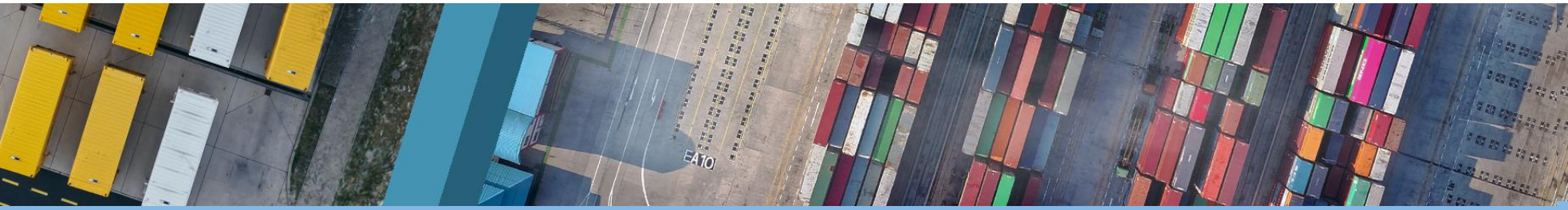
The role of legislation in improving testing and deployment conditions for AVs in logistics

AWARD

Scaling autonomous logistics

3 October 2023, Brussels



AWARD has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement No 10 1006817

Welcome & introduction

Raluca Marian
Director EU Advocacy & General Delegate

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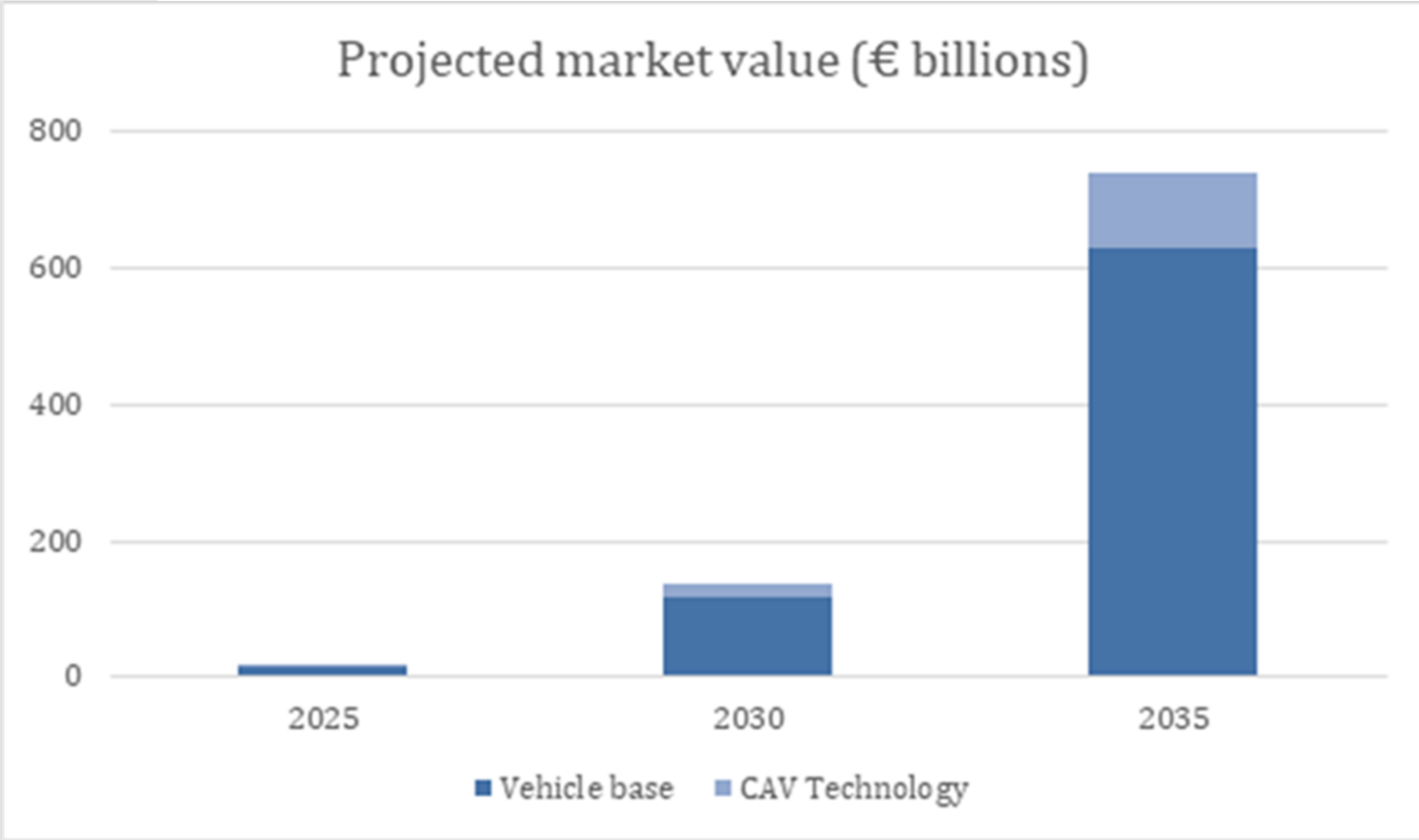
Automated Vehicles
A growing market



Global market for AVs (Level 3 or above) and Connected and Autonomous Vehicles (CAVs) technologies is expected to reach about €741bn in 2035

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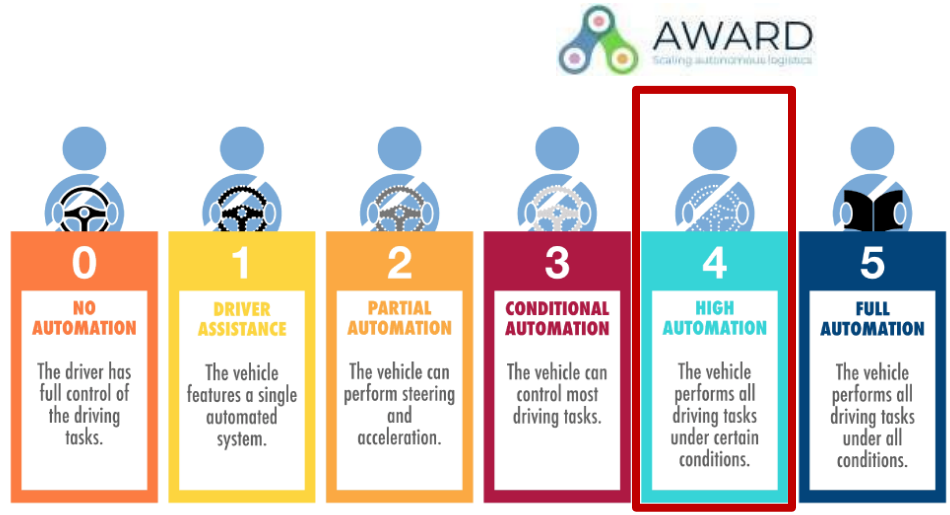
AVs in logistics
The AWARD project

- Able to **handle adverse environmental conditions** such as heavy rain, snowfall, fog
- Targeting compliance with **ISO 26262** and taking into consideration **SOTIF recommendations**
- Integrating **multiple sensor modalities and an embedded teleoperation system to address 24/7 availability**
- **Optimized fleet management & supervision system** for logistics use cases



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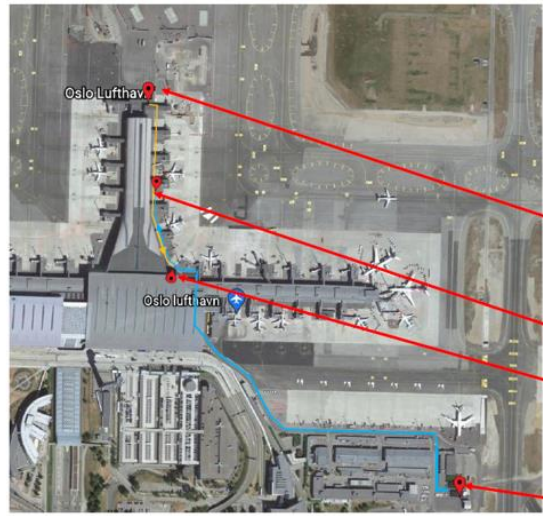
AVs in logistics
The AWARD project

- Pre-testing finalized
- Use-case connected to the Fleet Management System
- Official testing has started recently

Route Description



- Use Case:
  - TractEasy waiting mission point
  - Go manually to pick up empty dollies along P-North, then go to Start Auto Mission point
  - Bring them autonomously to containers storage
  - Go back autonomously to End Auto Mission point
  - Drive manually to TractEasy waiting Mission point

Waiting Mission point

End Auto Mission Station

Start Auto Mission Station

Containers storage

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AVs in logistics

The AWARD project

- Safety testing done
- Vehicle arrived in Rotterdam on September 11
- Official testing started last week

3 phases

Phase 1: Trailer move from drop off area to holding area ready for loading onto the ship

Phase 2: Public road access and gate-processes

Phase 3: Loading of a trailer onto a ship

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AVs in logistics
The AWARD project

- Testing to kick-off in December
- Change in the use-case resulted to the delay

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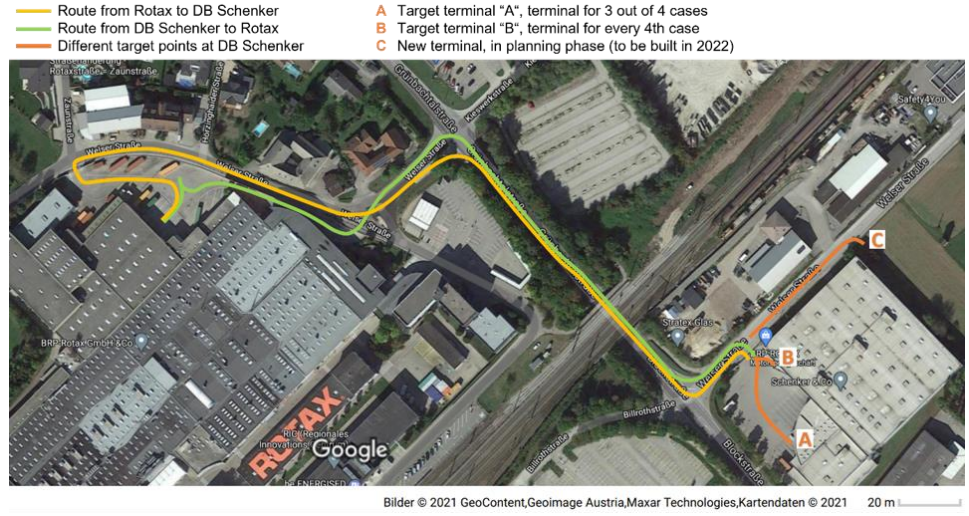
AVs in logistics
The AWARD project

