

OCF 2.3 (“Cleveland”) – New Device and Resource Types for Energy Manager; New mode and operational state enumeration values for UPlus alignment; New Operational States for oneM2M Alignment – CTWG CRs 2607, 2667, & 2675

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OCF Device Specification

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112 **1 Scope**

113 The OCF Device specification is an Application Profile specification.

114 The Device definitions use Resource definitions from the OCF Resource Type Specification.

115 The Device Specification is built on top of the Core Specification. The Core Specification specifies
116 the core architecture, interfaces protocols and services to enable the implementation of profiles for
117 IoT usages and ecosystems. The Core specification also defines the main architectural components
118 of network connectivity, discovery, data transmission, device & service management and ID &
119 security. The core architecture is scalable to support simple devices (constrained devices) and
120 more capable devices (smart devices).

121 **2 Normative references**

122 The following documents, in whole or in part, are normatively referenced in this document and are
123 indispensable for its application. For dated references, only the edition cited applies. For undated
124 references, the latest edition of the referenced document (including any amendments) applies.

125 OCF Core Specification, *Open Connectivity Foundation Core Specification*, Version 1.3. Available
126 at: https://openconnectivity.org/specs/OCF_Core_Specification_v1.3.0.pdf
127 Latest version available at https://openconnectivity.org/specs/OCF_Core_Specification.pdf

128 OCF Resource Type Specification, *Open Connectivity Foundation Resource Type Specification*,
129 Version 1.3. Available at:
130 https://openconnectivity.org/specs/OCF_Resource_Type_Specification_v1.3.0.pdf
131 Latest version available at
132 https://openconnectivity.org/specs/OCF_Resource_Type_Specification.pdf

133 OCF Security Specification, *Open Connectivity Foundation Security Capabilities*, Version 1.3
134 Available at: https://openconnectivity.org/specs/OCF_Security_Specification_v1.3.0.pdf
135 Latest version available at https://openconnectivity.org/specs/OCF_Security_Specification.pdf

136 IETF RFC 7049, *Concise Binary Object Representation (CBOR)*, October 2013
137 <http://www.ietf.org/rfc/rfc7049.txt>

138 IETF RFC 7159, *The JavaScript Object Notation (JSON) Data Interchange Format*, March 2014
139 <http://www.ietf.org/rfc/rfc7159.txt>

140 RAML, *Restful API modelling language*, Version 0.8.
141 <https://github.com/raml-org/raml-spec/blob/master/raml-0.8.md>

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

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

147 **3 Terms, definitions, symbols and abbreviations**

148 **3.1 Terms and definitions**

149 **3.1.1**

150 **Actuator**

151 Resource with support of the UPDATE operation.

152 **3.1.2**

153 **Bridge Device**

154 A Device that is capable of representing other devices that exist on the network.

155 **3.1.3**
156 **OCF Device**
157 A Device that is conformant to the normative requirements contained in this specification.

158 **3.1.4**
159 **Sensor**
160 Resource without support of the UPDATE operation.

161 **3.1.5**
162 **Healthcare Device**
163 A Device that is conformant to the normative requirements contained in Annex C of this
164 specification.

165 **3.2 Symbols and abbreviations**

166 **3.2.1**
167 **CRUDN**
168 Create Retrieve Update Delete Notify
169 This is an acronym indicating which operations are possible on the Resource.

170 **3.2.2**
171 **CSV**
172 Comma Separated Value
173 Comma Separated Value is a construction to have more fields in 1 string separated by commas. If
174 a value itself contains a comma then the comma can be escaped by adding “\” in front of the comma.

175 **3.2.3**
176 **OCF**
177 Open Connectivity Foundation
178 The organization that created these specifications.

179 **3.2.4**
180 **RAML**
181 RESTful API Modelling Language
182 RAML is a simple and succinct way of describing practically-RESTful APIs. See RAML.

183 **3.2.5**
184 **Representational State Transfer**
185 **REST**
186 REST is an architecture style for designing networked applications that relies on a stateless, client-
187 server, cacheable communications protocol.

188 **3.2.6**
189 **SDP**
190 Session Description Protocol
191 SDP describes multimedia sessions for the purposes of session announcement, session invitation,
192 and other forms of multimedia session initiation. It is fully defined in IETF RFC 4566.

193 **3.2.7**
194 **UDC**
195 Universal Device Classification
196 An enumeration of device types published as A Basic Classification System for Energy-Using
197 Products--Universal Device Classification

198 **3.3 Conventions**
199 In this specification a number of terms, conditions, mechanisms, sequences, parameters, events,
200 states, or similar terms are printed with the first letter of each word in uppercase and the rest

201 lowercase (e.g., Network Architecture). Any lowercase uses of these words have the normal
202 technical English meaning.

203 **4 Document conventions and organization**

204 This document lists all the Devices used in identified vertical domains, as of this Specification that
205 encompasses the Smart Home. The devices are specified by which mandatory and optional
206 Resources are used.

207 For the purposes of this document, the terms and definitions given in OCF Core Specification and
208 OCF Resource Type Specification apply.

209 **4.1 Notation**

210 In this document, features are described as required, recommended, allowed or DEPRECATED as
211 follows:

212 Required (or shall or mandatory).

213 These basic features shall be implemented. The phrases “shall not”, and “PROHIBITED”
214 indicate behavior that is prohibited, i.e. that if performed means the implementation is not in
215 compliance.

216 Recommended (or should).

217 These features add functionality supported by a Device and should be implemented.
218 Recommended features take advantage of the capabilities a Device, usually without imposing
219 major increase of complexity. Notice that for compliance testing, if a recommended feature is
220 implemented, it shall meet the specified requirements to be in compliance with these guidelines.
221 Some recommended features could become requirements in the future. The phrase “should not”
222 indicates behavior that is permitted but not recommended.

