

# OCF Cloud API for Cloud Services Specification

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## CONTENTS

20  
21

22	1	Scope .....	1
23	2	Normative references .....	1
24	3	Terms, definitions, and abbreviated terms .....	1
25	3.1	Terms and definitions.....	1
26	3.2	Abbreviated terms.....	2
27	4	Document conventions and organization.....	3
28	4.1	Conventions.....	3
29	4.2	Notation .....	3
30	5	Overview .....	4
31	5.1	Introduction.....	4
32	5.2	General OCF Cloud API for Cloud Services elements .....	4
33	5.3	Cloud to Cloud operational overview .....	5
34	5.3.1	Introduction .....	5
35	5.3.2	Conceptual architecture.....	5
36	5.3.3	Authorizing Cloud connectivity.....	6
37	5.3.4	Synchronization of User's set of Devices .....	6
38	5.3.5	Keeping up-to-date: Notifications of changes on other Clouds .....	6
39	5.3.6	Handling of Requests and Responses for connected Devices .....	7
40	6	Authentication and authorization.....	7
41	7	Account Linking API .....	7
42	7.1	General.....	7
43	7.2	OAuth2.0 access token scopes .....	8
44	8	Devices API.....	10
45	8.1	Introduction.....	10
46	8.2	Parameters supported in Requests .....	10
47	8.3	Retrieve all Devices .....	10
48	8.3.1	Summary .....	10
49	8.3.2	Request and Response payload .....	11
50	8.3.3	Responses .....	12
51	8.4	Retrieve one Device.....	12
52	8.4.1	Summary .....	12
53	8.4.2	Request and Response payload .....	13
54	8.4.3	Responses .....	13
55	8.5	Retrieve specific Resource .....	14
56	8.5.1	Summary .....	14
57	8.5.2	Request and Response payload .....	14
58	8.5.3	Responses .....	15
59	8.6	Update a Resource on a Device.....	15
60	8.6.1	Summary .....	15
61	8.6.2	Request and Response payload .....	16

62	8.6.3	Responses .....	16
63	9	Events API .....	17
64	9.1	Introduction.....	17
65	9.2	Events authentication.....	18
66	9.2.1	Introduction .....	18
67	9.2.2	Create event signature .....	18
68	9.2.1	Verify the event signature.....	18
69	9.3	Parameters supported.....	19
70	9.4	Events API subscription and notification payload definitions .....	19
71	9.4.1	Subscription request.....	19
72	9.4.2	Subscription response .....	20
73	9.4.3	Notification request.....	21
74	9.4.4	Notification response .....	23
75	9.5	Subscribe and unsubscribe to devices level event types .....	23
76	9.5.1	Summary .....	23
77	9.5.2	Request and Response payload .....	23
78	9.5.3	Responses .....	24
79	9.6	Subscribe and unsubscribe to device level events.....	24
80	9.6.1	Summary .....	24
81	9.6.2	Request and Response payload .....	25
82	9.6.3	Responses .....	25
83	9.7	Subscribe and unsubscribe to resource level events .....	25
84	9.7.1	Summary .....	25
85	9.7.2	Request and Response payload .....	26
86	9.7.3	Responses .....	26
87	9.8	Notification of devices level events .....	27
88	9.8.1	Summary .....	27
89	9.8.2	Request and Response payload .....	27
90	9.8.3	Responses .....	27
91	9.9	Notification of Device level events .....	28
92	9.9.1	Summary .....	28
93	9.9.2	Request and Response payload .....	28
94	9.9.3	Responses .....	28
95	9.10	Notification of Resource level events .....	29
96	9.10.1	Summary .....	29
97	9.10.2	Request and Response payload .....	29
98	9.10.3	Responses .....	29
99		Annex A Representative Flows .....	31
100	A.1	Introduction.....	31
101	A.2	OAuth2.0 application registration .....	31
102	A.3	Account linking .....	31
103	A.4	Retrieval of all Devices .....	32
104	A.4.1	Summary .....	32
105	A.4.2	Flow .....	32

106	A.4.3	Flow description .....	33
107	A.5	Retrieval of a single Device .....	33
108	A.5.1	Summary .....	33
109	A.5.2	Flow .....	33
110	A.5.3	Flow description .....	34
111	A.6	Retrieval of a single Resource .....	34
112	A.6.1	Summary .....	34
113	A.6.2	Flows.....	34
114	A.7	Update of a single Resource .....	36
115	A.7.1	Summary .....	36
116	A.7.2	Flows.....	36
117	A.8	Establishment of new subscription request.....	37
118	A.8.1	Summary .....	37
119	A.8.2	Flows.....	37
120	A.9	Event generated for a subscription.....	38
121	A.9.1	Summary .....	38
122	A.9.2	Flows.....	38
123	A.10	Addition of new registration.....	38
124	A.10.1	Summary .....	38
125	A.10.2	Flows.....	39
126	A.11	Removal of existing device registration .....	39
127	A.11.1	Summary .....	39
128	A.11.2	Flows.....	39
129	Annex B	Open API Definition .....	40
130	B.1	OCF Cloud API for Cloud Services.....	40
131	B.1.1	Supported APIs .....	40
132	B.1.2	OpenAPI 2.0 definition.....	41
133			
134			

135  
136  
137  
138  
139  
140  
141  
142  
143  
144  
145  
146  
147  
148  
149  
150  
151  
152  
153  
154  
155

Figures

Figure 1 – OCF Cloud Overview .....4

Figure 2 – Conceptual Architecture .....6

Figure 3 – Subscription Request Example.....20

Figure 4 – Subscription Response Example Payload.....21

Figure A.1 – Establish business relationship example flow .....31

Figure A.2 – Initial association example flow .....32

Figure A.3 – Retrieve all Devices example flow .....33

Figure A.4 – Retrieve single Device example flow .....34

Figure A.5 – Retrieve Resource (success) example flow .....35

Figure A.6 – Retrieve Resource (timeout) example flow .....36

Figure A.7 – Update Resource (success) example flow .....36

Figure A.8 – Update Resource (timeout) example flow .....37

Figure A.9 – Subscription establishment example flow .....38

Figure A.10 – "resource\_contentchanged" event example flow.....38

Figure A.11 – Addition of new registered Device example flow.....39

Figure A.12 – Removal of existing registration example flow .....39

## Tables

Table 1 – OAuth 2.0 access token scopes .....	9
Table 2 – Applicable OAuth2.0 access token scopes per API Endpoint .....	9
Table 3 – Parameters used in Requests in the Device API .....	10
Table 4 – Retrieve All Devices API Summary .....	11
Table 5 – Response payload Property definition .....	11
Table 6 – "device" Property definition .....	11
Table 7 – Devices API non-success path responses .....	12
Table 8 – Retrieve One Device API Summary .....	13
Table 9 – Device API non-success path responses .....	13
Table 10 – Retrieve Specific Resource API Summary .....	14
Table 11 – Resource Retrieval API non-success path responses .....	15
Table 12 – Update Resource API Summary .....	16
Table 13 – Resource Update API non-success path responses .....	17
Table 14 – Parameters used in the Events API .....	19
Table 15 – Event types and API Endpoints .....	20
Table 16 – Subscription Request Payload Properties .....	20
Table 17 – Subscription Response Properties .....	21
Table 18 – Notification request HTTP Headers .....	21
Table 19 – Event type to notification payload content .....	22
Table 20 – Subscription to /devices API Summary .....	23
Table 21 – Devices Event Subscription API non-success path responses .....	24
Table 22 – Subscription to Single Device API Summary .....	24
Table 23 – Device Event Subscription API non-success path responses .....	25
Table 24 – Subscription to Resource API Summary .....	26
Table 25 – Resource Event Subscription API non-success path responses .....	27
Table 26 – Notification of /devices API Summary .....	27
Table 27 – Devices Event Notification non-success path responses .....	28
Table 28 – Notification of Single Device API Summary .....	28
Table 29 – Device Event Notification non-success path responses .....	29
Table 30 – Notification of Resource API Summary .....	29
Table 31 – Resource Event Notification non-success path responses .....	30
Table A.1 – Retrieve all Devices flow summary .....	33
Table A.2 – Retrieve single Device flow summary .....	34
Table A.3 – Retrieve single Resource flow summary .....	35
Table A.4 – Update single Resource flow summary .....	37

## 1 Scope

This document defines functional requirements for the OCF Cloud to Cloud Application Programming Interface (API).

## 2 Normative references

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

IETF RFC 2818, *HTTP over TLS*, May 2000  
<https://tools.ietf.org/html/rfc2818>

IETF RFC 5646, *Tags for Identifying Languages*, September 2009  
<https://www.rfc-editor.org/info/rfc5646>

IETF RFC 6749, *The OAuth 2.0 Authorization Framework*, October 2012  
<https://tools.ietf.org/html/rfc6749>

IETF RFC 6750, *The OAuth 2.0 Authorization Framework: Bearer Token Usage*, October 2012  
<https://www.rfc-editor.org/info/rfc6750>

IETF RFC 7628, *A Set of Simple Authentication and Security Layer (SASL) Mechanisms for OAuth*, August 2015  
<https://www.rfc-editor.org/info/rfc7628>

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

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

OCF Device to Cloud Services Specification, *Open Connectivity Foundation Device to Cloud Services Specification*,  
Latest version available at:  
[https://openconnectivity.org/specs/OCF\\_Cloud\\_Specification.pdf](https://openconnectivity.org/specs/OCF_Cloud_Specification.pdf)

OCF Cloud API for Cloud Services <https://github.com/openconnectivityfoundation/core-extensions/blob/ocfcloud-openapi/swagger2.0/oic.r.cloudopenapi.swagger.json>  
OpenAPI 2.0, *fka Swagger RESTful API Documentation Specification*, Version 2.0  
<https://github.com/OAI/OpenAPI-Specification/blob/master/versions/2.0.md>

## 3 Terms, definitions, and abbreviated terms

### 3.1 Terms and definitions

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

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

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



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

237

### 238 **3.1.1**

#### 239 **API Endpoint**

240 a defined URL to which requests defined in this document are sent

### 241 **3.1.2**

#### 242 **Bearer Token**

243 an OAuth2.0 access token as defined within IETF RFC 6750

### 244 **3.1.3**

#### 245 **Origin Cloud**

246 the OCF Cloud or the 3<sup>rd</sup> party Cloud through which the user works with his OCF Devices

### 247 **3.1.4**

#### 248 **Subscription ID**

249 a unique identity that is associated with an instance of a subscription to an event (or events)

### 250 **3.1.5**

#### 251 **Target Cloud**

252 the OCF Cloud to which OCF Servers (OCF Devices) are connected which the user wants to control  
253 via the Origin Cloud (3.1.2)

## 254 **3.2 Abbreviated terms**

### 255 **3.2.1**

#### 256 **API**

257 Application Programming Interface

### 258 **3.2.2**

#### 259 **HMAC**

260 Hash-based Message Authentication Code

261

## 4 Document conventions and organization

### 4.1 Conventions

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

### 4.2 Notation

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

Required (or shall or mandatory)(M).

- These basic features shall be implemented to comply with Core Architecture. The phrases "shall not", and "PROHIBITED" indicate behaviour that is prohibited, i.e. that if performed means the implementation is not in compliance.

Recommended (or should)(S).

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

Allowed (may or allowed)(O).

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

DEPRECATED.

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

Conditionally allowed (CA)

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

Conditionally required (CR)

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

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

Words that are emphasized are printed in *italic*.

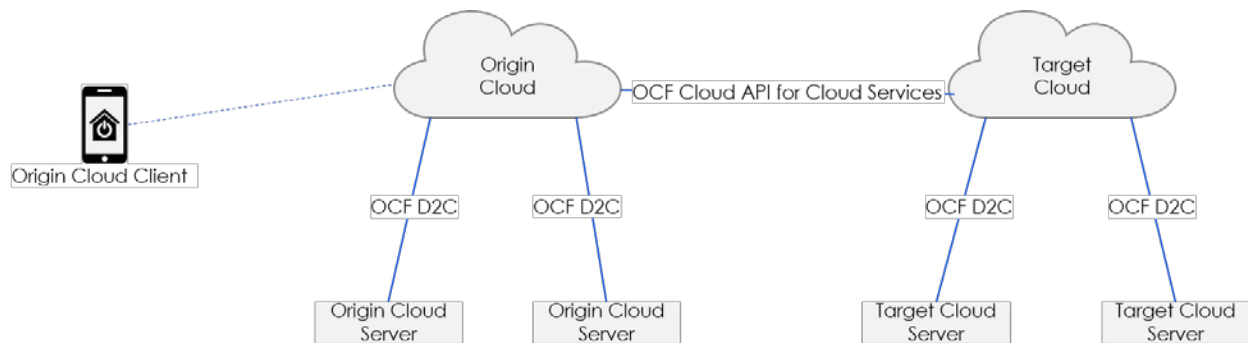
## 5 Overview

### 5.1 Introduction

This document defines the OCF Cloud API for Cloud Services. In this document Origin Cloud refers to the OCF Cloud or the 3<sup>rd</sup> party Cloud through which the user works with his OCF Devices, Target Cloud refers to the OCF Cloud to which OCF Servers (OCF Devices) are connected which the user wants to control via the Origin Cloud.

An OCF Device is a collection of Resources, each Resource being an OpenAPI 2.0 defined object that represents a physical property or characteristic of the Device (e.g. temperature sensed, light colour, power on switch). The Device itself has an associated Device Type that provides an indication of what the Device is, for example a Light is represented as a Device Type of "oic.d.light".

Please see Figure 1 for a representation of the target architecture.



**Figure 1 – OCF Cloud Overview**

The OCF Cloud API for Cloud Services supports the following cases:

- Account Linking API (clause 7)
  - Initial Account Linking
  - Removal of linked account
- Devices API (clause 8)
  - Retrieval of all Devices associated with a User (clause 8.3)
  - Retrieval of a single Device associated with a User (clause 8.4)
  - Retrieval of a single Resource (clause 8.5)
  - Update of a single Resource (clause 8.6)
- Events API (clause 9)
  - Subscription to an event: establishment of a subscription (clause 9.4.1)
  - Notification: event generated on an established subscription (clause 9.4.3)

### 5.2 General OCF Cloud API for Cloud Services elements

The OCF Cloud API for Cloud Services is a RESTful API over HTTPS (IETF RFC 2818). The API is defined using OpenAPI 2.0.

The Origin Cloud communicates with the Target Cloud using the domain name or URI it has obtained from the initial OAuth 2.0 (IETF RFC 6749) Client Setup, covered in clause 7. Communication between OCF Devices and OCF Clouds is defined in the OCF Device to Cloud Services Specification.

All URIs presented within a "href" Link Parameter present in any payload shall be in the form "/<deviceId>/<resourcehref>"; where <deviceId> is the identity of the Device as provided in the "di" Property of "/oic/d" and "resourcehref" is the "href" of the Resource as provided by the Target Cloud.

An Origin Cloud shall obtain a Bearer Token from the Target Cloud using standard OAuth2.0 (IETF RFC 6749) mechanisms. All subsequent requests from an Origin Cloud to the Target Cloud shall include this Bearer Token for the user in question.

Any query parameters received by an Origin Cloud in a request from an OCF Client shall be passed through clean (i.e. are part of the URI) in any request that is sent to a Target Cloud.

Each request may contain an optional HTTP Correlation-ID header, which carries a unique identifier value that provides a reference to a particular transaction or event chain in the Target Cloud. If the request does contain a Correlation-ID header, a Correlation-ID populated with the same value shall be present in any response to that request. If the request does not contain a Correlation-ID header, one should be present in the response.

All requests shall include an HTTP Accept header with the exception of a DELETE (as there is no payload expected in the response). All requests or responses that carry content shall include an HTTP Content-Type header. At a minimum media-types "application/json" and "application/vnd.ocf+cbor" shall be supported. If the recipient of a request cannot provide a response that is encoded according to the content of the Accept header, then a HTTP 406 (not acceptable) response should be sent in accordance with IETF RFC 2818. On reception of a 406 response the originator of the request may re-attempt the request using an alternative Content-Type if supported.

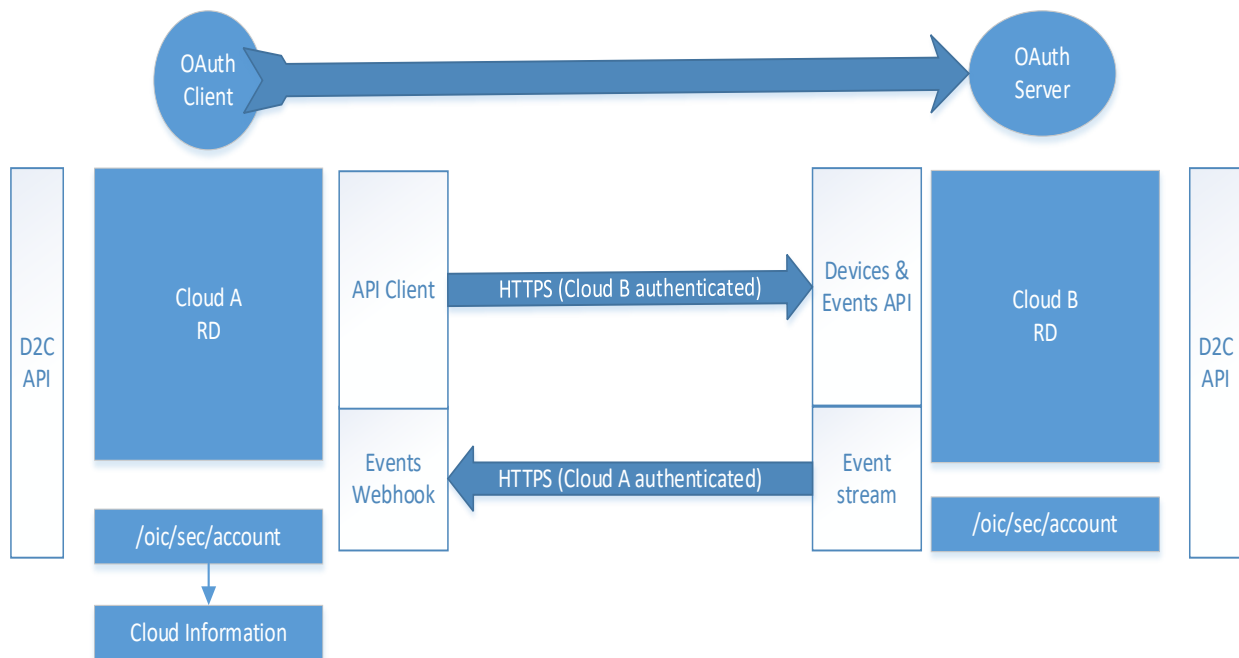
## **5.3 Cloud to Cloud operational overview**

### **5.3.1 Introduction**

This clause provides an informative overview of the flows that are enabled by the detailed API defined in clauses 6, 7, 8, and 9. Clause 5.3 provides references to the applicable clauses within this document that define the API specifics.