AWARD
Scaling autonomous logistics

ROTAX AIRCRAFT ENGINES | BRP | DB SCHENKER

- Authorisation received
- Testing in progress (concluded first round of testing)
- Safety driver onboard
- Evaluation of first round is expected soon



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The Hub-to-Hub use-case

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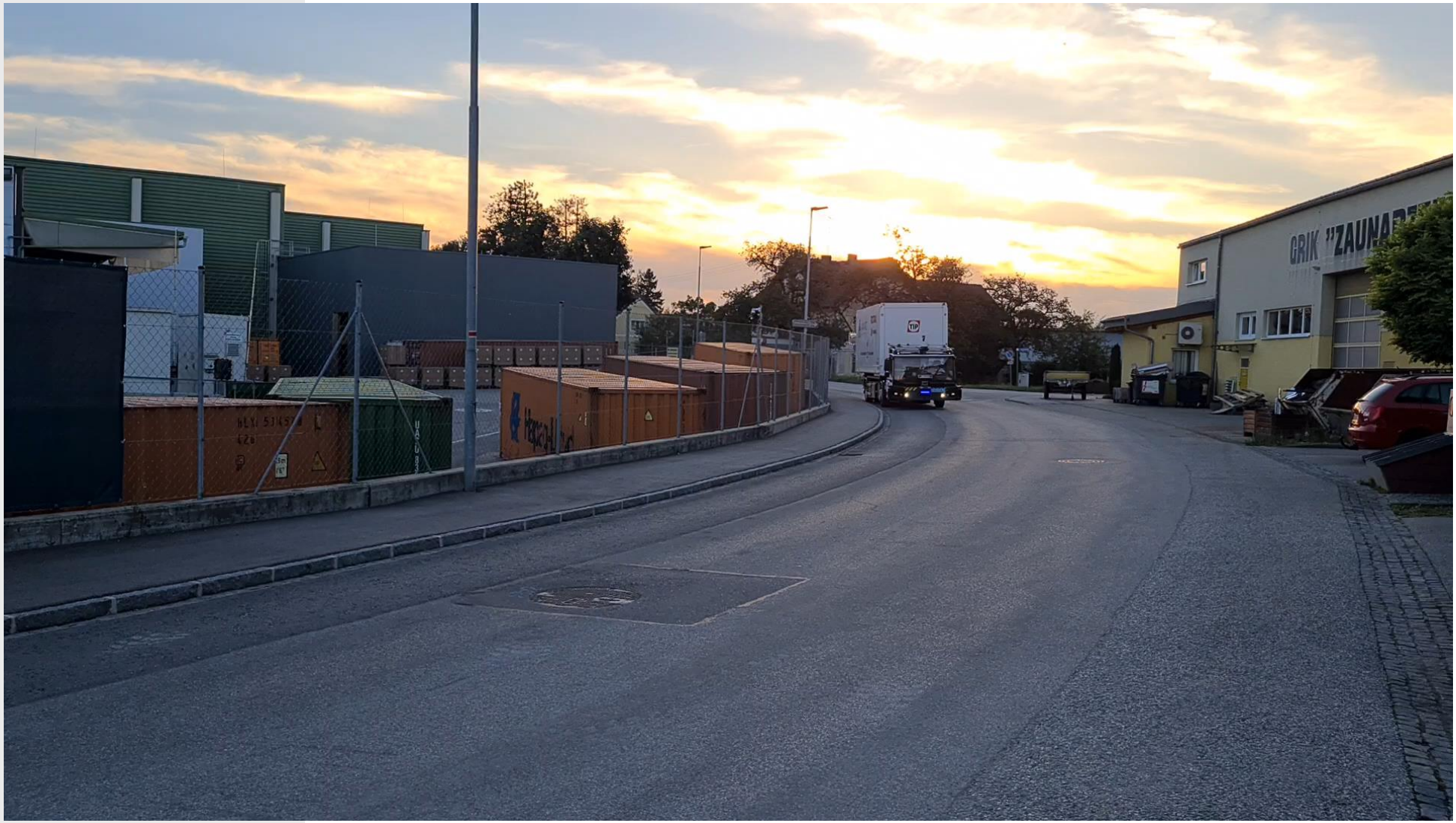
The Hub-to-Hub use-case



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Practical experience with the Austrian framework for testing automated vehicles (AWARD Hub-to-Hub Use Case)

Dominik Schallauer
Expert Automated Mobility & Safety
austriatech

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Content

- Current test framework for automated mobility in Austria
- Practical experiences from AWARD Hub-to-Hub Use Case

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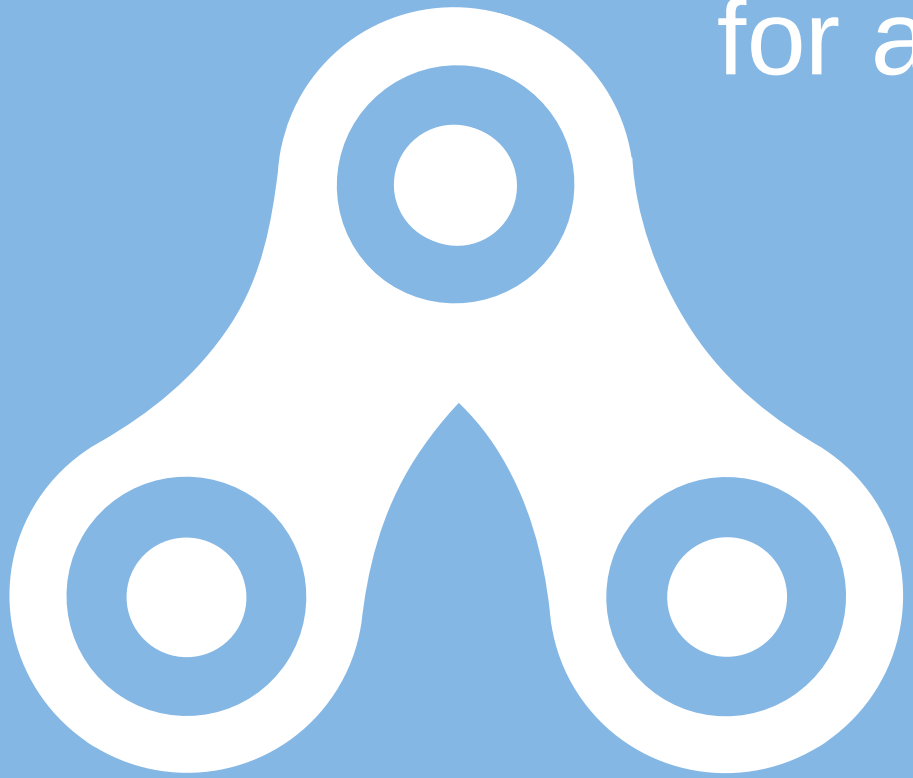
Current test framework for automated mobility in Austria



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2016 → **2023**

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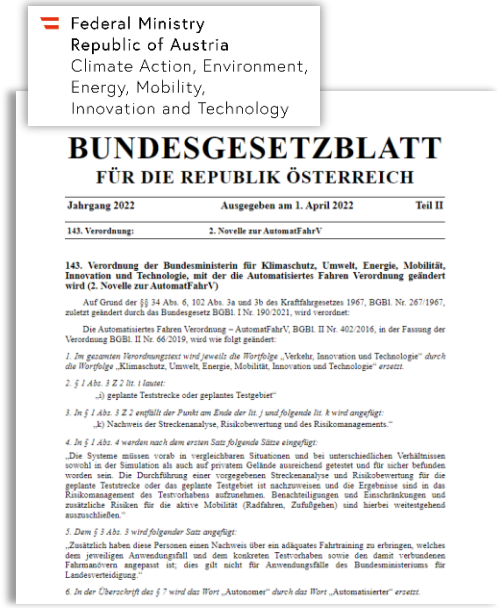
Automated Driving Ordinance („AutomatFahrV“)



Federal Ministry
Republic of Austria
Climate Action, Environment,
Energy, Mobility,
Innovation and Technology

BUNDESGESETZBLATT
FÜR DIE REPUBLIK ÖSTERREICH

Jahrgang 2022 **Ausgegeben am 1. April 2022** **Teil II**

143. Verordnung: **2. Novelle zur AutomatFahrV**

143. Verordnung der Bundesministerin für Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie, mit der die Automatisiertes Fahren Verordnung geändert wird (2. Novelle zur AutomatFahrV)

Auf Grund der §§ 34 Abs. 6, 102 Abs. 3a und 3b des Kraftfahrgesetzes 1967, BGBl. Nr. 267/1967, zuletzt geändert durch das Bundesgesetz BGBl. I Nr. 190/2021, wird verordnet:

Die Automatisiertes Fahren Verordnung – AutomatFahrV, BGBl. II Nr. 402/2016, in der Fassung der Verordnung BGBl. II Nr. 66/2019, wird wie folgt geändert:

1. Im gesamten Verordnungstext wird jeweils die Wortfolge „Verkehr, Innovation und Technologie" *durch die Wortfolge* „Klimaschutz, Umwelt, Energie, Mobilität, Innovation und Technologie" *ersetzt.*

2. § 1 Abs. 3 Z 2 lit. i lautet:

„i) geplante Teststrecke oder geplantes Testgebiet"

3. In § 1 Abs. 3 Z 2 entfällt der Punkt am Ende der lit. j und folgende lit. k wird angefügt:

„k) Nachweis der Streckenanalyse, Risikobewertung und des Risikomanagements."