223 Allowed (or allowed).

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

226 Conditionally allowed (CA).

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

229 Conditionally required (CR).

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

233 DEPRECATED

234 Although these features are still described in this specification, they should not be implemented
235 except for backward compatibility. The occurrence of a deprecated feature during operation of
236 an implementation compliant with the current specification has no effect on the
237 implementation’s operation and does not produce any error conditions. Backward compatibility
238 may require that a feature is implemented and functions as specified but it shall never be used
239 by implementations compliant with this specification.

240 Strings that are to be taken literally are enclosed in “double quotes”.

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

242 **4.2 Data types**

243 See OCF Core Specification.

244 **4.3 Document structure**

245 This document describes specific requirements governing the indication of Device Types on
246 Devices and the requirements that are associated with specific Device Types themselves. The
247 document makes use of functionality defined in the OCF Core Specification and OCF Resource
248 Type Specification.

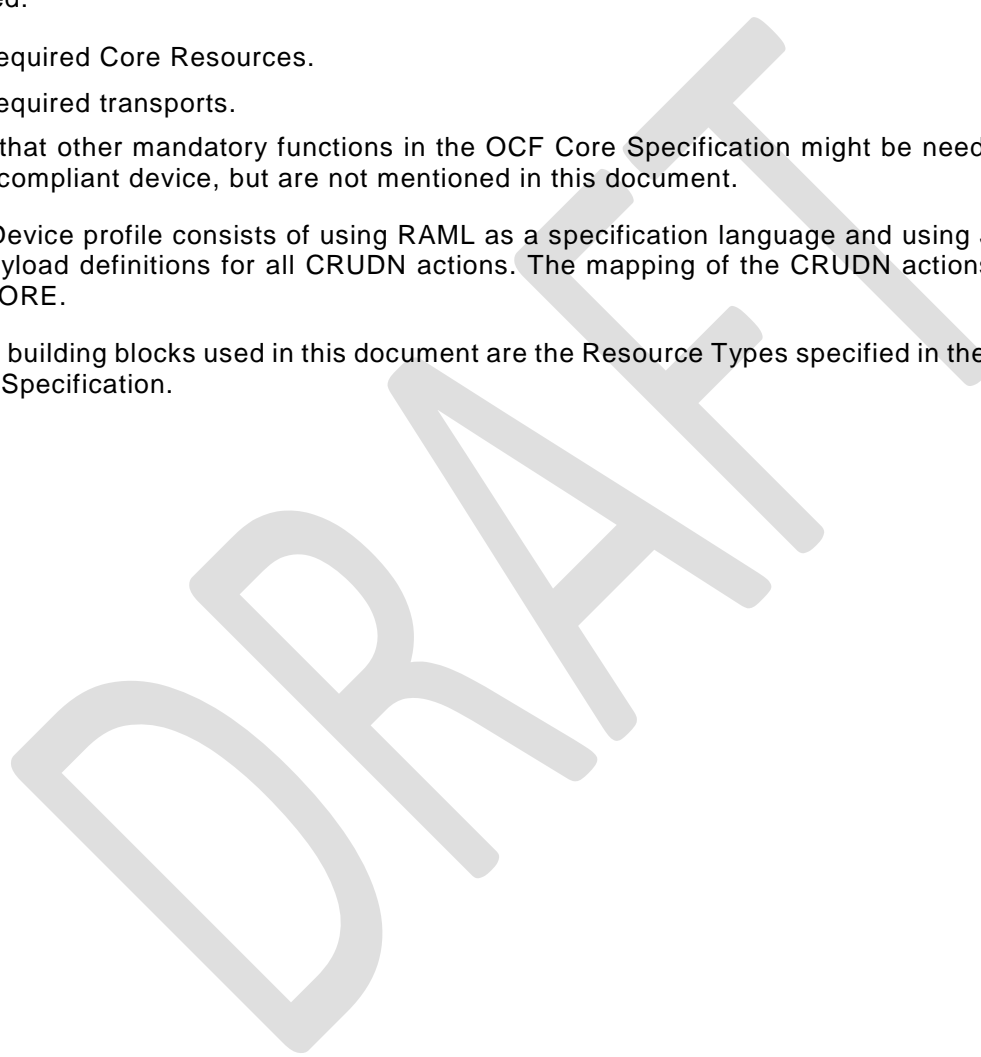
249 The OCF Core Specification provides building blocks to define Devices. The following functionality
250 is used:

- 251 • Required Core Resources.
- 252 • Required transports.

253 Note that other mandatory functions in the OCF Core Specification might be needed to create an
254 OCF compliant device, but are not mentioned in this document.

255 The Device profile consists of using RAML as a specification language and using JSON Schemas
256 as payload definitions for all CRUDN actions. The mapping of the CRUDN actions is specified in
257 the CORE.

258 Other building blocks used in this document are the Resource Types specified in the OCF Resource
259 Type Specification.