### **5.3.2 Conceptual architecture**

Figure 2 describes the overall conceptual architecture.



**Figure 2 – Conceptual Architecture**

### 5.3.3 Authorizing Cloud connectivity

Consider a user who has accounts on two distinct, separately owned clouds, and devices associated with each of those accounts on those clouds. The user wants to have a unified view of all of their devices from a single client rather than having a client per cloud. The user via the client they want to use for all devices indicates to the directly connected cloud (Origin Cloud) that they want to link this account with an account on the other cloud (Target Cloud). This initiates a standard OAuth2.0 authorization code grant type flow, see IETF RFC 6749, clause 1.3.1. Application of this flow is described in clause 7.

### 5.3.4 Synchronization of User's set of Devices

After completion of the authorization code grant type flow from clause 5.3.3 the Origin Cloud (that is the cloud to which the user is connected) is authorized to use the Device API to obtain on behalf of the user the complete list of devices hosted on the Target Cloud for which the user has access. The API is described in clause 8, and the flow is further illustrated in clause A.4.

The result of the invocation of the Device API is a complete set of device information that may then be provided in a response to a RETRIEVE on "/oic/res" from the Origin Cloud.

### 5.3.5 Keeping up-to-date: Notifications of changes on other Clouds

Once the set of devices has been obtained, the Origin Cloud can subscribe to the events to which it is interested across the user's complete device set ("/devices"), or per device in that set ("/devices/{deviceid}"). See clause 9 for details of the API itself.

The subscription to "/devices" enables the Origin Cloud to be notified whenever a new device is added or an existing device removed from the Target Cloud.

The subscription to "/devices/{deviceid}" enables the Origin Cloud to be notified whenever there is a change in the state of a device (e.g. it has de-registered).

When a new Device registers on the Target Cloud, and a subscription exists for that event, then a notification is sent to the Origin Cloud with an event type of "devices\_registered" and a payload

which contains the "di" of the newly registered device. The Origin Cloud may then RETRIEVE the Links exposed by the newly added device using "/devices/{deviceid}" where "deviceid" was provided in the payload of the notification. See clause A.10 for a flow illustrating this interaction.

### **5.3.6 Handling of Requests and Responses for connected Devices**

From the perspective of the client connected to the Origin Cloud there is no distinction between devices and their Resources hosted by the Origin Cloud itself and devices and their resources that are hosted by a Target Cloud reached via this API.

Thus all requests for a target resource are formed using the mechanisms described in the OCF Device to Cloud Services Specification.

The Origin Cloud identifies the Target Cloud for the requested Resource via the "deviceid" that is in the request URI which is matched to the "di" Property in "/oic/sec/account". The request is then effectively proxied to the Target Cloud via the "/devices/{deviceid}/{resourcehref}" API exposed by the Target Cloud (see clause 8.5 and 8.6). Any query parameters received over the device to cloud connection are included in the URI unaltered. The content-type of the payload in the request or response is honoured. See clauses A.6 and A.7 for illustrative flows of this mechanism for both RETRIEVE and UPDATE cases.

## **6 Authentication and authorization**

A Target Cloud shall only expose secure endpoints; any requests received over an unsecured connection (i.e. HTTP) shall be redirected to the secure equivalent of that endpoint. The Origin Cloud shall use the "Bearer" authentication scheme inside the "Authorization" request header field to transmit the access token, as per IETF RFC 6750 clause 2.1. For definition of the "Authorization" request header field, see IETF RFC 2818.

Bearer Tokens issued by the Target Cloud shall identify the user as well as the client that is sending requests on behalf of the user to the Target Cloud.

On the OCF Server side there is no distinction between requests forwarded from the Origin Cloud and requests coming via the Target Cloud.

## **7 Account Linking API**

### **7.1 General**

The account linking API is the mechanism by which Devices hosted on behalf of a user by the Target Cloud are linked with a user identity on the Origin Cloud. Account linking is established solely between the Origin Cloud and the Target Cloud; an Origin Cloud shall not proxy devices from the Target Cloud to another third-party Cloud.

The OAuth 2.0 Origin Cloud Client has to be registered with the Target Cloud as a prerequisite to initiating the Authorization Code Grant Type flow, which allows the user to link his Origin Cloud account with the Target Cloud. This process is named OAuth application registration and is beyond the scope of this document. Successful registration of the OAuth 2.0 Origin Cloud Client in the Target Cloud relies on the two entities establishing trust and obtaining the required client parameters and OAuth2.0 Token Endpoints (e.g. client id, client secret, allowed redirect URIs). See IETF RFC 6749, clause 2.

The linking is then achieved via the use of an OAuth2.0 authorization code grant type. Part of the linking process is the end-user consent, which is very important in cross-domain identity federation, ensuring that a malicious OAuth 2.0 Origin Cloud Client cannot obtain authorization without the awareness and explicit consent of the resource owner (that is the user) of the Target Cloud. The Target Cloud presents to the user linking the account the precise scope of authorization information being requested by the Client. Details about scopes are available in clause 7.2. After the user's

consent and subsequent authorization code exchange, the Bearer Token and refresh tokens (see IETF RFC 6749) shall be obtained from the Target Cloud by the Origin Cloud, following the format and Content Type in IETF RFC 6750 clause 4. The Bearer Token identifies a user identity on the Target Cloud. All requests for a Bearer Token or a refresh token shall include the "client\_id" and "client\_secret" as defined by IETF RFC 6749. IETF RFC 6749 clause 2.3.1 describes two schemes for inclusion of the "client\_id" and "client\_secret", one using an Authorization header with a "Basic" scheme, and one that encodes the client credentials in the request body which is not recommended by the referenced RFC. A Client shall provide an Authorization header in requests using the "Basic" scheme, a Client should not encode the information in the request body.

A Target Cloud may make use of the "offline\_access" scope as defined by IETF RFC 7628, in such an instance a Client requesting a token from such a Target Cloud shall include the scope in the token request. How a Client determines what scopes the Target Cloud does or does not support is outside of the scope of this document.

The "state" query parameter shall be present in each authorization request, see IETF RFC 6749 clause 4.1.1. State is an opaque value used by the Origin Cloud Client to maintain state between the request and the callback during the account linking process, see clause A.3.

All requests, responses, and error codes that may be sent during Account Linking shall conform to those defined in RFC 6749.

Once such a Bearer Token has been acquired, the Origin Cloud shall link the OAuth2.0 access and refresh token with its known local "userid". The user who linked his Target Cloud account with the Origin Cloud account is from this moment able to request all his devices through the Origin Cloud, because the Origin Cloud can make requests to the Target Cloud on behalf of the Target Cloud user account. However, if an Origin Cloud makes a request that is not included in the OAuth2.0 access token scope granted by the Bearer Token, the Target Cloud shall reply with an appropriate error response.

When a Bearer Token is first acquired, it is recommended that the Origin Cloud use the Device API to retrieve the Device details for all Devices in OAuth2.0 access token scope of the Bearer Token.

If the Origin Cloud supports the behaviour defined in the OCF Device to Cloud Services Specification, then once the Origin Cloud has the set of Devices from the Target Cloud it creates an instance of "/oic/sec/account" per Device. The optional Property "cloudid" in "/oic/sec/account" is set to the OCF Cloud UUID of the Target Cloud available in the Common Name field of the End-Entity certificate. If the Property is missing, empty, or contains the same value as the UUID of the Origin Cloud, then the Device is local to the Origin Cloud.

The Origin Cloud may use the Events API to establish a subscription with the Device(s) on the Target Cloud; such that addition or deletion of Devices on the Target Cloud can be correctly reflected in the Origin Cloud. When the Device is deregistered from the Target Cloud, that Device is no longer accessible via the Origin Cloud. When the Bearer Token obtained from the Target Cloud expires and the refresh token is still valid, the Origin Cloud may ask for a new Bearer Token through the OAuth2.0 token endpoint of the Target Cloud. Whenever the refresh token expires, is not available, or the Bearer Token cannot be obtained, the Origin Cloud shall remove all associations with the Devices hosted by the Target Cloud. See IETF RFC 6749 for further details.

It is recommended that the Origin Cloud subscribe to events of every Device that is hosted on the Target Cloud by using the subscription mechanism described in clause 9.6.

## **7.2 OAuth2.0 access token scopes**

This document defines a core set of OAuth2.0 access token scopes, see IETF RFC 6749. An Origin Cloud may request one or more of these scopes, a vendor extension thereof, or a vendor specific scope(s) as part of the account linking process. If the scope being provided by the Target Cloud is different from the requested scope, then that scope shall be included in the issued access token

(see clause 5.1 of IETF RFC 6749). If the Target Cloud supports access token requests with no scopes provided, and an access token request with no scopes is received from the Origin Cloud, then the returned access token from the Target Cloud shall grant access to all of the OAuth2.0 access token scopes defined in Table 1.

The description for each of the OAuth2.0 access token scopes shall be presented to the user during the account linking process by the OAuth2.0 server of the Target Cloud. The Target Cloud user sees a description on the consent screen and give an explicit consent that the Origin Cloud requesting that the Bearer Token is authorized to act on behalf of the user in the boundary of obtained OAuth2.0 access token scopes.

**Table 1 – OAuth 2.0 access token scopes**

OAuth2.0 access token scope name	OAuth2.0 access token scope description "The application will be able to:"
r:*	Read
w:*	Update

Table 2 details the OAuth2.0 access token scopes that are applicable per API Endpoint. All API Endpoints that are listed in Table 2 shall be supported by a Target Cloud. So, for example, if an Origin Cloud sends a GET request to "/api/v1/devices?content=all" API Endpoint, the Origin Cloud must have a Bearer Token that contains OAuth2.0 access token scope "r:\*" or a vendor extension thereof

**Table 2 – Applicable OAuth2.0 access token scopes per API Endpoint**

API Endpoint	HTTP Request type	Applicable scopes
/api/v1/devices	GET	r:*
/api/v1/devices?content=all	GET	r:*
/api/v1/devices/{deviceid}	GET	r:*
/api/v1/devices/{deviceid}?content=all	GET	r:*
/api/v1/devices/{deviceid}/{resourcehref}	GET	r:*
	POST	w:*
/api/v1/devices/subscriptions	POST	r:*
	DELETE	r:*
/api/v1/devices/{deviceid}/subscriptions	POST	r:*
	DELETE	r:*
/api/v1/devices/{deviceid}/{resourcehref}/subscriptions	POST	r:*
	DELETE	r:*

A vendor may extend the list of OAuth2.0 access token scopes beyond those listed in Table 2. They are extended by adding additional vendor-specific information before the \* in the OAuth2.0 access token scope name (e.g. "r:xyz:\*"). How these extensions work is outside the scope of the OCF but they may be present in the OAuth2.0 access token request. Note that if the user gives consent to the Origin Cloud to "w:\*", consent applies also to any derived OAuth2.0 access token scopes (e.g. "w:xyz:\*").



## 8 Devices API

### 8.1 Introduction

The Devices API supports the ability to retrieve and interact with the OCF Devices that are within the scope of the provided Bearer Token.

### 8.2 Parameters supported in Requests

Table 3 lists the parameters that may be provided as part of a request within the Device API.

**Table 3 – Parameters used in Requests in the Device API**

Friendly Name	Parameter Name	Location	Mandatory	Description
Accept	Accept	HTTP Header	Yes	An Accept request HTTP header advertises which content types, expressed as MIME types, the Origin Cloud is able to understand. The Target Cloud then selects one of the proposed content types and informs the Origin Cloud of its choice with the Content-Type response header.
Content Type	Content-Type	HTTP Header	No	The Content-Type header is used to indicate the media type of the payload. A Content-Type header tells the recipient what the content type of the returned payload actually is.
Correlation ID	Correlation-ID	HTTP Header	No	A Correlation ID, also known as a Transit ID, is a unique identifier value that is attached to requests and messages that allows reference to a particular transaction or event chain.
Content	content=[base, all]	Query String Parameter	No	When set to "base" this indicates to the recipient that the response payload Links are not resolved.  When set to "all" this indicates to the recipient that the response payload <b>is</b> the resolved (i.e. resource representation) Link and not the Link itself. If not present "base" is assumed.

### 8.3 Retrieve all Devices

#### 8.3.1 Summary

This request is sent from the Origin Cloud to the Target Cloud in order to obtain information on all the Devices that are registered for the user that are in scope as defined by the Bearer Token on the Target Cloud.

A request to this API may be invoked by the Origin Cloud on completion of account linking. Where the Cloud supports the behaviour defined in the OCF Device to Cloud Services Specification this may also be invoked by reception of a RETRIEVE to "/oic/res" of the Cloud Resource Directory from an OCF Client.

Table 4 provides a summary of the API.

**Table 4 – Retrieve All Devices API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
GET	/api/v1/devices	content=[base, all], Correlation-ID, Accept	200	See clause B.1 - array of /definitions/Device (for content=base) and /definitions/DeviceContentAll (for content=all)
			400, 401, 403, 503, 504	The response may include a diagnostic payload containing a reason string.

### 8.3.2 Request and Response payload

There is no required payload in the request; if one is received at the Target Cloud it shall be ignored. The required response payload for a request that includes "content=base" or no "content" parameter shall be an array of objects; each object shall contain the Properties identified in the schema provided in Annex B, a "device" Property as defined by the schema, a status Property ("status") that indicates whether the Device is online or offline, and an array of Links (as defined for "/oic/res") for the Resources exposed by the specific Device. These Properties are further summarised in Table 5, with the specific Properties in the "device" Property summarised in Table 6.

**Table 5 – Response payload Property definition**

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Device	"device"	"object"	N/A	N/A	R	Yes	Set of Properties that defined the Device itself; see Table YYYY
Device Status	"status"	"string:"	Value from the enumeration {"online", "offline"}	N/A	R	Yes	Status of the Device.
Device Links	"links"	"array"	N/A	N/A	R	Yes	The published set of Links exposed by the Device

**Table 6 – "device" Property definition**

Property title	Property name	Value type	Value rule	Unit	Access mode	Mandatory	Description
Resource Type	"rt"	"array"	N/A	N/A	R	Yes	Array contained the Device Type of the Device
(Device) Name	"n"	"string:"	N/A	N/A	R	Yes	Human friendly name defined by the vendor.
Device ID	"di"	"uuid"	N/A	N/A	R	Yes	Unique identifier for Device.
Manufacturer Name	"dmn"	"array"	N/A	N/A	R	Yes	Name of manufacturer of the Device, in one or more languages. This Property is an array of objects where each object has a "language" field (containing an IETF RFC 5646 language tag) and

							a "value" field containing the manufacturer name in the indicated language.
--	--	--	--	--	--	--	---

The minimum set of Resources that are exposed depends on the OCF Device Type of the Device; this shall be the set defined in clause 6.1.3.2.1 of the OCF Device to Cloud Services Specification.

If the request includes "content=all" (analogous to a batch retrieval of /oic/res in the proximal network) then the response payload shall be as defined for "content=base" with the exception that instead of an array of Links to the hosted Resources, the response payload shall include an array of the representations of the Resources themselves that are exposed for each Device that is available. This is illustrated in the examples provided for the Device API in Annex B. See also the definition of a batch response in

ISO/IEC 30118-1:2018.

### 8.3.3 Responses

A 200 response shall be provided in a success case. The payload shall contain information for all Devices that are in the scope of the Bearer Token.

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 7 lists possible non-success path responses and possible scenarios that trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 7 – Devices API non-success path responses**

Response Code	Response scenario
<b>400</b>	May be sent by the Target Cloud if the request was malformed or badly constructed
<b>401</b>	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
<b>403</b>	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
<b>406</b>	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable
<b>503</b>	May be sent by the Target Cloud if the service on the Target Cloud is unavailable
<b>504</b>	May be sent by the Target Cloud if the target Device is registered at the Target Cloud, however the Device itself is unavailable, offline, or otherwise unreachable. The response should include a Retry-After header containing the time after which the request may be re-attempted. Additional information may be indicated in a diagnostic payload

## 8.4 Retrieve one Device

### 8.4.1 Summary

This request may be sent from the Origin Cloud to the Target Cloud in order to obtain information on a specific Device that is registered for the user that is in scope as defined by the Bearer Token on the Target Cloud.

A request to this API may be invoked at the Origin Cloud following reception of a notification that a new Device has been added to a partner cloud, or alternatively as part of the flow following account linking. Where the Origin Cloud supports the OCF Device to Cloud Services Specification, a request to this API may also be invoked following reception of a RETRIEVE to "/oic/res" of the Origin Cloud Resource Directory from an OCF Client with a query parameter that specifies a particular "deviceid" (i.e. "?anchor=ocf://<some device id>").

Table 8 provides a summary of the API.

**Table 8 – Retrieve One Device API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
GET	/api/v1/devices/{deviceid}	content=[base, all], Correlation-ID, Accept	200	See clause B.1 - /definitions/Device (for content=base) and /definitions/DeviceContentAll (for content=all)
			400, 401, 403, 404, 503, 504	The response may include a diagnostic payload containing a reason string

#### 8.4.2 Request and Response payload

There is no required payload in the request; if one is received at the Target Cloud it shall be ignored.

The "deviceid" in the URI of the request is the same as the "di" Property from /oic/d of the target OCF device.

The response payload shall be an object containing the mandatory Device information as defined in clause 8.3.2.

#### 8.4.3 Responses

A 200 response shall be provided in a success case. The payload shall contain information for the requested Device.

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 9 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 9 – Device API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the indicated "deviceid" is not present on the Target Cloud

406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable
503	May be sent by the Target Cloud if the service on the Target Cloud is unavailable
504	May be sent by the Target Cloud if the target Device is registered at the Target Cloud, however the Device itself is unavailable, offline, or otherwise unreachable. The response should include a Retry-After header containing the time after which the request may be re-attempted. Additional information may be indicated in a diagnostic payload

## 8.5 Retrieve specific Resource

### 8.5.1 Summary

This request is sent from the Origin Cloud to the Target Cloud in order to obtain information on a specific Resource that is exposed by a Device that is registered for the user that is in scope as defined by the Bearer Token on the Target Cloud.

Where the Cloud supports the OCF Device to Cloud Services Specification this may be triggered by reception of a RETRIEVE to a URI exposed by a Link in the Cloud Resource Directory from an OCF Client.

Table 10 provides a summary of the API.

**Table 10 – Retrieve Specific Resource API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
GET	/api/v1/devices/{deviceid}/{resourcehref}	Correlation-ID, Accept	200	Response payload as defined by OCF for the target Resource Type
			400, 401, 403, 404	The response may include a diagnostic payload containing a reason string
			503	The response may include a diagnostic payload containing a reason string
			504	Retry-After header and optionally a diagnostic payload containing a reason string.

