# ROCIN-ECO - AUTOMATISIERTES LADEN

## 12. FORUM ELEKTROMOBILITÄT SCHLESWIG-HOLSTEIN

20.11.2024

MATTHIAS HARDT (AUDI AG)

Gefördert durch:

Bundesministerium für Digitales und Verkehr

Finanziert von der Europäischen Union
NextGenerationEU

aufgrund eines Beschlusses des Deutschen Bundestages

# PROJECT INFORMATION

| | |
|---|---|
| Project name | ROCIN-ECO |
| Poject duration | 01.10.2021 – 30.06.2024 (30 months) |
| Project lead | IONITY GmbH |
| Project Partner | IONITY GmbH, AUDI AG, TÜV SÜD |
| Associated Partner | Porsche AG, BMW AG, Ford AG, AVL GmbH, Huber+Suhner AG, ROCSYS |
| Short description | **ROCIN-ECO – Robot Charging Infrastructure Ecosystem enabling carefree emobility across Europe**<br>The goal of ROCIN-ECO is the development and demonstration of an interoperable, standardized, automated charging solution by means of a robot. Since the automated charging solution must be fully interoperable with both the charging infrastructure and e-vehicles, success can only be achieved with a coherent, integrated approach that involves standardization activities throughout the whole project. Our realization will be the only vendor-independent solution with a strong focus on non-discrimination and standardization. The practice-oriented approach by considering public use cases as well as a safe soft-robot technology and high charging performance confirm the difference of ROCIN-ECO from other projects. Respecting multiple aspects for automated charging we claim to find the optimal technology for enabling carefree emobility across Europe. |