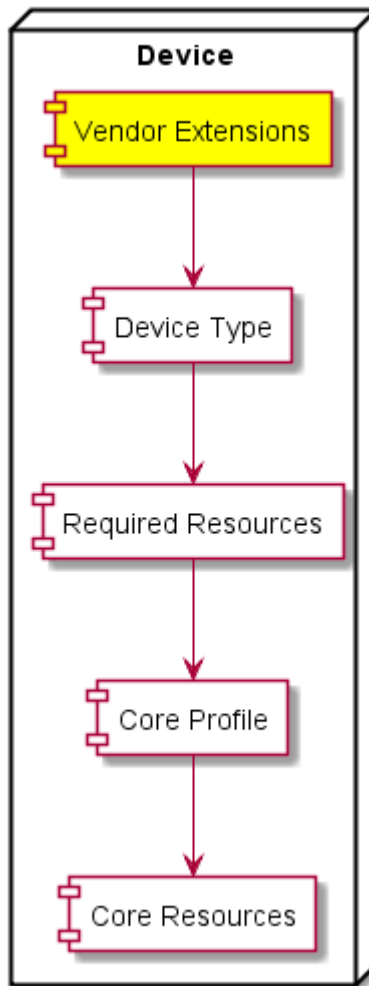


Figure 1 – Device building blocks

260

261

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

265 5 Operational scenarios

266 5.1 Specification version

267 All Devices conformant to this specification version shall add the string “ocf.sh.1.3.0” to the dmV
 268 Property in oic.wk.d. This Property is for legacy Device support only and will no longer be revised
 269 in alignment with specification versions.

270 6 Core resource model

271 6.1 Introduction

272 The Core Resource model is described in the OCF Core Specification.

273 6.2 Device type

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

275 Examples of Device Types are:

- 276 • oic.d.fan
- 277 • oic.d.thermostat

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

282 The OCF Core Specification defines a Device Resource with a URI of “/oic/d”. A Device shall
283 include in the “Resource type” Property of “/oic/d” the Device Type (or Device Types) from
284 Table A.2 of the physical device hosting the Server; the inclusion of the Device Type shall be done
285 using one of the methods provided by Section 11.3.4 of the OCF Core Specification (i.e. add to the
286 array of values).

287 Therefore a Device may be discovered by adding a query for the “rt” of the Device Type itself (e.g.
288 “?rt=oic.d.fan”) to the multicast Endpoint discovery method (see 7.1).

289 6.3 Profile of OCF Core Specification

290 This section describes the profiling of the Core Resources and transport mechanisms and functions
291 that are defined in the OCF Core Specification.

292 The required OCF Core Specification Resources are also required for a profile implementation.

293 In addition to the required Resources the optional OCF Core Specification Resources in shall be
294 required.

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

Resource (“rt”)	Required in Profile
Intentionally left blank	Intentionally left blank

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

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

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

299 A Device shall support CoAP based endpoint discovery as defined in Section 10.2 of the OCF Core
300 Specification.

301 The messaging protocol for a Device shall be CoAP (see OCF Core Specification).

302 A Device shall support a network layer as defined in Section 9 of the OCF Core Specification
303 including any necessary defined bridging functions that ensure inter-operability with IPv6.

304 7 Modelling of multiple logical devices

305 7.1 Introduction

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

309 For example, a door that includes the functionality of a contact sensor, a lock and a camera may
310 be modeled as a single-Platform, a multi-Platform, or a Composite Device. Each of these three
311 options will be detailed in the following Sections.

312 **7.2 Single platform model**

313 The physical Device exposes one or more logical Devices that are independently discoverable (i.e.
314 they separately respond to multicast discovery request messages as defined in Section 11.3 of the
315 OCF Core Specification). Given the door example there could be a single discovery response with
316 an instance of "/oic/d" that exposes a single Device Type (such as "oic.d.door") or multiple
317 discovery responses, each response having a single Device Type in the "rt" of "/oic/d" that
318 represents the logical Device. The common denominator being that for all discovered logical
319 Devices the Properties of "/oic/p" have the same values.

320 **7.3 Multi-platform model**

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

326 **7.4 Composite device model**

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

333 Figure 2 illustrates the response to a discovery request using the baseline Interface on "/oic/res"
334 for a Composite Device modeled as described in this Section. Figure 3 illustrates the response to
335 a unicast RETRIEVE request using the baseline Interface to the Collection that represents the door
336 Device.

337

```

[
  {
    "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-017eea863989",
  "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"}
      ]
    }
  ]
}

```

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

341 **8 Discovery**

342 **8.1 Endpoint discovery**

343 Clients may discover Servers by using the mechanisms defined by the OCF Core Specification
 344 Section 10. A Client may populate an “rt” query parameter with the Device Types that the Client
 345 wants to discover, or if no “rt” query parameter is provided then the search is for all available Device
 346 Types irrespective.

347 Devices may be discovered by Device Type or implemented Resource Type. This difference is
 348 conveyed by the population of any “rt” query parameter included as part of discovery (see section
 349 11.3 of the OCF Core Specification).

350 The values that may be used for discovering a specific Device Type are listed in Table A.2. The
 351 values that may be used to discover a specific Resource Type are listed in the OCF Resource Type
 352 Specification in Section 6 of that document.

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

355 **8.2 Resource discovery**

356 Section intentionally left blank

357

358 **9 Security**

359 A Device shall implement the mandated Security Virtual Resources specified in the OCF Security
360 Specification. Additionally, all exposed OCF Resource Type Specification defined Resources shall
361 be accessible via at least one secure Endpoint (i.e. use of a “coaps” or “coaps+tcp” scheme locator
362 within the “eps” Parameter exposed by /oic/res; see Core Specification Section 10.2.4). A Device
363 shall not expose OCF Resource Type Specification defined Resources using unsecured Endpoints
364 (i.e. “coap” or “coap+tcp” scheme locator in the “eps” Parameter).