4. In § 1 Abs. 4 werden nach dem ersten Satz folgende Sätze eingefügt:

„Die Systeme müssen vorab in vergleichbaren Situationen und bei unterschiedlichen Verhältnissen sowohl in der Simulation als auch auf privatem Gelände ausreichend getestet und für sicher befunden worden sein. Die Durchführung einer vorgegebenen Streckenanalyse und Risikobewertung für die geplante Teststrecke oder das geplante Testgebiet ist nachzuweisen und die Ergebnisse sind in das Risikomanagement des Testvorhabens aufzunehmen. Benachteiligungen und Einschränkungen und zusätzliche Risiken für die aktive Mobilität (Radfahren, Zufußgehen) sind hierbei weitestgehend auszuschließen."

5. Dem § 3 Abs. 3 wird folgender Satz angefügt:

„Zusätzlich haben diese Personen einen Nachweis über ein adäquates Fahrtraining zu erbringen, welches dem jeweiligen Anwendungsfall und dem konkreten Testvorhaben sowie den damit verbundenen Fahrmanövern angepasst ist; dies gilt nicht für Anwendungsfälle des Bundesministeriums für Landesverteidigung."

6. In der Überschrift des § 7 wird das Wort „Autonomer" *durch das Wort* „Automatisierter" *ersetzt.*

- **2016:** Automated Driving Ordinance came into force
- **2019:** 1st Amendment
- **2022:** 2nd Amendment

Specifies the conditions for testing automated vehicles on public roads and defines which systems in which traffic situation, on which types of roads, up to which speed ranges can be tested.

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First three Use Cases for test purposes (2016)

Automated minibus
a minibus equipped with a system capable of taking over all driving tasks at a speed of up to 20 km/h.

Motorway pilot with automated lane change
a system that can take over the longitudinal and lateral guidance of the vehicle on motorways and motorways.

Autonomous military vehicle
a vehicle equipped with a system capable of performing all driving tasks by itself or by teleoperation.

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5 new use cases (since 2022)

Automated vehicle for passenger transport
intended for tests with automated vehicles based on vehicles that have already been type-approved before. Speed limitation to max. 50km/h.
Vehicle categories: M1, M2 and L7e

Motorway pilot with automated driving on motorway on- and off-ramps and exits

enables automated driving on and off ramps.

Automated vehicle for the transport of goods

Vehicle categories: L7e, N1, N2 and N2
Speed limitation to max. 30 km/h or 50 km/h if based on type-approved vehicles.

Automated valet parking

enables testing of automated parking, for example in multi-storey car parks at speeds of up to 10 km/h.

Automated working machine

allows working machines to be tested without an operator on board and with a maximum speed of up to 10 km/h.

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austriatech

» kontaktstelle automatisierte mobilität

first point of contact on legal and technological matters for national and international companies and projects that want to test automated vehicles in Austria in accordance with the Automated Driving Ordinance (AutomatFahrV).

Tasks:

- Reviews requirements for obtaining a certificate for testing automated vehicles
- Links different test environments, projects and actors in order to communicate and exchange knowledge and information
- Issues a yearly report on all activities related to automated mobility in Austria

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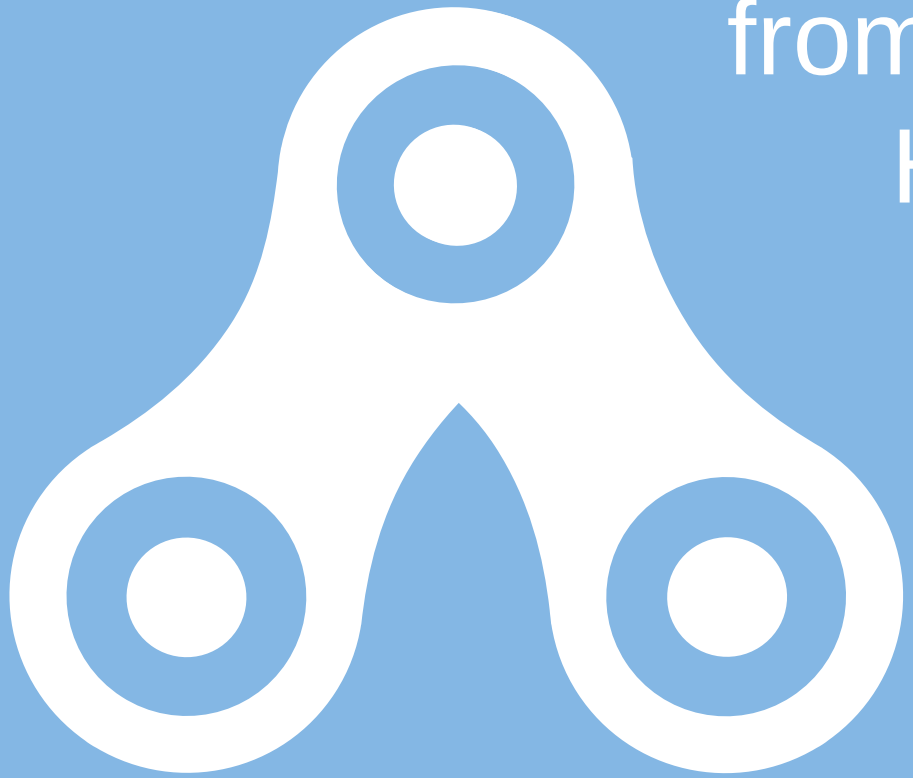
Practical experiences from AWARD Hub-to-Hub Use Case



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Procedure

First contact & consultation

Application

Consultation in the advisory board

Issue of the certificate

Test drives, On-Site Visit

Test report

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Procedure

First contact & consultation

Application

10/2022: Submission

Consultation in the advisory board

12/2022

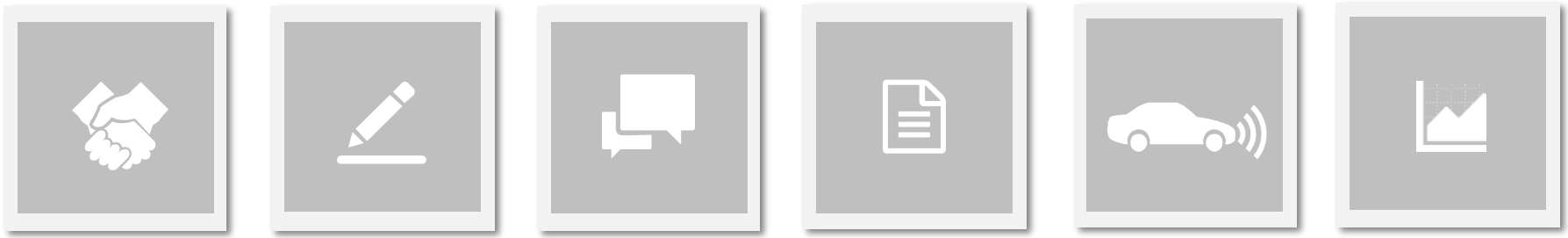
Issue of the certificate

Until 06/2023: Collecting and submitting missing information

06/2023: Issue of the certificate

Test drives, On-Site Visit **starting 06/2023 08/2023**

Test report



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Necessary information on application

- Contact person
- Description of the use case
- Purpose of the test / research questions
- Name of operators
- Licence plate number (please consider the required lead time for obtaining a license plate)
- Confirmation of third-party liability motor insurer
- Duration of tests
- Planned route or area
- Evidence of having informed the state governor and the road administration
- Approval from the driver/operator to perform data recording
- Accident data recorder
- Description of necessary infrastructure adaptations
- And a few other brief questions

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Necessary information on application II

- Analysis and risk assessment of the planned **route** following a given template (including corresponding documentation of risk mitigation measures)
- Confirmation of **operator** training:
  - Test driver certificate (or similar) – focussing on driver skills
  - Training / introduction covering the vehicle specifics, route specifics, use case specific manoeuvres etc.
- Description how the necessary **manoeuvres** have been **tested beforehand** on a proving ground and in simulation
- Description of **manual override** of the system
- Description of **manual deactivation** of the system
- Description if a **risk analysis** for the whole test has been carried out and if **mitigation measures** have been taken; including description of **method** used

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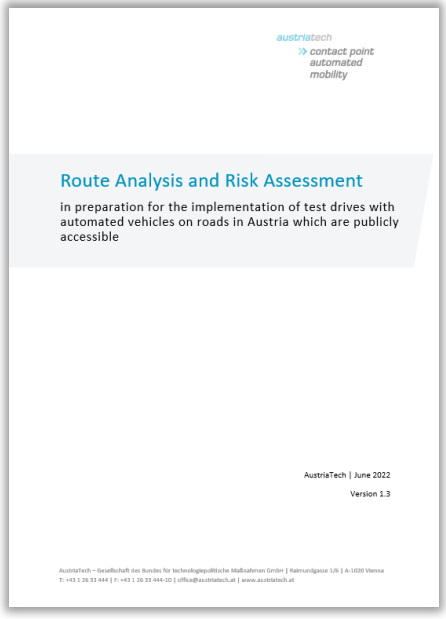
Route Analysis and Risk Assessment



1. **Initial analysis of the route (using a checklist)**
   - local circumstances and surroundings are analysed.
   - includes the identification of specific places such as schools or accident hotspots.
2. **Route Segmentation**
   - route is divided into individual sections whenever relevant criteria are changing (e.g. intersections, curves or a change in lane width)
3. **Assessment of the risk potential for every section using a criteria catalogue**

https://www.austriatech.at/assets/Uploads/Fokusseiten/Kontaktstelle-Automatisierte-Mobilitaet/Dokumente/15e3d3833a/Streckenanalyse_Risikobewertung_062022_EN.docx