### 8.5.2 Request and Response payload

There is no required payload in the request; if one is received at the Target Cloud it shall be ignored.

The "deviceid" in the URI in the request is the same as the "di" Property from "/oic/d" of the target OCF device. The "resourcehref" in the URI is the same as the "href" Link Parameter for the target Resource instance.

The response payload shall be as defined by OCF for the Resource being received, or as defined by the vendor if the Resource is a 3<sup>rd</sup> party Resource.

The content-type of the response payload received from the target server is honoured; that is the content and payload as received by the Target Cloud shall be proxied unaltered in the response. Thus for example in the case where the target server is an OCF Device the content type would be "application/vnd.ocf+cbor".

An Origin Cloud shall include unaltered in the requestURI of the request sent to the Target Cloud any query parameters received over the device to cloud connection.

### 8.5.3 Responses

A 200 response shall be provided in a success case. The payload in the response shall be as defined in <http://oneiota.org> for the target Resource Type.

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 11 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 11 – Resource Retrieval API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the indicated "deviceid" is not present on the Target Cloud or the "resourcehref" is not found
406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable
503	May be sent by the Target Cloud if the service on the Target Cloud is unavailable
504	May be sent by the Target Cloud if the target Device is registered at the Target Cloud, however the Device itself is unavailable, offline, or otherwise unreachable. The response should include a Retry-After header containing the time after which the request may be re-attempted. Additional information may be indicated in a diagnostic payload

## 8.6 Update a Resource on a Device

### 8.6.1 Summary

This request is sent from the Origin Cloud to the Target Cloud in order to update information contained within a specific Resource exposed by a Device that is registered for the user that is in scope as defined by the Bearer Token on the Target Cloud.

Where the Cloud supports the OCF Device to Cloud Services Specification a request to this API may be triggered by reception of an UPDATE to a URI exposed by a Link in the Cloud Resource Directory from an OCF Client.

Table 12 provides a summary of the API.

626

**Table 12 – Update Resource API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
<b>POST</b>	/api/v1/devices/{deviceid}/{resourcehref}	payload, Correlation-ID, Accept, Content-Type	200	Optional resource representation
			400, 401, 403, 404, 415	The response may include a diagnostic payload containing a reason string.
			503	The response may include a diagnostic payload containing a reason string.
			504	Retry-After header and optionally a diagnostic payload containing a reason string

627

**8.6.2 Request and Response payload**

628 The request payload shall be as defined by OCF for the Resource being updated, or as defined by  
 629 the vendor if the Resource is a 3<sup>rd</sup> party Resource.  
 630

631 The "deviceid" in the URI in the request is the same as the "di" Property from /oic/d of the target  
 632 OCF device. The "resourcehref" in the URI is the same as the "href" Link Parameter for the target  
 633 Resource instance.

634 The response payload shall be as defined by OCF for the Resource being received, or as defined  
 635 by the vendor if the Resource is a 3<sup>rd</sup> party Resource.

636 The Content-Type of the request is defined in an HTTP Content-Type header. In the case that the  
 637 request was initiated by another OCF Device, the CoAP content-format header value shall be  
 638 mapped to the HTTP Content-Type header to the Target Cloud. If the value is not present, the  
 639 Target Cloud shall forward the request as-is. Thus, for example, in the case where the origin client  
 640 is an OCF Device, the CoAP content-format option would be "application/vnd.ocf+cbor", which is  
 641 passed to the Target Cloud as an HTTP Content-Type header.

642 An Origin Cloud shall include unaltered in the requestURI of the request sent to the Target Cloud  
 643 any query parameters received over the device to cloud connection.

**8.6.3 Responses**

645 A 200 response shall be provided in a success case. The payload may optionally contain the  
 646 representation of the Resource that was updated.

647 A non-success path response that is indicative of the type of error shall be returned by a Target  
 648 Cloud if an error scenario is detected. Table 13 lists possible non-success path responses and  
 649 possible scenarios that may trigger their generation; an implementation may support additional  
 650 responses as defined by IETF RFC 2818.

**Table 13 – Resource Update API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the indicated "deviceid" is not present on the Target Cloud or the "resourcehref" is not found
406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable
415	May be sent by the Target Cloud if an unsupported media type was specified in the Content-Type header
503	May be sent by the Target Cloud if the service on the Target Cloud is unavailable
504	May be sent by the Target Cloud if the target Device is registered at the Target Cloud, however the Device itself is unavailable, offline, or otherwise unreachable. The response should include a Retry-After header containing the time after which the request may be re-attempted. Additional information may be indicated in a diagnostic payload

## 653 9 Events API

### 654 9.1 Introduction

655 The Events API supports the ability for an interested party to subscribe to events and subsequently  
 656 receive notifications for those events. The events can be at the Resource level (like a CoAP  
 657 observe) or at a more system level (such as for a change in the set of known Devices).

658 The Events API makes use of a mechanism whereby the Target Cloud notifies the Origin Cloud  
 659 when a new event has occurred on the Target Cloud or any Device linked with the Target Cloud.  
 660 This event stream (continual series of notifications) may be started by sending an initial  
 661 subscription request to the Target Cloud specifying "eventTypes", "eventsUrl" (the API Endpoint to  
 662 which notifications are sent), and the "signingSecret", the latter to verify whether requests from the  
 663 Target Cloud are authentic. See clause 9.2. for details on the mechanism for how the  
 664 "signingSecret" is used and clause 9.4.1 for details on the subscription request.

665 A Subscription ID shall be provided in the response to an initial subscription request. The  
 666 Subscription ID is a unique string of type UUID, which shall be created and persisted by the Target  
 667 Cloud. The created ID shall be part of each notification sent to the configured "eventsUrl". The  
 668 Subscription ID shall also be used to DELETE this subscription. The Subscription ID is either  
 669 present in a response payload, or within a HTTP header, or present as part of the request URI  
 670 depending on the operation being undertaken. See clauses 9.4.2 and 9.4.3 for more details.

671 After the subscription is successful, the Target Cloud shall send an initial notification to the Origin  
 672 Cloud "eventsUrl" (that was provided during establishment of the subscription) with the current  
 673 state of the items to which the subscription applies. The Target Cloud shall send further  
 674 notifications to the Origin Cloud whenever any changes occur (i.e. events) to the items to which  
 675 the subscription applies.



Following the Origin Cloud's successful subscription to events of the Target Cloud, the Target Cloud shall start sending notifications only after it establishes a new server-authenticated TLS connection to the "eventsUrl" as specified by the Target Cloud.

Notifications generated by the Target Cloud in response to a subscription shall only be for devices and system changes the Bearer Token authorizes.

## **9.2 Events authentication**

### **9.2.1 Introduction**

Hash-based Message Authentication Code (HMAC) signatures are a way to sign the notification data using the "signingSecret" that only the Origin Cloud and Target Cloud know. The "signingSecret" shall be created by the Origin Cloud and sent within the subscription request as defined in the clause 9.4.1. After a successful subscription, the Target Cloud shall sign each notification using the HMAC-SHA256 hashing algorithm following the formula from the clause 9.2.2. The calculated signature shall be attached as the "Event-Signature" header with each notification request sent to the Origin Cloud.

The signature shall be used by the Origin Cloud to verify the legitimacy of the source and data itself. When the notification is received by the Origin Cloud it shall use its stored secret and the notification to generate its own HMAC-SHA256 signature using the formula from clause 9.2.1 to compare with the value from the "Event-Signature" header.

When the signing secret and notification request are the same on both sides then the HMAC signature will match. This match proves the authenticity of the request and data.

When the HMAC signature does not match, the Origin Cloud shall ignore the notification request message.

Detailed overview is provided in A.8.2, A.9.2, A.10.2, and A.11.2.

### **9.2.2 Create event signature**

1) Get the current timestamp in the Unix time format; this is used to populate the "Event-Timestamp" header.

2) Create a string, that is made up of the concatenation of the encoded content of the following headers that are part of the notification that is to be sent, in order: "Content-Type", "Event-Type", "Subscription-ID", "Sequence-Number", and "Event-Timestamp". Between each value insert a colon (ASCII character value hex 3A) as a delimiter. If any one of the headers is not present, do not include that value but still include the delimiter (e.g. if "Content-Type" is not present include a ":" prior to encoding the "Event-Type"). All headers that are defined to be strings shall be handled as ASCII characters.

3) After the encoding for "Event-Timestamp" add a final colon (ASCII character value hex 3A) and the raw bytes (i.e. as would be included in the HTTP request) that make up the notification body to be sent.

4) Hash the resulting string, using the "signingSecret" as a key using the HMAC-SHA256 hashing algorithm, and taking the hex digest of the hash.

5) Include the resulting signature to the "Event-Signature" header of the notification and timestamp to the "Event-Timestamp" header

### **9.2.1 Verify the event signature**

1) Create a string, that is made up of the concatenation of the encoded content of the following headers received in the notification, in order: "Content-Type", "Event-Type", "Subscription-ID", "Sequence-Number", and "Event-Timestamp". Between each value insert a colon (ASCII character

value hex 3A) as a delimiter. If any one of the headers is not present, do not include that value but still include the delimiter (e.g. if "Content-Type" is not present include a ":" prior to encoding the "Event-Type"). All headers that are defined to be strings shall be handled as ASCII characters.

2) After the encoding for "Event-Timestamp" add a final colon (ASCII character value hex 3A) and the received raw bytes (i.e. not subject to any decode) of the notification body.

3) Hash the resulting string, using the "signingSecret" as a key using the HMAC-SHA256 hashing algorithm and take the hex digest of the hash.

4) Compare the created signature to the "Event-Signature" header of the received notification and verify that they match.

### 9.3 Parameters supported

Table 14 lists the parameters that may be provided within the Events API.

**Table 14 – Parameters used in the Events API**

Friendly Name	Parameter Name	Location	Mandatory	Description
<b>Accept</b>	Accept	HTTP Header	Yes except for subscription cancellation (DELETE)	An Accept request HTTP header advertises which content types, expressed as MIME types, the client is able to understand. The resource server then selects one of the proposal and informs the client of its choice with the Content-Type response header. Each notification sent to the defined "eventsUrl" is then using this Accepted content type.
<b>Correlation ID</b>	Correlation-ID	HTTP Header	No	A Correlation ID, also known as a Transit ID, is a unique identifier value that is attached to requests and responses that allows reference to a particular transaction or notification.
<b>Content Type</b>	Content-Type	HTTP Header	No	The Content-Type header is used to indicate the media type of the payload. A Content-Type header tells the recipient what the content type of the returned payload actually is.

## 9.4 Events API subscription and notification payload definitions

### 9.4.1 Subscription request

A subscription request is sent by an Origin Cloud to the API Endpoint defined for the event type to which the subscription is targeted. The set of event types and associated API Endpoints is provided in Table 15. A Target Cloud should support "resources\_published" and "resources\_unpublished" event types, a Target Cloud shall support all other event types listed in Table 15. If for whatever reason a Target Cloud cannot honour the subscription request to an event type, it shall respond with an appropriate non-success path final response.

Subscription to a "subscription\_cancelled" event type is not done explicitly by an Origin Cloud; it shall always be enabled at the Target Cloud whenever any other supported event type is the target of a subscription.

743

**Table 15 – Event types and API Endpoints**

Event-Type	API Endpoint
<b>subscription_cancelled</b>	N/A as a subscription_cancelled event type is not explicitly subscribed to.
<b>devices_registered</b>	/api/v1/devices/subscriptions
<b>devices_unregistered</b>	/api/v1/devices/subscriptions
<b>devices_online</b>	/api/v1/devices/subscriptions
<b>devices_offline</b>	/api/v1/devices/subscriptions
<b>resource_contentchanged</b>	/api/v1/devices/{deviceid}/{resourcehref}/subscriptions
<b>resources_published</b>	/api/v1/devices/{deviceid}/subscriptions
<b>resources_unpublished</b>	/api/v1/devices/{deviceid}/subscriptions

744

745 Annex B provides a definition of the payload contained within the subscription request. The  
 746 Properties that are contained in the payload are further clarified in Table 16.

747

**Table 16 – Subscription Request Payload Properties**

Payload Property Name	Value type	Mandatory	Description
<b>eventsUrl</b>	URI	Y	URI to which notifications are to be sent
<b>eventTypes</b>	array of enum	Y	Event type(s) for which the subscription is targeted. See Table 15
<b>signingSecret</b>	String of length 32	Y	Secret used to create HMAC signature for each event

748

749 Figure 3 is an example of such a payload.

```
{
  "eventsUrl": "https://mynotificationuri",
  "eventTypes": ["resource_contentchanged"],
  "signingSecret": "DVDUEBe5nciVSXU85BPxrAjSsHenTzWY"
}
```

750

**Figure 3 – Subscription Request Example**

#### 751 9.4.2 Subscription response

752 The definition of the response to a subscription request is in Annex B. The Properties that are  
 753 contained with the payload are further clarified in Table 17.

754

**Table 17 – Subscription Response Properties**

Payload Property Name	Value type	Mandatory	Description
<b>subscriptionId</b>	Uuid	Y	Identity of the subscription (the Subscription ID). May be mapped from other protocols if a unique identifier exists. Note this cannot be mapped from a CoAP Token as the Token in CoAP is Client-local in scope (i.e. not guaranteed unique beyond the Client issuing the request).

755

756 Figure 4 is an example of such a payload.

```
{
  "subscriptionId": "leeb465c-5e8d-4305-a366-bbf035fff671"
}
```

757

**Figure 4 – Subscription Response Example Payload****9.4.3 Notification request**

759 When a subscription is first successfully established, the Target Cloud shall send a POST request  
 760 to the "eventsUrl" that was provided in the subscription with the current state of the items to which  
 761 the subscription applies. There shall be one POST request per subscribed event type; that is, if a  
 762 subscription request contains multiple event types in the "eventTypes" Property, there is a  
 763 notification request per identified event type, not one for all event types.

764 When there is a subsequent change (i.e. an event) that triggers a notification, the Target Cloud  
 765 shall send a POST request to the "eventsUrl" that was provided in the subscription. The Target  
 766 Cloud shall populate all headers defined in Table 18 in the POST that is sent to the "eventsUrl"  
 767 provided by the Origin Cloud together with any notification payload.

768 The Target Cloud shall send a notification with an event type of "subscription\_cancelled" to the  
 769 "eventsUrl" provided by the Origin Cloud if there is a cancellation of the subscription. As there is  
 770 no defined payload for a "subscription\_cancelled" event, a POST request that is sent for this event  
 771 type shall not include a "Content-Type" header. The cancellation may be through reception of a  
 772 DELETE from the Origin Cloud (see clauses 9.4.4, 9.6, and 9.7) or through internal logic on the  
 773 Target Cloud itself.

774 If the request that established the subscription contained a Correlation-ID header, then all  
 775 notifications that are sent as a result of that subscription shall contain a Correlation-ID header  
 776 populated with the same value as received in the original subscription request.

777

**Table 18 – Notification request HTTP Headers**

HTTP Header	Value Type	Mandatory	Description
<b>Correlation-ID</b>	UUID	No	A Correlation ID, also known as a Transit ID, is a unique identifier value that is attached to requests and responses that allows reference to a particular transaction or event chain.
<b>Content-Type</b>	String	Yes, for notifications that include a payload	Indicates the media type of the notification payload

<b>Event-Type</b>	String	Yes	Type of the event
<b>Subscription-ID</b>	UUID	Yes	Subscription identifier for which this notification is being sent
<b>Sequence-Number</b>	String encoded Integer	Yes	Sequence number of the notification; the first notification shall have a value of 0, this value shall be incremented by 1 (one) for all subsequent notifications
<b>Event-Timestamp</b>	Unix time format	Yes	Time when the event occurred in standard Unix time format
<b>Event-Signature</b>	String	Yes	HMAC-SHA256 signature proving the authenticity of the request and data. See 9.2 Events authentication

The format of the payload in a notification request depends on the event type for which the subscription was created. Table 19 defines the format of the payload provided in a notification per "eventType" (as received in the payload of the subscription request from the Origin Cloud) that may be sent by the Target Cloud. A Target Cloud shall populate the notification payload for the event type being signalled in the Event-Type HTTP header as defined in Table 19. The schema definitions for all payloads are provided in Annex B.

**Table 19 – Event type to notification payload content**

Event-Type header population	Notification payload on establishment of the subscription	Notification payload per subsequent notification
<b>subscription_cancelled</b>	Not present	Not applicable
<b>devices_registered</b>	Array of all currently registered Device IDs	Array containing Device IDs that have been registered since the previous notification was sent.
<b>devices_unregistered</b>	Empty array (i.e. [])	Array containing Device IDs for devices that have been de-registered since the previous notification was sent
<b>devices_online</b>	Array of all currently online Device IDs	Array containing Device IDs that have come online since the previous notification was sent.
<b>devices_offline</b>	Array of all currently offline Device IDs	Array containing Device IDs for devices that have gone offline since the previous notification was sent
<b>resource_contentchanged</b>	Current Resource Representation of the target Resource	Payload of the changed Resource as received by the Target Cloud
<b>resources_published</b>	Array of Links of all published Resources for the Device ID in the path	Array of Links of all Resources published by the Device ID in the path since the previous notification was sent

<b>resources_unpublished</b>	Empty array (i.e. [])	Array of Links of all Resources unpublished by the Device ID in the path since the previous notification was sent
------------------------------	-----------------------	---

#### 9.4.4 Notification response

If the Target Cloud receives a non-success path response to a notification request it shall treat the response as indicative of a request to cancel the subscription, and no further notifications for the Subscription ID that was in the request shall be sent. See clauses 9.8.3, 9.9.3, and 9.10.3 for further information.

### 9.5 Subscribe and unsubscribe to devices level event types

#### 9.5.1 Summary

This request is sent from the Origin Cloud to the Target Cloud. An Origin Cloud may use this API when it wants to receive notifications of events generated due to changes to the set of Devices that are exposed.

Event types that may be subscribed to using this API are: devices\_registered, devices\_unregistered, devices\_online and devices\_offline.

An Origin Cloud may establish a subscription by sending a POST request to the API Endpoint shown in Table 20. To remove an existing subscription an Origin Cloud shall send a DELETE request to the API Endpoint as shown in Table 20.

Table 20 provides a summary of the API.

**Table 20 – Subscription to /devices API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
<b>POST</b>	/api/v1/devices/subscriptions	Correlation-ID, Accept, Content-Type	201	See clause B.1 - /definitions/SubscribeResponse
			400, 401, 403	
<b>DELETE</b>	/api/v1/devices/subscriptions/{subscriptionId}	Correlation-ID	202	
			400, 401, 403, 404	

#### 9.5.2 Request and Response payload

The request payload for the POST shall be as defined in clause 9.4.1.

