

OCPI 2.1

Open Charge Point Interface 2.1, document version: 2.1

<https://github.com/ocpi>

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Version History

| Version | Date | Description |
|---------|------------|---|
| 2.1 | 08-04-2016 | Added command module . Added support for real-time authorization . Lots of small improvements: see changelog |
| 2.0-d2 | 15-02-2016 | 2nd documentation revision of the OCPI 2.0 spec. Only documentation updated: ConnectorType of Connector was not visible, credentials clarified, location URL segments incorrect (now string, was int), minor textual updates. DateTime with timezones is still an issue |
| 2.0 | 30-12-2015 | First official release of OCPI. |
| 0.4 | 04-11-2014 | First draft of OCPI. (Also known as Draft v4) |
| 0.3 | 06-05-2014 | First draft of OCPI. (Also known as Draft v3) |

Document revisions

There can be multiple documentation revisions of the same version of the OCPI protocol.
The newer revisions of the same protocol version can never change the content of the messages: no new fields or renaming of fields. A new revision can only clarify/fix texts/descriptions and fix typos etc.
These revisions (not the first) will be named: d2, d3, d4 etc.

1 OCPI

1.1 Introduction and background

The Open Charge Point Interface (OCPI) enables a scalable, automated EV roaming setup between Charge Point Operators and e-Mobility Service Providers. It supports authorization, charge point information exchange (including live status updates and transaction events), charge detail record exchange, remote charge point commands and, finally, the exchange of smart-charging commands between parties.

It offers market participants in EV an attractive and scalable solution for (international) roaming between networks, avoiding the costs and innovation-limiting complexities involved with today's non-automated solutions or with central roaming hubs.

As such it helps to enable EV drivers to charge everywhere in a fully-informed way, helps the market to develop quickly and helps market players to execute their business models in the best way.

What does it offer (main functionalities):

- A good roaming system (for bilateral usage and/or via a hub).
- Real-time information about location, availability and price.
- A uniform way of exchanging data (Notification Data Records and Charge Data Records), before during and after the transaction.
- Remote mobile support to access any charge station without pre-registration.

Starting in 2009, e-laad foundation and the predecessor of the eViolin association specified 2 standards in order to retrieve charge point details and active state. These are called the VAS interface and the Amsterdam interface. In this same period, a CDR format for the exchange of charge sessions between eViolin members was defined. This format is currently in use by the majority of the eViolin members. (eViolin is the branch organisation for EV operators and service providers in NL and responsible for national roaming and issuing of ID's). This resulted in 2014 in the development of OCPI.

An international group of companies already supports OCPI. Initiators are EV Box, The New Motion, ElaadNL, BeCharged, Greenflux and Last Mile Solutions. Other participants include Next Charge, Freshmile, Plugsurfing, Charge-partner, Hsubject, e-clearing.net, IHomer and Siemens. Several other major organizations and roaming platforms are interested in participating. The Netherlands Knowledge Platform for Charging Infrastructure (NKL) facilitates and coordinates this project to guarantee progress and ensure development and results. Part of this project is to find a place to continue development in the future.

This document describes a combined set of standards based on the work done in the past. Next to that, the evolution of these standards and their use is taken into account and some elements have been updated to match nowadays use.

The latest version of this specification can be found here: <https://github.com/ocpi/ocpi>

2 Terminology and Definitions

2.1 Abbreviations

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

2.2 Provider and Operator abbreviation

In OCPI it is advised to use eMI3 compliant names for Contract IDs and EVSE IDs. The provider and the operator name is important here, in order to target the right provider or operator, they need to be known upfront, at least between the cooperating parties.

In several standards, an issuing authority is mentioned that will keep a central registry of known Providers and Operators.

At this moment, the following countries have an authority that keeps track of the known providers and operators:

2.2.1 The Netherlands

The Dutch foundation, named [eViolin](#) keeps the registry for The Netherlands.

- The list of operator IDs and provider IDs can be viewed on their website [eViolin/Leden](#).

2.2.2 Germany

The BDEW organisation keeps the registry for Germany in their general code number service [bdew-codes.de](#).

- **Provider ID List** See <https://bdew-codes.de/Codenumbers/EMobilityId/ProviderIdList>
- **EVSE Operator ID List** See <https://bdew-codes.de/Codenumbers/EMobilityId/OperatorIdList>

2.2.3 Austria

Austrian Mobile Power GmbH maintains a registry for Austria. This list is not publicly available. For more information visit [austrian-mobile-power.at](#)

2.2.4 France

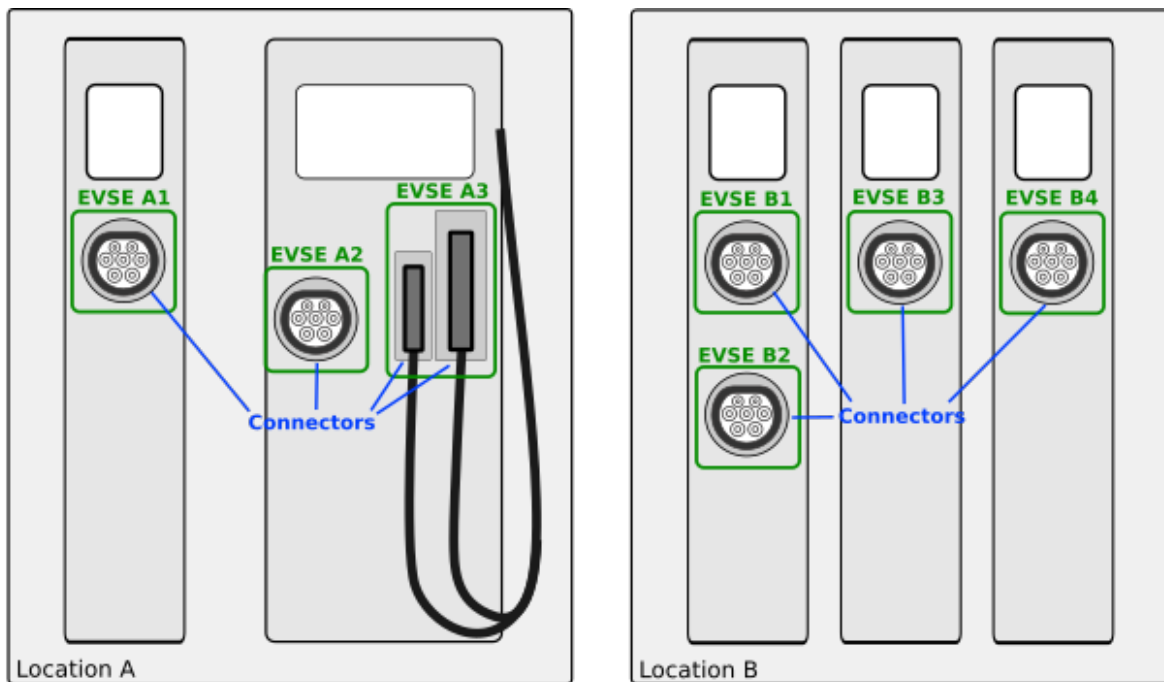
The AFIREV* organisation will keep/keeps the registry for France. It provides operation Id for CPO and eMSP in compliance with eMI3 id structure. The prefix of these Ids is the “fr” country code. AFIREV will also be in charge of the definition of EVSE-Id structure, Charging-Pool-Id structure (location), and Contract-Id structure for France. AFIREV bases its requirements and recommendations on eMI3 definitions.

AFIREV stands for: Association Française pour l’Itinérance de la Recharge Électrique des Véhicules

2.3 Charging topology

The charging topology, as relevant to the eMSP, consists of three entities:

- *Connector* is a specific socket or cable available for the EV to make use of.
- *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.



A Location is typically the exact location of one or more EVSEs, but it can also be the entrance of a parking garage or a gated community. It is up to the CPO to use whatever makes the most sense in a specific situation. Once arrived at the location, any further instructions to reach the EVSE from the Location are stored in the EVSE object itself (such as the floor number, visual identification or manual instructions).

2.4 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.

2.5 Cardinality

When defining the cardinality of a field, the following symbols are used during the document:

| 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 |

| Symbol | Description | Type |
|--------|--|----------|
| * | A list of zero or more objects. If empty, it might be <code>null</code> , <code>[]</code> or the field might be omitted. | [Object] |
| + | A list of at least one object. | [Object] |

3 Transport and format

3.1 JSON / HTTP implementation guide

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

3.1.1 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.