FUNDED PARTNERS

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IONITY KONSORTIALFÜHRER

ASSOCIATED PARTNERS & SUBCONTRACTORS

ROCSYS EV Charging Automation

HUBER+SUHNER

ASSOCIATED PARTNERS

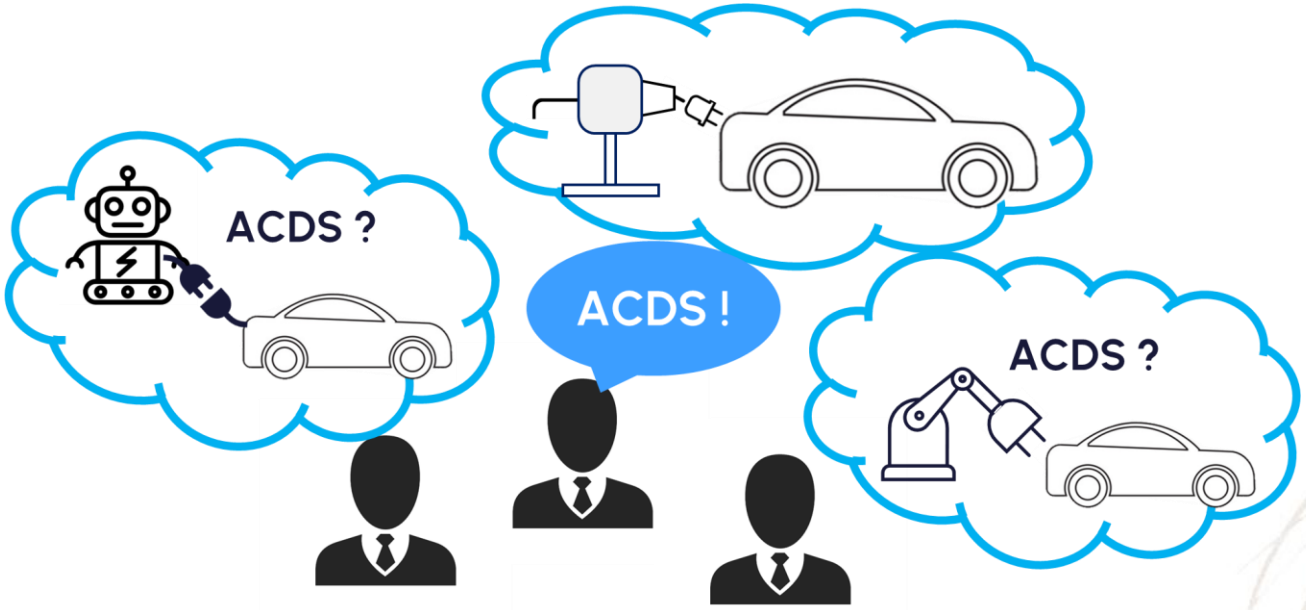
MARQUARDT

PORSCHE

AVL

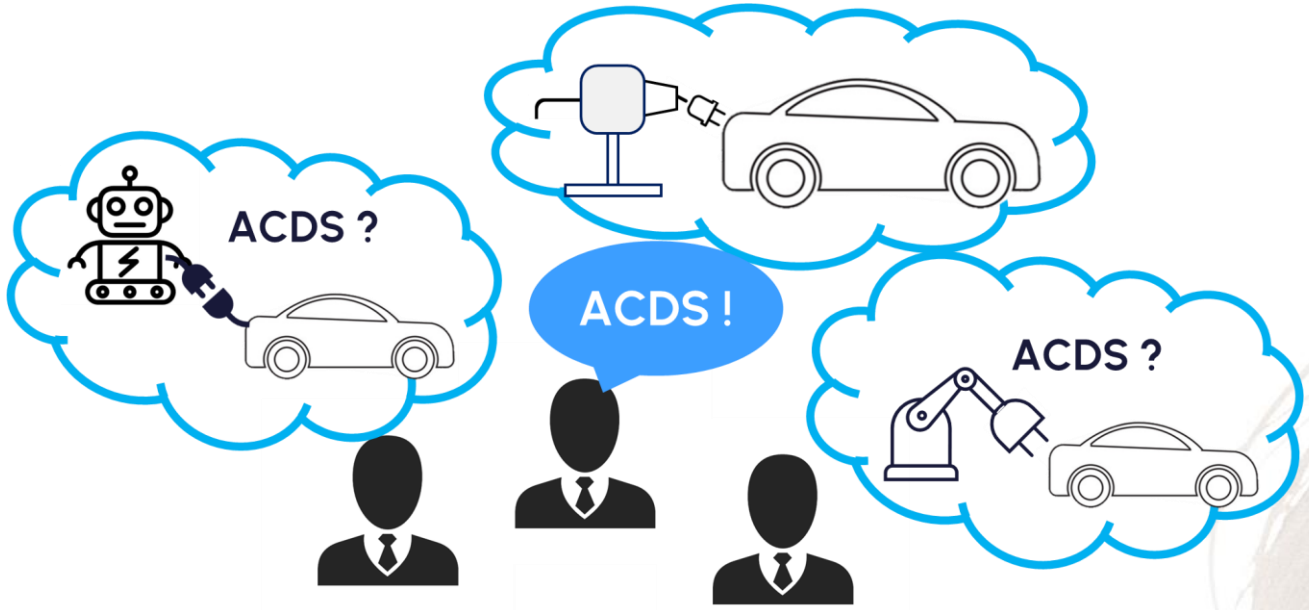
+ offen für weitere Partner

# ROCIN-ECO - INTRODUCTION



# ROCIN-ECO - PROJECT GOALS

1. Understanding the ACDS process and technology
