Proposal for Motown.io
an open source webservices layer
to connect chargepoints and applications

Auke Hoekstra & Olger Warnier

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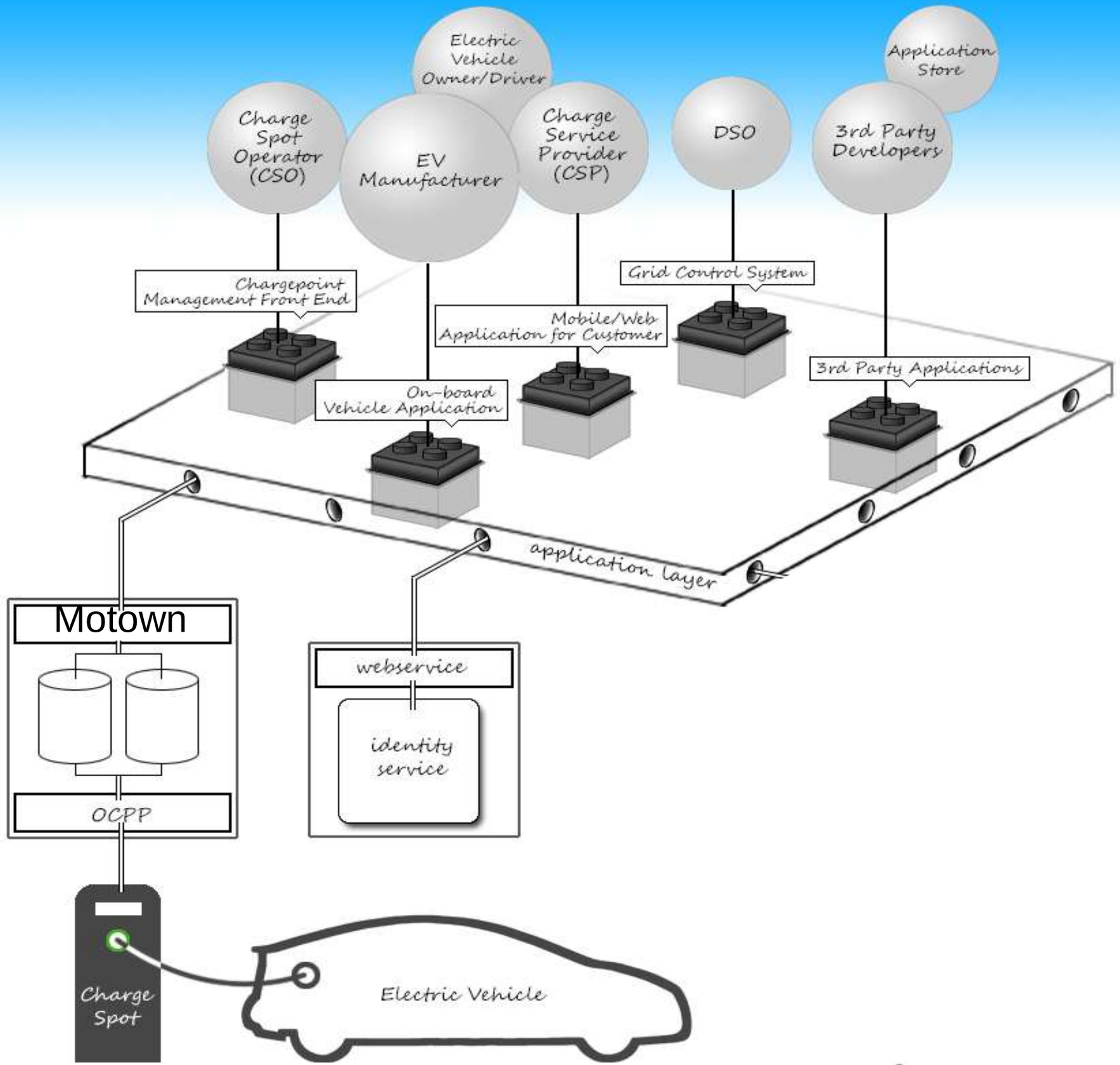
What is Motown.io?

- **Motown is a standardised set of webservices connecting charge spots with business applications**
- Motown stores the communication to and from charge spots and makes webservices using this data available to application developers. Through Motown, applications can also send commands to the charge spot.
- The acronym stands for MObility Transition Open source Webservices iNterface



Competition

Open Source

Competition

THE HEART AND SOUL OF ELECTRIC MOBILITY

Motown is NOT OPEN DATA
You CAN share. You don't HAVE to.

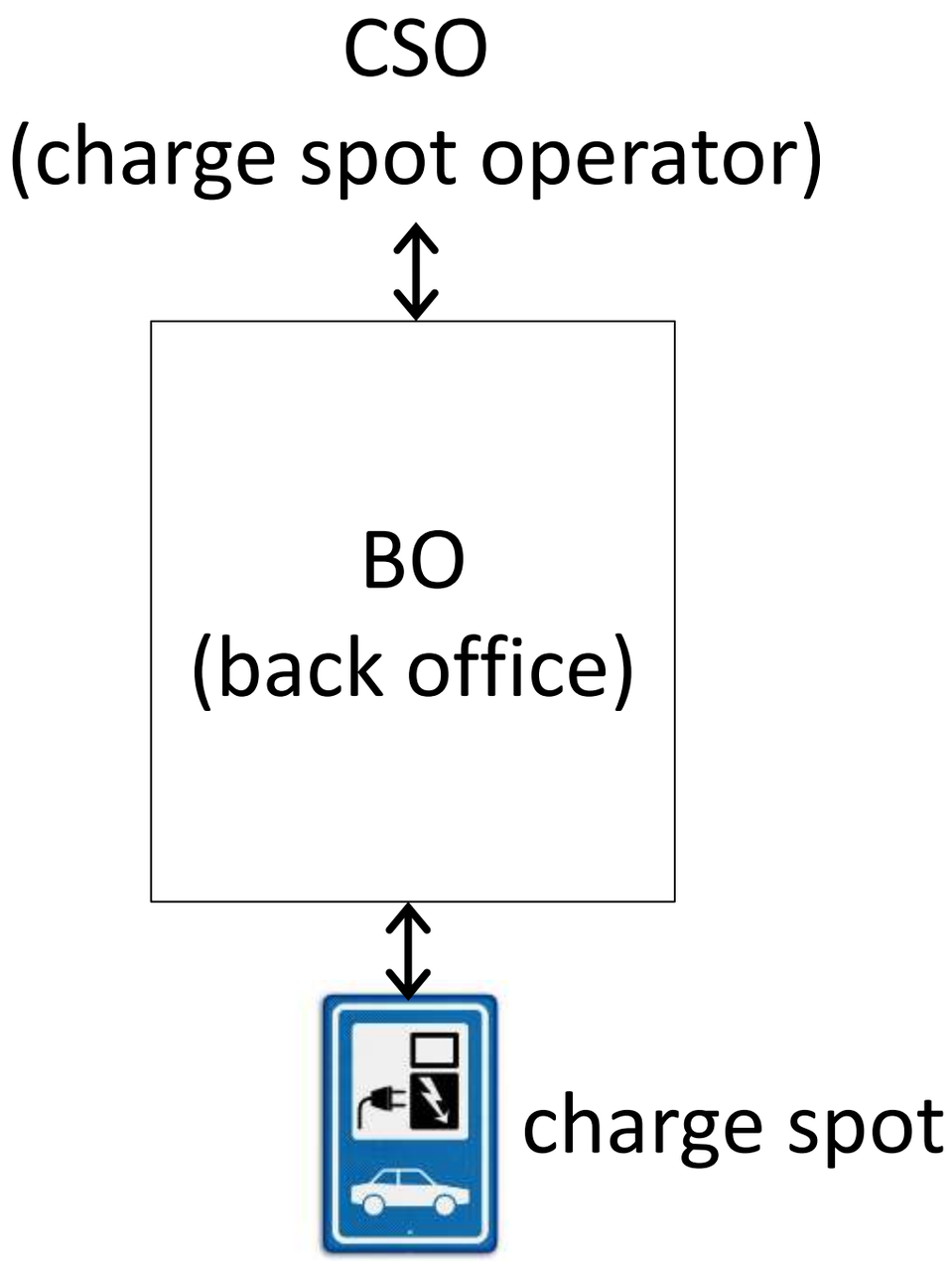
A typical scenario:

- The chargepoint operator downloads and installs Motown. The Motown software does not yet contain any information about specific chargepoints.
- The chargepoint operator fills the Motown database with chargepoint information.
- The chargepoint operator makes the data available to whomever he wishes. Motown makes this easy by standardising the interface, offering rich webservices and by offering advanced identity management.

The importance of Motown in the BIG picture

- Worldwide**, cars are a five thousand billion euro a year industry** with one billion cars on the road already and two billion on the horizon. **We need to switch this industry from oil to electricity** if we want to preserve the world we know and love but the amount of money involved is huge.
- Smart chargepoints are a blessing for the electricity grid and enable EV's to store renewable energy from wind and solar. But if 50% of cars end up needing one or two chargepoints **we need more than one billion charge spots worldwide** costing hundreds of billions of euro's.
- **Motown helps us to reach our destination faster and against lower costs.** Motown optimizes markets by lowering barriers for entry, enabling innovation and encouraging sharing.

