APPENDIX B

CALIFORNIA OPEN CHARGE POINT INTERFACE TEST PROCEDURES FOR NETWORKED ELECTRIC VEHICLE SERVICE EQUIPMENT FOR LEVEL 2 AND DIRECT CURRENT FAST CHARGE CLASSES

Adopted: [INSERT DATE OF ADOPTION]

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NOTE: The entire text of “California Open Charge Point Interface Test Procedures for Networked Electric Vehicle Service Equipment for Level 2 and Direct Current Fast Charge Classes,” set forth below is new language in “normal type” proposed to be added to section 2360.3, title 13, California Code of Regulations.

A. Terminology and Definitions

1. Abbreviations

OCPI	Open Charge Point Interface
CDR	Charge Detail Record
CPO	Charging Point Operator
eMSP	e-Mobility Service Provider

2. Provider and Operator Abbreviation

It is advised to use eMI3 compliant names for Contract IDs and EVSE IDs.

3. Charging Topology

The charging topology, as relevant to the eMSP, consists of three entities:
Connector is a specific socket or cable for an EV to use.
EVSE is the part that controls the power supply to a single EV in a single session. An EVSE may provide multiple connectors but only one of these can be active at the same time.
Location is a group of one or more EVSEs that belong together geographically or spatially.

4. Variable names

In order to prevent issues with capitals in variable names, the naming in JSON is not CamelCase but snake_case. All variables are lowercase and include an underscore for a space.

5. Cardinality

When defining the cardinality of a field, the following symbols are used in the protocol:

Symbol	Description	Type
?	An optional object. If not set, it might be null, or the field might be omitted. When the field is omitted and it has a default value, the value is the default value	Object
1	Required object	Object value,
*	A list of zero or more objects. If empty, it might be null, [ ] or the field might be omitted.	[Object]
+	A list of at least one object.	[Object]

B. Transport and Format

1. JSON/HTTP Implementation Guide

The communications protocol is based on HTTP and uses the JSON format. It follows a RESTful architecture for web services where possible.

1.1 Security and authentication

The interfaces are protected on HTTP transport level, with SSL and token based authentication. Please note that this mechanism does **not** require client side certificates for authentication, only server side certificates in order to setup a secure SSL connection

1.2 Request format

Each HTTP request must add an 'Authorization' header. The header looks as following:

```
Authorization:  Token  IpbJOXxkxOAuKR92z0nEcmVF3Qw09VG7I7d/WCg0koM=
```

The literal 'Token' indicates that the token based authentication mechanism is used. Its parameter is a string consisting of printable, non-whitespace ASCII characters. The token must uniquely identify the requesting party. The server can then use this to link data and commands to this party's account.

The request method can be any of GET, PUT, PATCH or DELETE. The protocol uses them in a similar way as REST APIs do.

Method	Description
GET	Fetches objects or information
POST	Creates new objects or information
PUT	Updates existing objects or information
PATCH	Partially updates existing objects or information
DELETE	Removes existing objects or information

The mimetype of the request body is `application/json` and may contain the data as documented for each endpoint.

1.2.1 GET

All GET methods that return a list of objects have pagination.
To enable pagination of the returned list of objects extra URL parameters are allowed for the GET request and extra headers need to be added to the response.

1.2.1.1 Paginated Request

The following table is a list of all the parameters that have to be supported, but might be omitted by a client request.

Parameter	Description
offset	The offset of the first object returned. Default is 0.
limit	Maximum number of objects to GET. Note: the server might decide to return less objects, because there are no more objects or the server limits the maximum amount of objects to return. This is to prevent, for example, overloading the system.

1.2.1.2 Paginated Response

For pagination to work correctly it is important that multiple calls to the same URL (including query parameters) result in the same objects being returned to the server. It is important that the sequence of objects does not change. It is a best practice to return the oldest (by creation date) first.
While a client crawls over the pages (multiple GET requests every time to the 'next' page Link), a new object might be created on the server. The client detects this: the X-Total-Count will be higher on the next call. The client does not need to correct for this as only the last page will be different or will be an additional page. HTTP headers that have to be added to any paginated GET response.

HTTP Parameter	Description
link	Link to the 'next' page should be provided, if this is NOT the last page. See example below.
X-Total-Count	(Custom HTTP Header)Total number of objects available in the server system
X-Limit	(Custom HTTP Header) Number of objects that are returned. Note that this is an upper limit, if there are not enough remaining objects to return, fewer objects than this upper limit will be returned

Example of a required OCPI pagination link header:

```
Link:
<https://www.server.com/ocpi/cpo/2.0/cdrs/?offset=5&limit=50>;
rel="next"
```

After the client has called the given "next" page URL above the Link parameter will most likely look like:

```
Link:  https://www.server.com/ocpi/cpo/2.0/cdrs?offset=200&limit=50;
rel="next"
```

1.2.2 PUT

A PUT request must specify all required fields of an object (similar to a POST request). Optional fields that are not included will revert to their default value which is either specified in the protocol or NULL.

1.2.3 PATCH

A PATCH request must only specify the object's identifier (if needed to identify this object) and the fields to be updated. Any fields (required or optional) that are left out remain unchanged.
The mimetype of the request body is application/json and may contain the data as documented for each endpoint.
In case a PATCH request fails, the client is expected to call the GET method to check the state of the object in the other parties system. If the object doesn't exist, the client should do a PUT.

1.3 Client owned object push

Normal client/server RESTful services work in a way that the Server is the owner of the objects that are created. The client requests a POST method with an object to the end-point URL. The response send by the server will contain the URL to the new object. The client will only request one server to create a new object, not multiple servers.

Many OCPI modules work differently: the client is the owner of the object and only

pushes the information to one or more servers for information sharing purposes.
For example: the CPO owns the Tariff objects and pushes them to a couple of eMSPs, so each eMSP gains knowledge of the tariffs that the CPO will charge them for their customers' sessions. eMSP might receive Tariff objects from multiple CPOs. They need to be able to make a distinction between the different tariffs from different CPOs.
The distinction between objects from different CPOs/eMSPs is made based on a {country-code} and {party-id}.
The country-code and party-id of the other party are received during the credentials handshake, so that a server might know the values a client will use in an URL.

Client owned object URL definition:
```
{base-ocpi-url}/{end-point}/{country-code}/{party-id}/{object-id}
```

Example of a URL to a client owned object:
```
https://www.server.com/ocpi/cpo/2.0/tariffs/NL/TNM/14
```

POST is not supported for these kind of modules.
PUT is used to send new objects to the servers.
If a client tries to access an object with a URL that has a different country-code and/or party-id then given during the credentials handshake, it is allowed the respond with a HTTP 404 status code, this way blocking client access to object that do not belong to them.

1.3.1 Errors

When a client pushes a client owned object, but the {object-id} in the URL is different from the id in the object being pushed. A Server implementation is advised to return an OCPI status code: 2001.

1.4 Response Format

When a request cannot be accepted, an HTTP error response code is expected including a JSON object that contains more details.

The content that is sent with all the response messages is an 'application/json' type and contains a JSON object with the following properties:

Property	Type	Cardinality	Description
data	Array or Object	* or ?	Contains the actual response data object or list of objects from each request, depending on the cardinality of the response data, this is an array (card. * or +) or a single object (card. 1 or ?)
status_code	int	1	Response code, as listed in Status Codes, indicates how the request was handled. To avoid confusion with HTTP codes, at least four digits are used.
Status_message	string	?	An optional status message which may help when debugging.
timestamp	DateTime	1	The time this message was generated.

Additional examples in the specification will only contain the value of the "data" field.

1.4.1 Example: Version information response (list of objects)

```
{
   "data": [{
      "version": "1.9",
      "url": "https://example.com/ocpi/cpo/1.9/"
   }, {
      "version": "2.0",
      "url": "https://example.com/ocpi/cpo/2.0/"
   }],
   "status_code":  1000,
   "status_message": "Success",
   "timestamp":  "2015-06-30T21:59:59Z"
}
```

1.4.2 Example: Version information response (one object)

```
{
   "data": {
      "version": "2.0",
      "endpoints": [{
         "identifier": "credentials",
         "url":"https://example.com/ocpi/cpo/2.0/credentials/"
      }, {
         "identifier": "locations",
         "url": "https://example.com/ocpi/cpo/2.0/locations/"
      }]
   },
   "status_code":  1000,
   "status_message": "Success",
   "timestamp":  "2015-06-30T21:59:59Z"
}
```

1.4.3 Example: Tokens GET Response with one Token object. (CPO end-point) (one object)

```
{
   "data": {
      "uid": "012345678",
      "type":  "RFID",
      "auth_id":  "FA54320",
      "visual_number": "DF000-2001-8999",
      "issuer":  "TheNewMotion",
      "valid": true,
      "allow_whitelist": true
   },
   "status_code":  1000,
   "status_message": "Success",
   "timestamp":  "2015-06-30T21:59:59Z"
}
```

1.4.4 Example: Tokens GET Response with list of Token objects. (eMSP end-point) (list of objects)

```
{
   "data": [{
      "uid": "100012",
      "type":  "RFID",
      "auth_id":  "FA54320",
      "visual_number": "DF000-2001-8999",
      "issuer":  "TheNewMotion",
      "valid": true,
      "allow_whitelist": true
   }, {
      "uid": "100013",
      "type":  "RFID",
      "auth_id":  "FA543A5",
      "visual_number": "DF000-2001-9000",
      "issuer":  "TheNewMotion",
      "valid": true,
      "allow_whitelist": true
   }, {
      "uid": "100014",
      "type":  "RFID",
      "auth_id":  "FA543BB",
      "visual_number":  "DF000-2001-9010",
      "issuer":  "TheNewMotion",
      "valid": false,
      "allow_whitelist": true
   }],
   "status_code":  1000,
   "status_message": "Success",
   "timestamp":  "2015-06-30T21:59:59Z"
}
```

1.3.5 Example: Response with an error (contains no data field)

```
{
   "status_code":  2001,
   "status_message": "Missing required field: type",
   "timestamp":  "2015-06-30T21:59:59Z"
}
```

2. Interface endpoints

As OCPI contains multiple interfaces, different endpoints are available for messaging. The protocol is designed such that the exact URLs of the endpoints can be defined by each party. It also supports an interface per version.
The locations of all the version specific endpoints can be retrieved by fetching the API information from the versions endpoint. Each version specific endpoint will then list the available endpoints for that version. It is strongly recommended to insert the protocol version into the URL.

For example: `/ocpi/cpo/2.0/locations  and /ocpi/emsp/2.0/locations.`

The URLs of the endpoints in this document are descriptive only. The exact URL can be found by fetching the endpoint information from the API info endpoint and looking up the identifier of the endpoint.

Operator interface	Identifier	Example URL
Credentials	credentials	https://example.com/ocpi/cpo/2.0/credentials
Charging location details	locations	https://example.com/ocpi/cpo/2.0/locations

eMSP interface	Identifier	Example URL
Credentials	credentials	https://example.com/ocpi/emsp/2.0/credentials
Charging location updates	locations	https://example.com/ocpi/emsp/2.0/locations

3. Offline behavior

During communication over OCPI, it might happen that one of the communication parties is unreachable for an amount of time.
OCPI works event based. New messages and status are pushed from one party to another. When communication is lost, updates cannot be delivered.
OCPI messages should not be queued.
When the connection is re-established, it is up the client of a connection to GET the current status from to server to get back in-sync.
For example:

- CDRs of the period of communication loss can be retrieved with a GET command on the CDRs module, with filters to retrieve only CDRs of the period since the last CDR was received.
- Status of EVSEs (or Locations) can be retrieved by calling a GET on the Locations module.

C. Status Codes

There are two types of status codes:

- Transport related (HTTP)
- Content related (OCPI)

The transport layer ends after a message is correctly parsed into a (semantically unvalidated) JSON structure. When a message does not contain a valid JSON string, the HTTP error 400 - Bad request is returned.
If a request is syntactically valid JSON and addresses an existing resource, no HTTP error should be returned. Those requests are supposed to have reached the OCPI layer. As is customary for RESTFUL APIs, if the resources does not exist, the server should return a HTTP 404 – Not Found.
When the server receives a valid OCPI object it should respond with:

- HTTP 200 – OK when the object already existed and is successfully updated
- HTTP 201 – Created when the object is newly created in the server system

Requests that reach the OCPI layer should return an OCPI response message with a status_code field as defined below.

Range	Description
1xxx	Success
2xxx	Client errors – The data sent by the client cannot be processed by the server
3xxx	Server errors – The server encountered an internal error

When the status code is in the success range (1xxx), the data field in the response message should contain the information as specified in the protocol. Otherwise the data field is unspecified and may be omitted, null or something else that could help to debug the problem from a programmer's perspective. For example, it could specify which fields contain an error or are missing.

1. 1xxx: Success

Code	Description
1000	Generic success code

2. 2xxx: Client errors

Errors a server detected in the message sent by a client

Code	Description
2000	Generic client error
2001	Invalid or missing parameters
2002	Not enough information; for example: Authorization request with too little information
2003	Unknown location; for example: Command: START_SESSION with unknown location

3. 3xxx: Server errors

Error during processing of the OCPI payload in the server. The message was syntactically right but could not be processed by the server.

Code	Description
3000	Generic server error
3001	Unable to use the client's API. For example, during the credentials registration: When the initializing party requests data from the other party during the open POST call to its credentials endpoint. If one of the GETs cannot be processed, the party should return this error in the POST response
3002	Unsupported version
3003	No matching endpoints or expected endpoints missing between parties. Used during the registration process if the two parties do not have any mutual modules or endpoints available, or the minimum expected by the other party implementation

D. Version Information Endpoint

This endpoint lists all the available OCPI versions and the corresponding URLs to where version specific details such as the supported endpoints can be found.
Example endpoint structure: /ocpi/cpo/versions and /ocpi/emsp/versions
The exact URL to the implemented version endpoint should be given (offline) to parties that interface with your OCPI implementation, this endpoint is the starting point for discovering locations of the different modules and version of OCPI that have been implemented.
Both the CPO and the eMSP must have this endpoint.

Method	Description
GET	Fetch information about the supported versions

1. Data

Property	Type	Card	Description
versions	Version	+	A list of supported OCPI versions

1.1 Version class

Property	Type	Card	Description
Version	VersionNumber	1	The version number
url	URL	1	URL to the endpoint containing version specific information

2. GET

Fetch all supported OCPI versions of this CPO or eMSP.