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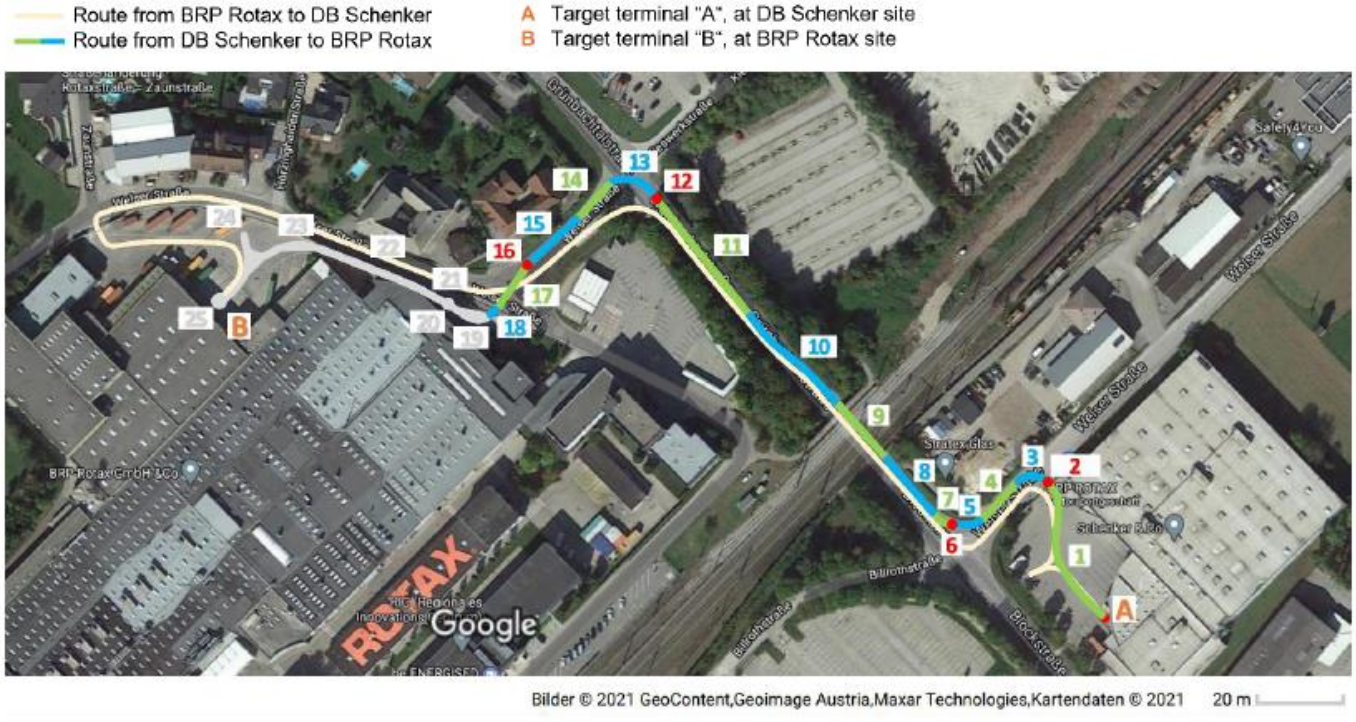
Segments of the Hub-to-Hub route



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Risk mitigation

If it becomes apparent that the **risk potential is too high** in certain sections, the applicant can take appropriate **mitigation measures** to reduce the risk potential.

- **Risk mitigation is possible with the following precautions or measures:**
  - **Infrastructural measures:** this can include the improvement of existing infrastructure elements as well as the addition of new ones (concrete measures can include, for example, the improvement of poor road markings or the improvement of visibility through regular trimming of plants and grass).
  - **Vehicle-related, organisational or other adequate measures:** here, for example, measures such as the limitation of operating hours to off-peak times or specific instructions to the operators on how to deal with the concrete risks on certain sections of the route can be taken.

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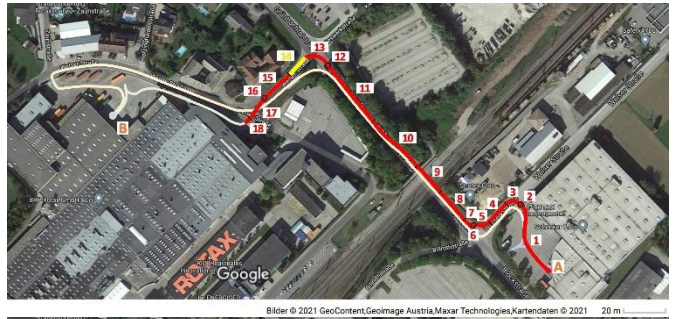
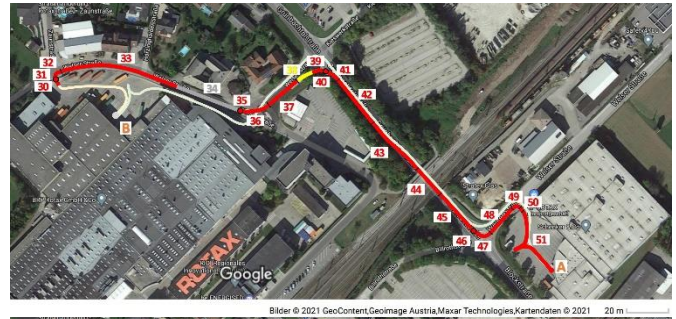
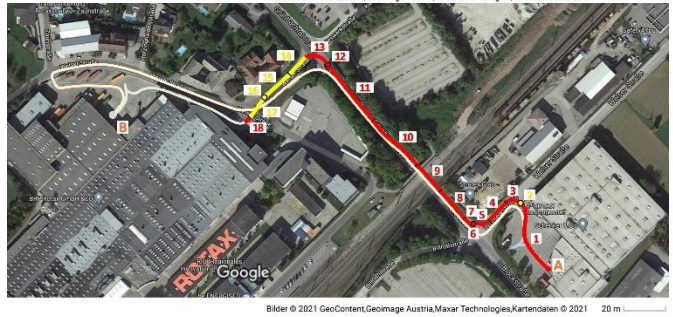
Risk potentials Hub-to-Hub route

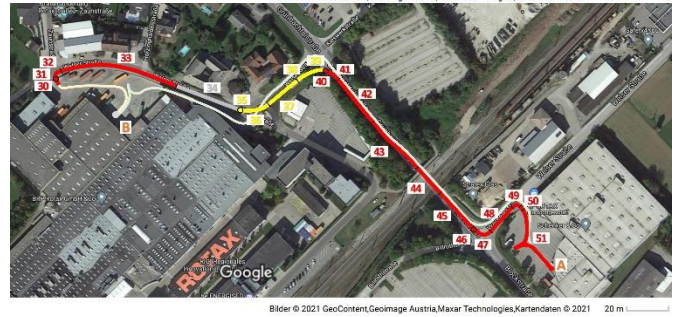
Phase 1



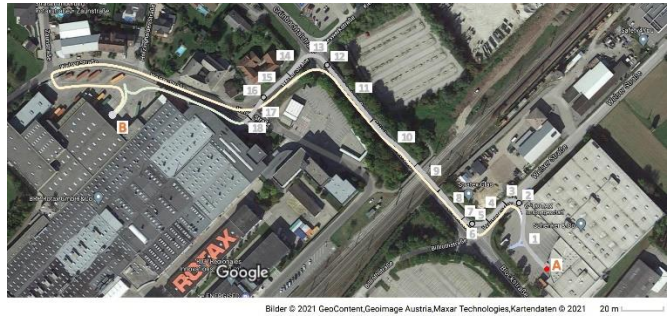


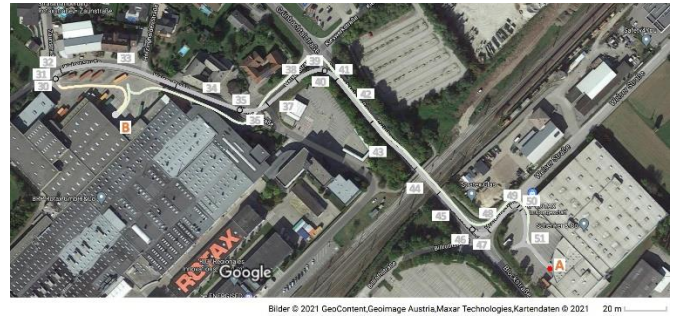
Phase 2





Phase 3





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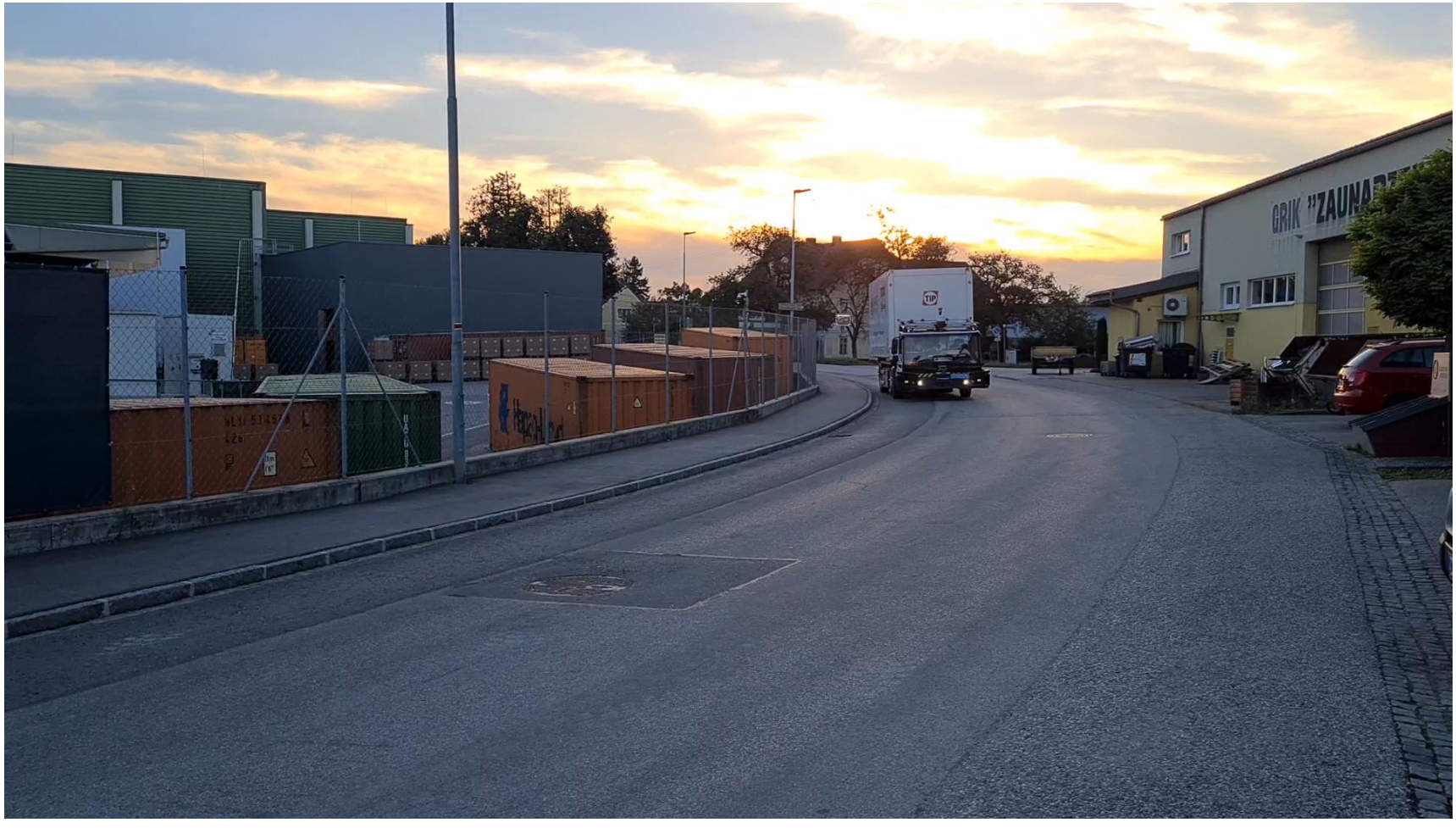

