

# Identification of Electric Vehicles in CSMS via OCPP 1.6 and 2.0.1

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## 1 Introduction

### 1.1 Motivation

Load management plays a central role in certain charging station environments, especially when many electric vehicles need to be charged at the same point of time, but load peaks are to be avoided. A load management algorithm requires a lot of different information sources to calculate the optimal set of charging profiles.

In some scenarios the information which vehicle is connected to which charging station is mandatory. The following examples shall show the necessity:

#### > Use-case Fleet-Management (company pool vehicles, electric busses, commercial vehicles, ...):

The charging of the vehicles shall be prioritized depending on the departure time. The departure time is provided by a fleet-management tool in the back end and is updated by a fleet operator. The vehicle which departs at first shall be charged with the maximum possible power and vehicles which departure later get the remaining available power. In OCPP such load management is realized by the Smart Charging features, i.e. TxProfiles and SAScheduleList. In order to send the prioritized TxProfile to the correct charging station, a mapping between vehicle and charging station is required within the Charging Station Management System (CSMS).

#### > Use-case Value-Added-Service (VAS):

The ISO15118 protocol defines an additional communication channel between vehicle and infrastructure to exchange data, which is not defined in the ISO15118 protocol itself. The endpoint of this communication channel is usually not the charging station, but a separate back end server. With this mechanism, the vehicle can offer additional data or control interfaces for special use cases. This is already used by electric busses to control the preconditioning and to optimize the load management.

Since the OCPP connection and the VAS connection are completely separated communication channels, a mapping is required. For this purpose, a common identifier is required which is provided by both communication channels and which allows a mapping of them.

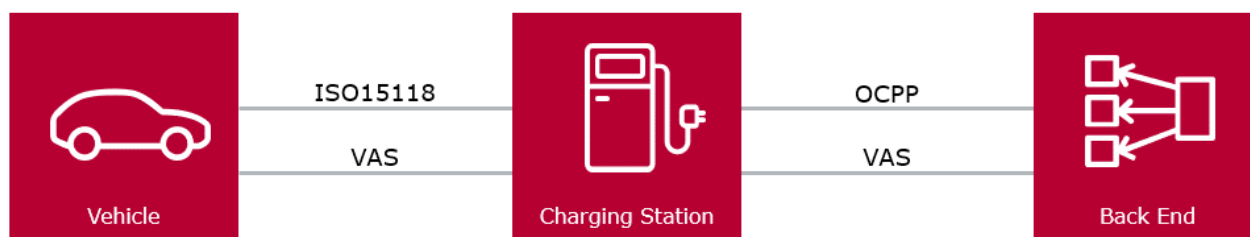


Figure 1: Communication channels in the charging system

## 1.2 Identification vs. Authorization

In some cases, the identity of the vehicle is already available by the authorization of the charging process. This will be the case if the chosen authorization method relates to the vehicle, not the driver.

Examples:

- > Plug & Charge: The vehicle uses a contract certificate for authorization
- > Autocharge: The charging station uses the EVCC ID (MAC address of EVCC) for authorization of the vehicle

However, in some charging environments there is no authorization used at all, for example in private environments where access is restricted at a gate and no further authorization at the charging station is required. Also, some authorization methods relate to the driver and not the vehicle, for example a personalized RFID chip.

In these scenarios, the identification of the vehicle is not possible via the authorization process.

## 2 Solution

The following chapters describe possible methods for the identification of a vehicle with OCPP. It is recommended to support these methods in charging stations and charging station management systems. If both parties support the described methods, interoperability is possible without any further project-specific adaptations.

### 2.1 ID Token with EVCC ID

The vehicle is identified based on the EVCC ID. The ISO15118 defines the EVCC ID as the MAC address of the EVCC (see [V2G2-879] in [1]) and should therefore be unique. The same is true for DIN70121. The EVCC ID is defined as hex binary with max. 6 bytes (ISO15118) or 8 bytes (DIN70121), i.e. the MAC address is transferred without colons. Some vehicles using DIN70121 fill the 8 bytes with leading zeros.

In this solution, the OCPP ID Token shall be used to transport the EVCC ID.

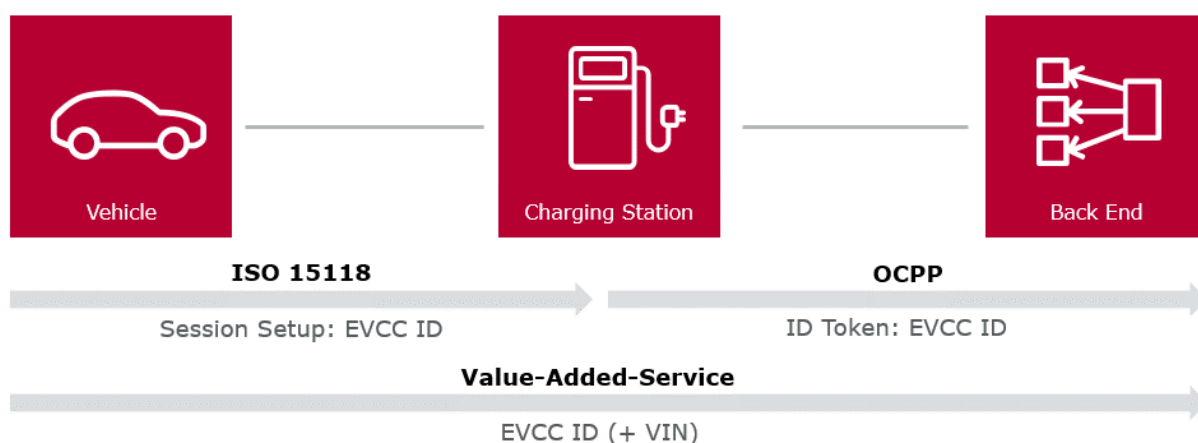


Figure 2: Proposed vehicle identification solution

#### 2.1.1 Connector Mapping

An ID Token can be part of several OCPP messages. To allow a mapping between vehicle and the actual charge point, the ID Token must be sent at least with the StartTransaction.req / TransactionEventRequest message. This message also contains the connector ID (and EVSE ID for OCPP2.0.1). This information is necessary for a correct mapping, especially if a charging station consists of several EVSEs and connectors.