Example
```
[
   {
      "version": "1.9",
      "url": "https://example.com/ocpi/cpo/1.9/"
   },
   {
      "version": "2.0",
      "url": "https://example.com/ocpi/cpo/2.0/"
   }
]
```

E. Version Details Endpoint

Example: `/ocpi/cpo/2.0/  and /ocpi/emsp/2.0/`

This endpoint lists the supported endpoints and their URLs for a specific OCPI version. To notify the other party that the list of endpoints of your current version has changed, you can send a PUT request to the corresponding credentials endpoint (see the credentials chapter).
Both the CPO and the eMSP must have this endpoint.

Method	Description
GET	Fetch information about the supported endpoints for this version

1. Data

Property	Type	Cardinality	Description
Version	VersionNumber	1	The version number
Endpoints	Endpoint	+	A list of supported endpoints for this version

1.1 Endpoint *class*

Property	Type	Cardinality	Description
Identifier	ModuleID	1	Endpoint identifier
url	URL	1	URL to the endpoint

1.2 ModuleID *enum*

The Module identifiers for each endpoint are in the beginning of each *Module* chapter. The following table contains the list of modules in this version of OCPI. Most modules (except Credentials & registration) are optional, but there might be dependencies between modules, if so that will be mentioned in the module description.

Module	ModuleID	Remark
CDRs	cdrs	
Commands	commands	
Credentials & registration	credentials	Required for all implementations
Locations	locations	
Sessions	sessions	
Tariffs	tariffs	
Tokens	tokens	

1.3 VersionNumber *enum*

List of known versions

Value	Description
2.0	OCPI version 2.0
2.1	OCPI version 2.1 (DEPRECATED, use 2.1.1)
2.1.1	OCPI version 2.1.1

1.3.1 Custom Modules

Parties are allowed to create custom modules or customized version of the existing modules.
For this the ModuleID enum can be extended with additional custom moduleIDs.
These custom moduleIDs may only be send to parties with which there is an agreement to use a custom module.
It is advised to use a prefix (country_code + party_id) for any custom moduleID, this ensures that the moduleID will not be used for any future module of OCPI.

For example: `nltnm-tokens`

2. GET

Fetch information about the supported endpoints and their URLs for this version.

Example

```
{
   "version": "2.0",
   "endpoints": [
      {
         "identifier": "credentials",
         "url": "https://example.com/ocpi/cpo/2.0/credentials/"
      },
      {
         "identifier": "locations",
         "url": "https://example.com/ocpi/cpo/2.0/locations/"
      }
   ]
}
```

F. Credentials Endpoint

Module Identifier: credentials

1. Interfaces and endpoints

Example: `/ocpi/cpo/2.0/credentials, /ocpi/emsp/2.0/credentials`

Method	Description
GET	Retrieves the credentials object to access the server’s platform
POST	Provides the werver with a credentials object to access the client’s system (i.e. register)
PUT	Provides the server with an updated credentials object to access the client’s system
PATCH	n/a
DELETE	Informs the server that its credentials to the client’s system are now invalid (i.e. unregister)

1.1 GET Method

Retrieves the credentials object to access the server’s platform. The request body is empty, the response contains the credentials object to access the server’s platform. This credentials object also contains extra information about the server such as its business details.

1.2 POST Method

Provides the server with credentials to access the client’s system. This credentials object also contains extra information about the client such as its business details.
A POST initiates the registration process for this endpoint’s version. The server must also fetch the client’s endpoints for this version.
If successful, the server must generate a new token and respond with the client’s new credentials to access the server’s system. The credentials object in the response also contains extra information about the server such as its business details.
This must return a `HTTP status code 405: method not allowed` if the client was already registered.

1.3 PUT Method

Provides the server with updated credentials to access the client's system. This credentials object also contains extra information about the client such as its business details.
A PUT will switch to the version that contains this credentials endpoint if it's different from the current version. The server must fetch the client's endpoints again, even if the version has not changed.
If successful, the server must generate a new token for the client and respond with the client's updated credentials to access the server's system. The credentials object in the response also contains extra information about the server such as its business details.
This must return a `HTTP status code 405:  method not allowed` if the client was not registered.

1.4 DELETE Method

Informs the server that its credentials to access the client's system are now invalid and can no longer be used. Both parties must end any automated communication. This is the unregistration process.
This must return a `HTTP status code 405:  method not allowed` if the client was not registered.

2. Object description

2.1 Credentials object

Property	Type	Card.	Description
token	string (64)	1	The token for the other party to authenticate in your system
url	URL	1	The URL to your API versions endpoint
business_details	BusinessDetails	1	Details of this party
party_id	string(3)	1	CPO or eMSP ID of this party (following the 15118 ISO standard)
country_code	string(2)	1	Country code of the country this party is operating in

The party_id and country_code are provided here to inform a server about the party_id and country_code a client will use when pushing client owned objects. This helps a server determine the URLs a client will use when pushing a client owned object.
The country_code is added to make certain the URL used when pushing a client owned object is unique. There might be multiple parties in the world with the same party_id, but the combination should always be unique.
A party operating in multiple countries can always use the home country of the company for all connections. For example, an OCPI implementation might push EVSE IDs from a company for different countries, preventing an OCPI connection per country in which a company is operating.
The party_id and country_code given here have no direct link with the eMI3 EVSE IDs and Contract IDs that might be used in the different OCPI modules. For example, an implementation OCPI might push EVSE IDs with a different eMI3 spot operator, then the OCPI party_id and/or different country_code.

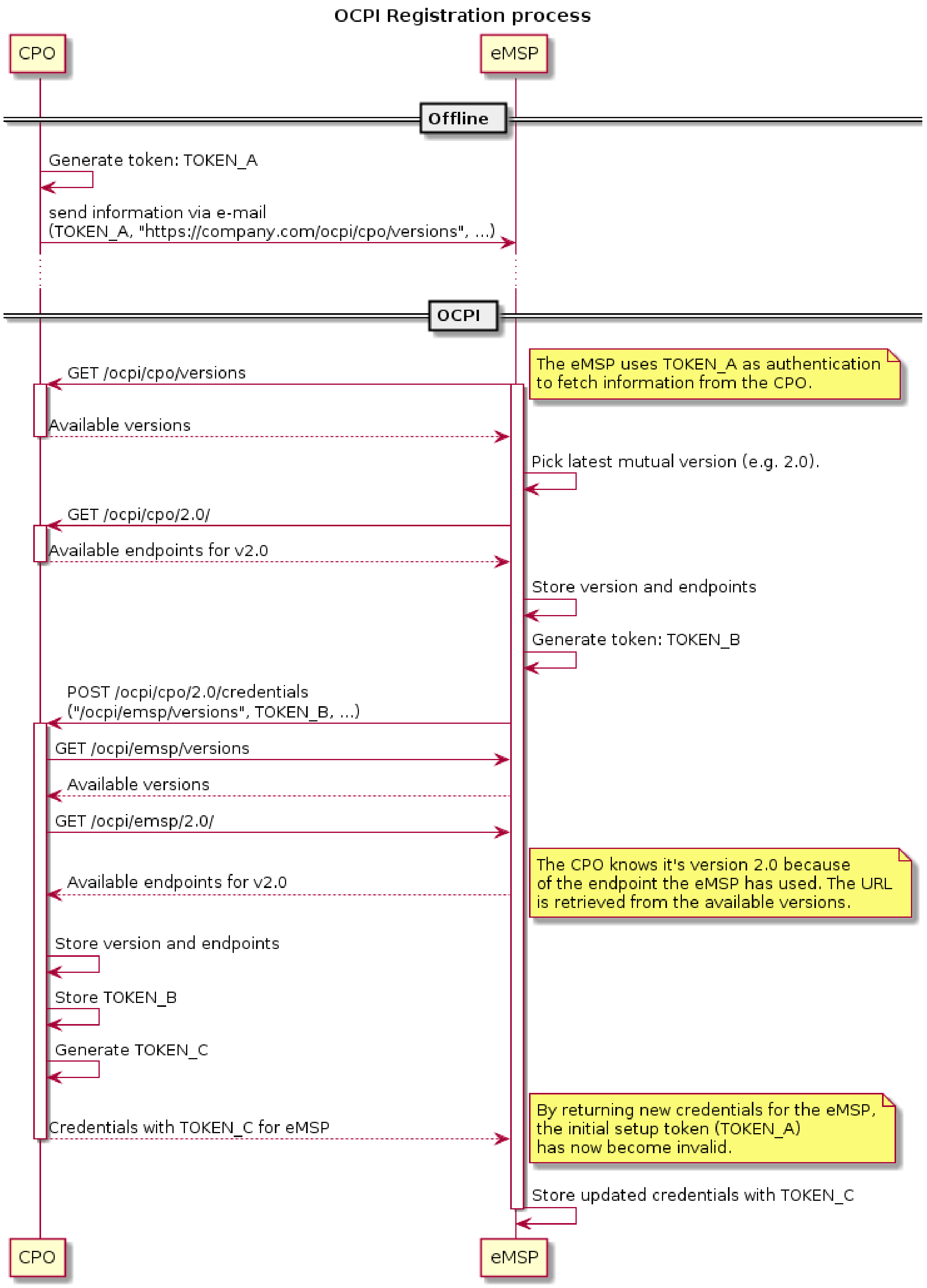
Example

```
{
   "url": "https://example.com/ocpi/cpo/",
   "token": "ebf3b399-779f-4497-9b9d-ac6ad3cc44d2",
   "party_id": "EXA",
   "country_code": "NL",
   "business_details": {
      "name": "Example Operator",
      "logo": {
         "url": "https://example.com/img/logo.jpg",
         "thumbnail": "https://example.com/img/logo_thumb.jpg",
         "category": "OPERATOR",
         "type": "jpeg",
         "width": 512,
         "height": 512
      },
      "website": "http://example.com"
   }
}
```

3. Use cases

3.1 Registration

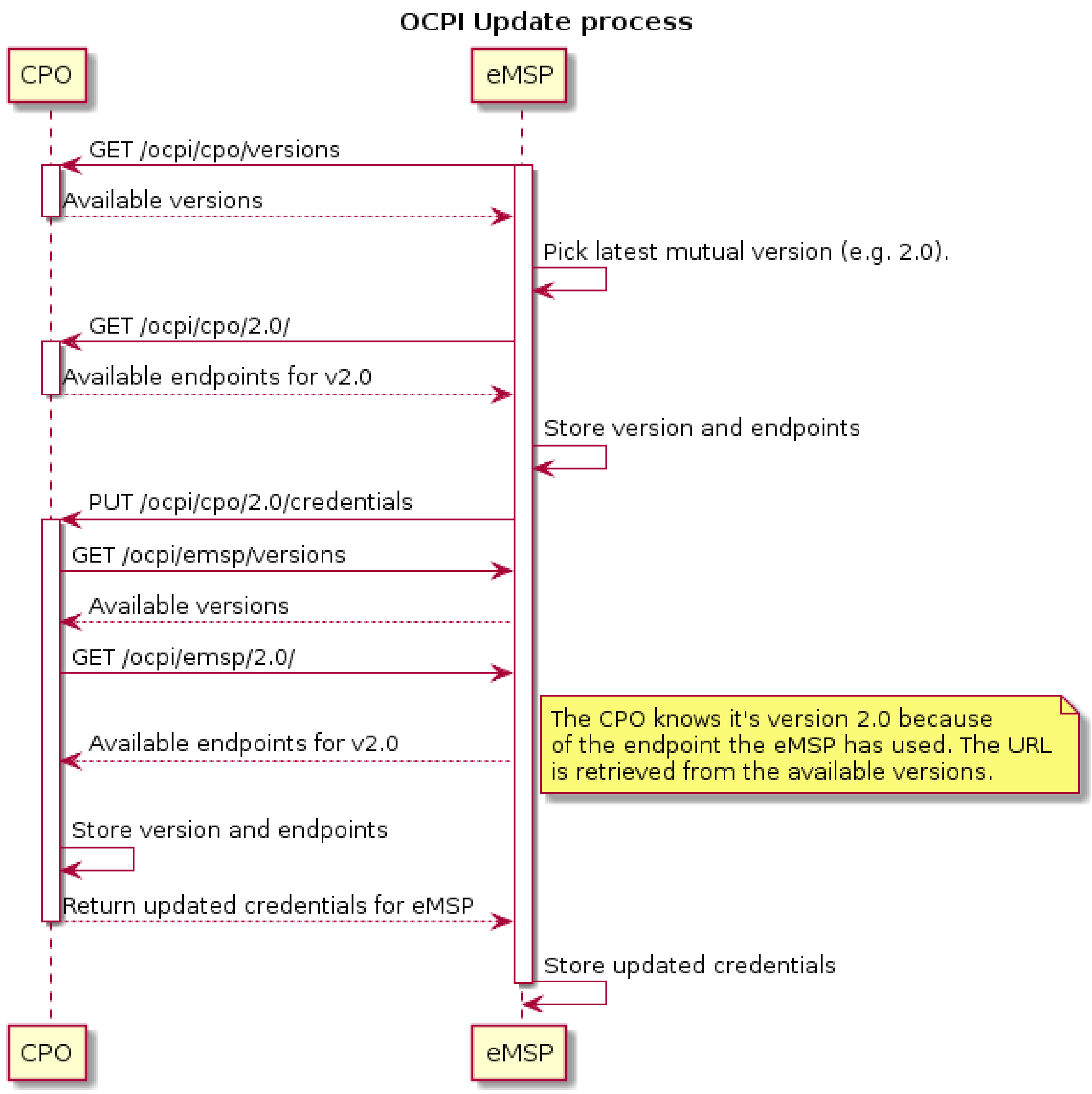
To register a CPO in an eMSP platform (or vice versa), the CPO must create a unique token that can be used for authenticating the eMSP. This token along with the versions endpoint should be sent to the eMSP in a secure way that is outside the scope of this protocol.
TOKEN_A is given offline. After registration, store the TOKEN_C which will be used in future exchanges.
(In the sequence diagrams below relative paths are used as short resource identifiers to illustrate a point; please note that they should be absolute URLs in any working implementation of OCPI)


OCPI Registration process
CPO
eMSP
Offline
Generate token: TOKEN_A
send information via e-mail (TOKEN_A, "https://company.com/ocpi/cpo/versions", ...)
OCPI
GET /ocpi/cpo/versions
The eMSP uses TOKEN_A as authentication to fetch information from the CPO.
Available versions
Pick latest mutual version (e.g. 2.0).
GET /ocpi/cpo/2.0/
Available endpoints for v2.0
Store version and endpoints
Generate token: TOKEN_B
POST /ocpi/cpo/2.0/credentials ("/ocpi/emsp/versions", TOKEN_B, ...)
GET /ocpi/emsp/versions
Available versions
GET /ocpi/emsp/2.0/
Available endpoints for v2.0
The CPO knows it's version 2.0 because of the endpoint the eMSP has used. The URL is retrieved from the available versions.
Store version and endpoints
Store TOKEN_B
Generate TOKEN_C
Credentials with TOKEN_C for eMSP
By returning new credentials for the eMSP, the initial setup token (TOKEN_A) has now become invalid.
Store updated credentials with TOKEN_C
CPO
eMSP

Due to its symmetric nature, the CPO and eMSP can be swapped in the registration sequence.

