3B.
Gearing up cities and regions for automation

04:45 PM - 06:15 PM

Traffic Efficiency


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Karlsruhe
SHOW
AUTOMATED URBAN MOBILITY
bax
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Societal impacts of automated mobility for public transport:

Insights from a modified Delphi study and expert interviews

Víctor Ferran, BAX

SHOW

SHared automation **O**perating models for **W**orldwide adoption

- **66 partners** from 13 countries
- January 2020 – September 2024
- **€30m** funding (Horizon 2020 GA No. 875530)

- In **21 cities** – mixed traffic
- In **open traffic** & **confined/ industrial** environments
- Transferring more than **150,000 passenger** rides & **5000 cargo** units

SHOW
AUTOMATED URBAN MOBILITY

More than **80**
Automated Vehicles

Shuttles, mid & large size buses, vans/pods, freight vehicles, delivery robots, robo-taxis and modular vehicles

- Mega & Satellite sites
- Follower Sites

State of the art

Societal impacts of CCAV addressed

Accessibility to public transport

Public transport **equity**

Housing **prices**

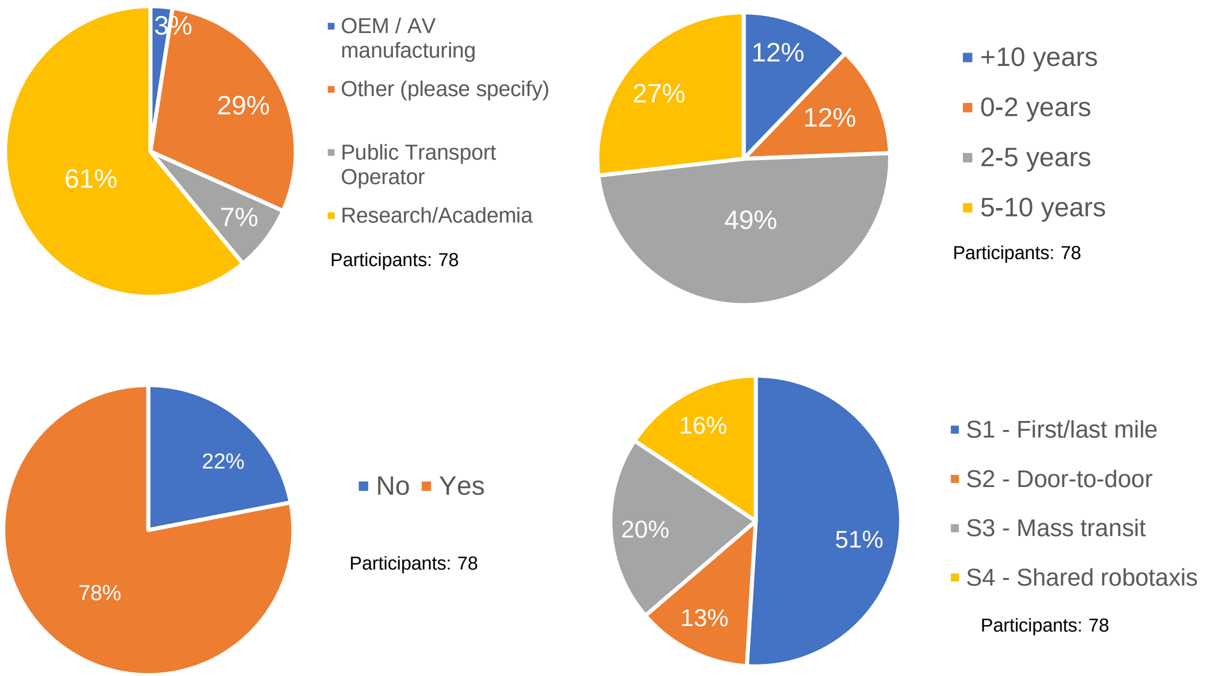
User **perceived safety**

Impact on **jobs** – job loss, job creation, workers response

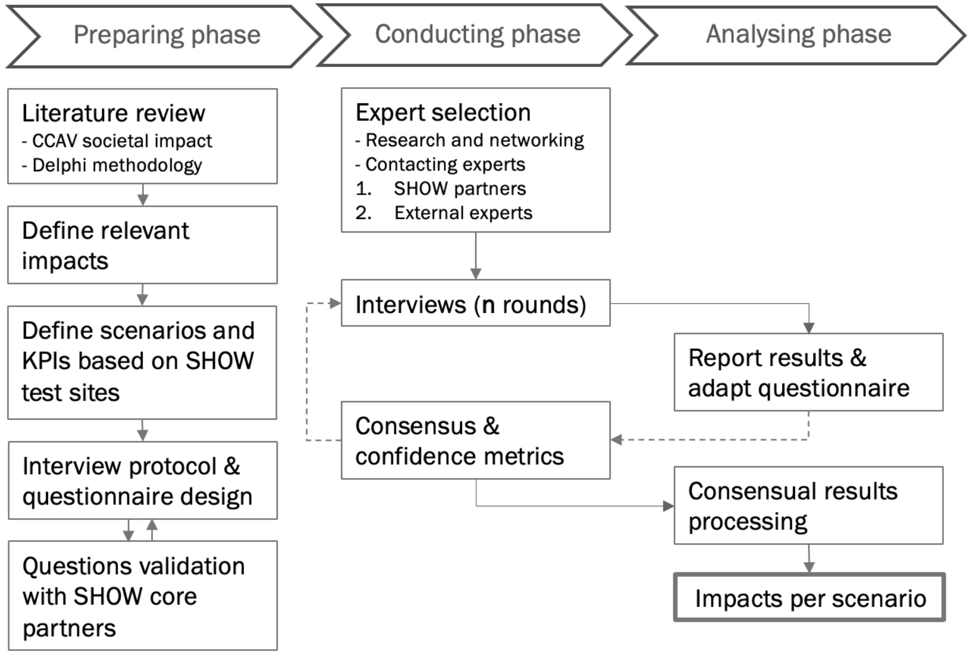
Impact on **jobs** – modification, re-skilling

Methodology

- Delphi study
- Interviews
  - Pilots Sites in SHOW
  - External experts



Profile of participants



Methodology of the Delphi study

Scenarios and phases addressed

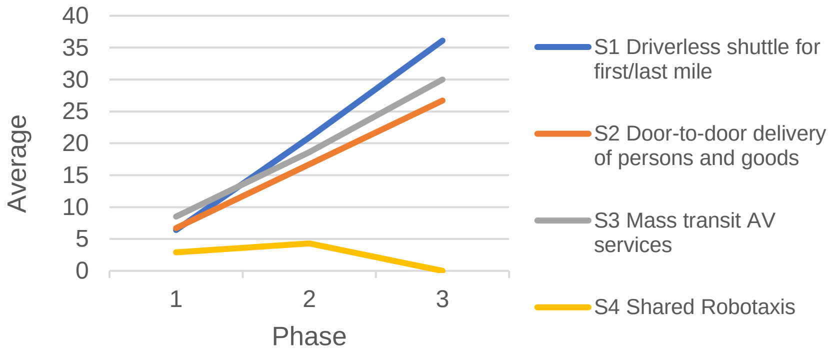
Scenarios tested

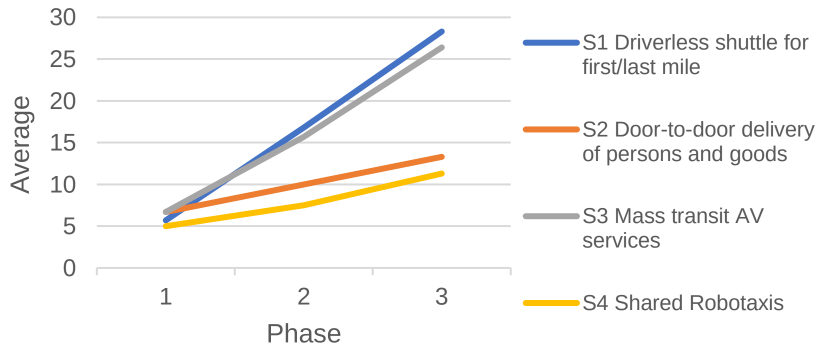
- **S1** Automated shuttle(s) for first/last mile
- **S2** Door-to-door delivery of persons and goods
- **S3** Mass transit AV services
- **S4** Shared Robotaxis

Phases of implementation

- **Phase 1:** service is introduced for testing.
- **Phase 2:** higher penetration rate. Less dedicated human control, although still needed.
- **Phase 3:** full deployment of services and penetration rate. No need for on-board human support.

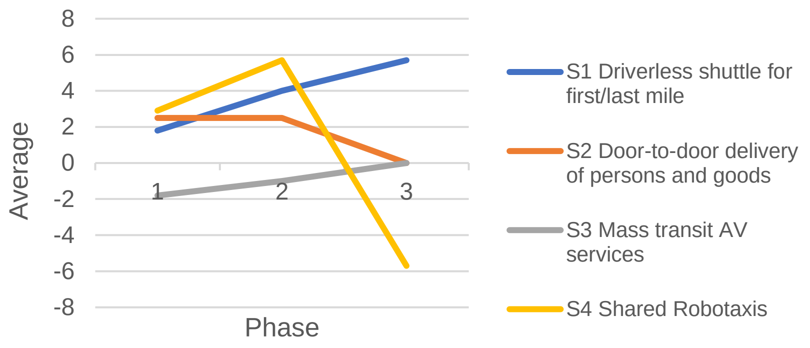
Results and discussion

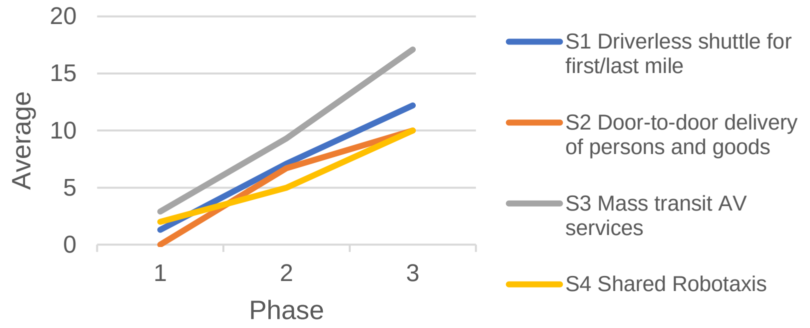


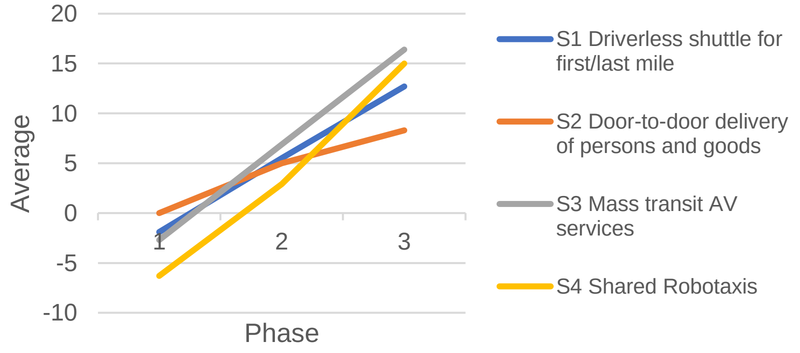


- **Accessibility to public transport**
  - Expected to increase for S1,2,3.
  - S4 Robotaxis depend on more factors, such as the business model, or policy agreements.

- **Public transport equity**
  - Expected to improve for S1 and S3. Less improvement for S2 and S4, probably due to the cost of service for the customers.
  - In order to improve equity, prices should, at least, match the public transport prices.
  - Safety issues arise due to the lack of driver, including sexual harassment. CCTV systems are already in place, but response mechanisms and their effectiveness should be further evaluated to ensure the safety of passengers in AVs.

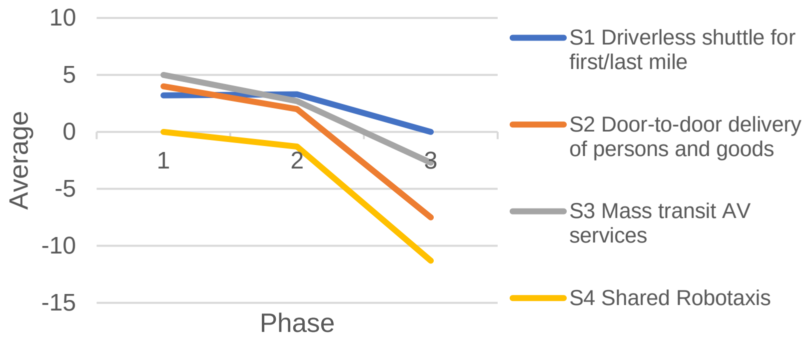


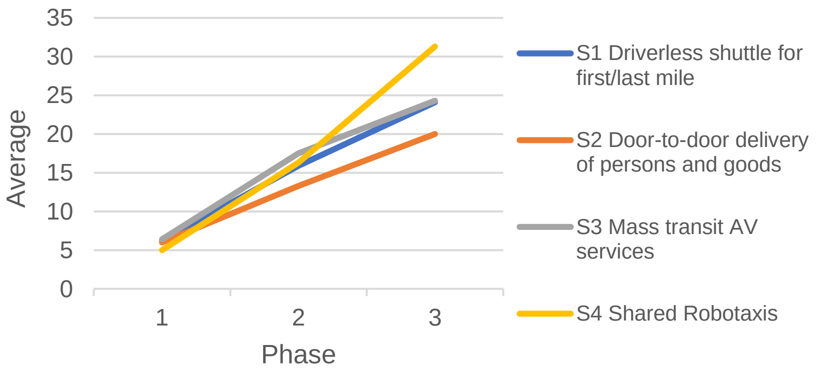




- **Public space consumption**
  - Likely to be more available with a high penetration rate for S2 (door-to-door), and S4 (shared robotaxis). Not the case for regular lines services (S1) or mass transit (S3).
  - Traffic could potentially increase with the growth of robotaxis as well as private AVs.
- **House prices**
  - Increase in all scenarios as better public transport increase land prices and house prices respectively.
  - Potential urban sprawl in S4, could increase land prices in suburban areas.
- **Perceived safety**
  - Key to scale-up services.
  - Expected to grow as the penetration rate increases and technologies improve.

Results and discussion





- **Job creation/loss.**
  - Employment opportunities expected to increase in first 2 phases, as regular services will continue as usual.
  - Overall number of workers will stabilize in the long term
  - S4 Robotaxis does not reach a clear consensus and show a decrease in the long term due to the easy scalability of the service, monitored with minimal human intervention.
- **Job modification/re-skilling**
  - Jobs will change significantly as there is a clear trend towards re-skilling across **all services**
  - **New profiles** will be needed, such as IT specialists, on-board control centre operators, new city roles, etc.
  - Selecting motivated individuals is key, as the tasks of safety operator are more demanding and distinct from the driver position.