2. Provide recommendations towards standardization

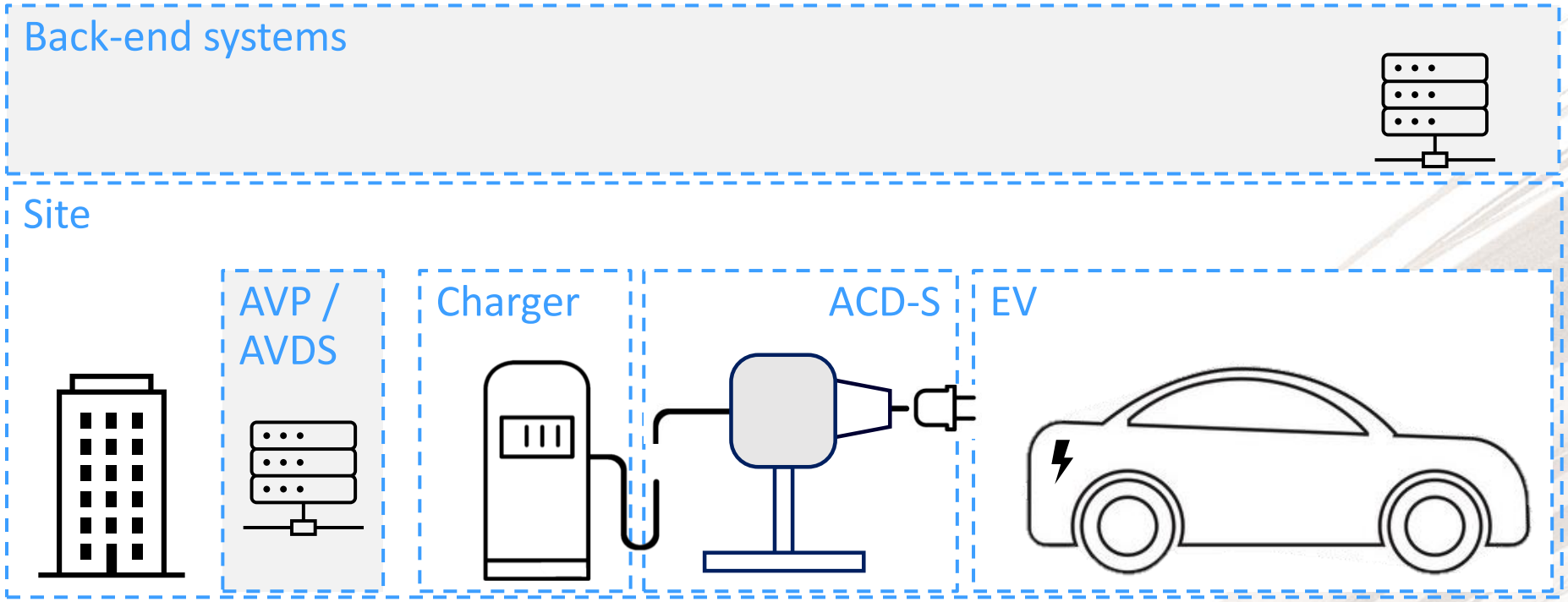


## Method

Get close to a standardizable process, with available means.

**Method**

Get close to a standardizable process, with available means.



# ROCIN-ECO - LEARNING BY DOING

## First steps

**Apr. 2022**

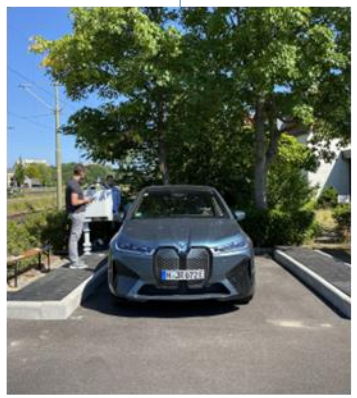
## Where are we now

**Nov. 2023**

# ROCIN-ECO - LEARNING BY DOING

**Apr. 2022**

Test physically plugging in and out.