3.2 Updating procedure

The update process is provided in the sequence diagram below.


OCPI Update process
CPO
eMSP
GET /ocpi/cpo/versions
Available versions
Pick latest mutual version (e.g. 2.0).
GET /ocpi/cpo/2.0/
Available endpoints for v2.0
Store version and endpoints
PUT /ocpi/cpo/2.0/credentials
GET /ocpi/emsp/versions
Available versions
GET /ocpi/emsp/2.0/
Available endpoints for v2.0
The CPO knows it's version 2.0 because of the endpoint the eMSP has used. The URL is retrieved from the available versions.
Store version and endpoints
Return updated credentials for eMSP
Store updated credentials
CPO
eMSP

3.3 Changing endpoints for the current version

This can be done by following the update procedure for the same version. By sending a PUT request to the credentials endpoint of this version, the other party will fetch and store the corresponding set of endpoints.

3.4 Updating the credentials and resetting the token

The credentials (or parts thereof, such as the token) can be updated by sending the new credentials via a PUT request to the credentials endpoint of the current version, similar to the update procedure described above.

3.5 Errors during registration

When the Server connects back to the client during the credentials registration, it might encounter problems. When this happens, the Server should add the status code: 3001 in the response to the POST from the client.

3.6 Required endpoints not available

When two parties connect, it might happen that one of the parties expects a certain endpoint to be available at the other party.
For example, a CPO could only want to connect when the CDRs endpoint is available in an eMSP system.
In the case in which the client is starting the credentials exchange process and cannot find the endpoints it expects, it is expected NOT to send the POST request with credentials to the server. Log a message/notify the administrator to contact the administrator of the server system.
In the case in which the server, receiving the request from a client, cannot find the endpoints it expects, it is expected to respond to the request with a status code: 3003.

G. Locations Module

Module Identifier: `locations`

The Location objects live in the CPO back-end system. They describe the charging locations of that operator.
Module dependency: the eMSP endpoint is dependent on the Tariffs module.

1. Flow and lifecycle

The Locations module has Locations as base object. Locations have EVSEs; EVSEs have Connectors. With the methods in the eMSP interface, Location information/statuses can be shared with the eMSP. Updates can be done to the Location, but also to only an EVSE or a Connector.
When a CPO creates Location objects they push them to the eMSPs by calling PUT on the eMSPs Locations endpoint. Providers who do not support push mode need to call GET on the CPOs Locations endpoint to receive the new object.
If the CPO wants to replace a Location related object, they push it to the eMSP systems by calling PUT on their Locations endpoint.
Any changes to a Location related object can also be pushed to the eMSP by calling the PATCH on the eMSPs Locations endpoint. Providers who do not support push mode need to call GET on the CPOs Locations endpoint to receive the updates.
When the CPO wants to delete an EVSE they must update by setting the status field to REMOVED and call the PUT or PATCH on the eMSP system. A Location without valid EVSE objects can be considered as expired and should no longer be displayed. There is no direct way to delete a location.
When the CPO is not sure about the state or existence of a Location, EVSE or Connector object in the eMSPs system, the CPO can call the GET to validate the object in the eMSP system.

2. Interfaces and endpoints

There is both a CPO and an eMSP interface for Locations. It is advised is to use the push direction from CPO to eMSP during normal operation.
The CPO interface is meant to be used when the connection between two parties is established, to retrieve the current list of Location objects with the current status, and when the eMSP is not certain the Locations cache is completely correct.
The eMSP can use the CPO GET Object interface to retrieve a specific Location, EVSE or Connector. This might be used by a eMSP that wants information about a specific Location, but has not implemented the eMSP Locations interface (cannot receive push).

2.1 CPO Interface

Example endpoint structure: `/ocpi/cpo/2.0/locations`

Method	Description
GET	Fetch a list of locations, last updated between the {date_from} and {date_to}(paginated), or get a specific location, EVSE or Connector
POST	n/a
PUT	n/a
PATCH	n/a
DELETE	n/a

2.1.1 GET Method

Depending on the URL Segments provided, the GET request can either be used to retrieve information about a list of available locations and EVSEs at this CPO: GET List, or it can be used to get information about a specific Location, EVSE or Connector: GET Object

2.1.1.1 GET List Request Parameters

Example endpoint structures for retrieving a list of Locations:

```
/ocpi/cpo/2.0/locations/?date_from=xxx&date_to=yyy
/ocpi/cpo/2.0/locations/?offset=50
/ocpi/cpo/2.0/locations/?limit=100
/ocpi/cpo/2.0/locations/?offset=50&limit=100
```

If additional parameters: {date_from} and/or {date_to} are provided, only Locations with (last_updated) between the given date_from and date_to will be returned.
If an EVSE is updated, also the ‘parent’ Location’s last_updated fields is updated.
If a Connector is updated, the EVSE’s last_updated and the Location’s last_updated field are updated.
This request is paginated, it supports the pagination related URL parameters.

Parameter	Datatype	Required	Description
date_from	DateTime	no	Only return Locations that have last_updated after this Date/TIme
date_to	DateTime	no	Only return Locations that have last_updated before this Date/TIme
offset	int	no	The offset of the first object returned. Default is 0
limit	int	no	Maximum number of objects to GET

2.1.1.2 GET List Response Data

The endpoint returns a list of Location objects. The header will contain the pagination related headers.
Any older information that is not specified in the response is considered as no longer valid.
Each object must contain all required fields. Fields that are not specified may be considered as null values.

Type	Card.	Description
Location	*	List of all locations with valid EVSE

2.1.1.3 GET Object Request Parameters

Example endpoint structures for a specific Location, EVSE or Connector:

```
/ocpi/cpo/2.0/locations/{location_id}
/ocpi/cpo/2.0/locations/{location_id}/{evse_uid}
/ocpi/cpo/2.0/locations/{location_id}/{evse_uid}/{connector_id}
```

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
location_id	string(39)	yes	Location.id of the Location object to retrieve
evse_id	string(39)	no	EVSE.uid, required when requesting an EVSE or Connector object
connector_id	string(36)	no	Connector.id, required when requesting a Connector object

2.1.1.4 GET Object Response Data

The response contains the requested object.

Type (choice of one)	Card.	Description
Location	1	If a Location object was requested: the Location object
EVSE	1	If an EVSE object was requested: the EVSE object
Connector	1	If a Connector object was requested: the Connector object

2.2 eMSP Interface

Locations is a client owned object, so the end-points need to contain the required extra fields: {party_id} and {country_code}.
Example endpoint structures:

```
/ocpi/emsp/2.0/locations/{country_code}/{party_id}/{location_id}
/ocpi/emsp/2.0/locations/{country_code}/{party_id}/{location_id}/{e
vse_uid}
/ocpi/emsp/2.0/locations/{country_code}/{party_id}/{location_id}/{e
vse_uid}/{connector_id}
```

Method	Description
GET	Retrieve a Location as it is stored in the eMSP system.
POST	n/a (use PUT)
PUT	Push new/updated Location, EVSE, and/or Connectors to the eMSP
PATCH	Notify the eMSP of partial updates to a Location, EVSE, or Connector (such as status)
DELETE	n/a (use PATCH)

2.2.1 GET Method

If the CPO wants to check the status of a Location, EVSE or Connector object in the eMSP system, it might GET the object from the eMSP system for validation purposes. The CPO is the owner of the objects, so it would be illogical if the eMSP system had a different status of was missing an object. If a discrepancy is found, the CPO might push an update to the eMSP via a PUT or PATCH call.

2.2.1.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
location_id	string(15)	yes	Location.id of the Location object to retrieve
evse_uid	string(15)	no	EVSE.uid, required when requesting an EVSE or Connector object
connector_id	string(15)	no	Connector.id, required when a Connector object is send/replaced

2.2.1.2 Response Data

The response contains the requested object.

Type (choice of one)	Cardinality	Description
Location	1	If a Location object was requested: the Location object
EVSE	1	If an EVSE object was requested: the EVSE object
Connector	1	If a Connector object was requested: the Connector object

2.2.2 PUT Method

The CPO pushes available Location/EVSE or Connector objects to the eMSP. PUT is used to send new Location objects to the eMSP, or to replace existing Locations.

2.2.2.1 Request Parameters

This is an information push message; the objects pushed will not be owned by the eMSP. To make distinctions between objects being pushed to an eMSP from different CPOs, the {party_id} and {country_code} must be included in the URL as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
location_id	string(39)	yes	Location.id of the new Location object, or the Location of which an EVSE or Location object is send
evse_uid	string(39)	no	EVSE.uid, required when an EVSE or Connector object is send/replaced
connector_id	string(36)	no	Connector.id, required when a Connector object is send/replaced

2.2.2.2 Request Body

The request contains the new/updated object

Type (choice of one)	Cardinality	Description
Location	1	New Location object, or Location object to replace
EVSE	1	New EVSE object, or EVSE object to replace
Connector	1	New Connector object, or Connector object to replace

2.2.3 PATCH Method

Same as the PUT method, but only the fields/objects that have to be updated have to be present, other fields/objects that are not specified are considered unchanged.

2.2.3.1 Example: a simple status update

This is the most common type of update message to notify eMSPs that an EVSE (EVSE with uid 3255 of Charge Point 1012) is now occupied.

```
PATCH To URL: https://www.server.com/ocpi/emsp/2.0/locations/NL/TNM/1012/3255
{
   "status":  "CHARGING",
}
```

2.2.3.2 Example: change the location name

In this example the name of location 1012 is updated.

```
PATCH To URL:  https://www.server.com/ocpi/emsp/2.0/locations/NL/TNM/1012
{
   "name" :   "Interparking Gent Zuid",
}
```

2.2.3.3 Example: set tariff update

In this example connector 2 of EVSE 1 of Charge Point 1012, receives a new pricing scheme.

```
PATCH To URL:
https://www.server.com/ocpi/emsp/2.0/locations/NL/TNM/1012/3255/2
{
   "tariff_id" :   "15″
}
```

2.2.3.4 Example: add an EVSE

To add an EVSE, simply put the full object in an update message, including all its required fields. Since the id is new, the receiving party will know that it is a new object. When not all required fields are specified, the object may be discarded.

```
PUT To URL:  https://www.server.com/ocpi/emsp/2.0/locations/NL/TNM/1012/3256
{
   "uid": "3256",
   "evse_id":  "BE-BEC-E041503003",
   "status":  "AVAILABLE",
   "capabilities":  ["RESERVABLE"],
   "connectors": [
      {
         "id": "1",
         "standard":  "IEC_62196_T2",
         "format":  "SOCKET",
         "tariff_id": "14"
      }
   ],
   "physical_reference":  3,
   "floor": -1,
}
```

2.2.3.5 Example: delete an EVSE

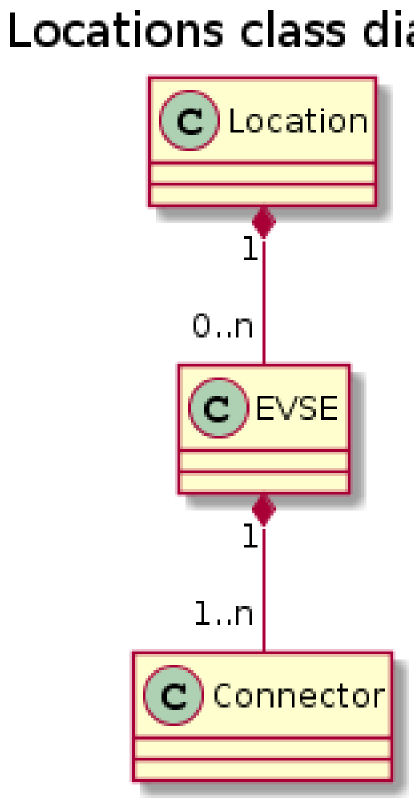
An EVSE can be deleted by updating its status property.

```
PATCH To URL: https://www.server.com/ocpi/emsp/2.0/locations/NL/TNM/1012/3256
{
   "status":  "REMOVED",
}
```

Note: To inform that an EVSE is scheduled for removal, the status_schedule field can be used.

3. Object description

Location, EVSE, and Connector have the following relationship:



3.1 Location Object

The Location object describes the location and its properties where a group of EVSE belonging together are installed. Typically the Location object is the exact location of the group of EVSE, but it can also be the entrance of a parking garage which contains the EVSE. The exact way to reach each EVSE can be further specified by its own properties.

