HERAUSFORDERUNG LEVEL 3. WAS KANN C-ITS-KOMMUNIKATION ZUR VERKEHRSSICHERHEIT BEITRAGEN?

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ASFINAG MAUT SERVICE GMBH

AUTOMATISIERTES FAHREN: REALITÄT UND POTENZIAL

WKÖ, WIEN, 02.12.2022

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GUTE FAHRT, ÖSTERREICH!

AGENDA

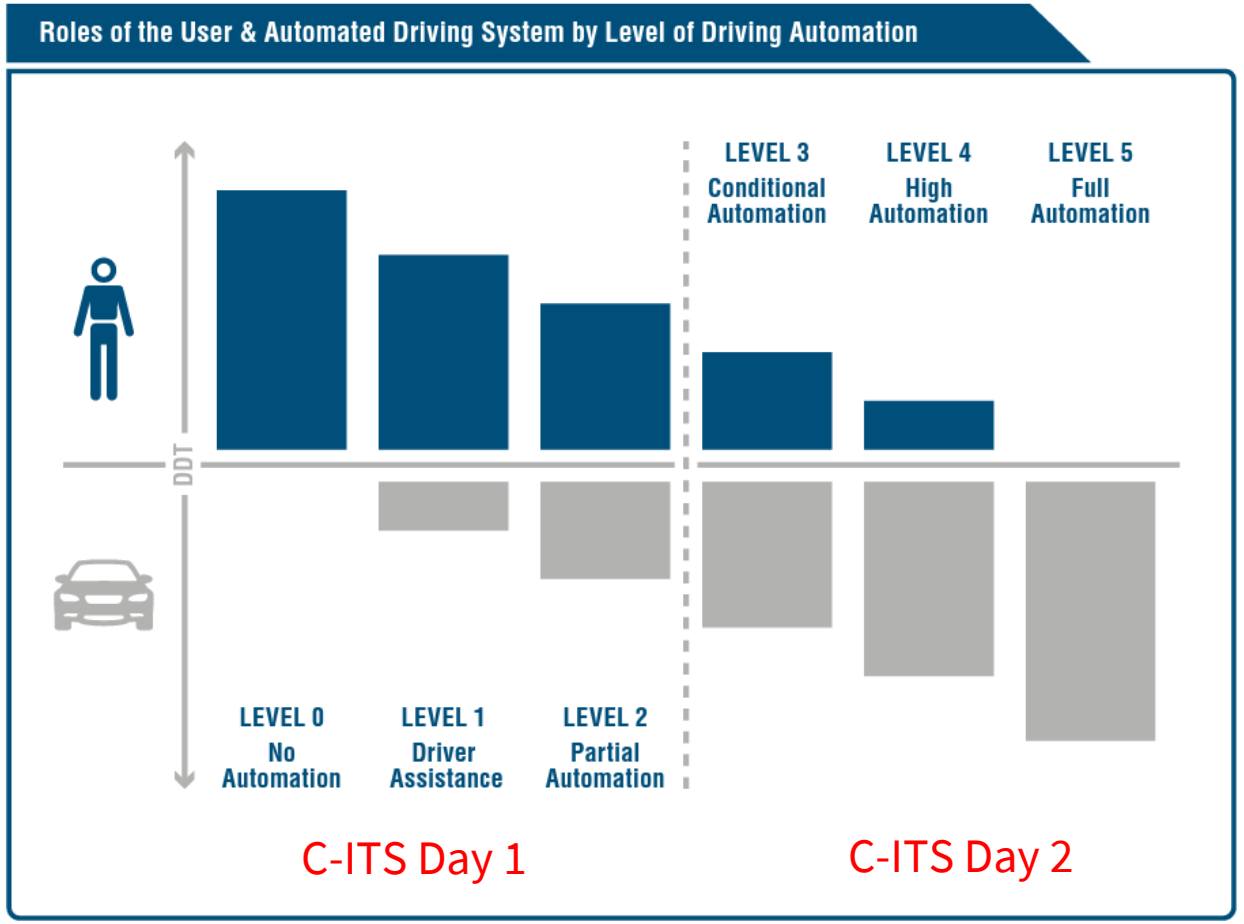
1. Herausforderungen des automatisierten Fahrens
   - Fahrerübernahme
   - Automatisierte Fahrzeuge Level 3
   - Mensch-Machine Schnittstelle

2. Die Rolle der Infrastruktur
   - Zunehmende Automatisierung im Straßenverkehr: Vom Mensch hin zur Maschine
   - Verkehrssicherheit durch Vernetzung
   - C-ITS Anwendungsfälle: Gegenwart und Zukunft