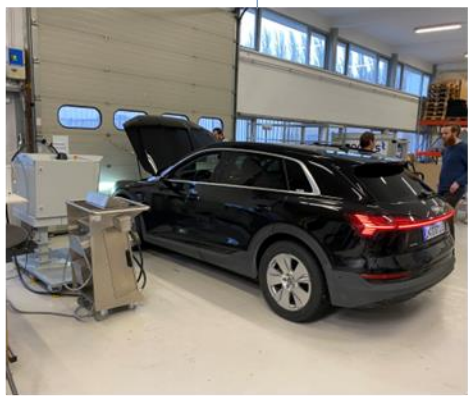
**Jun. 2022**

Try out user stories and parking layouts

**Oct. 2022**

Integrate infrastructure components

Simulate user story for the automated process



**Jan. 2023**

Test communications for a fully automated process

**Jun. 2023**

Test complete user story

**Nov. 2023**

Installation of final demonstrator

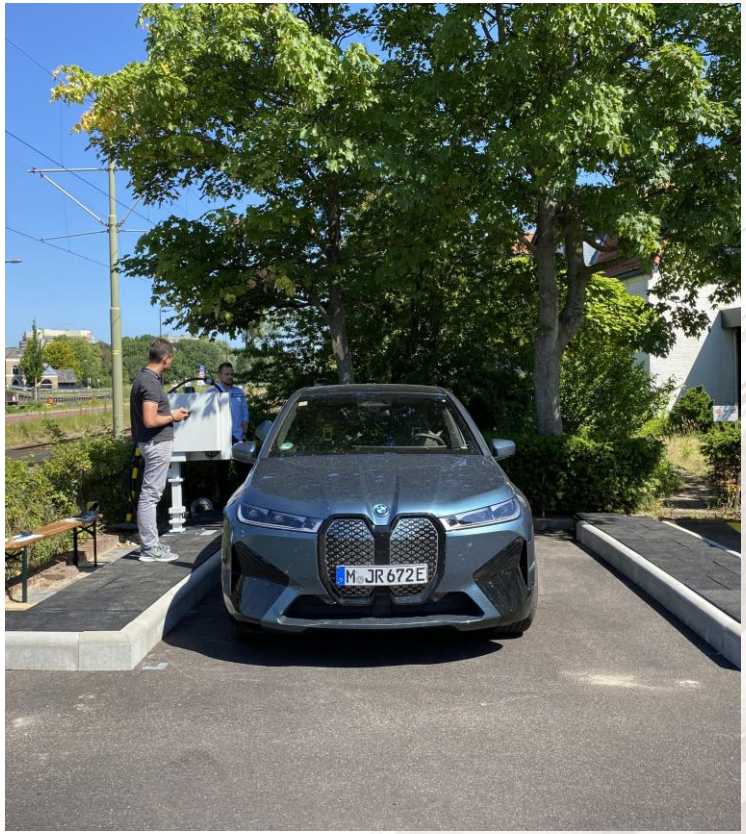
**Testing plugging in and out**

- Provide demarcated parking spot
- Provide clearance between parking spot and arm

# ROCIN-ECO - LEARNINGS

## Try out user stories and parking layouts

- Front/reverse parking is most repeatable
- Only a noteworthy hazard while plugging in

