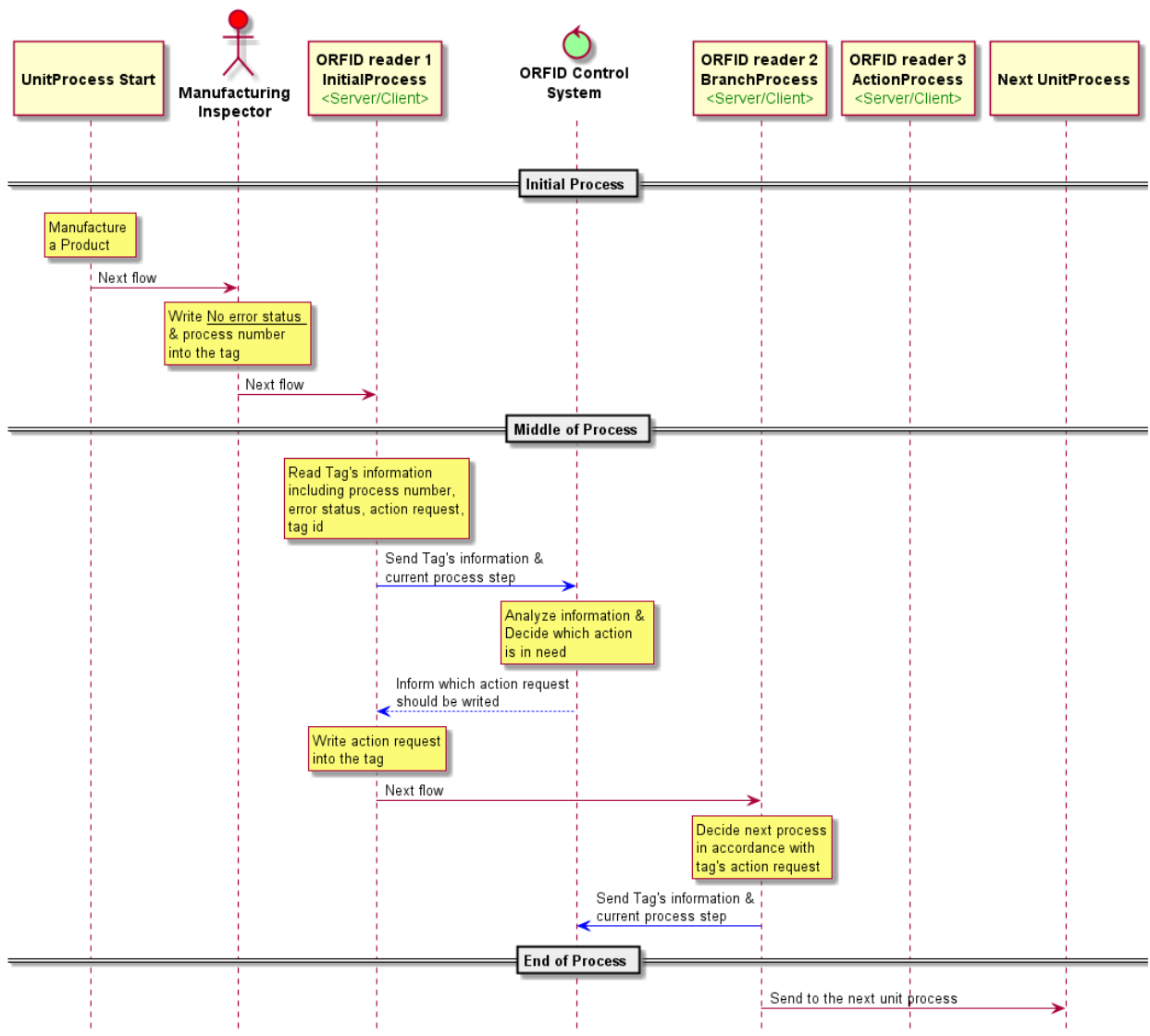
819 Commercial actuation is the real-time interaction to take actions on system failures such as
820 defected product's isolation, possibly sending the product into a repair line, alarming, such as
821 production line status, display panels and hazard issues such as fire and flood of the Commercial
822 environment by sending actuation requests to actuators directly and/or to client(s).

823 Optical augmented RFID reader and tag assist in production line control utilizing the OCF
824 ecosystem for smart factory environment. The optical augmented RFID reader is represented by
825 the RFID Station Resource Type, the tag by the RFID Tag Resource Type.

826 In the RFID Tag Resource Type the tagid is an integer showing the currently read optical
827 augmented RFID tag's identity information.

828 In the RFID Station Resource Type the process represents the stage of the product in the product
829 line which has an optical RFID tag on its body. Event is represented by a Boolean value set to
830 "True" or "False" alarming the issue when additional action is requested for the tagged product.
831 actionrequest represents necessary actions like the isolation of the product, to send the product
832 back to another specific line to modify or fix an issue.