In addition, the ID Token can be also sent with the Authorize.req. The same approach is used in AutoCharge (see [3] and [4]). Since this message does not contain any information about the used EVSE and connector, this message alone is not enough.

### 2.1.2 OCPP 1.6

The format of the parameter idTag shall be the following:

Parameter	Value
idTag	VID:<EVCCID>



#### Example for StartTransaction.req in OCPP1.6J:

```
{  
  "connectorId":1,  
  "idTag":" VID:001681020001",  
  "timestamp":"2020-02-19T16:45:52.719Z",  
  "meterStart":212  
}
```



#### Example for Authorize.req in OCPP 1.6J:

```
{  
  idTag: "VID:001681020001"  
}
```

### 2.1.3 OCPP 2.0.1

Following ID Token shall be used:

Parameter	Value
idToken	EVCCID
type	MacAddress
additionalInfo	<optional>



#### Example for TransactionEventRequest in OCPP2.0.1:

```
{
  "eventType": "Started",
  "timestamp": "2020-04-21T13:43:10Z",
  "triggerReason": "ChargingStateChanged",
  "seqNo": 0,
  "transactionInfo": {
    "transactionId": "cffa32c0-2ab5-498b-a381-76dbfdcf6360",
    "chargingState": "Charging"
  },
  "meterValue": [{
    "sampledValue": [{
      "value": 35.821999,
      "context": "Transaction.Begin",
      "unitOfMeasure": {
        "unit": "kWh"
      }
    }
  ]},
  "timestamp": "2020-04-21T13:43:10Z"
}],
  "evse": {
    "id": 1
  },
  "idToken": {
    "idToken": "001681020001",
    "type": "MacAddress"
  }
}
```

**Example for AuthorizeRequest in OCPP2.0.1:**

```
{
  "idToken": {
    "idToken": "001681020001",
    "type": "MacAddress"
  }
}
```

## 2.2 Combination of Identification and Authorization

Since the described approach only identifies the vehicle, there could be a conflict with another authorization method, e.g. a RFID chip or keycode.

### 2.2.1 OCPP 1.6

There is no approach to fulfill all requirements for identification and authorization. In this case the usage of OCPP2.0.1 is recommended.

### 2.2.2 OCPP 2.0.1

The EVCC ID is sent in the additionalInfo parameter of an ID Token. Therefore, the authorization message can be used as usual for the authorization data. It is very likely that the point of time for authorization and identification are different. Thus, the following sequence could be possible:

- > Driver wants to authorize. The Charging Station sends an AuthorizeRequest with the authorization data but without the additionalInfo parameter since the vehicle is not yet connected.
- > The vehicle is connected and the EVCCID is exchanged.
- > Before the charging starts, the Charging Station sends a TransactionEventRequest with an idToken which contains both the authorization data and the additionalInfo parameter.
- > The type of the additionalInfo parameter shall be "MacAddress".
- > The value of the additionalInfo parameter shall be the EVCC ID.



**Example for TransactionEventRequest in OCPP2.0.1 with authorization data:**

```
{
  "eventType": "Started",
  "timestamp": "2020-04-21T13:43:10Z",
  "triggerReason": "ChargingStateChanged",
  "seqNo": 0,
  "transactionInfo": {
    "transactionId": "cffa32c0-2ab5-498b-a381-76dbfdcf6360",
    "chargingState": "Charging"
  },
  "meterValue": [{
    "sampledValue": [{
      "value": 35.821999,
      "context": "Transaction.Begin",
      "unitOfMeasure": {
        "unit": "kWh"
      }
    }
  ]},
  "timestamp": "2020-04-21T13:43:10Z"
}],
  "evse": {
    "id": 1
  },
  "idToken": {
    "idToken": "1909",
    "type": "KeyCode",
    "additionalInfo": [
      {
        "additionalIdToken": "001681020001",
        "type": "MacAddress"
      }
    ]
  }
}
```

### 3 Appendix

#### 3.1 References

[1]	ISO15518-2	Road vehicles — Vehicle-to-Grid Communication Interface Version 2014-04-01
[2]	DIN70121	Electromobility - Digital communication between a d.c. EV charging station and an electric vehicle for control of d.c. charging in the Combined Charging System Version 2014-12
[3]	AutoCharge	<u><a href="#">Secure and User-Friendly EV Charging</a></u> A Comparison of Autocharge and ISO 15118's Plug & Charge June 12, 2019
[4]	AutoCharge	<u><a href="#">Autocharge</a></u> Automatic charging start and authorization of electric vehicles

#### 3.2 Glossary

CCS	Combined Charging System
CSMS	Charging Station Management System
EVCC	Electric Vehicle Communication Controller
EVCC ID	Unique identifier of Electric Vehicle Communication Controller
EVSE	Electric Vehicle Supply Equipment
OCPP	Open Charge Point Protocol
SAScheduleList	List with power and tariff table from secondary actor
TxProfiles	Transaction-specific charging profiles that limit the power or current
VAS	Value-Added-Service
VID	Vehicle Identifier



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