365 With the exception of those Resources related to Discovery that are explicitly identified by the OCF
366 Core Specification as not requiring secured access (see OCF Core Specification Section 11.3.4),
367 all other Resources defined in the OCF Core Specification implemented in the Smart Home Device
368 shall be accessible via at least one secure Endpoint (i.e. use of a “coaps” or “coaps+tcp” scheme
369 locator within the “eps” Parameter exposed by /oic/res). Similarly, any Resources defined in the
370 OCF Core Specification that do not require unsecured access that are not listed in /oic/res shall
371 also be 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 WiFi 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 version of the specification 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.3d.printer	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	

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397

Annex B Smart home device types

398 B.1 Smart home required resources per device type

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

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

408 **Table B.1 – Alphabetical list of device types (“rt”), including required resources for smart**
409 **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>			

410 **B.2 Standardized enumeration values**

411 Resource Types may have a list of supported enumeration values. The supported enumeration
412 values may differ when applied in different devices. In clause B.2 the affected Resource Types are
413 described by:

- 414 • Generic list of supported values
- 415 • Mandated list of supported values when applied to a specific Device

416 **B.2.1 Alphabetical list of standardized enumeration types**

417 This section lists the standardized enumeration types that are used in the oic.r.mode,
418 oic.r.operational.state, and oic.r.consumable Resources.

- 419 • aborted
- 420 • An internal device, communication or security error
- 421 • active
- 422 • Unit is active
- 423 • airDry
- 424 • unit is air drying
- 425 • armedAway
- 426 • unit is armed for away
- 427 • armedInstant
- 428 • unit is armed instantly
- 429 • armedMaximum
- 430 • unit is armed at maximum level
- 431 • armedNightStay
- 432 • unit is armed in night stay
- 433 • armedStay
- 434 • unit is armed in stay mode
- 435 • aroma
- 436 • unit is armed in aroma mode
- 437 • artificialintelligence
- 438 • unit is in artificial intelligence mode
- 439 • auto
- 440 • unit is in auto mode or state
- 441 • boiling
- 442 • unit is in boiling state or mode
- 443 • brewing
- 444 • unit is in brewing state or mode
- 445 • cancelled
- 446 • the job was cancelled either by the remote client or by the user
- 447 • circulating
- 448 • unit is in circulating model or state
- 449 • cleaning
- 450 • unit is in cleaning mode or state
- 451 • clothes
- 452 • unit is in clothes mode
- 453 • completed
- 454 • job finished successfully
- 455 • cool
- 456 • unit is in cooling mode or state

- 457 • delicate
- 458 • unit is in delicate mode or state
- 459 • disabled
- 460 • unit's current operational mode is disabled
- 461 • down
- 462 • unit is unavailable
- 463 • dry
- 464 • unit is dry mode
- 465 • dual
- 466 • unit is in dual mode
- 467 •
- 468 • enabled
- 469 • unit's current operational mode is enabled
- 470 • extended
- 471 • unit is in extended mode or state
- 472 • fan
- 473 • unit is in fan mode or state
- 474 • fast
- 475 • unit is in fast mode or state
- 476 • filterMaterial
- 477 • filter material that is used by a device
- 478 • focused
- 479 • unit is in focused mode or state
- 480 • grinding
- 481 • unit is in grinding state or mode
- 482 • heating
- 483 • unit is in heating mode or state
- 484 • heavy
- 485 • unit is in heavy mode or state
- 486 • idle
- 487 • new jobs can start processing without waiting
- 488 • ink
- 489 • generic ink cartridge for a device
- 490 • inkBlack
- 491 • black ink cartridge for a device
- 492 • inkCyan
- 493 • cyan ink cartridge for a device
- 494 • inkMagenta

- 495 • magenta ink cartridge for a device
- 496 • inkTricolour
- 497 • tricolour ink cartridge for a device
- 498 • inkYellow
- 499 • yellow ink cartridge for a device
- 500 • keepwarm
- 501 • unit is in keep warm state or mode
- 502 • normal
- 503 • unit is in a normal operational state
- 504 • notsupported
- 505 • ability to set a specific operational mode by a client is not supported
- 506 • pause
- 507 • unit is paused (by user)
- 508 • pending
- 509 • job initiated, engine is preparing
- 510 • pendingHeld
- 511 • job is not a candidate for processing for any number of reasons, will return to pending state
- 512 if reasons are solved
- 513 • permapress
- 514 • unit is in permanent press mode or state
- 515 • preWash
- 516 • unit is pre wash mode
- 517 • processing
- 518 • processing the job
- 519 • pure
- 520 • unit is in pure mode or state
- 521 • quick
- 522 • unit is in quick mode or state
- 523 • quiet
- 524 • unit is in quiet mode
- 525 • rinse
- 526 • unit is rinse mode
- 527 • sectored
- 528 • unit is in sectored mode or state
- 529 • silent
- 530 • unit is in silent mode or state
- 531 • sleep
- 532 • unit is in sleep mode or state
- 533 • smart

- 534 • unit is in smart mode or state
- 535 • spot
- 536 • unit is in spot mode or state
- 537 • steam
- 538 • unit is in steam mode or state
- 539 • stopped
- 540 • error condition occurred
- 541 • spin
- 542 • unit is in spin mode
- 543 • testing
- 544 • calibrating, preparing the unit
- 545 • toner
- 546 • generic toner cartridge for a device
- 547 • tonerBlack
- 548 • black toner cartridge for a device
- 549 • tonerCyan
- 550 • cyan toner cartridge for a device
- 551 • tonerMagenta
- 552 • magenta toner cartridge for a device
- 553 • tonerYellow
- 554 • yellow toner cartridge for a device
- 555 • warm
- 556 • unit is in warm mode
- 557 • wash
- 558 • unit is in wash mode
- 559 • wet
- 560 • unit is in wet mode or state
- 561 • wind
- 562 • unit is in wind mode
- 563 • wrinklePrevent
- 564 • unit is in winkle prevent mode
- 565 • zigzag
- 566 • unit is in zigzag mode or state

567 **B.2.2 Standardized list of supported values for mode resource type (oic.r.mode)**

568 The following enumeration values apply to both the supportedModes and modes Properties within
569 the Mode Resource Type.