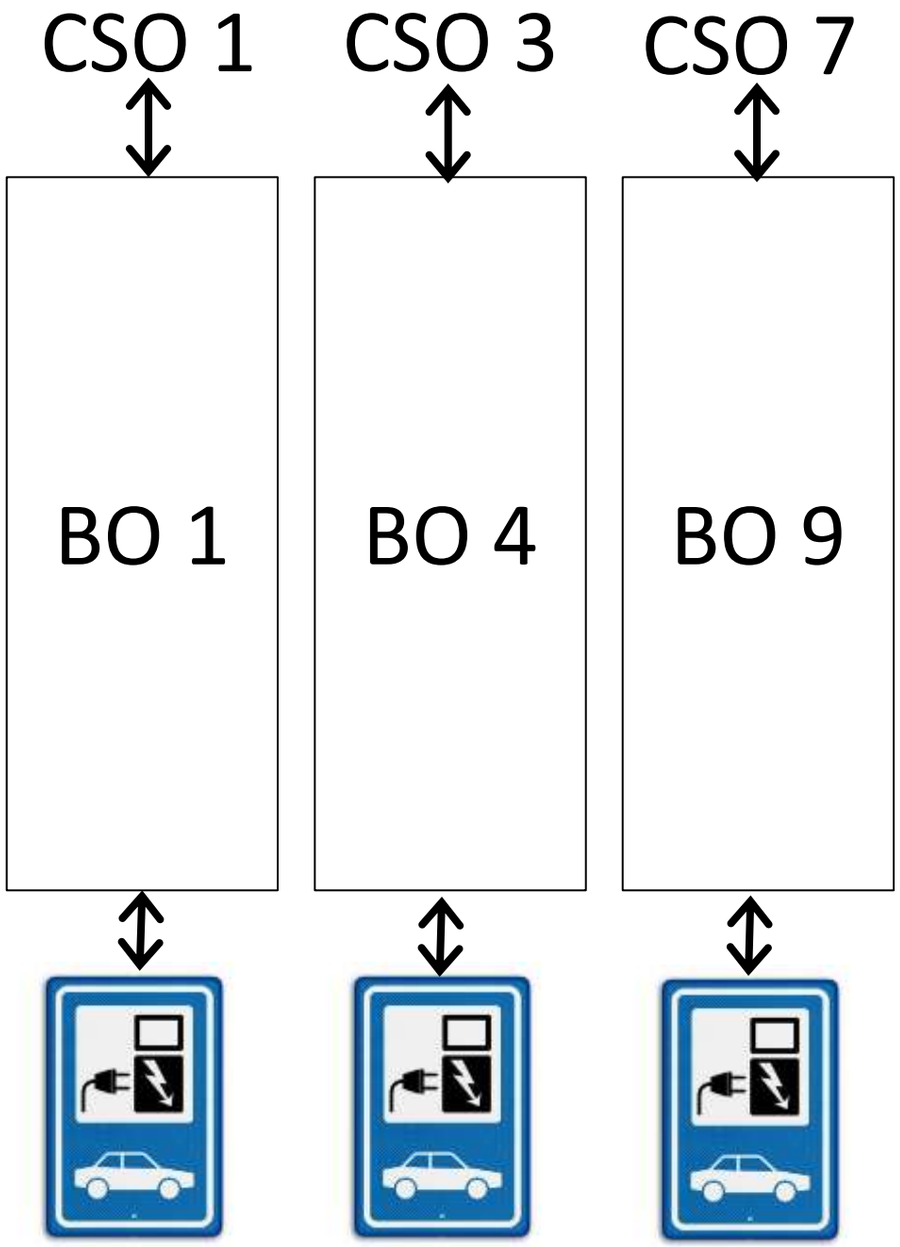
What is the current situation for a CSO?



All communication to and from a charge spot is handled by and capured in the back-office application (BO) of a charge spot operator (CSO). The BO is necessary for:

- Charging (check ID and start session)
- Smart charging (throttle power using price signals)
- Billing (generate charge detail records)
- Customer care (diagnostics, remote reset, start/stop, cable release, etc.)
- Problem prevention (diagnostics)
- Asset management (what, where, how old, maintenance, problem logging, etc.)
- Commication about free charge spots and their specifics

CSO problem 1: many competing back-offices



There are many different back-offices:

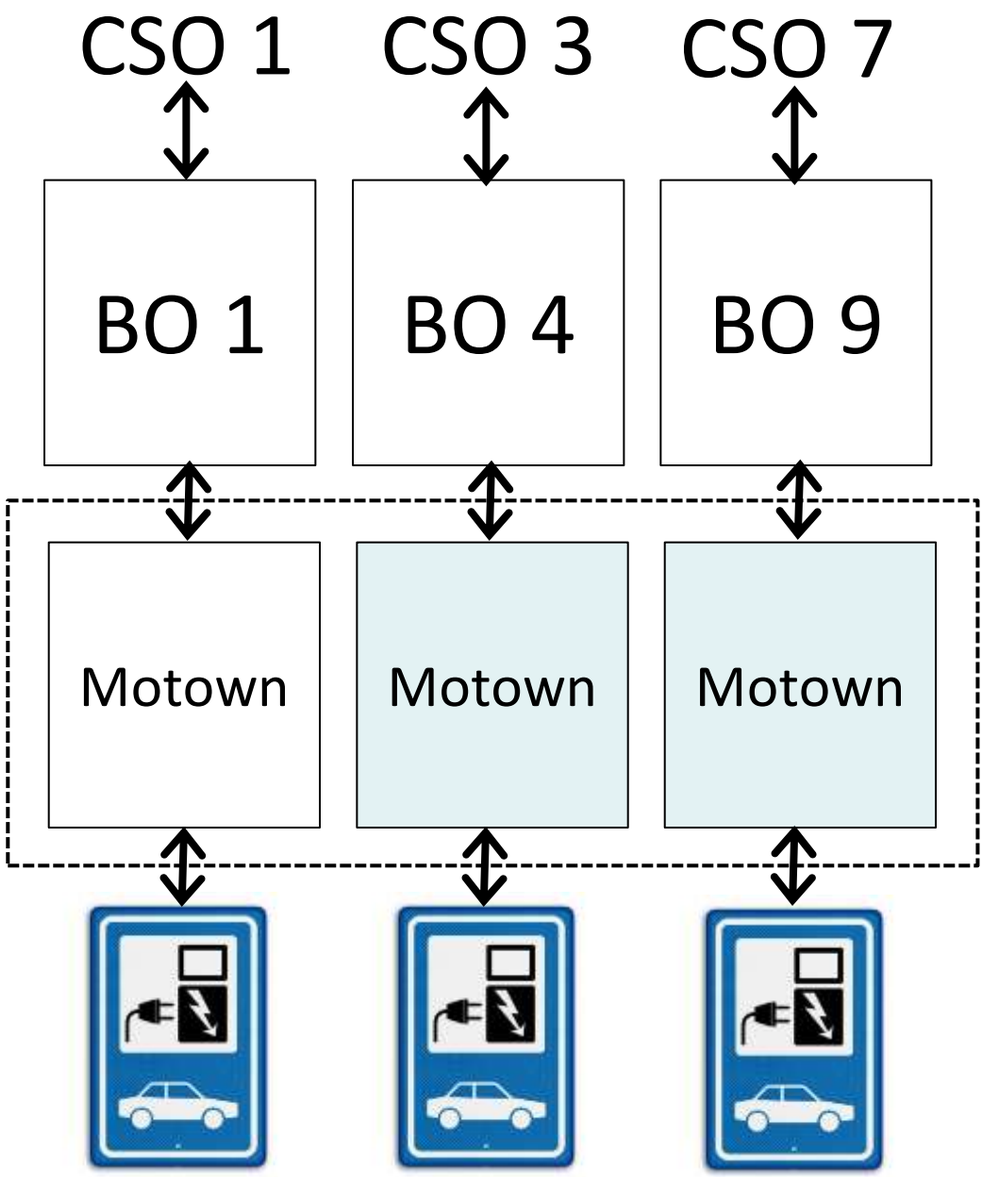
- The New Motion,
- CiMS,
- iHomer,
- ChargePoint (1+2),
- Succes Charging,
- EVBox
- Et cetera

This has disadvantages:

- Costly (everybody develops the same functionality over and over again)
- Creates lock-in (changing from one back-office to another is difficult)

BUT: we want to stimulate innovation and healthy competition, not “one size fits all”

CSO solution 1: Motown standardizes and shares the OCPP related functionality in the back office

