OCPP virtual stations

Accelerate and make OCPP development more reliable

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Version : 8

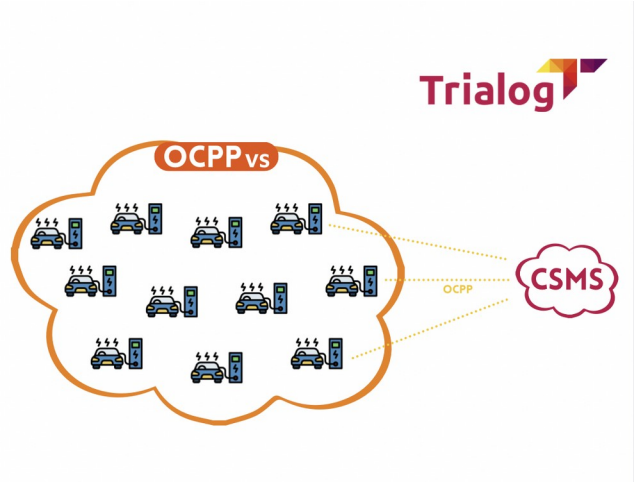
Trialog has been working on EV charging for more than 10 years, which has allowed us to develop a strong expertise on Electro-Mobility charge protocols like IEC 61851-1, DIN 70121, ISO 15118 and OCPP 1.6/2.0.
In this context, Trialog has developed several communication stacks and validation tools.

OCPP virtual simulator is a cloud based service for CSMS and EMS validation, is one of these tools. It provides access to cloud based virtual charging stations for scalability and stress testing of **OCPP 1.6** or **OCPP 2.0.1** implementations**. Pick the number of virtual stations you need (1, 10, 150, more) and let's start testing!**

OCPPvs is complementary to OCA OCTT 1.6 and 2.0.1 certification tools. It is not a conformance testing tool, but rather a real life simulation tool.

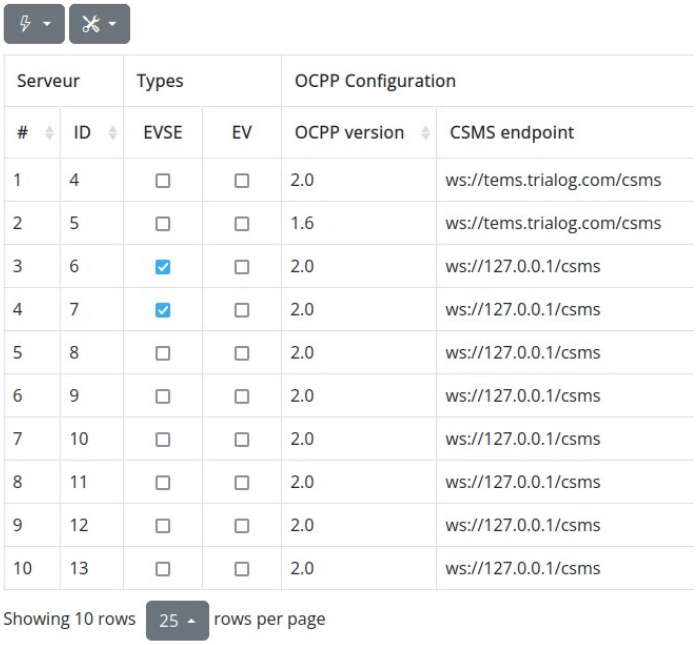
What is the typical usage?

- **OCPP developments validation:** OCPP CSMS manual testing during development. OCPPvs has been **certified by the OCA** for the Core and Adavanced Security Profiles (OCPP 2.0.1), with more profiles to come
- **OCPP CSMS scalability stress tests:** make sure your CSMS can handle heavy loads
- **Business use case validation:** simulate your physical setup before deployment