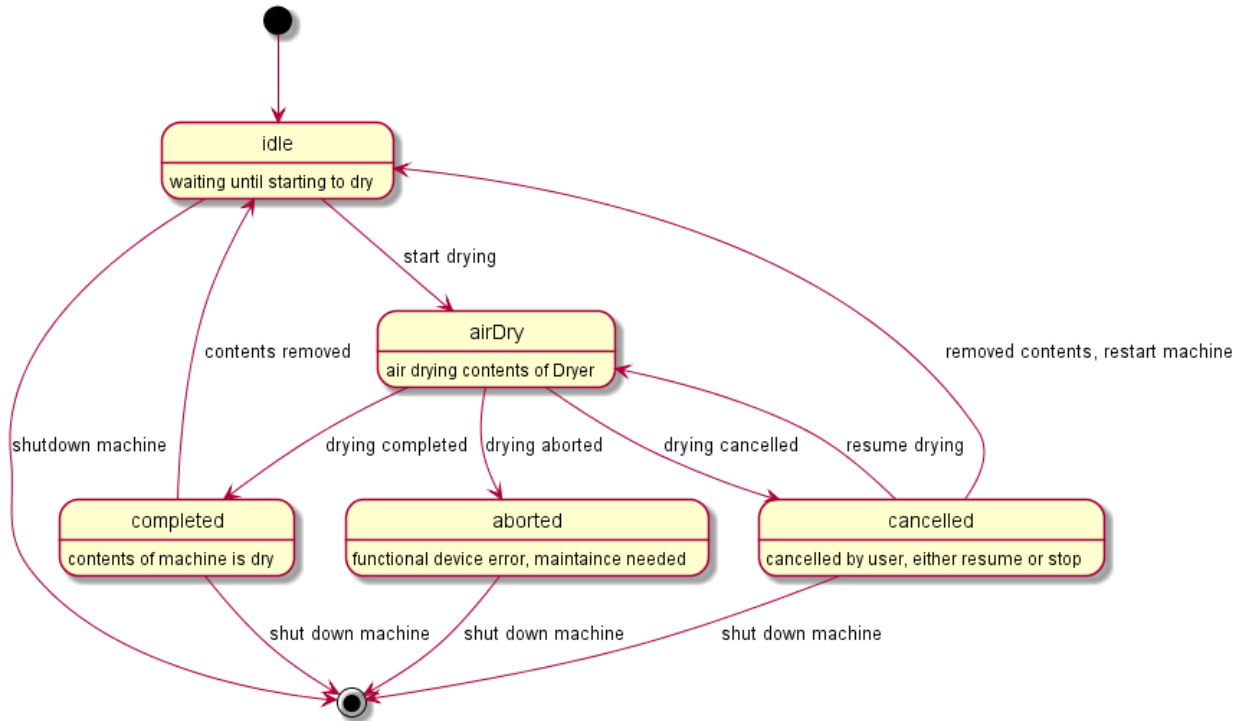
570

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

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

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



574

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

575

576

B.2.3 Standardized list of supported values for operational state resource type (oic.r.operational.state)

577

578

579 The following enumeration values apply to the jobStates and machineStates Properties within the
 580 operational state Resource Type.

581 **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
			aborted
			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

582 The operational state can be viewed as state changes of the device that includes separate handling
 583 of jobs within the overall machine state. However this specification does not impose any
 584 relationship between the different machine or job states of a device. Hence all machine states and
 585 or jobstate changes are expected to occur from a Client point of view.

