



LF ENERGY

CitrineOS

CitrineOS: One Year of Progress, Challenges, and Lessons Learned for an Opensource Charge Station Management System

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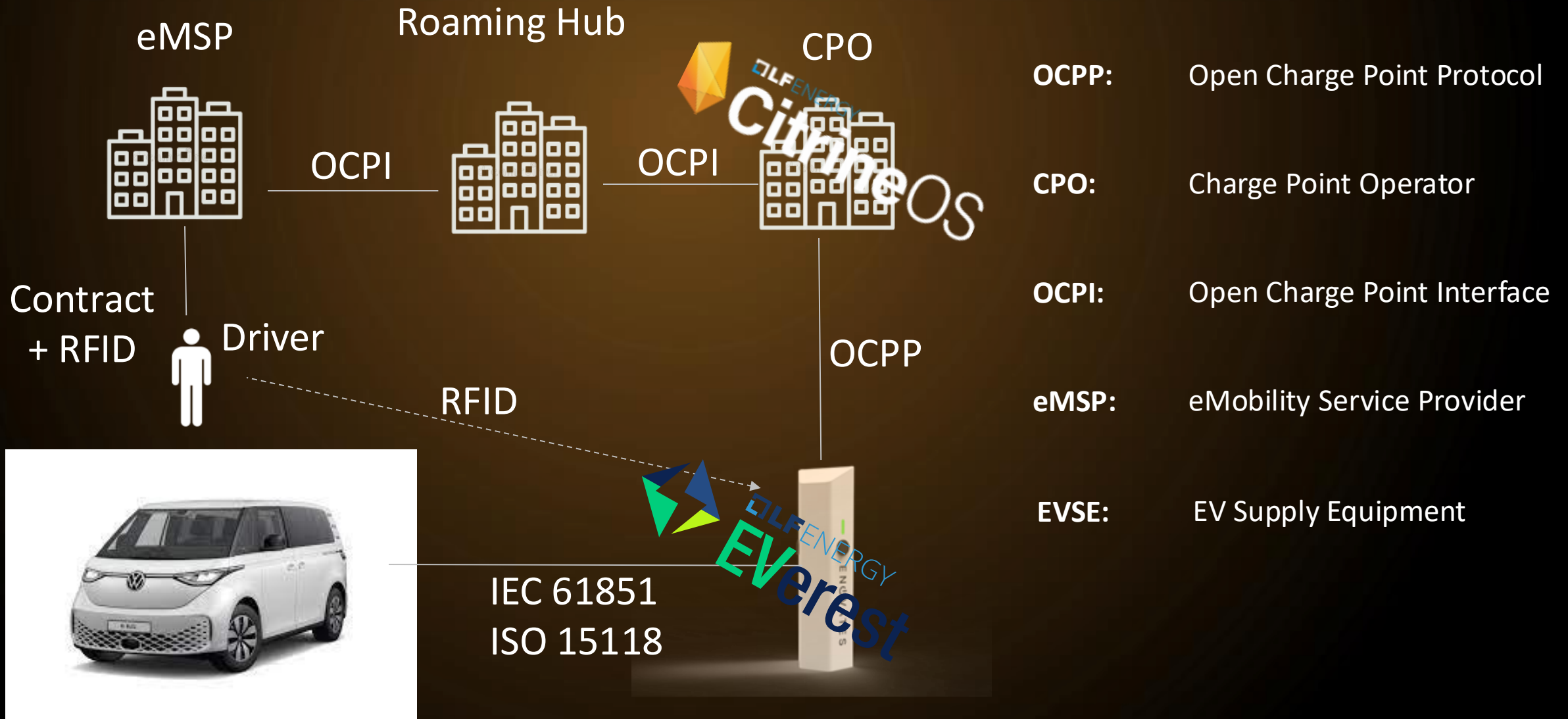
<https://citrineos.github.io/>

About me

- Contributor to CitrineOS and part of the original authors
- Senior Software Engineer at S44 Energy
- Working on EV charging for ~7 years