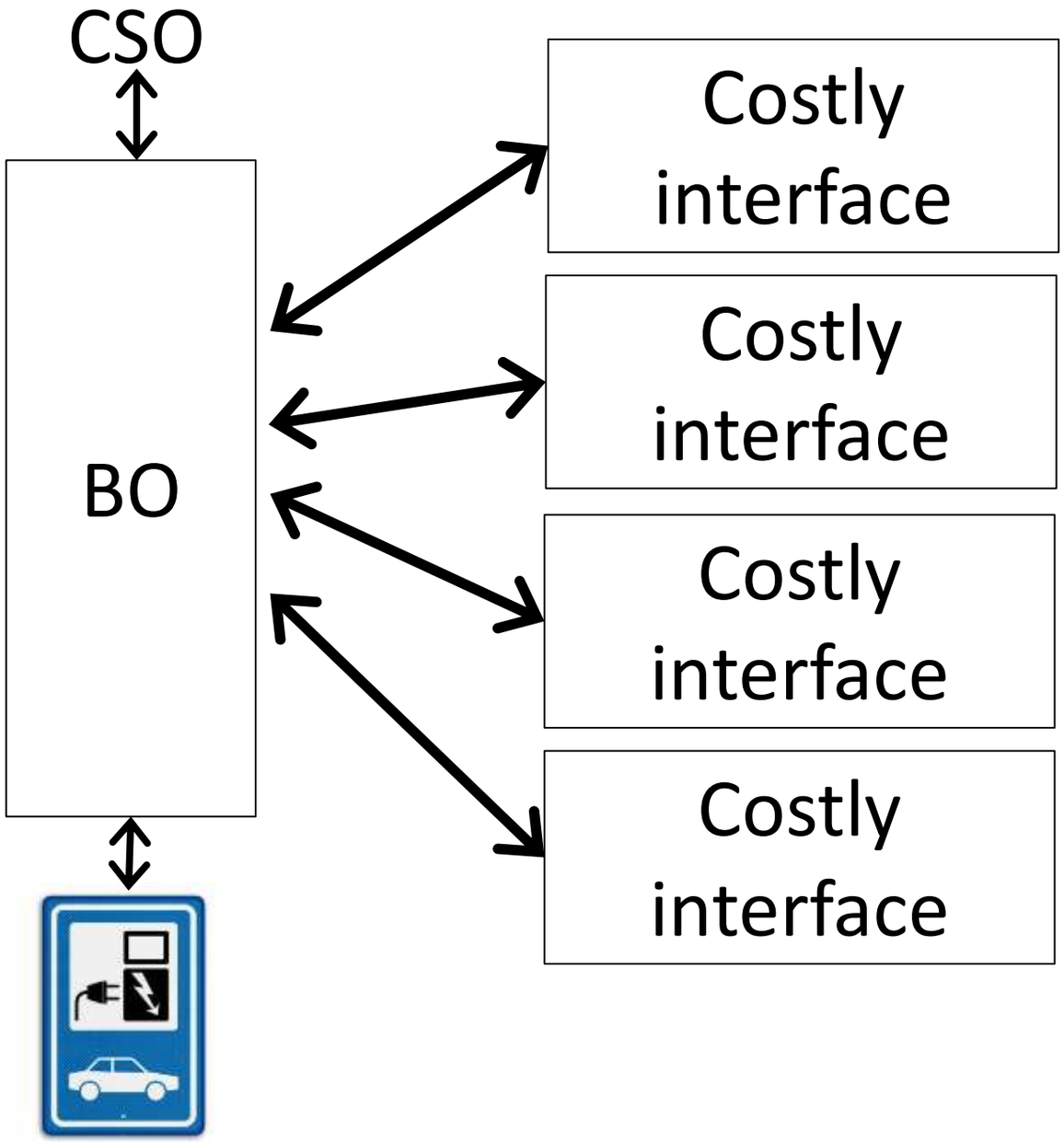


Let’s share the part that is the same for everyone because of OCPP: giving and storing interactions with the charge spot

- Cheaper (costs are shared)
- Less lock-in (relatively easy to change back-office)
- Option to share hosting etc.
- Healthy competition (back-office developers can still create unique selling points)

Open source is the simplest way of sharing shis functionality

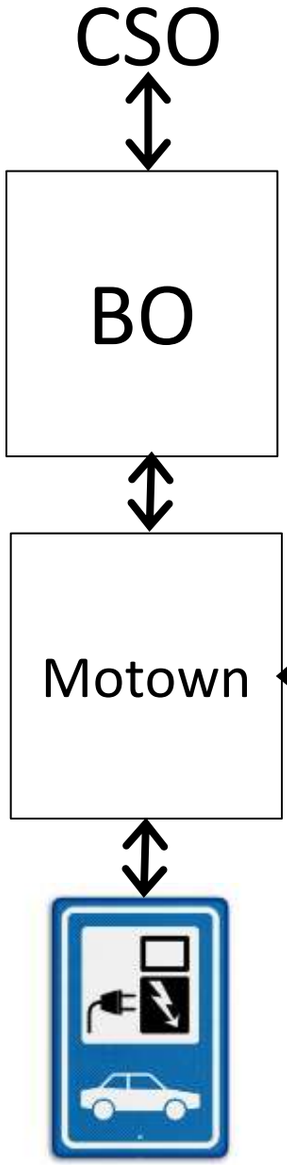
CSO problem 2: more and more costly interfaces



Examples:

- Service providers use the data for billing and other services
- TomTom, oplaadpalen.nl, GoogleMaps, etc will want to provide up-to-date status info
- Customer support call centers want diagnosic info
- Self help apps will want access
- Network operators want to keep peak power within limits
- Car manufacturers (will) use the data in value added services apps
- Third party apps will give the user personalized info (e.g. “the usual” charge spots, usage statistics, etc)

CSO solution 2: Motown offers standardized interfaces



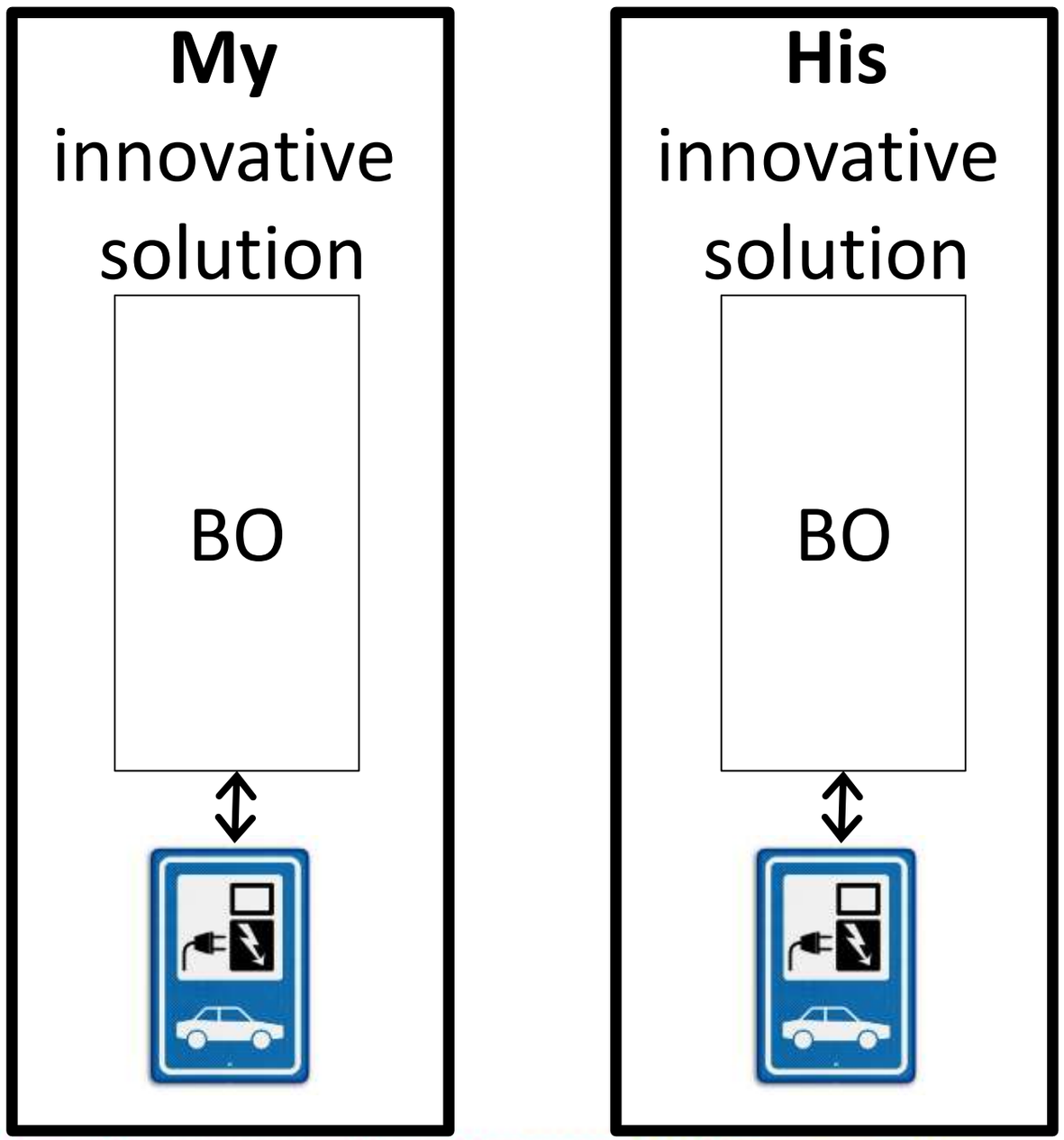
Motown comes with a multitude of cheap standardized interfaces

Standard interface are beneficial for both the CSO and the connecting party because you greatly reduce the amount of interfaces you have to develop. A bit like OCCP.

Supplying the source code for the interfaces in Motown takes it a step further: now the costs and development times drop even further.

And most importantly: the charge point network is opened up for more value added services.

The current situation as seen by the charge spot manufacturer (CSM)