The "subscriptionId" in the URI for the DELETE case shall be the "subscriptionId" that was returned in the response to the subscription POST request.

The response payload for the subscription POST request shall contain the Subscription ID in a "subscriptionId" Property as defined in clause 9.4.2.

There is no required payload for a DELETE unsubscribe response.

### 9.5.3 Responses

A 201 response shall be sent by the Target Cloud in a success case.

A 202 response shall be sent by the Target Cloud following a DELETE request and indicates that the subscription was marked for cancellation; confirmation of the cancellation of the subscription shall be provided by a subsequent notification with an Event-Type of "subscription\_cancelled".

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 21 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 21 – Devices Event Subscription API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the subscription was not found or the subscribed to Event-Type is not supported
406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable

## 9.6 Subscribe and unsubscribe to device level events

### 9.6.1 Summary

This request is sent from the Origin Cloud to the Target Cloud. This API is used when the Origin Cloud wants to receive notifications for a specific Device on the Target Cloud.

Event types that may be subscribed to using this API are: resources\_published and resources\_unpublished.

An Origin Cloud may establish a subscription by sending a POST request to the API Endpoint shown in Table 22. To remove an existing subscription an Origin Cloud shall send a DELETE request to the API Endpoint as shown in Table 22.

Table 22 provides a summary of the API.

**Table 22 – Subscription to Single Device API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
POST	/api/v1/devices/{deviceid}/subscriptions	Correlation-ID, Accept, Content-Type	201	See clause B.1 - /definitions/SubscribeResponse
			400, 401, 403, 404	

<b>DELETE</b>	/api/v1/devices/{deviceid}/subscriptions/{subscriptionId}	Correlation-ID	202	
			400, 401, 403, 404	

### 9.6.2 Request and Response payload

The request payload for the POST shall be as defined in clause 9.4.1.

The "deviceid" in the request URI shall be the same as the "di" Property from "/oic/d" of the target OCF device.

The "subscriptionId" in the URI for the DELETE case shall be the "subscriptionId" that was returned in the response to the subscription POST request.

The response payload for the subscription POST request shall contain the Subscription ID in a "subscriptionId" Property as defined in clause 9.4.2.

There is no required payload for a DELETE unsubscribe response.

### 9.6.3 Responses

A 201 response shall be sent by the Target Cloud in a success case.

A 202 response shall be sent by the Target Cloud following a DELETE request and indicates that the subscription was marked for cancellation; confirmation of the cancellation of the subscription shall be provided by a subsequent notification with an Event-Type of "subscription\_cancelled".

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 23 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 23 – Device Event Subscription API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the subscription was not found or the subscribed to Event-Type is not supported
406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable

## 9.7 Subscribe and unsubscribe to resource level events

### 9.7.1 Summary

This request is sent from the Origin Cloud to the Target Cloud. This API may be used by the Origin Cloud to receive notifications from a specific observable Resource that exists on a specific Device on the Target Cloud.

Events that may be subscribed to using this API are: resource\_contentchanged.



An Origin Cloud may establish a subscription by sending a POST request to the API Endpoint shown in Table 15. To remove an existing subscription an Origin Cloud shall send a DELETE request to the API Endpoint as shown in Table 24.

Table 24 provides a summary of the API.

**Table 24 – Subscription to Resource API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
POST	/api/v1/devices/{deviceid}/{resourcehref}/subscriptions	Correlation-ID, Accept, Content-Type	201	See clause B.1 - /definitions/SubscribeResponse
			400, 401, 403, 404	
DELETE	/api/v1/devices/{deviceid}/{resourcehref}/subscriptions/{subscriptionId}	Correlation-ID	202	
			400, 401, 403, 404	

### 9.7.2 Request and Response payload

The request payload for the POST shall be as defined in clause 9.4.1.

The "deviceid" in the URI in the request shall be the same as the "di" Property from /oic/d of the target OCF device.

The "resourcehref" in the URI shall be the same as the "href" Link Parameter for the target Resource instance.

The "subscriptionId" in the URI for the DELETE case shall be the "subscriptionId" that was returned in the response to the subscription POST request.

The response payload for the subscription POST request shall contain the Subscription ID in a "subscriptionId" Property as defined in clause 9.4.2.

There is no required payload for a DELETE unsubscribe response.

### 9.7.3 Responses

A 201 response shall be sent by the Target Cloud in a success case.

A 202 response shall be sent by the Target Cloud following a DELETE request and indicates that the subscription was marked for cancellation; confirmation of the cancellation of the subscription shall be provided by a subsequent notification with an Event-Type of "subscription\_cancelled".

A non-success path response that is indicative of the type of error shall be returned by a Target Cloud if an error scenario is detected. Table 25 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

**Table 25 – Resource Event Subscription API non-success path responses**

Response Code	Response scenario
400	May be sent by the Target Cloud if the request was malformed or badly constructed
401	May be sent by the Target Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Target Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
404	May be sent by the Target Cloud if the subscription was not found or the subscribed to Event-Type is not supported
406	May be sent by the Target Cloud if the media type in the received Accept header is not supported/acceptable

## 9.8 Notification of devices level events

### 9.8.1 Summary

This request is sent from the Target Cloud to the Origin Cloud whenever there is an initial subscription to an event or an event for which a subscription exists occurs as defined in clause 9.4.4.

Table 26 provides a summary of the API.

**Table 26 – Notification of /devices API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
POST	{eventsUrl}	Correlation-ID, Content-Type, Event-Type, Subscription-ID, Sequence-Number, Event-Signature, Event-Timestamp	200	
			400, 410	

### 9.8.2 Request and Response payload

The “eventsUrl” in the URI shall be the value of the “eventsUrl” Property that was provided in the subscription request.

The payload in the notification request depends on the Event-Type that is the subject of the notification request; please see Table 19 for specifics and clause 9.4.3 for further information.

### 9.8.3 Responses

A 200 response shall be provided in a success case.

A non-success path response that is indicative of the type of error shall be returned by an Origin Cloud if an error scenario is detected. Table 27 lists possible non-success path responses and possible scenarios that may trigger their generation; an implementation may support additional responses as defined by IETF RFC 2818.

903

**Table 27 – Devices Event Notification non-success path responses**

Response Code	Response scenario
400	May be sent by the Origin Cloud if the request was malformed or badly constructed
401	May be sent by the Origin Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Origin Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
406	May be sent by the Origin Cloud if the media type in the received Accept header is not supported/acceptable
410	May be sent by the Origin Cloud if the subscription identified by the Subscription-ID header is no longer valid

904

## 905 **9.9 Notification of Device level events**

### 906 **9.9.1 Summary**

907 This request is sent from the Target Cloud to the Origin Cloud whenever there is an initial  
 908 subscription to an event or an event for which a subscription exists occurs as defined in clause 9.6.

909 Table 28 provides a summary of the API.

910

**Table 28 – Notification of Single Device API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
<b>POST</b>	{eventsUrl}	Correlation-ID, Content-Type Event-Type, Subscription-ID, Sequence-Number, Event-Signature, Event-Timestamp	200	
			400, 410	

### 911 **9.9.2 Request and Response payload**

912 The “eventsUrl” in the URI shall be the value of the "eventsUrl" Property that was provided in the  
 913 subscription request.

914 The payload in the notification request depends on the Event-Type that is the subject of the  
 915 notification request; please see Table 19 for specifics and clause 9.4.3 for further information.

### 916 **9.9.3 Responses**

917 A 200 response shall be provided in a success case.

918 A non-success path response that is indicative of the type of error shall be returned by an Origin  
 919 Cloud if an error scenario is detected. Table 29 lists possible non-success path responses and  
 920 possible scenarios that may trigger their generation; an implementation may support additional  
 921 responses as defined by IETF RFC 2818.

922

**Table 29 – Device Event Notification non-success path responses**

Response Code	Response scenario
400	May be sent by the Origin Cloud if the request was malformed or badly constructed
401	May be sent by the Origin Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Origin Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
406	May be sent by the Origin Cloud if the media type in the received Accept header is not supported/acceptable
410	May be sent by the Origin Cloud if the subscription identified by the Subscription-ID header is no longer valid

923

924 **9.10 Notification of Resource level events**925 **9.10.1 Summary**

926 This request is sent from the Target Cloud to the Origin Cloud whenever there is an initial  
 927 subscription to an event or an event for which a subscription exists occurs as defined in clause 9.7.

928 Table 30 provides a summary of the API.

929

**Table 30 – Notification of Resource API Summary**

HTTP Request Type	API Endpoint	Parameters	Response Code	Response Payload
<b>POST</b>	{eventsUrl}	Correlation-ID, Content-Type Event-Type, Subscription-ID, Sequence-Number, Event-Signature, Event-Timestamp	200	
			400, 410	

930 **9.10.2 Request and Response payload**

931 The “eventsUrl” in the URI shall be the value of the "eventsUrl" Property that was provided in the  
 932 subscription request.

933 The payload in the notification request depends on the Event-Type that is the subject of the  
 934 notification request; please see Table 19 for specifics and clause 9.4.3 for further information.

935 **9.10.3 Responses**

936 A 200 response shall be provided in a success case.

937 A non-success path response that is indicative of the type of error shall be returned by an Origin  
 938 Cloud if an error scenario is detected. Table 31 lists possible non-success path responses and  
 939 possible scenarios that may trigger their generation; an implementation may support additional  
 940 responses as defined by IETF RFC 2818.

941

**Table 31 – Resource Event Notification non-success path responses**

Response Code	Response scenario
400	May be sent by the Origin Cloud if the request was malformed or badly constructed
401	May be sent by the Origin Cloud if the request is unauthorized (e.g. an invalid or missing Bearer Token)
403	May be sent by the Origin Cloud if the requestor is known however the OAuth2.0 Access Token Scope of the request is forbidden
406	May be sent by the Origin Cloud if the media type in the received Accept header is not supported/acceptable
410	May be sent by the Origin Cloud if the subscription identified by the Subscription-ID header is no longer valid

942

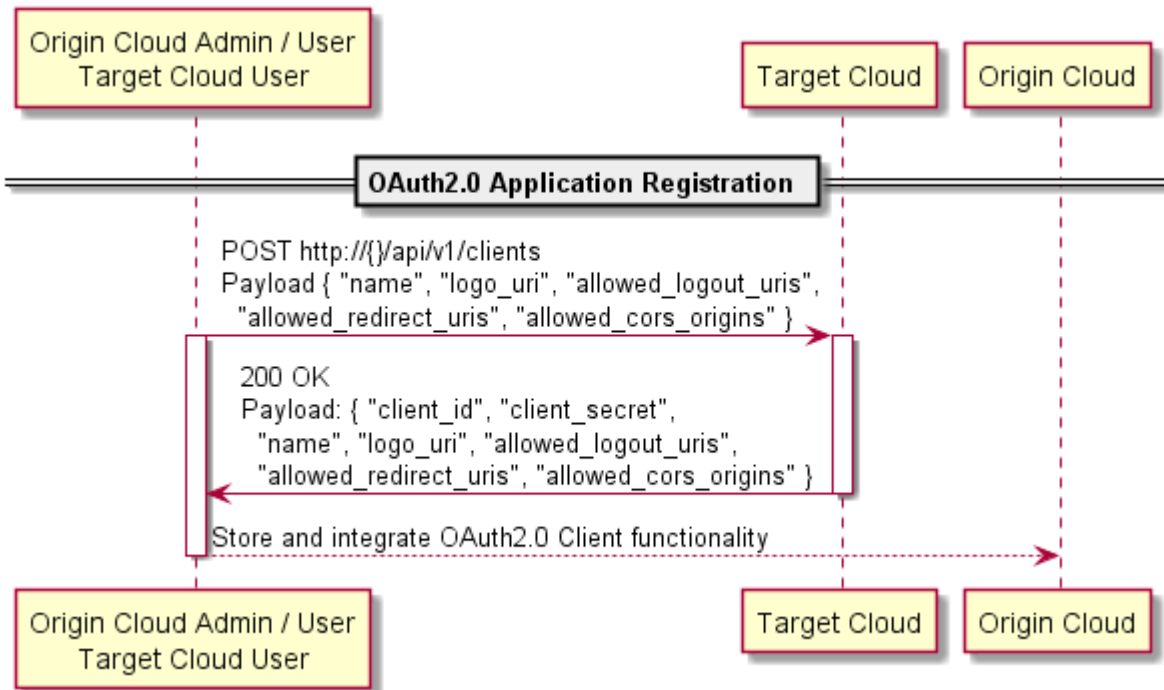
943 **Annex A**  
944 **Representative Flows**

945 **A.1 Introduction**

946 The flows illustrate use of the OCF Cloud API for Cloud Services using OCF Devices as the target  
947 servers where applicable and OCF Clouds as the two Clouds that are invoking/acting as API  
948 Endpoints. Note that this is for example use only and the API does not force this setup, which  
949 means non-OCF clouds with non-OCF devices may also use the API for interworking with other  
950 vendor's clouds.

951 **A.2 OAuth2.0 application registration**

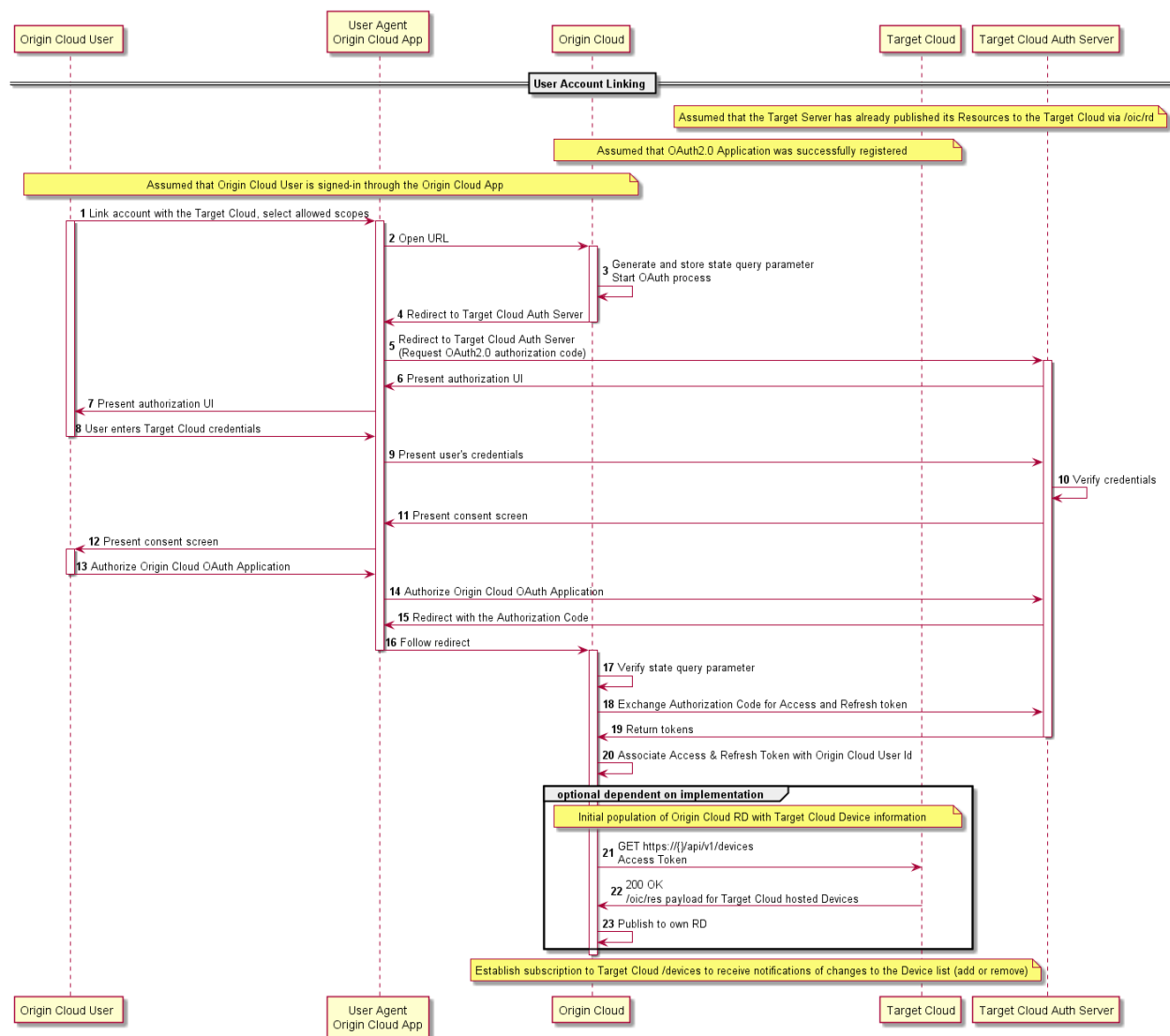
952 Figure A.1 provides an example flow showing the registration of the OAuth 2.0 Origin Cloud Client.



953  
954 **Figure A.1 – Establish business relationship example flow**

955 **A.3 Account linking**

956 Figure A.2 provides an example flow of the account linking for a particular user.



**Figure A.2 – Initial association example flow**

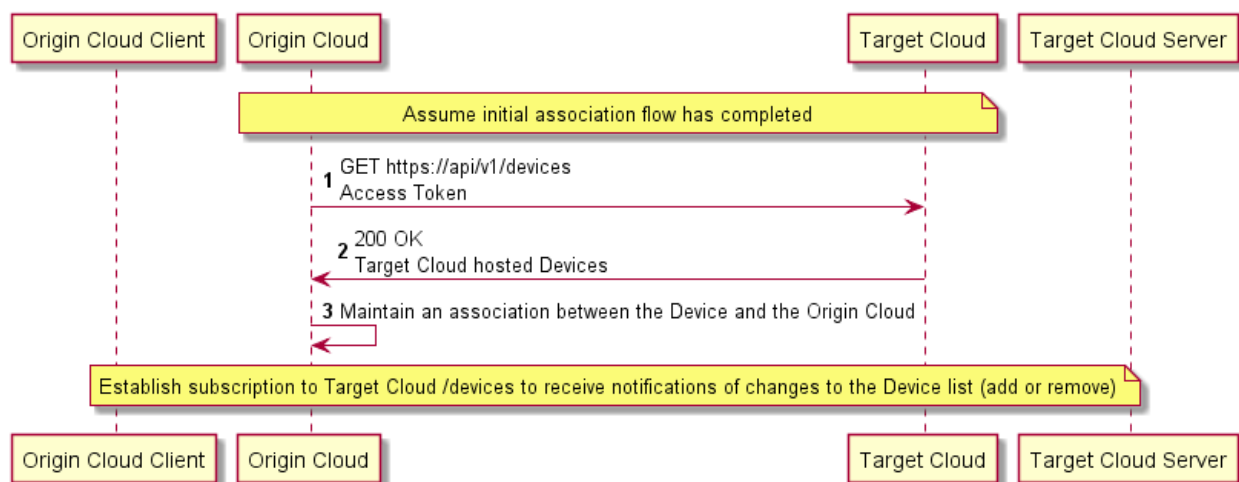
## A.4 Retrieval of all Devices

### A.4.1 Summary

The Origin Cloud requests all Devices associated with a user (defined by the provided Bearer Token). This may be invoked following account linking in order to retrieve the set of Devices for the user.

