eMall

Cialini – Colangelo – La Ferla

Requirement Analysis and Specification Document (RASD)

Goals & use-cases of the system

Stations

- Location, price and offers
- Reservations
- Energy settings

Charging Process

- Monitor
- Stop
- Pay

Customization

- Vehicles
- Payments
- Recommendations

Requirements

- **Station View: the Driver must be able to visualise (map and list) the nearby stations and to book the desired station**
- **Charging Process: the Driver is notified when the recharge ends and can stop the charging process**
- **Profile: the User can select an active vehicle and an active payment method**
- **Recommendations: Driver can accept a reservation suggestion by the system**
- **The CPO Administrator must be able to know the status of his stations and to manage their settings**

Assumptions

Sockets

- **Universal type**
- **Retrieve real time info**
- **Speed constraint**

External Services

- **GPS and schedule information**
- **Vehicle verification**
- **DSO and station information**

Alloy

Signatures & Facts

// Each violation has only one corresponding ticket

fact
EachViolatioContainsOneTicket {
one t : Ticket , v : Violation |
t.violations = v
}

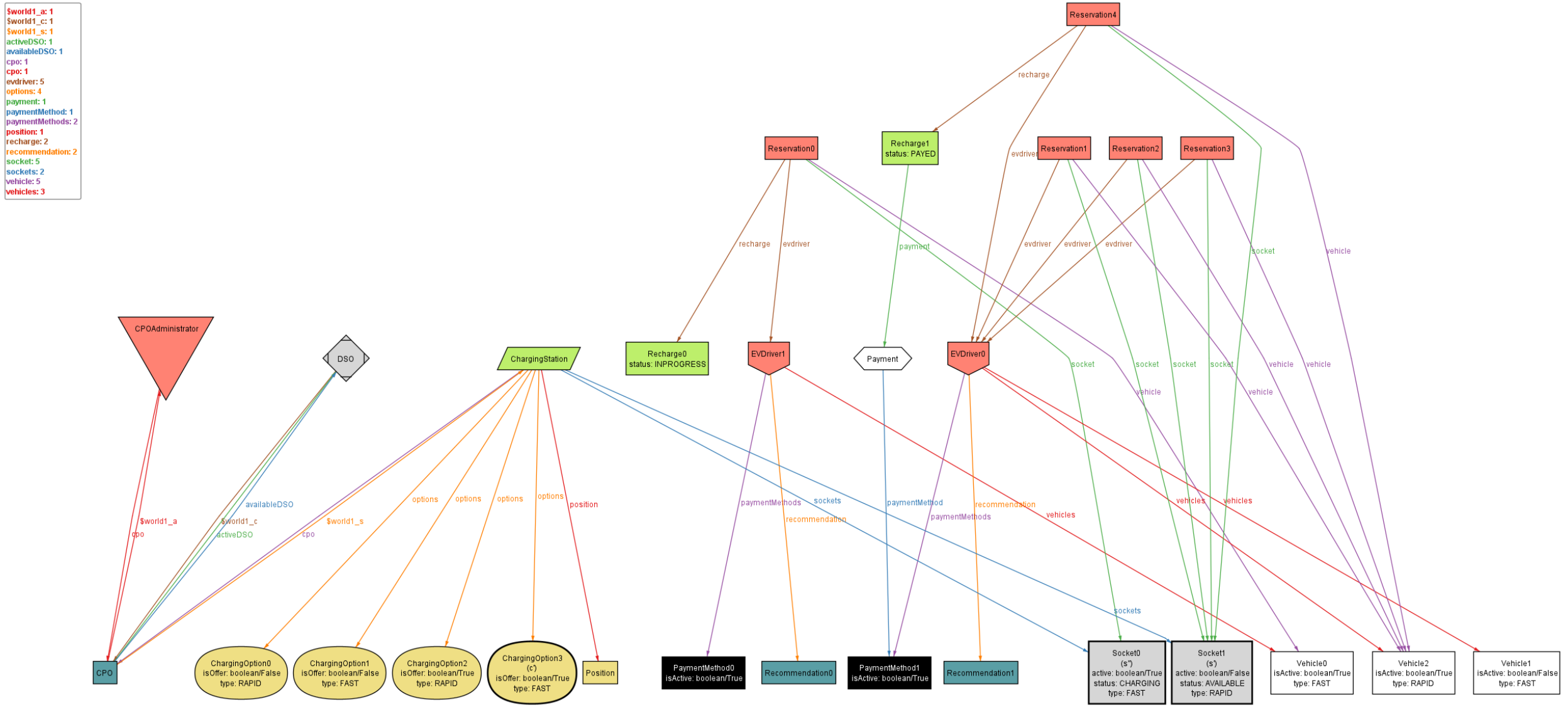
// Each Ticket Issued by one Authority

fact
EachTicketOneAuthority {
all t: Ticket | one au: Authority | au.tickets = t

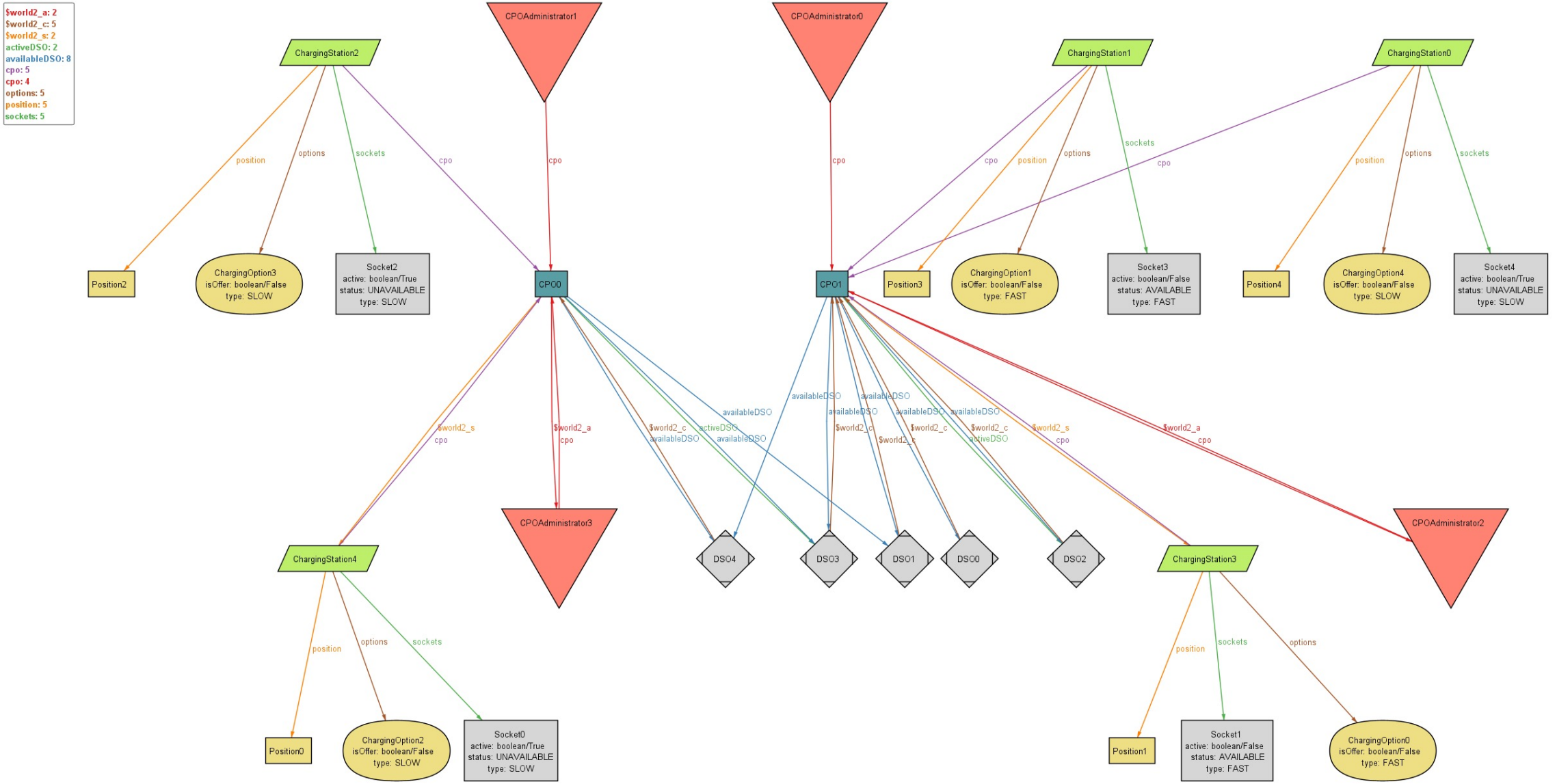
// location of an EndUser should be equal to the reverse geocoding address

fact
EqualLocationForEndUserAndGeo {
one revGeo : ReverseGeoCoding |
one u : EndUser |
revGeo.loc = u.userLocation
}