Supported Features

OCPP Communication



Serveur		Types		OCPP Configuration	
#	ID	EVSE	EV	OCPP version	CSMS endpoint
1	4	☐	☐	2.0	ws://tems.trialog.com/csms
2	5	☐	☐	1.6	ws://tems.trialog.com/csms
3	6	☑	☐	2.0	ws://127.0.0.1/csms
4	7	☑	☐	2.0	ws://127.0.0.1/csms
5	8	☐	☐	2.0	ws://127.0.0.1/csms
6	9	☐	☐	2.0	ws://127.0.0.1/csms
7	10	☐	☐	2.0	ws://127.0.0.1/csms
8	11	☐	☐	2.0	ws://127.0.0.1/csms
9	12	☐	☐	2.0	ws://127.0.0.1/csms
10	13	☐	☐	2.0	ws://127.0.0.1/csms

Showing 10 rows 25 rows per page

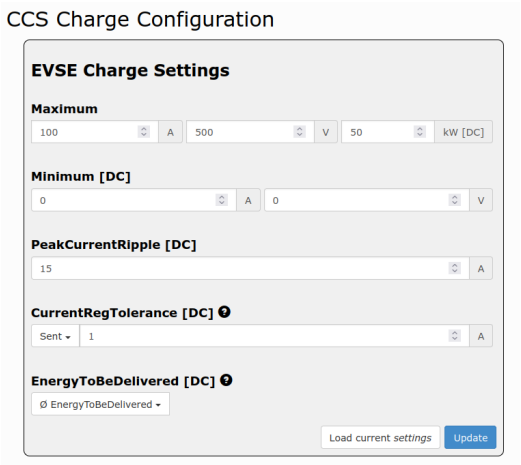
Pick a number of virtual stations and their related virtual vehicles and connect them to your OCPP endpoints.

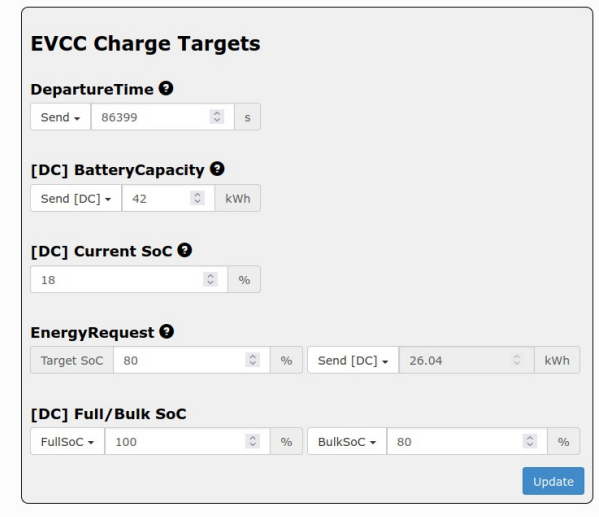
Your OCPP endpoints shall be accessible over the Internet.

High EV/EVSE configurability through UI/HTTP API

Configure the virtual station behaviour

- charge mode AC or DC
- power limitations





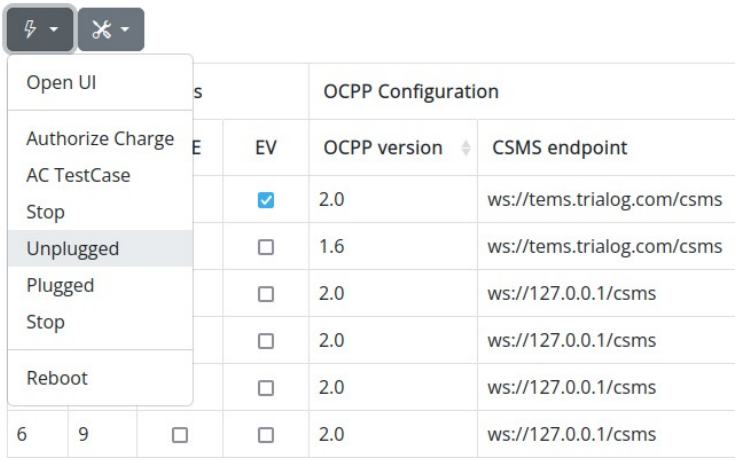
Configure the virtual vehicle behavior and capabilities