EV Charging Landscape



OCPP: Open Charge Point Protocol

CPO: Charge Point Operator

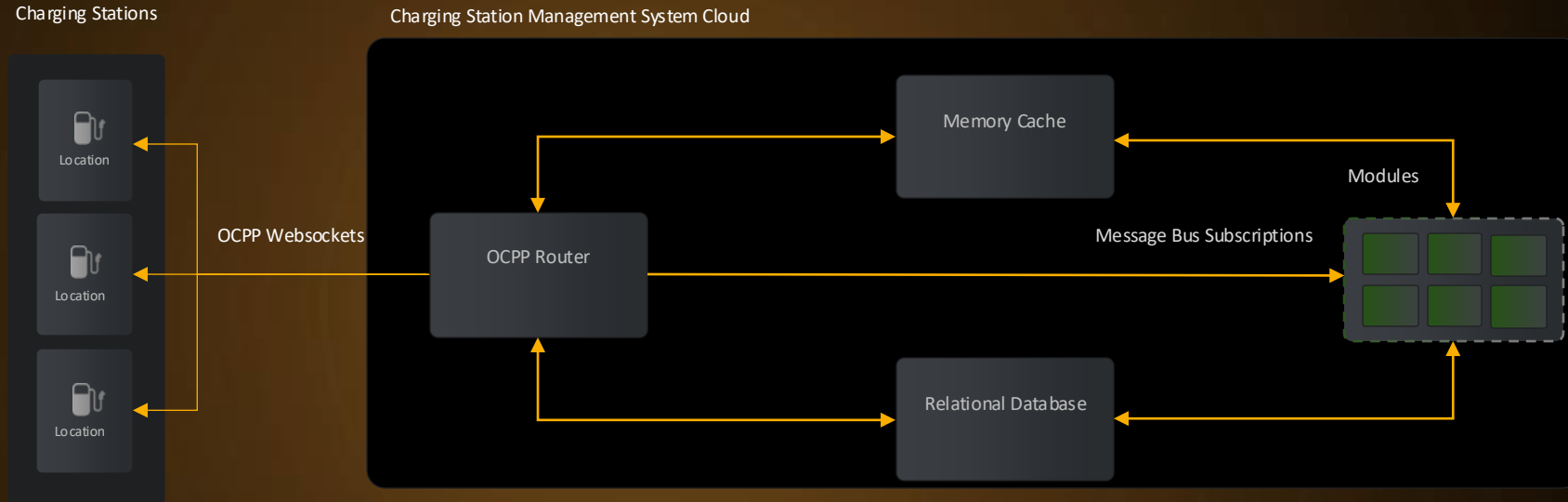
OCPI: Open Charge Point Interface

eMSP: eMobility Service Provider

EVSE: EV Supply Equipment



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- **Apache 2.0 License**
- **Written in Typescript for NodeJS**
- **REST API based with a modular architecture**

Core Idea

The protocol implementation should not be the hard part!

- Layers of implementation
 - 00_Base having the protocol data structures
 - 01_Data having persistence
 - 02_Util providing some functionality
 - 03_Module implementing the logic
- Scale modules individually
- REST API to interact with existing logic
- Message broker integration to extend with own modules for your usecase

What happened over the last year

- Had technical steering committee meetings
- Released Citrine-core version 1.0
- Currently on Version 1.5.1
- Citrine was at a bunch of EV charging events giving talks and discussing protocols
 - Open EV Charging Summit Texas
 - Plugfest at Pionix/EVERest in Germany
 - Plugfest in Virginia, USA
 - ICNC Berlin
 - Linux Foundation Energy Summit in Brussels
- Webinars about EV charging protocols



What happened over the last year

- Implemented the the full protocol with things like `Advanced User Interface`
- Implemented OCPP 2.2.1
- New Operator UI to avoid Directus licensing issues and get certified
- Discord community is growing and now has roughly ~320 people on it
- We are getting contributions from outside – If any of you are seeing this: THANK YOU!
- We got OCPP 2.0.1 certified with the new UI!



The screenshot displays the CitrineOS v1.8.1 interface, which includes a sidebar with navigation options and a main table of transactions. The table has the following columns: Actions, Transaction Id, Station Id, Error Database Id, Is Active, Events, Charging State, Time Spent Charging, Total Kwh, Stopped Reason, Remote Start Id, Updated At, and Created At. The data rows show various transaction statuses such as 'EVConnected' and 'EVDisconnected'.

