

5th Trilateral Conference 19./20.April 2023 – Review

Austria, Hungary, Slovenia and Czech Republic
Cross-border testing of Automated Driving



Legal notice

Media owner, publisher, editor:

Federal Ministry Republic of Austria Climate Action, Environment, Energy, Mobility,
Innovation and Technology, Radetzkystraße 2, 1030 Vienna, Austria

Photo Credits: Cover ©DigiTrans GmbH; all photos of the event © Daniela Weilguni

Vienna, 2023.

Table of Contents

Review.....4

Rückblick6

Programme.....9

Wednesday, 19.04.2023..... 9

 Valentinum 9

Thursday, 20.04.2023 10

 Keynote Presentation..... 11

 Country Reports 12

 Panel Discussion “Cross-border collaboration – How could we use different national perspectives and competences for a successful co-opetition on a European level?” 14

 Cross-border innovation and research 15

 Afternoon Session 18

Exhibition Valentinum 24

 Automated test vehicle Digitrans eVAN 24

 Automated test vehicle Digitrans dTRUCK..... 25

Review

In the opening speech we heard the upcoming challenges in the mobility sector and the chances of automation for improving our overall traffic system. Of course this means we have to look more into detail especially when it comes to traffic management and the implementation into the existing mobility system. Test environments can therefore play a crucial role by identifying further needs and by supporting public authorities making their decisions about new technologies and the designing of the framework.

In our keynote speech we have seen how the mobility of the future might look like.. Automation will be part of this future without doubt but we have to learn how to combine it in the most efficient way with other trends and demands like cooperation, connectivity, sharing and electrification. If we do so, CCAM (Cooperative, Connected and Automated Mobility) enables more user-centred, all-inclusive mobility, while increasing safety, reducing congestion and contributing to decarbonisation.

CCAM will also enable the provision of new mobility services for passengers and goods, fostering benefits for users and for the mobility system as a whole. But again this will happen only when we take the overall mobility system into account.

In our country session we have heard four different approaches coming from Austria, Slovenia, Hungary and the Czech Republic. It is great and astonishing to see what has already been established in the different countries. When it comes to deployment all panellists agreed on the further need of better cooperation across borders. Europe needs more large-scale testing, demonstrations and pilot projects involving all relevant stakeholders to support implementation and remove barriers.

This counts especially for Level 4 (Preliminary stage to autonomous driving, in which the vehicle navigates independently for the majority of its journey) on demand shuttles or teleoperated vehicles but also when it comes to the deployment of ADAS (Advanced Driver Assistance System) functions like ALKS (Automated Lane Keeping Systems). Here we need a better understanding of the technology and its effects before we can discuss deploying them in real world.

We also identified the need for new forms of cooperation and collaboration like alliances including all different stakeholders, from infrastructure to car manufacturer, operators, and authorities and so on. This might be key for deployment on a national level but will also foster the cooperation on a European level, like within CCAM (ccam.eu).

However, there are still gaps and hurdles to overcome which require further research activities. Here we have observed huge progress in terms of cooperation between infrastructure and the vehicle following a CCAM approach. Although it might be possible to drive autonomously one day, when it comes to the phase of mixed traffic, cooperation will be necessary to improve our traffic management system. Therefore we have seen presentations focusing on the vehicle, the infrastructure and the human being. We have heard from holistic solutions to support and operate autonomous vehicles in cooperation with infrastructure elements, current challenges and opportunities of testing and verification methods in automated driving systems and aspects dealing with human-machine-interactions under challenging conditions.