3.1.2 Request format

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

```
Authorization: Token IpbJ0Xxkx0AuKR92z0nEcmVF3Qw09VG7I7d/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. Then, the server can 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 OCPI 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.

3.1.2.1 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.

3.1.2.1.1 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. |

3.1.2.1.2 Paginated Response 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 number 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"

3.1.2.2 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.

3.1.2.3 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 (both 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**.

3.1.3 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 1 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-uri}/{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.

3.1.3.1 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**.

3.1.4 Response format

When a request cannot be accepted, an HTTP error response code is expected including a JSON object that contains more details. HTTP status codes are described on w3.org.

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 | Card. | 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. |

For brevity's sake, any further examples used in this specification will only contain the value of the "data" field. In reality, it will always have to be wrapped in the above response format.

3.1.4.1 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"
}
```

3.1.4.2 Example: Version details 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"
}

```

3.1.4.3 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"
}

```

3.1.4.4 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"
}

```

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

```

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

```

3.2 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 |

3.3 Offline behaviour

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 to 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.

4 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.

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 can not 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.

4.1 1xxx: Success

| Code | Description |
|------|----------------------|
| 1000 | Generic success code |

4.2 2xxx: Client errors

Errors a server detected in the message sent by a client: The client did something wrong

| 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: <code>START_SESSION</code> with unknown location. |

4.3 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 can not 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. |

5 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. |

5.1 Data

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

5.1.1 Version class

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

5.2 GET

Fetch all supported OCPI versions of this CPO or eMSP.

5.2.1 Example

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

6 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. |

6.1 Data

| Property | Type | Card. | Description |
|-----------|-------------------------------|-------|---|
| version | VersionNumber | 1 | The version number. |
| endpoints | Endpoint | + | A list of supported endpoints for this version. |

6.1.1 Endpoint *class*

| Property | Type | Card. | Description |
|------------|--------------------------|-------|----------------------|
| identifier | ModuleID | 1 | Endpoint identifier. |
| url | URL | 1 | URL to the endpoint. |

6.1.2 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 | |

6.1.3 VersionNumber *enum*

List of known versions.

| Value | Description |
|-------|----------------------------------|
| 2.0 | OCPI version 2.0. |
| 2.1 | OCPI version 2.1. (this version) |

6.1.3.1 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. Do NOT send custom moduleIDs to parties you are not 100% sure that they understand the custom moduleIDs.

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:

`nltm-tokens`

6.2 GET

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

6.2.1 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/"
    }
  ]
}
```

7 Credentials endpoint

Module Identifier: `credentials`

7.1 Interfaces and endpoints

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

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

7.1.1 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.

7.1.2 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.

7.1.3 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 yet.

7.1.4 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.

7.2 Object description

7.2.1 Credentials object

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

The `party_id` and `country_code` give 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`.

7.2.2 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"
  }
}
```


7.3 Use cases

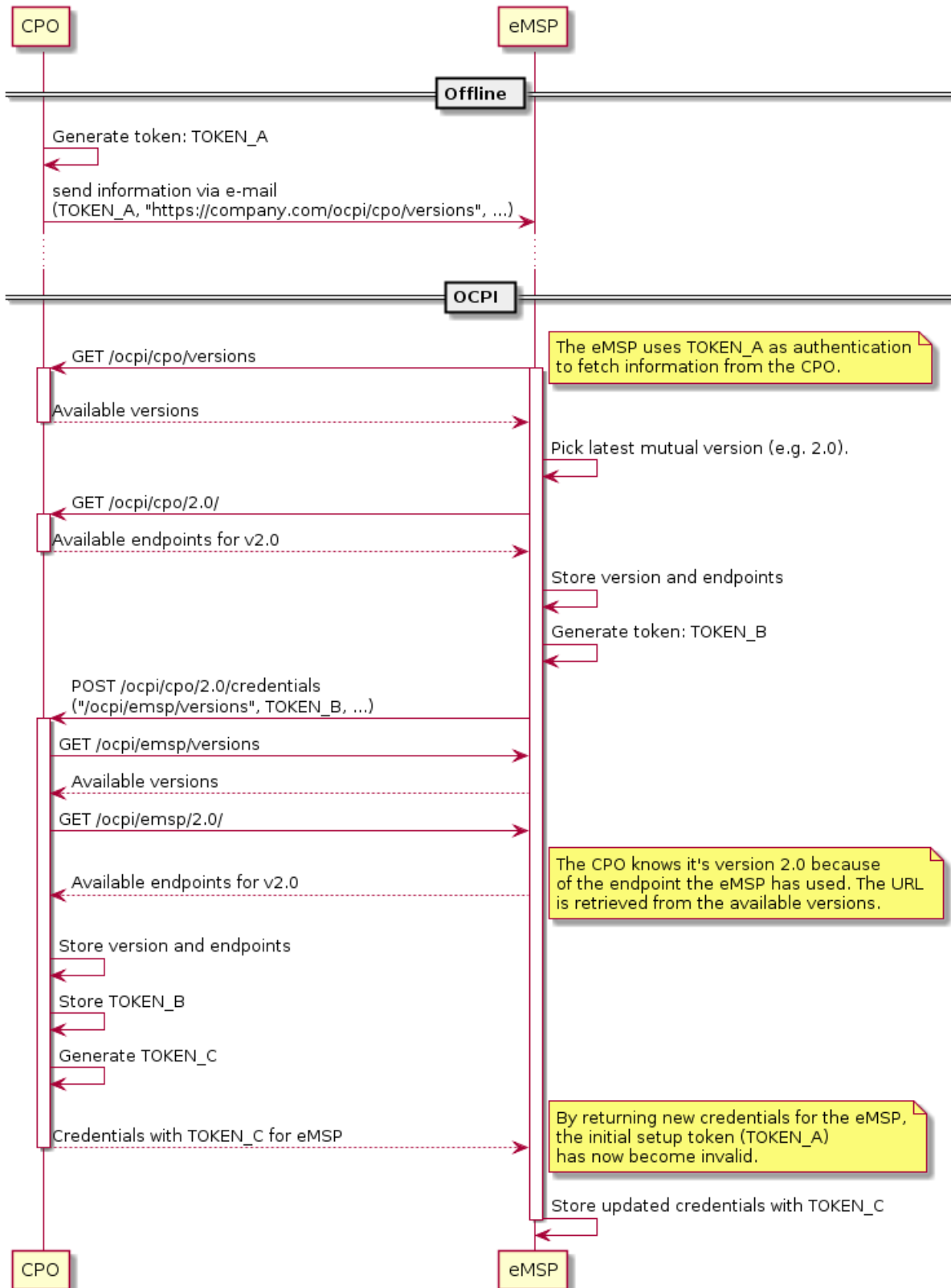
7.3.1 Registration

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 we use relative paths as short resource identifiers to illustrate a point; please note that they should really be absolute URLs in any working implementation of OCPI)

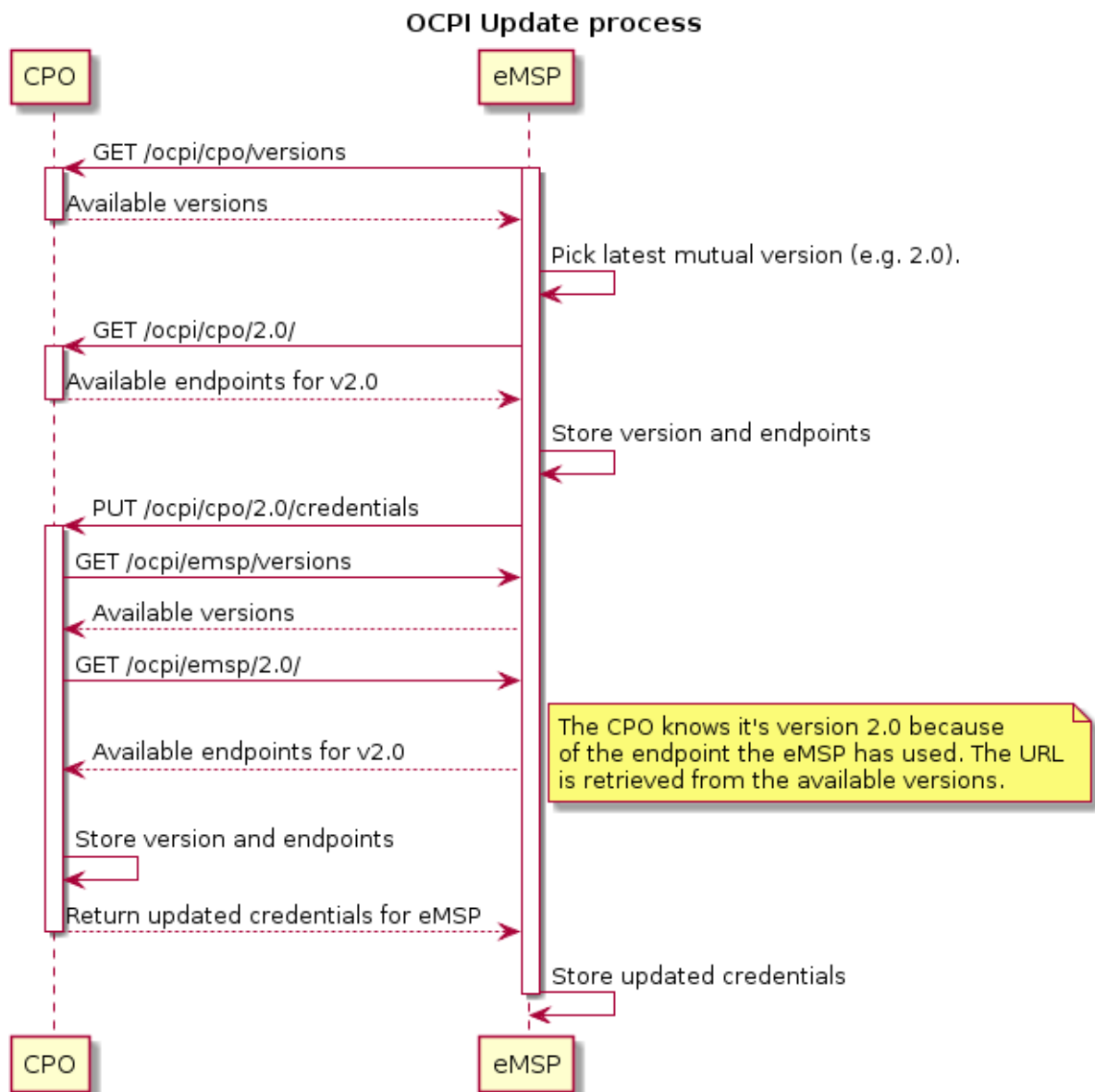
OCPI Registration process



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

7.3.2 Updating to a newer version

At some point both parties will have implemented a newer OCPI version. To start using the newer version, one party has to send a PUT request to the credentials endpoint of the other party.



7.3.3 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.

7.3.4 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.

7.3.5 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.

7.3.6 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 case the client is starting the credentials exchange process and cannot find the endpoints it expects. Then, 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 case the server, receiving the request from a client, cannot find the endpoints it expects, then it is expected to respond to the request with a status code: **3003**.

8 *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](#)

8.1 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.

8.2 Interfaces and endpoints

There is both a CPO and an eMSP interface for Locations. 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 2 parties is established, to retrieve the current list of Location objects with the current status, and when the eMSP is not 100% sure 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).

8.2.1 CPO Interface

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

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

8.2.1.1 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](#)

8.2.1.1.1 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. |

8.2.1.1.2 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 EVSEs. |

8.2.1.1.3 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(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 requesting a Connector object. |

8.2.1.1.4 GET Object Response Data

The response contains the requested object.

| Type | Card. | Description |
|-----------------------------|-------|--|
| <i>Choice: one of three</i> | | |
| > 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. |

8.2.2 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}/{evse_uid}
/ocpi/emsp/2.0/locations/{country_code}/{party_id}/{location_id}/{evse_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, EVSEs or Connector (such as the status). |
| DELETE | n/a (use PATCH) |

8.2.2.1 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.

8.2.2.1.1 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 requesting a Connector object. |

8.2.2.1.2 Response Data The response contains the requested object.

| Type | Card. | Description |
|-----------------------------|-------|-------------|
| <i>Choice: one of three</i> | | |

| Type | 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. |

8.2.2.2 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.

8.2.2.2.1 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}` have to 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(15) | yes | Location.id of the new Location object, or the Location of which an EVSE or Location object is send |
| evse_uid | string(15) | no | Evse.uid, required when an EVSE or Connector object is send/replaced. |
| connector_id | string(15) | no | Connector.id, required when a Connector object is send/replaced. |

| Type | Card. | Description |
|-----------------------------|-------|---|
| <i>Choice: one of three</i> | | |
| > 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. |

8.2.2.3 Request Body

8.2.2.4 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.

8.2.2.4.1 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",
}
```