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Digitrans experience

- Legal framework already allows for testing a variety of use cases with automated vehicles on public roads with on-board safety operators in Austria
- Central contact point for automated mobility in Austria providing extensive instructions and feedback related to test permissions for use cases on public roads when needed
- Accurate monitoring by the contact point during application process and test operation
- Considerable efforts for application process & relatively long lead times
- Detailed knowledge and analysis of route, vehicle etc. required

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- Legal framework allows **testing new technologies** (which might not fulfil all standards yet)
- Safety is ensured by making sure that relevant **risks have been identified** and adequate **mitigation strategies** are applied
- **Safety driver** still has an important role (e.g. being aware of specific risk at certain parts of the route and being able to override anytime)

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Thank you!

Dominik.Schallauer@austriatech.at

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Status of legislation and analysis by AWARD

Dr. Jens Henkner
CEO - CERTX

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Overview

What was done to come up with recommendations

- Operation & Risk
- Standards & Research
- Regulations & Compliance

AWARD
Scaling autonomous logistics

CERTX

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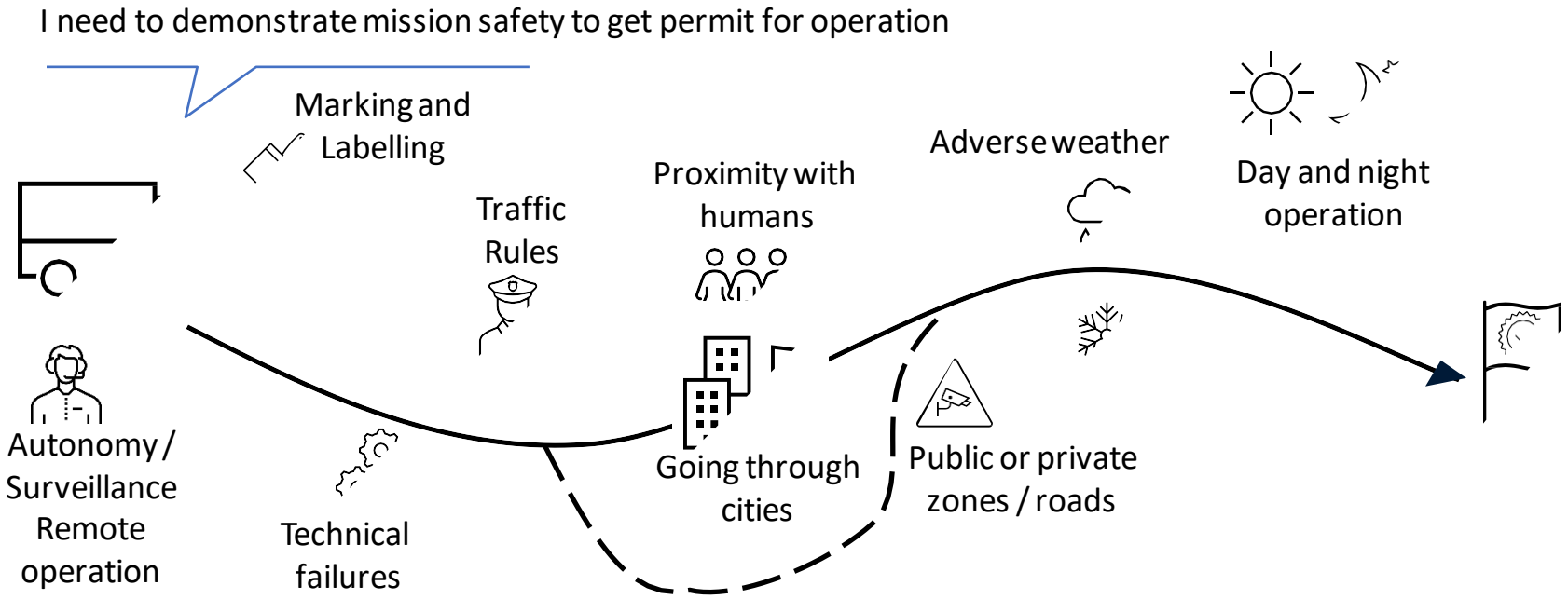
ODD - Operational Design Domain



All elements need to be considered for assessing the risk for the operation requested.

AWARD Scaling autonomous logistics
CERTX

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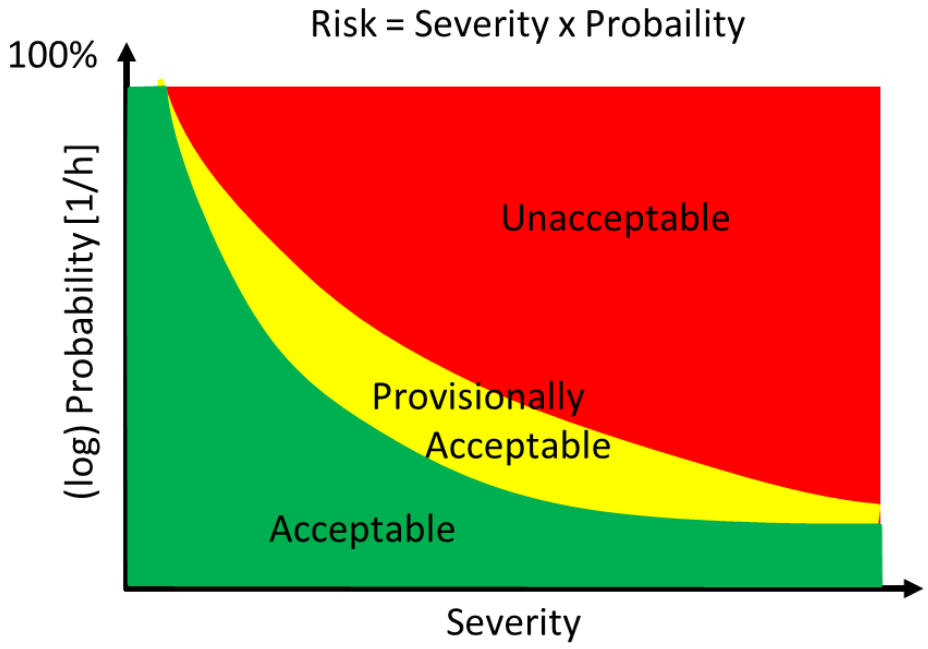
Hazard Analysis and Risk Analyis - HARA

Examines how the basic dimensions (severity, occurrence, exposure, avoidance / controllability) in its ODD affect the criticality of the system under consideration.
Follows EN / ISO 12100 to be done as part of CE conformity



Risks classified in several categories – a typical acceptance level is 1 fatality or sever injury in 10^7 hours

AWARD Scaling autonomous logistics
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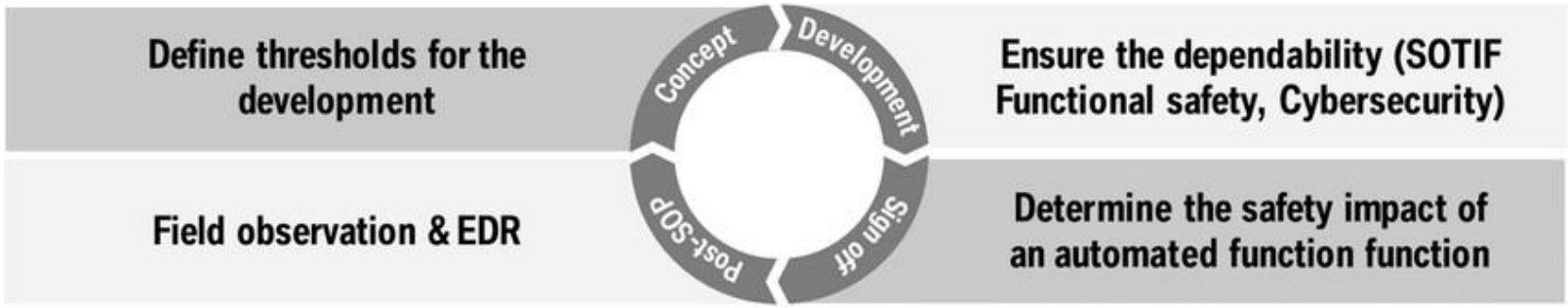
Positive Risk Balance: A constant trade-off

- Alternative way to show that a new system / process / product is implemented the overall risk is better than the existing one. Sometimes difficult to show.
- Once the minimum acceptance criteria are defined and met there should be an ongoing trade-off on implementing further risk reductions



From: Positive risk balance: a comprehensive framework to ensure vehicle safety,
Nina Kaufmann, Felix Fahrenkrog, Ludwig Drees and Florian Raisch, Springer Verlag, 2022

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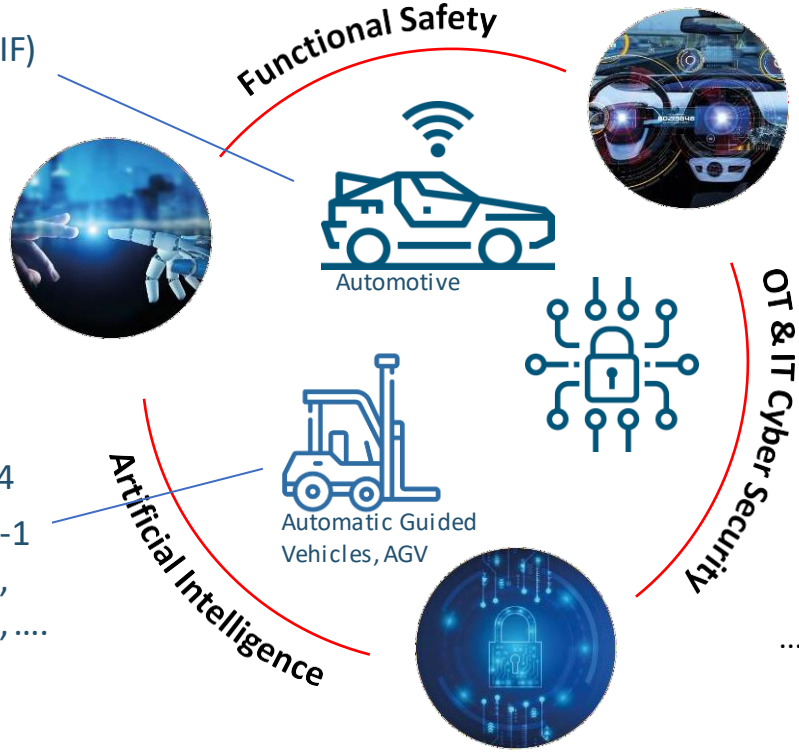
Relevant Standards

ISO 26262
ISO 21448 (SOTIF)
ASPICE
UN-R 157



IEC 62443
ISO 21434
UN-R 155 GDPR
UN-R 156

ISO 3691-4
ISO 13849-1
IEC 61508,
ISO 62061, ….