Conclusions

While CCAV holds promise for **enhancing accessibility** to public transport, challenges persist, particularly regarding affordability and inclusivity, notably with regard to the deployment of shared robotaxi services.

The transition to automated services presents both **opportunities** and **challenges** for **employment**, emphasising the importance of proactive measures in workforce planning.

The scope of the study was limited to certain regions and sectors, which may affect the generalisability of our findings, for example, regarding the limited examples of shared robotaxis in Europe

Thank you for your attention!

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Should city officials take a different perspective on the deployment of autonomous vehicles?

Insights from population surveys in Germany.

Torsten Fleischer, KIT-ITAS

Maike Puhe, KIT-ITAS

Jens Schippl, KIT-ITAS

Institute for Technology Assessment and Systems Analysis

Background

- Advocates for autonomous vehicles (AV) offer ample ideas and promises how they could improve public transport and contribute to achieving sustainability goals
- Majority of studies on deployment, diffusion and acceptance of AVs in public transport focuses on new on-demand mobility services (mini-shuttles, robotaxis) in metropolitan environments
- High hopes, high complexity, few experiences, some problematic trade-offs

Some current limitations / blindspots

- Focus on deployment of vehicles, not on system building for mobility services (depot management, remote supervision, roadside assistance/teleoperation, customer needs, service launch)
- More conservative innovation strategies and behaviors only occasionally mapped, e.g.:
  - potential of automating familiar means of public transport (e.g. electric BRT/BHNS),
  - better understanding of reasons for non-use or rejection of certain forms of mobility services (usage complexity)
  - application experiences and mobility needs in different, less dense settlement structures
  - mobility requirements in urban-periurban links

Evidence

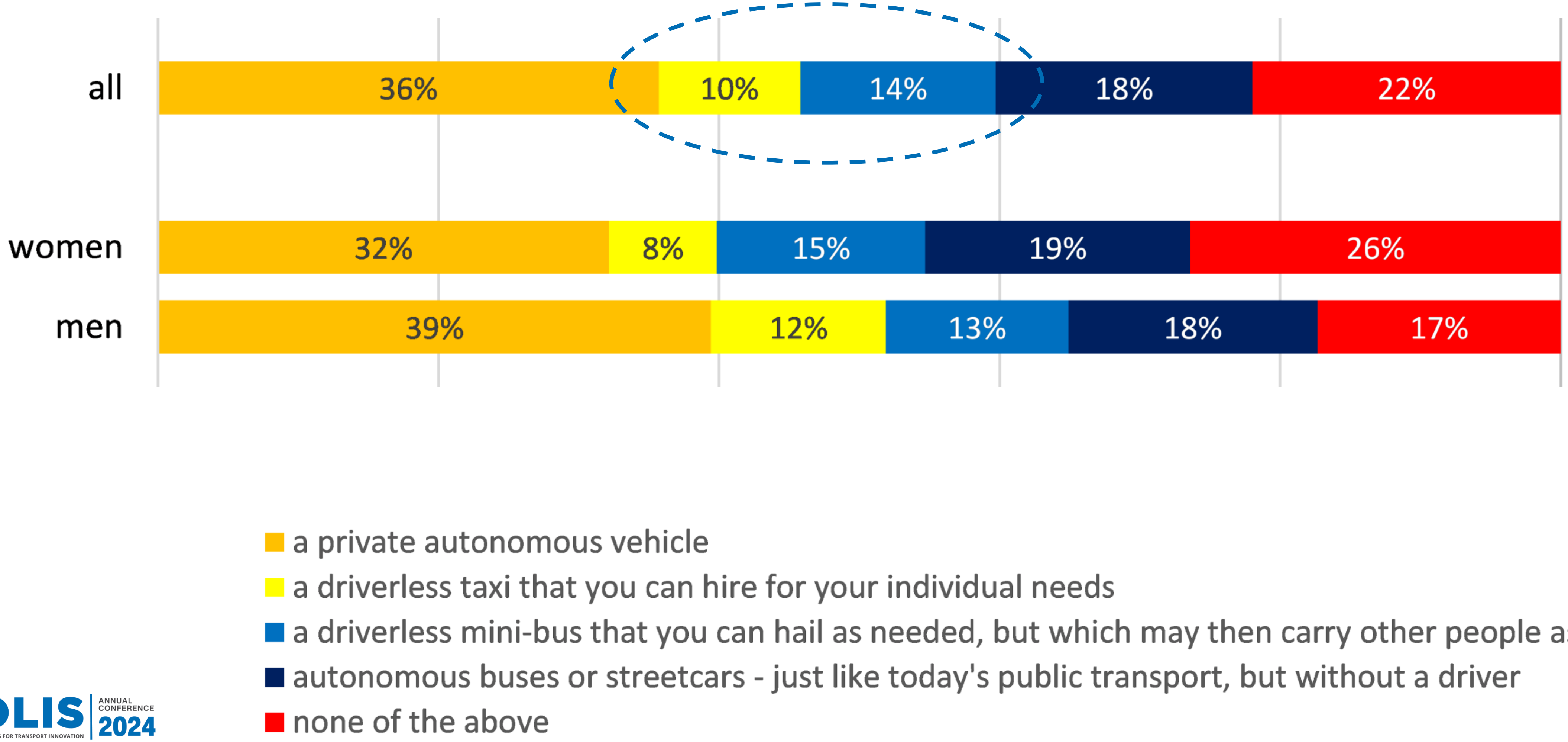
Excerpts from representative population survey in Germany

- on mobility behavior, mobility needs and autonomous driving, attitudes towards technology (and, of course, sociodemographics).
- German-speaking resident population in private households aged 16 and older **(N = 1,507)**
- conducted in November / December 2022 in a mixed-mode design (CATI/CAWI)

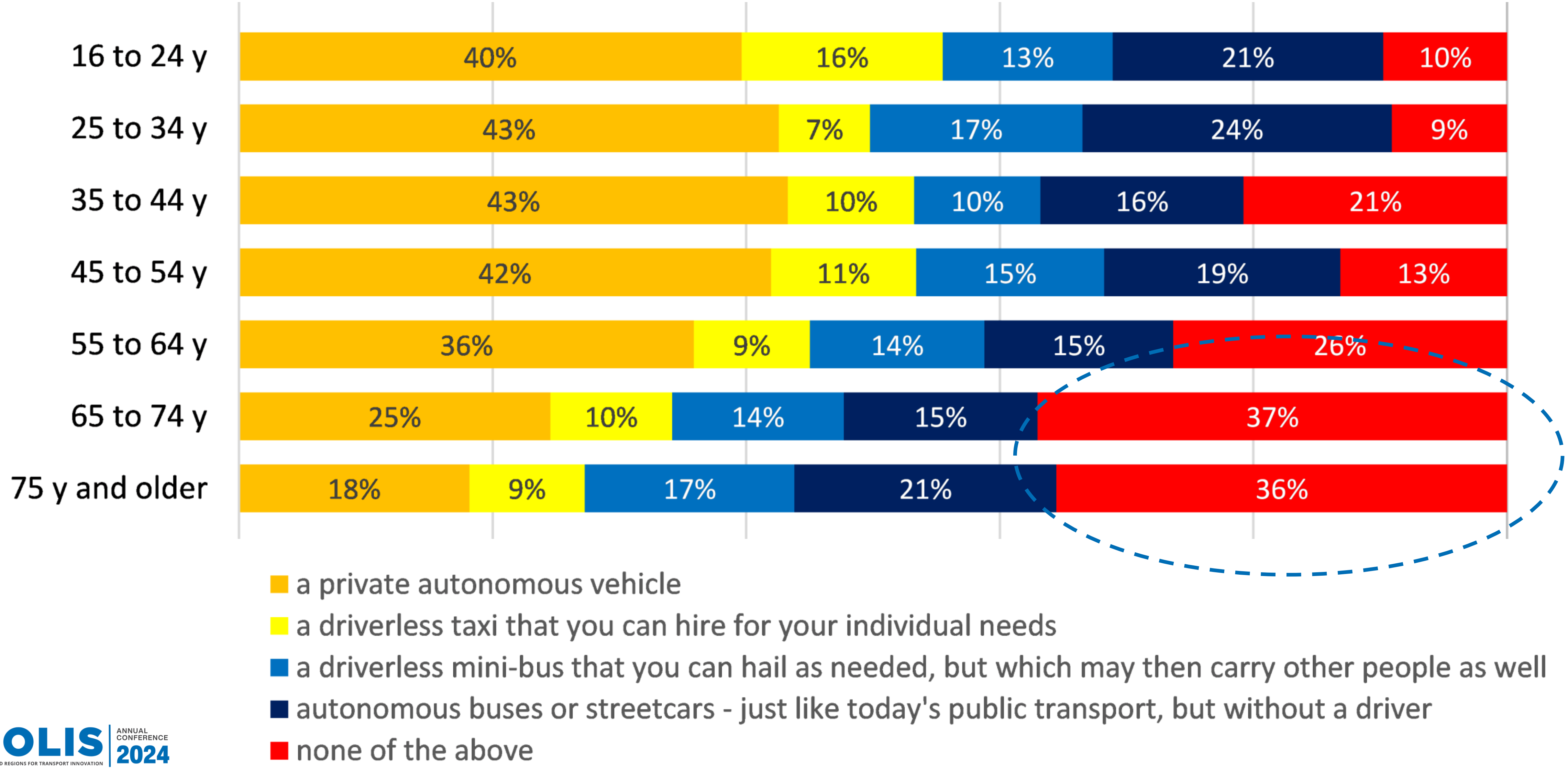
Two questions re adoption

- When you think about autonomous vehicles, which of the following options would be most suitable for your everyday life?
- Now imagine that a transport company in your area offers a new local bus route on which autonomous mini-buses are used. Which of the following statements is most likely to apply to you?

Most suitable mobility option



Most suitable mobility option



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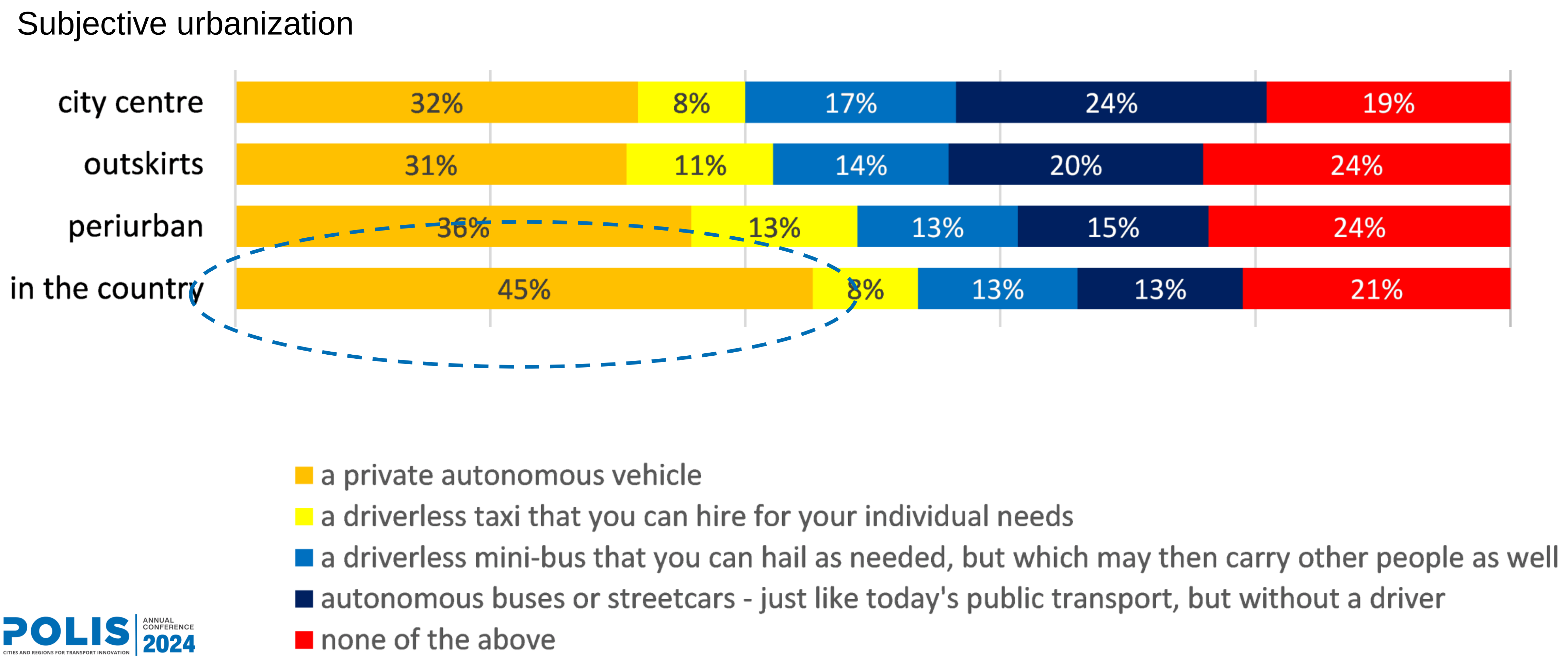
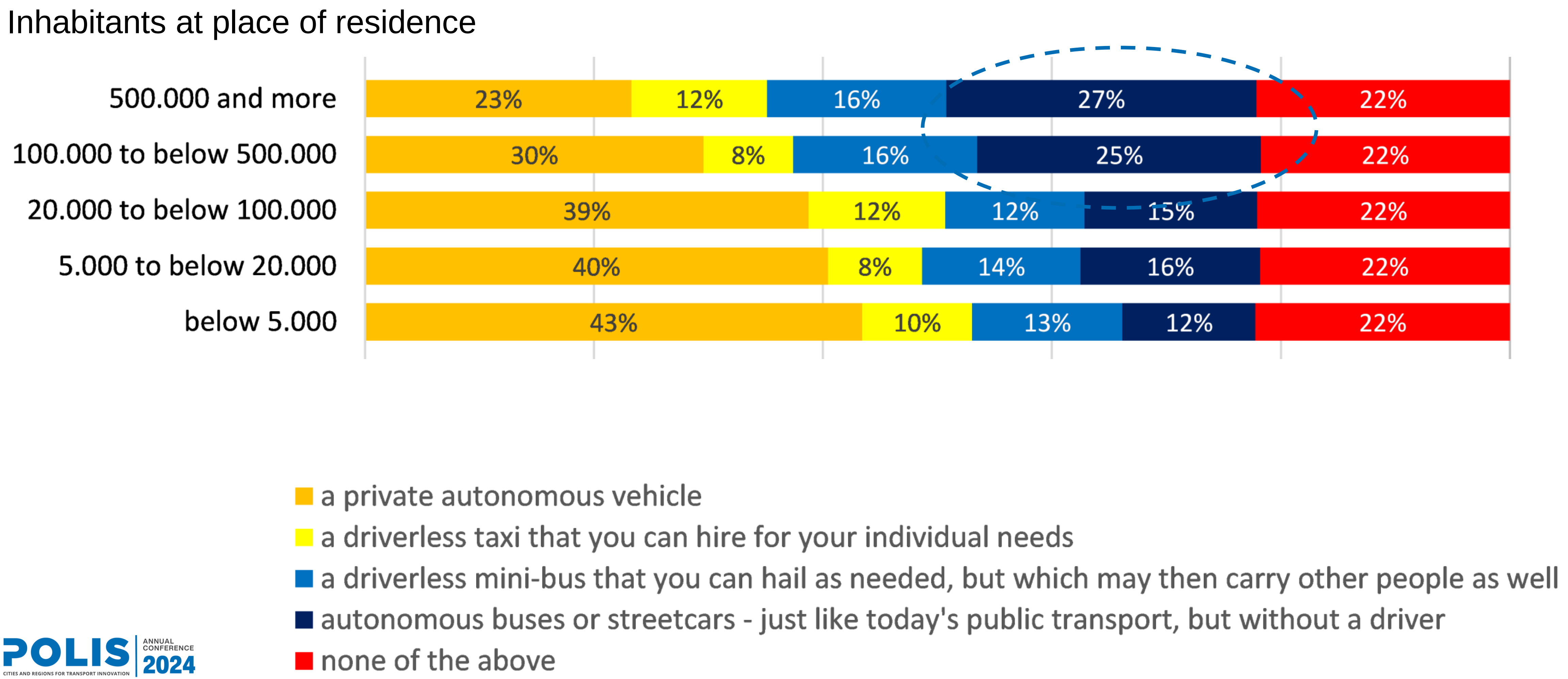
Most suitable mobility option