Alloy worlds

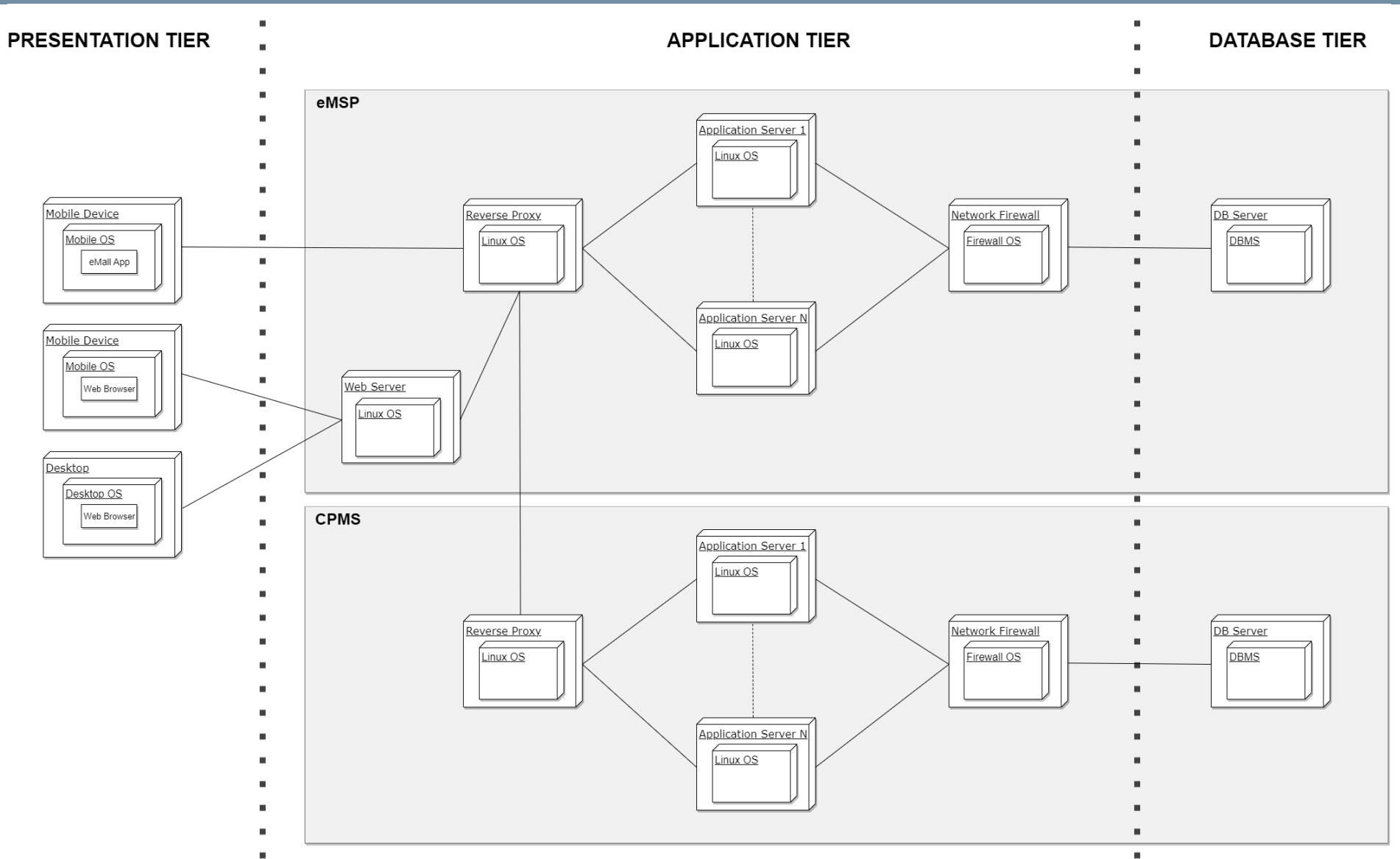


Alloy worlds

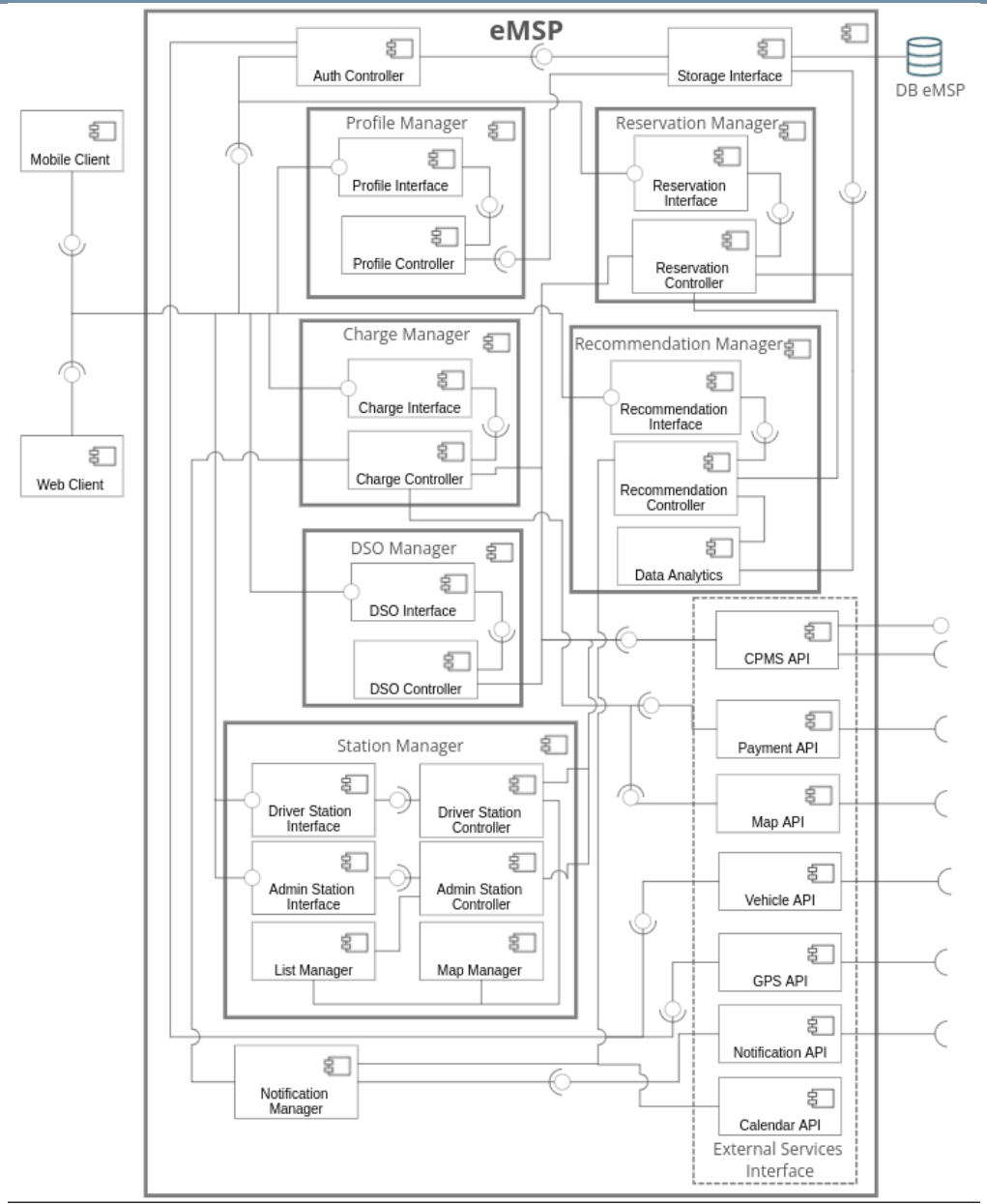


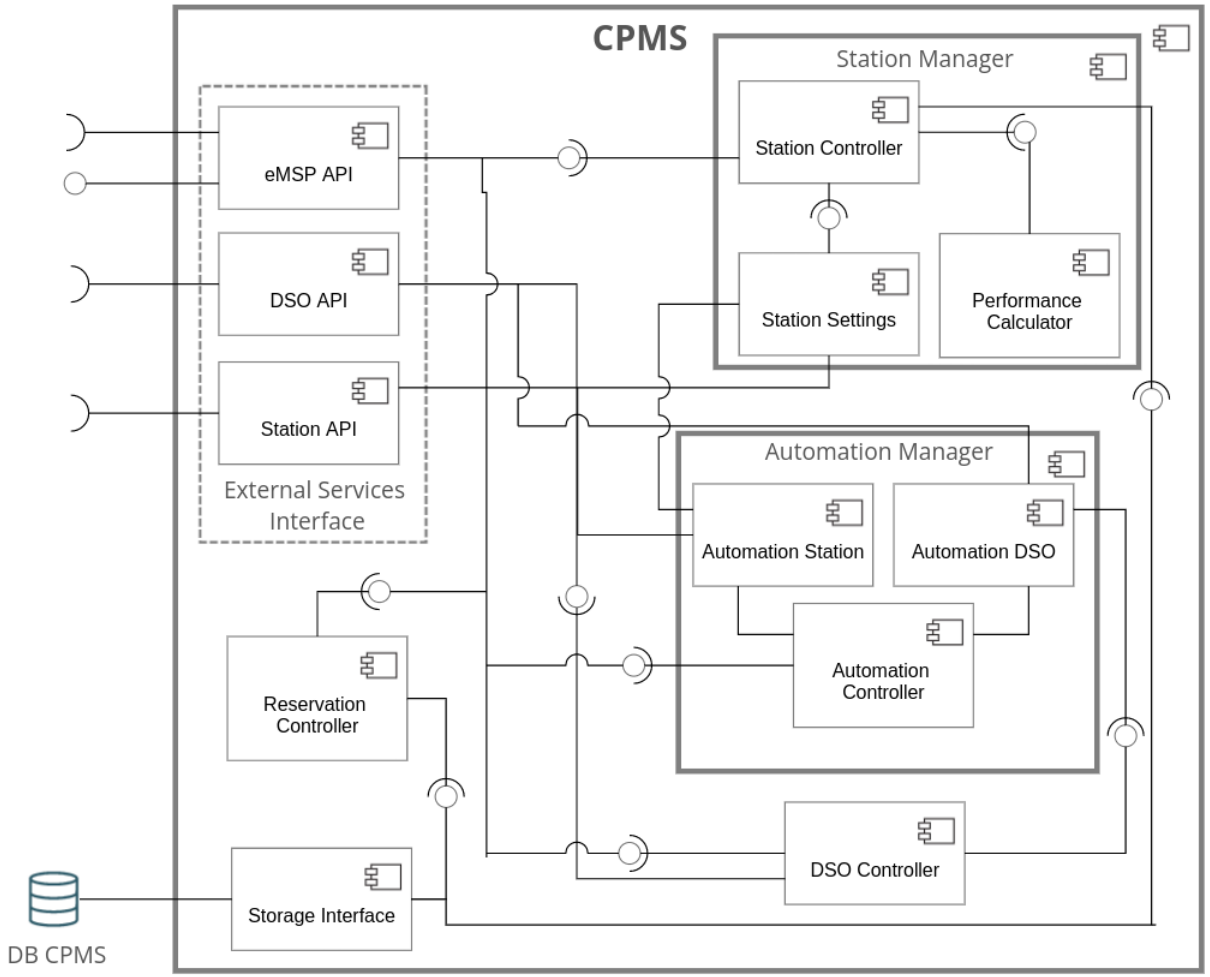
Design Document (DD)

Deployment


PRESENTATION TIER
APPLICATION TIER
DATABASE TIER
eMSP
Application Server 1
Linux OS
Mobile Device
Mobile OS
eMall App
Reverse Proxy
Linux OS
Network Firewall
Firewall OS
DB Server
DBMS
Application Server N
Linux OS
Mobile Device
Mobile OS
Web Browser
Web Server
Linux OS
Desktop
Desktop OS
Web Browser
CPMS
Application Server 1
Linux OS
Reverse Proxy
Linux OS
Network Firewall
Firewall OS
DB Server
DBMS
Application Server N
Linux OS

