



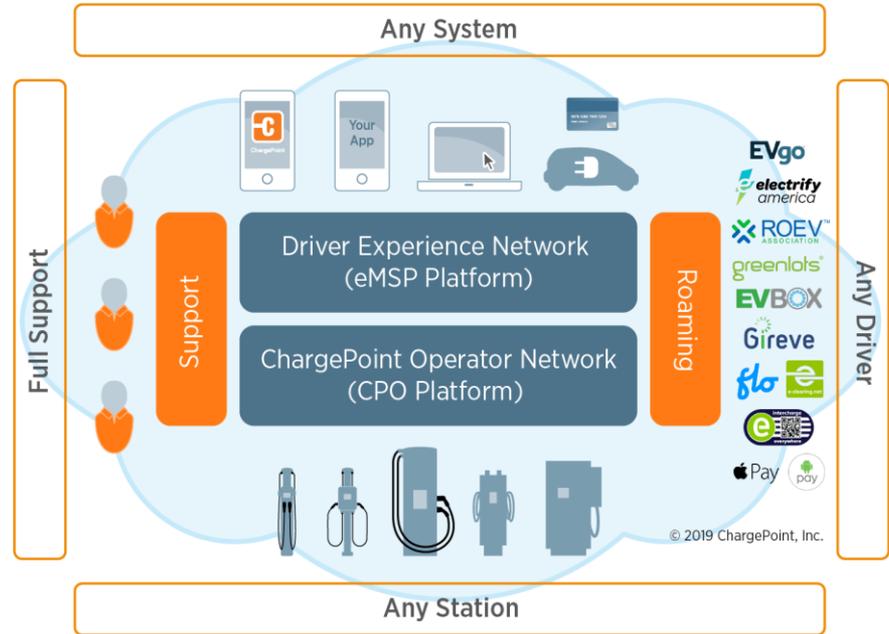
Peer-to-Peer Roaming in Public EV Charging Interoperability

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ChargePoint & Roaming

- + Fully integrated hardware and software from the station owner to the driver
- + North America and Europe: 110k charging spots
- + Roaming direct P2P and clearinghouses/roaming platform relationships with other major players on both continents



The Standard Charging Driver Journey

Locate



- Where is the station?
- No, really, where is it?
- Is it available?/Is it working?
- Does it have the connectors I need for my car?
- What is the price to charge?
- Who is the provider/operator (I have a favourite operator/network/network subscription)?
- How do I start a charge?



Charge



- How do I start a charge?
- How do I know the session is started?
- Can I track spend/battery?
- How do I stop the charge?
- Can I know the session is stopped?



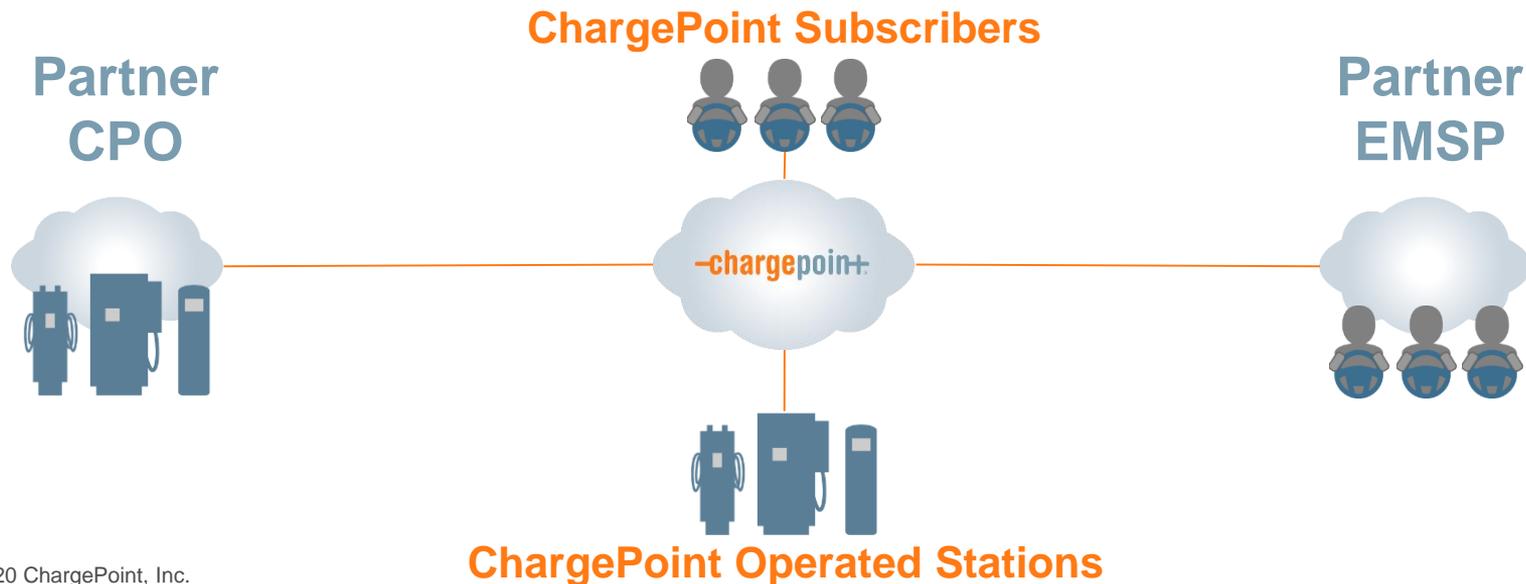
Pay



- How can I pay?
- How much did I get charged?
- Do I get a receipt? Invoice?
- Where can I see my past sessions?