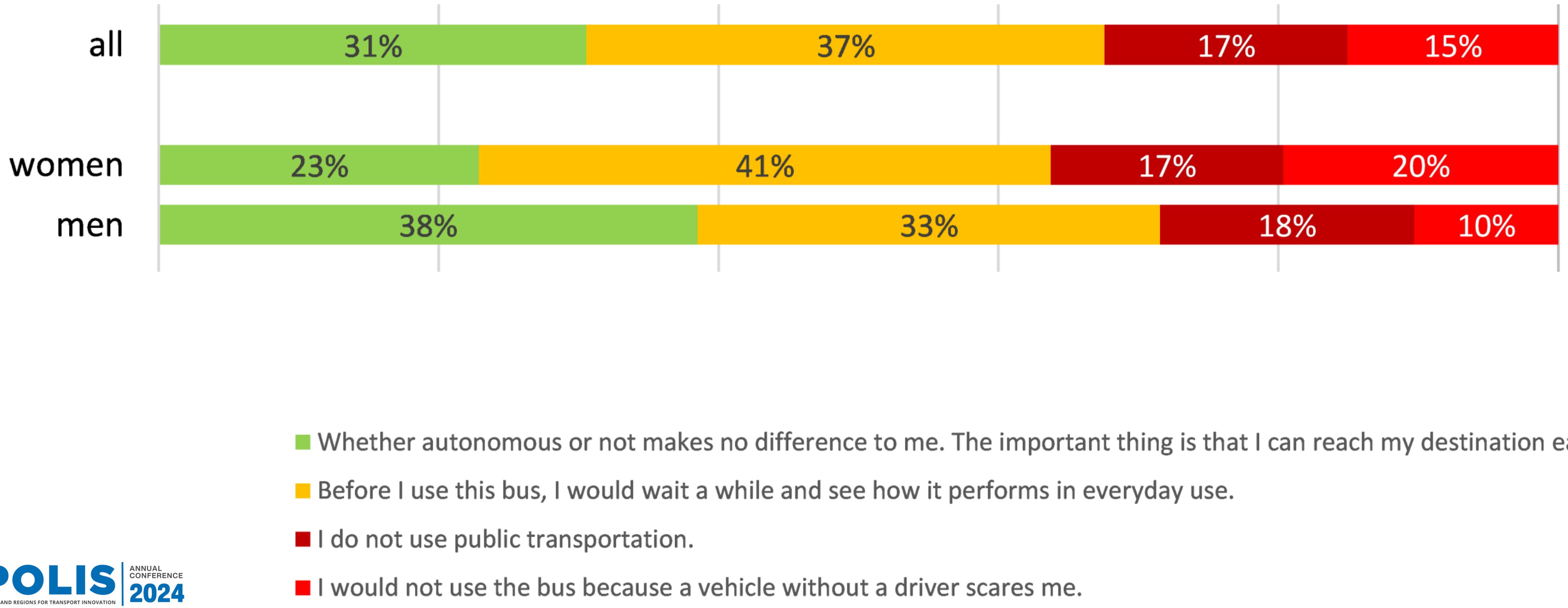


Most suitable mobility option

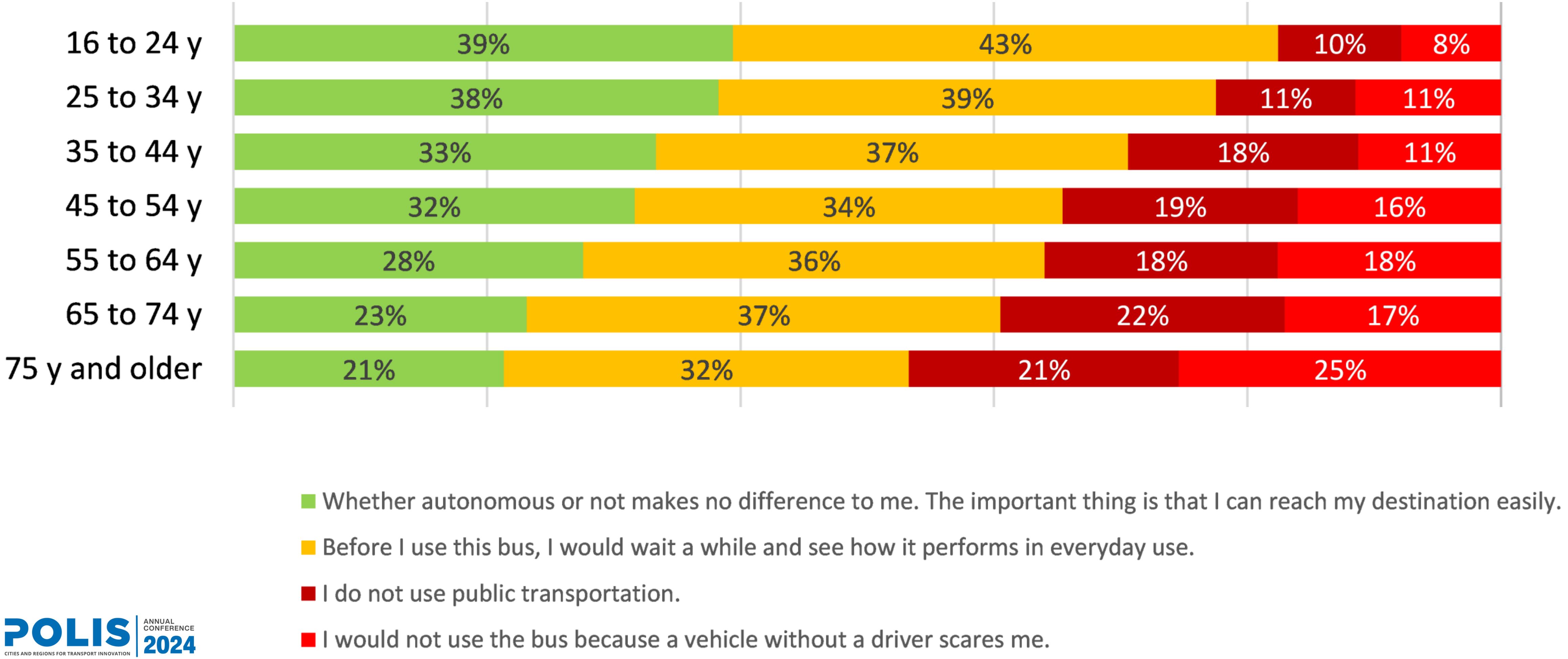


Willingness to use autonomous minibus

Now imagine that a transport company in your area offers a new local bus route on which autonomous mini-buses are used. Which of the following statements is most likely to apply to you?

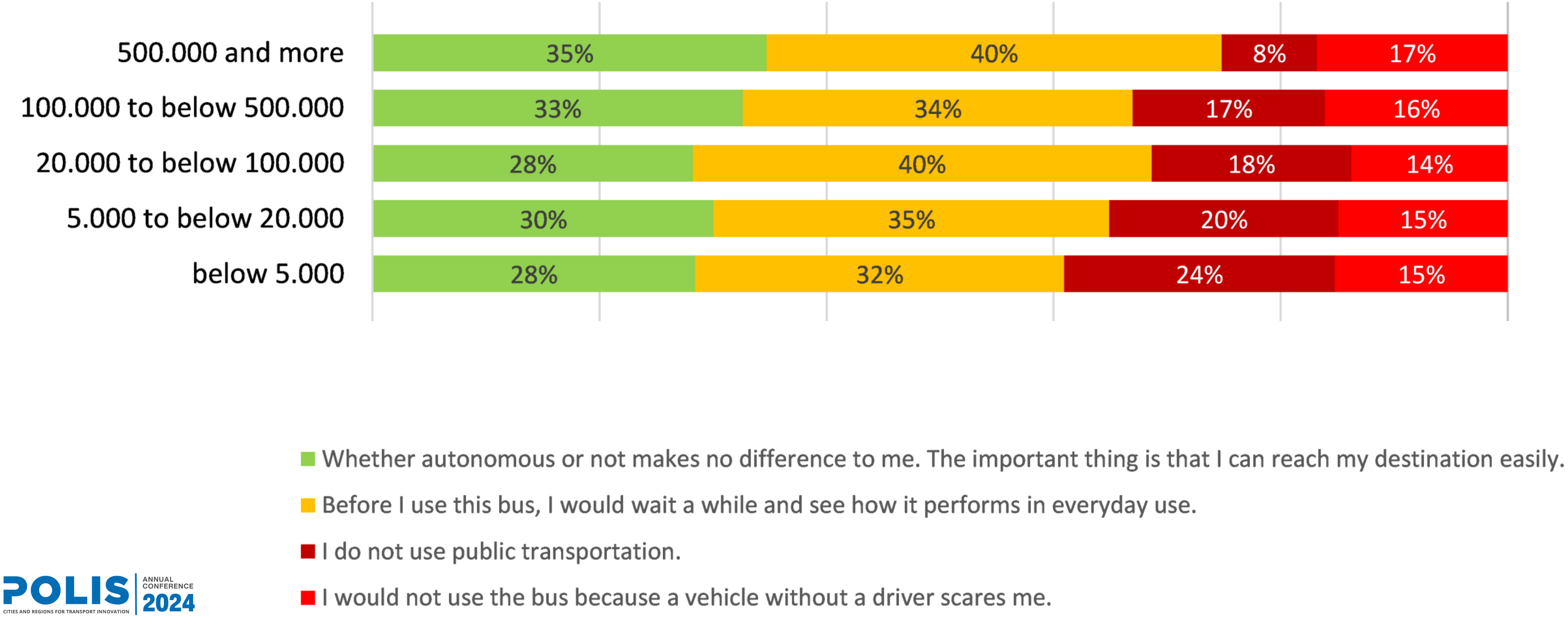


Willingness to use autonomous minibus



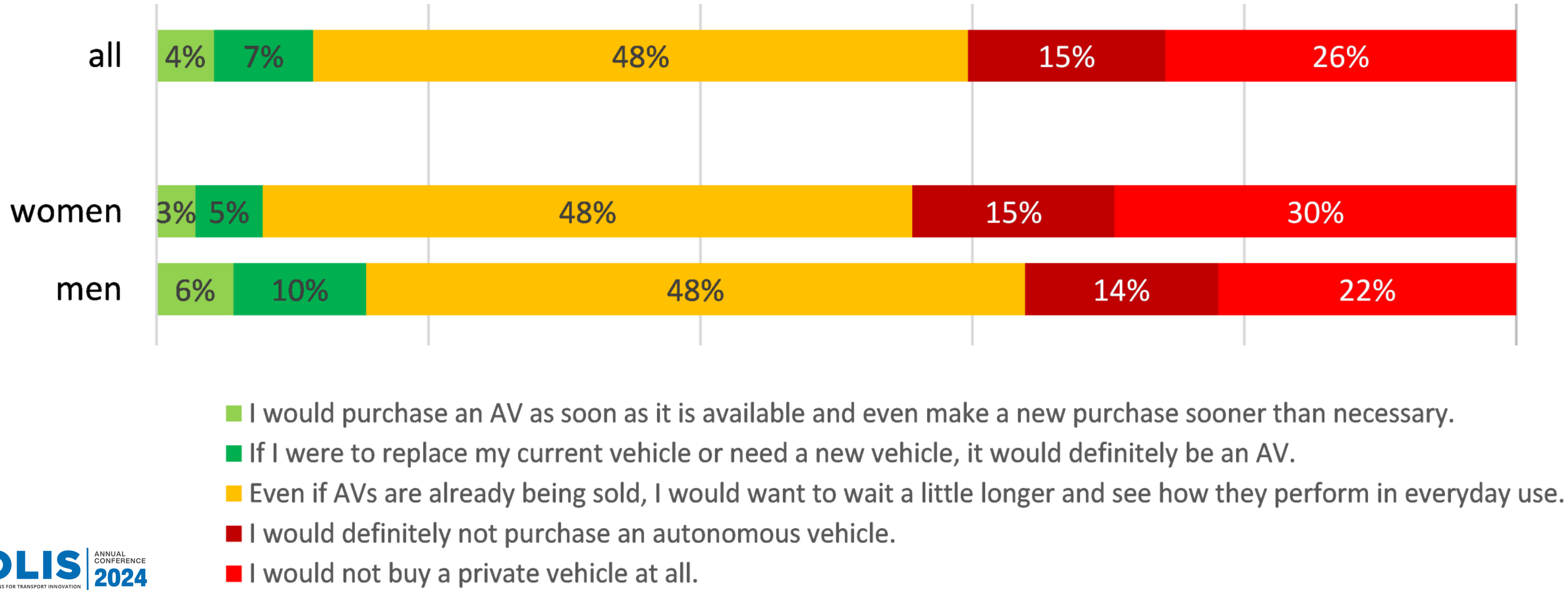
Willingness to use autonomous minibus

Inhabitants at place of residence



Buying a personal autonomous car?