### A.4.2 Flow

Figure A.3 provides an example flow for the retrieval of all Devices.



**Figure A.3 – Retrieve all Devices example flow**

### A.4.3 Flow description

Table A.1 explains each element in Figure A.3

**Table A.1 – Retrieve all Devices flow summary**

Number	Description
1	Cloud requests all Devices given by the scope in the Bearer Token that was obtained via OAuth.
2	Response is an array of Device information ( Properties that are defined in /oic/d that are pertinent to Cloud functionality and Device status).
3	Cloud maintains an association between the Device and the host Cloud.

## A.5 Retrieval of a single Device

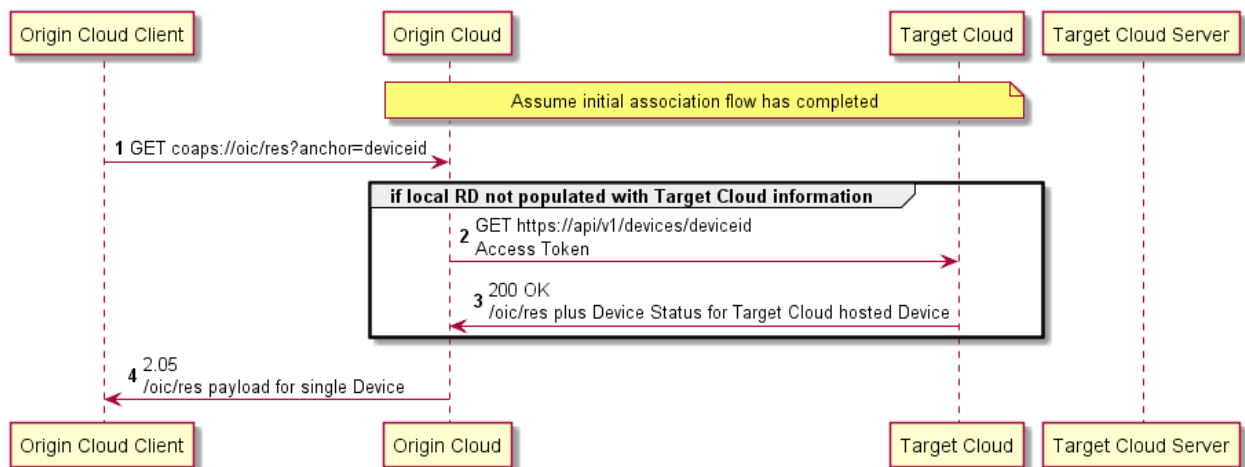
### A.5.1 Summary

The Origin Cloud requests information for a single, specific Device associated with a user (defined by the provided Bearer Token). This may be invoked by the Origin Cloud receiving a retrieve request from a connected Client.

### A.5.2 Flow

Figure A.4 provides an example flow for the retrieval of a single Device.





**Figure A.4 – Retrieve single Device example flow**

### A.5.3 Flow description

Table A.2 explains each element in Figure A.4.

**Table A.2 – Retrieve single Device flow summary**

Number	Description
1	[OCF Device to Cloud] OCF Client role Device requests /oic/res from the Cloud for a specific anchor (device id).
2	[Assuming that the information hasn't been cached by the Cloud] For the instance of /oic/sec/account that exists for the Device the Cloud does a GET /devices/{deviceid} to the Cloud identified by the "clouded" in "/oic/sec/account". {deviceid} is also taken from /oic/sec/account.
3	Response is the Device information as well as an array of Links. The "href" in each Link will be of the form "/deviceid/resourcehref".
4	Response payload.

## A.6 Retrieval of a single Resource

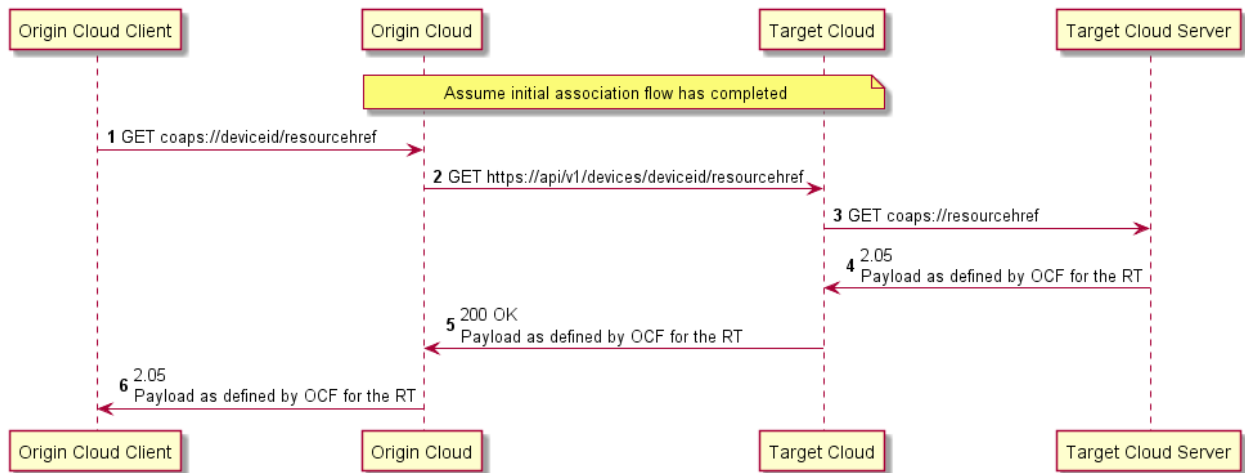
### A.6.1 Summary

The Origin Cloud requests information for a single, specific Resource exposed by a Device associated with a user (defined by the provided Bearer Token). This may be invoked by the Origin Cloud receiving a retrieve request from a connected Client.

### A.6.2 Flows

#### A.6.2.1 Success path

Figure A.5 provides an example flow for the retrieval of a single Resource.



**Figure A.5 – Retrieve Resource (success) example flow**

### A.6.2.2 Success path flow description

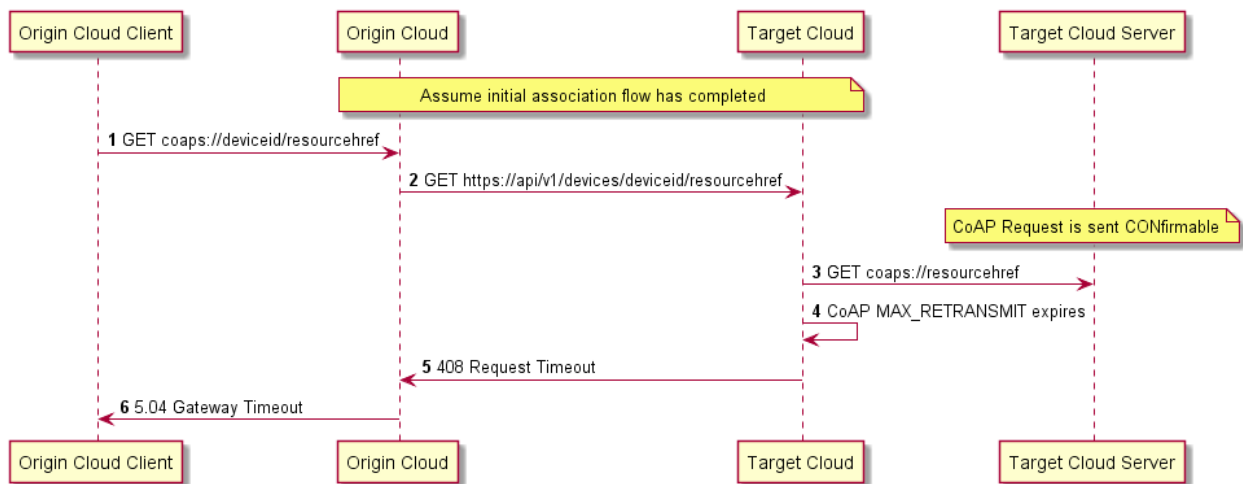
Table A.3 explains each element in Figure A.5.

**Table A.3 – Retrieve single Resource flow summary**

Number	Description
1	[OCF Device to Cloud] OCF Client role Device requests a Resource from the Cloud using the "href" exposed in the /oic/res response. This will be of the form "/deviceid/resourcehref"
2	[Assuming that the resource representation hasn't been cached by the Cloud] Cloud identifies the host Cloud for the Resource via the instance of /oic/sec/account for the "deviceid". The request is then effectively proxied to the Target Cloud via a GET /devices/{deviceid}/{resourcehref}. Any query parameters received over CoAP are included in the URI unaltered.
3	[OCF Device to Cloud] Target Cloud identifies the TLS connection to the end Device via the {deviceid} and proxies the request.
4	Standard OCF response
5	Success path response including the response payload as received for the target Resource
6	Standard OCF response

### A.6.2.3 Device is temporarily unavailable

Figure A.6 illustrates the case where the Device is temporarily unavailable.



**Figure A.6 – Retrieve Resource (timeout) example flow**

## A.7 Update of a single Resource

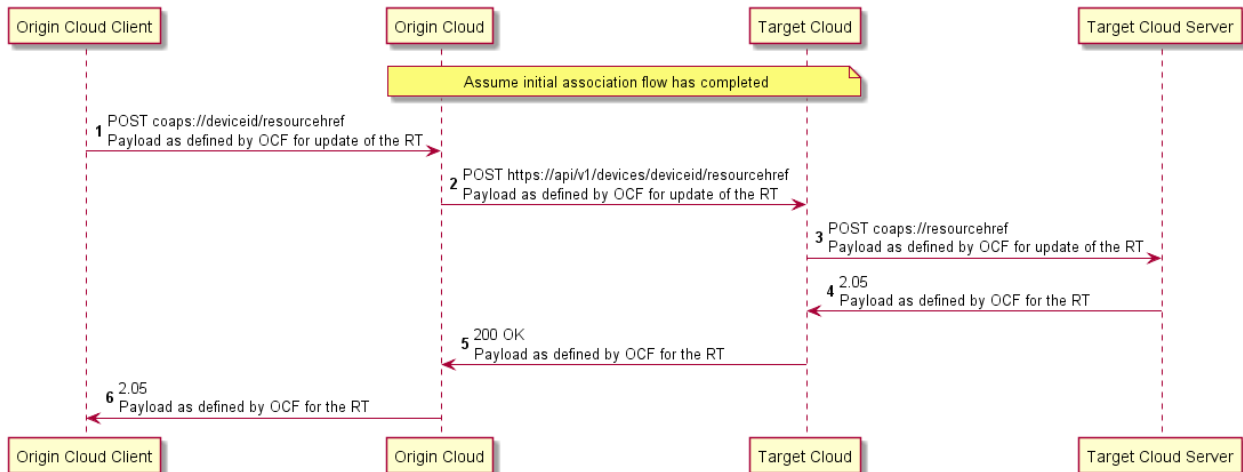
### A.7.1 Summary

The Origin Cloud updates information for a single, specific Device associated with a user (defined by the provided Bearer Token). This may be invoked by the Origin Cloud receiving an update request from a connected Client.

### A.7.2 Flows

#### A.7.2.1 Success path

Figure A.7 provides an example flow for the updating of a single Resource.



**Figure A.7 – Update Resource (success) example flow**

#### A.7.2.2 Success path flow description

Table A.4 explains each element in Figure A.7.

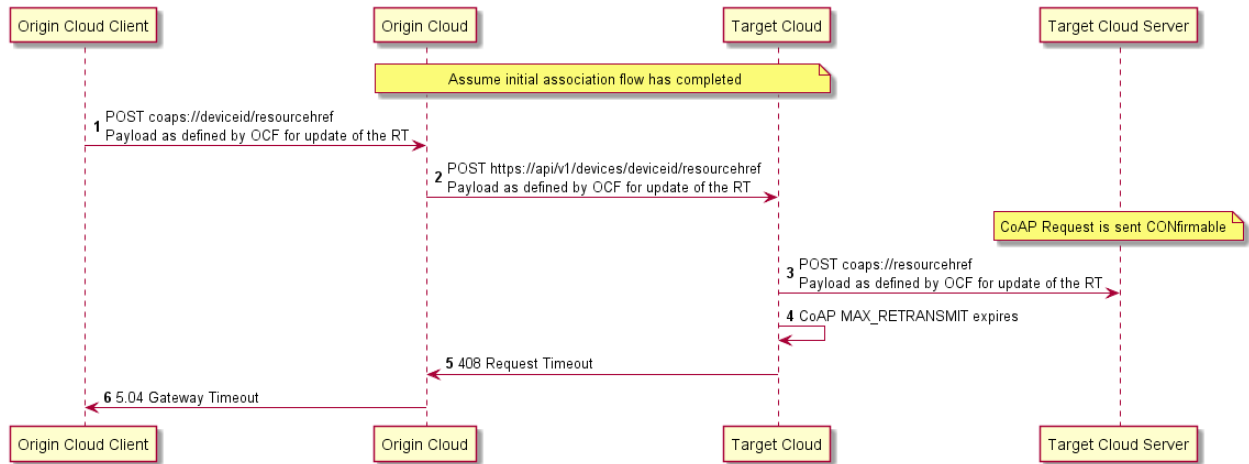
1014

Table A.4 – Update single Resource flow summary

Number	Description
1	[OCF Device to Cloud] OCF Client role Device requests a Resource from the Cloud using the "href" exposed in the /oic/res response. This will be of the form "/deviceid/resourcehref"
2	Cloud identifies the host Cloud for the Resource via the instance of /oic/sec/account for the "deviceid". The request is then effectively proxied to the Target Cloud via a POST /devices/{deviceid}/{resourcehref} including the payload from the original request. Any query parameters received over CoAP are included in the URI unaltered.
3	[OCF Device to Cloud] Target Cloud identifies the TLS connection to the end Device via the {deviceid} and proxies the request.
4	Standard OCF response
5	Success path response including the response payload as received for the target Resource
6	Standard OCF response

1015 **A.7.2.3 Device is temporarily unavailable**

1016 Figure A.8 illustrates the case where the Device is temporarily unavailable.



1017

1018 **Figure A.8 – Update Resource (timeout) example flow**

1019 **A.8 Establishment of new subscription request**

1020 **A.8.1 Summary**

1021 The Origin Cloud requests the establishment of an observe relationship with a single, specific  
1022 Resource on a Device associated with a user (defined by the provided Bearer Token). This may be  
1023 invoked by Origin Cloud receiving a retrieve request containing an observe option from a connected  
1024 Client.

1025 **A.8.2 Flows**

1026 Figure A.9 provides an example flow for the establishment of a subscription to the  
1027 "resource\_contentchanged" event for a specific Resource.

1028

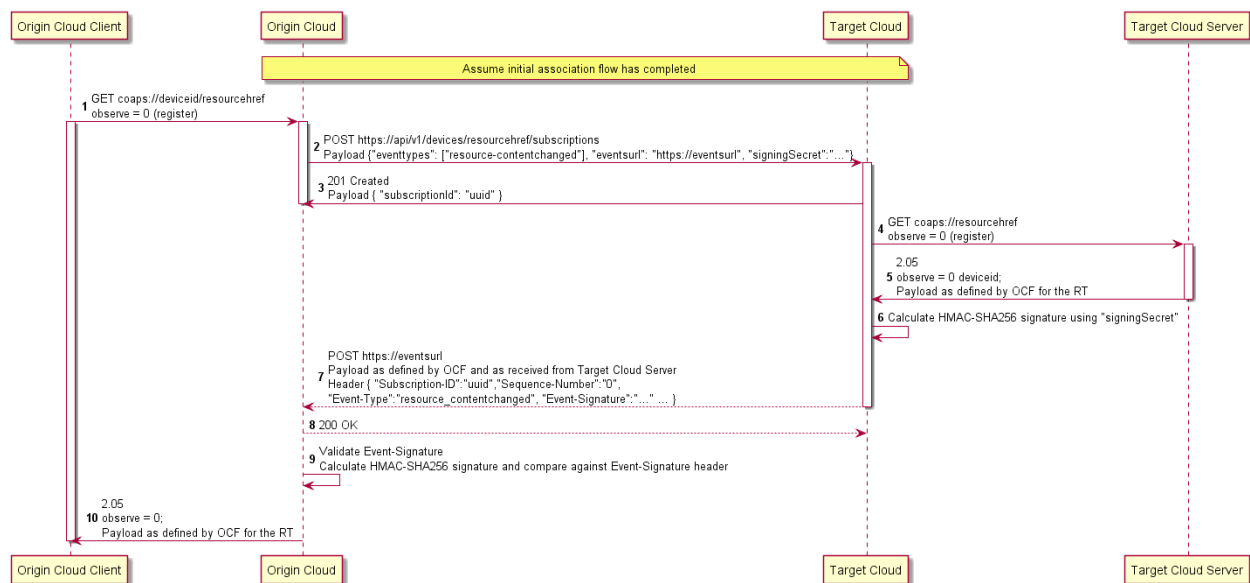


Figure A.9 – Subscription establishment example flow

## A.9 Event generated for a subscription

### A.9.1 Summary

An event occurs for a Resource with which the Origin Cloud has established a subscription/event relationship. This may be invoked by the target end Device being updated.

### A.9.2 Flows

Figure A.10 provides an example flow for the handling of a generated "resource\_contentchanged" event.