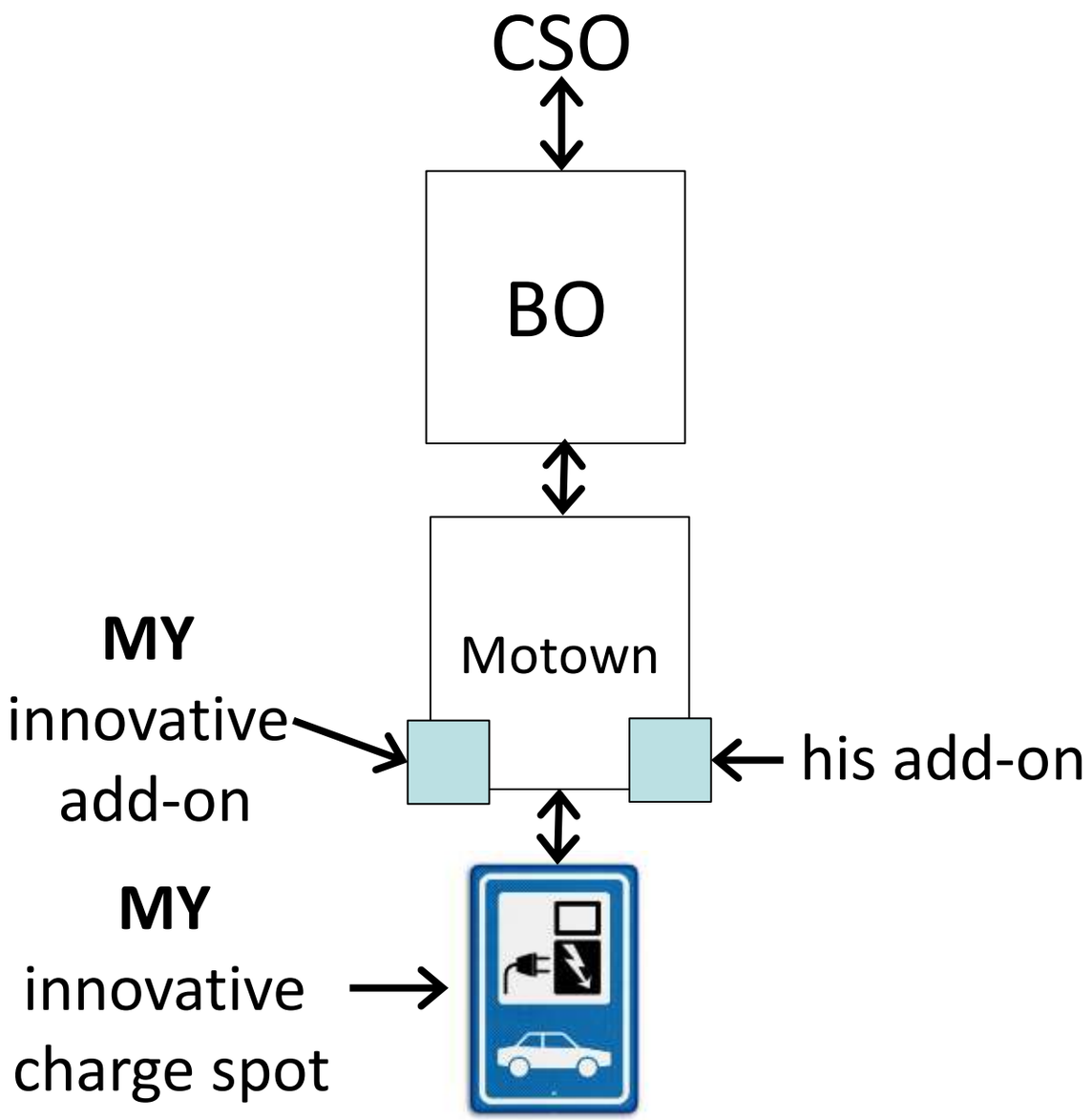
OCPP standardizes the chargepoint interface: great! BUT:

- If I innovate by adding features not (yet) supported by OCPP, I have to develop an entire costly back-office.
- Sales is hampered (buyers must also buy that back-office)
- Lock-in potential is high (innovative features only work with this back-office)

Examples are ChargePoint, EVBox and Alphen

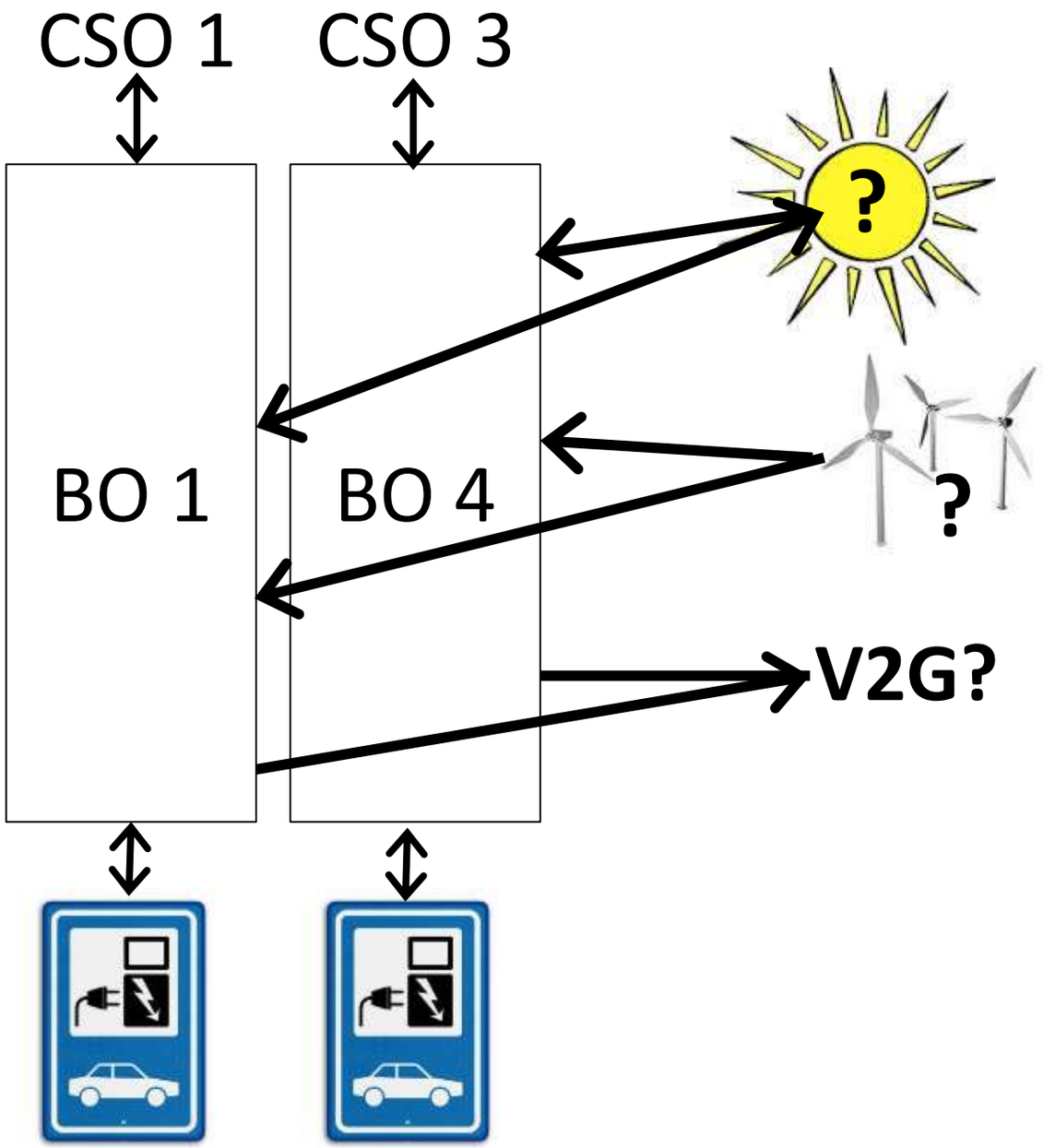
Optimum: the innovation without the cost en without the lock-in

Solution for charge spot manufacturers: with Motown you create simple add-ons instead of entire back-offices



- Small changes to OCPP can be solved by add-ons for Motown. Compare them to printer drivers. Motown makes it easy because of its architecture en because its open source.
- When you buy the innovative chargepoint, you install the Motown add-on and you are good to go
- And it works for all back-offices that use Motown
- And if my innovation becomes popular it will become a standard Motown feature.

The current situation for renewable energy suppliers



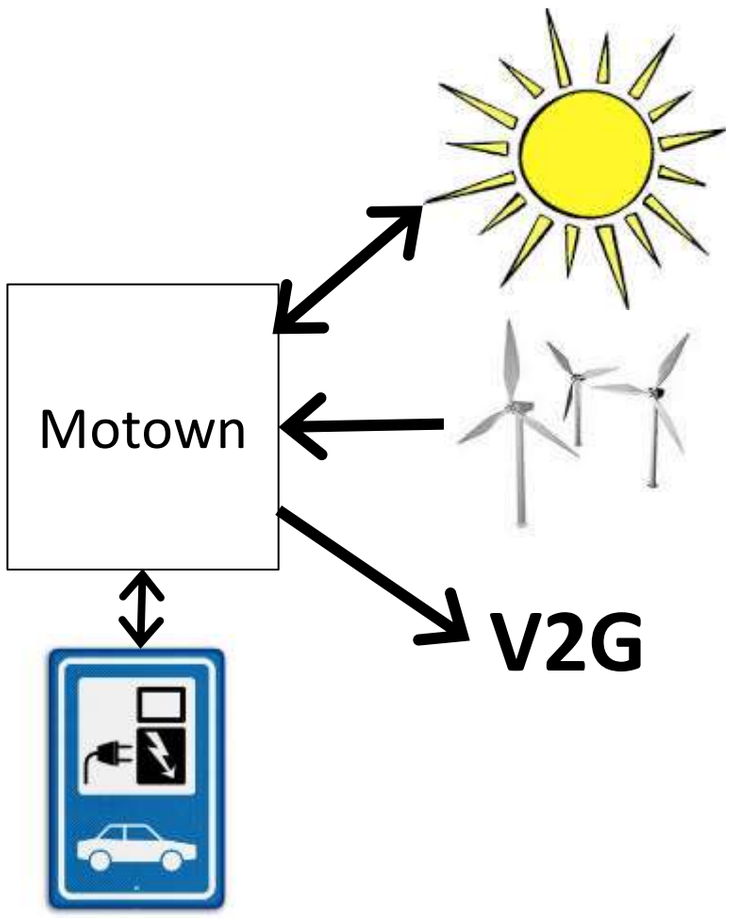
Solar and wind have to be utilized when the sun us shining of the wind is blowing. Otherwise they go to waste.

Electric vehicles are the most promising application for timeshifting demand. Eventually EV's will be able to use or produce 100x the peak power of current power plants.

Pricing signals will have to lead to timeshifting. But how?

And how will we take decentralized supply and grid capacityinto account?