In the afternoon session we had the chance to see several demonstrations and the test environment of Digitrans. We have seen:

- demonstrations dealing with digital twins and ultra-high-definition maps
- teleoperated vehicles which were located at the ZalaZONE proving ground in Hungary
- performance tests of perception sensors at different rain intensities at Digitrans' unique outdoor rain plant
- ADAS Testing in Urban Environment focussing on the testing of the Emergency Brake Assist (Euro NCAP)
- Experience Automated Driving and its technical details behind the system
- Dynamic Ground Truth System™ for highly accurate environmental measurements

Automation will happen but it will not improve our overall system automatically. That's why we have to figure out how to deploy it and under which condition it can generate the best benefit. To answer open questions and complete the puzzle we need efforts from all sides and different approaches, like we have seen today.

Last not least thanks to all panellists and experts for their ideas and demonstrations and thank you dear participants for joining us.

Rückblick

In den Eröffnungsvorträgen wurden die anstehenden Herausforderungen im Mobilitätssektor und die Chancen der Automatisierung zur Verbesserung unseres gesamten Verkehrssystems angesprochen. Das bedeutet natürlich, dass wir uns mehr mit den Details beschäftigen müssen, vor allem wenn es um das Verkehrsmanagement und die Implementierung in das bestehende Mobilitätssystem geht. Testumgebungen können daher eine entscheidende Rolle spielen, indem sie den weiteren Bedarf ermitteln und die Behörden bei ihren Entscheidungen über neue Technologien und die Gestaltung der Rahmenbedingungen unterstützen.

In unserer Keynote haben wir gesehen, wie die Mobilität der Zukunft aussehen könnte. Die Automatisierung wird zweifellos Teil dieser Zukunft sein, aber wir müssen lernen, wie wir sie am effizientesten mit anderen Trends und Anforderungen wie Kooperation, Konnektivität, Sharing und Elektrifizierung kombinieren können. Wenn wir dies tun, ermöglicht CCAM (Cooperative, Connected and Automated Mobility, kooperative, vernetzte und automatisierte Mobilität) eine nutzerzentrierte, allumfassende Mobilität, die gleichzeitig die Sicherheit erhöht, Staus reduziert und zur Dekarbonisierung beiträgt.

CCAM wird auch die Bereitstellung neuer Mobilitätsdienste für Personen und Güter ermöglichen, was den Nutzer:innen und dem Mobilitätssystem insgesamt zugutekommen wird. Aber auch dies wird nur dann möglich sein, wenn wir das gesamte Mobilitätssystem in Betracht ziehen.

In unserer Ländersitzung haben wir vier verschiedene Ansätze aus Österreich, Slowenien, Ungarn und der Tschechischen Republik gehört. Es ist großartig und erstaunlich zu sehen, was sich in den verschiedenen Ländern bereits etabliert hat. Was die Einführung betrifft, so waren sich alle Diskussionsteilnehmer:innen einig, dass eine bessere Zusammenarbeit über die Grenzen hinweg notwendig ist. Europa braucht mehr groß angelegte Tests, Demonstrationen und Pilotprojekte unter Einbeziehung aller relevanten Interessengruppen, um die Umsetzung zu unterstützen und Hindernisse zu beseitigen.

Dies gilt insbesondere für Level 4/Stufe 4 (Vorstufe zum autonomen Fahren, bei der das Fahrzeug den größten Teil seiner Fahrt selbstständig steuert), für On-Demand-Shuttles oder teleoperierte Fahrzeuge, aber auch für den Einsatz von ADAS-Funktionen (Advanced

Driver Assistance System, Fortschrittliches Fahrerassistenzsystem) wie ALKS (Automated Lane Keeping Systems, Automatisierte Spurhaltesysteme). Hier brauchen wir ein besseres Verständnis der Technologie und ihrer Auswirkungen, bevor wir über ihren Einsatz in der realen Welt diskutieren können.

Wir haben auch festgestellt, dass neue Formen der Zusammenarbeit und Kooperation notwendig sind, wie z. B. Allianzen, die alle verschiedenen Interessengruppen einbeziehen, von der Infrastruktur bis hin zu Automobilherstellern, Betreibern, Behörden und so weiter. Dies könnte der Schlüssel für die Einführung auf nationaler Ebene sein, wird aber auch die Zusammenarbeit auf europäischer Ebene fördern, wie z. B. im Rahmen des CCAM (ccam.eu).