- battery capacity
- initial state of charge
- power limitations

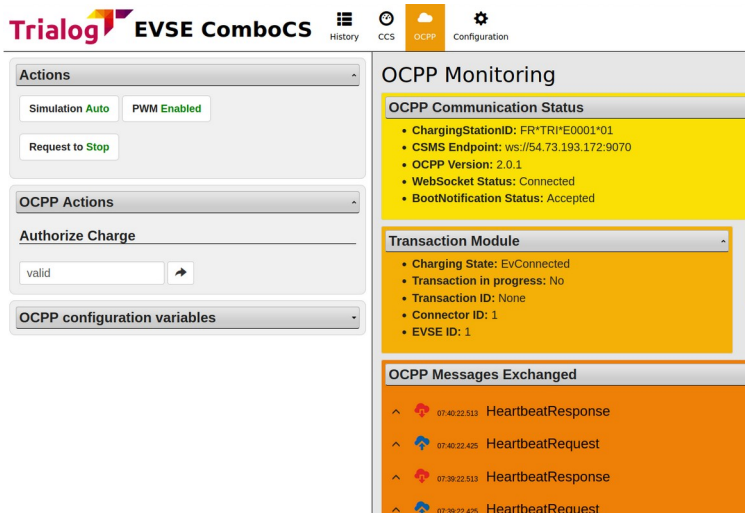
Batch actions to facilitate the usage

Simulate charge one by one or by group

- plug the vehicle
- swip an RFID tag
- request to stop
- unplug
- restart
- reset stations
- HTTP requests



OCPP debugging facilitated

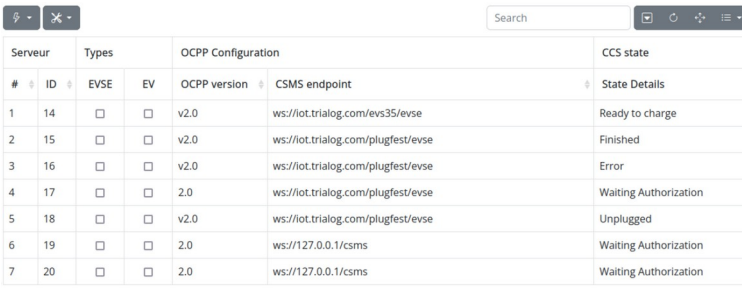


Communicate with virtual stations using OCPP 1.6-J or OCPP 2.0.1 and monitor details OCPP status and exchanged message with each stations.

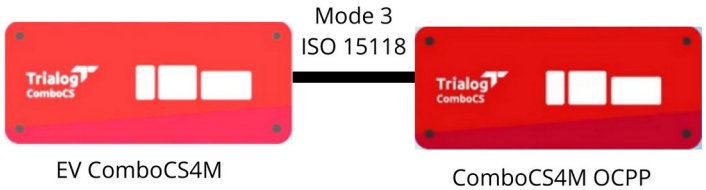
OCPP communication logs can be downloaded for further analysis.

Automatized or manual testing, you decide

Monitor and control a group of virtual stations, or each virtual stations and vehicules individualy using the Web UI **or an HTTP API**



As close as possible from real hardware



OCPPvs is based on real EV and EVSE simulation using Mode 3, DIN 70121 and ISO 15118 charging sessions.

Supported OCPP Features

Supported OCPP versions

- OCPP 1.6 WS/JSON
- OCPP 2.0.1

OCPP 1.6 Supported Messages

Functional Block	Coverage	Details
HTTP/SOAP		Not supported. Not planned.
WebSocket/JSON	100%	
Core	100%	
Firmware Management	100%	*Message will be exchanged but no firmware update will be done.*
Local Auth List Management	100%	
Reservation	100%	
SmartCharging	100%	
Remote Trigger	100%	
Cybersecurity extension	100%	

OCPP 2.0.1 Supported Messages

Functional Block	Coverage	Details
WebSocket/JSON	100%	

A. Security	100%	
B. Provisionning	100%	
C. Authorization	100%	
D. Local Auth List Management	100%	
E. Transactions	90%	
F. RemoteControl	100%	
G. Availability	100%	
H. Reservation	100%	
I. TariffAndCost		*Not planned yet. Not used.*
J. MeterValues	100%	*J03 is not yet really usable as defined in OCPP*
K. SmartCharging	100%	
L. FirmwareManagement	100%	*Message will be exchanged but no firmware update will be done.*
M. ISO 15118 CertificateManagement	100%	
N. Diagnostics	30%	*Variable monitoring is not yet available.*
O. DisplayMessage	100%	
P. DataTransfer	100%	

OCPP 2.x support for bidirectional charge is currently under implementation in a prototype demonstrator.