The Peer-to-Peer (P2P) Model: How It Works

- + P2P means making a direct connection with other emobility providers (EMSPs) or stations networks



What You'll Find in a Roaming Agreement

Pricing & Billing

B2B Prices charged by the CPO to the EMSP for charging sessions, billing cycle, dispute handling



Rules

Data license, limitations of use, IP protection, no reverse engineering, etc.



Customer support

Data who supports what & SLAs

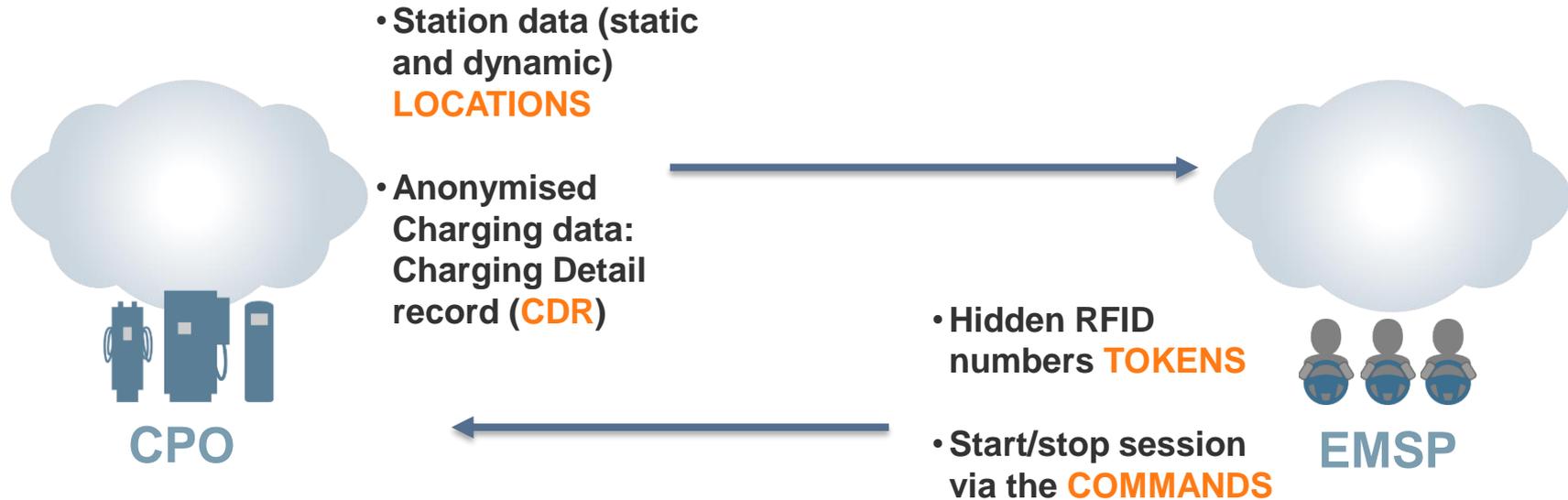


Technical specifications

(connection protocol, access type, app, RFID badge, etc)



Setting Up the Connection



The roaming partners communicate via the OCPI protocol (Open Charge Point Interface) through a series of standardised independent modules

Billing

- + As agreed in the contract, the CPO bills the EMSP at the end of each agreed billing period, based on the CDRs of the period
- + Reconciliation/checks are easy using unique CDR ids
- + Depending on the EMSP's pricing policy, the amount collected from the driver by the EMSP for a given session (B2C pricing) may differ from the price charged to the EMSP by the CPO (B2B pricing), e.g. because
 - EMSP has a subscription model
 - EMSP averages all prices as a rule to keep it simple for the drivers
 - ...

Urban Legends on Peer-to-Peer Roaming

#1 „The P2P model with multiple roaming partners is complicated“

#2 „The P2P model is expensive“

#3 „Roaming partners will use my data against me“

#4 „Adhoc charging is good enough“

#5 „I lose control over my stations/network“

#6 „I lose control of my customers“

#7 „This may work in continental Europe, but will never fly in the UK“

Q&A

Appendix - What's in a Charge Detail record (CDR)?

Property	Type	Card.	Description
id	CiString(36)	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	1	Stop timestamp of the charging session.
auth_id	string(36)	1	Reference to a token, identified by the auth_id field of the Token .
auth_method	AuthMethod	1	Method used for authentication.
location	Location	1	Location where the charging session took place, including only the relevant EVSE and Connector .
meter_id	string(255)	?	Identification of the Meter inside the Charge Point.
currency	string(3)	1	Currency of the CDR in ISO 4217 Code.
tariffs	Tariff	*	List of relevant tariff elements, see: Tariffs . When relevant, a "Free of Charge" tariff should also be in this list, and point to a defined "Free of Charge" tariff.
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.
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 (or created).

Source: Open Charge Point Interface 2.1.1, document version: 2.1.1-RC1 / <https://github.com/ocpi>