8.2.2.4.2 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",
}
```

8.2.2.4.3 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"
}
```

8.2.2.4.4 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,
}
```

8.2.2.4.5 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>

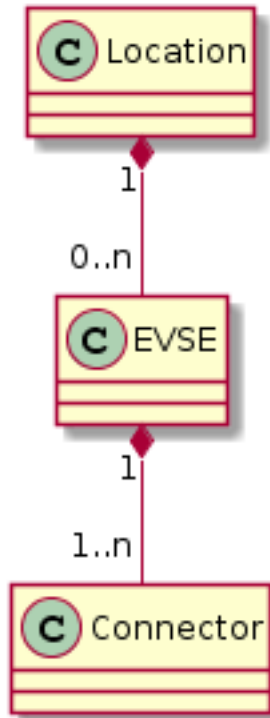
```
{
  "status": "REMOVED",
}
```

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

8.3 Object description

Location, EVSE and Connector have the following relation.

Locations class diagram



8.3.1 Location Object

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

| Property | Type | Card. | Description |
|-------------------|-----------------------|-------|--|
| id | string(15) | 1 | Uniquely identifies the location within the CPOs platform (and suboperator platforms). |
| 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 | AdditionalGeoLocation | * | Geographical location of related points relevant to the user. |
| evses | EVSE | * | List of EVSEs that belong to this Location. |

| Property | Type | Card. | Description |
|----------------------|---------------------------------|-------|---|
| 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 <code>api_info</code> endpoint should be used instead. |
| suboperator | BusinessDetails | ? | Information of the suboperator if available. |
| owner | BusinessDetails | ? | Information of the owner if available. |
| facilities | Facility | * | Optional list of facilities this charge location directly belongs to. |
| time_zone | string(255) | ? | One of IANA tzdata's TZ-values representing the time zone of the location. Examples: "Europe/Oslo", "Europe/Zurich". (http://www.iana.org/time-zones) |
| opening_times | Hours | ? | The times when the EVSEs at the location can be accessed for charging. |
| charging_when_closed | boolean | ? | Indicates if the EVSEs are still charging outside the opening hours of the location. E.g. when the parking garage closes its barriers over night, is it allowed to charge till the next morning? 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_updated | DateTime | 1 | Timestamp when this Location or one of its EVSEs or Connectors were last updated. |

8.3.1.1 Example