Es gibt jedoch noch Lücken und Hürden zu überwinden, die weitere Forschungsaktivitäten erfordern. Hier haben wir von den großen Fortschritten bei der Zusammenarbeit zwischen der Infrastruktur und dem Fahrzeug nach dem CCAM-Konzept gehört. Auch wenn es eines Tages möglich sein wird, autonom zu fahren, wird in der Phase des gemischten Verkehrs eine Zusammenarbeit erforderlich sein, um unser Verkehrsmanagementsystem zu verbessern. Hier haben wir Präsentationen gesehen, die sich auf das Fahrzeug, die Infrastruktur und den Menschen konzentrieren. Wir hörten von ganzheitlichen Lösungen zur Unterstützung und zum Betrieb autonomer Fahrzeuge in Zusammenarbeit mit Infrastrukturelementen, von aktuellen Herausforderungen und Möglichkeiten von Test- und Verifikationsmethoden in automatisierten Fahrsystemen und von Aspekten, die sich mit Mensch-Maschine-Interaktionen unter schwierigen Bedingungen befassen.

Am Nachmittag hatten wir die Gelegenheit, verschiedene Demonstrationen und die Testumgebung von Digitrans zu sehen. Es war sehr beeindruckend, die Vorführungen zu sehen und mit den Experten in Kontakt zu kommen und Details über die Aktivitäten in den Projekten zu erfahren. Vor allem wurde der Bedarf an Testumgebungen deutlich.

Wir haben gesehen:

- Demonstrationen zu digitalen Zwillingen und ultrahochauflösenden Karten – Joanneum Research
- teleoperierte Fahrzeuge, die auf dem ZalaZONE-Testgelände in Ungarn eingesetzt wurden –TU Budapest
- Leistungstests von Wahrnehmungssensoren bei unterschiedlichen Regenintensitäten in der einzigartigen Regenanlage im Freien – Digitrans und TU Graz

- ADAS-Tests im städtischen Umfeld mit Schwerpunkt auf den Tests des Notbremsassistenten (Euro NCAP) – Alp.Lab
- Automatisiertes Fahren im Praxistest und die dazugehörigen technischen Details hinter diesem System – Virtual Vehicle
- Dynamic Ground Truth System™ für hochgenaue Umweltmessungen – AVL

Die Automatisierung wird kommen, aber sie wird unser Gesamtsystem nicht automatisch verbessern. Deshalb müssen wir herausfinden, wie sie eingesetzt werden kann und unter welchen Bedingungen sie den größten Nutzen bringen könnte. Um diese Aufgabe zu lösen, brauchen wir Anstrengungen von allen Seiten und mit unterschiedlichen Ansätzen, wie wir sie heute gesehen haben.

Zu guter Letzt möchte wir uns bei allen Diskussionsteilnehmer:innen und Experten:innen für ihre Ideen und Demonstrationen und Ihnen, liebe Teilnehmer:innen, für Ihre Teilnahme an der Veranstaltung bedanken.

Programme

Wednesday, 19.04.2023

Valentinum

Valentinumplatz 1, 4300 St. Valentin



Thursday, 20.04.2023

Conference moderator:

Michael Nikowitz (Co-ordinator CCAM, Unit Intelligent Transport Systems & Digital Transformation, BMK)



Welcome and Opening speech:

Jaqueline Matijevic (Head of Unit III/4 Mobility and Transport Technologies, BMK)



Keynote Presentation

Future Mobility - Connected, Autonomous and Safe.

Speaker (Organisation): Mirko Taubenreuther (Senior Vice President of Automated Driving Functions, IAV)

The mobility of tomorrow will be shaped by automotive, intelligent infrastructure, networked functions and data services. Mirko Taubenreuther traces the path from research to real implementation and provides insights into new technologies and current reference examples (e.g. autonomous shuttles / eVAN).