Property	**Type**	**Cardinality**	**Description**
id	string(39)	1	Uniquely identifies the location within the CPO's platform (and suboperator platforms). This field can never be changed, modified, or renamed.
type	LocationType	1	The general type of the charge point location
name	string(255)	?	Display name of the location
address	string(45	1	Street/block name and house number if available
city	string(45)	1	City or town
postal_code	string(10)	1	Postal code of the location
country	string(3)	1	ISO 3166-1-alpha-3 code for the country of this location
coordinates	GeoLocation	1	Coordinates of the location
related_ locations	AdditionalGeo Locations	*	Geographical location of related points relevant to the user
evses	EVSE	*	List of EVSE that belong to this Location
directions	DisplayText	*	Human-readable directions on how to reach the location
operator	BusinessDetails	*	Information of the operator. When not specified, the information retrieved from the api_info endpoint should be used instead
suboperator	BusinessDetails	?	Information of the suboperator if available
owner	BusinessDetails	?	Owner information if available
facilities	Facility	*	Optional list of facilities to which this charge location belongs
time_zone	string(45)	?	One of IANA tzdata's TZ-values representing the time zone of the location (http://www.iana.org/time-zones)
opening_times	Hours	?	Times when EVSE at the location may be accessed for charging
charging_when_ closed	boolean	?	Indicates if the EVSE operate outside the open hours of the location (e.g. charging during garage closure); default: true
images	Image	*	Links to images related to the location such as photos or logos
energy_mix	EnergyMix	?	Details on the energy supplied at this location
last_updates	DateTime	1	Timestamp when this Location or one of its EVSE or Connectors was last updated or created

3.1.1 Example

```
{
   "id":  "LOC1",
   "type":  "ON_STREET",
   "name":  "Gent  Zuid",
   "address":  "F.Rooseveltlaan  3A",
   "city":  "Gent",
   "postal_code": "9000",
   "country":  "BEL",
   "coordinates": {
      "latitude": "51.04759",
      "longitude": "3.72994"
   },
   "evses": [{
      "uid": "3256",
      "id":  "BE-BEC-E041503001",
      "status":  "AVAILABLE",
      "status_schedule": [],
      "capabilities": [
         "RESERVABLE"
      ],
      "connectors": [{
         "id": "1",
         "status":  "AVAILABLE",
         "standard":  "IEC_62196_T2",
         "format":  "CABLE",
         "power_type":  "AC_3_PHASE",
         "voltage":  220,
         "amperage":  16,
         "tariff_id": "11"
         "last updated":  "2015-03-16T10:10:02Z"
      }, {
         "id": "2",
         "status":  "AVAILABLE",
         "standard":  "IEC_62196_T2",
         "format":  "SOCKET",
         "power_type":  "AC_3_PHASE",
         "voltage":  220,
         "amperage":  16,
         "tariff_id": "11"
         "last updated":  "2015-03-18T08:12:01Z"
      }],
      "physical_reference": "1"
      "floor_level": "-1"
      "last updated":  "2015-06-28T08:12:01Z"
   }, {
      "uid": "3257",
      "id": "BE-BEC-E041503002",
      "status": "IEC62196_T2",
      "capabilities": [
         "RESERVABLE"
      ]
      "connectors": [{
         "id": "1",
         "status":  "RESERVED",
         "standard":  "IEC_62196_T2",
         "format":  "SOCKET",
         "power_type":  "AC_3_PHASE",
         "voltage":  220,
         "amperage":  16,
         "tariff_id": "12"
      }],
      "physical_reference": "2"
      "floor_level": "-2"
      "last updated":  "2015-06-29T20:39:09Z"
   }],
   "operator": {
      "name": "BeCharged"
   }'

   "last updated":  "2015-06-29T20:39:09Z"
}
```

3.2 *EVSE* Object

The *EVSE* object describes the part that controls the power supply to a single EV in a single session. It always belongs to a *Location* object. It will only contain directions to get from the location to the EVSE (i.e. *floor*, *physical_reference* or *directions*). When these properties are insufficient to reach the EVSE from the *Location* point, then it typically indicates that this EVSE should be put in a different *Location* object (sometimes with the same address but with different coordinates/directions).
An *EVSE* object has a list of connectors which cannot be used simultaneously: only one connector per EVSE can be used at a time.

Property	**Type**	**Cardinality**	**Description**
uid	string(39)	1	Uniquely identifies the EVSE within the CPO's platform (and suboperator platforms). This field can never be changed, modified, or renamed.
evse_id	String(48)	?	Compliant with the following specification for EVSE ID from "eMI3 standard version V1.0" (http://emi3group.com/documents-links/) "Part 2: business objects."
status	Status	1	Indicates the current status of the EVSE
status_schedule	StatusSchedule	*	Indicates a planned status in the future of the EVSE
capabilities	Capability	*	List of functionalities of which the EVSE is capable
connectors	Connector	+	List of available connectors on the EVSE
floor_level	String(4)	?	Level on which the charging station is located (in garages) in the locally displayed numbering scheme
coordinates	GeoLocations	?	Coordinates of the EVSE
physical_reference	String(16)	?	A number/string printed on the outside of the EVSE for visual identification
directions	DisplayText	*	Human-readable directions on how to reach the location
parking_restrictions	ParkingRestriction	*	The restrictions that apply to the parking spot
images	Image	*	Links to images related to the EVSE such as photos or logos
last_updates	DateTime	1	Timestamp when this EVSE or one of its Connectors was last updated or created

3.3 *Connector* Object

A connector is the socket or cable available for the EV to use. A single EVSE may provide multiple connectors but only one of them can be in use at the same time. A connector always belongs to an *EVSE* object.

Property	**Type**	**Cardinality**	**Description**
Id	string(36)	1	Identifier of the connector within the EVSE. Two connectors may have the same id as long as they do not belong to the same *EVSE* object
standard	ConnectorType	1	The standard of the installed connector
format	ConnectionFormat	1	The format (socket/cable) of the installed connector
power_type	PowerType	1	
voltage	int	1	Voltage of the connector (line to neutral for AC_3_PHASE), in volt(V)
amperage	int	1	Maximum amperage of the connector, in ampere (A)
tariff_id	string(36)	?	Identifier of the current charging tariff structure. For a “Free of Charge” tariff this field should be set, and point to a defined “Free of Charge” tariff.
terms_and_conditions	URL	?	URL to the operator’s terms and conditions
last_updates	DateTime	1	Timestamp when theConnector was last updated or created

4. Data types

4.1 AdditionalGeoLocation *class*

This class defines a geo location. The geodetic system to be used is WGS 84.

Property	**Type**	**Cardinality**	**Description**
latitude	string(10)	1	Latitude of the point in decimal degree. Example: 50.770774. Decimal separator: “.” Regex: -?[0-9{1,2}\.[0-9]{6}
longitude	string(11)	1	Longitude of the point in decimal degree. Example: -126.104065. Decimal separator: “.” Regex: -?[0-9{1,3}\.[0-9]{6}
name	DisplayText	?	Name of the point in local language or as written at the location (e.g. street name, parking lot entrance)

4.2 BusinessDetails *class*

Property	**Type**	**Cardinality**	**Description**
name	string(100)	1	Name of the operator
website	URL	?	Link to the operator’s website
logo	Image	?	Image link to the operator’s logo

4.3 Capability *enum*

The capabilities of an EVSE.

Value	**Description**
CHARGING_PROFILE_CAPABLE	The EVSE supports charging profiles (sending charging profiles is not yet supported by OCPI)
CREDIT_CARD_PAYABLE	Charging at this EVSE may be paid with a credit card
REMOTE_START_STOP_CAPABLE	The EVSE can remotely be started/stopped
RESERVABLE	The EVSE can be reserved
RFID_READER	Charging at this EVSEcan be authorized with a RFID token
UNLOCK_CAPABLE	Connectors have a mechanical lock nay can be unlocked by a request

4.4 ConnectorFormat *enum*

The format of the connector, whether it is a socket or a plug.

VALUE	**DESCRIPTION**
SOCKET	The connector is a socket; the user must provide a fitting plug
CABLE	The connector is a cable; the user’s car must have a fitting inlet

4.5 ConnectorType *enum*

The socket or plug standard of the charging point

Value	Description
CHADEMO	The connector type is CHAdeMO, DC
DOMESTIC_A	Standard/Domestic household, type “A”, NEMA 1-15, 2 pins
DOMESTIC_B	Standard/Domestic household, type “B”, NEMA 5-15, 3 pins
DOMESTIC_C	Standard/Domestic household, type “C”, CEE 7/17, 2 pins
DOMESTIC_D	Standard/Domestic household, type “D”, 3 pin
DOMESTIC_E	Standard/Domestic household, type “E”, CEE 7/5 3 pins
DOMESTIC_F	Standard/Domestic household, type “F”, CEE 7/4, Schuko, 3 pins
DOMESTIC_G	Standard/Domestic household, type “G”, BS 1363, Commonwealth, 3 pins
DOMESTIC_H	Standard/Domestic household, type “H”, SI-32, 3 pins
DOMESTIC_I	Standard/Domestic household, type “I”, AS 3112, 3 pins
DOMESTIC_J	Standard/Domestic household, type “J”, SEV 1011, 3 pins
DOMESTIC_K	Standard/Domestic household, type “K”, DS 60884-2-D1, 3 pins
DOMESTIC_L	Standard/Domestic household, type “L”, CEI 23-16-VII, 3 pins
IEC_60309_2_single_16	6IEC 60309-2 Industrial Connector single phase 16 Amperes (usually blue)
IEC_60309_2_three_16	IEC 60309-2 Industrial Connector three phase 16 Amperes (usually red)
IEC_60309_2_three_32	IEC 60309-2 Industrial Connector three phase 32 Amperes (usually red)
IEC_60309_2_three_64	IEC 60309-2 Industrial Connector three phase 64 Amperes (usually red)
IEC_62196_T1	IEC 62196 Type 1 “SAE J1772”
IEC_62196_T1_COMBO	Combo Type 1 based, DC
IEC_62196_T2	IEC 62196 Type 2 “Mennekes”
IEC_62196_T2_COMBO	Combo Type 2 based, DC
IEC_62196_T3A	IEC 62196 Type 3A
IEC_62196_T3C	IEC 62196 Type 3C “Scame”

4.6 EnergyMix *class*

This type is used to specify the energy mix and environmental impact of the supplied energy at a location or in a tariff.

Property	**Type**	**Cardinality**	**Description**
is_green_energy	boolean	1	True if 100% from regenerative sources
energy_sources	EnergySource	*	Key-value pairs (enum + percentage) of energy sources of this location's tariff
environ_impact	EnvironmentalImpact	*	Key-value pairs (enum + percentage) of nuclear waste and CO2 exhaust of this location's tariff
supplier_name	string(64)	?	Name of the energy supplier, delivering the energy for this location or tariff*
energy_product_name	string(64)	?	Name of the energy suppliers product/tariff plan used at this location*

* These fields can be used to look up energy qualification

4.6.1 Examples

4.6.1.1 Simple

```
"energy_mix": {
      "is_green_energy": true
      }
```

4.6.1.2 Tariff name based

```
"energy_mix": {
   "is_green_energy":   true,
   "supplier_name":     "Greenpeace  Energy  eG",
   "energy_product_name":  "eco-power"
   }
```

4.6.1.3 Complete

```
"energy_mix": {
   "is_green_energy": false,
   "energy_sources": [
         {  "source":  "GENERAL_GREEN",   "percentage":  35.9  },
         {  "source":  "GAS", "percentage":  6.3      },
         {  "source":  "COAL",      "percentage":  33.2  },
         {  "source":  "GENERAL_FOSSIL",  "percentage":  2.9,  },
         {  "source":  "NUCLEAR",   "percentage":  21.7  }
      ],
   "environ_impact": [
         {  "source":  "NUCLEAR_WASTE",   "amount":  0.00006,  },
         {  "source":  "CARBON_DIOXIDE",  "amount":  372,   }
      ],
      "supplier_name":  "E.ON Energy Deutschland",
      "energy_product_name":  "E.ON  DirektStrom  eco"
      }
```

4.7 EnergySource *class*

Key-value pairs (enum + percentage) of energy sources. All given values should add up to 100 percent per category.

Property	Type	Cardinality	Description
source	EnergySourceCategory	1	The type of energy source
percentage	number	1	Percentage of this source (0-100) in the mix

4.8 EnergySourceCategory *enum*

Categories of energy sources

Value	Description
SOLAR	Regenerative power from photovotaic
WIND	Regenerative power from wind turbines
WATER	Regenerative power from water turbines
GENERAL_GREEN	All kinds of regenerative power sources
GAS	Fossil power from gas
NUCLEAR	Nuclear power sources
GENERAL_FOSSIL	All kinds of fossil power sources
COAL	Fossil power from coal

4.9 EnvironmentalImpact *class*

Key-value pairs (enum + amount) of waste and carbon dioxide emission per kWh

Property	Type	Cardinality	Description
source	EnvironmentalImpactCategory	1	The category of this value
amount	number	1	Amount of this portion in g/kWh

4.10 EnvironmentalImpactCategory *enum*

Categories of environmental impact values

Value	Description
NUCLEAR_WASTE	Produced nuclear waste in g/kWh
CARBON_DIOXIDE	Exhausted carbon dioxide in g/kWh

4.11 EnvironmentalPeriod *class*

Specifies one exceptional period for opening or access hours

Property	Type	Cardinality	Description
period_name	DateTime	1	Beginning of the exception
period_end	DateTime	1	End of the exception

4.12 Facility *enum*

Value	Description
HOTEL	A hotel
RESTAURANT	A restaurant
CAFE	A café
MALL	A mall or shopping center
SUPERMARKET	A supermarket
SPORT	Sports facilities
RECREATION AREA	A recreation area
NATURE	Located in, or close to, a park or nature reserve
MUSEUM	A museum
BUS_STOP	A bus stop
TAXI_STAND	A taxi stand
TRAIN_STATION	A train station
AIRPORT	An airport
CARPOOL_PARKING	Carpool parking
FUEL_STATION	A fuel station
WIFI	Wifi or other type of internet available

4.13 GeoLocation *class*

Property	Type	Cardinality	Description
latitude	string(10)	1	Latitude of the point in decimal degree. Example: 50.770774. Decimal separator: "." Regex: -?[0-9{1,2}\.[0-9]{6}
longitude	string(11)	1	Longitude of the point in decimal degree. Example: -126.104065. Decimal separator: "." Regex: -?[0-9{1,3}\.[0-9]{6}

4.14 Hours *class*

Opening and access hours of the location.

Field Name (one of two)	**Field Type**	**Cardinality**	**Description**
>regular_hours	RegularHours	*	Regular hours, weekday based. Should not be set for representing 24/7 as this is the most common case.
>twentyfourseven	boolean	1	True to represent 24 hours a day and 7 days a week, except for the given exceptions.
exceptional_openings	ExceptionalPeriod	*	Exceptions for specific calendar dates, time-range based. Periods the station is operating/accessible. Additional to regular hours. May overlap regular rules.
Exceptional_closings	ExceptionalPeriod	*	Exceptions for specific calendar dates, time-range based. Periods the station is not operating/accessible. Overwriting regularHours and exceptionalOpenings. Should not overlap exceptionalOpenings.

4.15 Image *class*

This class references images related to a EVSE in terms of a file name or url. According to the roaming connection between one EVSE Operator and one or more Navigation Service Providers the hosting or file exchange of image payload data has to be defined. The exchange of this content data is out of scope of OCHP. However, the recommended setup is a public available web server hosted and updated by the EVSE Operator. Per charge point an unlimited number of images of each type is allowed. Recommended are at least two images where one is a network or provider logo and the second is a station photo. If two images of the same type are defined they should be displayed additionally, not optionally.

Photo Dimensions:
The recommended dimensions for all photos is a minimum of 800 pixels wide and 600 pixels height. Thumbnail representations for photos should always have the same orientation as the original with a size of 200 to 200 pixels.

Logo Dimensions:
The recommended dimensions for logos are exactly 512 pixels wide and 512 pixels height. Thumbnail representations for logos should be exactly 128 pixels in width and height. If not squared, thumbnails should have the same orientation as the original.

Field Name	**Field Type**	**Cardinality**	**Description**
url	URL	1	URL from where the image can be fetched through a web browser
thumbnail	URL	?	URL from where a thumbnail of the image can be fetched through a web browser
category	ImageCategory	1	Describes for what the image is used
type	string(4)	1	Image type like gif, jpeg, png
width	int(5)	?	Width of the full scale image
height	int(5)	?	Height of the full scale image

4.16 ImageCategory *enum*

The category of an image to obtain the correct usage in a user presentation. The category has to be set accordingly to the image content in order to guarantee the right usage.