….and general quality QMS: ISO 9001

Standards do define the current acceptable level of risk for a "classical" system ⇨ Basis for evaluation

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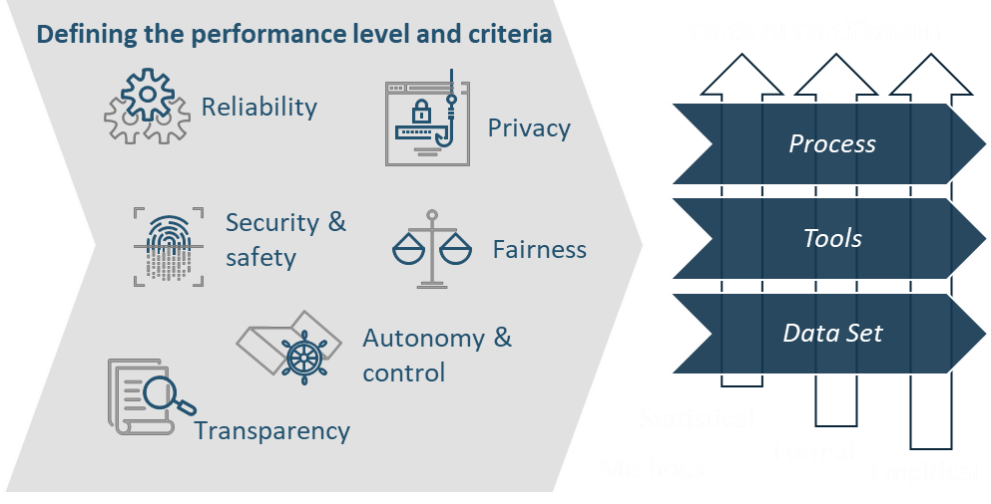
Specific risks related to AI systems

- To define requirements for AI systems, e.g., Intended purpose, operational situations and performance
- Following the approach of ISO 21448 (SOTIF) on system level
- Today, AI for safety critical applications is still equipped with a deterministic “guiderail”, limiting the effect of possible failures
- Schemes to evaluate trustworthiness of AI are currently being rolled out e.g., by CERTX



Will result in a quantified risk level concerning the target metrics

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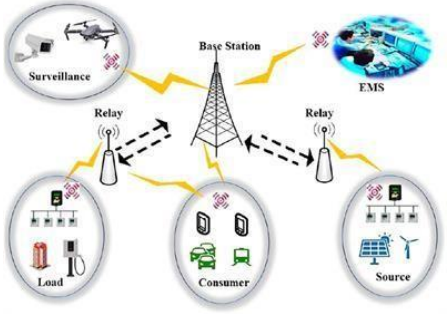
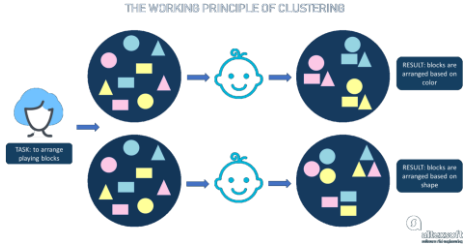
Operability vs. Safety

- Safety can jeopardize system availability (SOTIF), which becomes more critical when systems are intended to operate fully autonomous. (false positive vs false negative).

- Known contradictions between security and safety can decelerate communication and hence compromise performance.



- AI, unsupervised training can result in wrong classifications and result in unsafe situations ⍰ only supervised training for safety critical AI. But limits training speed.



A very safe system might not be very operable

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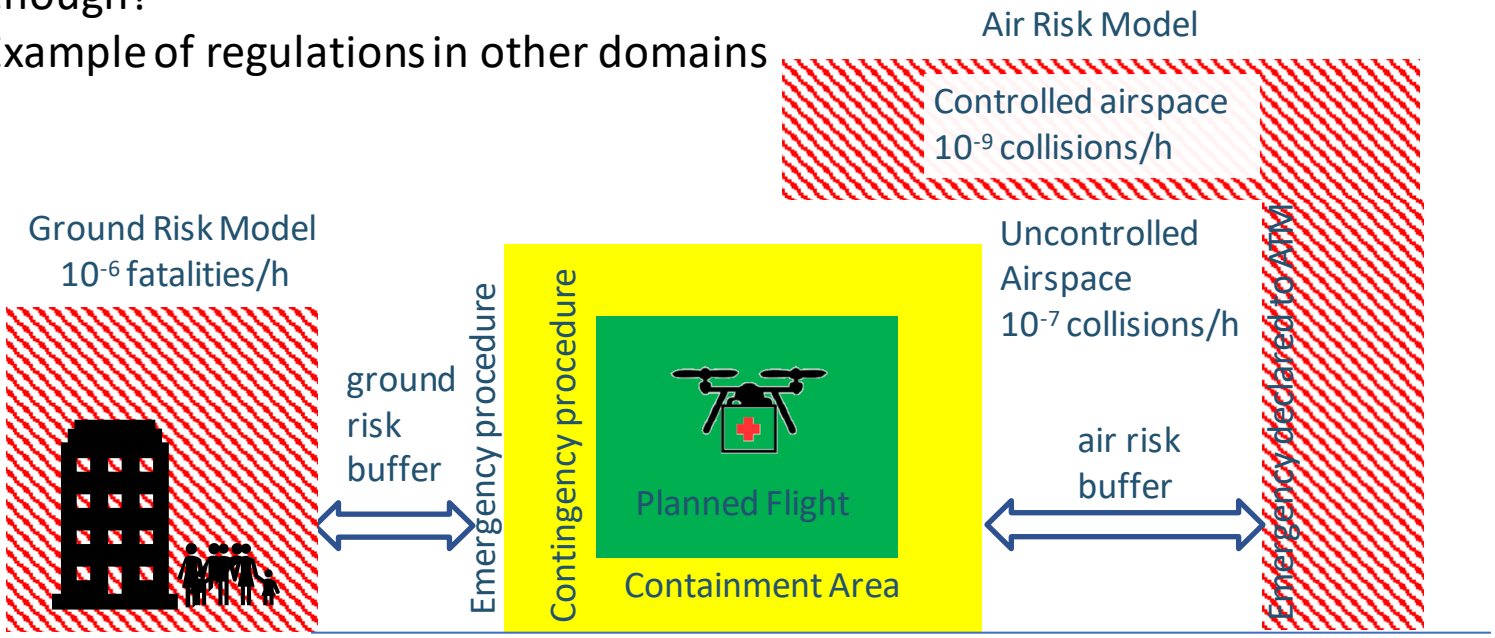
What is the acceptable level of risk?

From a technical perspective risk can be quantified but what is low enough?

Example of regulations in other domains



In Germany: ~800 Billion km in private cars, 4000 traffic deaths/ year, average speed est.: ~80km/h → 10 Billion hour of driving → ~4*10-7/h across all ODDs

Standardized ODD + Standardized Demonstration of Compliance Helps

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03/10/2023

Thank you!

Dr. Jens Henkner

CERTX

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IRU AWARD Workshop

AWARD

Scaling autonomous logistics

3 October 2023, Brussels

Victoire Couëlle
Junior Policy Adviser – Social Affairs

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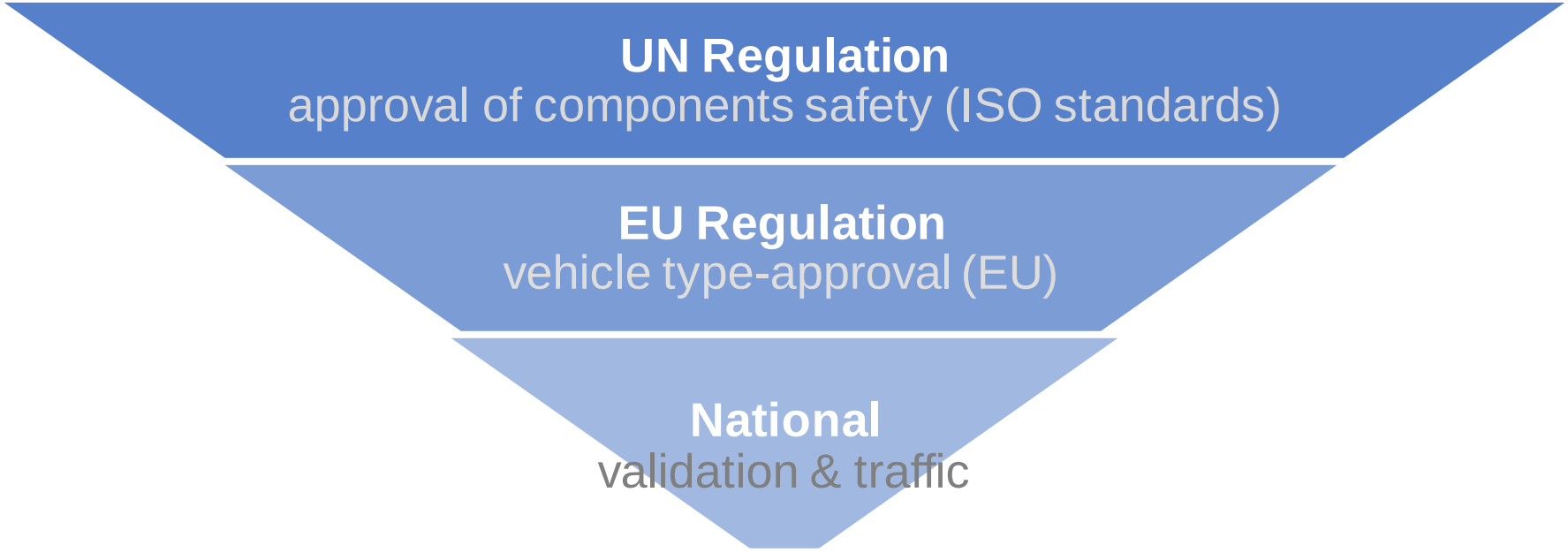
Automation in legislation: a brief overview

Who does what?