Country Reports

Austria

Jaqueline Matijevic

(Head of Unit III/4 Mobility and Transport Technologies, BMK)



Slovenia

Ulrich Zorin

(Director for International Projects, DARS Slovenia)



Hungary

Zsolt Szalay

(Head of Department Automotive Technologies, Budapest University of Technology and Economics / Head of Research and Innovation, ZalaZONE Hungary)



Czech Republic

Tereza Čížková

(Deputy Director for Autonomous Mobility and Research, Development and Innovation, Ministry of Transport Czech Republic)



Panel Discussion “Cross-border collaboration – How could we use different national perspectives and competences for a successful co-opetition on a European level?”

Moderator: Martin Russ (Managing Director, AustriaTech GmbH)



The panellists will give a short overview on current actions and measures in the context of automated mobility in Austria, Hungary, Slovenia and the Czech Republic and what the national focus in each country will be in the upcoming years. Starting from that, the panel discussion will widen this national focus and discuss common perspectives, European collaboration and the role of testing and validation.

Cross-border innovation and research

EUREKA Central System Project – Realizing a transport system for operation of autonomous vehicles in cooperation with road infrastructure

Speaker (Organisation): Viktor Tihanyi (Research Program Manager, BME Automated Drive Laboratory, Budapest University of Technology and Economics)

The Central System project is focusing on realizing a transport system using the highest-level state of the art technology to develop and demonstrate a holistic solution to support and operate autonomous vehicles in cooperation with infrastructure elements. The project targets to implement the system for testing purposes in the beginning, but should evolve for transport operation and control.



EUREKA Test.EPS – Testing & Verification of Automated Driving Systems: Current Developments and Future Outlook

Speaker (Organisation): Pamela Innerwinkler (Workpackage Lead Virtual Testing; Senior Researcher, Virtual Vehicle Research GmbH) and Jakob Reckenzaun (Project Coordinator; Senior Researcher, Virtual Vehicle Research GmbH)

This presentation will highlight the current challenges and opportunities of testing and verification methods in automated driving systems and provide an overview of the current developments. Attendees will gain valuable knowledge about the EUREKA Test.EPS project, products and services expected to emerge from research conducted within the project. The speakers will conclude with insights into emerging trends, potential needs for the AUT-HUN-SVN region and an outlook in this field.



i-DREAMS – An overview of Safety Tolerance Zone for driver-vehicle-environment interactions under challenging conditions

Speaker (Organisation): Matjaž Šraml (Vice-Dean for international and inter-university cooperation, Head of Chair for Traffic Traffic Engineering and Safety, Faculty of Civil Engineering, Transportation Engineering and Architecture, University of Maribor)

i-DREAMS is a 3-year project funded by the European Union's H2020 research and innovation program, aiming at setting up a platform to define, develop, test and validate a 'Safety Tolerance Zone' to prevent drivers from getting too close to the boundaries of unsafe operation by mitigating risks in real-time and after the trip. After the definition, development and testing of the system, the project team is now assessing its outcomes which are turning into positive insights.