The solution for renewable energy providers: Motown relays the pricing signals to the charge spots



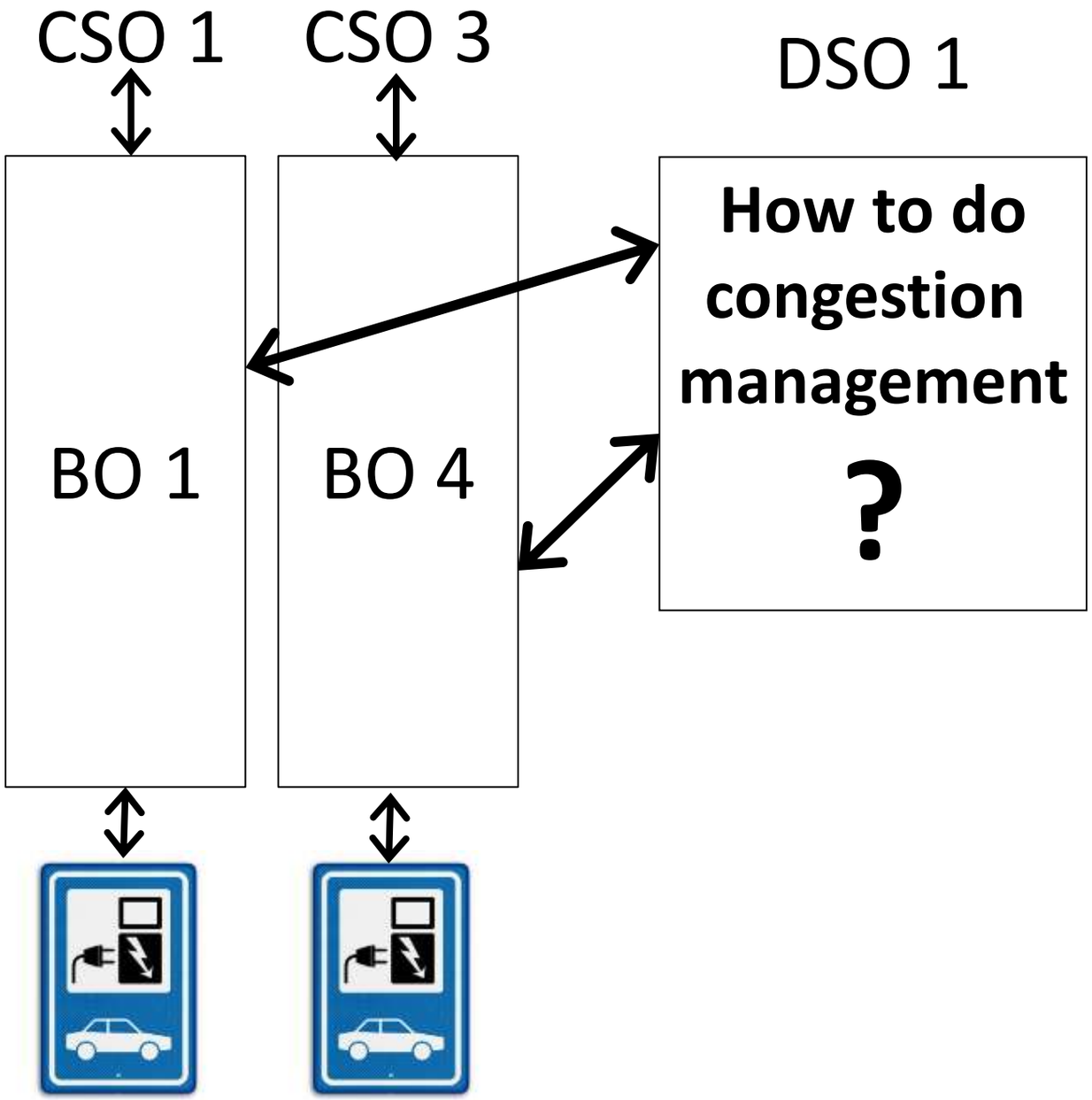
Motown will support OSCP (Open Smart Charging Protocol) and algorithms like the powermatcher that implement a market place for smart charging.

By participating in Motown, green energy providers ensure a communications channel between their energy supply and charge spots.

Participating in Motown is less time consuming than dealing with all the different back-office providers.

The profit they stand to gain dwarfs the cost of contributing to Motown.

The current situation for grid owners (DSO's)

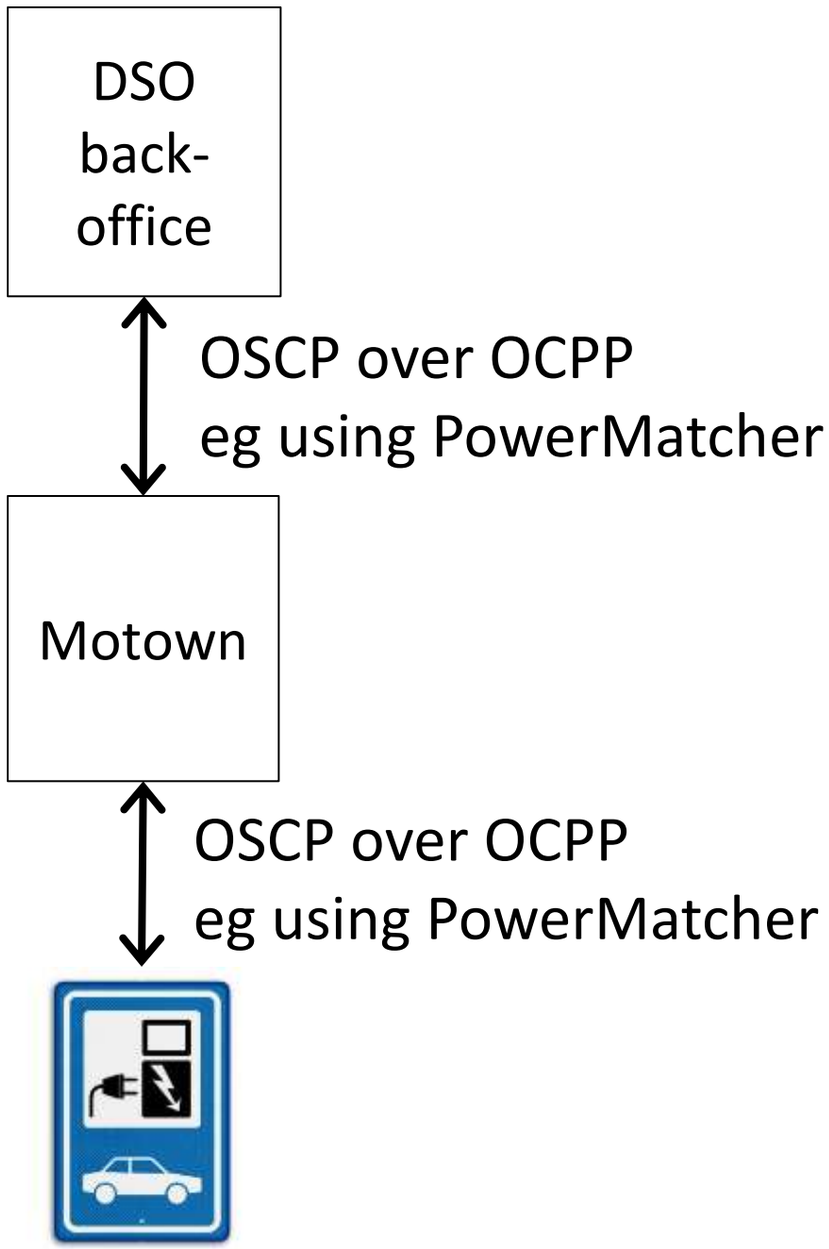


Renewable energy, dynamic pricing, distributed energy generation and EV's will overload the grid, unless there is a way to influence supply and demand.

Especially EV's with their **peak potential of 100x current supply and demand** and their concentration in vulnerable outer branches are of utmost importance.

But **how can the grid owner reach specific EV's in dangerously overloaded outer brances?**
(Preferably even a specific phase.)

The solution for DSO's: Motown makes it possible to take grid capacity and grid losses into account



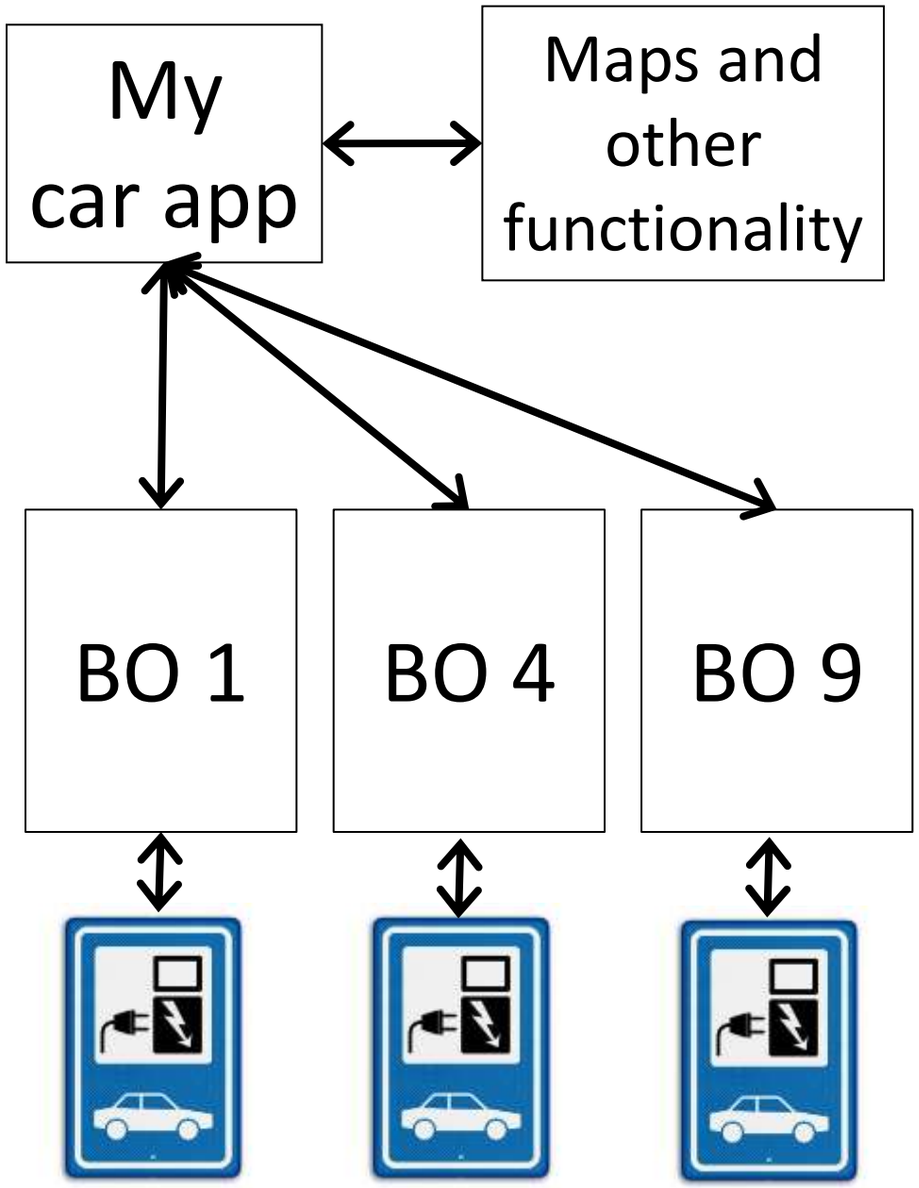
Motown supports OSCP (Open Smart Charging Protocol) and algorithms like the PowerMatcher.