Please imagine that in the near future it will be possible for private customers to purchase autonomous passenger vehicles, i.e. vehicles that do not require a human driver and therefore no pedal or steering wheel. Which of the following statements is most likely to apply to you?



To summarize

- Attitudes towards (new) technologies and mobility expectations (pragmatic and normative) need to be disentangled.
- Younger men with higher education are most interested in purchasing or using AVs – also most relevant group in modes of active transportation
- AVs as inclusion option for elderly might prove to be a demanding task → Challenge for deployment strategies and policy communication
- Substantial wait-and-see groups in both adoption scenarios, but much larger for private than public. Advantage? Rebounds?
- Smaller groups of habitual non-users and automation sceptics. Learnings?
- Familiarity with service perpetuates in AV scenarios.

→ Better empirical research. Learning, correctable diffusion strategies. RWL

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Integrating Citizen Engagement and Modern Technologies to accelerate CCAM Deployment

16:45 - 18:15

28 November 2024

Maximilian Schrapel, KIT

Expectations vs. Reality

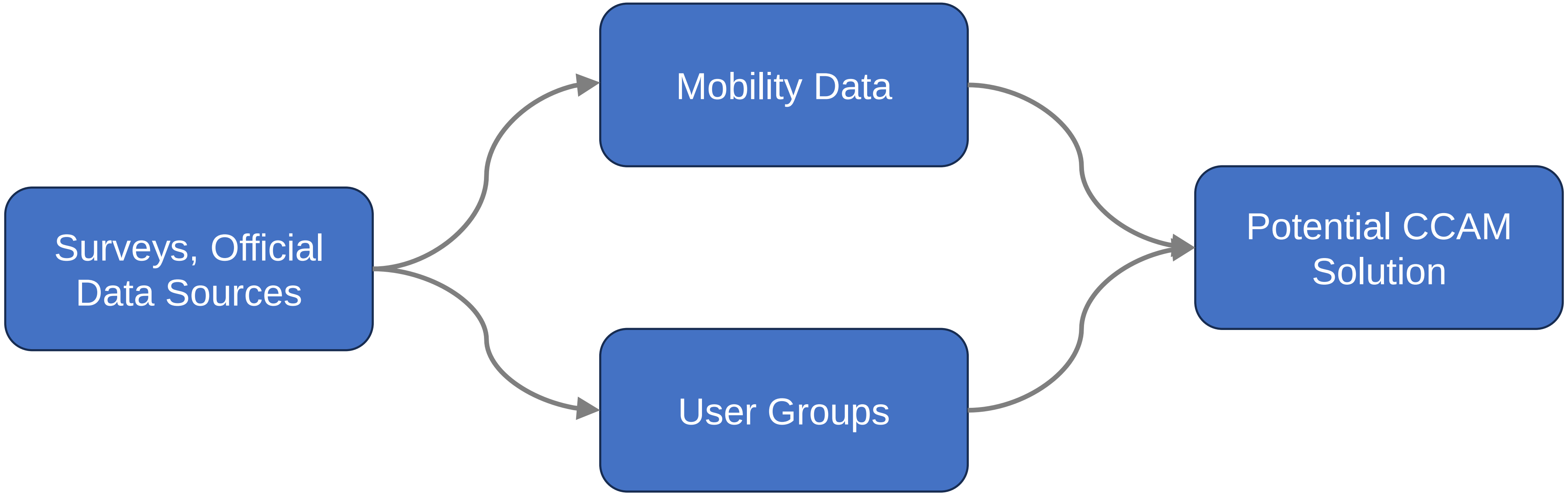
- Technological advancements may not be understood equally
- May lead to misuse or disuse of CCAM
- Developer:
  - Creates advanced CCAM solutions
  - Has deep knowledge of technologies
  - Knows capabilities of CCAM
- End User:
  - Wants easy solutions to improve mobility
  - Has (maybe) no knowledge of CCAM
  - Media-Driven expectations of CCAM

CCAM Ideation

- Challenge:

  How to communicate CCAM solutions with the public in early stages?

  How does cultural diversity affect the deployment?

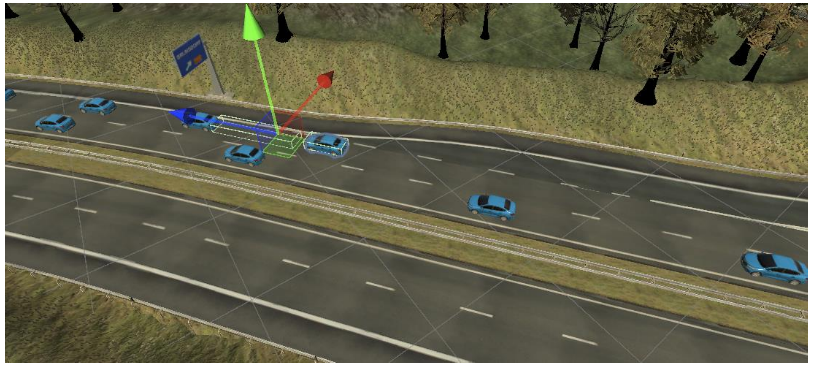


New Technologies in Participation

- Virtual Reality, Augmented Reality, Vision Videos & Real World Labs
- Accompanied by user studies
- Includes baseline condition to eliminate novelty effects
- Simulation of CCAM solutions
  - Can be integrated at early ideation phases
  - Able to showcase an intended use case
  - Easy to produce
  - Easy to iterate
- Challenges
  - Limited realism
  - Motion sickness
  - Not for all user groups

Virtual Reality

- Immerse user in futuristic mobility solution
- Low costs
- Example: Platooning vehicles on highways
- Investigation of impact on manual traffic
- Analysis of manual driving behavior
    - Headway distance, speed, lane changes
- Survey data to measure impression



Vision Videos

- Showcase intended use case
- 360° Videos for full realistic experience
- Low to moderate costs
- Example: Traffic guidance robots
- Collect data to measure impact
  - Head movements & physiological data
  - Survey on perceived safety & trust
- No full interactive environment
- Fast moving scenes should be avoided

Augmented Reality

- Embeds virtual objects in real world
- Low to moderate costs
- Example: AV – Pedestrian Communication
- Measure perceived safety and trust
  - Head movements, observations, video recordings
  - Survey data
- Limited usage scenarios
- Safe environment required
- Affected by daylight

Real World Labs

- Most realistic
- Requires advanced prototypes
- High costs
- May involves regulatory steps
- Example: Group cycling
- Measure impact on cycling
  - Group density, cycling behavior
  - Survey on experience and workload

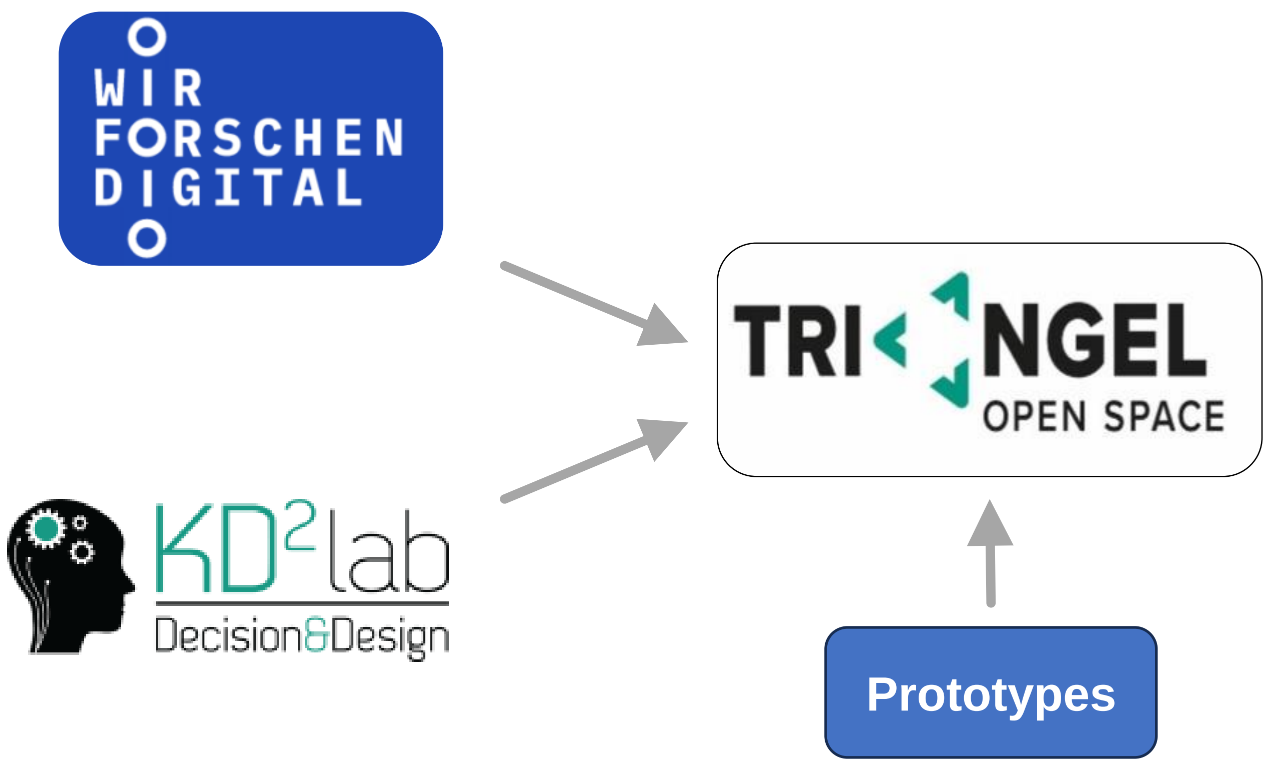
Demonstration Site KIT Campus

- Encapsuled environment in Karlsruhe
- High cultural diversity
- Ability to scale solutions
- On-demand autonomous shuttle bus
- Collaboration with INIT & ITAS
- First focus on partial aspects
    - Interface design
    - Booking systems
    - Demands

Citizen Involvement

Acquisition

Participation



Next Steps

- 5 demonstration sites will use participatory processes in CCAM deployment
- Efforts will contribute to integrate diversity into planning tools

Catalonia

Karlsruhe

Eliat

Lubljana

Oxfordshire

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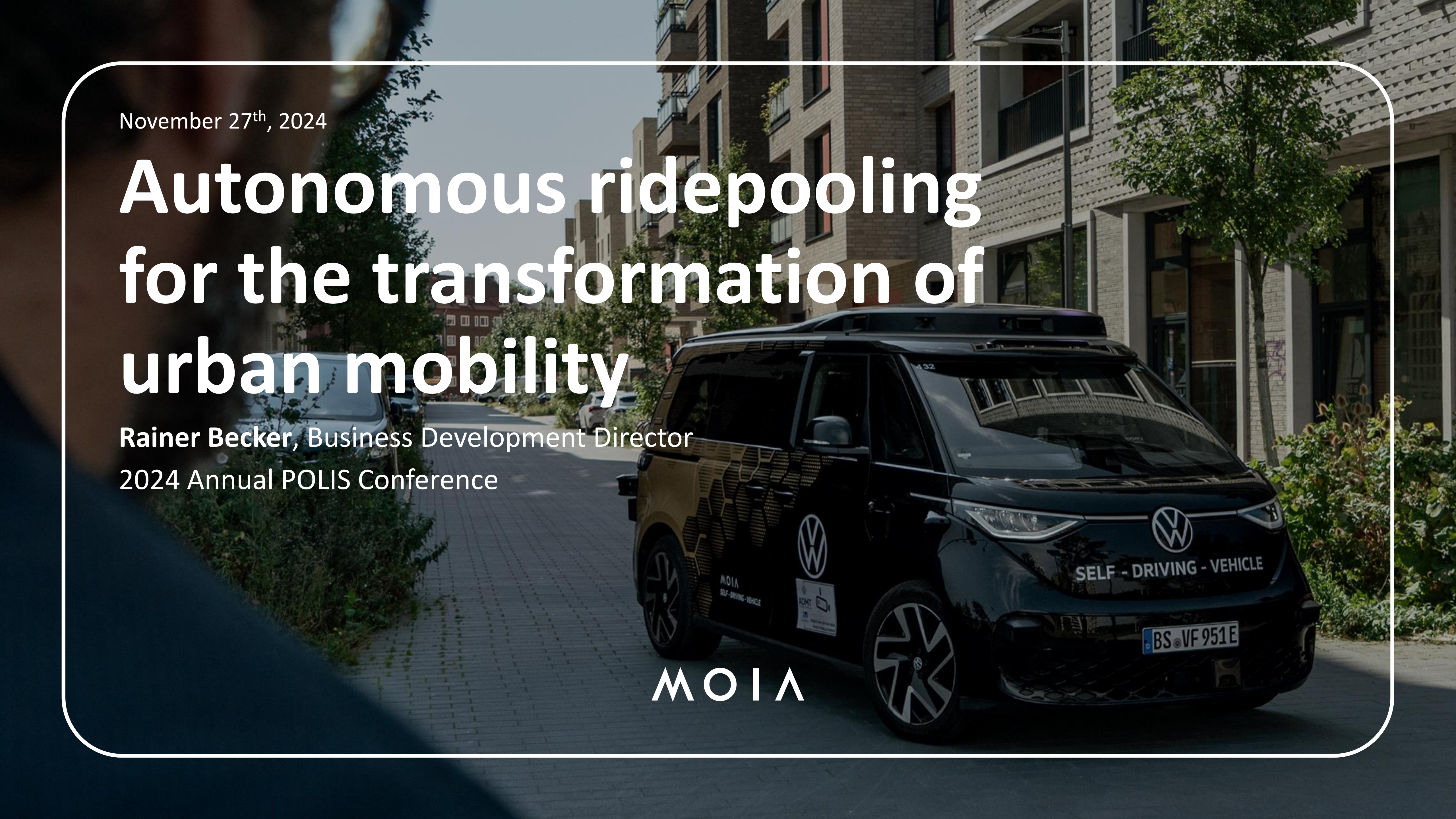
November 27th, 2024