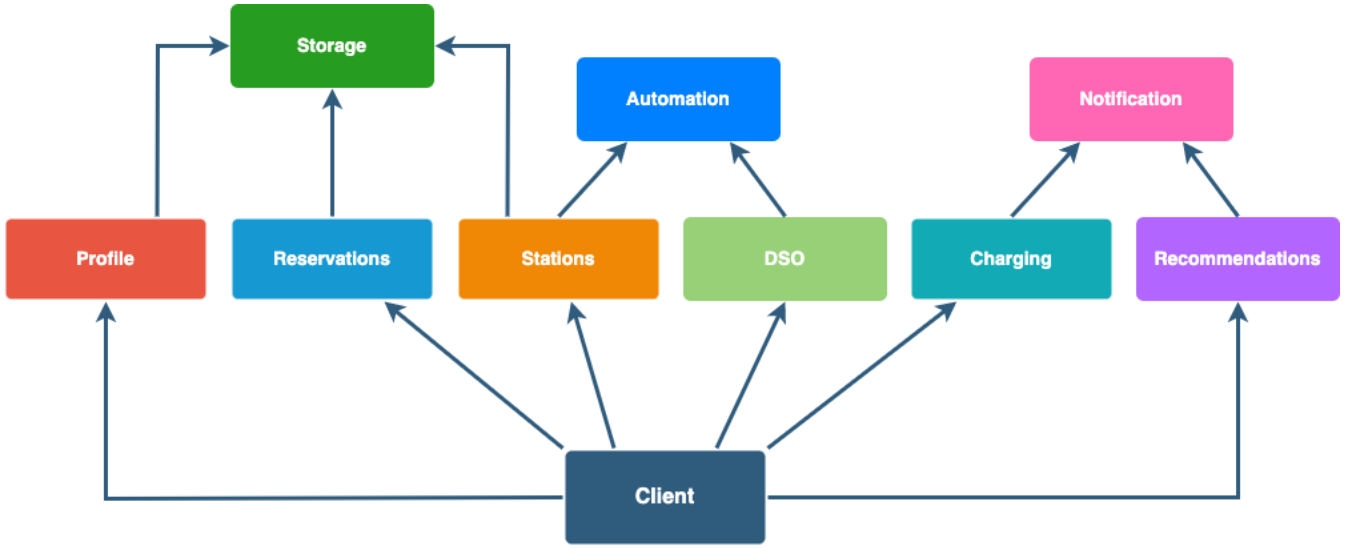
eMSP and CPMS components architecture



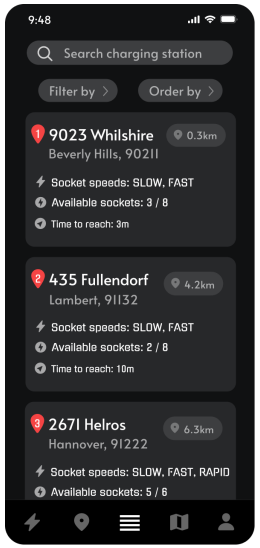


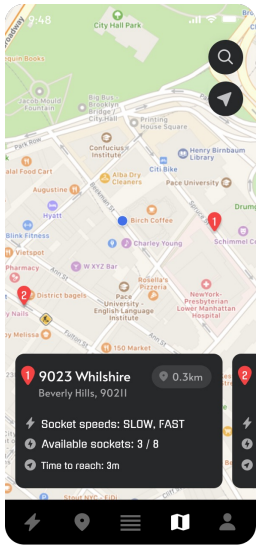
Implementation & Testing

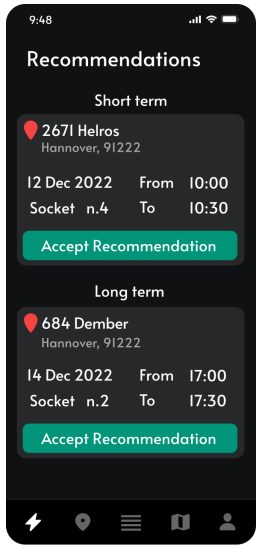
- Bottom-up strategy
- Backend subsystems integration
- Unit test in each subsystem