```
{
  "id": "LOC1",
  "type": "ON_STREET",
  "name": "Gent Zuid",
  "address": "F.Rooseveltplaan 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"
    }, {
        "id": "2",
        "status": "AVAILABLE",
        "standard": "IEC_62196_T2",
        "format": "SOCKET",
        "power_type": "AC_3_PHASE",
        "voltage": 220,
        "amperage": 16,
        "tariff_id": "11"
    }],
    "physical_reference": "1",
    "floor_level": "-1"
}, {
    "uid": "3257",
    "id": "BE-BEC-E041503002",
    "status": "RESERVED",
    "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"
}],
"operator": {
    "name": "BeCharged"
}
}

```

8.3.2 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 can not be used simultaneously: only one connector per EVSE can be used at the time.

| Property | Type | Card. | Description |
|----------------------|--------------------|-------|---|
| uid | string(15) | 1 | Uniquely identifies the EVSE within the CPOs platform (and suboperator platforms). For example a database unique ID |
| 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.” Optional because: if an EVSE ID is to be re-used the EVSE ID can be removed from an EVSE that is removed (status: REMOVED) |
| 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 that the EVSE is capable of. |
| connectors | Connector | + | List of available connectors on the EVSE. |
| floor_level | string(4) | ? | Level on which the charging station is located (in garage buildings) in the locally displayed numbering scheme. |
| coordinates | GeoLocation | ? | Coordinates of the EVSE. |
| physical_reference | string(16) | ? | A number/string printed on the outside of the EVSE for visual identification. |
| directions | DisplayText | * | Multi-language human-readable directions when more detailed information on how to reach the EVSE from the <i>Location</i> is required. |
| 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_updated | DateTime | 1 | Timestamp when this EVSE or one of its Connectors was last updated. |

8.3.3 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 | Card. | Description |
|----------|-----------------|-------|--|
| id | string(15) | 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 <i>EVSE</i> object. |
| standard | ConnectorType | 1 | The standard of the installed connector. |
| format | ConnectorFormat | 1 | The format (socket/cable) of the installed connector. |

| Property | Type | Card. | Description |
|----------------------|-------------------|-------|---|
| 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(15) | ? | Identifier of the current charging tariff structure |
| terms_and_conditions | URL | ? | URL to the operator's terms and conditions. |
| last_updated | DateTime | 1 | Timestamp when this Connectors was last updated. |

8.4 Data types

8.4.1 AdditionalGeoLocation *class*

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

| Property | Type | Card. | Description |
|-----------|--------------------|-------|--|
| latitude | string(10) | 1 | Latitude of the point in decimal degree. Example: 50.770774. Decimal separator: “.” Regex: <code>-?[0-9]{1,2}\.[0-9]{6}</code> |
| longitude | string(11) | 1 | Longitude of the point in decimal degree. Example: -126.104965. Decimal separator: “.” Regex: <code>-?[0-9]{1,3}\.[0-9]{6}</code> |
| name | DisplayText | ? | Name of the point in local language or as written at the location. For example the street name of a parking lot entrance or it's number. |

8.4.2 BusinessDetails *class*

| Property | Type | Card. | 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. |

8.4.3 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 can be paid with credit card. |
| REMOTE_START_STOP_CAPABLE | The EVSE can remotely be started/stopped. |
| RESERVABLE | The EVSE can be reserved. |

| Value | Description |
|----------------|---|
| RFID_READER | Charging at this EVSE can be authorized with a RFID token |
| UNLOCK_CAPABLE | Connectors have mechanical lock that can be requested by the eMSP to be unlocked. |

8.4.4 ConnectorFormat *enum*

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

| Value | Description |
|--------|---|
| SOCKET | The connector is a socket; the EV user needs to bring a fitting plug. |
| CABLE | The connector is an attached cable; the EV users car needs to have a fitting inlet. |

8.4.5 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 | IEC 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” |
| TESLA_R | Tesla Connector “Roadster”-type (round, 4 pin) |
| TESLA_S | Tesla Connector “Model-S”-type (oval, 5 pin) |

8.4.6 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 | Card. | Description |
|---------------------|---------------------|-------|---|
| is_green_energy | boolean | 1 | True if 100% from regenerative sources. (CO2 and nuclear waste is zero) |
| 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 or to show it directly to the customer (for well-known brands like Greenpeace Energy, etc.)

8.4.6.1 Examples

8.4.6.1.1 Simple:

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

8.4.6.1.2 Tariff name based:

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

8.4.6.1.3 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"
}

```

8.4.7 EnergySource *class*

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

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

8.4.8 EnergySourceCategory *enum*

Categories of energy sources.

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

8.4.9 EnvironmentalImpact *class*

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

| Property | Type | Card. | Description |
|----------|-----------------------------|-------|----------------------------------|
| source | EnvironmentalImpactCategory | 1 | The category of this value. |
| amount | number | 1 | Amount of this portion in g/kWh. |

8.4.10 EnvironmentalImpactCategory *enum*

Categories of environmental impact values.

| Value | Description |
|----------------|--|
| NUCLEAR_WASTE | Produced nuclear waste in gramms per kilowatthour. |
| CARBON_DIOXIDE | Exhausted carbon dioxide in gramms per kilowarrhour. |

8.4.11 ExceptionalPeriod *class*

Specifies one exceptional period for opening or access hours.

| Field Name | Field Type | Card. | Description |
|--------------|-----------------|-------|-------------------------|
| period_begin | DateTime | 1 | Begin of the exception. |
| period_end | DateTime | 1 | End of the exception. |

8.4.12 Facility *enum*

| Value | Description |
|-----------------|---|
| HOTEL | A hotel. |
| RESTAURANT | A restaurant. |
| CAFE | A cafe. |
| MALL | A mall or shopping center. |
| SUPERMARKET | A supermarket. |
| SPORT | Sport facilities: gym, field etc. |
| RECREATION_AREA | A Recreation area. |
| NATURE | Located in, or close to, a park, nature reserve/park etc. |
| MUSEUM | A museum. |
| BUS_STOP | A bus stop. |
| TAXI_STAND | A taxi stand. |
| TRAIN_STATION | A train station. |
| AIRPORT | An airport. |
| CARPOOL_PARKING | A carpool parking. |
| FUEL_STATION | A Fuel station. |
| WIFI | Wifi or other type of internet available. |

8.4.13 GeoLocation *class*

| Property | Type | Card. | Description |
|-----------|--------------------|-------|---|
| latitude | string (10) | 1 | Latitude of the point in decimal degree. Example: 50.770774. Decimal separator: “.” Regex: <code>-?[0-9]{1,2}\.[0-9]{6}</code> |
| longitude | string (11) | 1 | Longitude of the point in decimal degree. Example: -126.104965. Decimal separator: “.” Regex: <code>-?[0-9]{1,3}\.[0-9]{6}</code> |

8.4.14 Hours *class*

Opening and access hours of the location.

| Field Name | Field Type | Card. | Description |
|---------------------------|---------------------|-------|--|
| <i>Choice: one of two</i> | | | |
| > 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 the given exceptions. |

| Field Name | Field Type | Card. | Description |
|----------------------|-------------------|-------|---|
| exceptional_openings | ExceptionalPeriod | * | Exceptions for specified calendar dates, time-range based. Periods the station is operating/accessible. Additional to regular hours. May overlap regular rules. |
| exceptional_closings | ExceptionalPeriod | * | Exceptions for specified calendar dates, time-range based. Periods the station is not operating/accessible. Overwriting regularHours and exceptionalOpenings. Should not overlap exceptionalOpenings. |

8.4.15 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 | Card. | Description |
|------------|---------------|-------|--|
| url | URL | 1 | URL from where the image data can be fetched through a web browser. |
| thumbnail | URL | ? | URL from where a thumbnail of the image can be fetched through a webbrowser. |
| category | ImageCategory | 1 | Describes what the image is used for. |
| type | string(4) | 1 | Image type like: gif, jpeg, png, svg |
| width | int(5) | ? | Width of the full scale image |
| height | int(5) | ? | Height of the full scale image |

8.4.16 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 |

8.4.17 LocationType *enum*

Reflects the general type of the charge points location. May be used for user information.

| Value | Description |
|--------------------|---|
| ON_STREET | Parking in public space. |
| PARKING_GARAGE | Multistorey car park. |
| UNDERGROUND_GARAGE | Multistorey car park, mainly underground. |
| PARKING_LOT | A cleared area that is intended for parking vehicles, i.e. at super markets, bars, etc. |
| OTHER | None of the given possibilities. |
| UNKNOWN | Parking location type is not known by the operator (default). |

8.4.18 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. |

8.4.19 PowerType *enum*

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

| Value | Description |
|------------|----------------|
| AC_1_PHASE | AC mono phase. |

| Value | Description |
|------------|-----------------|
| AC_3_PHASE | AC 3 phase. |
| DC | Direct Current. |

8.4.20 RegularHours *class*

Regular recurring operation or access hours

| Field Name | Field Type | Card. | 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 for period_begin. Must be later than period_begin. |

8.4.20.1 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 ~~stroked-out~~ 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 | 08 | 08 | 08 | 08 | 08 | 09 | - | 08 | - | 08 | 08 | 08 | - | - |
| from | | | | | | | | | | | | | | |
| Open | 20 | 20 | 20 | 20 | 20 | 12 | - | 20 | - | 20 | 20 | 20 | - | - |
| till | | | | | | | | | | | | | | |

8.4.21 Status enum

The status 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) |

8.4.22 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 | Card. | 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 EVSEs **status** field itself.

9 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.

9.1 Flow and Lifecycle

9.1.1 Push model

When the CPO creates a Session object they push it to the eMSPs by calling **PUT** on the eMSPs 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 eMSPs 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 eMSPs system, the CPO can call the **GET** to validate the Session object in the eMSP system.

9.1.2 Pull model

eMSPs who do not support the push model need to call **GET** on the CPOs 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.

9.2 Interfaces and endpoints

9.2.1 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 |

9.2.1.1 GET Method Fetch Sessions from the CPO systems.

9.2.1.1.1 Request Parameters Only Sessions with `last_update` between the given {date_from} and {date_to} will be returned.