Overall, various level of regulation to ensure minimum safety requirements for ADS.

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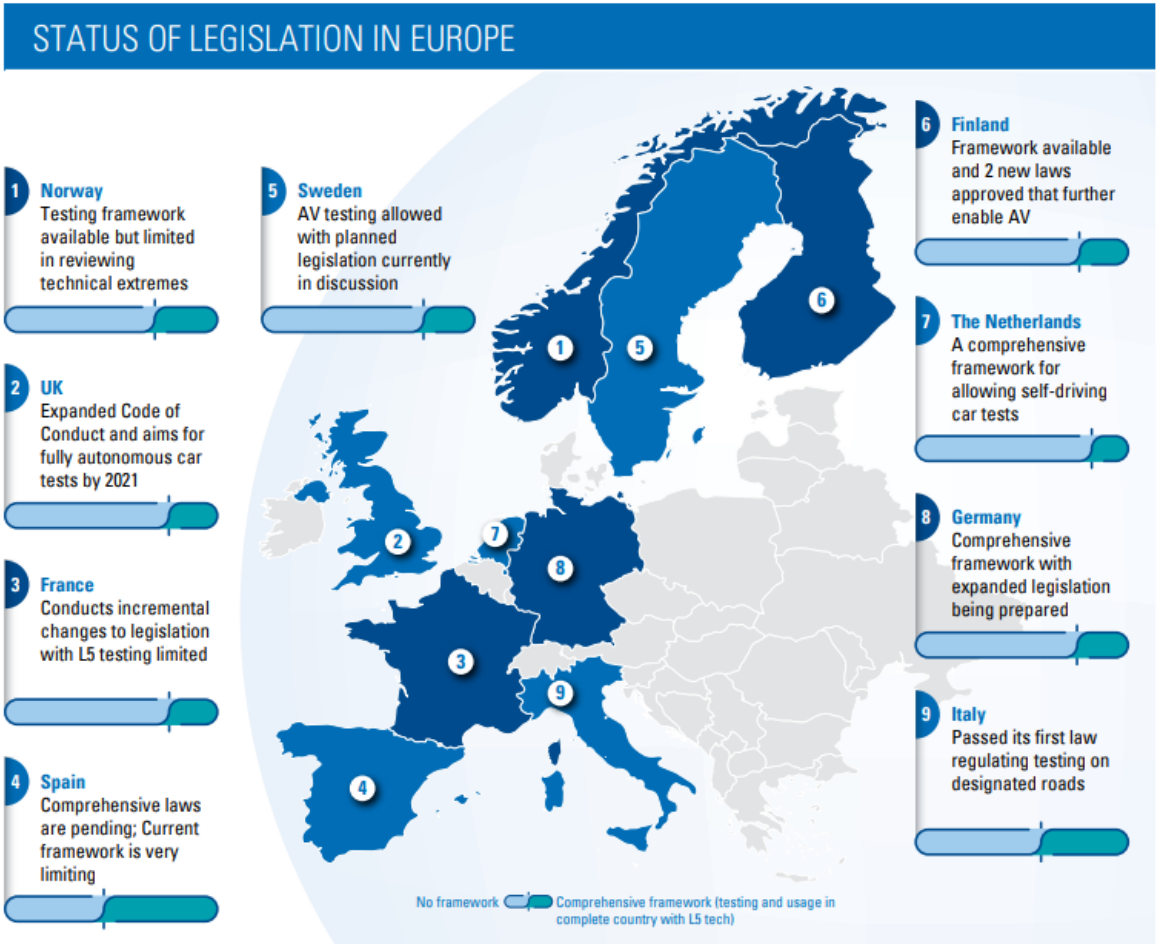
Automation across the EU: a brief overview



Source: TUV SUD

What is missing today?

Harmonised provisions and minimum requirements across the EU

Clarity to all stakeholders

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Removing the driver from the vehicle: legal implications

UNECE Vienna Convention required all vehicles to have a driver within the vehicle (location) and in control of it at all times (liability).

Amendment in 2021, enabled human supervision outside of the vehicle.

Source: DB Schenker

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Removing the driver from the vehicle: the implications

Opens the door to new questions

- Who is responbile (in case of accidents, damaged goods, checking the vehicle, paperwork)?
- Which actor is involved in driving and monitoring the vehicle?
- What new knowledge and training is required?

New legal, operational and social changes to take into account.

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Removing the driver from the vehicle: the implications

Opens the door to new questions

- Who is responbile in case of (accidents, damaged goods, checking the vehicle, paperwork)?
- Which actor is involved in driving a vehicle, monitoring, deploying?
- What new knowledge and training is required?

New legal, operational and stakeholder changes to take into account.

Brief overview of some of the:

- Legal changes
- Social changes
- Operational changes

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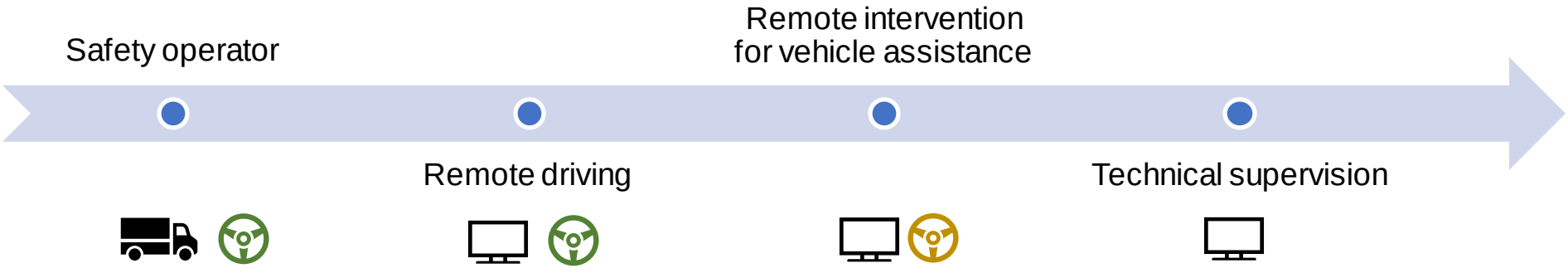
Legal changes
1) Defining new roles and tasks

Gradual evolution: from more active involvement to monitoring role



Clearer definition of roles enables to clearly define the tasks, responsibilities and liability, when carrying out operations.

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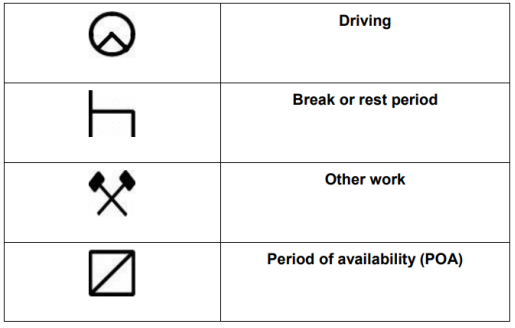
Legal changes
2) Adapt EU regulation accordingly

Adapt existing EU regulation

- *Driving and rest time rules*
- *remote safety operator*
- *teleoperator*

New elements

- *Minimum requirements for remote operator work environment*
- *Limit of vehicles set remote operator can monitor*
- *What information is required by the teleoperator?*



Set harmonised standards and requirements for teleoperators across the EU to ensure safe AV deployment.

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Societal changes
New training and qualifications

- Different requirements across Member States, but commonalities.
- **What should be required?**

Knowledge on the vehicle	Knowledge on remote operation	Knowledge on the specific operation
• Driving Licence of the respective vehicle category • Knowledge of the automated vehicle specifics and capabilities	• Certificate on remote operation • Knowledge and experience on safety procedures for intervention specific to each system	• Characteristics of routes or zones (e.g. restricted area) • Use-case manoeuvres (e.g. loading)

Define minimum training and certificate requirements for remote operators across the EU.

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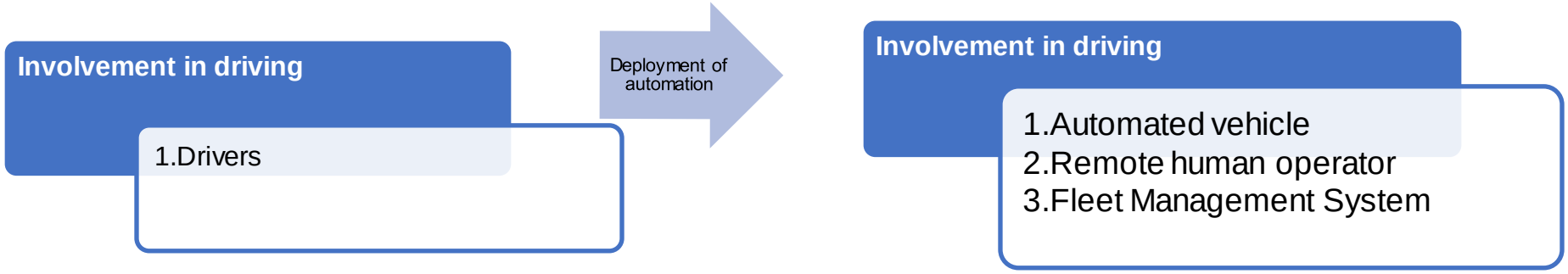
Operational changes
1) Liability – under normal circumstances