833 Figure D.1 shows a normal, non-error case process flow in the smart factory. Blue arrow lines are
834 where OCF communication exists. ORFID tag ID is only readable to maintain consistent identity.



835

836

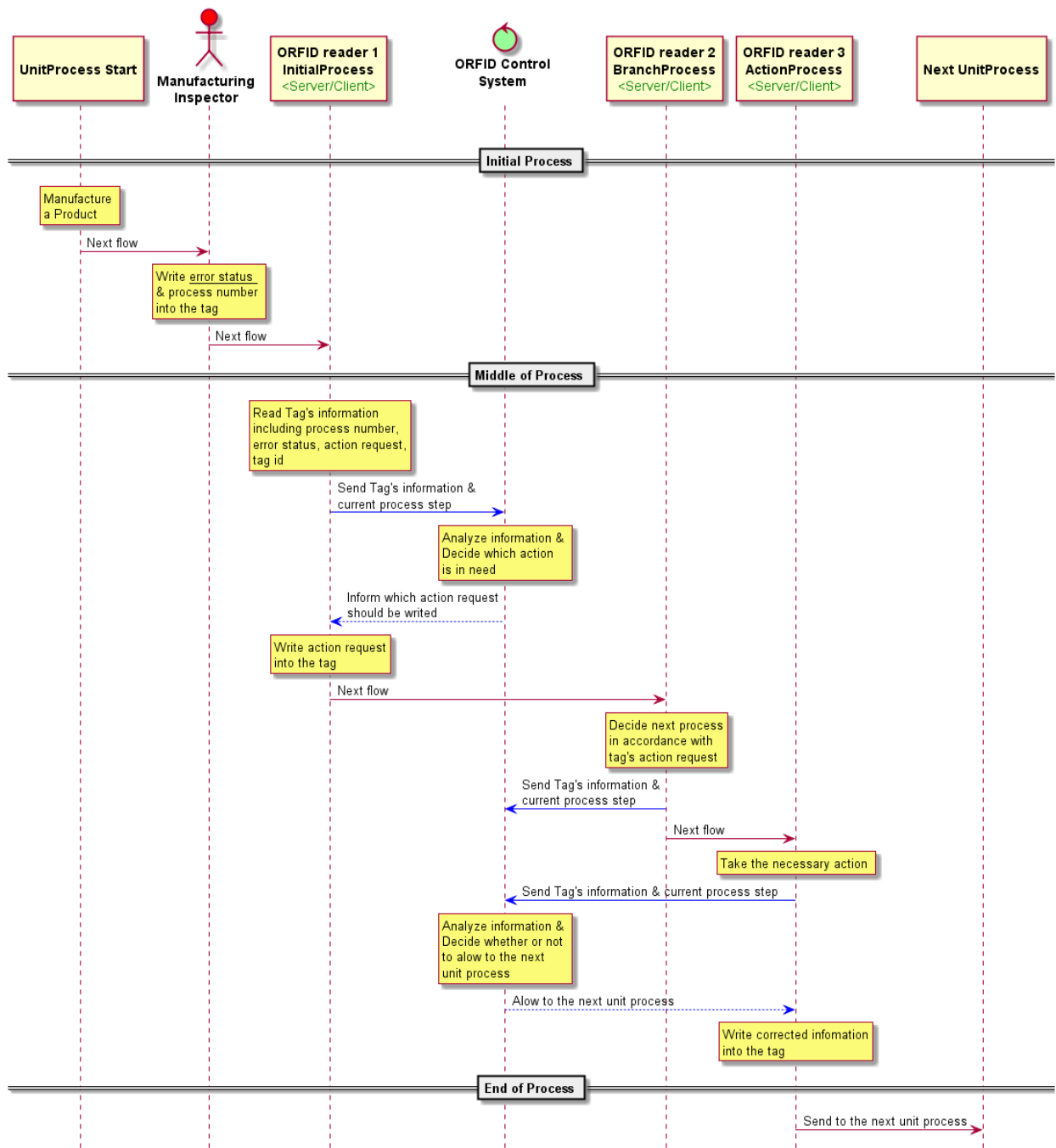
837

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

838

839

Figure D.2 shows product error control scheme in the smart factory. Blue arrow lines are where OCF communication exists. ORFID tag ID is only readable to maintain consistent identity.



840

841 **Figure D.2 – Abnormal process scheme of optical augmented RFID in smart factory**
 842 **environment**

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

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

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

855 **D.2 Industrial required resources per device type**

856 Device Types may mandate that specific Resources be implemented. The required Resource per
 857 Device Type where mandated by the Industrial vertical is listed in Table B.1.

858 **Table D.1 – Alphabetical list of device types ("rt"), including required resources for**
 859 **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

860