This request is **paginated**, so 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. |

9.2.1.1.2 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 | Card. | Description |
|----------|-------|---|
| Session | * | List of Session objects that match the request parameters |

9.2.2 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 | Update the Session object of id {session_id}. |
| DELETE | n/a |

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

9.2.2.1.1 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. |
| session_id | string(15) | yes | id of the Session object to get from the eMSP system. |

9.2.2.1.2 Response Data The response contains the request Session object, if available.

| Datatype | Card. | Description |
|----------|-------|---------------------------|
| Session | 1 | Session object requested. |

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

9.2.2.2.1 Request Body The request contains the new or updated Session object.

| Type | Card. | Description |
|---------|-------|---------------------|
| Session | 1 | new Session object. |

9.2.2.2.2 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(15) | yes | id of the new or updated Session object. |

9.2.2.3 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.

9.2.2.3.1 Example: update the total cost

PATCH To URL: <https://www.server.com/ocpi/cpo/2.0/sessions/NL/TNM/101>

```
{
  "total_cost": "0.60"
}
```

9.3 Object description

9.3.1 Session Object

| Property | Type | Card. | Description |
|----------------|------------|-------|--|
| id | string(15) | 1 | The unique id that identifies the session in the CPO platform. |
| start_datetime | 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(15) | 1 | An id provided by the authentication used, so that the eMSP knows to which driver the session belongs. |

| Property | Type | Card. | Description |
|------------------|----------------|-------|---|
| 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 | 1 | 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. |
| status | SessionStatus | 1 | The status of the session. |
| last_updated | DateTime | 1 | Timestamp when this Session was last updated. |

9.3.1.1 Examples

9.3.1.2 Simple Session example of a just 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.Roosevelttlaan 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"
    }
  ]
},
  "currency": "EUR",
  "total_cost": "2.50",
}
```

```

    "status": "PENDING"
  }
}

```

9.3.1.2.1 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"
    }
  ]
},
  "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": "2015-06-29T23:07:09+02:00",
    "dimensions": [{
      "type": "PARKING_TIME",
      "volume": 0.718
    }]
  },
  "total_cost": "8.50",
  "status": "COMPLETED"
}

```

9.4 Data types

Describe all datatypes used in this object

9.4.1 SessionStatus *enum*

| Property | Description |
|-----------|--|
| ACTIVE | The session is accepted and active. |
| COMPLETED | The session is finished successfully. |
| 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. |

10 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, it is seen as good practice to send them ASAP. But if there is an agreement between parties to send them for example once a month, that is also allowed by OCPI.

10.1 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.

10.1.1 Push model

When the CPO creates CDR(s) they push them to the relevant eMSP by calling **POST** on the eMSPs 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 can not yet be updated or removed. This might be added in a future version of OCPI.

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 eMSPs CDRs endpoint at the URL returned in the response to the **POST**.

10.1.2 Pull model

eMSPs who do not support the push model need to call **GET** on the CPOs 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, 'mist' during a time offline.

10.2 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, or the eMSP Interface/Push model, or both.

Push is the preferred model to use, the eMSP will receive CDRs when created by the CPO.

10.2.1 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) |

| Method | Description |
|--------|-------------|
| POST | n/a |
| PUT | n/a |
| PATCH | n/a |
| DELETE | n/a |

10.2.1.1 GET Method Fetch CDRs from the CPO systems.

10.2.1.1.1 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 |
|------------------------|-----------------|----------|---|
| <code>date_from</code> | DateTime | no | Only return CDRs that have <code>last_updated</code> after this Date/Time. |
| <code>date_to</code> | DateTime | no | Only return CDRs that have <code>last_updated</code> before this Date/Time. |
| <code>offset</code> | int | no | The offset of the first object returned. Default is 0. |
| <code>limit</code> | int | no | Maximum number of objects to GET. |

10.2.1.1.2 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 | Card. | Description |
|------------|-------|---------------|
| CDR | * | List of CDRs. |

10.2.2 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) |

10.2.2.1 GET Method Fetch CDRs from the eMSP system.

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

10.2.2.1.2 Response Data The endpoint returns the requested CDR, if it exists

| Datatype | Card. | Description |
|----------|-------|-----------------------|
| CDR | 1 | Requested CDR object. |

10.2.2.2 POST Method Creates a new CDR.

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

10.2.2.2.1 Request Body In the post request the new CDR object is sent.

| Type | Card. | Description |
|------|-------|-----------------|
| CDR | 1 | New CDR object. |

| 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 do a GET on of the same CDR |

10.2.2.2.2 Response Headers Example: Location: /ocpi/emsp/2.0/cdrs/123456

10.3 Object description

10.3.1 CDR Object

The *CDR* object describes the Charging Session and its costs. How these costs are build up etc.

| Property | Type | Card. | Description |
|------------------|----------------|-------|--|
| id | CiString(15) | 1 | Uniquely identifies the CDR within the CPOs platform (and suboperator platforms). |
| start_date_time | DateTime | 1 | Start timestamp of the charging session. |
| stop_date_time | DateTime | ? | Stop timestamp of the charging session. |
| auth_id | string(32) | 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 4217 Code. |
| tariffs | Tariff | * | List of relevant tariff elements, see: Tariffs . |
| charging_periods | ChargingPeriod | + | List of charging periods that make up this charging session. A session consists of 1 or more periods, where each period has a different relevant Tariff. |
| total_cost | number | 1 | Total cost of this transaction. |
| total_energy | number | 1 | Total energy charged, in kWh. |
| total_time | number | 1 | Total time charging, in hours. |

| Property | Type | Card. | Description |
|--------------------|-------------|-------|--|
| total_parking_time | number | ? | Total time not charging, in hours. |
| remark | string(255) | ? | Optional remark, can be used to provide addition human readable information to the CDR, for example: reason why a transaction was stopped. |
| last_updated | DateTime | 1 | Timestamp when this CDR was last updated. |

10.3.1.1 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"
    }]
  }
},
  "currency": "EUR",
  "tariffs": [{
    "id": "12",
    "currency": "EUR",
    "elements": [{
      "price_components": [{
        "type": "TIME",
        "price": "2.00",
        "step_size": 300
      }]
    }]
  }],
}
```



```

    "charging_periods": [{
      "start_date_time": "2015-06-29T21:39:09+02:00",
      "dimensions": [{
        "type": "TIME",
        "volume": "1.973"
      }]
    }],
    "total_cost": "4,00",
    "total_usage": [{
      "type": "TIME",
      "volume": "1.973"
    }, {
      "type": "ENERGY",
      "volume": "15.342"
    }]
  }

```

10.4 Data types

10.4.1 AuthMethod *enum*

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

10.4.2 CdrDimension *class*

| Property | Type | Card. | Description |
|----------|----------------------------------|-------|---|
| type | CdrDimensionType | 1 | Type of cdr dimension |
| volume | number | 1 | Volume of the dimension consumed, measured according to the dimension type. |

10.4.3 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. |

10.4.4 ChargingPeriod *class*

A charging period consists of a start timestamp and a list of possible values that influence this period, for example: Amount of energy charged this period, maximum current during this period etc.

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

11 *Tariffs* module

Module Identifier: `tariffs`

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

11.1 Flow and Lifecycle

11.1.1 Push model

When the CPO creates a new Tariff they push them to the eMSPs by calling the **PUT** on the eMSPs 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 eMSPs Tariffs endpoint with the updated Tariff object.

When the CPO deletes a Tariff, they will update the eMSPs systems by calling **DELETE** on the eMSPs 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 eMSPs system, the CPO can call the **GET** to validate the Tariff object in the eMSP system.

11.1.2 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.

11.2 Interfaces and endpoints

There is both a CPO and an eMSP interface for Tariffs. 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 2 parties is established to retrieve the current list of Tariffs objects, and when the eMSP is not 100% sure the Tariff cache is still correct.

11.2.1 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 |

11.2.1.1 **GET Method** Fetch information about all Tariffs.

11.2.1.1.1 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 returned. Default is 0. |
| limit | int | no | Maximum number of objects to GET. |

11.2.1.1.2 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 | Card. | Description |
|--------|-------|----------------------|
| Tariff | * | List of all tariffs. |

11.2.2 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 |

11.2.2.1 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.

11.2.2.1.1 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(15) | yes | Tariff.id of the Tariff object to retrieve. |

11.2.2.1.2 Response Data The response contains the requested object.

| Type | Card. | Description |
|--------|-------|------------------------------|
| Tariff | 1 | The requested Tariff object. |

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

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

| Type | Card. | Description |
|--------|-------|------------------------------|
| Tariff | 1 | New or updated Tariff object |

11.2.2.2.2 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(15) | yes | Tariff.id of the (new) Tariff object (to replace). |

11.2.2.2.3 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
    }]
  }]
}
```

11.2.2.3 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.