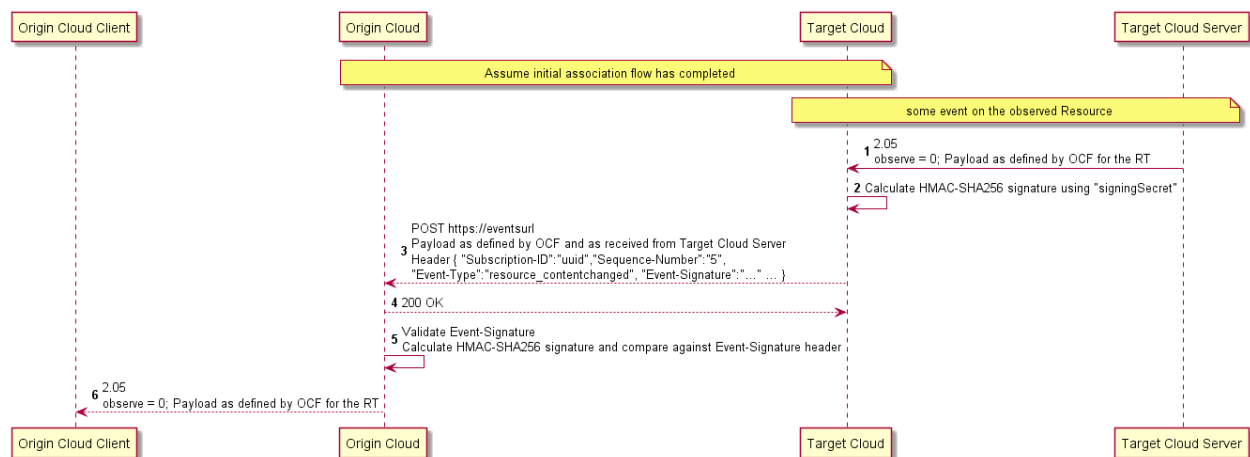


Figure A.10 – "resource\_contentchanged" event example flow

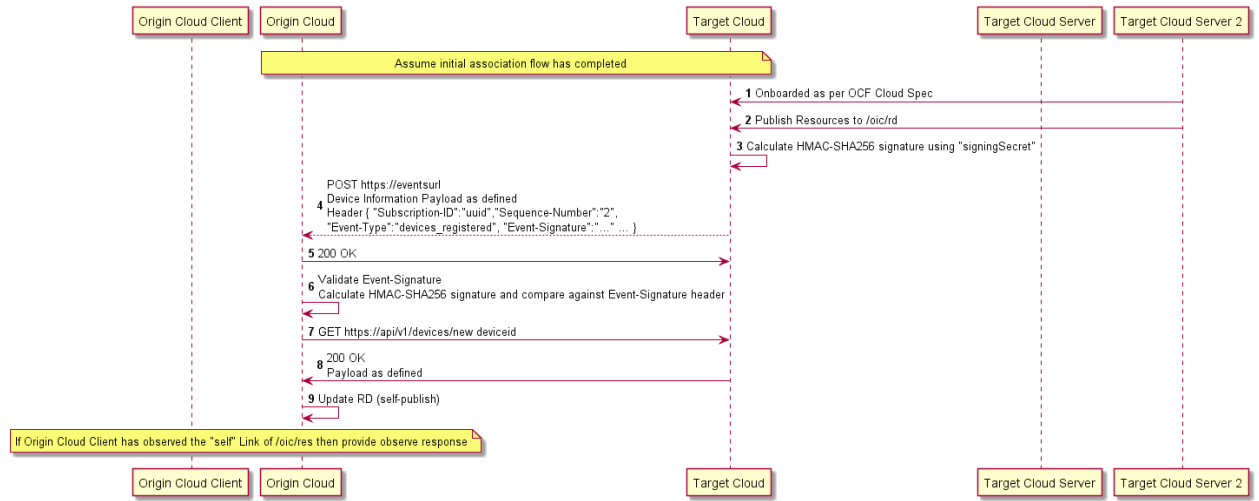
## A.10 Addition of new registration

### A.10.1 Summary

The Origin Cloud has a priori established a subscription/event relationship with the set of Devices associated with a user exposed by Target Cloud. The user then registers a new Device with Target Cloud.

**A.10.2 Flows**

Figure A.11 provides an example flow for the generation of a notification (event) when a new Device is registered.



**Figure A.11 – Addition of new registered Device example flow**

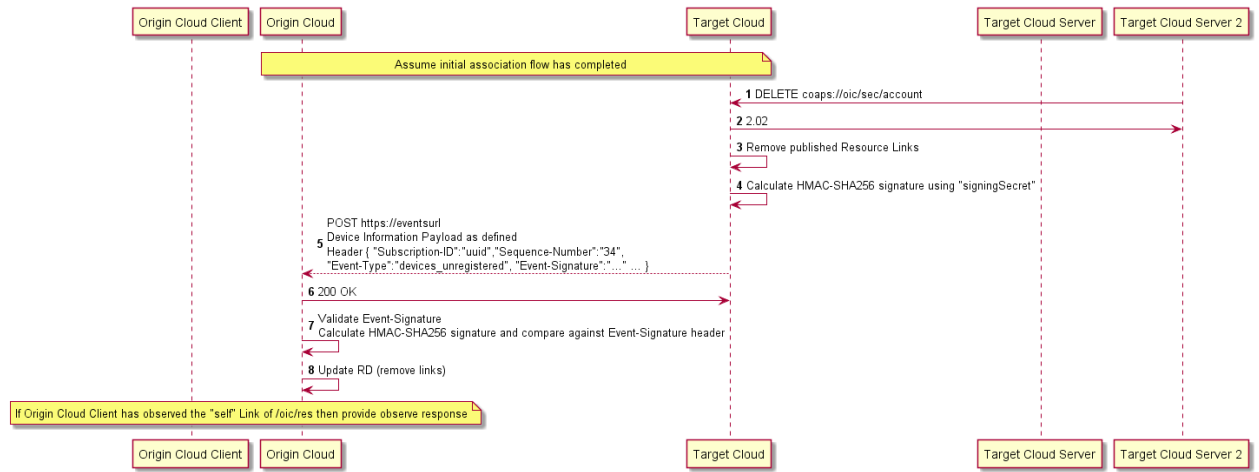
**A.11 Removal of existing device registration**

**A.11.1 Summary**

The Origin Cloud has a priori established a subscription/event relationship with the set of Devices associated with a user exposed by Target Cloud. The user then removes a Device from Target Cloud.

**A.11.2 Flows**

Figure A.12 provides an example flow for the generation of a notification (event) when a Device is removed.



**Figure A.12 – Removal of existing registration example flow**

## Annex B Open API Definition

### B.1 OCF Cloud API for Cloud Services

#### B.1.1 Supported APIs

##### B.1.1.1 `/api/v1/devices?content=base`

Get meta-information, including Resource Links, for all Devices which are signed up to the OCF Cloud - either "online" or "offline". Devices which are "online" are signed in to the system and are accessible. Offline devices are signed up to the system, but currently disconnected.

##### B.1.1.2 `/api/v1/devices?content=all`

Get meta-information, including Resource Representations, for all Devices which are signed up to the OCF Cloud - either "online" or "offline". Devices which are "online" are signed in to the system and are accessible. Offline devices are signed up to the system, but currently disconnected.

##### B.1.1.3 `/api/v1/devices/subscriptions`

Subscribe to devices events by providing "eventTypes" you're interested in and an "eventsUrl" endpoint where notifications will be sent to as defined. A successful response contains a "subscriptionId" which identifies the registered subscription and is part of each notification. First notification for each registered event type is received immediately after subscription and contains the actual state of the resource, followed by new notifications in case of any change.

Supported events:

- "devices\_registered"
- "devices\_unregistered"
- "devices\_online"
- "devices\_offline"

##### B.1.1.4 `/api/v1/devices/subscriptions/{subscriptionId}`

Cancel the subscription identified by the provided "subscriptionId" that was returned in the response to the subscription request.

##### B.1.1.5 `/api/v1/devices/{deviceId}?content=base`

Get the meta-information for the Device given by the provided "deviceId" including Resource Links.

##### B.1.1.6 `/api/v1/devices/{deviceId}?content=all`

Get the meta-information for the Device given by the provided "deviceId" including Resource Representations.

##### B.1.1.7 `/api/v1/devices/{deviceId}/subscriptions`

Subscribe to Device level events by providing "eventTypes" you're interested in and an "eventsUrl" API Endpoint where notifications will be sent to as defined. A successful response contains a "subscriptionId" which identifies the registered subscription and is part of each notification. First notification for each registered event type is received immediately after subscription and contains the actual state of the resource, followed by new notifications in case of any change.

Supported events:

1104 - "resources\_published"  
 1105 - "resources\_unpublished"

1106 **B.1.1.8     /api/v1/devices/{deviceId}/subscriptions/{subscriptionId}**  
 1107 Cancel the subscription identified by the provided "subscriptionId" that was returned in the  
 1108 response to the subscription request.

1109 **B.1.1.9     /api/v1/devices/{deviceId}/{resourceLinkHref}**  
 1110 Get or update the Resource Representation of the Resource found at "resourceLinkHref" on the  
 1111 Device with the given "deviceId"

1112 **B.1.1.10    /api/v1/devices/{deviceId}/{resourceLinkHref}/subscriptions**  
 1113 Subscribe to Resource level events by providing "eventTypes" you're interested in and  
 1114 "eventsUrl" API Endpoint where notifications will be sent to as defined. A successful response  
 1115 contains a "subscriptionId" which identifies the registered subscription and is part of each event.  
 1116 First notification for each registered event type is received immediately after subscription and  
 1117 contains the actual state of the resource, followed by new notifications in case of any change.  
 1118  
 1119 Supported events:  
 1120 - "resource\_contentchanged"

1121 **B.1.1.11    /api/v1/devices/{deviceId}/{resourceLinkHref}/subscriptions/{subscriptionId}**  
 1122 Cancel the subscription identified by the provided "subscriptionId" that was returned in the  
 1123 response to the subscription request.

1124 **B.1.1.12    /{eventsUrl}**  
 1125 Events endpoint provided during subscription where notifications for the events specified in the  
 1126 subscription will be sent to as defined per event type. Confirmation of each notification sent to the  
 1127 "eventsUrl" endpoint is required with a "2xx" success code.  
 1128  
 1129 Notifications you may receive based on the event type you're subscribed to are:  
 1130 - "subscription\_cancelled": "SubscriptionCancelledEvent"  
 1131 - "devices\_registered": "DevicesRegisteredEvent"  
 1132 - "devices\_unregistered": "DevicesUnregisteredEvent"  
 1133 - "resources\_published": "ResourcesPublishedEvent"  
 1134 - "resources\_unpublished": "ResourcesUnpublishedEvent"  
 1135 - "devices\_online": "DevicesOnlineEvent"  
 1136 - "devices\_offline": "DevicesOfflineEvent"  
 1137 - "resource\_contentchanged": "ResourceContentChangedEvent"

1138 **B.1.2     OpenAPI 2.0 definition**  
 1139 {  
 1140   "swagger": "2.0",  
 1141   "info": {  
 1142     "title": "OCF Cloud API for Cloud Services",  
 1143     "version": "0.0.3-20190828",  
 1144     "license": {  
 1145       "name": "Copyright 2019 Open Connectivity Foundation, Inc. All rights reserved.",  
 1146       "x-description": "Redistribution and use in source and binary forms, with or without  
 1147 modification, are permitted provided that the following conditions are met:\n     1.  
 1148 Redistributions of source code must retain the above copyright notice, this list of conditions and  
 1149 the following disclaimer.\n     2. Redistributions in binary form must reproduce the above  
 1150 copyright notice, this list of conditions and the following disclaimer in the documentation and/or  
 1151 other materials provided with the distribution.\n\n     THIS SOFTWARE IS PROVIDED BY THE Open  
 1152 Connectivity Foundation, INC. \\"AS IS\'' AND ANY EXPRESS OR IMPLIED WARRANTIES, INCLUDING, BUT NOT  
 1153 LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE OR  
 1154 WARRANTIES OF NON-INFRINGEMENT, ARE DISCLAIMED.\n     IN NO EVENT SHALL THE Open Connectivity  
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1157 SERVICES; LOSS OF USE, DATA, OR PROFITS; OR BUSINESS INTERRUPTION)\n          HOWEVER CAUSED AND ON
1158 ANY THEORY OF LIABILITY, WHETHER IN CONTRACT, STRICT LIABILITY, OR TORT (INCLUDING NEGLIGENCE OR
1159 OTHERWISE) ARISING IN ANY WAY OUT OF THE USE OF THIS SOFTWARE, EVEN IF ADVISED OF THE POSSIBILITY OF
1160 SUCH DAMAGE.\n"
1161 }
1162 },
1163 "host": "api.example.com",
1164 "schemes": [
1165     "https"
1166 ],
1167 "tags": [
1168     {
1169         "name": "Devices",
1170         "description": "Basic information about devices"
1171     },
1172     {
1173         "name": "Resources",
1174         "description": "Read or change the configuration of the device"
1175     },
1176     {
1177         "name": "Events",
1178         "description": "Be notified about changes occurring on the device"
1179     }
1180 ],
1181 "paths": {
1182     "/api/v1/devices?content=base": {
1183         "parameters": [
1184             {
1185                 "$ref": "#/parameters/CorrelationId"
1186             },
1187             {
1188                 "$ref": "#/parameters/Accept"
1189             },
1190             {
1191                 "$ref": "#/parameters/BatchFormat"
1192             }
1193         ],
1194         "get": {
1195             "tags": [
1196                 "Devices"
1197             ],
1198             "summary": "Get all devices with resource links",
1199             "description": "Get meta-information, including Resource Links, for all Devices which are
1200 signed up to the OCF Cloud - either \"online\" or \"offline\". Devices which are \"online\" are
1201 signed in to the system and are accessible. Offline devices are signed up to the system, but
1202 currently disconnected.",
1203             "produces": [
1204                 "application/json"
1205             ],
1206             "responses": {
1207                 "200": {
1208                     "description": "An array of devices",
1209                     "schema": {
1210                         "type": "array",
1211                         "items": {
1212                             "$ref": "#/definitions/Device"
1213                         }
1214                     }
1215                 },
1216                 "400": {
1217                     "$ref": "#/responses/BadRequest"
1218                 },
1219                 "401": {
1220                     "$ref": "#/responses/Unauthorized"
1221                 },
1222                 "403": {
1223                     "$ref": "#/responses/Forbidden"
1224                 },
1225                 "406": {
1226                     "$ref": "#/responses/NotAcceptable"

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1227         },
1228         "503": {
1229             "$ref": "#/responses/ServiceUnavailable"
1230         },
1231         "504": {
1232             "$ref": "#/responses/GatewayTimeout"
1233         }
1234     },
1235     "security": [
1236         {
1237             "oauth2": [
1238                 "r:*"
1239             ]
1240         }
1241     ]
1242 },
1243 {
1244     "/api/v1/devices?content=all": {
1245         "parameters": [
1246             {
1247                 "$ref": "#/parameters/CorrelationId"
1248             },
1249             {
1250                 "$ref": "#/parameters/Accept"
1251             },
1252             {
1253                 "$ref": "#/parameters/BatchFormat"
1254             }
1255         ],
1256         "get": {
1257             "tags": [
1258                 "Devices"
1259             ],
1260             "summary": "Get all devices with resource representations",
1261             "description": "Get meta-information, including Resource Representations, for all Devices
1262 which are signed up to the OCF Cloud - either \"online\" or \"offline\". Devices which are
1263 \"online\" are signed in to the system and are accessible. Offline devices are signed up to the
1264 system, but currently disconnected.",
1265             "produces": [
1266                 "application/json"
1267             ],
1268             "responses": {
1269                 "200": {
1270                     "description": "An array of devices",
1271                     "schema": {
1272                         "type": "array",
1273                         "items": {
1274                             "$ref": "#/definitions/DeviceContentAll"
1275                         }
1276                     }
1277                 },
1278                 "400": {
1279                     "$ref": "#/responses/BadRequest"
1280                 },
1281                 "401": {
1282                     "$ref": "#/responses/Unauthorized"
1283                 },
1284                 "403": {
1285                     "$ref": "#/responses/Forbidden"
1286                 },
1287                 "406": {
1288                     "$ref": "#/responses/NotAcceptable"
1289                 },
1290                 "503": {
1291                     "$ref": "#/responses/ServiceUnavailable"
1292                 },
1293                 "504": {
1294                     "$ref": "#/responses/GatewayTimeout"
1295                 }
1296             },
1297             "security": [

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1298         {
1299             "oauth2": [
1300                 "r:*"
1301             ]
1302         }
1303     ]
1304 }
1305 },
1306 "/api/v1/devices/subscriptions": {
1307     "parameters": [
1308         {
1309             "$ref": "#/parameters/CorrelationId"
1310         },
1311         {
1312             "$ref": "#/parameters/Accept"
1313         }
1314     ],
1315     "post": {
1316         "tags": [
1317             "Events"
1318         ],
1319         "summary": "Subscribe to events against the set of devices",
1320         "description": "Subscribe to devices events by providing \"eventTypes\" you're interested in
1321 and an \"eventsUrl\" endpoint where notifications will be sent to as defined. A successful response
1322 contains a \"subscriptionId\" which identifies the registered subscription and is part of each
1323 notification. First notification for each registered event type is received immediately after
1324 subscription and contains the actual state of the resource, followed by new notifications in case of
1325 any change.\n\nSupported events:\n- \"devices_registered\"\n- \"devices_unregistered\"\n-
1326 \"devices_online\"\n- \"devices_offline\"",
1327         "parameters": [
1328             {
1329                 "$ref": "#/parameters/ContentType"
1330             },
1331             {
1332                 "$ref": "#/parameters/SubscribeRequestDevices"
1333             }
1334         ],
1335         "consumes": [
1336             "application/json"
1337         ],
1338         "produces": [
1339             "application/json"
1340         ],
1341         "responses": {
1342             "201": {
1343                 "$ref": "#/definitions/SubscribeResponse"
1344             },
1345             "400": {
1346                 "$ref": "#/responses/BadRequest"
1347             },
1348             "401": {
1349                 "$ref": "#/responses/Unauthorized"
1350             },
1351             "403": {
1352                 "$ref": "#/responses/Forbidden"
1353             }
1354         },
1355         "security": [
1356             {
1357                 "oauth2": [
1358                     "r:*"
1359                 ]
1360             }
1361         ]
1362     },
1363 },
1364 "/api/v1/devices/subscriptions/{subscriptionId}": {
1365     "parameters": [
1366         {
1367             "$ref": "#/parameters/CorrelationId"
1368         },

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1369         {
1370             "$ref": "#/parameters/SubscriptionIdPath"
1371         }
1372     ],
1373     "delete": {
1374         "tags": [
1375             "Events"
1376         ],
1377         "summary": "Unsubscribe from events against the set of devices",
1378         "description": "Cancel the subscription identified by the provided \"subscriptionId\" that
1379 was returned in the response to the subscription request.",
1380         "responses": {
1381             "202": {
1382                 "description": "Subscription was marked for cancellation"
1383             },
1384             "400": {
1385                 "$ref": "#/responses/BadRequest"
1386             },
1387             "401": {
1388                 "$ref": "#/responses/Unauthorized"
1389             },
1390             "403": {
1391                 "$ref": "#/responses/Forbidden"
1392             },
1393             "404": {
1394                 "$ref": "#/responses/NotFound"
1395             },
1396             "406": {
1397                 "$ref": "#/responses/NotAcceptable"
1398             }
1399         },
1400         "security": [
1401             {
1402                 "oauth2": [
1403                     "r:*"
1404                 ]
1405             }
1406         ]
1407     }
1408 },
1409 "/api/v1/devices/{deviceId}?content=base": {
1410     "parameters": [
1411         {
1412             "$ref": "#/parameters/CorrelationId"
1413         },
1414         {
1415             "$ref": "#/parameters/Accept"
1416         },
1417         {
1418             "$ref": "#/parameters/DeviceId"
1419         },
1420         {
1421             "$ref": "#/parameters/BatchFormat"
1422         }
1423     ],
1424     "get": {
1425         "tags": [
1426             "Devices"
1427         ],
1428         "summary": "Get the device with resource links by ID",
1429         "description": "Get the meta-information for the Device given by the provided \"deviceId\"
1430 including Resource Links.",
1431         "consumes": [
1432             "application/json"
1433         ],
1434         "produces": [
1435             "application/json"
1436         ],
1437         "responses": {
1438             "200": {
1439                 "description": "Device requested with content=all query parameter",