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

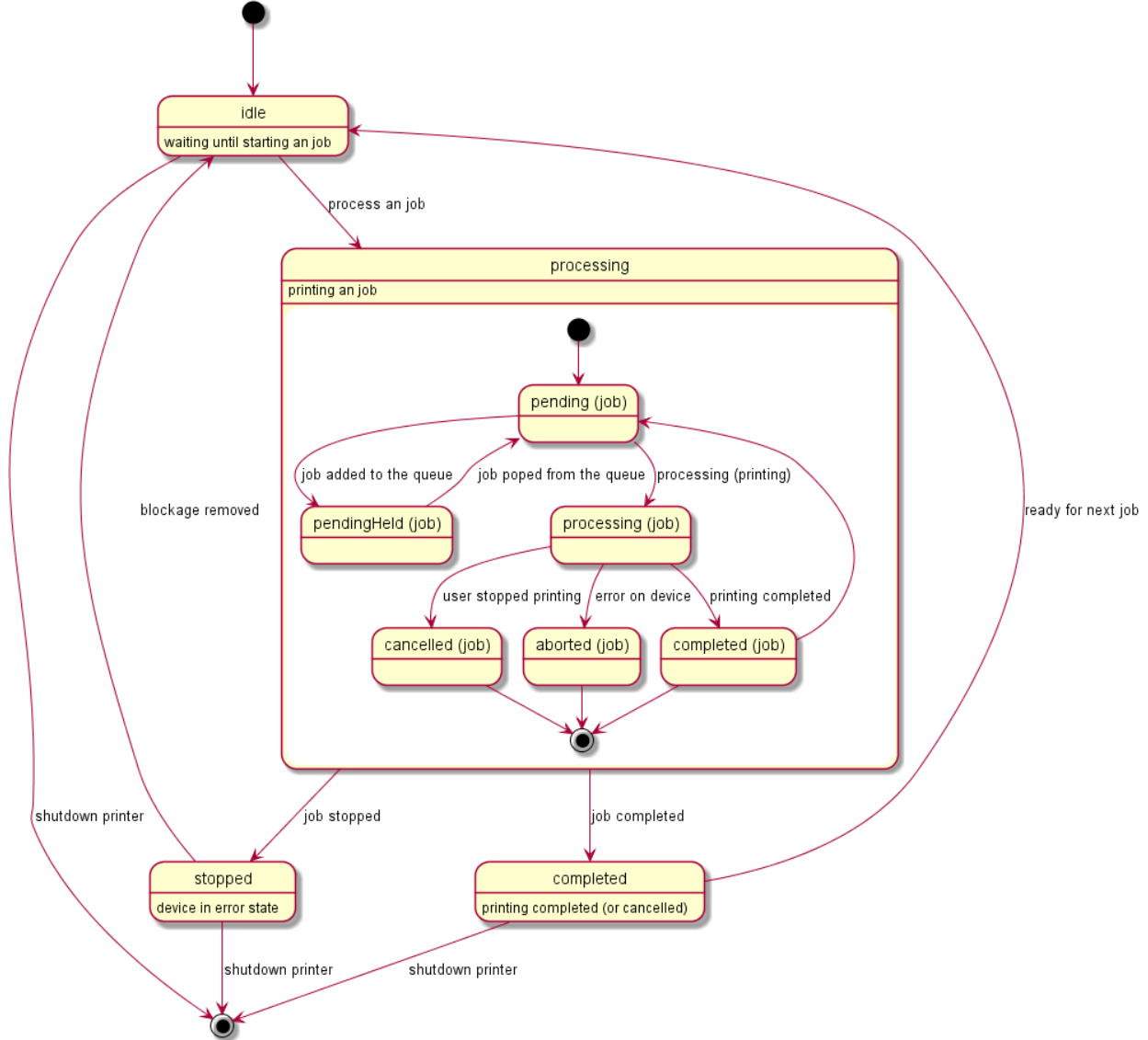


Figure B.2 – Example of mode transitions of a printer

B.2.4 Standardized list of supported values for consumable and consumable collection resource types (oic.r.consumable, oic.r.consumablecollection)

The following enumeration values 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 the OCF Resource Type Specification.

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.

600

601 **B.2.5 Standardized list of supported values for the IASZone resource type**
602 **(oic.r.iaszone)**

603 The following enumeration values may be populated in the zonetype Property within the IASZone
604 Resource Type. Further, per zonetype the allowed values for the zonestatus.alarms Property are
605 also provided.

606 This constitutes the known set of possible values for this Property in the IASZone Resource. A
607 vendor may extend this set by providing vendor defined enumerations following the convention
608 defined in the OCF Resource Type Specification.

Friendly Name (informative)	Enumeration Value (Normative)	Supported zonestatus.alarms
Standard CIE	standardcie	system
Motion Sensor	motionsensor	intrusion, presence
Contact Sensor	contactsensor	1stportalopenclose, 2ndportalopenclose
Fire Sensor	firesensor	fire
Water Sensor	watersensor	wateroverflow
Carbon Monoxide (CO) Sensor	cosensor	CO, cooking
Personal Emergency Device	ped	fall, emergencybutton
Vibration Sensor	vibrationsensor	movement, vibration
Remote Control	remotecontrol	panic, emergency
Key Fob	keyfob	panic, emergency
Keypad	keypad	panic, emergency
Standard Warning Device	swd	

Glass Break Sensor	glassbreaksensor	Glassbreak
Security Repeater	securityrepeater	
Manufacturer Specific	vendorspecific	
Invalid Zone Type	invalid	

609

610 **B.2.6 Standardized list of supported values for the Window Covering resource type**
611 **(oic.r.windowcovering)**

612 The following enumeration values may be populated in the windowcoveringtype Property within the
613 Window Covering Resource Type.

614 This constitutes the known set of possible values for this Property in the Window Covering
615 Resource. A vendor may extend this set by providing vendor defined enumerations following the
616 convention defined in the OCF Resource Type Specification.

Friendly Name (informative)	Enumeration Value (Normative)
Roller Shade	rollershade
Roller Shade (2 Motor)	rollershade2
Roller Shade Exterior	rollershadeext
Roller Shade Exterior (2 Motor)	rollershadeext2
Drapery	drapery
Awning	awning
Shutter	shutter
Tilt Blind - Tilt Only	tiltblind
Tilt Blind - Lift and Tilt	tiltblind2mode
Projector Screen	projectorscreen

617

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

619 The supported camera media formats can be discovered by looking at the SDP (see IETF RFC
620 4566) list of the media Resource Type. The recommended list of supported media formats are listed
621 in Table B.5.

622

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)
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624 **B.4 Additional requirements per device type**

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626 **Annex C**
627 (normative)

628 **Healthcare device types**
629

630 **C.1 Scope**

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

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

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

638 This Annex references and inherits data models defined in the OCF Resource Type Specification,
639 to define OCF Healthcare Device Types in Section C.4.

640 **C.3 Operational scenarios**

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



645
646 **Figure C.1 – Schematic diagram of healthcare usages**

647 As shown in the schematic diagram, data from various fitness and healthcare devices can be
648 gathered on a smart phone for monitoring and can be transmitted to the healthcare services through
649 a gateway or through the smartphone. The protocol to be used for transmission is defined in the
650 OCF Core Specification. Collected personal fitness and/or medical data are used for condition
651 monitoring or medical research, receiving advice from a trainer/doctor, or triggering an emergency
652 notification.

653 **C.4 Standardized device types**

654 OCF Healthcare Device Types specify Devices in the healthcare and fitness domains of the OCF
655 ecosystem. The Device Type exposed by the "rt" value of /oic/d of all Healthcare Devices shall

656 have a Resource Type value ("rt") prefixed with "oic.d." The Healthcare Device Types are listed in
 657 Table C.1.