11.2.2.3.1 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
    }]
  }]
}
```

```

    }
}

```

11.2.2.4 DELETE Method Delete a no longer valid Tariff object.

11.2.2.4.1 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(15) | yes | Tariff.id of the Tariff object to delete. |

11.3 Object description

11.3.1 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, than 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 non of the TariffElements before this matches the current charging period.

| Property | Type | Card. | Description |
|-----------------|---------------|-------|--|
| id | string(15) | 1 | Uniquely identifies the tariff within the CPOs platform (and suboperator platforms). |
| currency | string(3) | 1 | Currency of this tariff, ISO 4217 Code |
| tariff_alt_text | DisplayText | * | List of multi language alternative tariff info text |
| tariff_alt_url | URL | ? | Alternative URL to tariff info |
| elements | TariffElement | + | List of tariff elements |
| energy_mix | EnergyMix | ? | Details on the energy supplied with this tariff. |
| last_updated | DateTime | 1 | Timestamp when this Tariff was last updated. |

11.3.1.1 Examples

11.3.1.1.1 Simple Tariff example 2 euro per hour

```

{
  "id": "12",
  "currency": "EUR",
  "elements": [{
    "price_components": [{
      "type": "TIME",

```

```

        "price": "2.00",
        "step_size": 300
    ]
}

```

11.3.1.1.2 Simple Tariff example with alternative multi language text

```

{
  "id": "12",
  "currency": "EUR",
  "tariff_alt_text": [{
    "language": "en",
    "text": "2 euro p/hour"
  }, {
    "language": "nl",
    "text": "2 euro p/uur"
  }],
  "elements": [{
    "price_components": [{
      "type": "TIME",
      "price": "2.00",
      "step_size": 300
    }
  ]
}

```

11.3.1.1.3 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
    }
  ]
}

```

11.3.1.1.4 Complex Tariff example 2.50 euro start tariff

1.00 euro per hour charging tariff for less than 32A (paid per 15 minutes)

2.00 euro per hour charging tariff for more than 32A on weekdays (paid per 10 minutes)

1.25 euro per hour charging tariff for more than 32A during the weekend (paid per 10 minutes)

Parking costs:

- Weekdays: between 09:00 and 18:00 : 5 euro (paid per 5 minutes)
- Saturday: between 10:00 and 17:00 : 6 euro (paid per 5 minutes)

```

{
  "id": "11",
  "currency": "EUR",
  "tariff_alt_url": "https://company.com/tariffs/11",

```

```

"elements": [{
  "price_components": [{
    "type": "FLAT",
    "price": "2.50",
    "step_size": 1
  }]
}, {
  "price_components": [{
    "type": "TIME",
    "price": "1.00",
    "step_size": "900"
  }],
  "restrictions": [{
    "max_power": "32.00"
  }]
}, {
  "price_components": [{
    "type": "TIME",
    "price": "2.00",
    "step_size": "600"
  }],
  "restrictions": [{
    "min_power": "32.00",
    "day_of_week": ["MONDAY", "TUESDAY", "WEDNESDAY", "THURSDAY", "FRIDAY"]
  }]
}, {
  "price_components": [{
    "type": "TIME",
    "price": "1.25",
    "step_size": "600"
  }],
  "restrictions": [{
    "min_power": "32.00",
    "day_of_week": ["SATURDAY", "SUNDAY"]
  }]
}, {
  "price_components": [{
    "type": "PARKING_TIME",
    "price": "5.00",
    "step_size": "300"
  }],
  "restrictions": [{
    "start_time": "09:00",
    "end_time": "18:00",
    "day_of_week": ["MONDAY", "TUESDAY", "WEDNESDAY", "THURSDAY", "FRIDAY"]
  }]
}, {
  "price_components": [{
    "type": "PARKING_TIME",
    "price": "6.00",
    "step_size": "300"
  }],
  "restrictions": [{
    "start_time": "10:00",
    "end_time": "17:00",
    "day_of_week": ["SATURDAY"]
  }]
}]

```


}

11.4 Data types

11.4.1 DayOfWeek *enum*

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

11.4.2 PriceComponent *class*

| Property | Type | Card. | Description |
|-----------|--|-------|---|
| type | [TariffDimensionType](#tariffdimensionstype-enum |) 1 | Type of tariff dimension |
| price | number | 1 | price per unit for this tariff dimension |
| step_size | int | 1 | Minimum amount 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, so if 6 minutes is used, 10 minutes (2 blocks of step_size) will be billed. |

11.4.3 TariffElement *class*

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

11.4.4 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 |

11.4.5 TariffRestrictions class

| Property | Type | Card. | Description |
|--------------|------------|-------|--|
| start_time | string(5) | ? | Start time of day, for example 13:30, valid from this time of the day. Must be in 24h 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 the 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 day(s) of the week this tariff is valid |

12 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.

12.1 Flow and Lifecycle

12.1.1 Push model

When the MSP creates a new Token object they push it to the CPO by calling `PUT` on the CPOs 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 sure 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.

12.1.2 Pull model

When a CPO is not sure 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 eMSPs Token endpoint to receive all Tokens, updating already known Tokens and adding new received Tokens to it own list of Tokens. This method is not for operational flow.

12.1.3 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 doesn’t want real-time authorization, the `POST Authorize request` doesn’t have to be implemented as long as all their Tokens have `Token.whitelist` set to `ALWAYS`.

12.2 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 100% sure the Token cache is still correct.

12.2.1 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). |

12.2.1.1 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.

12.2.1.1.1 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 requesting this GET from the CPO system. |
| party_id | string(3) | yes | Party ID (Provider ID) of the eMSP requesting this GET from the CPO system. |
| token_uid | string(15) | yes | Token.uid of the Token object to retrieve. |

12.2.1.1.2 Response Data The response contains the requested object.

| Type | Card. | Description |
|--------------|-------|-----------------------------|
| Token | 1 | The requested Token object. |

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

12.2.1.2.1 Request Body In the put request a the new or updated Token object is send.

| Type | Card. | Description |
|--------------|-------|------------------------------|
| Token | 1 | New or updated Token object. |

12.2.1.2.2 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 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(15) | yes | Token.uid of the (new) Token object (to replace). |

12.2.1.2.3 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,
  "allow_whitelist": true
}
```

12.2.1.3 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.

12.2.1.3.1 Example: invalidate a Token

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

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

12.2.2 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 Tokens, last updated between the {date_from} and {date_to} (paginated) |
| POST | Real-time authorization request |
| PUT | n/a |
| PATCH | n/a |
| DELETE | n/a |

12.2.2.1 GET Method Fetch information about Tokens known in the eMSP systems.

12.2.2.1.1 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 returned. Default is 0. |
| limit | int | no | Maximum number of objects to GET. |

12.2.2.1.2 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 | Card. | Description |
|--------------|-------|---------------------|
| Token | * | List of all tokens. |

12.2.2.2 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 to little information (no LocationReferences provided) to determine if the Token might be used, the eMSP SHOULD respond with the OCPI status: **2002**

12.2.2.2.1 Request Parameters The following parameter has to be provided as URL segments.

| Parameter | Datatype | Required | Description |
|------------------------|--------------------|----------|---|
| <code>token_uid</code> | string (15) | yes | Token.uid of the Token for which this authorization is. |

12.2.2.2.2 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 | Card. | Description |
|---------------------------|-------|---|
| LocationReferences | ? | Location and EVSEs/Connectos for which the Token is requested to be authorized. |

12.2.2.2.3 Response Data The endpoint response contains a **AuthorizationInfo** object.

| Type | Card. | Description |
|--------------------------|-------|---|
| AuthorizationInfo | 1 | Contains information about the authorization, if the Token is allowed to charge and optionally which EVSEs/Connectors are allowed to be used. |

12.3 Object description

12.3.1 *AuthorizationInfo* Object

| Property | Type | Card. | 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 request in the request, and if the EV driver is allowed to charge at that location. Only the EVSEs/Connectors the EV driver is allowed to charge at are returned. |
| info | DisplayText | ? | Optional display text, additional information to the EV driver. |

12.3.2 Token Object

| Property | Type | Card. | Description |
|---------------|-------------------------------|-------|--|
| uid | string (15) | 1 | Identification used by CPO system to identify this token, for example RFID hidden ID |
| type | TokenType | 1 | Type of the token |
| auth_id | string (32) | 1 | Uniquely identifies the EV Driver contract token within the eMSPs 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 of the Token |
| issuer | string (64) | 1 | Issuing company |
| 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. This 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. |

The combination of *uid* and *type* should be unique for every token.

12.3.2.1 Example