If CSO's and CSP's use Motown, it becomes possible to implement smart charging, thereby saving billions in the Netherlands alone over the cource of the next decennia.

E.g. by transforming bid curves for outer branches so the EV's on that specific branche decrease (or increase) their power usage.

For DSO's Motown is easier and more effective than dealing with a multitude of CSO and CSP systems.

The current situation for (PH)EV manufacturers

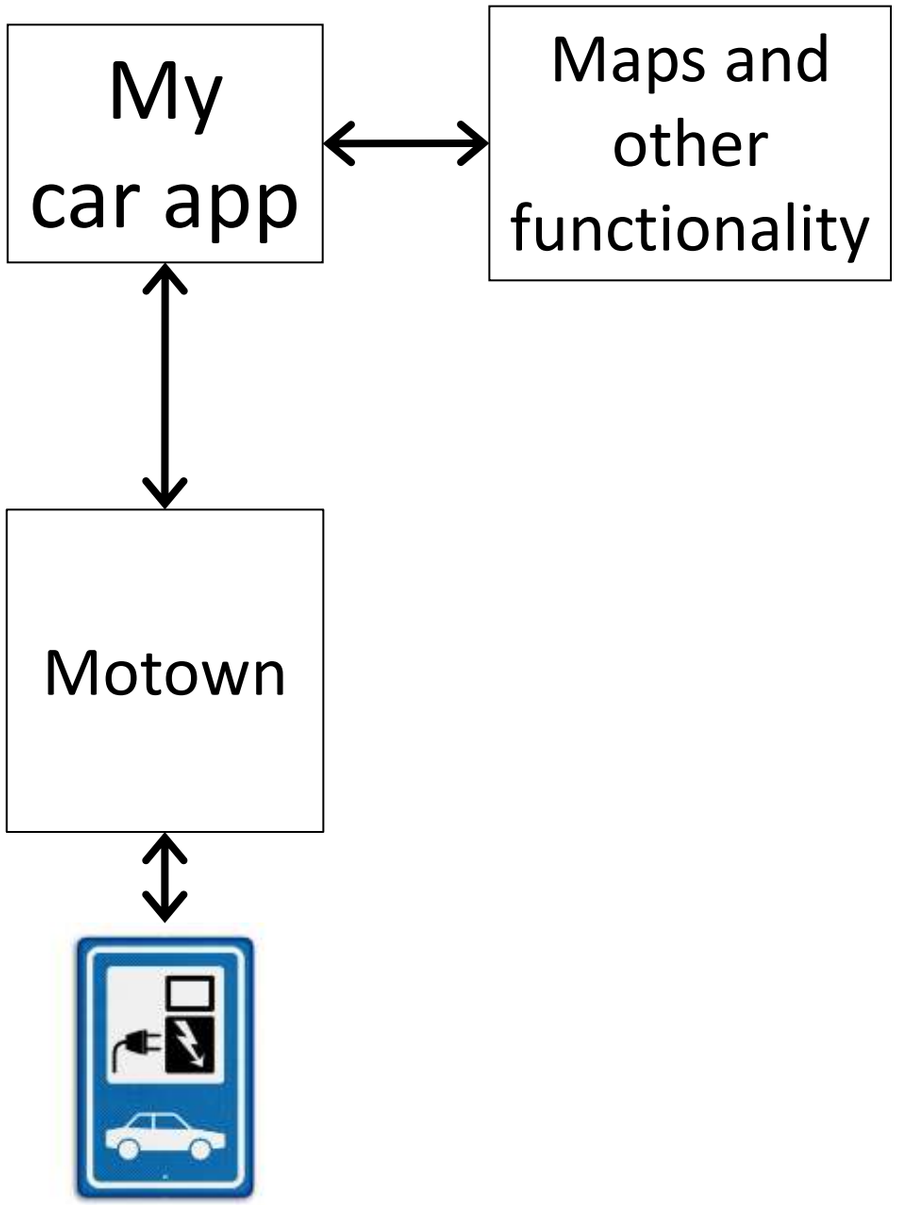


Energy suppliers and DSO's are large players but car manufacturers (and oil companies) are among the biggest companies on earth.

Car companies are discovering that cars are not stand-alone products anymore. EV's need to interact with the Internet and the smart grid in order to deliver maximum added value to buyers.

Especially charge spots and smart charging need to be seamlessly integrated into the user experience. Efforts regarding IEC 15118 and European smart charging standards indicate that manufacturers are aware of this and are starting to claim their position in the EV market as (among others) CSP.

The solution for EV manufacturers: Motown puts all the charge spot information they need at their fingertips

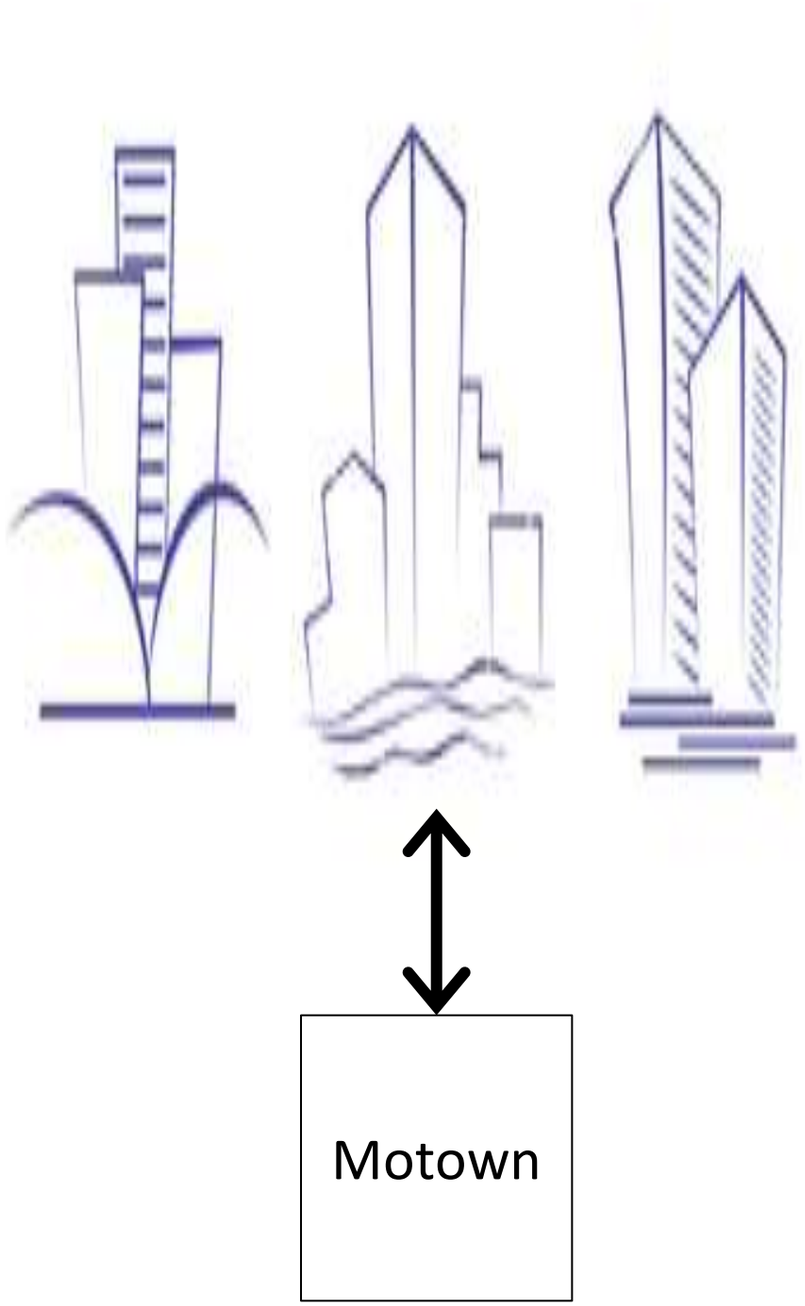


Motown offers the EV manufacturers access to charge spots:

- What charge spots are available?
- Charge speed and price (taking into account network capacity, energy prices, other users bid curves and driver demands).
- Fast charging options en route.
- Driver support (including diagnostics).
- Driver information (charging history etc).
- Other apps (most is still unknown).