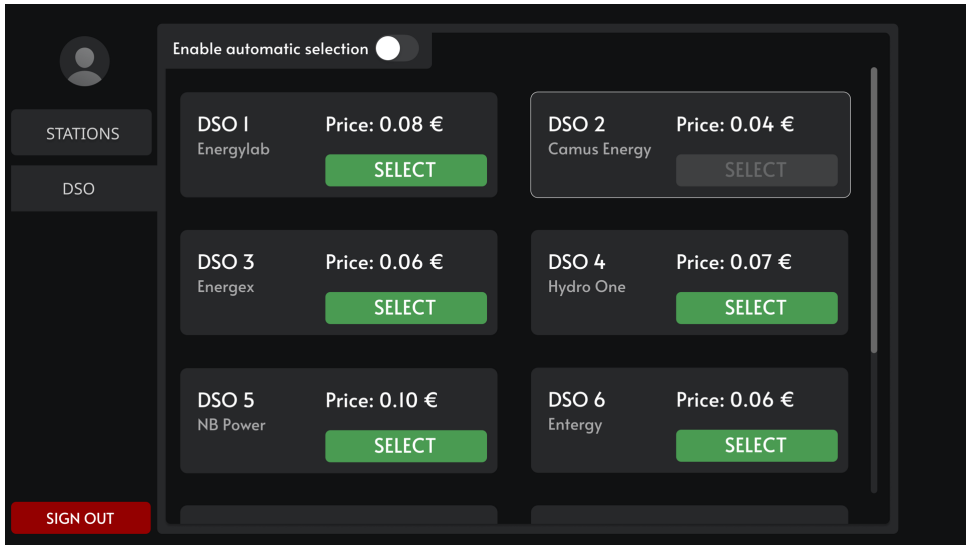


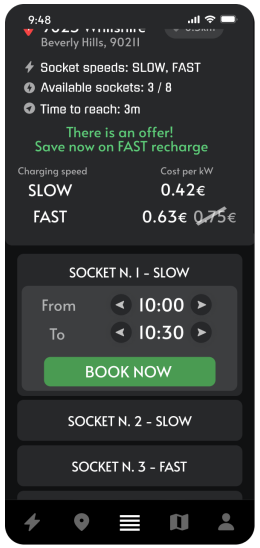
Mockups

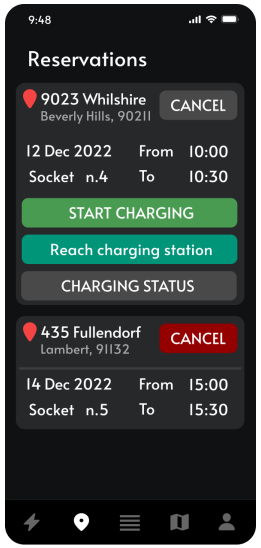

9:48
Search charging station
Filter by
Order by
9023 Whilshire
0.3km
Beverly Hills, 90211
Socket speeds: SLOW, FAST
Available sockets: 3 / 8
Time to reach: 3m
435 Fullendorf
4.2km
Lambert, 91132
Socket speeds: SLOW, FAST
Available sockets: 2 / 8
Time to reach: 10m
2671 Helros
6.3km
Hannover, 91222
Socket speeds: SLOW, FAST, RAPID
Available sockets: 5 / 8