```
{
  "uid": "012345678",
  "type": "RFID",
  "auth_id": "FA54320",
  "visual_number": "DF000-2001-8999",
  "issuer": "TheNewMotion",
  "valid": true,
  "allow_whitelist": true
}
```

12.4 Data types

12.4.1 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 has not enough credits to charge at the given location. |
| NOT_ALLOWED | Token is valid, but is not allowed to charge at the given location. |

12.4.2 LocationReferences *class*

References to location details.

| Field Name | Field Type | Card. | Description |
|---------------|------------|-------|--|
| location_id | string(15) | 1 | Uniquely identifier for the location. |
| evse_uids | string(15) | * | Uniquely identifier for EVSEs within the CPOs platform for the EVSE within the the given location. |
| connector_ids | string(15) | * | Identifies the connectors within the given EVSEs. |

12.4.3 TokenType *enum*

| Value | Description |
|-------|---------------------|
| OTHER | Other type of token |
| RFID | RFID Token |

12.4.4 WhitelistType *enum*

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

| Value | Description |
|-----------------|--|
| ALWAYS | Token always has to 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/forbidden, only realtime authorization allowed. Token should always be authorized by the eMSP. |

13 *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](#)

13.1 Flow

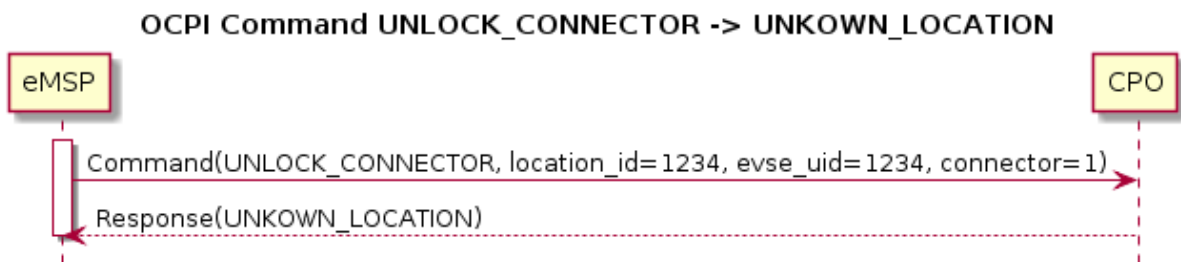
With the Commands module, commands can be sent from the eMSP, via the CPO to a Charge Point. Most Charge Point are hooked up to the internet via a relative slow wireless connection. To prevent long blocking calls, the commands module is designed to work asynchronously.

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.

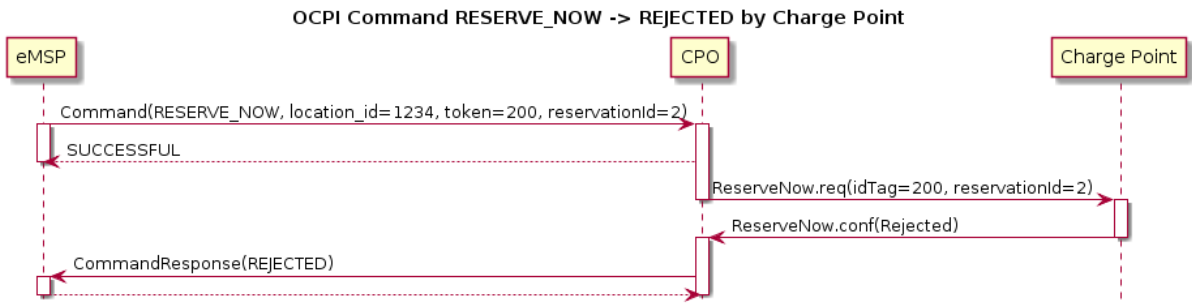
The CPO sends the requested command (via another protocol, for example: OCPP) to a Charge Point. The Charge Point will respond if it understands the command and will try to execute the command. This response doesn't mean that the command was executed successfully. The CPO will forward this command in 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.

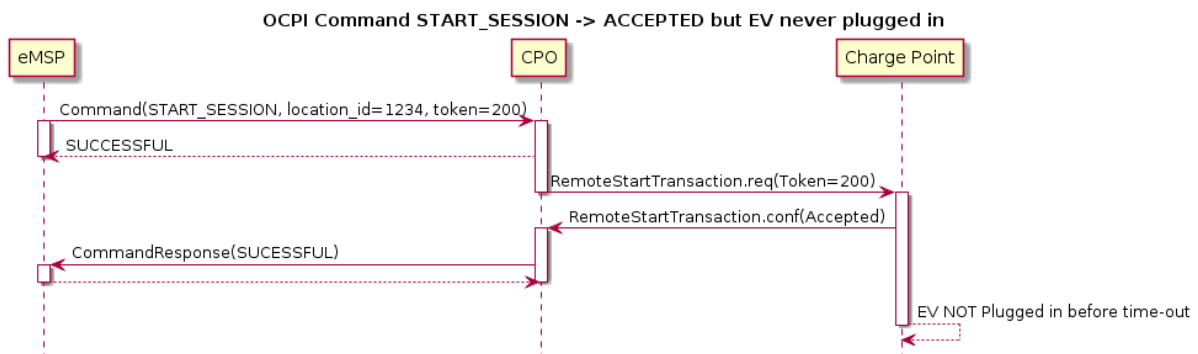
Example of a `UNLOCK_CONNECTOR` that fails because the Location is not known by the CPO.



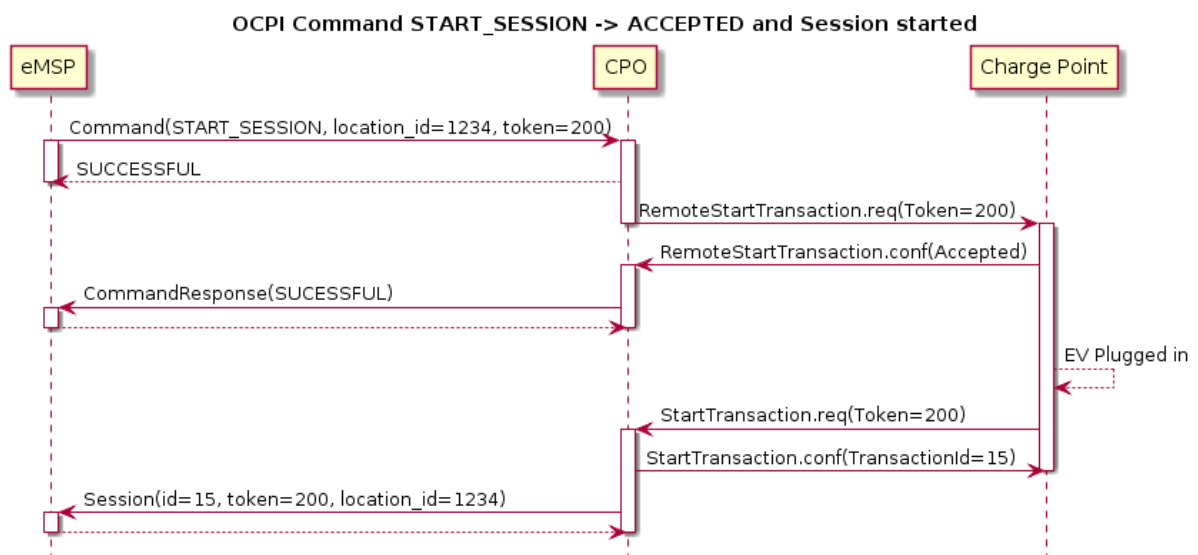
Example of a `RESERVE_NOW` that is rejected by the Charge Point.



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



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



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

13.2 Interfaces and endpoints

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

13.2.1 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 |

13.2.1.1 POST Method

13.2.1.1.1 Request Parameters The following parameters can be provided as URL segments.

| Parameter | Datatype | Required | Description |
|-----------|-------------|----------|------------------------------------|
| command | CommandType | yes | Type of command that is requested. |

13.2.1.2 Request Body Depending on the `command` parameter the body SHALL contain the applicable object for that command.

| Type | Card. | Description |
|----------------------------|-------|--|
| <i>Choice: one of four</i> | | |
| > 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 sessions. |
| > StopSession | 1 | StopSession object, for the STOP_SESSION command, with information needed to stop a sessions. |
| > UnlockConnector | 1 | UnlockConnector object, for the UNLOCK_CONNECTOR command, with information needed to unlock a connector of a Charge Point. |

13.2.1.2.1 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 | Card. | Description |
|---------------------|-------|--|
| CommandResponseType | 1 | Result of the command request by the CPO (not the Charge Point). |

13.2.2 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 |

| Method | Description |
|--------|-------------|
| DELETE | n/a |

13.2.2.1 POST Method

13.2.2.1.1 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 | Card. | Description |
|----------------------------|-------|--|
| CommandResponseType | 1 | Result of the command request by the CPO (not the Charge Point). |

13.2.2.2 Request Body

13.3 Object description

13.3.1 *CommandResponse* Object

| Property | Type | Card. | Description |
|----------|----------------------------|-------|---|
| result | CommandResponseType | 1 | Result of the command request as sent by the Charge Point to the CPO. |

13.3.2 *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 | Card. | Description |
|----------------|-----------------|-------|---|
| response_url | URL | 1 | URL that the CommandResponse POST should be send to. This URL might contain an 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 |

| Property | Type | Card. | Description |
|-------------|------------|-------|--|
| location_id | string(15) | 1 | Location.id of the Location (belonging to the CPO this request is send to) for which to reserve an EVSE. |
| evse_uid | string(15) | ? | Optional EVSE.uid of the EVSE of this Location if a specific EVSE has to be reserved. |

13.3.3 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 | Card. | Description |
|--------------|------------|-------|---|
| response_url | URL | 1 | URL that the CommandResponse POST should be sent to. This URL might contain an 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 this request is send to) on which a session is to be started. |
| evse_uid | string(15) | ? | Optional EVSE.uid of the EVSE of this Location on which a session is to be started. |

13.3.4 StopSession Object

| Property | Type | Card. | Description |
|--------------|------------|-------|--|
| response_url | URL | 1 | URL that the CommandResponse POST should be sent to. This URL might contain an 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. |

13.3.5 UnlockConnector Object

| Property | Type | Card. | Description |
|--------------|------------|-------|--|
| response_url | URL | 1 | URL that the CommandResponse POST should be sent to. This URL might contain an unique ID to be able to distinguish between UnlockConnector requests. |
| location_id | string(15) | 1 | Location.id of the Location (belonging to the CPO this request is send to) of which it is requested to unlock the connector. |
| evse_uid | string(15) | 1 | EVSE.uid of the EVSE of this Location of which it is requested to unlock the connector. |
| connector_id | string(15) | 1 | Connector.id of the Connector of this Location of which it is requested to unlock. |