Afternoon Session

Digitrans Test Center – Proving Ground St. Valentin

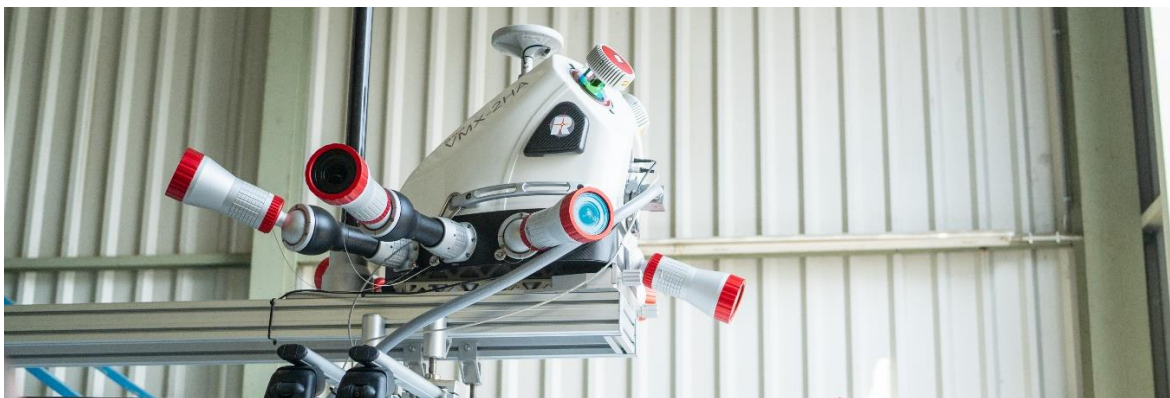
Use Case Demonstrations

1. Creating digital twins of proving grounds for simulation and testing of automated vehicles

Organisation(s) in charge: JOANNEUM RESEARCH Forschungsgesellschaft mbH., DIGITAL TWIN LAB

Location on the Proving Ground: Vehicle inspection building (C)

At the Trilateral Conference the DIGITAL TWIN LAB will exhibit its unique set of survey-grade 3D mapping vehicles, drones and wearable laser-scanning systems. It will be showcased how simulation-capable 3D digital twins and ultra-high-definition maps (UHDmaps®) of the Digitrans proving ground have been created and how digital twins are used for simulation and testing in the EUREKA projects Test.EPS and Central System funded by BMK.



2. Teleoperation from Digitrans to ZalaZONE using real time digital twin

Organisation(s) in charge: Budapest University of Technology and Economics

Location on the Proving Ground: Moving hall – external test rig (B)

The teleoperated vehicle is located at the ZalaZONE proving ground in Hungary. It operates in a virtual environment that is represented by a precise digital twin. The teleoperation is realized in a booth at the Digitrans proving ground and carried out by a remote human driver. A pedestrian dummy interferes with the vehicle's planned trajectory and the automated driving function reacts to it by an autonomous emergency braking maneuver.



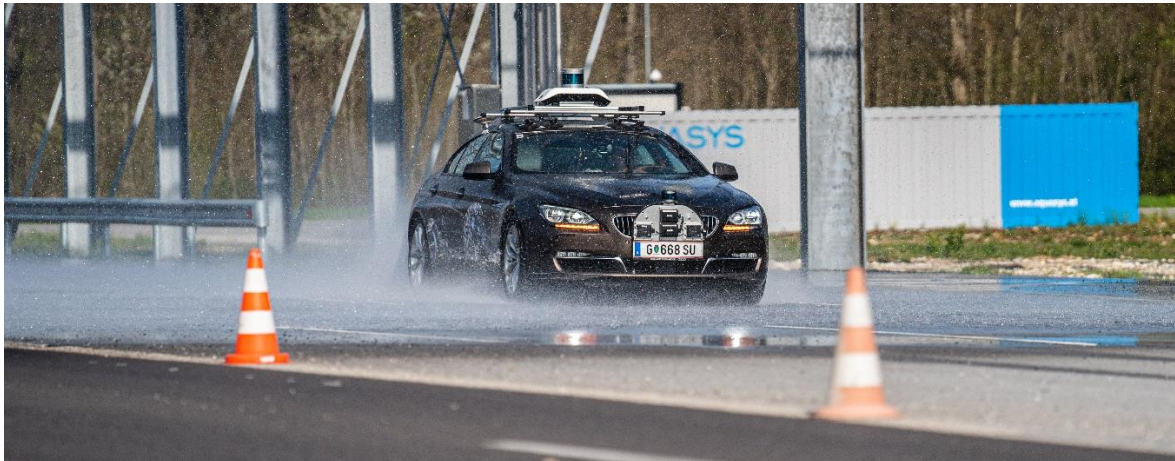
3. Performance tests of perception sensors at different rain intensities