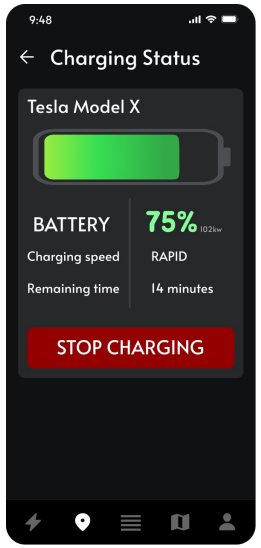

9023 Whilshire
0.3km
Beverly Hills, 90211
Socket speeds: SLOW, FAST
Available sockets: 3 / 8
Time to reach: 3m

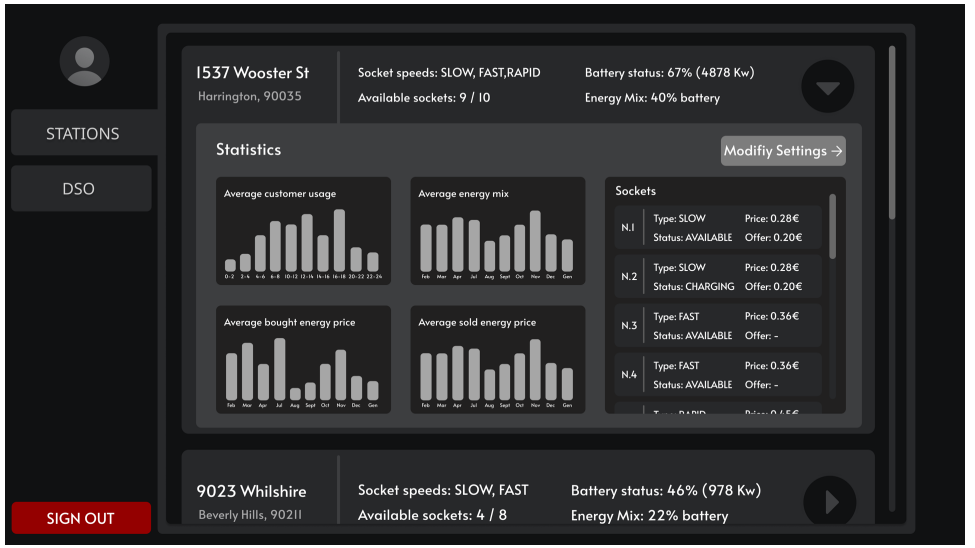

9:48
Recommendations
Short term
2671 Helros
Hannover, 91222
12 Dec 2022
From 10:00
Socket n.4
To 10:30
Accept Recommendation
Long term
684 Dember
Hannover, 91222
14 Dec 2022
From 17:00
Socket n.2
To 17:30
Accept Recommendation


Enable automatic selection
STATIONS
DSO
SIGN OUT
DSO 1
Energylab
Price: 0.08 €
SELECT
DSO 2
Camus Energy
Price: 0.04 €
SELECT
DSO 3
Energex
Price: 0.06 €
SELECT
DSO 4
Hydro One
Price: 0.07 €
SELECT
DSO 5
NB Power
Price: 0.10 €
SELECT
DSO 6
Entergy
Price: 0.06 €
SELECT


9:48
Beverly Hills, 90211
Socket speeds: SLOW, FAST
Available sockets: 3 / 8
Time to reach: 3m
There is an offer!
Save now on FAST recharge
Charging speed
Cost per kW
SLOW
0.42€
FAST
0.63€ 0.75€
SOCKET N. 1 - SLOW
From
10:00
To
10:30
BOOK NOW
SOCKET N. 2 - SLOW
SOCKET N. 3 - FAST


9:48
Reservations
9023 Whilshire
Beverly Hills, 90211
CANCEL
12 Dec 2022
From 10:00
Socket n.4
To 10:30
START CHARGING
Reach charging station
CHARGING STATUS
435 Fullendorf
Lambert, 91132
CANCEL
14 Dec 2022
From 15:00
Socket n.5
To 15:30


9:48
Charging Status
Tesla Model X
BATTERY
75%
Charging speed
RAPID
Remaining time
14 minutes
STOP CHARGING


STATIONS
DSO
SIGN OUT
1537 Wooster St
Harrington, 90035
Socket speeds: SLOW, FAST,RAPID
Available sockets: 9 / 10
Battery status: 67% (4878 Kw)
Energy Mix: 40% battery
Statistics
Modifiy Settings
Average customer usage
Average energy mix
Sockets
N.1
Type: SLOW
Price: 0.28€
Status: AVAILABLE
Offer: 0.20€
N.2
Type: SLOW
Price: 0.28€
Status: CHARGING
Offer: 0.20€
N.3
Type: FAST
Price: 0.36€
Status: AVAILABLE
Offer: -
N.4
Type: FAST
Price: 0.36€
Status: AVAILABLE
Offer: -
Average bought energy price
Average sold energy price
9023 Whilshire
Beverly Hills, 90211
Socket speeds: SLOW, FAST
Available sockets: 4 / 8
Battery status: 46% (978 Kw)
Energy Mix: 22% battery