Motown is a low-risk, low-cost way of protecting investments in an EV line-up and pushing up sales by optimal integration in the software ecosystem.

Motown as a solution for app developers



Motown realizes that **you** are the driving force behind this ecosystem, whether you are an enterprise architect or a one-man band. You create the added value that the other stakeholders need in order to recoup their investments. That's why they support you.

Motown puts a world of EV data and functionality at your fingertips, ready for integration into your application, wherever your creativity takes you.

Summary

- Motown makes it easier to develop applications that interact with chargepoints.
- This saves money and creates revenues for all businesses that rely on these applications:
  - Chargepoint operators (promote and manage)
  - Mobility service providers (selling services)
  - DSO’s (smart charging within grid capacity)
  - Energy suppliers (smart charging with green energy)
  - Chargepoint manufacturers (develop once - sell everywhere)
  - Electric Car Manufacturers (added value services)

Market roles

Electric Vehicle Owner / Driver

Application Store

Charge Spot Operator (CSO)

Charge Service Provider (CSP)

EV Manufacturer (OEM)

Clearing House

DSO

3rd Party Developers

Application layer (functionality / presentation)

Chargepoint Management System

Mobile / Web Application for Customer

On-board Vehicle Application

Clearing House Application

Grid Control System

3rd Party Applications

Shared services

Motown

Webservices

Data Warehouse 1

Data Warehouse n

Identity Management

OCPP

Infrastructure layer

Charge Spot

OCPP

Electric Vehicle

Why is Motown open source?

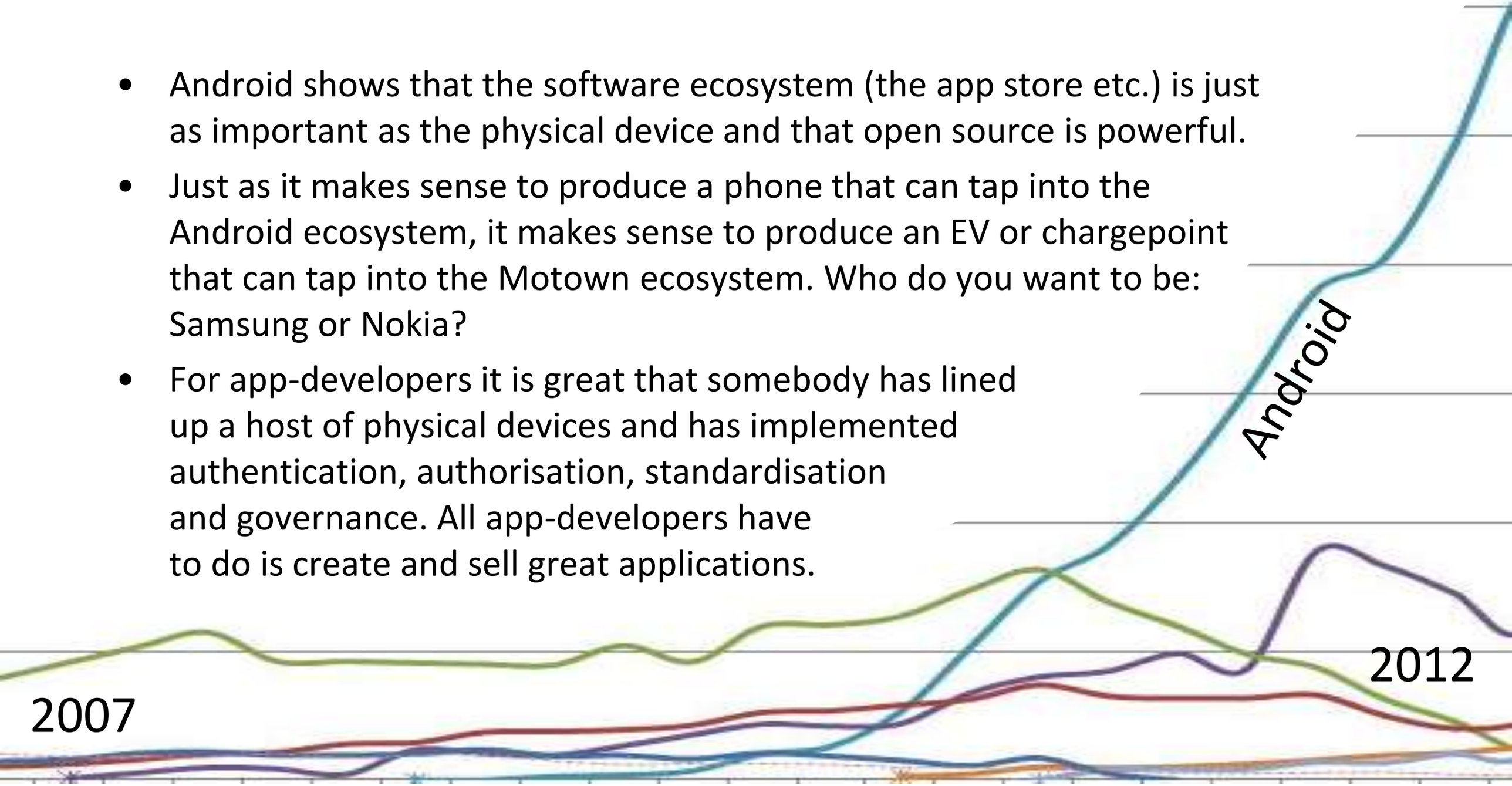
- Many stakeholders use the same functions and the same information. Sharing is more cost-effective than each stakeholder going it alone.
- Open source is simply the most cost-effective way of sharing, developing and approving code between all stakeholders in this highly diversified business ecosystem.
- Developers can directly look at the code so they understand how to interact with it and how to enhance it.
- It lowers barriers of entry for new stakeholders so they can enrich and grow this new business ecosystem.

Why not just a protocol like OCPP?

- A protocol for chargepoints like OCPP is a good solution if you want to encourage hardware innovation: different hardware requires different code. Motown lives on the web, independent of hardware.
- If Motown was just a protocol, all stakeholders would in effect have to develop their own special Motown implementation. Why spend money on redundant code?
- By creating an open source environment, each stakeholder can profit from and contribute to a growing set of shared functionality.

Motown could be for charge spots what Android is for mobile phones

- Android shows that the software ecosystem (the app store etc.) is just as important as the physical device and that open source is powerful.
- Just as it makes sense to produce a phone that can tap into the Android ecosystem, it makes sense to produce an EV or chargepoint that can tap into the Motown ecosystem. Who do you want to be: Samsung or Nokia?
- For app-developers it is great that somebody has lined up a host of physical devices and has implemented authentication, authorisation, standardisation and governance. All app-developers have to do is create and sell great applications.



Motown is a unique opportunity

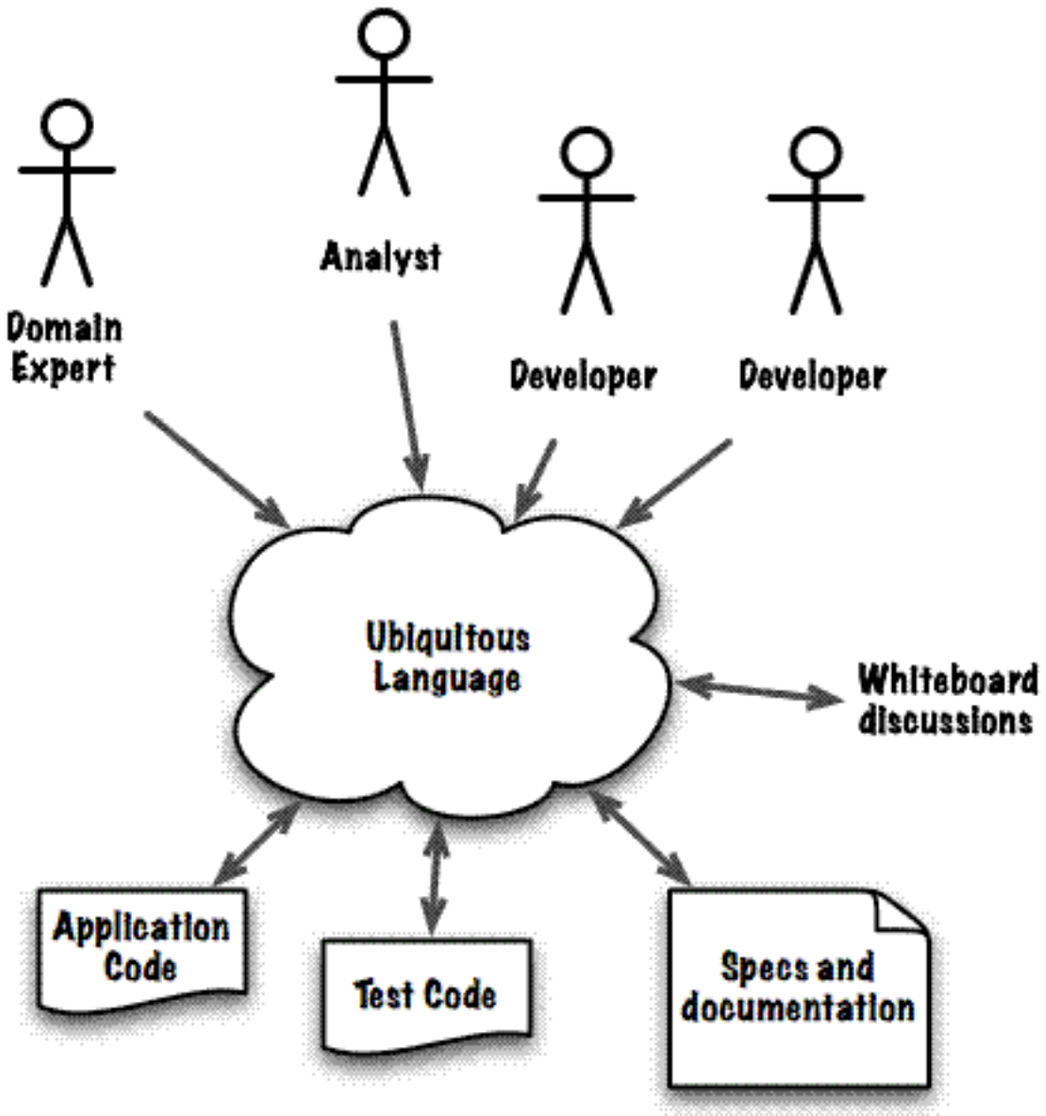
- Our goal is to save the planet by enabling entrepeneurs to make a profit. Motown ensures that costs are low and innovation is swift.
- Worldwide, software development is heading towards open source programming and open source data platforms. Revenues are generated by selling physical devices and by writing value added apps. That's what Motown is designed for.
- If we look to the future we realize that the market for EV's and chargepoints has yet to reach 0,01% of its full potential. Now is the time to design the market and software ecosystem in the best possible way. We did it before with OCPP. Lets do it again!