Actions	Transaction Id	Station Id	Error Database Id	Is Active	Events	Charging State	Time Spent Charging	Total Kwh	Stopped Reason	Remote Start Id	Updated At	Created At
[Icon]	0455_2348	cp001	1	[Red Dot]	[Icon]	EVConnected	1.46 kWh	1.46 kWh	Remote	0	2025-01-29 18:07:08	2025-01-29 18:00:56
[Icon]	0456_2492	cp001	1	[Red Dot]	[Icon]	EVConnected	1.43 kWh	1.43 kWh	Remote	0	2025-01-29 18:04:13	2025-01-29 14:54:50
[Icon]	0457_2170	cp001	1	[Red Dot]	[Icon]	EVConnected	8.35 kWh	8.35 kWh	Remote	0	2025-01-29 14:51:24	2025-01-29 14:48:20
[Icon]	2227_4044	cp001	1	[Red Dot]	[Icon]	EVConnected			EVDisconnected	0	2025-01-29 14:48:00	2025-01-29 14:47:45
[Icon]	0444_0148	cp001	1	[Red Dot]	[Icon]	EVConnected			EVDisconnected	0	2025-01-29 14:47:19	2025-01-29 14:47:04
[Icon]	0447_2444	cp001	1	[Red Dot]	[Icon]	EVConnected	8.38 kWh	8.38 kWh	Remote	0	2025-01-28 14:11:13	2025-01-28 14:08:56
[Icon]	0797_7844	cp001	1	[Red Dot]	[Icon]	EVConnected	8.38 kWh	8.38 kWh	EVDisconnected	0	2025-01-28 14:05:28	2025-01-28 14:03:27
[Icon]	0442_2444	cp001	1	[Red Dot]	[Icon]	EVConnected	8.38 kWh	8.38 kWh	Remote	0	2025-01-28 13:59:03	2025-01-28 13:56:41
[Icon]	0508_3449	cp001	1	[Red Dot]	[Icon]	EVConnected	8.38 kWh	8.38 kWh	EVDisconnected	0	2025-01-28 13:54:03	2025-01-28 13:51:43
[Icon]	0442_3006	cp001	1	[Red Dot]	[Icon]	EVConnected			EVDisconnected	0	2025-01-28 13:31:39	2025-01-28 13:30:43

What are the lessons we took from the last year

- Pushing the industry forward on a protocol is hard! Not everyone likes to be at the forefront
- Explaining why open source is a good thing takes a lot of effort
- Feedback cycles with outsiders are essential
- Packaging a UI is more important than expected
- Being technology agnostic in every direction is not always worth the complexity

What's next?

- Release 1.6 will have basic OCPP 1.6 support
- Complete OCPP 1.6 support in release 1.7
- Add OCPP 2.1 support
- OCPI 3.0 support
- The new UI will get some improvements surrounding the dashboard and usability

```
2025-01-30 21:31:50.081 INFO /Users/christian/Developer/CitrineOS/citrineos-core/02_Util/dist/networkconnection/WebsocketNetworkConnection.js:297 CitrineOS Logger:WebsocketNetworkConnection Successfully connected new charging station. 237998
2025-01-30 21:31:50.367 DEBUG /Users/christian/Developer/CitrineOS/citrineos-core/02_Util/dist/queue/rabbit-mq/sender.js:122 CitrineOS Logger:RabbitMqSender Publishing to citrineos: {
  origin: 'cs',
  eventGroup: 'general',
  action: 'BootNotification',
  context: {
    stationId: '237998',
    correlationId: '531531531',
    tenantId: '',
    timestamp: '2025-01-30T21:31:50.344Z'
  },
  state: 1,
  protocol: 'ocpp1.6',
  payload: {
    chargePointVendor: 'go-e',
    chargePointModel: 'go-eCharger_V4',
    chargePointSerialNumber: '237998',
    firmwareVersion: '57.1'
  }
}
```

Get involved!

- **Attend a Technical Steering Committee meeting - first Thursday of every month, 6pm UTC**
- Make a pull request
- Join the Discord server and reach out!
- Visit <https://citrineos.github.io/latest/> for docs