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1440         "schema": {
1441             "$ref": "#/definitions/DeviceContentAll"
1442         },
1443     },
1444     "400": {
1445         "$ref": "#/responses/BadRequest"
1446     },
1447     "401": {
1448         "$ref": "#/responses/Unauthorized"
1449     },
1450     "403": {
1451         "$ref": "#/responses/Forbidden"
1452     },
1453     "404": {
1454         "$ref": "#/responses/NotFound"
1455     },
1456     "406": {
1457         "$ref": "#/responses/NotAcceptable"
1458     },
1459     "503": {
1460         "$ref": "#/responses/ServiceUnavailable"
1461     },
1462     "504": {
1463         "$ref": "#/responses/GatewayTimeout"
1464     }
1465 },
1466 "security": [
1467     {
1468         "oauth2": [
1469             "r:*"
1470         ]
1471     }
1472 ]
1473 },
1474 },
1475 "/api/v1/devices/{deviceId}?content=all": {
1476     "parameters": [
1477         {
1478             "$ref": "#/parameters/CorrelationId"
1479         },
1480         {
1481             "$ref": "#/parameters/Accept"
1482         },
1483         {
1484             "$ref": "#/parameters/DeviceId"
1485         },
1486         {
1487             "$ref": "#/parameters/BatchFormat"
1488         }
1489     ],
1490     "get": {
1491         "tags": [
1492             "Devices"
1493         ],
1494         "summary": "Get the device with resource representations by ID",
1495         "description": "Get the meta-information for the Device given by the provided \"deviceId\" including Resource Representations.",
1496         "consumes": [
1497             "application/json"
1498         ],
1499         "produces": [
1500             "application/json"
1501         ],
1502     },
1503     "responses": {
1504         "200": {
1505             "description": "Device requested with content=all query parameter",
1506             "schema": {
1507                 "$ref": "#/definitions/DeviceContentAll"
1508             }
1509         },
1510         "400": {

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1511         "$ref": "#/responses/BadRequest"
1512     },
1513     "401": {
1514         "$ref": "#/responses/Unauthorized"
1515     },
1516     "403": {
1517         "$ref": "#/responses/Forbidden"
1518     },
1519     "404": {
1520         "$ref": "#/responses/NotFound"
1521     },
1522     "406": {
1523         "$ref": "#/responses/NotAcceptable"
1524     },
1525     "503": {
1526         "$ref": "#/responses/ServiceUnavailable"
1527     },
1528     "504": {
1529         "$ref": "#/responses/GatewayTimeout"
1530     }
1531 },
1532 "security": [
1533     {
1534         "oauth2": [
1535             "r:*"
1536         ]
1537     }
1538 ]
1539 },
1540 },
1541 "/api/v1/devices/{deviceId}/subscriptions": {
1542     "parameters": [
1543         {
1544             "$ref": "#/parameters/CorrelationId"
1545         },
1546         {
1547             "$ref": "#/parameters/DeviceId"
1548         },
1549         {
1550             "$ref": "#/parameters/Accept"
1551         }
1552     ],
1553     "post": {
1554         "tags": [
1555             "Events"
1556         ],
1557         "summary": "Subscribe to events against a specific device",
1558         "description": "Subscribe to Device level events by providing \"eventTypes\" you're
1559 interested in and an \"eventsUrl\" API Endpoint where notifications will be sent to as defined. A
1560 successful response contains a \"subscriptionId\" which identifies the registered subscription and
1561 is part of each notification. First notification for each registered event type is received
1562 immediately after subscription and contains the actual state of the resource, followed by new
1563 notifications in case of any change.\n\nSupported events:\n- \"resources_published\"\n-
1564 \"resources_unpublished\"",
1565         "parameters": [
1566             {
1567                 "$ref": "#/parameters/ContentType"
1568             },
1569             {
1570                 "$ref": "#/parameters/SubscribeRequestDevice"
1571             }
1572         ],
1573         "consumes": [
1574             "application/json"
1575         ],
1576         "produces": [
1577             "application/json"
1578         ],
1579         "responses": {
1580             "201": {
1581                 "$ref": "#/definitions/SubscribeResponse"

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1582     },
1583     "400": {
1584         "$ref": "#/responses/BadRequest"
1585     },
1586     "401": {
1587         "$ref": "#/responses/Unauthorized"
1588     },
1589     "403": {
1590         "$ref": "#/responses/Forbidden"
1591     },
1592     "404": {
1593         "$ref": "#/responses/NotFound"
1594     },
1595     "406": {
1596         "$ref": "#/responses/NotAcceptable"
1597     }
1598 },
1599 "security": [
1600     {
1601         "oauth2": [
1602             "r:*"
1603         ]
1604     }
1605 ]
1606 },
1607 },
1608 "/api/v1/devices/{deviceId}/subscriptions/{subscriptionId}": {
1609     "parameters": [
1610         {
1611             "$ref": "#/parameters/CorrelationId"
1612         },
1613         {
1614             "$ref": "#/parameters/DeviceId"
1615         },
1616         {
1617             "$ref": "#/parameters/SubscriptionIdPath"
1618         }
1619     ],
1620     "delete": {
1621         "tags": [
1622             "Events"
1623         ],
1624         "summary": "Unsubscribe from events against a specific device",
1625         "description": "Cancel the subscription identified by the provided \"subscriptionId\" that
1626 was returned in the response to the subscription request.",
1627         "responses": {
1628             "202": {
1629                 "description": "Subscription was marked for cancellation"
1630             },
1631             "400": {
1632                 "$ref": "#/responses/BadRequest"
1633             },
1634             "401": {
1635                 "$ref": "#/responses/Unauthorized"
1636             },
1637             "403": {
1638                 "$ref": "#/responses/Forbidden"
1639             },
1640             "404": {
1641                 "$ref": "#/responses/NotFound"
1642             }
1643         },
1644         "security": [
1645             {
1646                 "oauth2": [
1647                     "r:*"
1648                 ]
1649             }
1650         ]
1651     }
1652 },