Supported Use Cases

The virtual charging stations are supporting both OCPP 1.6 and 2.0.1 versions. All OCPP messages are supported, but the stations does not react necessarily to all of them.
OCPPvs has been **certified by the OCA** regarding OCPP 2.0.1 Core & Advanced Security profiles.
The following use cases, based on OCPP 2.0.1 specification, are currently supported for both OCPP 1.6 (when relevant) and OCPP 2.0.1:

Use Case	Status
A01 - Update Charging Station Password for HTTP Basic Authentication	Available
A02 - Update Charging Station Certificate by request of	Available

CSMS	
A03 - Update Charging Station Certificate initiated by the Charging Station	Available
A04 – Security Event Notification	Available
A05 – Upgrade Charging Station Security Profile	Available
B01 - Cold Boot Charging Station	Available
B02 - Cold Boot Charging Station - Pending	Available
B03 - Cold Boot Charging Station - Rejected	Available
B04 - Offline Behavior Idle Charging Station	Available
B05 - Set Variables	Available
B06 - Get Variables	Available
B07 – Get Base Report	Available
B08 - Get Custom Report	Available
B09 – Setting a New Network Connection Profile	Available
B10 – Migrate to a new CSMS	Available
B11 - Reset - Without Ongoing Transaction	Available
B12 - Reset - With Ongoing Transaction	Available
C01 - EV Driver Authorization using RFID	Available
C03 - Authorization using credit/debit card	Available
C05 - Authorization for CSMS initiated transactions	Available
C06 - Authorization using local id type	Available
C07 - Authorization using Contract Certificates	Available
C08 - Authorization at EVSE using ISO 15118 External Identification Means (EIM)	Available
C09 - Authorization by GroupId	Available
C10 - Store Authorization Data in the Authorization Cache	Available
C11 - Clear Authorization Data in Authorization Cache	Available
C12 - Start Transaction - Cached Id	Available
C13 - Offline Authorization through Local Authorization List	Available
C14 - Online Authorization through Local Authorization	Available

List	
C15 - Offline Authorization of unknown Id	Available
C16 - Stop Transaction with a Master Pass	Available
Additional UC: T-C01: Authentication through EVCCID	Available
E01 - Start Transaction Options	Available
E02 - Start Transaction - Cable Plugin First	Available
E03 - Start Transaction - IdToken First	Available
E04 - Transaction started while Charging Station is offline	Available
E06 - Stop Transaction options	Available
E07 - Transaction locally stopped by IdToken	Available
E11 - Connection Loss During Transaction	Available
E12 - Inform CSMS of an Offline Occurred Transaction	Available
E13 - Transaction related message not accepted by CSMS	Available
E15 - End of charging process	Available
F03 - Remote Stop Transaction	Available
F04 - Remote Stop ISO / IEC 15118 charging from CSMS	Available
F05 - Remotely Unlock Connector	Available
F06 - Trigger Message	Available
G01 - Status Notification	Available
G02 - Heartbeat	Available
G03 - Change Availability EVSE	Available
G04 - Change Availability Charging Station	Available
J01 - Sending Meter Values not related to a transaction	
J02 - Sending transaction related Meter Values	Available
J03 - Charging Loop with metering information exchange	
K01 - SetChargingProfile	Available
K02 - Central Smart Charging	Available
K05 - Remote Start Transaction with Charging Profile	Available
K06 - Offline Behavior Smart Charging During Transaction	Available
K07 - Offline Behavior Smart Charging at Start of	Available

Transaction	
K16 - Optimized charging with scheduling to the CSMS	Available
K17 - Renegotiating a Charging Schedule	Available
L01 – Secure Firmware Update	Available
N01 - Retrieve Log Information	Available

Validation and Interoperability

The virtual OCPP charging stations are ready to use, fully validated with Trialog's expertise and tested with multiples actors. The OCPP implementation is **participating to all OCPP plugfests since 2018** in order to provide interoperability confidence.