Value	**Description**
CHARGER	Photo of the physical device that contains one or more EVSEs
ENTRANCE	Location entrance photo. Should show the car entrance to the location from street side
LOCATION	Location overview photo
NETWORK	Logo of an associated roaming network to be displayed with the EVSE for example in lists, maps and detailed information view
OPERATOR	Logo of the charge points operator, for example a municipality, to be displayed with the EVSEs detailed information view or in lists and maps, if no networkLogo is present
OTHER	Other
OWNER	Logo of the charge points owner, for example a local store, to be displayed with the EVSEs detailed information view

4.17 LocationType *enum*

Reflects the general type of the charge point’s location. May be used for user information.

Value	Description
ON_STREET	Parking in public space
PARKING_GARAGE	Multistory car park
UNDERGROUND_GARAGE	Multistory cark park, mainly underground
PARKING_LOT	A cleared area intended for parking vehicles, i.e. at stores and restaurants
OTHER	None of the given possibilities
UNKNOWN	Parking location type is not known by the operator (default)

4.18 ParkingRestriction *enum*

This value, if provided, represents the restriction to the parking spot for different purposes.

Value	Description
EV_ONLY	Reserved parking spot for electric vehicles
PLUGGED	Parking is only allowed while plugged in (charging)
DISABLED	Reserved parking spot for disabled people with valid ID
CUSTOMERS	Parking spot for customers/guests only, for example in case of a hotel or shop
MOTORCYCLES	Parking spot only suitable for (electric) motorcycles or scooters

4.19 PowerType *enum*

The format of the connector, whether it is a socket or a plug.

Value	Description
AC_1_PHASE	AC mono phase
AC_3_PHASE	AC 3 phase
DC	Direct Current

4.20 RegularHours *class*

Regular recurring operation or access hours

Field Name	Field Type	Cardinality	Description
weekday	int(1)	1	Number of day in the week, from Monday (1) till Sunday (7)
period_begin	string(5)	1	Begin of the regular period given in hours and minutes. Must be in 24h format with leading zeros. Example: “18:15”. Hour/Minute separator: “:” Regex: [0-2][0-9]:[0-5][0-9]
period_end	string(5)	1	End of the regular period, syntax as fpr period_begin. Must be later than period_begin.

4.20.1 Example

Operating on weekdays from 8am till 8pm with one exceptional opening on 22/6/2014 and one exceptional closing the Monday after:

```
"opening_times": {
   "regular_hours": [
      {
         "weekday":  1,
         "period_begin": "08:00",
         "period_end": "20:00"
      },
      {
         "weekday":  2,
         "period_begin": "08:00",
         "period_end": "20:00"
      },
      {
         "weekday":  3,
         "period_begin": "08:00",
         "period_end": "20:00"
      },
      {
         "weekday":  4,
         "period_begin": "08:00",
         "period_end": "20:00"
      },
      {
         "weekday":  5,
         "period_begin": "08:00",
         "period_end": "20:00"
      }
   ],
   "twentyfourseven": false,
   "exceptional_openings": [
      {
         "period_begin": "2014-06-21T09:00:00+02:00",
         "period_end": "2014-06-21T12:00:00+02:00"
      }
   ],
   "exceptional_closings": [
      {
         "period_begin": "2014-06-24T00:00:00+02:00",
         "period_end": "2014-06-25T00:00:00+02:00"
      }
   ]
}
```

This represents the following schedule, where ~~striked~~ days are without operation hours, **bold** days are where exceptions apply, and regular displayed days are where the regular schedule applies.

Weekday	Mo	Tu	We	Th	Fr	Sa	Su	Mo	Tu	We	Th	Fr	Sa	Su
Date	16	17	18	19	20	**21**	~~22~~	23	**~~24~~**	25	26	27	~~28~~	~~29~~
Open from	08	08	08	08	08	09	-	08	-	08	08	08	-	-
Open until	20	20	20	20	20	12	-	20	-	20	20	20	-	-

4.21 Status *enum*

The statue of an EVSE

Value	Description
AVAILABLE	The EVSE/Connector is able to start a new charging session
BLOCKED	The EVSE/Connector is not accessible because of a physical barrier, i.e. a car
CHARGING	The EVSE/Connector is in use
INOPERATIVE	The EVSE/Connector is not yet active or it is no longer available (deleted)
OUTOFORDER	The EVSE/Connector is currently out of order
PLANNED	The EVSE/Connector is planned, will be operating soon
REMOVED	The EVSE/Connector/charge point is discontinued/removed
RESERVED	The EVSE/Connector is reserved for a particular EV driver and is unavailable for other drivers
UNKNOWN	No status information available. (Also used when offline)

4.22 StatusSchedule *class*

This type is used to schedule status periods in the future. The eMSP can provide this information to the EV user for trip planning purpose. A period MAY have no end. Example: "This station will be running as of tomorrow. Today it is still planned and under construction."

Property	**Type**	**Cardinality**	**Description**
period_begin	DateTime	1	Begin of the scheduled period
period_end	DateTime	?	End of the scheduled period, if known
status	Status	1	Status value during the scheduled period

Note that the scheduled status is purely informational. When the status actually changes, the CPO must push an update to the EVSE's status field itself.

H. Sessions module

Module Identifier: `sessions`

The Session object describes one charging session.
The Session object is owned by the CPO back-end system, and can be GET from the CPO system, or pushed by the CPO to another system.

1. Flow and Lifecycle

1.1 Push model

When the CPO creates a Session object they push it to the eMSPs by calling PUT on the eMSP's Sessions endpoint with the newly created Session object.
Any changes to a Session in the CPO system are sent to the eMSP system by calling PATCH on the eMSP's Sessions endpoint with the updated Session object.
Sessions cannot be deleted, final status of a session is: COMPLETED.
When the CPO is not sure about the state or existence of a Session object in the eMSP's system, the CPO can call the GET to validate the Session object in the eMSP system.

1.2 Pull model

eMSPs who do not support the push model need to call GET on the CPO's Sessions endpoint to receive a list of Sessions.
This GET can also be used, combined with the Push model to retrieve Sessions after the system (re)connects to a CPO, to get a list Sessions 'missed' during a time offline.

2. Interfaces and endpoints

2.1 CPO Interface

Example endpoint structure: `/ocpi/cpo/2.0/sessions/?date_from=xxx&date_to=yyy`

Method	Description
GET	Fetch Session objects of charging sessions last updated between the {date_from} and {date_to} (paginated)
POST	n/a
PUT	n/a
PATCH	n/a
DELETE	n/a

2.1.1 GET Method

Fetch Sessions from the CPO systems

2.1.1.1 Request Parameters

Only Sessions with last_update between the given {date_from} and {date_to} will be returned.
This request is paginated, so it also supports the pagination related URL parameters.

Parameter	Datatype	Required	Description
date_from	DateTime	yes	Only return Sessions that have last_updated after this Date/Time
date_to	DateTime	no	Only return Sessions that have last_updated before this Date/Time
offset	int	no	The offset of the first object returned. Default is 0
limit	int	no	Maximum number of objects to GET

2.1.1.2 Response Data

The response contains a list of Session objects that match the given parameters in the request, the header will contain the pagination related headers.
Any older information that is not specified in the response is considered as no longer valid.
Each object must contain all required fields. Fields that are not specified may be considered as null values.

Datatype	Cardinality	Description
Session	*	List of Session objects that match the request parameters

2.2 eMSP Interface

Sessions is a client owned object, so the end-points need to contain the required extra fields: {party_id} and {country_code}.
Example endpoint structure:
`/ocpi/emsp/2.0/sessions/{country_code}/{party_id}/{session_id}`

Method	Description
GET	Get the Session object from the eMSP system by its id {session_id}
POST	n/a
PUT	Send a new/updated Session object
PATCH	Send the Session object of id {session_id}
DELETE	n/a

2.2.1 GET Method

The CPO system might request the current version of a Session object from the eMSP system for validation purposes, or the CPO system might have received an error on a PATCH.

2.2.1.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this GET to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this GET to the eMSP system
session_id	string(36)	yes	id of the Session object to get from the eMSP system

2.2.1.2 Response Data

The response contains the request Session object, if available.

Datatype	Cardinality	Description
Session	1	Session object requested

2.2.2 PUT Method

Inform the system about a new/updated session in the eMSP backoffice by PUTing a Session object.

2.2.2.1 Request Body

The request contains the new or updated Session object.

Datatype	Cardinality	Description
Session	1	New Session object

2.2.2.2 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
session_id	string(36)	yes	id of the new or updated Session object

2.2.3 PATCH Method

Same as the PUT method, but only the fields/objects that have to be updated have to be present, other fields/objects that are not specified are considered unchanged.

2.2.3.1 Example: update the total cost

```
PATCH   To   URL: https://www.server.com/ocpi/cpo/2.0/sessions/NL/TNM/101
{
      "total_cost": "0.60"
}
```

3. Object description

3.1 *Session* Object

Property	Type	Cardinality	Description
id	string(36)	1	The unique id that identifies the session in the CPO platform
start_datetine	DateTime	1	The time when the session became active
end_datetime	DateTime	?	The time when the session is completed
kwh	number	1	How many kWh are charged
auth_id	string(36)	1	Reference to a token, identified by the auth_id field of the Token
auth_method	AuthMethod	1	Method used for authentication
location	Location	1	The location where this session took place, including only the relevant EVSE and connector
meter_id	string(255)	?	Optional identification of the kWh meter
currency	string(3)	1	ISO 4217 code of the currency used for this session
charging_periods	ChargingPeriod	*	An optional list of charging periods that can be used to calculate and verify the total cost
total_cost	Number	?	The total cost (excluding VAT) of the session in the specified currency. This is the price that the eMSP will have to pay to the CPO. A total_cost of 0.00 means free of charge. When omitted, no price information is geven in the Session object, but it may not mean the session is free of charge
status	SessionStatus	1	The status of the session
last_updated	DateTime	1	Timestamp when this Session was last updated or created

3.3.3 Examples

3.1.2 Simple Session

Example of a starting session

```
{
   "id": "101",
   "start_datetime": "2015-06-29T22:39:09+02:00",
   "kwh":  "0.00",
   "auth_id":  "FA54320",
   "location": {
      "id":  "LOC1",
      "type": "on_street",
      "name":  "Gent  Zuid",
      "address":  "F.Rooseveltlaan  3A",
      "city":  "Gent",
      "postal_code": "9000",
      "country": "BE",
      "coordinates": {
         "latitude": "3.72994",
         "longitude": "51.04759"
      },
      "evse": {
         "uid": "3256",
         "evse_id":  "BE-BEC-E041503003",
         "STATUS":  "AVAILABLE",
         "connectors": [{
            "id": "1",
            "standard":  "IEC_62196_T2",
            "format":  "SOCKET",
            "power_type":  "AC_1_PHASE",
            "voltage":   "230",
            "amperage":  "64",
            "tariff_id": "11"
            "last_updated": "2015-06-29T22:39:09Z"
         }]
         "last_updated": "2015-06-29T22:39:09Z"
      }]
      "last_updated": "2015-06-29T22:39:09Z"
   },
   "currency":  "EUR",
   "total_cost": "2.50",
   "status": "PENDING"
   "last_updated": "2015-06-29T22:39:09Z"
}
```

3.1.2.1 Simple Session example of a short finished session

```
{
   "id": "101",
   "start_datetime": "2015-06-29T22:39:09+02:00",
   "end_datetime": "2015-06-29T23:50:16+02:00",
   "kwh":  "0.00",
   "auth_id":  "FA54320",
   "location": {
      "id":  "LOC1",
      "type": "on_street",
      "name":  "Gent  Zuid",
      "address":  "F.Rooseveltlaan  3A",
      "city":  "Gent",
      "postal_code": "9000",
      "country": "BE",
      "coordinates": {
         "latitude": "3.72994",
         "longitude": "51.04759"
      },
      "evse": [{
         "uid": "3256",
         "evse_id":  "BE-BEC-E041503003",
         "STATUS":  "AVAILABLE",
         "connectors": [{
            "id": "1",
            "standard":  "IEC_62196_T2",
            "format":  "SOCKET",
            "power_type":  "AC_1_PHASE",
            "voltage":   "230",
            "amperage":  "64",
            "tariff_id": "11"
            "last_updated": "2015-06-29T23:09:10Z"
         }]
         "last_updated": "2015-06-29T23:09:10Z"
      }]
      "last_updated": "2015-06-29T23:09:10Z"
   },
   "currency":  "EUR",
   "charging_periods": [{
      "start_date_time": "2015-06-29T22:39:09+02:00",
      "dimensions": [{
         "type":  "ENERGY",
         "volume":  120
      }, {
         "type":  "MAX_CURRENT",
         "volume":  30
      }]
   }, {
      "start_date_time": "2015-06-29T22:40:54+02:00",
      "dimensions": [{
         "type": "energy",
         "volume":  41000
      }, {
         "type":  "MIN_CURRENT",
         "volume":  34
      }]
   }, {
      "start_date_time": "2015-06-29T23:07:09Z",
      "dimensions": [{
         "type": "PARKING_TIME",
         "volume":  0.718
      }]
   }],
   "total_cost": 8.50,
   "status": "COMPLETED",
   "last_updated": "2015-06-29T23:09:10Z"
}
```

4. Data types

Describe all datatypes used in this *object*

4.1 SessionStatus *enum*

Property	Description
ACTIVE	The session is accepted and active. Al pre-condition are met: Communication between EV and EVSE; EV or Driver is authorized. EV is being charged, or can be charged. Energy is, or is not, being transferred.
COMPLETED	The session is finished successfully. Nomore modifications will be made to this session.
INVALID	The session is declared invalid and will not be billed.
PENDING	The session is pending and has not yet started. This is the initial state.

I. *CDRs* module

Module Identifier: cdrs

A Charge Detail Record is the description of a concluded charging session. The CDR is the only billing-relevant object.
CDRs are sent from the CPO to the eMSP after the charging session has ended. There is no requirement to send CDRs semi-realtime, however it is seen as good practice to send them as soon as possible. If there is an agreement between parties to send them for example once a month, that is also allowed by OCPI.

1. Flow and Lifecycle

CDRs are created by the CPO. They probably only will be sent to the eMSP that will be paying the bill of a charging session. Because a CDR is for billing purposes, it cannot be changed/replaced, once sent to the eMSP, changes are not allowed in a CDR.