TECHNICAL IMPLEMENTATION

EV enabling

- Starts with an operator platform
- That allows for easy management
- That is extended by settlement services
- That is extended by provider services
- That’s run in a shared (multi-tenant) mode
- To simplify the life of App developers

Domain Driven Design



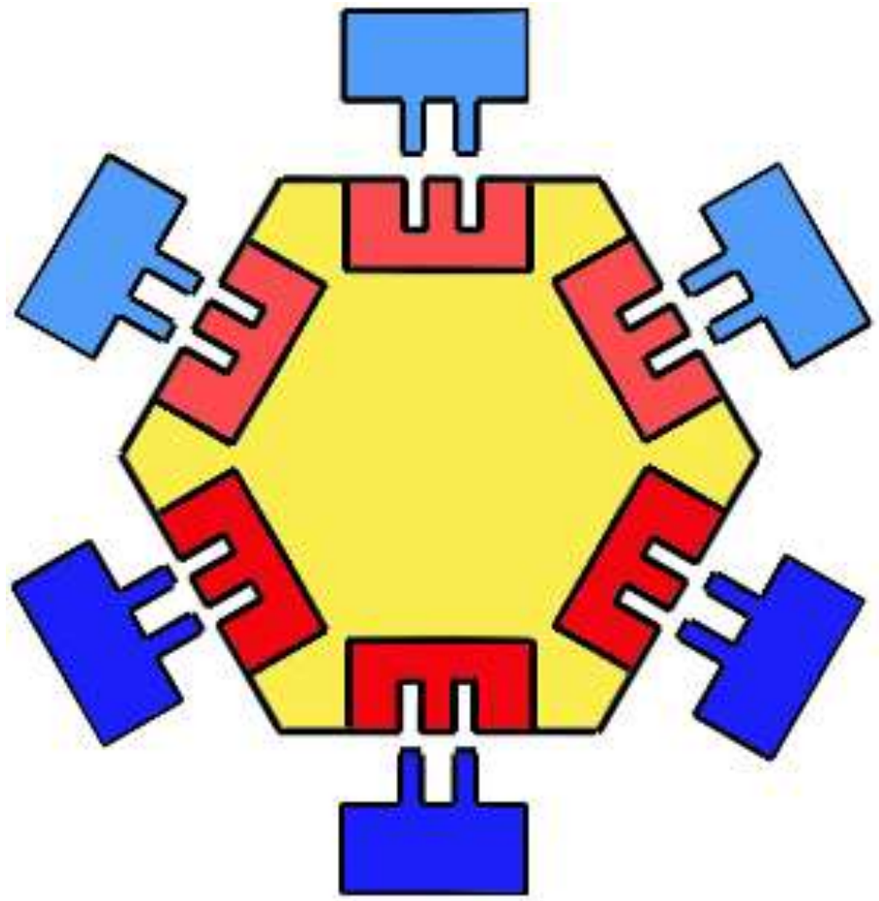
- Business Oriented
- Readable translation -> decisions seen in software and readable
- A single language over business and IT

Event sourced data store

- Keep History -> Always
- Track user intent -> The why of actions
- Replay of history enriches datastores
- Answer questions not known at start

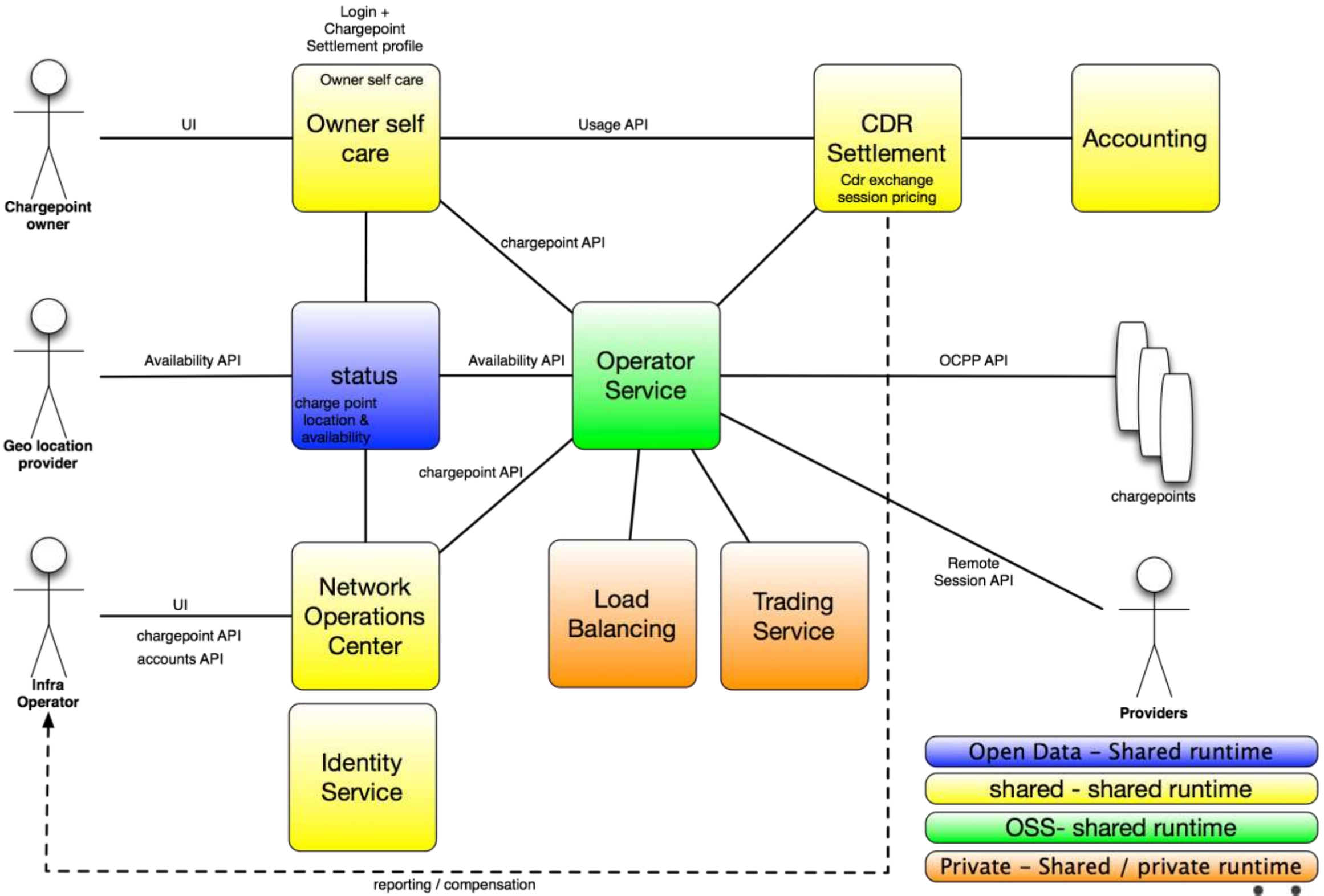
Hexagonal model

- Enable Add-Ons
- Enable composition
- Event driven architecture
- Async messages for scalability



http://www.dossier-andreas.net/software_architecture/ports_and_adapters.html

http://alistair.cockburn.us/Hexagonal+architecture


Login +
Chargepoint
Settlement profile
Owner self care
Owner self care
UI
Usage API
CDR Settlement
Cdr exchange session pricing
Accounting
Chargepoint owner
chargepoint API
Availability API
status
charge point location & availability
Availability API
Operator Service
OCPP API
Geo location provider
chargepoints
chargepoint API
Network Operations Center
Load Balancing
Trading Service
Remote Session API
UI
chargepoint API
accounts API
Infra Operator
Providers
Identity Service
reporting / compensation
Open Data – Shared runtime
shared - shared runtime
OSS- shared runtime
Private – Shared / private runtime

Practical organization

- Information shared via website (glue between systems) (at a later stage)
- Code shared via GitHub, incl ticketing
- Triggered builds, nightly builds and ‘releases’ all in continuous delivery style
- Google group for communication

Agile development

- Quick start based on existing code
- Minimal Viable Product (MVP) approach by ‘split’ tactic
- MVP elements will be released OSS
- Development created on Agile concepts, depending on the team KanBan / Scrum

Supported

- Like to join ?
- contact:
  arjan.wargers@e-laad.nl
  auke.hoekstra@alliander.com
  louis.dietvorst@enexis.nl
  o.warnier@thenewmotion.com
  patrick.rademakers@ihomer.nl