Furthermore, the **OCPP version 2.0.1 is currently used as one of the two reference implementations to validate the official OCPP Test Tool 2.0.1 (OCTT 2.0.1)** made by the Open Charge Alliance. This OCTT will be used to perform OCPP certification. OCPPvs is OCPP 2.0.1 certificated.

The interoperability with the following supervisors has for example been covered.

OCPP 1.6	OCPP 2.0.1
BluemarbleCharging	ChargeCloud
DemandQ	Current
InfoData Process	DemandQ
Nexans	Daon Inc.
TotalEVCharge	Driivz
SAP Labs	eDRV
FreshMiles	iHomer
See You Sun	MaxemEnergySolutions
	Meras Plugin

	Niyata Infotech Rectifier Technologies Sagasystem AS Schneider Siemens SolidStudio Syntech TMH Ubitricity Vector VW Elli Zapinamo
+ implementations using Trialog's QOCPP-CSMS stack	

More to come

OCPPvs is a new service is constant evolution to provide the best tooling for OCPP and scale-up testing.

Here is a quick overview of our middle-terme roadmap:

Phase 1 :	Add configurable EV Models to reproduce real Evs characteristics such as maximum ratings (Power/Current/Voltage), battery capacity, supported protocols,… Add EV Schedule management that allows to configure week-long scenarios (plugin time, plugout time, SoC upon arrival, …)
Phase 2	Add Fleet management with automatic scenarios to simulate groups of vehicle behaviours. For example:

	• 20 vehicles plugged only during the night, 20 doing several short charges during the day, 2 never working vehicles, 8 vehicles regularily plugged 2 days long • Completely random scenario for fuzzy testing This can already be done using the HTTP API provided with OCPPvs, but it requires you to implement these scenarios. This feature will therefore facilitate testing of advanced real life scenarios.
Phase 3	Add pre-configured charging station models to be able to reproduce real behaviour of existing charging stations into the street.
Long-time roadmap	Better Mode 3 support Add ISO 15118-20 and OCPP 2.x support More and more vehicle and charging station models and behaviours Increase robustness to support more and more virtual equipements in a single server Provide tooling for digital twins

VDV261 option

This feature is an option, not provided by default. It can be activated opn demand.

With the VDV261 option, the virtual vehicles will behaves like buses connecting to a VDV261 backend for preconditioning and monitoring. The backend is not provided with this option.

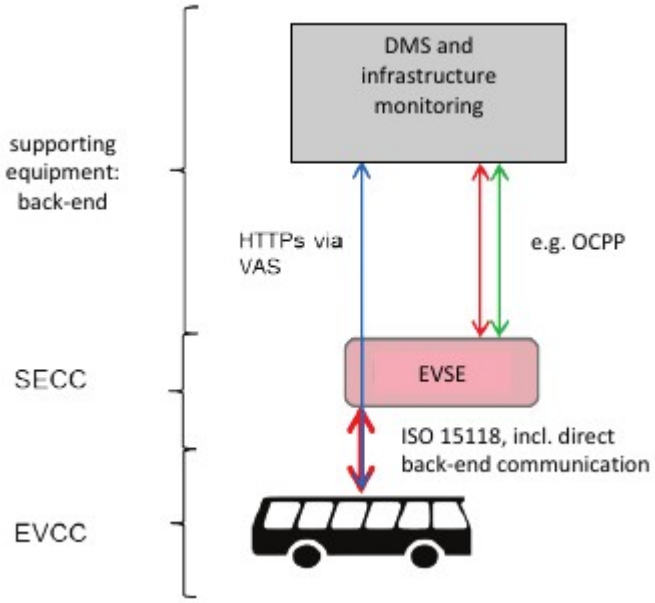


Figure 1: VDV261 typical flow

- Configure the virtual charging stations with the VDV261 backend parameters
- Virtual charging stations are proposing the VDV261 VAS to the virtual vehicles
- Virtual vehicles will select this VAS
- Virtual vehicles will then connect to the provided VDV261 back-end (no VDV261 backend is provided by the virtual charging stations)
- VDV261 data are displayed in the Supervision view of the virtual vehicles

Contact us

*For more information about **OCPP virtual charging stations**, please contact us: emobilitysales@trialog.com.*