1.1 Push model

When the CPO creates CDR(s), they push them to the relevant eMSP by calling POST on the eMSP’s CDRs endpoint with the newly created CDR(s).
CDRs should contain enough information (dimensions) to allow the eMSP to validate the total costs. It is advised to send enough information to the eMSP so it can calculate its own costs for billing their customer. An eMSP might have a very different contract/pricing model with the EV driver than the tariff structure from the CPO.
NOTE: CDRs cannot be updated or removed.
If the CPO, for any reason wants to view a CDR it has posted to a eMSP system, the CPO can retrieve the CDR by calling the GET on the eMSP’s CDRs endpoint at the URL returned in the response to the POST.

1.2 Pull model

eMSPs who do not support the push model need to call GET on the CPO’s CDRs endpoint to receive a list of CDRs.

This GET can also be used, combined with the Push model to retrieve CDRs, after the system (re)connects to a CPO, to get a list of CDRs missed during a time offline.

2. Interfaces and endpoints

There is both a CPO and an eMSP interface for CDRs. Depending on business requirements parties can decide to use the CPO Interface/Get model, the eMSP Interface/Push model, or both.
Push is the preferred model to use; the eMSP will receive CDRs when created by the CPO.

2.1 CPO Interface

The CDRs endpoint can be used to create or retrieve CDRs.
Example endpoint structure: `/ocpi/cpo/2.0/cdrs/?date_from=xxx&date_to=yyy`

Method	Description
GET	Fetch CDRs, last updated between the {date_from} and {date_to} (paginated)
POST	n/a
PUT	n/a
PATCH	n/a
DELETE	n/a

2.2.1 GET Method

Fetch CDRs from the CPO systems.

2.1.1.1 Request Parameters

If additional parameters: {date_from} and/or {date_to} are provided, only CDRs with last_updated between the given date_from and date_to will be returned.
This request is paginated, it supports the pagination related URL parameters.

Parameter	Datatype	Required	Description
date_from	DateTime	no	Only return CDRs that have last_updated after this Date/Time
date_to	DateTime	no	Only return CDRs that have last_updated before this Date/Time
offset	int	no	The offset of the first object is returned. Default is 0
limit	int	no	Maximum number of objects to GET

2.1.1.2 Response Data

The endpoint returns a list of CDRs matching the given parameters in the GET request; the header will contain the pagination related headers.
Any older information that is not specified in the response is considered as no longer valid.
Each object must contain all required fields. Fields that are not specified may be considered as null values.

Datatype	Cardinality	Description
CDR	*	List of CDRs

2.2 eMSP Interface

The CDRs endpoint can be used to create, or get CDRs.
Example endpoint structure: `/ocpi/emsp/2.0/cdrs`

Method	Description
GET	Retrieve an existing CDR
POST	Send a new CDR
PUT	n/a (CDRs cannot be replaced)
PATCH	n/a (CDRs cannot be updated)
DELETE	n/a (CDRs cannot be removed)

2.2.1 GET Method

Fetch CDRs from the eMSP system.

2.2.1.1 Response URL

To retrieve an existing URL from the eMSP system, the URL, returned in the response to a POST of a new CDR, must be used.

2.2.1.2 Response Data

The endpoint returns the requested CDR, if it exists

Datatype	Cardinality	Description
CDR	1	Requested CDR object

2.2.2 POST Method

Creates a new CDR.
The post method should contain the full, final CDR object.

2.2.2.1 Request Body

In the post request the new CDR object is sent.

Datatype	Cardinality	Description
CDR	1	New CDR object

2.2.2.2 Response Headers

The response should contain the URL to the just created CDR object in the eMSP system.

Parameter	Datatype	Required	Description
Location	URL	yes	URL to the newly created CDR in the eMSP system, can be used by the CPO system to dpo a GET on the same CDR

3. Object description

3.1 *CDR* Object

The *CDR* object describes the Charging Session and its costs.

Property	Type	Cardinality	Description
id	string(36)	1	Uniquely identifies the CDR within the CPO's platform (and suboperator platforms)
start_date_time	DateTime	1	Start timestamp of the charging session
stop_date_time	DateTime	1	Stop timestamp of the charging session
auth_id	string(36)	1	Reference to a token, identified by the auth_id field of the token
auth_method	AuthMethod	1	Method used for authentication
location	Location	1	Location where the charging session took place, including only the relevant EVSE and Connector
meter_id	string(255)	?	Identification of the meter inside the charge point
currency	string(3)	1	Currency of the CDR in ISO 44217 Code
tariffs	Tariff	*	List of relevant tariff elements. When relevant, a "free of charge" tariff should also be in this list
charging_periods	ChargingPeriod	+	Lisst of charging periods that make up this charging session. A session consists of one or more periods, where each period has a different tariff
total_cost	number	1	Total cost (excluding VAT) of this transaction
total_energy	number	1	Total energy charged, in kWh
total_time	number	1	Total duration of this session (including the duration of charging and not charging), in hours
total_parking_time	number	?	Total duration during this session that the EV is not being charged (no energy being transferred between EVSE and EV), in hours
remark	string(255)	?	Optional remark, can be used to provide additional human readable information to the CDR; for example, why a transaction was stopped
last_updated	DateTime	1	Timestamp when this CDR was last updated or created

3.1.1 Example of a CDR

```
{
   "id": "12345",
   "start_date_time": "2015-06-29T21:39:09+02:00",
   "stop_date_time": "2015-06-29T23:37:32+02:00",
   "auth_id":  "FA54320",
   "auth_method":  "WHITELIST",
   "location":   {
      "id":  "LOC1",
      "type": "on_street",
      "name":  "Gent  Zuid",
      "address":  "F.Rooseveltlaan  3A",
      "city":  "Gent",
      "postal_code": "9000",
      "country": "BE",
      "coordinates": {
         "latitude": "3.72994",
         "longitude": "51.04759"
      },
      "evse": {
         "uid": "3256",
         "evse_id":  "BE-BEC-E041503003",
         "STATUS":  "AVAILABLE",
         "connectors": [{
            "id": "1",
            "standard":  "IEC-62196-T2",
            "format":  "SOCKET",
            "power_type":  "AC_1_PHASE",
            "voltage":  230,
            "amperage":  64,
            tariff_id": "11"
            "last_updated": "2015-06-29T21:39:01Z"
         }]
         "last_updated": "2015-06-29T21:39:01Z"
      }]
      "last_updated": "2015-06-29T21:39:01Z"
   },
   "currency":  "EUR",
   "tariffs": [{
      "id": "12",
      "currency":  "EUR",
      "elements": [{
         "price_components": [{
            "type":  "TIME",
            "price": "2.00",
            "step_size": 300
         }]
         "last_updated": "2015-02-02T14:15:01Z"
      }]
   }],
   "charging_periods": [{
      "start_date_time": "2015-06-29T21:39:09+02:00",
      "dimensions": [{
         "type":  "TIME",
         "volume":  "1.973"
      }]
   }],
   "total_cost": "4,00",
   "total_energy": 15.342
   "total_time": 1.973,
   "last_updated": "2015-06-29T22:01:13Z"
}
```

4. Data types

4.1 AuthMethod *enum*

Value	Description
AUTH_REQUEST	Authentication request from the eMSP
WHITELIST	Whitelist used to authenticate, no request done to the eMSP

4.2 CdrDimension *class*

Property	Type	Cardinality	Description
type	CdrDimensionType	1	Type of cdr dimension
volume	number	1	Volume of the dimension consumed, measured according to the dimension type

4.3 CdrDimensionType *enum*

Value	Description
ENERGY	defined in kWh, default step_size is 1 Wh
FLAT	flat fee, no unit
MAX_CURRENT	defined in A (Ampere), Maximum current reached during charging session
MIN_CURRENT	defined in A (Ampere), Minimum current used during charging session
PARKING_TIME	time not charging: defined in hours, default step_size is 1 second
TIME	time charging: defined in hours, default step_size is 1 second

4.4 ChargingPeriod *class*

A charging period consists of a start timestamp and a list of possible values that influence this period such as amount of energy charged this period, and maximum current during this period.

Property	Type	Cardinality	Description
start_date_time	DateTime	1	Start timestamp of the charging period. This period ends when a next period starts, thoe last period ends when the session ends
dimensions	CdrDimension	+	List of relevant values for this charging period

J. Tariffs module

Module Identifier: tariffs
The Tariffs module gives eMSPs information about the tariffs used by the CPO.

1. Flow and Lifecycle

1.1 Push model

When the CPO creates a new Tariff they push them to the eMSPs by calling the PUT on the eMSP's Tariffs endpoint with the newly created Tariff object.
Any changes to the Tariff(s) in the CPO system can be send to the eMSP system by calling either PUT or PATCH on the eMSP's Tariffs endpoint with the updated Tariff object.
When the CPO deletes a Tariff, they will update the eMSPs systems by calling DELETE on the eMSP's Tariffs endpoint, with the ID of the Tariff that is deleted.
When the CPO is not sure about the state or existence of a Tariff object in the eMSP's system, the CPO can call the GET to validate the Tariff object in the eMSP system.

1.2 Pull model

eMSPs who do not support the push model need to call GET on the CPOs Tariff endpoint to receive all Tariffs, replacing the current list of known Tariffs with the newly received list.

2. Interfaces and endpoints

There is both a CPO and an eMSP interface for Tariffs. It is advised is to use the push direction from CPO to eMSP during normal operation.
The CPO interface is meant to be used when the connection between two parties is established to retrieve the current list of Tariffs objects, and when the eMSP is not certain the Tariff cache is still correct.

2.1 CPO Interface

The CPO Tariffs interface gives the eMSP the ability to request tariffs.
Example endpoint structure: `/ocpi/cpo/2.0/tariffs/?date_from=xxx&date_to=yyy`

Method	Description
GET	Returns Tariff Objects from the CPO, last updated between the {date_from} and {date_to} (paginated)
POST	n/a
PUT	n/a
PATCH	n/a
DELETE	n/a

2.1.1 GET Method

Fetch information about all Tariffs.

2.1.1.1 Request Parameters

If additional parameters: {date_from} and/or {date_to} are provided, only Tariffs with (last_updated) between the given date_from and date_to will be returned.
This request is paginated; it supports the pagination related URL parameters.

Parameter	Datatype	Required	Description
date_from	DateTime	no	Only return Tariffs that have last_updated after this Date/Time
date_to	DateTime	no	Only return Tariffs that have last_updated before this Date/Time
offset	int	no	The offset of the first object is returned. Default is 0
limit	int	no	Maximum number of objects to GET

2.1.1.2 Response Data

The endpoint returns an object with a list of valid Tariffs, the header will contain the pagination related headers.
Any older information that is not specified in the response is considered as no longer valid.
Each object must contain all required fields. Fields that are not specified may be considered as null values.

Type	Cardinality	Description
Tariff	*	List of all tariffs

2.2 eMSP Interface

Tariffs is a client owned object, so the end-points need to contain the required extra fields {party_id} and {country_code}.
Example endpoint structure:
`/ocpi/emsp/2.0/tariffs/{country_code}/{party_id}/{tariff_id}`

Method	Description
GET	Retrieve a Tariff as it is stored in the eMSP system
POST	n/a
PUT	Push new/updated Tariff object to the eMSP
PATCH	Notify the eMSP of partial updates to a Tariff
DELETE	Remove Tariff object which is no longer valid

2.2.1 GET Method

If the CPO wants to check the status of a Tariff in the eMSP system it might GET the object from the eMSP system for validation purposes. The CPO is the owner of the objects, so it would be illogical if the eMSP system had a different status or was missing an object.

2.2.1.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
tariff_id	string(36)	yes	Tariff.id of the Tariff object to retrieve

2.2.1.2 Response data

The response contains the requested object.

Type	Cardinality	Description
Tariff	1	The requested Tariff object

2.2.2 PUT Method

New or updated Tariff objects are pushed from the CPO to the eMSP.

2.2.2.1 Request Body

In the put request the new or updated Tariff object is sent.

Type	Cardinality	Description
Tariff	1	New or updated Tariff object

2.2.2.2 Request Parameters

The following parameters can be provided as URL segments

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
tariff_id	string(36)	yes	Tariff.id of the Tariff object to retrieve

2.2.2.3 Example: New Tariff 2 euro per hour

PUT To URL: `https://www.server.com/ocpi/emsp/2.0/tariffs/NL/TNM/12`

```
{
   "id": "12",
   "currency":  "EUR",
   "elements": [{
      "price_components": [{
         "type":  "TIME",
         "price": "2.00",
         "step_size": 300
      }]
   }]
}
```

2.2.3 PATCH Method

The PATCH method works the same as the PUT method, except that the fields/objects that have to be updated have to be present, other fields/objects that are not specified are considered unchanged.

2.2.3.1 Example: Change Tariff to 2.50

PUT To URL: `https://www.server.com/ocpi/emsp/2.0/tariffs/NL/TNM/12`

```
{
      "elements": [{
            "price_components": [{
                  "type":  "TIME",
                  "price": "2.50",
                  "step_size": 300
            }]
      }]
}
```

2.2.4 DELETE Method

Delete a no longer valid Tariff object.

2.2.4.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the CPO requesting this PUT to the eMSP system
party_id	string(3)	yes	Party ID (Provider ID) of the CPO requesting this PUT to the eMSP system
tariff_id	string(36)	yes	Tariff.id of the Tariff object to retrieve

3. Object description

3.1 Tariff Object

A Tariff Object consists of a list of one or more TariffElements. These elements can be used to create complex Tariff structures.
When the list of elements contains more than 1 element, the first tariff in the list with matching restrictions will be used.
It is advised to always set a “default” tariff, the last tariff in the list of elements with no restriction. This acts as a fallback when none of the TariffElements before this matches the current charging period.

Property	Type	Cardinality	Description
id	String(36)	1	Uniquely identifies the tariff within the CPO’s platform (and suboperator platforms)
currency	String(3)	1	Currency of this tariff, ISO 4217 Code
tariff_alt_text	DisplayText	*	List of Multilanguage alternative tariff info text
tariff_alt_ur;	URL	?	Alternative URL to tariff info
elements	TariffElement	+	List of tariff elements
energy_mix	EnergyuMix	?	Details on the energy supplied with this tariff
last_updated	DateTime	1	Timestamp whrn this Tariff was last updated or created

3.1.1 Examples

Simple Tariff example 2 euro per hour

```
{
   "id": "12",
   "currency":  "EUR",
   "elements": [{
      "price_components": [{
         "type":  "TIME",
         "price": "2.00",
         "step_size": 300
      }]
   }]
   "last_updated": "2015-06-29T20:39:09Z"
}
```

Simple Tariff example with alternative URL

```
{
   "id": "12",
   "currency":  "EUR",
   "tariff_alt_url": "https://company.com/tariffs/12", "elements": [{
      "price_components": [{
         "type":  "TIME",
         "price": "2.00",
         "step_size": 300
      }]
   }]
   "last_updated": "2015-06-29T20:39:09Z"
}
```

4. Data types

4.1 DayOfWeek *enum*

Value	**Description**
MONDAY	Monday
TUESDAY	Tuesday
WEDNESDAY	Wednesday
THURSDAY	Thursday
FRIDAY	Friday
SATURDAY	Saturday
SUNDAY	Sunday

4.2 PriceComponent *class*

Property	**Type**	**Cardinality**	**Description**
type	TariffDimensionType	1	Type of tariff dimension
price	number	1	Price per unit (excluding VAT) for this tariff dimension
step_size	int	1	Minimumamount to be billed. This unit will be billed in this step_size blocks. For example, if type is time and step_size is 300, then time will be billed in blocks of 5 minutes. If 6 minutes is used, 10 minutes (2 blocks of step_size) will be billed.