Organisation(s) in charge: Graz University of Technology - Institute of Automotive Engineering / DigiTrans GmbH

Location on the Proving Ground: Outdoor Rain Plant (D)

The ego vehicle is equipped with automotive perception sensors (lidar, radar, camera) with open interfaces to retrieve raw data as well as processed object lists. A precise reference system is providing the ground truth for data post processing. Two driving maneuvers are carried out at different rain densities in the area of the DigiTans rain simulator:

1. Lane marking detection test
2. Cut-in maneuver using a moving target vehicle



4. ADAS Testing in Urban Environment: Testing of the Emergency Brake Assist (Euro NCAP)

Organisation(s) in charge: ALP.Lab GmbH

Location on the Proving Ground: City Zone (A)

ALP.Lab shows two scenarios from the Euro NCAP Active Safety catalog, which are used to test autonomous emergency braking functions. In the first scenario, a bicycle dummy controlled by a robotic platform is used. Hidden by a "parked car", it drives directly in front of the approaching test vehicle. In the second test, it is a child dummy. In both cases, the test vehicle is supposed to recognize the crossing person, brake in time and prevent an accident!



5. Experience Automated Driving

Organisation(s) in charge: Virtual Vehicle Research GmbH

Location on the Proving Ground: Round about (E)

Short description: Join the demonstration to witness the latest advancements of our automated drive demonstrator vehicles (ADD). Our ADD uses sensors, cameras, UHD[®] maps and advanced algorithms to navigate challenging environments and provide a comfortable, stress-free ride. During the demonstration, we will discuss the technical details behind our system, showcase testing and evaluation results and highlight challenges and lessons learned.



6. AVL's Dynamic Ground Truth System™ (DGT)

Organisation(s) in charge: AVL List GmbH

Location on the Proving Ground: Parking space near the office building (F)

One of the key elements on the path to homologation for ADAS / AD vehicles is the independent evaluation of the vehicle under test with a reliable and stable reference system in real-world traffic. The Dynamic Ground Truth (DGT) system in combination with the AAP (ADAS/AD Analytics Platform) from AVL is the data collection and analysis toolchain used in the automotive industry to validate and verify vehicle behavior in real-world scenarios on public road.



Exhibition Valentinum

The test regions for automated driving in Austria - DigiTrans and ALP.Lab – displayed their test vehicles from 19th to 20th of April at the forecourt of the Valentinum event location.

Automated test vehicle DigiTrans eVAN

Organisation(s) in charge: DigiTrans GmbH

Location: Forecourt of the Valentinum event location

A 100 % battery-electric VW e-Crafter is used as the base vehicle. The automated test vehicle is equipped with eight radar sensors, six LiDAR sensors, four cameras with 360° view and other sensors. The Vehicle has a state-of-the-art automation with dynamic path planning and a modular development platform with open interfaces. The vehicle can thus be optimally adapted to the respective test situation. It can be used as an automated passenger shuttle as well as for automated freight transport.