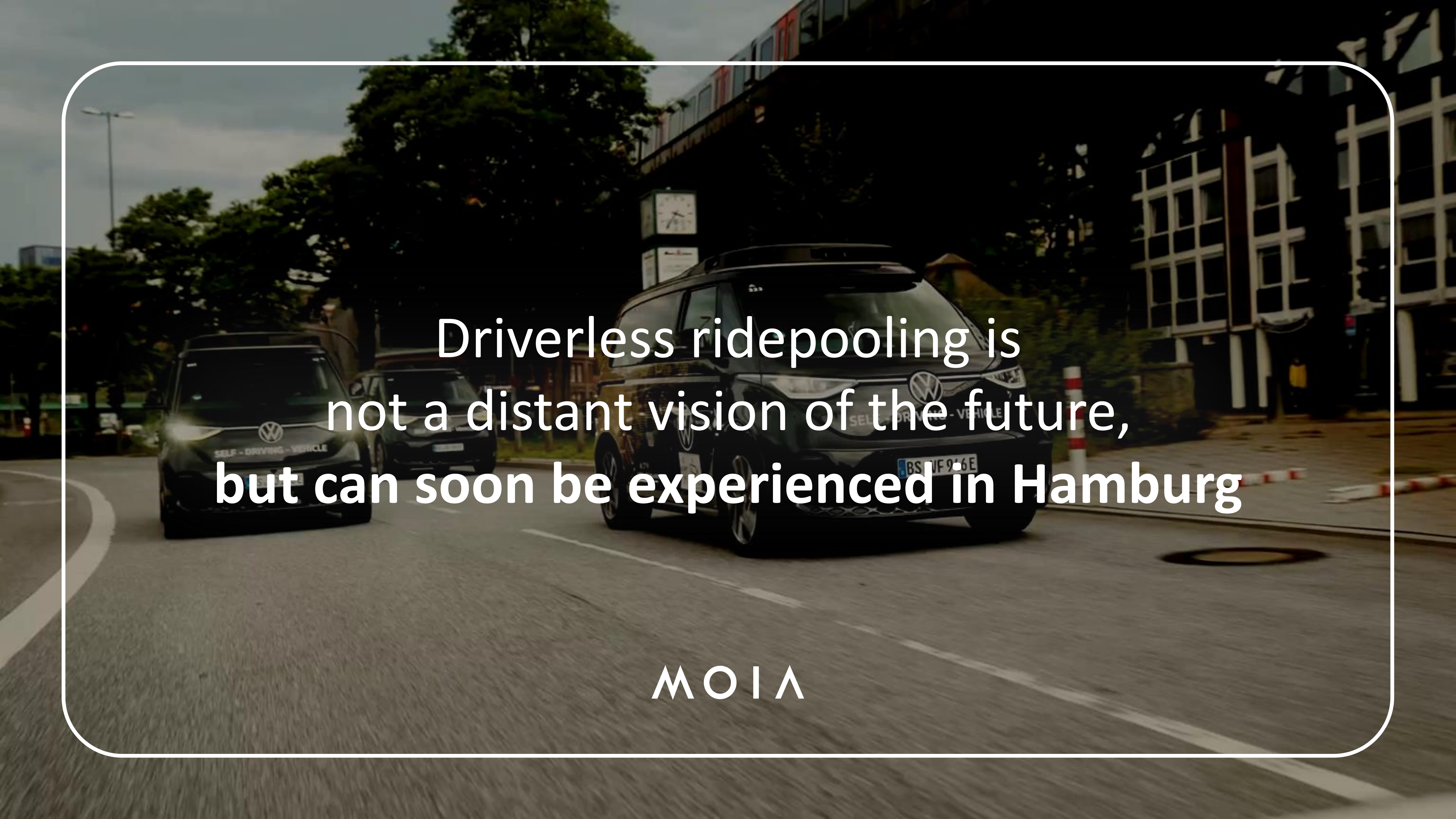
Autonomous ridepooling for the transformation of urban mobility

Rainer Becker, Business Development Director

2024 Annual POLIS Conference

MOIA




Driverless ridepooling is
not a distant vision of the future,
but can soon be experienced in Hamburg
MOIA

With MOIA ridepooling in Hamburg
we were able to lay the **foundation**
for our autonomous future

MOIA

MOIA

Experience from transporting **11+ million passengers**

Comprehensive automation of fleet management

Development of a **customer-friendly on-demand service**

In order to noticeably relieve traffic, ridepooling **must become self-driving**

Higher utilization
of ridepooling vehicles
for fewer cars on the roads

Better availability
for users

Lower costs
for customers and operators

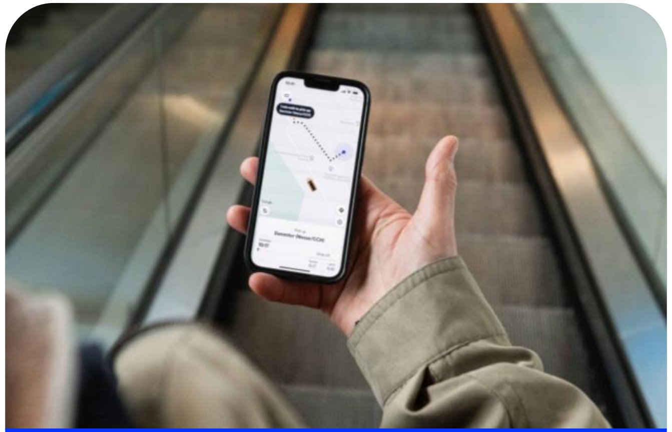
We turn a driverless vehicle into a mobility service **that people trust**

MOIA

MOIA

Self Driving System & Autonomous Vehicle

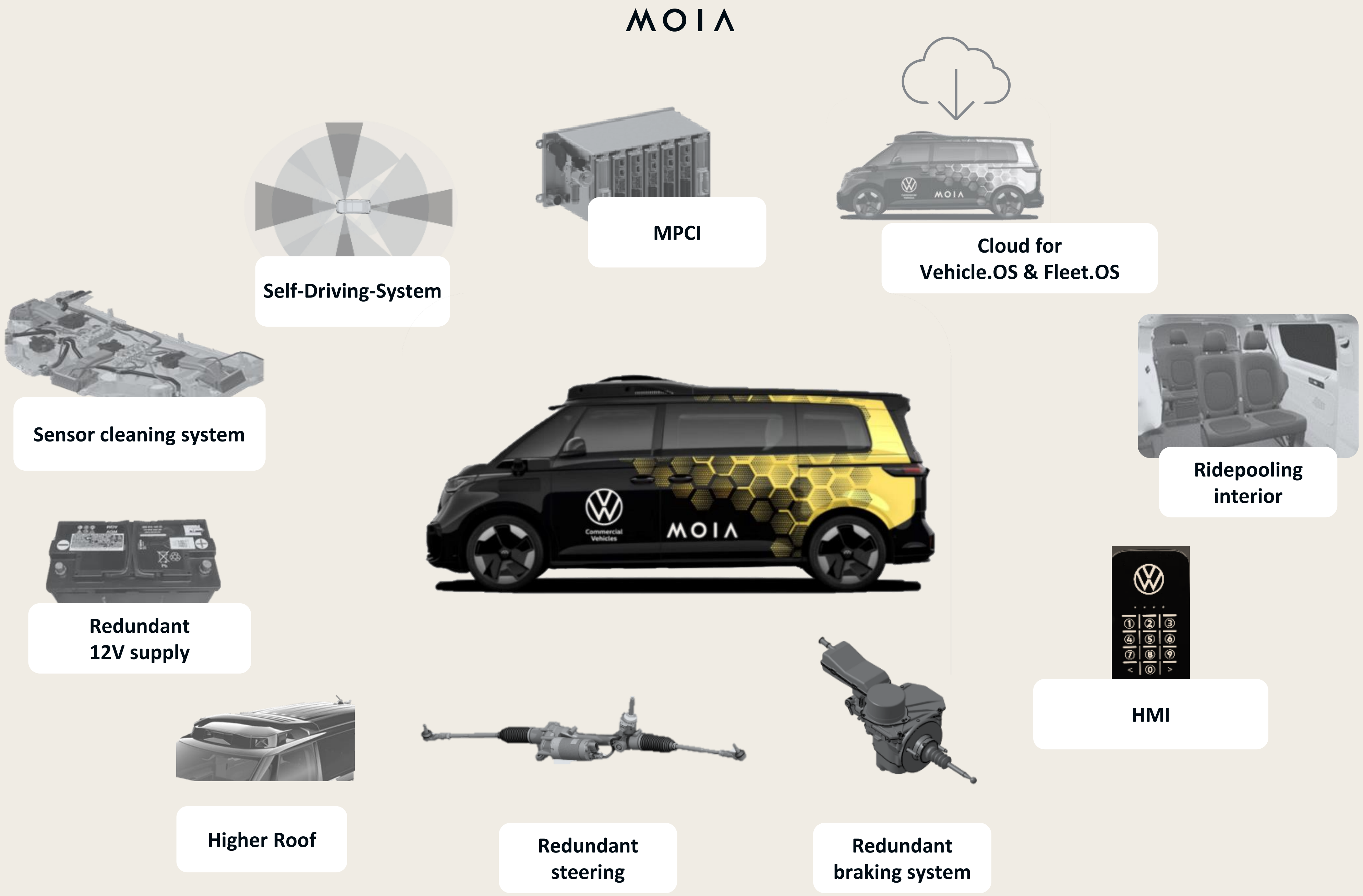
Fleet Operations
MOIA Fleet Control Center



Mobility Platform & Ridepooling algorithm

MOIA

The Volkswagen ID. Buzz AD is the **ideal series vehicle for scaling** autonomous ridepooling in the first years


MOIA
Self-Driving-System
MPCI
Cloud for
Vehicle.OS & Fleet.OS
Sensor cleaning system
Ridepooling
interior
Redundant
12V supply
HMI
Higher Roof
Redundant
steering
Redundant
braking system

What **other ingredients** are needed to build a driverless ridepooling service?

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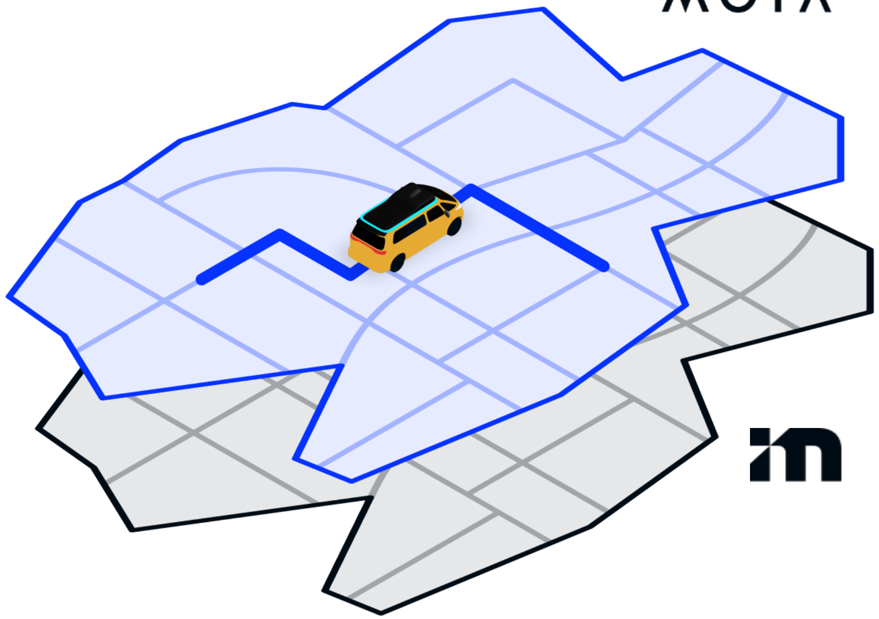
Fleet Operating System



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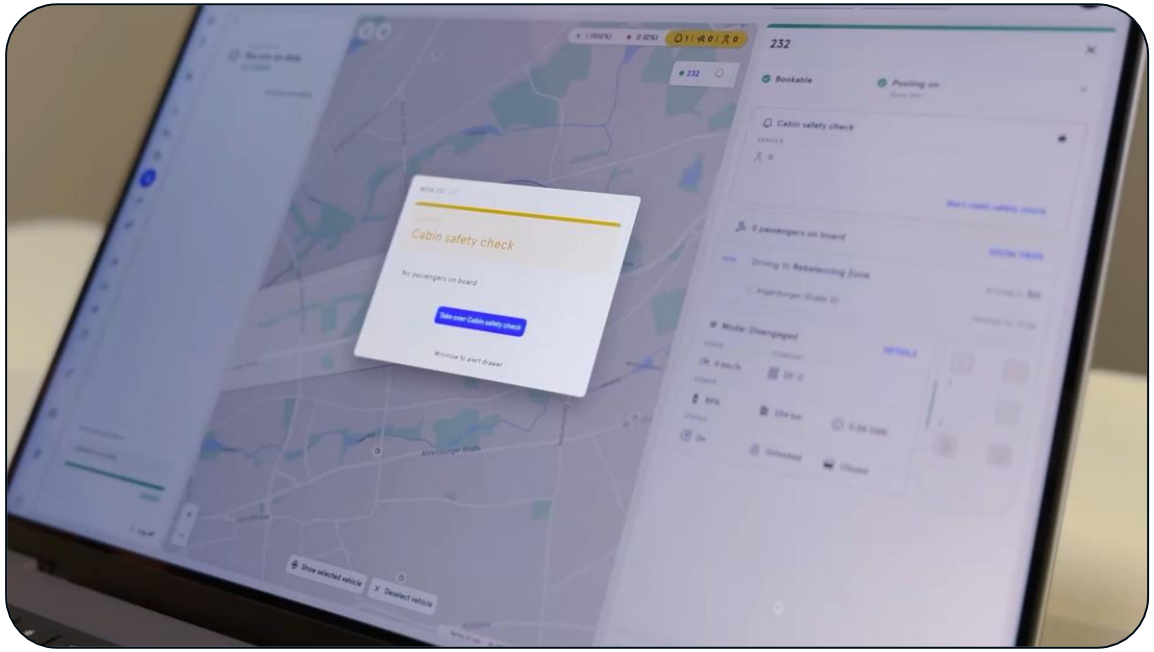
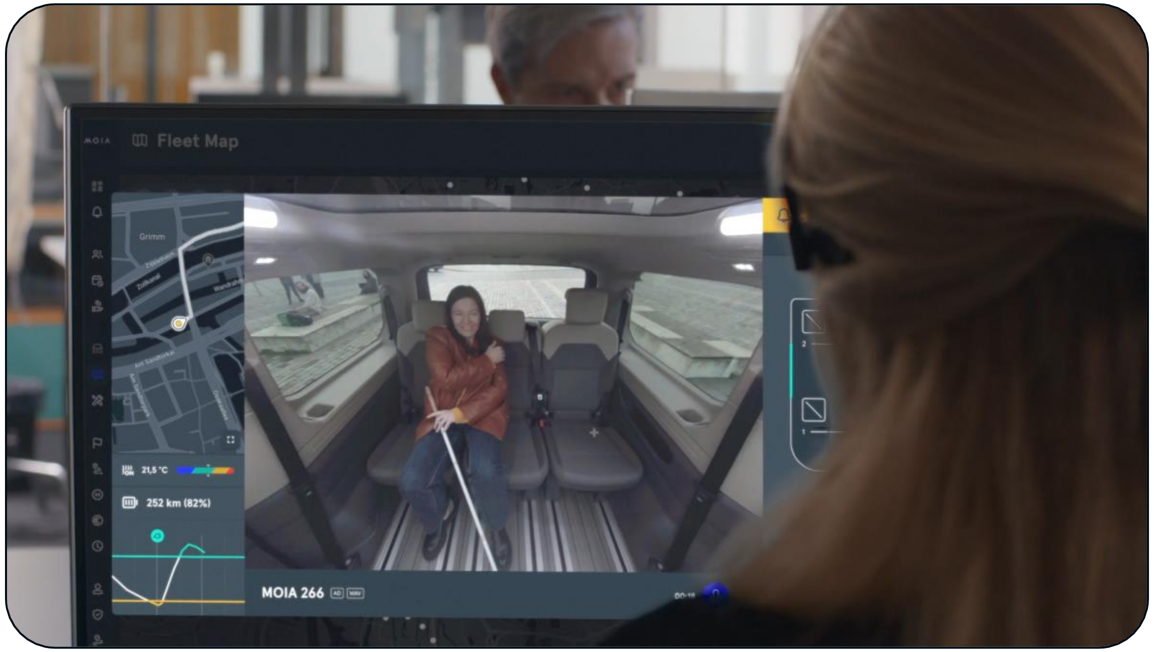
Passenger management