4.3 TariffElement *class*

Property	Type	Cardinality	Description
price_components	PriceComponent	+	List of price components that make up the pricing of this tariff
restrictions	TariffRestrictions	?	List of tariff restrictions

4.4 TariffDimensionType *enum*

Value	**Description**
ENERGY	Defined in kWh, default step_size is 1 Wh
FLAT	Flat fee, no unit
PARKING_TIME	Time not charging; defined in hours, default step_size is 1 second
TIME	Time charging; defined in hours, default step_size is 1 second

4.5 TariffRestrictions *class*

Property	Type	Cardinality	Description
start_time	string(5)	?	Start time of day, for example 13:30, valid from this time of the day. Must be in 24Hr format with leading zeros. Hour/Minute separator: “:”REGEX:[0-2[0-9:[0-5][0-9]
end_time	string(5)	?	End time of day, for example 19:45, valid until this time of day. Same syntax as start_time
start_date	string(10)	?	Start date, for example 2015-12-24, valid from this day
end_date	string(10)	?	End date, for example 2015-12-27, valid until this day (excluding this day)
min_kWh	number	?	Minimum used energy in kWh, for example 20, valid from this amount of energy is used
max_kWh	number	?	Maximum used energy in kWh, for example 50, valid until this amount of energy is used
min_power	number	?	Minimum power in kW, for example 0, valid from this charging speed
max_power	number	?	Maximum power in kW, for example 20, valid up to this charging speed
min_duration	int	?	Minimum duration in seconds, valid for a duration from x seconds
max_duration	int	?	Maximum duration in seconds, valid for a duration up to x seconds
day_of_week	DayOfWeek	*	Which days of the week this tariff is valid

K. Tokens module

Module Identifier: tokens

The tokens module gives CPOs knowledge of the token information of an eMSP. eMSPs can push Token information to CPOs; CPOs can build a cache of known Tokens.
When a request to authorize comes from a Charge Point, the CPO can check against this cache. With this cached information they know to which eMSP they can later send a CDR.

1. Flow and Lifecycle

1.1 Push model

When the MSP creates a new Token object they push it to the CPO by calling PUT on the CPO's Tokens endpoint with the newly created Token object.
Any changes to Token in the eMSP system are send to the CPO system by calling, either the PUT or the PATCH on the CPOs Tokens endpoint with the updated Token(s).
When the eMSP invalidates a Token (deleting is not possible), the eMSP will send the updated Token (with the field: valid set to False), by calling, either the PUT or the PATCH on the CPOs Tokens endpoint with the updated Token.
When the eMSP is not certain about the state or existence of a Token object in the CPO system, the eMSP can call the GET to validate the Token object in the CPO system.

1.2 Pull model

When a CPO is not certain about the state of the list of known Tokens, or wants to request the full list as a start-up of their system, the CPO can call the GET on the eMSP's Token endpoint to receive all Tokens, updating already known Tokens and adding new received Tokens to its own list of Tokens. This method is not for operational flow.

1.3 Real-time authorization

An eMSP might want their Tokens to be authorization 'real-time', not white-listed. For this the eMSP has to implement the POST Authorize request and set the Token.allow_whitelist field to FALSE for Tokens they want to have authorized 'real-time'.
If an eMSP does not want real-time authorization, the POST Authorize request does not have to be implemented as long as all their Tokens have Token.whitelist set to ALWAYS.

2. Interfaces and endpoints

There is both a CPO and an eMSP interface for Tokens. It is advised to use the push direction from eMSP to CPO during normal operation.
The eMSP interface is meant to be used when the CPO is not certain the Token cache is still correct.

2.1 CPO Interface

With this interface the eMSP can push the Token information to the CPO.
Tokens is a client owned object, so the end-points need to contain the required extra fields: {party_id} and {country_code}.
Example endpoint structure:
`/ocpi/cpo/2.0/tokens/{country_code}/{party_id}/{token_uid}`

Method	Description
GET	Retrieve a Token as it is stored in the CPO system
POST	n/a
PUT	Push new/updated Token object to the CPO
PATCH	Notify the CPO of partial updates to a Token
DELETE	n/a (use PUT, Tokens cannot be removed)

2.1.1 GET Method

If the eMSP wants to check the status of a Token in the CPO system it might GET the object from the CPO system for validation purposes. The eMSP is the owner of the objects, so it would be illogical if the CPO system had a different status or was missing an object.

2.1.1.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the eMSP sending this PUT request to the CPO system
party_id	string(3)	yes	Party ID (Provider ID) of the eMSP sending this PUT request to the CPO system
token_uid	string(36)	yes	Token.uid of the (new) Token object (to replace)

2.1.1.2 Response Data

The response contains the requested object.

Type	Cardinality	Description
Token	1	The requested Token object

2.1.2 PUT Method

New or updated Token objects are pushed from the eMSP to the CPO.

2.1.2.1 Request Body

In the put request the new or updated Token object is sent.

Type	Cardinality	Description
Token	1	New or updated Token object

2.1.2.2 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
country_code	string(2)	yes	Country code of the eMSP sending this PUT to the CPO system
party_id	string(3)	yes	Party ID (Provider ID) of the eMSP sending this PUT request to the CPO system
tariff_id	string(36)	yes	Token.uid of the (new)Token object (to replace)

2.1.2.3 Example: put a new Token

PUT To URL: `https://www.server.com/ocpi/cpo/2.0/tokens/NL/TNM/012345678`

```
{
   "uid": "012345678",
   "type":  "RFID",
   "auth_id":  "FA54320",
   "visual_number": "DF000-2001-8999",
   "issuer":  "TheNewMotion",
   "valid": true,
   "whitelist": true
   "last_updated": "2015-06-29T22:39:09Z"
}
```

2.1.3 PATCH Method

Same as the PUT method, but only the fields/objects that have to be updated have to be present, other fields/objects that are not specified are considered unchanged.

2.1.3.1 Example: invalidate a Token

PATCH To URL: `https://www.server.com/ocpi/cpo/2.0/tokens/NL/TNM/012345678`

```
{
   "valid": false
}
```

2,2 eMSP Interface

This interface enables the CPO to request the current list of Tokens, when needed. Via the POST method it is possible to authorize a single token.
Example endpoint structure: /ocpi/emsp/2.0/tokens/?date_from=xxx&date_to=yyy

Method	Description
GET	Get the list of known Token last updated between the {date_from} and {date_to} (paginated)
POST	Real-time authorization request
PUT	n/a
PATCH	n/a
DELETE	n/a

2.2.1 GET Method

Fetch information about Tokens known in the eMSP systems.

2.2.1.1 Request Parameters

If additional parameters: {date_from} and/or {date_to} are provided, only Tokens with (last_updated) between the given date_from and date_to will be returned.
This request is paginated, it supports the pagination related URL parameters.

Parameter	Datatype	Required	Description
date_from	DateTime	no	Only return Tokens that have last_updated after this Date/Time
date_to	DateTime	no	Only return Tokens that have last_updated before this Date/Time
offset	int	no	The offset of the first object is returned. Default is 0
limit	int	no	Maximum number of objects to GET

2.2.1.2 Response Data

The endpoint response with list of valid Token objects, the header will contain the pagination related headers.
Any older information that is not specified in the response is considered as no longer valid.
Each object must contain all required fields. Fields that are not specified may be considered as null values.

Type	Cardinality	Description
Token	*	List of all tokens

2.2.2 POST Method

Do a ‘real-time’ authorization request to the eMSP system, validating if a Token might be used (at the optionally given Location).
Example endpoint structure: /ocpi/emsp/2.0/tokens/{token_uid}/authorize
The /authorize is required for the real-time authorize request.

When the eMSP receives a ‘real-time’ authorization request from a CPO that contains too little information (no LocationReferences provided) to determine if the Token might be used, the eMSP should respond with the OCPI status: 2002

2.2.2.1 Request Parameters

The following parameter has to be provided as URL segments.

Parameter	Datatype	Required	Description
token_uid	string(36)	yes	Token_uid of the Token for which this authorization is
token_type	TokenType	No	Token.type of the Token for which this authorization is. Default if omitted: RFID

2.2.2.2 Request Body

In the body an optional LocationReferences object can be given. The eMSP SHALL then validate if the Token is allowed to be used at this Location, and if applicable: which of the Locations EVSEs/Connectors.
The object with valid Location and EVSEs/Connectors will be returned in the response.

Type	Cardinality	Description
LocationReferences	?	Location and EVSE/Connectors for which the Token is requested to be authorized

2.2.2.3 Response Data

The endpoint response contains a AuthorizationInfo object.

Type	Cardinality	Description
AuthorizationInfo	1	Contains information about the authorization, if the Token is allowed to charge and optionally which EVSE/Connectors are allowed to be used

3. Object description

3.1 *AuthorizationInfo* Object

Property	Type	Cardinality	Description
Allowed	Allowed	1	Status of the Token, and if it is allowed to charge at the optionally given location
Location	LocationReferences	?	Optional reference to the location if it was requested in the request, and if the EV driver is allowed to charge at that location. Only the EVSE/Connectors the EV driver is allowed to charge at are returned
Info	DisplayText	?	Optional display text, additional information to the EV driver

3.2 *Token* Object

Property	Type	Cardinality	Description
uid	string(36)	1	Identification used by CPO system to identify this token. In most cases this is the RFID hidden ID as read by the RFID reader
type	TokenType	1	Type of the token
auth_id	string(36)	1	Uniquely identifies the EV driver contract token within the eMSP's platform (and suboperator platforms). Recommended to follow the specification for eMA ID from "eMI3 standard version V1.0" (http://emi3group.com/documents-links/) "Part 2: business objects."
visual_number	string(64)	?	Visual readable number/identification as printed on the Token(RFID card), might be equal to the auth_id.
issuer	string(64)	1	Issuing company, most of the time the name of the company printed on the token (RFID card), not necessarily the eMSP
valid	boolean	1	Is this token valid
whitelist	WhitelistType	1	Indicates what type of white-listing is allowed
language	string(2)	?	Language Code ISO 639-1. The optional field indicates the Token owner's preferred interface language. If the language is not provided or not supported then the CPO is free to choose its own language
last_updated	DateTime	1	Timestamp when this Token was last updated or created

The combination of uid and type should be unique for every token within an eMSP's system.

3.2.1 Example

```
{
   "uid": "012345678",
   "type":  "RFID",
   "auth_id":  "FA54320",
   "visual_number": "DF000-2001-8999",
   "issuer":  "TheNewMotion",
   "valid": true,
   "whitelist": "ALLOWED"
   "last_updated": "2015-06-29T22:39:09Z"
}
```

4. Data types

4.1 Allowed *enum*

Value	Description
ALLOWED	This Token is allowed to charge at this location
BLOCKED	This Token is blocked
EXPIRED	This Token has expired
NO_CREDIT	This Token belongs to an account that does not have enough credits to charge at the given location
NOT_ALLOWED	Token is valid, but is not allowed to charge at the given location

4.2 LocationReferences *class*

Field Name	Field Type	Cardinality	Description
location_id	string(39)	1	Unique identifier for the location
evse_uids	string(39)	*	Unique identifier for EVSEs within the CPO's platform for the EVSE within the given location
connector_ids	string(36)	*	Identifies the connectors within the given EVSE

4.3 TokenType *enum*

Value	Description
OTHER	Other type of token
RFID	RFID Token

4.4 Whitelist Type *enum*

Defines when authorization of a Token by the CPO is allowed.

Value	Description
ALWAYS	Token always has to be whitelisted; realtime authorization is not possible/allowed
ALLOWED	It is allowed to whitelist the token; realtime authorization is also allowed
ALLOWED_OFFLINE	Whitelisting is only allowed when CPO cannot reach the eMSP (communication between CPO and eMSP is offline)
NEVER	Whitelisting is never allowed; only realtime authorization allowed. Token should always be authorized by the eMSP

L. *Commands* module

Module Identifier: commands
The Commands module enables remote commands to be sent to a Location/EVSE. The following commands are supported:

- RESERVE_NOW
- START_SESSION
- STOP_SESSION
- UNLOCK_CONNECTOR

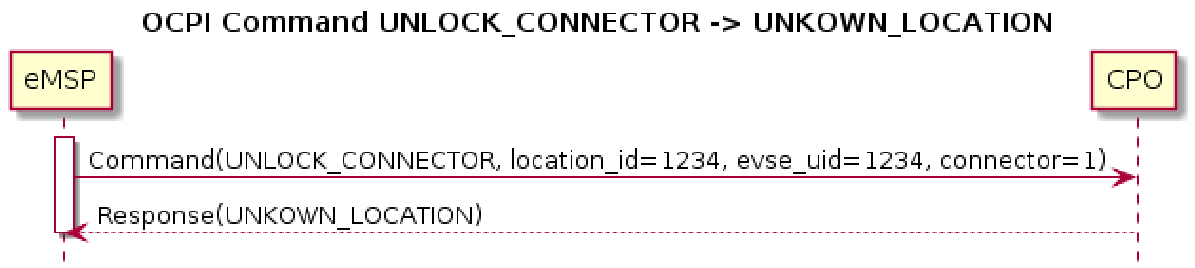
See CommandType for a description of the different commands.
Use the UNLOCK_CONNECTOR command with care, please read the note at CommandType.
Module dependency: Locations module

1 Flow

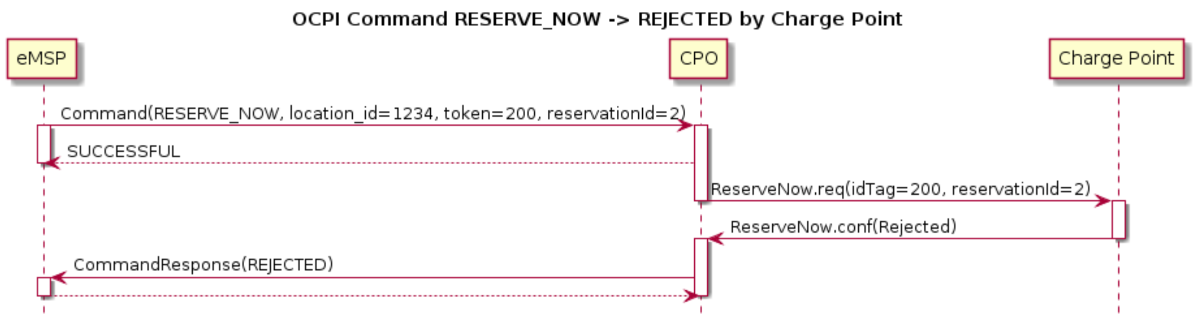
With the Commands module, commands can be sent from the eMSP, via the CPO to a Charge Point. Most Charge Point are hooked up to the internet via a relative slow wireless connection. To prevent long blocking calls, the commands module is designed to work asynchronously.