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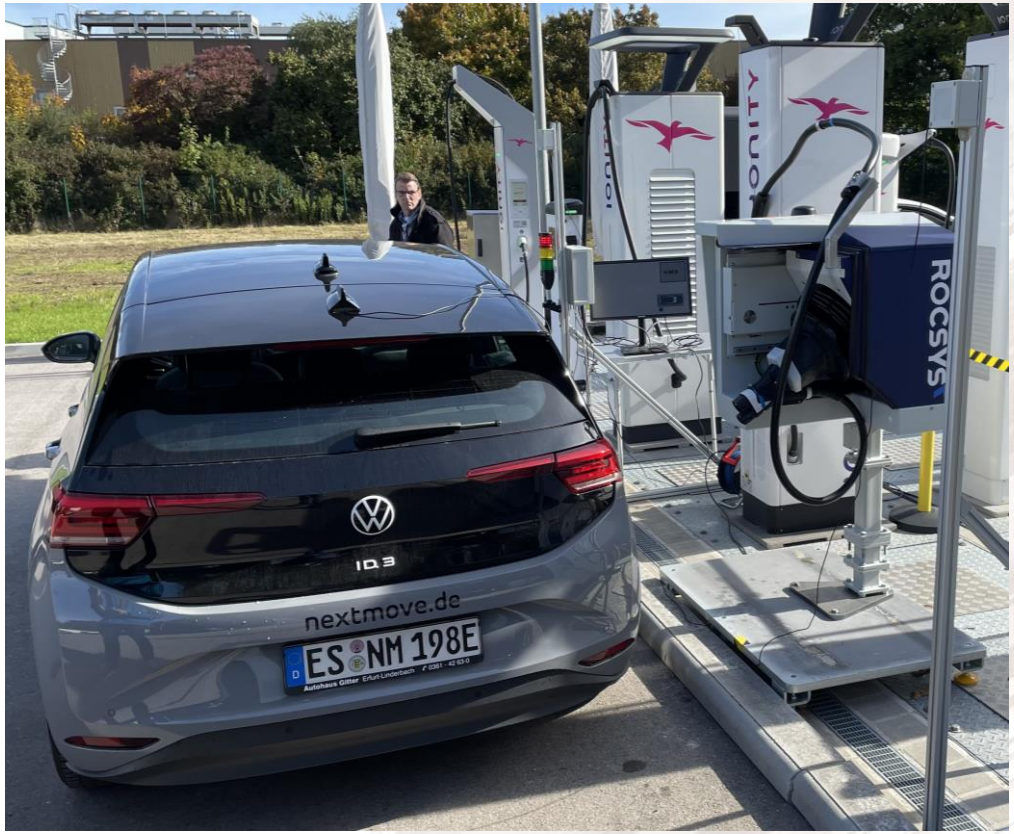
# ROCIN-ECO - LEARNINGS

**Integrate infrastructure components**
**&**
**Simulate user story for the automated process**

- Charging process can remain as is
  (with Plug n Charge, or preauthorization)
- Pre-charge checks take the most time
- Parking based on ranging feedback is more difficult than parking based on lines



# ROCIN-ECO - LEARNINGS

**Test communications for a fully automated process**

- Limited information exchange needed to execute process
- Most information exchange would take place in preparation of arrival

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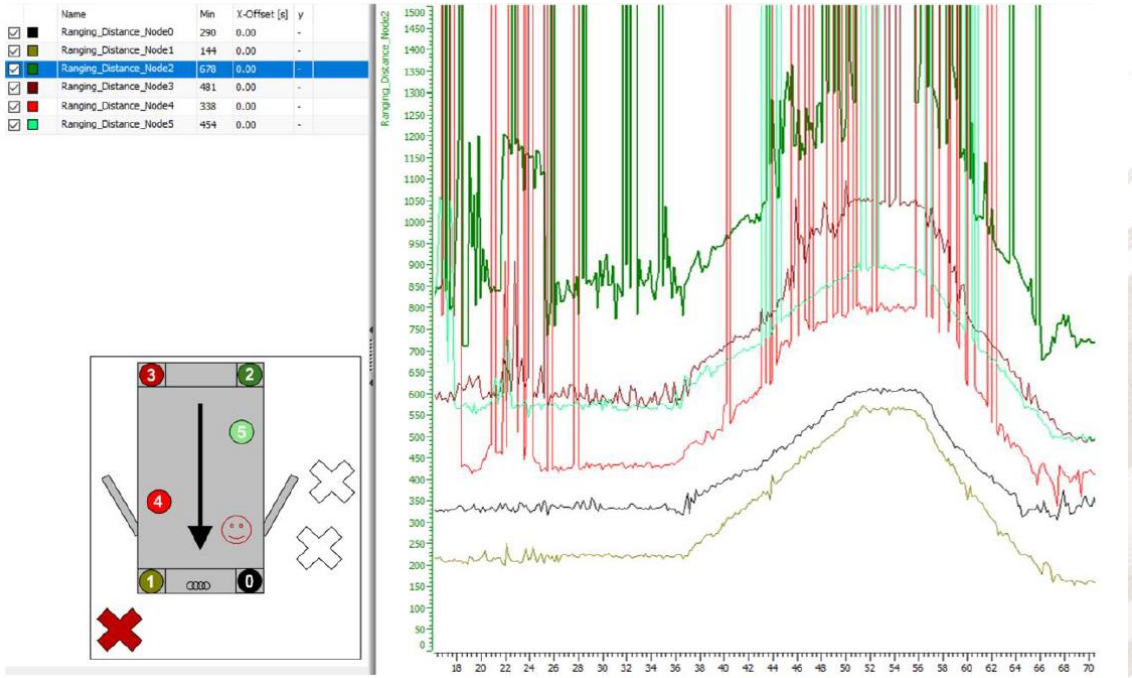
# ROCIN-ECO - LEARNINGS