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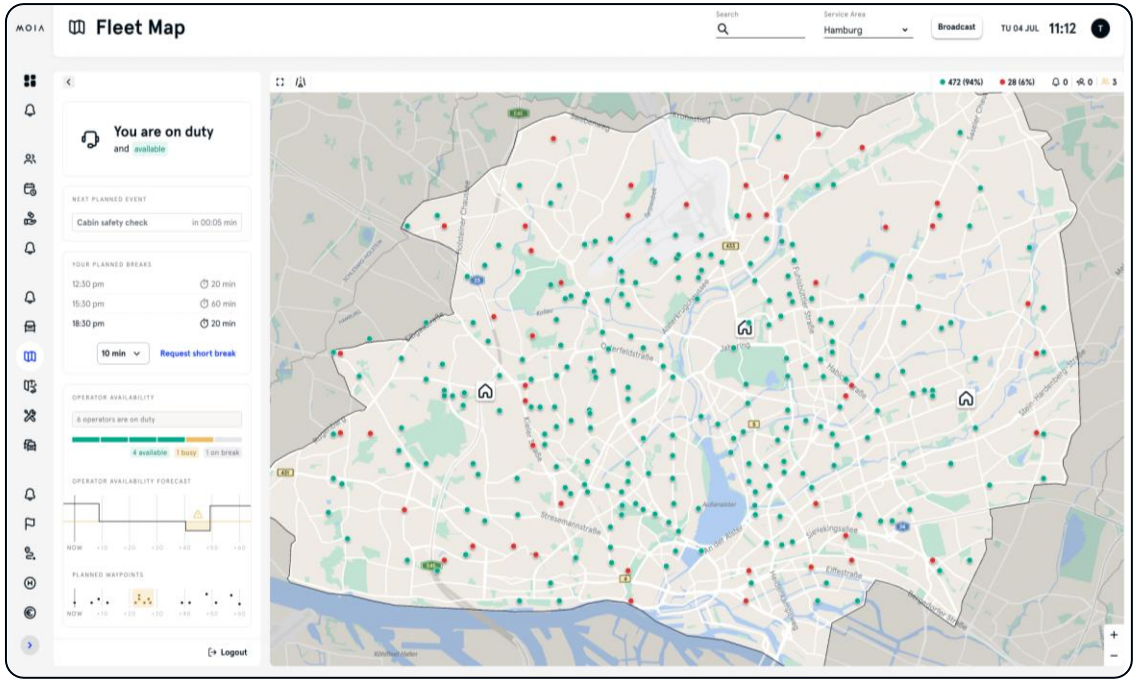
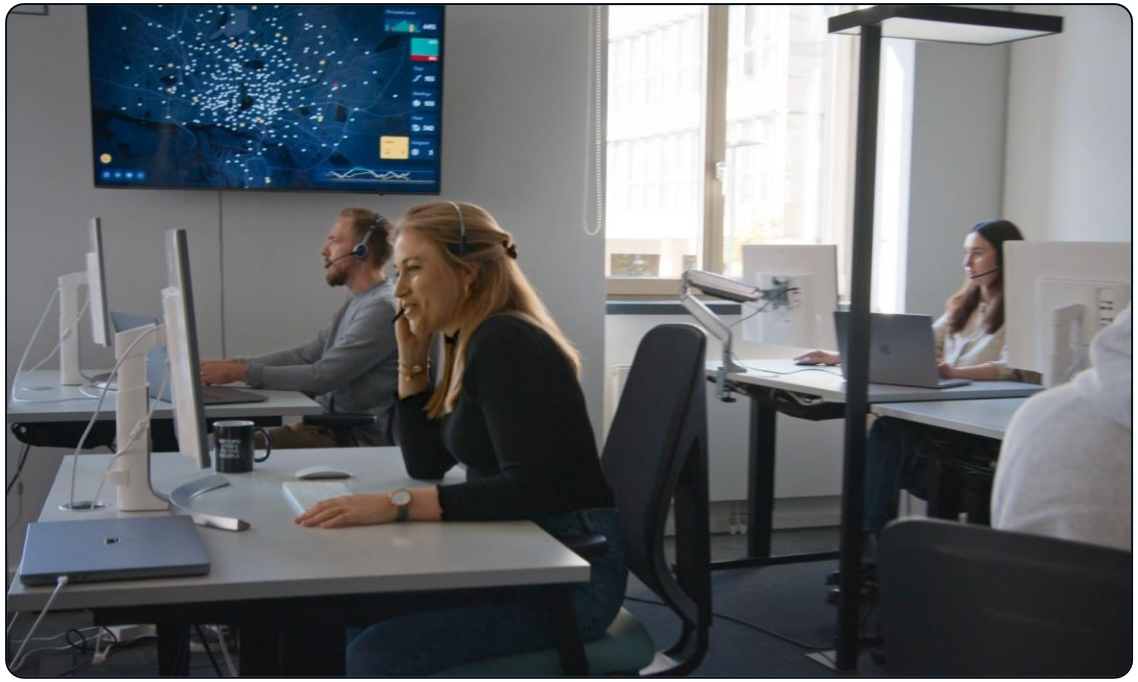
MOIA Fleet Control Center





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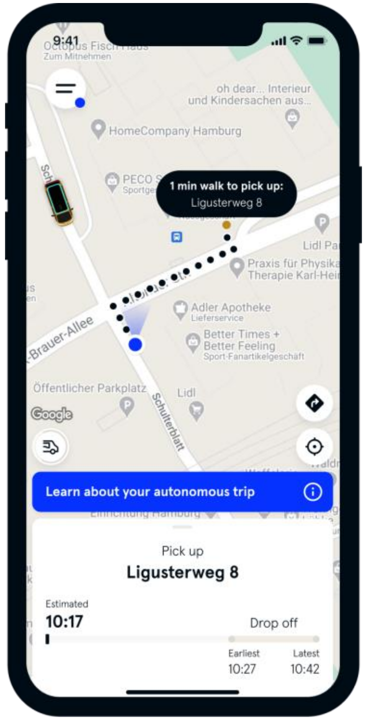
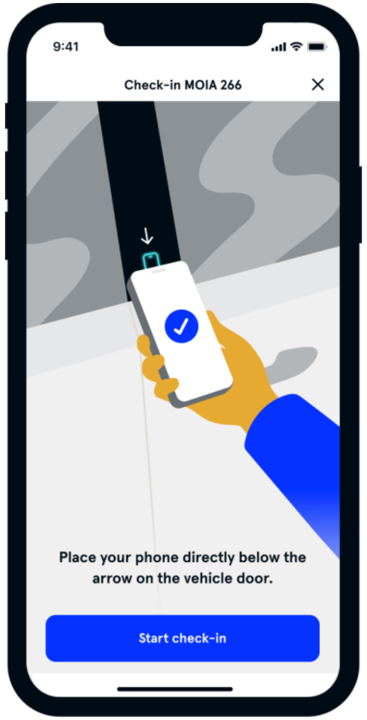
Mobility platform





In the coming months,
we are **laying the foundation**
for the launch of our driverless service

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Advancing the vehicle
type-approval process

Start of tests in
closed user groups

Preparation of the
UITP Summit 2025 in Hamburg
with our partners

We offer our partners a **comprehensive package** for scaling ridepooling services across Europe

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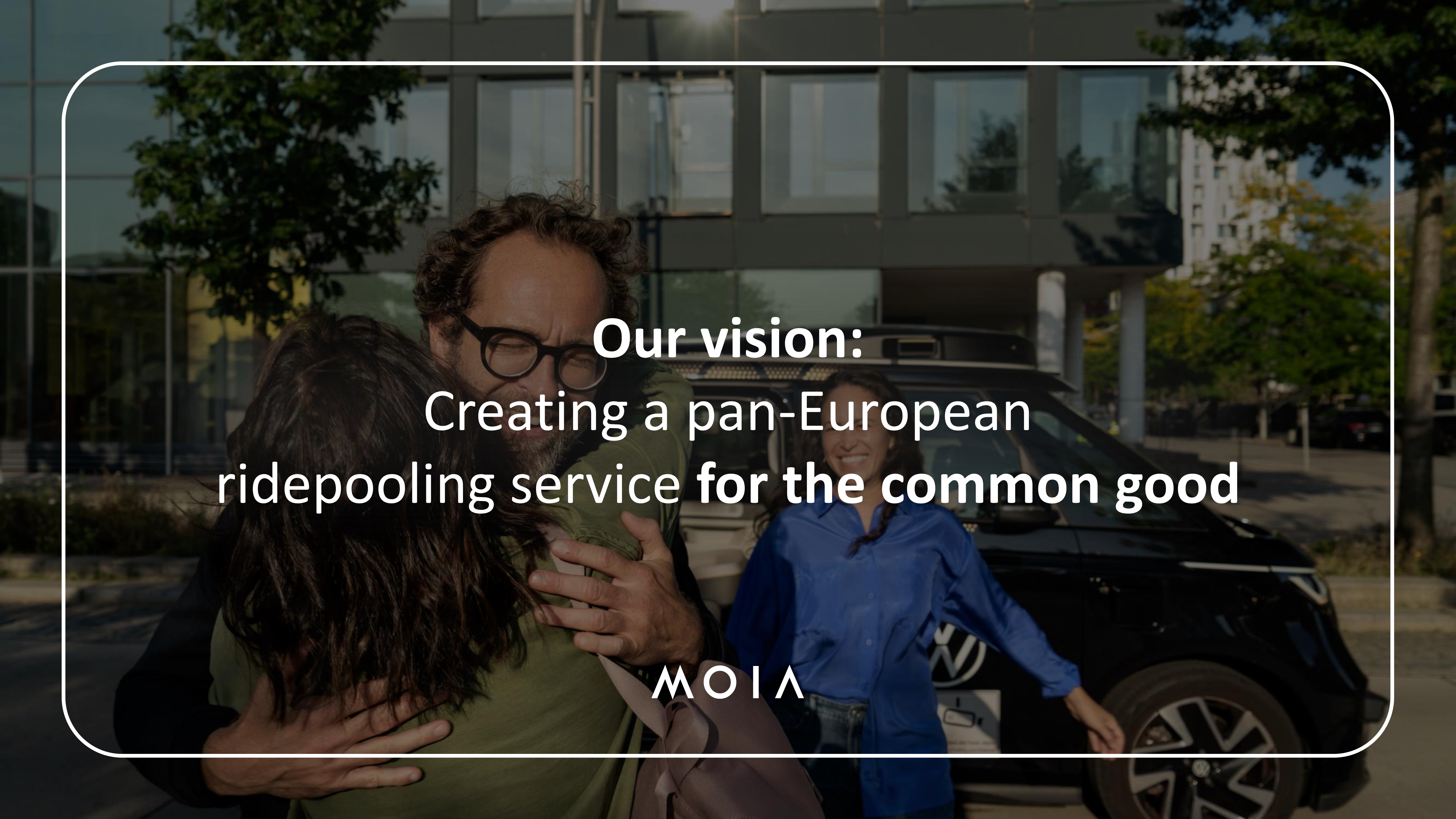
Intelligent
autonomous vehicle

Passenger management, FleetOS & Ridepooling intelligence

Local partnerships

hvv switch

Customer touchpoint
powered by MOIA


Our vision:
Creating a pan-European
ridepooling service **for the common good**
MOIA

Thank you!

MOIA ADMT

Volkswagen Nutzfahrzeuge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Shaping the future of public transport

The MARTHA autonomous bus project

Robert Kooijman, City of Rotterdam

Introduction

Metro
Aansluiting
Rotterdam
The
Hague
Airport

Unique selling points

MOIA

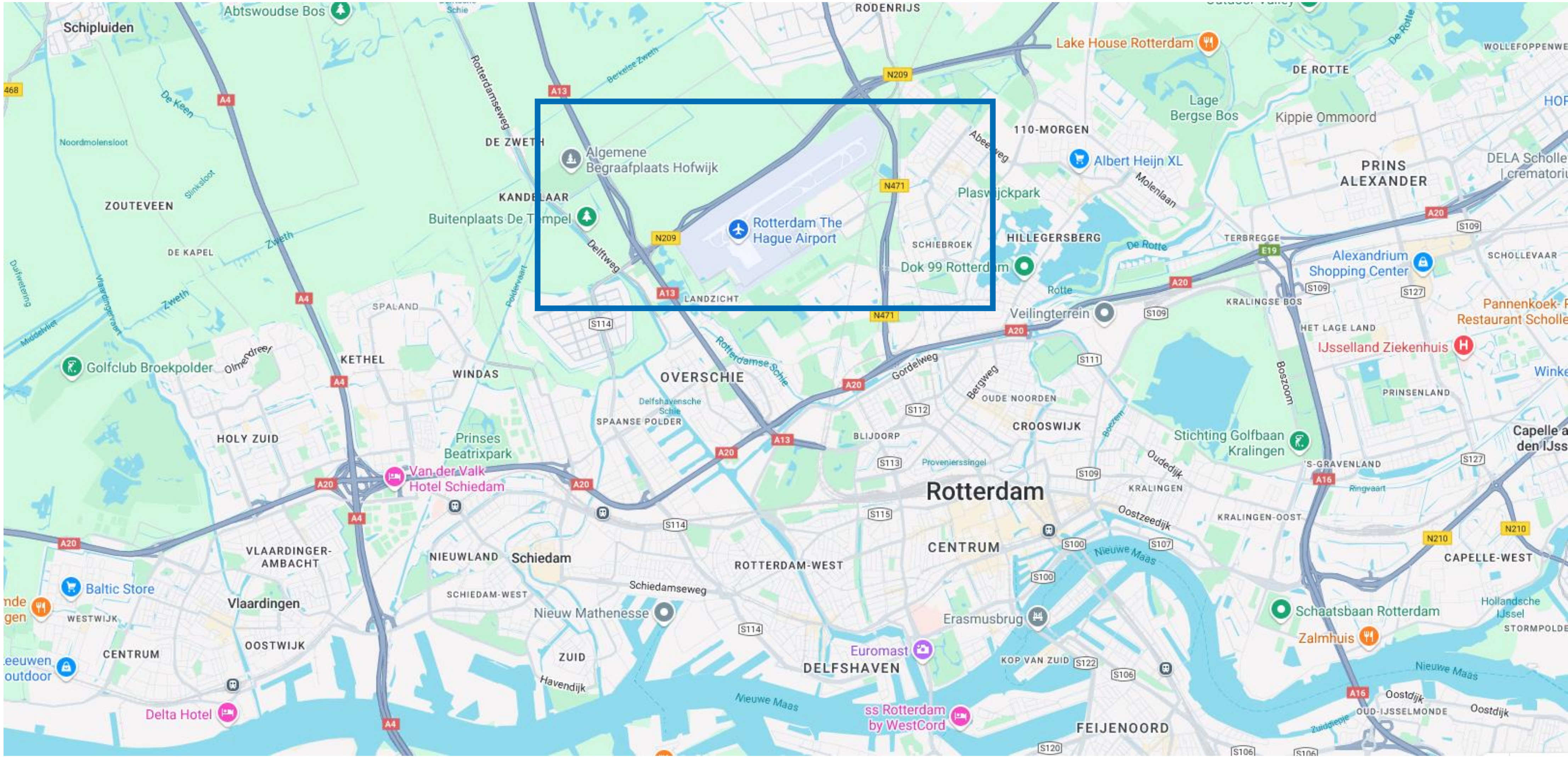
1st in NLD with next generation vehicles