13.4 Data types

13.4.1 CommandResponseType *enum*

The command requested.

| Value | Description |
|-----------------|--|
| NOT_SUPPORTED | The requested command is not supported by this CPO, Charge Point, EVSE etc. |
| 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 an reasonable time. |
| UNKNOWN_SESSION | The Session in the requested command is not known by this CPO. |

13.4.2 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. |
| UNLOCK_CONNECTOR | Request the Charge Point to unlock the connector (if applicable). 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, for example: fail when there is tension on the charging cable when the Charge Point tries to unlock the connector.

In such a situation the EV-Driver can call either the CPO or the eMSP to retry the unlocking.

14 Types

14.1 CiString *type*

Case Insensitive String. Only printable ASCII allowed.

14.2 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.

14.3 DisplayText *class*

| Property | Type | Card. | Description |
|----------|-------------|-------|---|
| language | string(2) | 1 | Language Code ISO 639-1 |
| text | string(512) | 1 | Text to be displayed to a end user. No markup, html etc. allowed. |

Example:

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

14.4 number *type*

Numbers in OCPI are formatted as JSON numbers.

Unless mentioned otherwise, numbers use 4 decimals and a *sufficiently large amount* of digits.

14.5 string *type*

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

14.6 URL *type*

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

15 Changelog

15.1 Changes between OCPI 2.0 and 2.1

| Context (Module / Object) | Expected Impact: eMSP / CPO | Expected Effort: eMSP / CPO | Description |
|----------------------------------|-----------------------------|-----------------------------|---|
| CDRs / CDR object | Major / Major | Minimal / Minimal | replaced field: “total_usage” with: “total_energy”, “total_time” and “total_parking_time” |
| CDRs / CDR object | Major / Major | Minimal / Minimal | OCPI decimal type is removed and replaced by JSON number. |
| CDRs / CDR object | Major / Major | Average / Average | new field added: “last_updated”, GET method filters changed to use this new field instead of start of charging session. |
| CDRs / CdrDimension class | Major / Major | Minimal / Minimal | OCPI decimal type is removed and replaced by JSON number. |
| CDRs / CdrDimension class | Minor / Minor | Minimal / Minimal | Generic DimensionType replaced by CdrDimensionType. |
| Credentials / Credentials object | Minor / Minor | Minimal / Minimal | field: “Token” had no max string length, is now set to 64. |
| Commands module | Optional / Optional | Large / Large | added new commands module. |
| Locations / Location object | Average / Optional | Minimal / Minimal | new field added: “owner” |
| Locations / Location object | Average / Optional | Minimal / Minimal | new field added: “time_zone” |
| Locations / Location object | Minor / Optional | Average / Average | new field added: “facilities”, a list of new type: Facility |
| Locations / Location object | Minor / Optional | Average / Average | new field added: “energy_mix” |
| Locations / Location object | Minor / Minor | Minimal / Minimal | new field added: “last_updated” |
| Locations / EVSE object | Minor / Minor | Minimal / Minimal | new field added: “last_updated” |
| Locations / Connector object | Minor / Minor | Minimal / Minimal | new field added: “last_updated” |
| Locations / GET list method | Optional / Average | Minimal / Average | added filters to retrieve only Locations that have been updated between date_to/date_from. |
| Locations / GET object method | Optional / Average | Average / Average | added functionality to retrieve information about a specific Location, EVSE or Connector from a CPO. This can be useful for eMSPs that require ‘real-time’ authorization of Tokens. |
| Locations / Capability enum | Minor / Optional | Minimal / Minimal | added new values to the enum: Capability. |
| Sessions / Session object | Major / Major | Minimal / Minimal | OCPI decimal type is removed and replaced by JSON number. |
| Sessions / Session object | Major / Major | Average / Average | new field added: “last_updated”, GET method filters changed to use this new field instead of start of charging session. |

| Context (Module / Object) | Expected Impact: eMSP / CPO | Expected Effort: eMSP / CPO | Description |
|--|-----------------------------|-----------------------------|--|
| Sessions / eMSP DELETE method | Minor / Optional | Minimal / Minimal | Session DELETE method is removed. |
| Tariffs / Tariff object | Minor / Minor | Minimal / Minimal | Tariffs / Tariff object Minor / Optional Average / Average new field added: "energy_mix" new field added: "last_updated" |
| Tariffs / PriceComponent class | Major / Major | Minimal / Minimal | OCPI decimal type is removed and replaced by JSON number. |
| Tariffs / PriceComponent class | Major / Major | Minimal / Minimal | OCPI decimal type is removed and replaced by JSON number. |
| Tariffs / PriceComponent class | Minor / Minor | Minimal / Minimal | Generic DimensionType replaced by TariffDimensionType. |
| Tariffs / CPO GET method | Optional / Average | Minimal / Average | added filters to retrieve only Tokens that have been updated between date_to/date_from. |
| Tokens / eMSP POST method | Optional / Major | Large / Large | added functionality for 'real-time' authorization of Tokens. |
| Tokens / Token object | Optional / Minor | Minimal / Average | new field added: language. |
| Tokens / Token object | Major / Major | Minimal / Average | changed field: whitelist_allowed (type: boolean) to whitelist (type: WhitelistType) |
| Tokens / Token object | Minor / Minor | Minimal / Minimal | new field added: "last_updated" |
| Tokens / Token object | Optional / Minor | Minimal / Minimal | field: "visual_number" is now optional. |
| Tokens / eMSP GET method | Average / Optional | Average / Minimal | added filters to retrieve only Tokens that have been updated between date_to/date_from. |
| Version information / Custom Modules | Optional / Optional | Average / Average | added description on how to add custom/customized modules to OCPI. |
| Version information / Version class | Minor / Minor | Minimal / Minimal | OCPI Version changed from OCPI decimal to VersionNumber enum. |
| Version information / Version details endpoint | Minor / Minor | Minimal / Minimal | OCPI Version changed from OCPI decimal to VersionNumber enum. |