The eMSP send a request to a CPO, via the CPO Commands interface. The CPO checks if it can send the request to a Charge Point and will respond to the request with a status, indicating if the request can be sent to a Charge Point.
The CPO sends the requested command (via another protocol, for example: OCPP) to a Charge Point. The Charge Point will respond if it understands the command and will try to execute the command. This response doesn't mean that the command was executed successfully. The CPO will forward this command in a new POST request to the eMSP Commands interface.
The following examples try to give insight into the message flow and the asynchronous nature of the OCPI Commands.

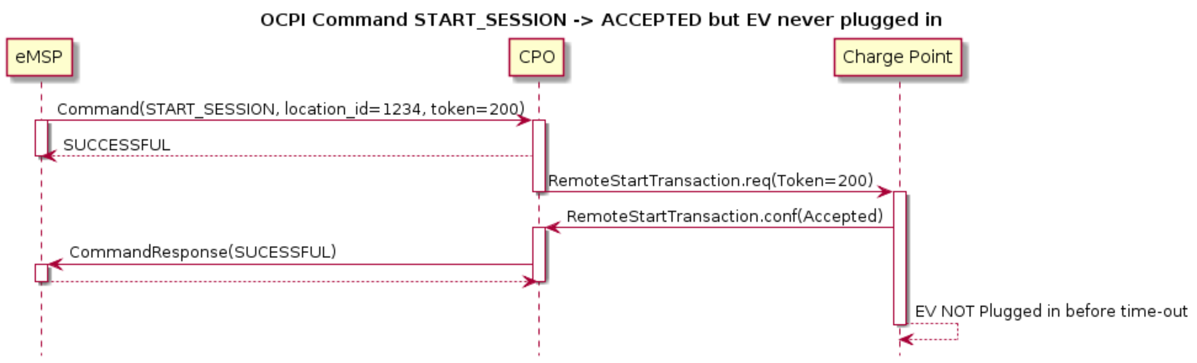
Example of a UNLOCK_CONNECTOR that fails because the Location is not known by the CPO.


OCPI Command UNLOCK_CONNECTOR -> UNKOWN_LOCATION
eMSP
CPO
Command(UNLOCK_CONNECTOR, location_id=1234, evse_uid=1234, connector=1)
Response(UNKOWN_LOCATION)

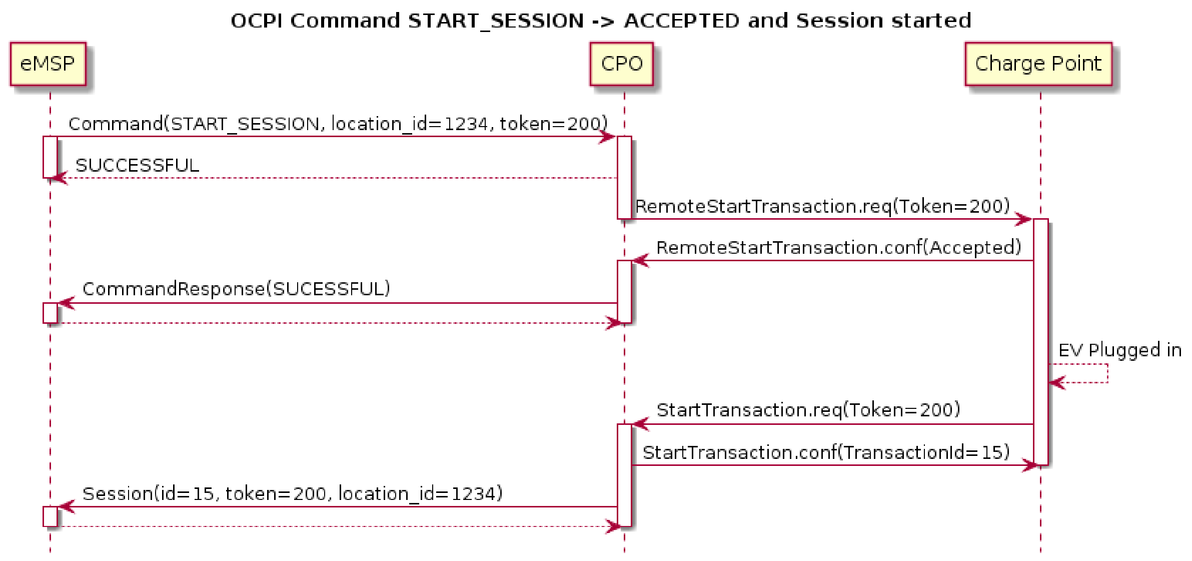
Example of a RESERVE_NOW that is rejected by the Charge Point.


OCPI Command RESERVE_NOW -> REJECTED by Charge Point
eMSP
CPO
Charge Point
Command(RESERVE_NOW, location_id=1234, token=200, reservationId=2)
SUCCESSFUL
ReserveNow.req(idTag=200, reservationId=2)
ReserveNow.conf(Rejected)
CommandResponse(REJECTED)

Example of a START_SESSION that is accepted, but no new Session is started because the EV not plugged in before end of time-out.


OCPI Command START_SESSION -> ACCEPTED but EV never plugged in
eMSP
CPO
Charge Point
Command(START_SESSION, location_id=1234, token=200)
SUCCESSFUL
RemoteStartTransaction.req(Token=200)
RemoteStartTransaction.conf(Accepted)
CommandResponse(SUCESSFUL)
EV NOT Plugged in before time-out

Example of a START_SESSION that is accepted and results in a new Session.


OCPI Command START_SESSION -> ACCEPTED and Session started
eMSP
CPO
Charge Point
Command(START_SESSION, location_id=1234, token=200)
SUCCESSFUL
RemoteStartTransaction.req(Token=200)
RemoteStartTransaction.conf(Accepted)
CommandResponse(SUCESSFUL)
EV Plugged in
StartTransaction.req(Token=200)
StartTransaction.conf(TransactionId=15)
Session(id=15, token=200, location_id=1234)

These examples use OCPP 1.6 based commands between CPO and Charge Point, but that is not a requirement for OCPI.

2. Interfaces and endpoints

The commands module consists of two interfaces: a CPO interface that enables an eMSP (and its clients) to send commands to a Charge Point and an eMSP interface to receive the response from the Charge Point asynchronously.

2.1 CPO Interface

Example endpoint structure: /ocpi/cpo/2.0/commands/{command}

Method	Description
GET	n/a
POST	Send a command to the CPO, requesting the CPO to send the command to the Charge Point
PUT	n/a
PATCH	n/a
DELETE	n/a

2.1.1 POST Method

2.1.1.1 Request Parameters

The following parameters can be provided as URL segments.

Parameter	Datatype	Required	Description
command	CommandType	yes	Type of command that is required

2.1.2 Request Body

Depending on the command parameter the body SHALL contain the applicable object for that command.

Type (one of four)	Cardinality	Description
> ReserveNow	1	ReserveNow object, for the RESERVE_NOW command, with information needed to reserve a (specific) connector of a Charge Point for a given Token
>StartSession	1	StartSession object, for the START_SESSION command, with information needed to start a session
>StopSession	1	StopSession object, for the STOP_SESSION command, with information needed to stop a session
>UnlockConnector	1	UnlockConnector object, for the UNLOCK_CONNECTOR command, with information needed to unlock a connector of a Charge Point

2.1.2.1 Response Data

The response contains the direct response from the CPO, not the response from the Charge Point itself, that will be sent via an asynchronous POST on the eMSP interface if this response is ACCEPTED.

Datatype	Cardinality	Description
CommandResponseType	1	Result of the command request by the CPO (not the Charge Point)

2.2 eMSP Interface

The eMSP interface receives the asynchronous responses.

Example endpoint structure:
/ocpi/emsp/2.0/commands/{command}
/ocpi/emsp/2.0/commands/{command}/{uid}

Method	Description
GET	n/a
POST	Receive the asynchronous response from the Charge Point
PUT	n/a
PATCH	n/a
DELETE	n/a

2.2.1 POST Method

2.2.1.1 Request Parameters

There are no URL segment parameters required by OCPI.
It is up to the implementation of the eMSP to determine what parameters are put in the URL. The eMSP sends a URL in the POST method body to the CPO. The CPO is required to use this URL for the asynchronous response by the Charge Point. It is advised to make this URL unique for every request to differentiate simultaneous commands, for example by adding a unique id as a URL segment.
Example:
/ocpi/emsp/2.0/commands/RESERVE_NOW/1234
/ocpi/emsp/2.0/commands/UNLOCK_CONNECTOR/2

Datatype	Cardinality	Description
CommandResponseType	1	Result of the command request from the Charge Point

2.2.2 Request Body

3. Object description

3.1 *CommandResponse* Object

Property	Type	Cardinality	Description
result	CommandResponseType	1	Result of the command request as sent by the Charge Point to the CPO

3.2 *ReserveNow* Object

The evse_uid is optional. If no EVSE is specified, the Charge Point should keep one EVSE available for the EV Driver identified by the given Token. (This might not be supported by all Charge Points).
A reservation can be replaced/updated by sending a RESERVE_NOW request with the same Location (Charge Point) and the same reservation_id.

Property	Type	Cardinality	Description
response_url	URL	1	URL to which the CommandResponse POST should be able to send. This URL might contain a unique ID to be able to distinguish between ReserveNow requests
token	Token	1	Token object for how to reserve this Charge Point (and specific EVSE)
expiry_date	DateTime	1	The Date/Time when this reservation ends
reservation_id	int	1	Reservation ID, unique for this reservation. If the Charge Point already has a reservation that matches this reservation ID the Charge Point will replace the reservation
location_id	string(39)	1	Location.id of the Location (belonging to the CPO to which this request is sent) for which to reserve an EVSE
evse_uid	string(39)	?	Optional EVSE.uid of the EVSE of this Location if a specific EVSE has to be reserved

3.3 *StartSession* Object

The evse_uid is optional. If no EVSE is specified, the Charge Point can itself decide on which EVSE to start a new session. (this might not be supported by all Charge Points).

Property	Type	Cardinality	Description
response_url	URL	1	URL to which the CommandResponse POST should be sent. This URL might contain a unique ID to be able to distinguish between StartSession requests
token	Token	1	Token object the Charge Point has to use to start a new session
location_id	string(15)	1	Location.id of the Location (belonging to the CPO to which this request is sent) on which a session is to be started
evse_uid	string(15)	?	Optional EVSE.uid of the EVSE of this Location to which a session is to be started.

3.4 *StopSession* Object

Property	Type	Cardinality	Description
response_url	URL	1	URL to which the CommandResponse POST should be sent. This URLmight contain a unique ID to be able to distinguish between StopSession requests.
session_id	string(15)	1	Session.id of the Session that is requested to be stopped

3.5 *UnlockConnector* Object

Property	Type	Cardinality	Description
response_url	URL	1	URL to which the CommandResponse POST should be sent. This URLmight contain a unique ID to be able to distinguish between UnlockConnector requests
Location_id	string(39)	1	Location.id of the Location (belonging to the CPO to which this request is sent) of which it is requested to unlock the connector
Evse_uid	string(39)	1	EVSE.uid of the EVSE of this Location of which it is requested to unlock the connector
Connector_id	string(36)	1	Connector.id of the Connector of this location of which it is requested to unlock

4. Data types

4.1 *CommandResponseType* enum

The command requested.

Value	Description
NOT_SUPPORTED	The requested command is not supported by this CPO, Charge Point, or EVSE
REJECTED	Command request rejected by the CPO or Charge Point
ACCEPTED	Command request accepted by the CPO or Charge Point
TIMEOUT	Command request timeout, no response received from the Charge Point in a reasonable time
UNKNOWN_SESSION	The Session in the requested command is not known by this CPO

4.2 *CommandType* enum

The command requested.

Value	Description
RESERVE_NOW	Request the Charge Point to reserve a (specific) EVSE for a Token for a certain time, starting now
START_SESSION	Request the Charge Point to start a transaction on the given EVSE/Connector.
STOP_SESSION	Request the Charge Point to stop an ongoing session. Request the Charge Point to unlock the connector (if applicable)
UNLOCK_CONNECTOR	This functionality is for help desk operators only

The command UNLOCK_CONNECTOR may only be used by an operator of the eMSP. This command shall never be allowed to be sent directly by the EV driver. The UNLOCK_CONNECTOR is intended to be used in the rare situation that the connector is not unlocked successfully after a transaction is stopped. The mechanical unlock of the lock mechanism might get stuck.
In such a situation the EV driver can call either the CPO or the eMSP to retry the unlocking.

M. Types

1. CiString *type*
Case Insensitive String. Only printable ASCII allowed.

2. DateTime *type*
All timestamps are formatted as string(25) using the combined date and time format from the ISO 8601 standard. All timestamps shall be in UTC. The absence of the timezone designator implies a UTC timestamp.

Example:
```
2015-06-29T22:39:09+02:00
2015-06-29T20:39:09Z
2015-06-29T20:39:09
Note:  +00:00 is not the same as UTC.
```

3. DisplayText *class*

Property	Type	Cardinality	Description
language	string(2)	1	Language Code ISO 639-1
text	string(512)	1	Text to be displayed to an end user. No markup or html is allowed

Example:

```
{
  "language": "en",
   "text": "Standard Tariff"
}
```

4 number *type*

Numbers in OCPI are formatted as JSON numbers.
Unless mentioned otherwise, numbers use 4 decimals and a sufficiently large amount of digits.

5. string *type*

Case Sensitive String. Only printable ASCII allowed. All strings in messages and enumerations are case sensitive, unless explicitly stated otherwise.

6 URL *type*

An URL a string(255) type following the w3.org spec.