1st in Europe with more than 1 vehicle

1st airportcase

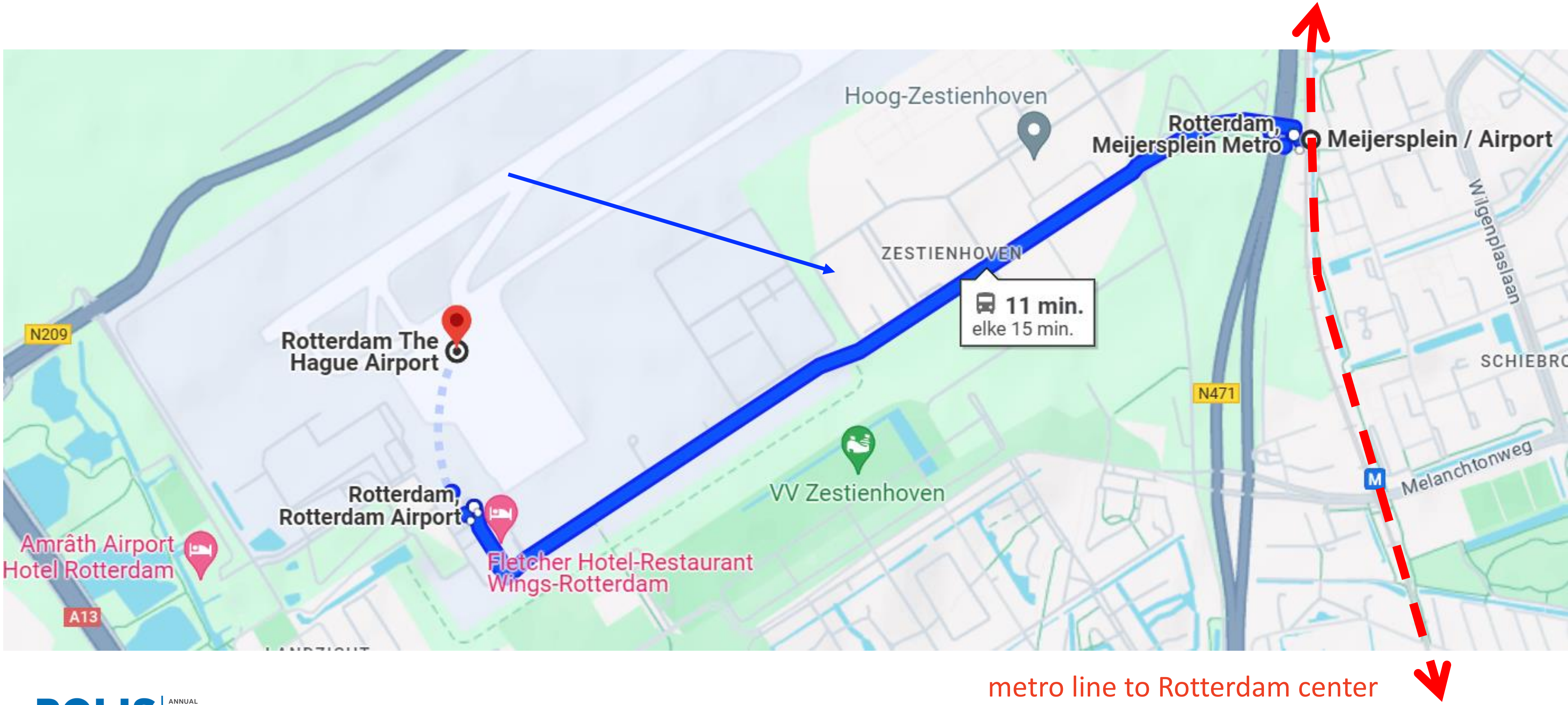
MOIA

Location



The trajectory

MOIA



metro line to Rotterdam center

MOIA

Challenges

Reachability:
poor reachability airport by public transport

Service optimization:
often relatively empty buses

Scheduling: Scheduling around the arrival and the departure times of planes with PT

Personnel:
Insufficient number of personnel for the optimal service

Densification:
last mile solutions for automated transport


Fairoaksbaan

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Berkel en
Rodenrijs
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Characteristics

MOIA

Route is 2.3 km long
one way

80% straight road
single lane

Mixed traffic
situations:
roundabouts,
pedestrian crossings
and priority signs

2 stops -
Metro stop
Meijersplein and
RTHA Terminal

Complex crossing
point with intelligent
traffic lights
ITS-G5 and WiFi-P

3 Development paths

Transition from safety driver onboard to remote supervision

Increase of the **speed**

(avg. from 15 – 30 km/h)

Integration in the commercial public transport service

Partners

MOIA

METROPOOLREGIO ROTTERDAM DEN HAAG

Public Transport Authority

RET

Public Transport Operator

Rotterdam The Hague Airport

Location-based owner

Dutch Automated Mobility

Automated transport operator

City of Rotterdam

Municipality and road authority

Consortium

KARSAN

ADASTEC

Automated, Shared, Connected

APPLIED AUTONOMY

Automated vehicle supplier

Planning

MOIA

T0	T1	T2	T3	T4	Upscale
29-2-2024	**Q1 2025**	**2025**	**2026**	**Q1 2027**	**2027 -**
Contract awarded	Vehicles approved by RDW and ready to drive	Drive with safety driver onboard	Drive without safety driver onboard	Evaluation and go/no-go decision for phase 2	Replacement of bus line 33 Extension of the route

The future is now!

MOIA

https://youtu.be/erO9PJbetKI

MOIA

POLIS ANNUAL CONFERENCE 2024
CITIES AND REGIONS FOR TRANSPORT INNOVATION

Thank you for your attention!

MOIA

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ANNUAL CONFERENCE 2024

27-28 NOVEMBER 2024

KARLSRUHE (DE)

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Baden-Württemberg Ministry of Transport

Karlsruhe


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Shaping the future of mobility

Preparing Autonomous Vehicles for efficient and sustainable public transport

Javier Guimerá Tena
Padam Mobility – A Siemens Business

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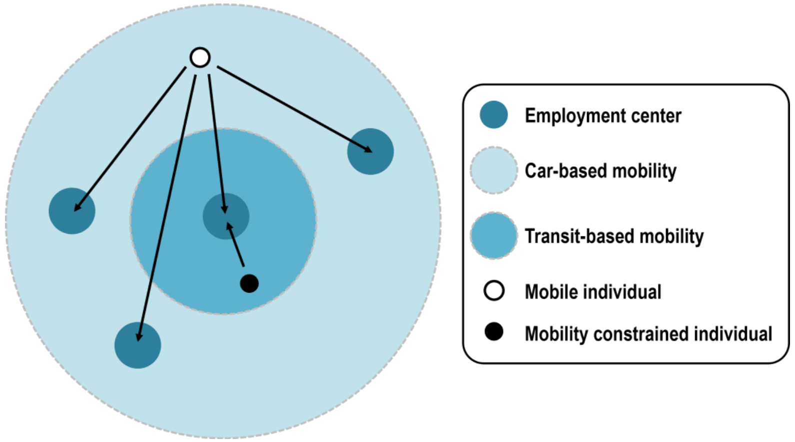
The limits of conventional public transport are at the origin of innovative solutions



Source: The Geography of Transport Systems

There is a gap that cannot be closed with the current commercially available options

Why is there car-based mobility?

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Siemens Mobility
Software Solutions
+ 1000 employees

HACON
EOS.UPTRADE
sqills exceeding expectations
PADAM MOBILITY

Padam Mobility is a European provider of dynamic Demand-Responsive Transport (DRT) solutions for PTOs and PTAs.

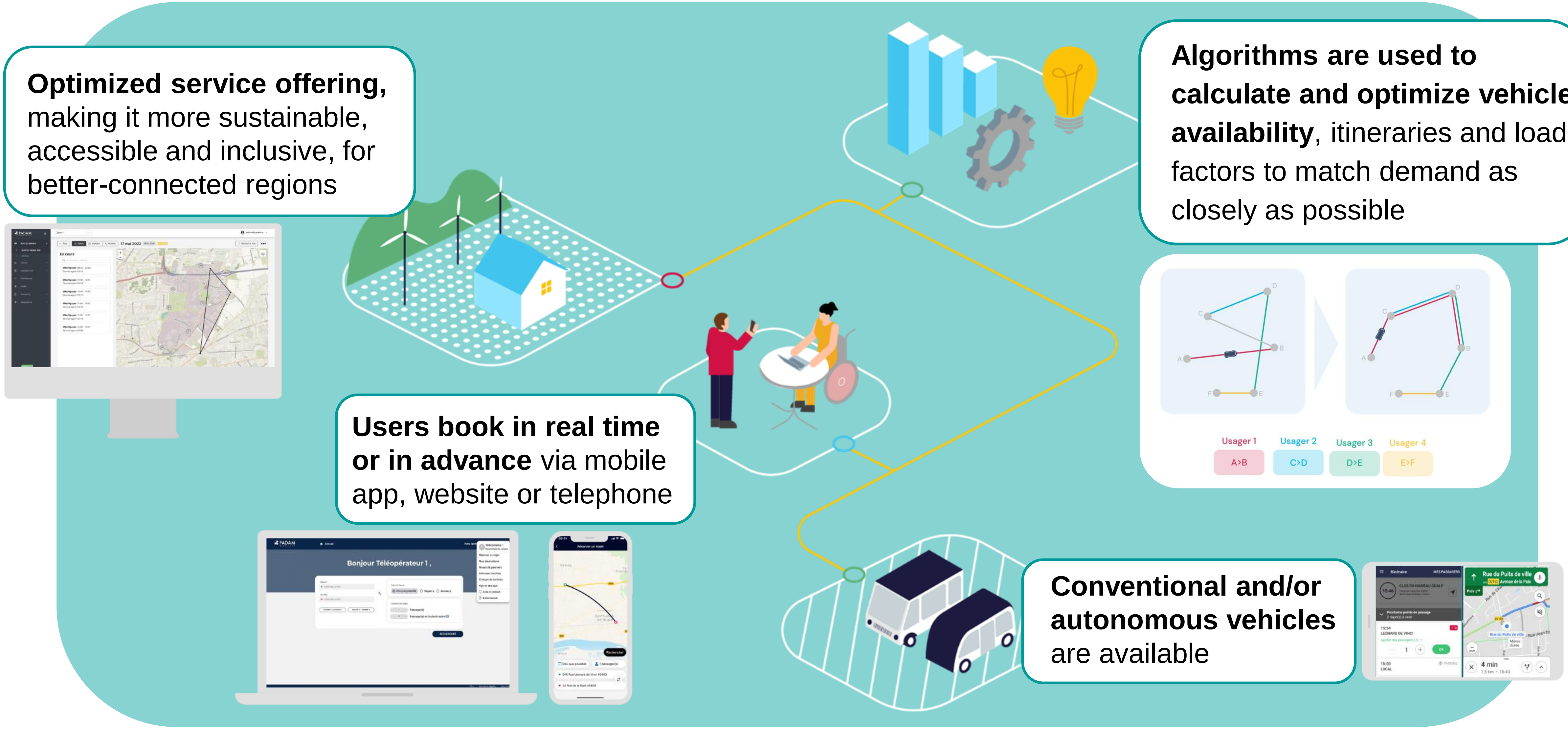
+ 10 years and one of the global leaders
+ 80 employees in 3 offices
+ 200 territories using our solutions
+ 15 countries

ULTIMO Project
Official partner

ULTIMO

Co-funded by the European Union

What is Demand-Responsive Transport?