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

Section	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

659 The remainder of this Annex defines Resource Types for each Device Type, but for full definitions
 660 of Resource Types, see OCF Resource Type Specification.

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

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

- 667 • expose that Atomic Measurement Resource Type in /oic/res
- 668 • expose that Resource Type as a Link in the Atomic Measurement

669 The mandatory Resource Types for an Atomic Measurement shall be listed in the "rts-m" Property
 670 Value.

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

678 Some Resource Types are commonly used for all Healthcare Device Types. Users may want to
 679 associate timestamps to the measurements when they access their healthcare information (in
 680 RFC3339 date and time format, oic.r.time.stamp). A Healthcare Device may be used by different
 681 users, so identifying a specific user with an ID may be appropriate (oic.r.userid). These Resource
 682 Types are exposed as Conditionally Required Resource Types of an Atomic Measurement (as
 683 defined per Section 7.8.4 of OCF Core Specification) of a specific Healthcare Device. The "rt" value
 684 of Resource Types that use Atomic Measurements are suffixed by -am (Atomic Measurements).
 685 When present in an Atomic Measurement, oic.r.time.stamp and oic.r.userid indicate the time when
 686 a sample of data is measured by a certain user.

687 **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

688 It should also be noted that Resource-level and Property-level requirements can be different. All
 689 OCF Resource Types are specified in JSON schema format and the Properties which are defined

690 in a specific schema can either be mandatory or optional. In other words, even if a Resource Type
 691 is mandatory for a Device Type, some of its Properties may not be mandatory.

692 **C.4.1 Blood pressure monitor**

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

697 **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

698 **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

699

700 **C.4.1.1 Required resource types**

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

703 **C.4.1.2 OCF-defined optional resource types**

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

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

706 **C.4.2 Glucose meter**

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

710 **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

711 **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.medications	O
	Context Sample Location	oic.r.glucose.samplelocation	O
	Context Tester	oic.r.glucose.testers	O

712

713 **C.4.2.1 Required resource types**

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

715 **C.4.2.2 OCF-defined optional resource types**

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

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

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

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

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

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

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

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

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

728 **C.4.3 Body scale**

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

731

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

732

733

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
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734 **C.4.3.1 Required resource types**

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

736 **C.4.3.2 OCF-defined optional resource types**

737 A body scale measures height using the oic.r.height Resource Type. Especially, a body scale
738 measures the height if BMI is also reported because the height is used when a body scale measures
739 BMI.

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

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

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

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

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

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

746 **C.4.4 Body thermometer**

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

751 **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

752 **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

753 **C.4.4.1 Required resource types**

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

756 **C.4.4.2 OCF-defined optional resource types**

757 A body thermometer measures temperature site using the oic.r.body.location.temperature
758 Resource Type.

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

760 **Annex D**
761 (normative)

762 **Industrial device types**
763

764 **D.1 Operational scenarios**

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

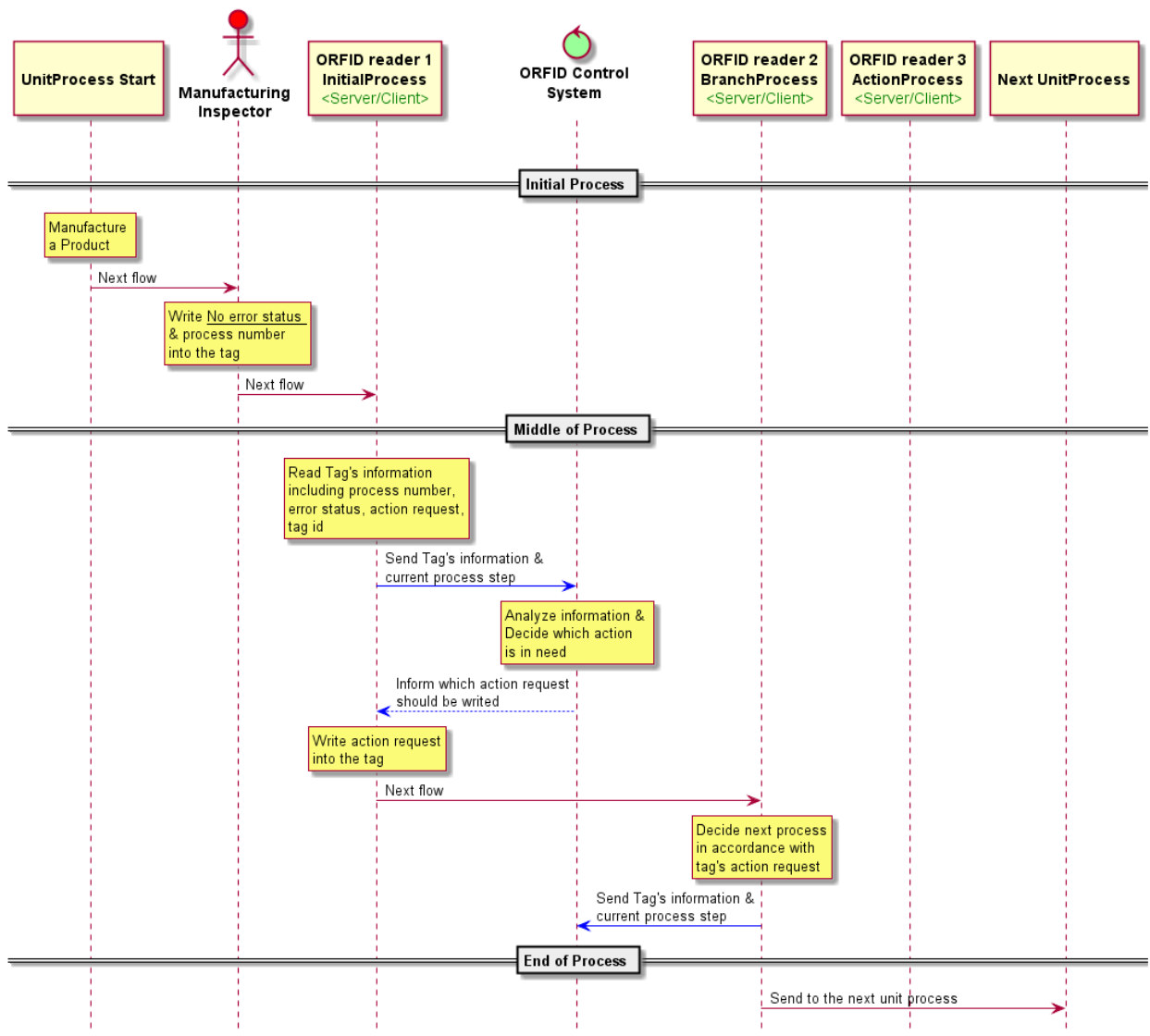
768 Commercial observation is the real-time monitoring to collect broad series of data from each
769 product on the production line and machineries from the plant floor. This collected big data can be
770 sent to OCF cloud and/or manufacturer's internal OCF network where it is analysed and used to
771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