## Validate complete user story

- Setting up of BLE communication when coming in range is fast and reliable enough for ACDS
- UWB (CCC implementation): at least sufficient for confirming position pairing of EV-aEVSE, further investigation ongoing …



## Demonstrate user story

- EV actions
- ACDS actions
- Human
- N/A

**3. Approaching and Parking at the automatic EVSE**

- *Start ACDS session*
- *Check ACDS compatibility*
- *Park EV*
- *Confirm correct parking*
- *Disable drive train*
- *Step out*

**4. Docking**

- *Open charge port cover*
- *Trigger docking*
- *Insert connector*
- *Lock connector*

**5. Energy transfer**

- *Set up and control energy transfer*
- *Follow EV motions*

**6. Undocking**

- *Unlock connector*
- *Trigger undocking*
- *Extract connector*
- *Close charge port cover*
- *Unblock drive train*

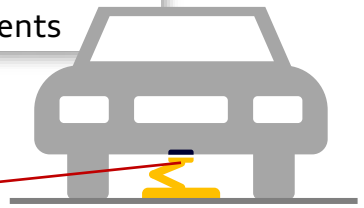
**7. Leaving the automatic EVSE**

- *Step in*
- *Drive away*
- *Terminate ACDS session*
- *Pay Service*

# ROCIN-ECO – ACD STANDARDS IN PROGRESS

**IEC 61851-26 (DTS)-> TS End 2024**
DKE GAK 353.0.13
IEC/TC 69/WG 14
ACD-U Infrastructure Requirements

**IEC 62196-9? (NP)**
DKE 542.4.8
ACD-U Coupler



conductive underbody (ACD-U)

**IEC 61851-28 (WD) -> TS End 2025**
DKE GAK 353.0.13
IEC/TC 69/WG 14
Communication between automatic EV supply equipment and vehicles

**ISO 12768 AVDS**
NA 052-00-37-50 AK
Automated Valet Driving

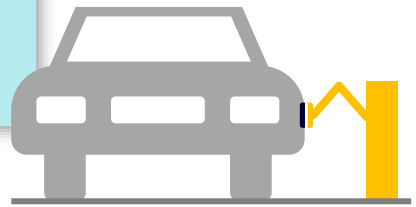
**ISO 23374**
ISO TC 204/WG 14
Automated Valet Parking

**CCC (Connected Car Consortium)**
Digital Key Communication
UWB Ranging

**ISO 15118 3rd Generation**
ISO/TC 22/SC 31
…on

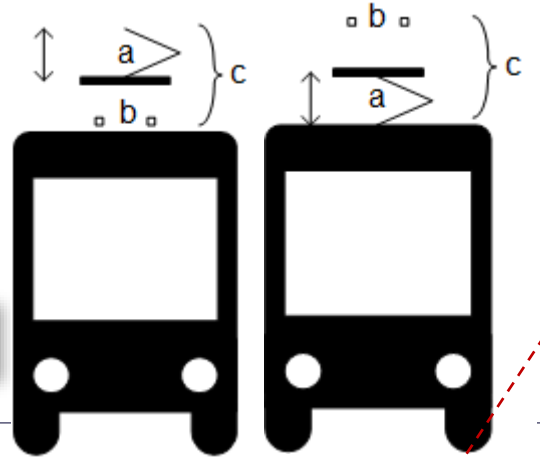
**ISO 15118-20 Ed. 2**
ISO/TC 22/SC 31
Charging communication