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Identifying pertinent use cases:

Key factor for a successful DRT service

- Employee mobility & campus areas
- Off-peak hours
- First & last mile
- People with reduced mobility
- Peri-urban & rural areas
- Specific shuttle services

Providing mobility solutions for <u>everyone</u> → Public Transport

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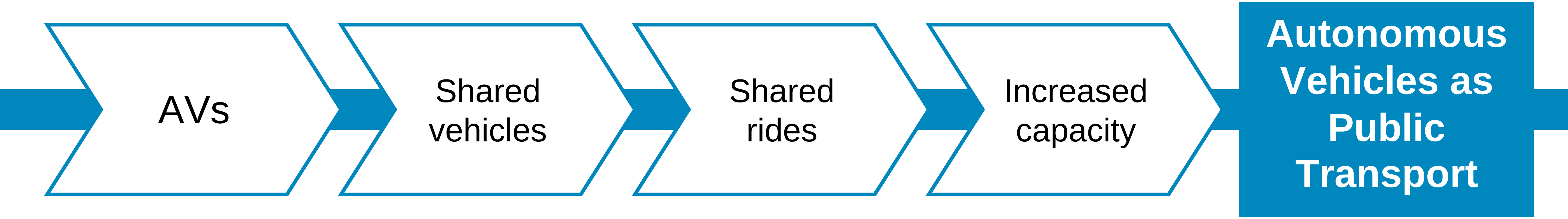
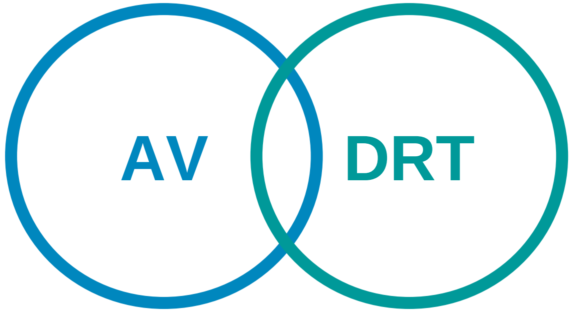
“The era of Autonomous Vehicles will happen… and we are still in time to decide how it should look like”





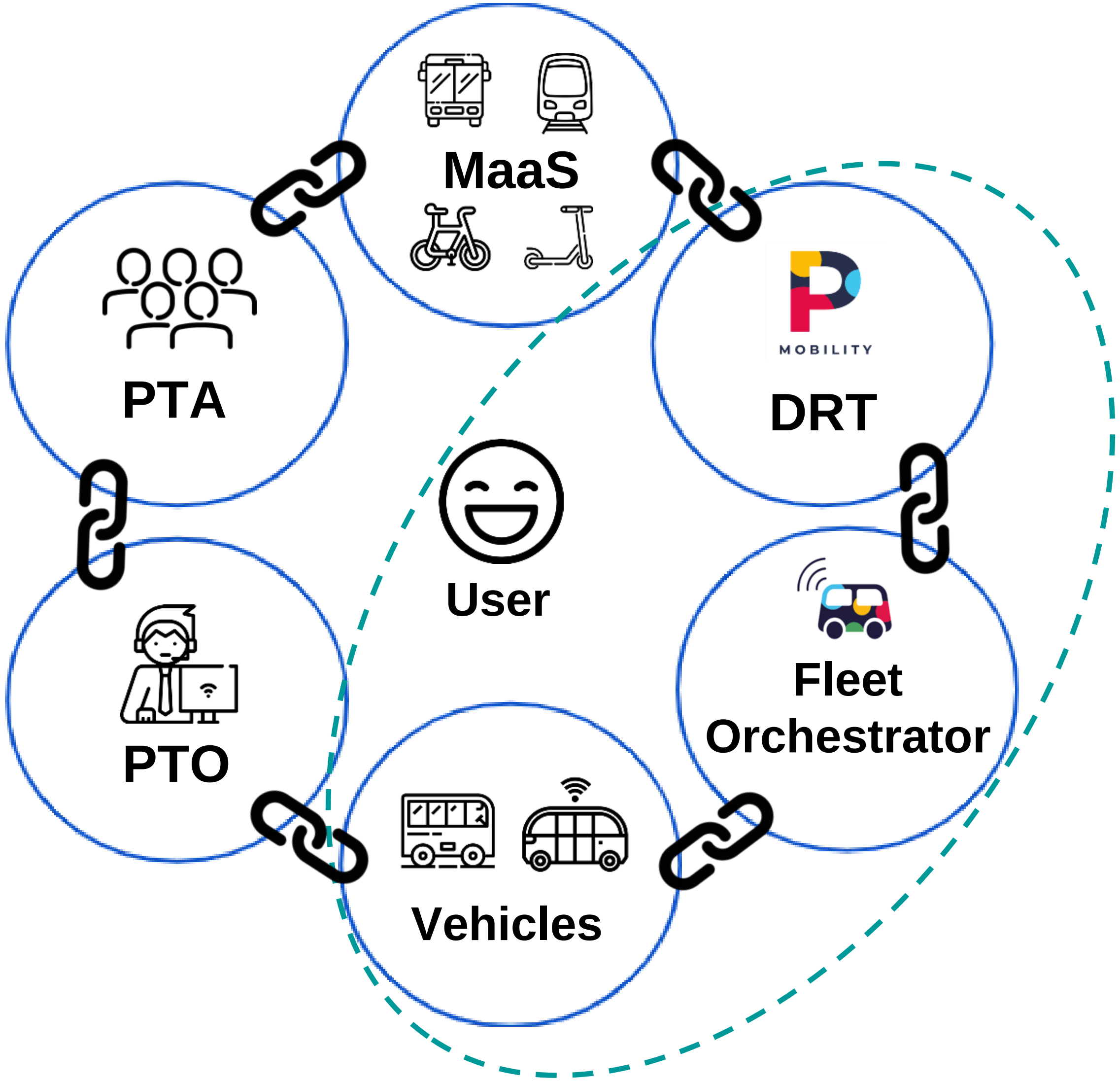
On-demand Autonomous Vehicles:

a new and impactful transit mode

Similar use cases

- **DRT & AVs**: compatible, complementary and have synergies
- AV **optimises operational costs** while DRT, allowed to deploy most of its potential, provides **real value for users**
- **Many drivers** required → **greater impact** of AVs
- **Closing the gap** → Alternative to private cars

The future shape of mobility: a modular ecosystem of agnostic players rather than isolated end-to-end solutions



PADAM MOBILITY

DRT System + Fleet Orchestrator

Providing the required additional functionnalities

From equipment → *To mobility service*

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Sharing responsibilities for efficient and sustainable Public Transport provided by Autonomous Vehicles

	ADAS	VIRTUAL DRIVER	HUMAN / Others
Driving	✓		
Road safety	✓		
Dynamic routing (where to go)		✓	
Mission management (when to go)		✓	
Passenger control (who I'm driving)		✓	
Parking management		✓	
Manual missions		✓	✓
Remote supervision		✓	✓
Remote driving			✓
Onboard safety			✓

Our focus

- Today's drivers will be supervising many vehicles at once
- **100% automated** but allowing manual actions when required

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Ride the future:

A living lab in Linköping (Sweden)

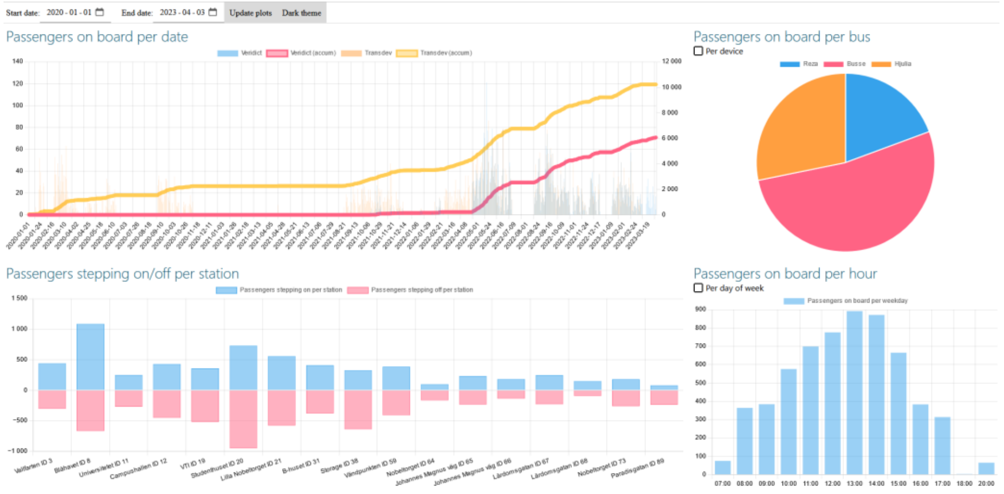
Operations

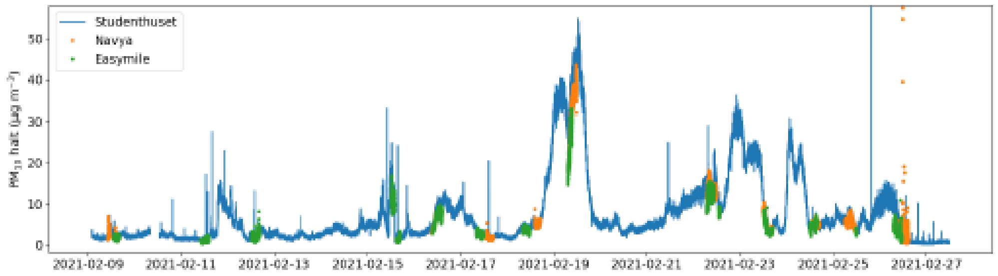
- Since 2018
- 2 areas served: Vallastaden and University
- 7 days/week or more than 50 hours/week

Objectives

- Show how an **autonomous electrified bus** can be part of the mobility ecosystem in a modern densified city
- Provide a platform for **research and study**
- Contribute to **collaboration** and regional development

Understanding the impact of using AVs as Public Transport: measurements, evaluations and learnings





What is measured

- Passengers transported (by stop, shuttle, day, hour, etc.)
- Speed, acceleration, deceleration, environmental particles etc.

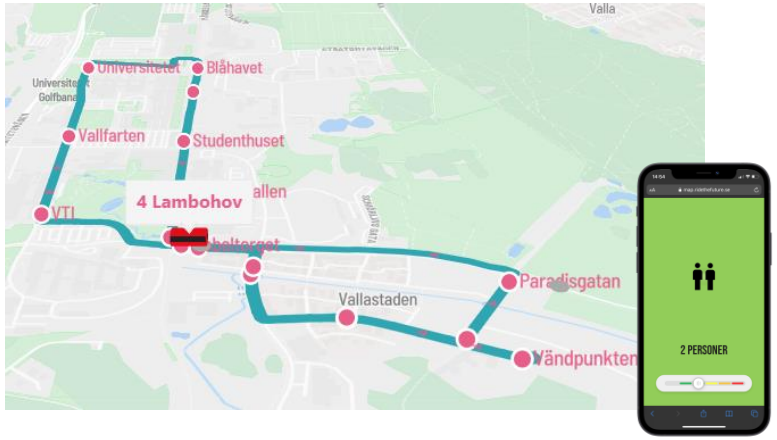
Following a user-centric approach

Main learning from evaluations

Travelers are willing to use (and like) AVs but the mobility service requires special attention (travel information)

Multi-fleet – 2 EasyMile + 1 Navya

Visualization of the service



1st Phase: From 2018 to 12 of September 2024

Current Phase…

Fixed line - 13 stops
in 4.2 km long

System for event logging

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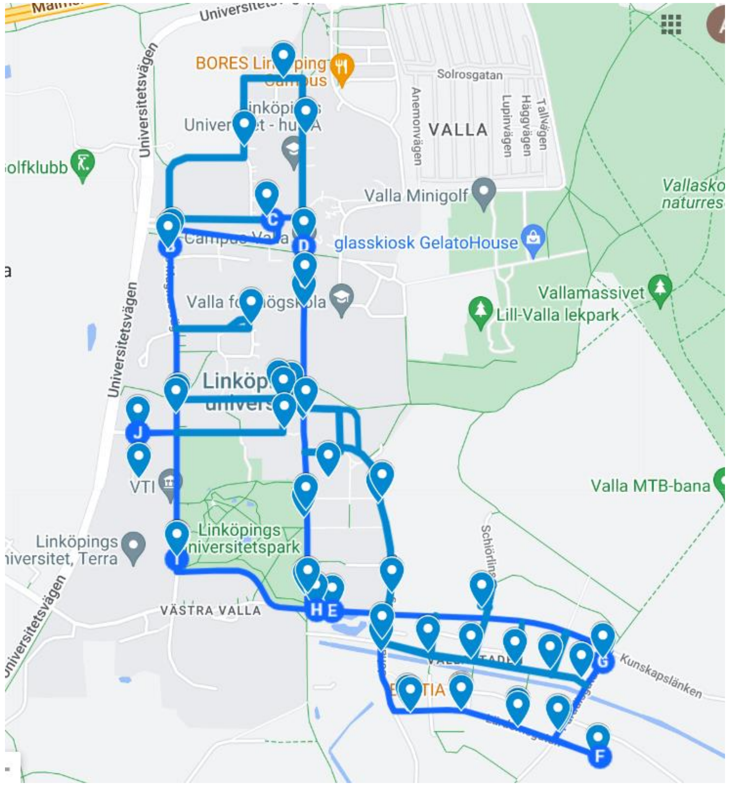
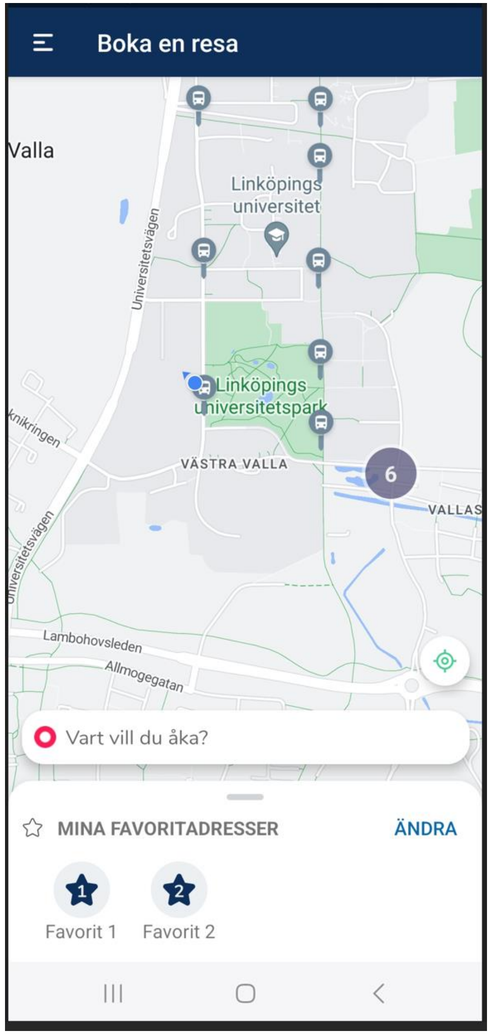
Current Phase: From 13 of September 2024 → Using Padam’s AV DRT



- In operation until at least mid 2025 with the **2 existing EasyMile**
- **Reservation system via website and mobile app** (iOs and Android) available in multiple languages
- The number of available streets has more than doubled, and the **service includes more than 50 stops**
- The DRT operation still focus on the first and last mile use case, **connecting to trunk lines**
- **Fully free-floating service**, all origin-destination origins are allowed within the service zones
- **Preparing for a future more mature phase** with new vehicles and driverless operation (2025-2026)



Ride the future is now a holistic living lab

A living lab with **many different mobility solutions and services**

- PT trunklines
- On-demand service with Automated shuttles
- Micro mobility
- Pedestrian/ cycling friendly
- Parking areas for passenger cars




A living lab with **many different user wishes and needs**

- Elderly with and without mobility impairment *(retirement home in Vallastaden)*
- Young children with and without impairments *(School in Vallastaden)*
- Students *(University)*
- Workers *(building/ university/ working)*

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Ride the future (living lab) www.ridethefuture.se

Let's talk on LinkedIn!


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