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

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

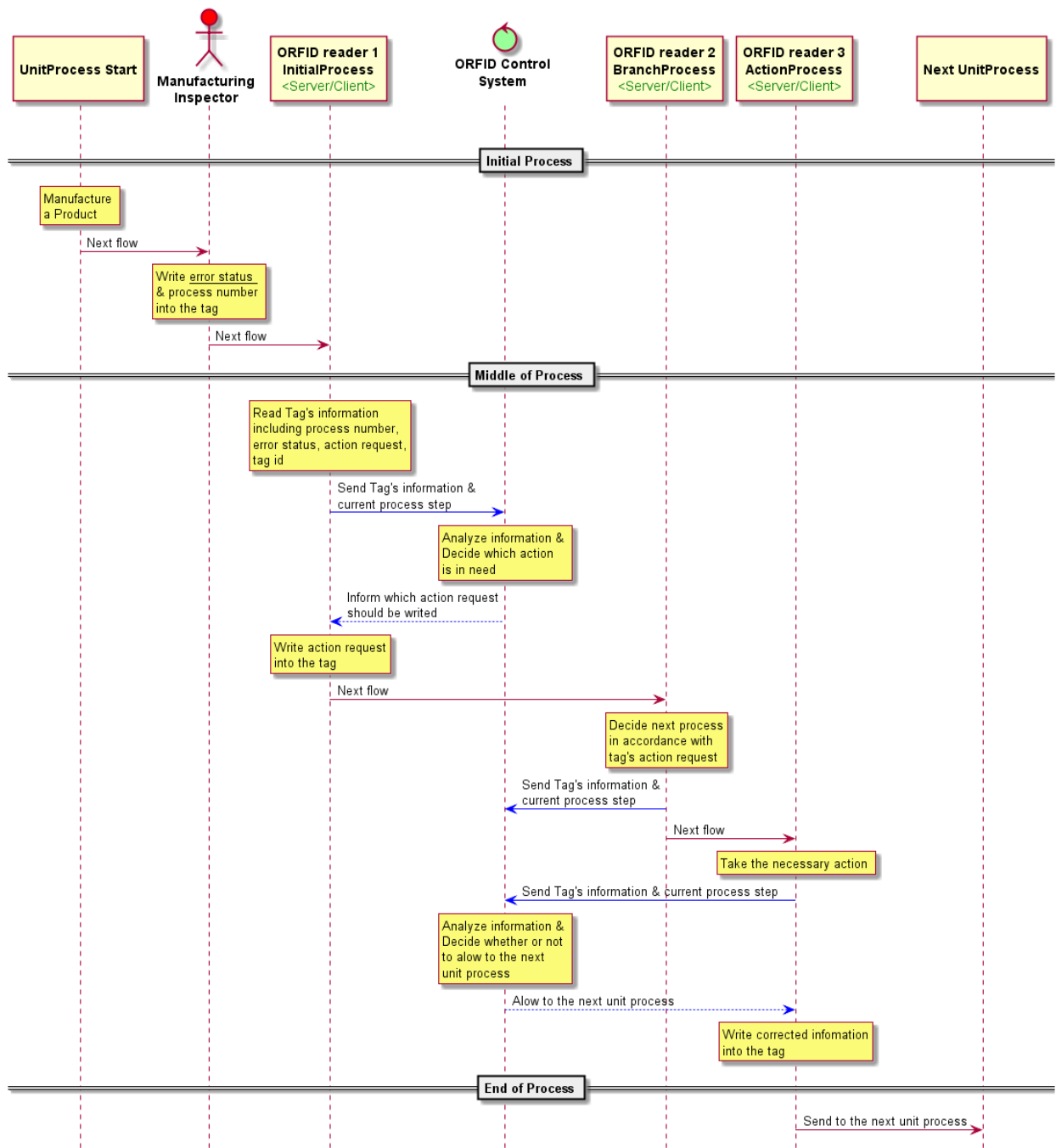
779 In the RFID Tag Resource Type the tagid is an integer showing the currently read optical
780 augmented RFID tag's identity information.

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



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789

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



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791

792

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

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

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

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

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

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

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

810 **Table D.1 – Alphabetical list of device types (“rt”), including required resources for**
 811 **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

812