Image: © DigiTrans GmbH

Automated test vehicle DigiTrans dTRUCK

Organisation(s) in charge: DigiTrans GmbH

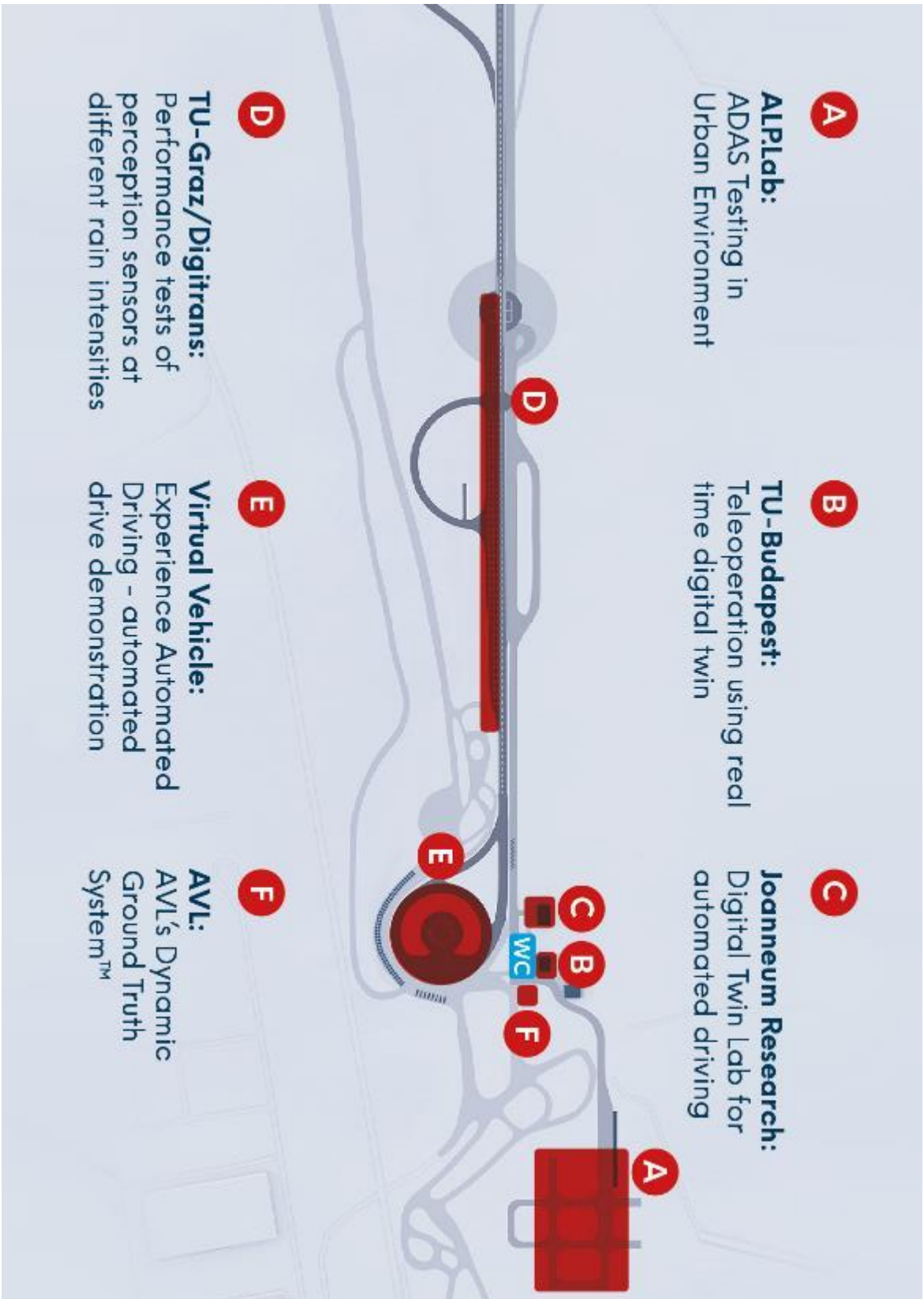
Location: Forecourt of the Valentinum event location

The Scania semi-trailer truck P410 is equipped with the most modern driving assistance systems (Level 2+), e.g. ACC / BSW / LKA / AEB / AICC. The test truck is to be equipped in further steps with an electric control system (Drive by Wire) and a "Drive Pilot" with safety layer. The additional systems will enable highly automated driving up to Level 3, both at the proving ground and on public roads. The test truck serves as an experimental and research platform for the further development of automated freight transport.



Image: © DigiTrans GmbH

Overview proving ground and Demo-Stations



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

Radetzkystraße 2, 1030 Vienna, Austria

+43 (0) 800 21 53 59

servicebuero@bmk.gv.at

bmk.gv.at