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```

1653     "/api/v1/devices/{deviceId}/{resourceLinkHref}": {
1654         "parameters": [
1655             {
1656                 "$ref": "#/parameters/CorrelationId"
1657             },
1658             {
1659                 "$ref": "#/parameters/DeviceId"
1660             },
1661             {
1662                 "$ref": "#/parameters/ResourceLinkHref"
1663             },
1664             {
1665                 "$ref": "#/parameters/Accept"
1666             }
1667         ],
1668         "get": {
1669             "tags": [
1670                 "Resources"
1671             ],
1672             "summary": "Retrieve resource values",
1673             "description": "Get or update the Resource Representation of the Resource found at
1674 \"resourceLinkHref\" on the Device with the given \"deviceId\",
1675             "consumes": [
1676                 "application/json",
1677                 "application/vnd.ocf+cbor"
1678             ],
1679             "produces": [
1680                 "application/json",
1681                 "application/vnd.ocf+cbor"
1682             ],
1683             "responses": {
1684                 "200": {
1685                     "$ref": "#/definitions/ResourceRetrieveResponse"
1686                 },
1687                 "400": {
1688                     "$ref": "#/responses/BadRequest"
1689                 },
1690                 "401": {
1691                     "$ref": "#/responses/Unauthorized"
1692                 },
1693                 "403": {
1694                     "$ref": "#/responses/Forbidden"
1695                 },
1696                 "404": {
1697                     "$ref": "#/responses/NotFound"
1698                 },
1699                 "406": {
1700                     "$ref": "#/responses/NotAcceptable"
1701                 },
1702                 "503": {
1703                     "$ref": "#/responses/ServiceUnavailable"
1704                 },
1705                 "504": {
1706                     "$ref": "#/responses/GatewayTimeout"
1707                 }
1708             },
1709             "security": [
1710                 {
1711                     "oauth2": [
1712                         "r:*"
1713                     ]
1714                 }
1715             ],
1716         },
1717         "post": {
1718             "tags": [
1719                 "Resources"
1720             ],
1721             "summary": "Update resource values",
1722             "parameters": [
1723                 {

```



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1724         "$ref": "#/parameters/ResourceUpdateRequest"
1725     },
1726     {
1727         "$ref": "#/parameters/ContentType"
1728     }
1729 ],
1730 "consumes": [
1731     "application/json",
1732     "application/vnd.ocf+cbor"
1733 ],
1734 "produces": [
1735     "application/json",
1736     "application/vnd.ocf+cbor"
1737 ],
1738 "responses": {
1739     "200": {
1740         "$ref": "#/definitions/ResourceRetrieveResponse"
1741     },
1742     "400": {
1743         "$ref": "#/responses/BadRequest"
1744     },
1745     "401": {
1746         "$ref": "#/responses/Unauthorized"
1747     },
1748     "403": {
1749         "$ref": "#/responses/Forbidden"
1750     },
1751     "404": {
1752         "$ref": "#/responses/NotFound"
1753     },
1754     "415": {
1755         "$ref": "#/responses/UnsupportedMediaType"
1756     },
1757     "503": {
1758         "$ref": "#/responses/ServiceUnavailable"
1759     },
1760     "504": {
1761         "$ref": "#/responses/GatewayTimeout"
1762     }
1763 },
1764 "security": [
1765     {
1766         "oauth2": [
1767             "r:*",
1768             "w:*"
1769         ]
1770     }
1771 ]
1772 },
1773 },
1774 "/api/v1/devices/{deviceId}/{resourceLinkHref}/subscriptions": {
1775     "parameters": [
1776         {
1777             "$ref": "#/parameters/CorrelationId"
1778         },
1779         {
1780             "$ref": "#/parameters/DeviceId"
1781         },
1782         {
1783             "$ref": "#/parameters/ResourceLinkHref"
1784         },
1785         {
1786             "$ref": "#/parameters/Accept"
1787         }
1788     ],
1789     "post": {
1790         "tags": [
1791             "Events"
1792         ],
1793         "summary": "Subscribe to events against a specific resource",
1794         "description": "Subscribe to Resource level events by providing \"eventTypes\" you're

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1795 interested in and \"eventsUrl\" API Endpoint where notifications will be sent to as defined. A
1796 successful response contains a \"subscriptionId\" which identifies the registered subscription and
1797 is part of each event. First notification for each registered event type is received immediately
1798 after subscription and contains the actual state of the resource, followed by new notifications in
1799 case of any change.\n\nSupported events:\n- \"resource_contentchanged\",
1800     \"parameters\": [
1801         {
1802             \"$ref\": \"#/parameters/ContentType\"
1803         },
1804         {
1805             \"$ref\": \"#/parameters/SubscribeRequestResources\"
1806         }
1807     ],
1808     \"consumes\": [
1809         \"application/json\"
1810     ],
1811     \"produces\": [
1812         \"application/json\"
1813     ],
1814     \"responses\": {
1815         \"201\": {
1816             \"$ref\": \"#/definitions/SubscribeResponse\"
1817         },
1818         \"400\": {
1819             \"$ref\": \"#/responses/BadRequest\"
1820         },
1821         \"401\": {
1822             \"$ref\": \"#/responses/Unauthorized\"
1823         },
1824         \"403\": {
1825             \"$ref\": \"#/responses/Forbidden\"
1826         },
1827         \"404\": {
1828             \"$ref\": \"#/responses/NotFound\"
1829         },
1830         \"406\": {
1831             \"$ref\": \"#/responses/NotAcceptable\"
1832         }
1833     },
1834     \"security\": [
1835         {
1836             \"oauth2\": [
1837                 \"r:\"
1838             ]
1839         }
1840     ]
1841 },
1842 },
1843 \"/api/v1/devices/{deviceId}/{resourceLinkHref}/subscriptions/{subscriptionId}\": {
1844     \"parameters\": [
1845         {
1846             \"$ref\": \"#/parameters/CorrelationId\"
1847         },
1848         {
1849             \"$ref\": \"#/parameters/DeviceId\"
1850         },
1851         {
1852             \"$ref\": \"#/parameters/ResourceLinkHref\"
1853         },
1854         {
1855             \"$ref\": \"#/parameters/SubscriptionIdPath\"
1856         }
1857     ],
1858     \"delete\": {
1859         \"tags\": [
1860             \"Events\"
1861         ],
1862         \"summary\": \"Unsubscribe from events against a specific resource\",
1863         \"description\": \"Cancel the subscription identified by the provided \"subscriptionId\" that
1864 was returned in the response to the subscription request.\",
1865         \"responses\": {

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1866         "202": {
1867             "description": "Subscription was marked for cancellation"
1868         },
1869         "400": {
1870             "$ref": "#/responses/BadRequest"
1871         },
1872         "401": {
1873             "$ref": "#/responses/Unauthorized"
1874         },
1875         "403": {
1876             "$ref": "#/responses/Forbidden"
1877         },
1878         "404": {
1879             "$ref": "#/responses/NotFound"
1880         }
1881     },
1882     "security": [
1883         {
1884             "oauth2": [
1885                 "r:*"
1886             ]
1887         }
1888     ]
1889 },
1890 {
1891     "/{eventsUrl}": {
1892         "post": {
1893             "tags": [
1894                 "Events"
1895             ],
1896             "summary": "Events endpoint provided by the subscriber, where events are delivered",
1897             "description": "Events endpoint provided during subscription where notifications for the
1898 events specified in the subscription will be sent to as defined per event type. Confirmation of
1899 each notification sent to the \"{eventsUrl}\" endpoint is required with a \"2xx\" success
1900 code.\n\nNotifications you may receive based on the event type you're subscribed to are:\n -
1901 \"subscription_cancelled\": \"SubscriptionCancelledEvent\"\n - \"devices_registered\":
1902 \"DevicesRegisteredEvent\"\n - \"devices_unregistered\": \"DevicesUnregisteredEvent\"\n -
1903 \"resources_published\": \"ResourcesPublishedEvent\"\n - \"resources_unpublished\":
1904 \"ResourcesUnpublishedEvent\"\n - \"devices_online\": \"DevicesOnlineEvent\"\n -
1905 \"devices_offline\": \"DevicesOfflineEvent\"\n - \"resource_contentchanged\":
1906 \"ResourceContentChangedEvent\"",
1907             "parameters": [
1908                 {
1909                     "$ref": "#/parameters/CorrelationId"
1910                 },
1911                 {
1912                     "$ref": "#/parameters/ContentType"
1913                 },
1914                 {
1915                     "$ref": "#/parameters/EventType"
1916                 },
1917                 {
1918                     "$ref": "#/parameters/SubscriptionId"
1919                 },
1920                 {
1921                     "$ref": "#/parameters/SequenceNumber"
1922                 },
1923                 {
1924                     "$ref": "#/parameters/EventSignature"
1925                 },
1926                 {
1927                     "$ref": "#/parameters/EventTimestamp"
1928                 },
1929                 {
1930                     "$ref": "#/parameters/EventsUrl"
1931                 },
1932                 {
1933                     "$ref": "#/parameters/Event"
1934                 }
1935             ],
1936             "consumes": [

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1937         "application/json",
1938         "application/vnd.ocf+cbor"
1939     ],
1940     "responses": {
1941         "200": {
1942             "description": "Event successfully recieved"
1943         },
1944         "400": {
1945             "$ref": "#/responses/BadRequest"
1946         },
1947         "410": {
1948             "description": "The subscription identified by the Subscription-ID header is no more in
1949 demand and shall be cancelled"
1950         }
1951     }
1952 }
1953 },
1954 },
1955 "securityDefinitions": {
1956     "oauth2": {
1957         "type": "oauth2",
1958         "flow": "accessToken",
1959         "authorizationUrl": "https://example.com/api/oauth/dialog",
1960         "tokenUrl": "https://example.com/api/oauth/token",
1961         "scopes": {
1962             "r:": "Read device data",
1963             "w:": "Update content of published resource"
1964         }
1965     }
1966 },
1967 "parameters": {
1968     "CorrelationId": {
1969         "name": "Correlation-ID",
1970         "in": "header",
1971         "type": "string",
1972         "format": "uuid",
1973         "description": "A Correlation ID, also known as a Transit ID, is a unique identifier value
1974 that is attached to requests and messages that allow reference to a particular transaction or event
1975 chain.\n"
1976     },
1977     "ContentType": {
1978         "name": "Content-Type",
1979         "in": "header",
1980         "type": "string",
1981         "enum": [
1982             "application/json",
1983             "application/vnd.ocf+cbor"
1984         ],
1985         "required": true,
1986         "description": "The Content-Type header is used to indicate the media type of the resource. In
1987 responses, a Content-Type header tells the client what the content type of the returned content
1988 actually is. In requests, (such as POST), the client tells the server what type of data is actually
1989 sent.\n"
1990     },
1991     "Accept": {
1992         "name": "Accept",
1993         "in": "header",
1994         "type": "string",
1995         "enum": [
1996             "application/json",
1997             "application/vnd.ocf+cbor"
1998         ],
1999         "description": "The Accept request header can be used to specify certain media types which are
2000 acceptable for the response. Accept headers can be used to indicate that the request is specifically
2001 limited to a small set of desired types.\n"
2002     },
2003     "SubscriptionId": {
2004         "name": "Subscription-ID",
2005         "in": "header",
2006         "description": "Unique id of the subscription",
2007         "type": "string",

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2008         "format": "uuid",
2009         "required": true
2010     },
2011     "SequenceNumber": {
2012         "name": "Sequence-Number",
2013         "in": "header",
2014         "description": "Sequence number of the event; first event starting with number 0",
2015         "type": "string",
2016         "required": true
2017     },
2018     "EventSignature": {
2019         "name": "Event-Signature",
2020         "in": "header",
2021         "description": "The signature created by combining the `signingSecret` from the subscription
2022 request, headers and the body of the request using a stanard HMAC-SHA256 keyed hash.",
2023         "type": "string",
2024         "required": true
2025     },
2026     "EventTimestamp": {
2027         "name": "Event-Timestamp",
2028         "in": "header",
2029         "description": "Time when the event occurred in standard Unix time format",
2030         "type": "string",
2031         "required": true
2032     },
2033     "EventType": {
2034         "name": "Event-Type",
2035         "in": "header",
2036         "type": "string",
2037         "enum": [
2038             "subscription_cancelled",
2039             "devices_registered",
2040             "devices_unregistered",
2041             "resource_contentchanged",
2042             "resources_published",
2043             "resources_unpublished",
2044             "devices_online",
2045             "devices_offline"
2046         ],
2047         "required": true
2048     },
2049     "DeviceType": {
2050         "description": "Filter devices by device type",
2051         "name": "rt",
2052         "in": "query",
2053         "type": "array",
2054         "items": {
2055             "type": "string"
2056         }
2057     },
2058     "ResourceLinkHref": {
2059         "description": "Path to resource",
2060         "name": "resourceLinkHref",
2061         "in": "path",
2062         "type": "string",
2063         "required": true
2064     },
2065     "DeviceId": {
2066         "description": "Id of the device",
2067         "name": "deviceId",
2068         "in": "path",
2069         "type": "string",
2070         "format": "uuid",
2071         "required": true
2072     },
2073     "SubscriptionIdPath": {
2074         "name": "subscriptionId",
2075         "in": "path",
2076         "type": "string",
2077         "format": "uuid",
2078         "required": true

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2079     },
2080     "BatchFormat": {
2081         "name": "content",
2082         "in": "query",
2083         "description": "Indicates to the recipient that the response payload shall be the resolved
2084 (i.e. resource representation) Link and not the Link itself. Default is `base`. When requesting
2085 `all`, additional scope `r:*` is required",
2086         "type": "string",
2087         "enum": [
2088             "base",
2089             "all"
2090         ]
2091     },
2092     "EventsUrl": {
2093         "name": "eventsUrl",
2094         "type": "string",
2095         "in": "path",
2096         "required": true
2097     },
2098     "ResourceUpdateRequest": {
2099         "description": "Map of resource values encoded to application/vnd.ocf+cbor type",
2100         "name": "content",
2101         "in": "body",
2102         "schema": {
2103             "$ref": "#/definitions/ResourceUpdateRequest"
2104         },
2105         "required": true
2106     },
2107     "SubscribeRequestDevices": {
2108         "name": "content",
2109         "in": "body",
2110         "schema": {
2111             "$ref": "#/definitions/SubscribeRequestDevices"
2112         },
2113         "required": true
2114     },
2115     "SubscribeRequestDevice": {
2116         "name": "content",
2117         "in": "body",
2118         "schema": {
2119             "$ref": "#/definitions/SubscribeRequestDevice"
2120         },
2121         "required": true
2122     },
2123     "SubscribeRequestResources": {
2124         "name": "content",
2125         "in": "body",
2126         "schema": {
2127             "$ref": "#/definitions/SubscribeRequestResources"
2128         },
2129         "required": true
2130     },
2131     "Event": {
2132         "description": "Event of a specific type, based on what you are subscribed to",
2133         "name": "content",
2134         "in": "body",
2135         "schema": {
2136             "$ref": "#/definitions/ResourceContentChangedEvent"
2137         },
2138         "required": true
2139     }
2140 },
2141 "responses": {
2142     "Unauthorized": {
2143         "description": "Unauthorized"
2144     },
2145     "NotFound": {
2146         "description": "Not found"
2147     },
2148     "SubscriptionCancellationPending": {
2149         "description": "Subscription was marked for cancellation"

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2150     },
2151     "Forbidden": {
2152       "description": "Insufficient permissions"
2153     },
2154     "BadRequest": {
2155       "description": "The request was malformed or badly constructed"
2156     },
2157     "ServiceUnavailable": {
2158       "description": "The service on the Target Cloud is unavailable for the reason indicated in the
2159 diagnostic payload"
2160     },
2161     "GatewayTimeout": {
2162       "description": "The target Device is registered at the target Cloud, however the Device itself
2163 is unavailable, offline, or otherwise unreachable. The response should include a Retry-After header
2164 containing the time after which the request may be re-attempted. Additional information is indicated
2165 in the diagnostic payload."
2166     },
2167     "UnsupportedMediaType": {
2168       "description": "The request contained an unsupported media type in the Content-Type header"
2169     },
2170     "NotAcceptable": {
2171       "description": "The server cannot honour the Content-Type requested in the Accept header"
2172     }
2173   },
2174   "definitions": {
2175     "DeviceProperties": {
2176       "type": "object",
2177       "required": ["rt", "di", "dmn", "n"],
2178       "properties": {
2179         "rt": {
2180           "description": "Resource Type of the Resource",
2181           "items": {
2182             "type": "string",
2183             "maxLength": 64
2184           },
2185           "minItems": 1,
2186           "readOnly": true,
2187           "uniqueItems": true,
2188           "type": "array"
2189         },
2190         "di": {
2191           "allOf": [
2192             {
2193               "$ref": "http://openconnectivityfoundation.github.io/core/schemas/oic.types-
2194 schema.json#/definitions/uuid"
2195             },
2196             {
2197               "description": "Unique identifier for the Device",
2198               "readOnly": true
2199             }
2200           ]
2201         },
2202         "dmn": {
2203           "description": "Manufacturer Name.",
2204           "items": {
2205             "properties": {
2206               "language": {
2207                 "allOf": [
2208                   {
2209                     "$ref": "http://openconnectivityfoundation.github.io/core/schemas/oic.types-
2210 schema.json#/definitions/language-tag"
2211                   },
2212                   {
2213                     "description": "An RFC 5646 language tag.",
2214                     "readOnly": true
2215                   }
2216                 ]
2217               },
2218               "value": {
2219                 "description": "Manufacturer name in the indicated language.",
2220                 "maxLength": 64,

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2221         "readOnly": true,
2222         "type": "string"
2223     },
2224 },
2225     "type": "object"
2226 },
2227     "minItems": 1,
2228     "readOnly": true,
2229     "type": "array"
2230 },
2231     "n": {
2232         "$ref": "
2233 https://openconnectivityfoundation.github.io/core/schemas/oic.common.properties.core-
2234 schema.json#/definitions/n"
2235     }
2236 },
2237 },
2238 "Device": {
2239     "type": "object",
2240     "required": ["device", "status", "links"],
2241     "properties": {
2242         "device": {
2243             "$ref": "#/definitions/DeviceProperties"
2244         },
2245         "status": {
2246             "$ref": "#/definitions/DeviceStatus"
2247         },
2248         "links": {
2249             "type": "array",
2250             "items": {
2251                 "$ref": "
2252 http://openconnectivityfoundation.github.io/core/swagger2.0/oic.wk.res.swagger.json#/definitions/oic.oic-link"
2253             }
2254         }
2255     },
2256 },
2257     "example": {
2258         "device": {
2259             "rt": ["oic.wk.d", "oic.d.sensor"],
2260             "dmn": "Open Connectivity Foundation",
2261             "n": "Food safety sensor",
2262             "di": "53080a4f-5e3e-4291-802f-3436238232d2"
2263         },
2264         "status": "online",
2265         "links": [
2266             {
2267                 "href": "/53080a4f-5e3e-4291-802f-3436238232d2/oic/d",
2268                 "rt": [
2269                     "oic.wk.d",
2270                     "oic.d.sensor"
2271                 ],
2272                 "if": [
2273                     "oic.if.r",
2274                     "oic.if.baseline"
2275                 ]
2276             },
2277             {
2278                 "href": "/53080a4f-5e3e-4291-802f-3436238232d2/oic/p",
2279                 "rt": [
2280                     "oic.wk.p"
2281                 ],
2282                 "if": [
2283                     "oic.if.r",
2284                     "oic.if.baseline"
2285                 ]
2286             },
2287             {
2288                 "href": "/53080a4f-5e3e-4291-802f-3436238232d2/humidity",
2289                 "rt": [
2290                     "oic.r.humidity"
2291                 ],

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2292         "if": [
2293             "oic.if.s",
2294             "oic.if.baseline"
2295         ]
2296     },
2297     {
2298         "href": "/53080a4f-5e3e-4291-802f-3436238232d2/temperature",
2299         "rt": [
2300             "oic.r.temperature"
2301         ],
2302         "if": [
2303             "oic.if.s",
2304             "oic.if.baseline"
2305         ]
2306     }
2307 ]
2308 }
2309 },
2310 "DeviceContentAll": {
2311     "type": "object",
2312     "required": ["device", "status", "links"],
2313     "properties": {
2314         "device": {
2315             "$ref": "#/definitions/DeviceProperties"
2316         },
2317         "status": {
2318             "$ref": "#/definitions/DeviceStatus"
2319         },
2320         "links": {
2321             "type": "array",
2322             "items": {
2323                 "type": "object",
2324                 "properties": {
2325                     "href": {
2326                         "type": "string"
2327                     },
2328                     "rep": {
2329                         "oneOf": [
2330                             {
2331                                 "type": "object"
2332                             },
2333                             {
2334                                 "type": "array"
2335                             }
2336                         ]
2337                     }
2338                 }
2339             }
2340         }
2341     },
2342     "example": {
2343         "device": {
2344             "rt": ["oic.wk.d", "oic.d.sensor"],
2345             "dmn": "Open Connectivity Foundation",
2346             "n": "Food safety sensor",
2347             "di": "53080a4f-5e3e-4291-802f-3436238232d2"
2348         },
2349         "status": "online",
2350         "links": [
2351             {
2352                 "href": "/53080a4f-5e3e-4291-802f-3436238232d2/oic/d",
2353                 "rep": {
2354                     "rt": ["oic.wk.d", "oic.d.sensor"],
2355                     "dmn": "Open Connectivity Foundation",
2356                     "n": "Food safety sensor",
2357                     "di": "53080a4f-5e3e-4291-802f-3436238232d2",
2358                     "icv": "ocf.2.0.5",
2359                     "dmv": "ocf.res.1.3.0, ocf.sh.1.3.0",
2360                     "piid": "6F0AAC04-2BB0-468D-B57C-16570A26AE48"
2361                 }
2362             }

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2363     {
2364         "href": "/53080a4f-5e3e-4291-802f-3436238232d2/oic/p",
2365         "rep": {
2366             "pi": "54919CA5-4101-4AE4-595B-353C51AA983C",
2367             "mnfv": "1.1.20"
2368         }
2369     },
2370     {
2371         "href": "/53080a4f-5e3e-4291-802f-3436238232d2/humidity",
2372         "rep": {
2373             "humidity": 62,
2374             "desiredHumidity": 65
2375         }
2376     },
2377     {
2378         "href": "/53080a4f-5e3e-4291-802f-3436238232d2/temperature",
2379         "rep": {
2380             "temperature": 21,
2381             "units": "C"
2382         }
2383     }
2384 ]
2385 }
2386 },
2387 "DeviceStatus": {
2388     "description": "Device status available from the OCF Cloud, which tracks if the device has
2389 opened TCP connection and is signed in",
2390     "type": "string",
2391     "enum": [
2392         "online",
2393         "offline"
2394     ]
2395 },
2396 "ResourceUpdateRequest": {
2397     "type": "string",
2398     "description": "Desired content of the resource",
2399     "example": "o29kZXNpcmVkSHVtaWRpdHkYPGV0eXBlc4Fub2ljLnIuaHVtaWRpdHloaHVtaWRpdHkYKA=="
2400 },
2401 "ResourceRetrieveResponse": {
2402     "type": "string",
2403     "description": "Content of the resource returned from the device",
2404     "example": "o29kZXNpcmVkSHVtaWRpdHkYPGV0eXBlc4Fub2ljLnIuaHVtaWRpdHloaHVtaWRpdHkYKA=="
2405 },
2406 "EventType": {
2407     "type": "string",
2408     "enum": [
2409         "subscription_cancelled",
2410         "devices_registered",
2411         "devices_unregistered",
2412         "resource_contentchanged",
2413         "resources_published",
2414         "resources_unpublished",
2415         "devices_online",
2416         "devices_offline"
2417     ]
2418 },
2419 "EventTypeDevices": {
2420     "type": "string",
2421     "enum": [
2422         "devices_registered",
2423         "devices_unregistered",
2424         "devices_online",
2425         "devices_offline"
2426     ]
2427 },
2428 "EventTypeDevice": {
2429     "type": "string",
2430     "enum": [
2431         "resources_published",
2432         "resources_unpublished"
2433     ]

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2434 },
2435 "EventTypeResources": {
2436   "type": "string",
2437   "enum": [
2438     "resource_contentchanged"
2439   ]
2440 },
2441 "SubscriptionId": {
2442   "description": "Unique id of the subscription",
2443   "type": "string",
2444   "format": "uuid"
2445 },
2446 "SubscribeRequestDevices": {
2447   "type": "object",
2448   "properties": {
2449     "eventsUrl": {
2450       "$ref": "#/definitions/EventsUrl"
2451     },
2452     "eventTypes": {
2453       "type": "array",
2454       "items": {
2455         "$ref": "#/definitions/EventTypeDevices"
2456       }
2457     },
2458     "signingSecret": {
2459       "type": "string",
2460       "maxLength": 32,
2461       "minLength": 32
2462     }
2463   },
2464   "required": [
2465     "eventsUrl",
2466     "eventTypes",
2467     "signingSecret"
2468   ],
2469   "example": {
2470     "eventsUrl": "https://events.example.com/",
2471     "eventTypes": [
2472       "devices_registered",
2473       "devices_unregistered"
2474     ],
2475     "signingSecret": "3BZ6oI9xbRJzOUvUoRb5RgaZjPqHrmql"
2476   }
2477 },
2478 "SubscribeRequestDevice": {
2479   "type": "object",
2480   "properties": {
2481     "eventsUrl": {
2482       "$ref": "#/definitions/EventsUrl"
2483     },
2484     "eventTypes": {
2485       "type": "array",
2486       "items": {
2487         "$ref": "#/definitions/EventTypeDevice"
2488       }
2489     },
2490     "signingSecret": {
2491       "type": "string",
2492       "maxLength": 32,
2493       "minLength": 32
2494     }
2495   },
2496   "required": [
2497     "eventsUrl",
2498     "eventTypes",
2499     "signingSecret"
2500   ],
2501   "example": {
2502     "eventsUrl": "https://events.example.com/",
2503     "eventTypes": [
2504       "resource_published",

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2505         "resource_unpublished"
2506     ],
2507     "signingSecret": "3BZ6oI9xbRJzOUvUoRb5RgaZjPqHrmql"
2508 }
2509 },
2510 "SubscribeRequestResources": {
2511     "type": "object",
2512     "properties": {
2513         "eventsUrl": {
2514             "$ref": "#/definitions/EventsUrl"
2515         },
2516         "eventTypes": {
2517             "type": "array",
2518             "items": {
2519                 "$ref": "#/definitions/EventTypeResources"
2520             }
2521         },
2522         "signingSecret": {
2523             "type": "string",
2524             "maxLength": 32,
2525             "minLength": 32
2526         }
2527     },
2528     "required": [
2529         "eventsUrl",
2530         "eventTypes",
2531         "signingSecret"
2532     ],
2533     "example": {
2534         "eventsUrl": "https://events.example.com/",
2535         "eventTypes": [
2536             "resource_contentchanged"
2537         ],
2538         "signingSecret": "3BZ6oI9xbRJzOUvUoRb5RgaZjPqHrmql"
2539     }
2540 },
2541 "SubscribeResponse": {
2542     "description": "Subscription was registered, waiting for verification",
2543     "type": "object",
2544     "properties": {
2545         "subscriptionId": {
2546             "$ref": "#/definitions/SubscriptionId"
2547         }
2548     },
2549     "required": [
2550         "subscriptionId"
2551     ],
2552     "example": {
2553         "subscriptionId": "1eeb465c-5e8d-4305-a366-bbf035fff671"
2554     }
2555 },
2556 "EventsUrl": {
2557     "type": "string",
2558     "format": "url",
2559     "example": "https://events.example.com/"
2560 },
2561 "SubscriptionCancelledEvent": {
2562     "type": "object",
2563     "description": "Subscription with provided id was cancelled"
2564 },
2565 "DevicesRegisteredEvent": {
2566     "description": "Device was successfully signed up to the OCF Cloud, as defined in the
2567 `oic.sec.account`",
2568     "type": "object",
2569     "properties": {
2570         "content": {
2571             "type": "array",
2572             "items": {
2573                 "properties": {
2574                     "di": {
2575                         "type": "string",

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2576         "format": "uuid"
2577     }
2578 }
2579 }
2580 }
2581 }
2582 },
2583 "DevicesUnregisteredEvent": {
2584     "description": "Device was successfully signed off from the OCF Cloud, as defined in the
2585 `oic.sec.account`,
2586     "type": "object",
2587     "properties": {
2588         "content": {
2589             "type": "array",
2590             "items": {
2591                 "properties": {
2592                     "di": {
2593                         "type": "string",
2594                         "format": "uuid"
2595                     }
2596                 }
2597             }
2598         }
2599     },
2600 },
2601 "ResourcesPublishedEvent": {
2602     "type": "object",
2603     "properties": {
2604         "content": {
2605             "type": "array",
2606             "items": {
2607                 "$ref":
2608 "http://openconnectivityfoundation.github.io/core/swagger2.0/oic.wk.res.swagger.json#/definitions/oi
2609 c.oic-link"
2610             }
2611         }
2612     },
2613 },
2614 "ResourcesUnpublishedEvent": {
2615     "type": "object",
2616     "properties": {
2617         "content": {
2618             "type": "array",
2619             "items": {
2620                 "$ref":
2621 "http://openconnectivityfoundation.github.io/core/swagger2.0/oic.wk.res.swagger.json#/definitions/oi
2622 c.oic-link"
2623             }
2624         }
2625     },
2626 },
2627 "DevicesOnlineEvent": {
2628     "type": "object",
2629     "properties": {
2630         "content": {
2631             "type": "array",
2632             "items": {
2633                 "properties": {
2634                     "di": {
2635                         "type": "string",
2636                         "format": "uuid"
2637                     }
2638                 }
2639             }
2640         }
2641     },
2642 },
2643 "DevicesOfflineEvent": {
2644     "type": "object",
2645     "properties": {
2646         "content": {

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2647         "type": "array",
2648         "items": {
2649             "properties": {
2650                 "di": {
2651                     "type": "string",
2652                     "format": "uuid"
2653                 }
2654             }
2655         }
2656     }
2657 },
2658 },
2659 "ResourceContentChangedEvent": {
2660     "type": "string",
2661     "description": "New Content of the resource returned from the device",
2662     "example": "o29kZXNpcmVkJHVtaWRpdHkYPGV0eXB1c4Fub2ljLnIuaHVtaWRpdHloaHVtaWRpdHkYKA=="
2663 }
2664 }
2665 }
2666

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