**IEC 61851-27 (DTS)> TS End 2024**
DKE GAK 353.0.13
IEC/TC 69/WG 14
ACD-S Infrastructure Requirements



conductive side (ACDS)

**ISO 5474-5 (TS)**
DIN AK Auto NA 52-00-37-56
ISO/TC 22/SC 37/WG 5
Vehicle Requirements (ACD-S + ACD-U)




conductive pantograph (ACDp)

**ISO 15118-20**
ISO/TC 22/SC 31
Kommunikation zwischen Fahrzeug und Infrastruktur

**IEC 61851-23-1**
**EN 50696**

= ROCIN - ECO Contribution

**ISO 15118-21**
ISO/TC 22/SC 31
Testcases

# ROCIN-ECO – RECOMMENDATIONS TO STANDARDIZATION

**EV requirements**

- The EV can put its inlet it within the mating space.
- EV is off when the ACD is active
- It's the EV's responsibility to make the inlet accessible.
- Interlock mechanisms are only engaged when the ACD is not active

**aEVSE requirements**

- Safety for clamping hazard
- Inlet detection not depending on vehicle
- Charging process remains unchanged
- Follow passive vehicle motions
- Use of space standardizable, via physical parking features (marking/bumps/etc.)
- Provide a barrier crossing

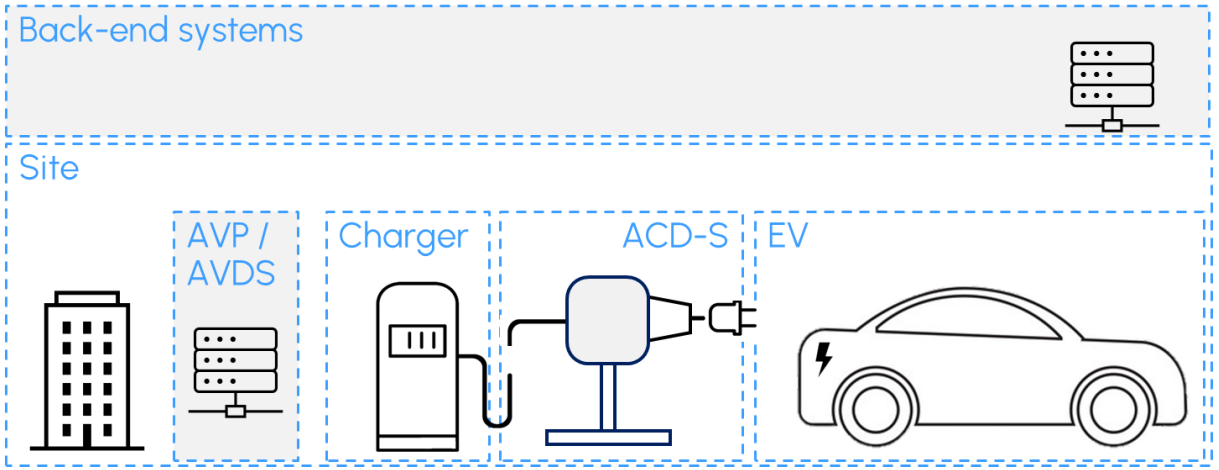
**Communication**

- Direct communication and ranging via BLE/UWB via CCCv3, or indirect via backend
- Preparation via backend systems

# ROCIN-ECO - CONCLUSIONS

**1.** Understanding the ACDS process and technology

**2.** Provide recommendations towards standardization



1. Choosing and Navigating to service site
2. Entering service site
3. Approaching and Parking at the automatic EVSE
4. Docking
5. Energy transfer
6. Undocking
7. Leaving the automatic EVSE

# Thank you for your attention

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