- ***Clearly define division of tasks and hand-over responsibilities between drivers (ADS and teleoperator).***
- ***Monitoring hand-over and entities in control of the vehicle (ADS, teleoperator) to identify liability.***
- ***Requirements and management process to ensure functioning of FMS.***

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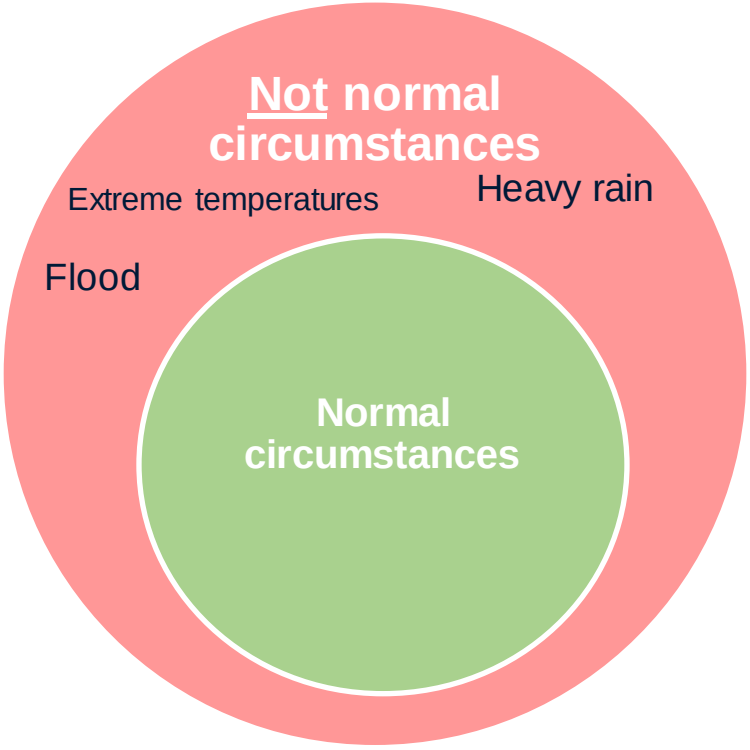
Operational changes
1) Liability – under not normal circumstances

In real-life, conditions may not always enable the safe deployment of vehicles (e.g. harsh weather conditions).

Scenario 1: Not ideal circumstances
- Mitigation measures

Scenario 2: Outside of scope
- Deactivation of ADS



- ***Harmonise the minimum information required to monitor the AV's environment within all operators (e.g., weather sensors) to make sure conditions are safe for deployment.***

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Operational changes
2) Obtaining a permit

Requirements to obtain permit

- Safety assessment and potential mitigation measures
- Operator (safety driver or teleoperator)
- Information on route or area

- ***Provide more clarity on the permitting process at national level, in view of a harmonisation across the EU.***
- ***Establish mutual recognition of safety assessment by Member States.***

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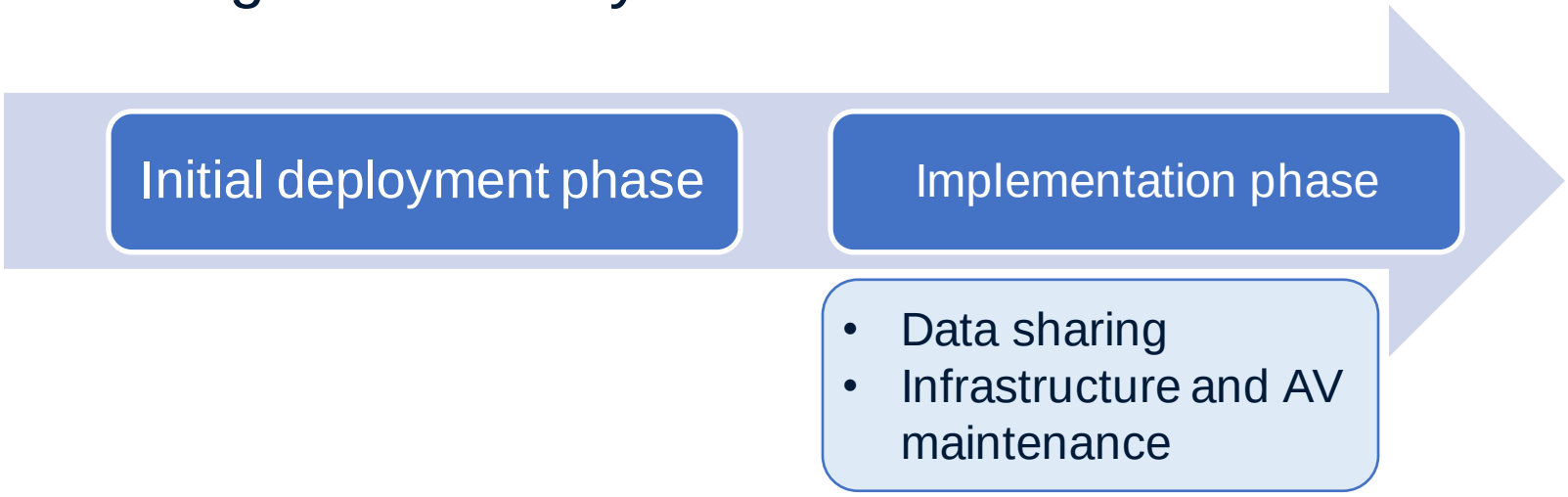
Operational changes
2) Monitoring of AV safety



- ***Data to be shared with national authorities, but owned by manufacturers and operators.***
- ***Respective responsibilities between stakeholders, to ensure safe deployment conditions.***

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Societal changes
3) Harmonised signalling of automated vehicles

- Automated vehicles should clearly be identifiable to a wide audience.
  - status of vehicle – on/off
  - actions – direction, acceleration/stop

- Promote safe AV operation and interaction with a wide audience.
  - working personnel (in logistics centers)
  - other users (open areas)

Harmonise automated vehicle identification and signaling across the EU.

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Questions

- What benefits can an operator expect from automation?
- What should be the focus of EU transport regulation in the short to middle term to enable AV deployment?
- What are the most important steps for national or EU legislation to enable AV deployment?
- Traffic regulation versus AV: which one should adapt?

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Let's get in groups!

- Which legal barrier(s) would be a deal breaker for operators when considering automated operations?
- Ensuring safe AV deployment is a priority - what measures can be taken at each level (authorities, OEMs, transport operator, others)?

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Let's keep in touch!

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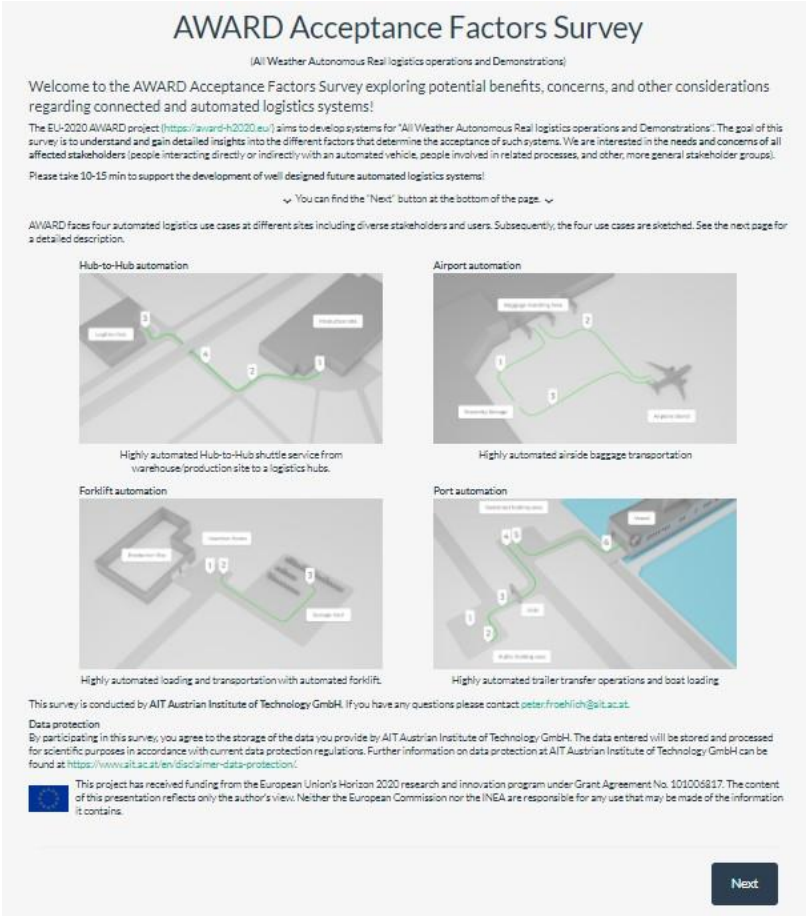
Participate to our Acceptance Factors survey!



AWARD Acceptance Factors Survey

(All Weather Autonomous Real logistics operations and Demonstrations)

Welcome to the AWARD Acceptance Factors Survey exploring potential benefits, concerns, and other considerations regarding connected and automated logistics systems!

The EU-2020 AWARD project (https://award-h2020.eu/) aims to develop systems for "All Weather Autonomous Real logistics operations and Demonstrations". The goal of this survey is to understand and gain detailed insights into the different factors that determine the acceptance of such systems. We are interested in the needs and concerns of all affected stakeholders (people interacting directly or indirectly with an automated vehicle, people involved in related processes, and other, more general stakeholder groups).

Please take 10-15 min to support the development of well designed future automated logistics systems!

You can find the "Next" button at the bottom of the page.

AWARD faces four automated logistics use cases at different sites including diverse stakeholders and users. Subsequently, the four use cases are sketched. See the next page for a detailed description.

Hub-to-Hub automation

Highly automated Hub-to-Hub shuttle service from warehouse/production site to a logistics hubs.

Airport automation

Highly automated airside baggage transportation

Forklift automation

Highly automated loading and transportation with automated forklift.

Port automation

Highly automated trailer transfer operations and boat loading

This survey is conducted by AIT Austrian Institute of Technology GmbH. If you have any questions please contact peter.froehlich@ait.ac.at.

Data protection

By participating in this survey, you agree to the storage of the data you provide by AIT Austrian Institute of Technology GmbH. The data entered will be stored and processed for scientific purposes in accordance with current data protection regulations. Further information on data protection at AIT Austrian Institute of Technology GmbH can be found at https://www.ait.ac.at/en/disclaimer-data-protection/.

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Next

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