3. Ein Blick in die Zukunft
   - ECO-System des Automatisierten Fahrens
   - Standardisierung
   - ISAD Services

VOM MENSCH HIN ZUR MASCHINE

- Mit zunehmender Automatisierung verschiebt sich die Verantwortung vom Fahrer zum Fahrzeug
- Damit verschieben sich auch die Anforderungen an die zur Verfügung gestellten Informationen: von Mitteilungen für die Fahrer (C-ITS Day 1) hin zu Daten für automatisierte Fahrzeuge (C-ITS Day 2)
- **Die Infrastruktur spielt hierbei eine zentrale Rolle und entwickelt sich stetig weiter**



https://www.mercedes-benz.com/content/dam/brandhub/innovation/safety-first-for-automated-driving/safety-first-for-automated-driving-withepaper_en.pdf

UNECE (/)

UNECE (/) **TRANSPORT (/TRANSPORT)**

UN Regulation on Automated Lane Keeping Systems is milestone for safe introduction of automated vehicles in traffic

Transport Autonomous Driving Intelligent Transport Systems Vehicle Regulations

24 June 2020

Some 60 countries have reached a milestone in mobility with the adoption of a United Nations Regulation that will allow for the safe introduction of automated vehicles in certain traffic environments.

The UN Regulation establishes strict requirements for Automated Lane Keeping Systems (ALKS) for passenger cars which, once activated, are in primary control of the vehicle. However, the driver can override such systems and can be requested by the system to intervene, at any moment.

Adopted yesterday by UNECE's World Forum for Harmonization of Vehicle Regulations, this is the first binding international regulation on so-called "level 3" (/DAM/Corrected_5_Levels_of_Driving_Automation.pdf) vehicle automation. The new Regulation therefore marks an important step towards the wider deployment of automated vehicles to help realize a vision of safer, more sustainable mobility for all. It will enter into force in January 2021.

ALKS can be activated under certain conditions on roads where pedestrians and cyclists are prohibited and which, by design, are equipped with a physical separation that divides the traffic moving in opposite directions. In its current form, the Regulation limits the operational speed of ALKS systems to a maximum of 60 km/h.

UN.ECE Transport Regulation Nr. 157

Some Facts:

- ALKS … Automated Lane Keeping Systems
- Level 3 Automated Vehicles
- Activation "under certain conditions"
- Separated carriageways
- No cyclists and pedestrians
- Limit of operational speed: 60 km/h
- Adoption: 23.06.2020
- Enter into Force: January 2021

UNECE (/)

UNECE (/) **PRESS RELEASES (/INFO/MEDIA/PRESS_RELEASES)**

UN Regulation extends automated driving up to 130 km/h in certain conditions

Sustainable Development Transport SDGs Autonomous Driving Vehicle Regulations Road Safety

22 June 2022

A new milestone in mobility has been reached with the adoption of a proposal to extend automated driving in certain traffic environments from the current limit of 60 km/h to up to 130 km/h.

The amendment (https://unece.org/sites/default/files/2022-05/ECE-TRANS-WP.29-2022-59r1e.pdf) to UN Regulation No. 157 adopted today by the World Forum for Harmonization of Vehicle Regulations extends the maximum speed for Automated Driving System (ADS) for passenger cars and light duty vehicles up to 130 km/h on motorways, and allows automated lane changes, among other dispositions. It will enter into force in January 2023 in those contracting parties (https://treaties.un.org/Pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XI-B-16-157&chapter=11&clang=_en) which decide to apply it.

Safety remains at the core of automation developments

The amendment, developed by the Working Party on Automated/Autonomous and Connected Vehicles (GRVA), builds on the experience in various countries following the adoption of the UN Regulation on Automated Lane Keeping Systems (ALKS) (https://unece.org/fileadmin/DAM/trans/main/wp29/wp29resolutions/ECE-TRANS-WP29-1140e.pdf) , the first binding international regulation on so-called "level 3" vehicle automation, in June 2020.

UN.ECE Transport Regulation Nr. 157 Amendment

Some Facts:

- Still: ALKS, but in addition automated lane changes allowed
- Still: Level 3 Automated Vehicles
- Still: Activation "under certain conditions"
- Still: Separated carriageways
- Still: No cyclists and pedestrians
- Limit of operational speed: 130 km/h
- Adoption: 22.06.2022
- Enter into Force: January 2023

CEDR
Conférence Européenne des Directeurs des Routes
Conference of European Directors of Roads

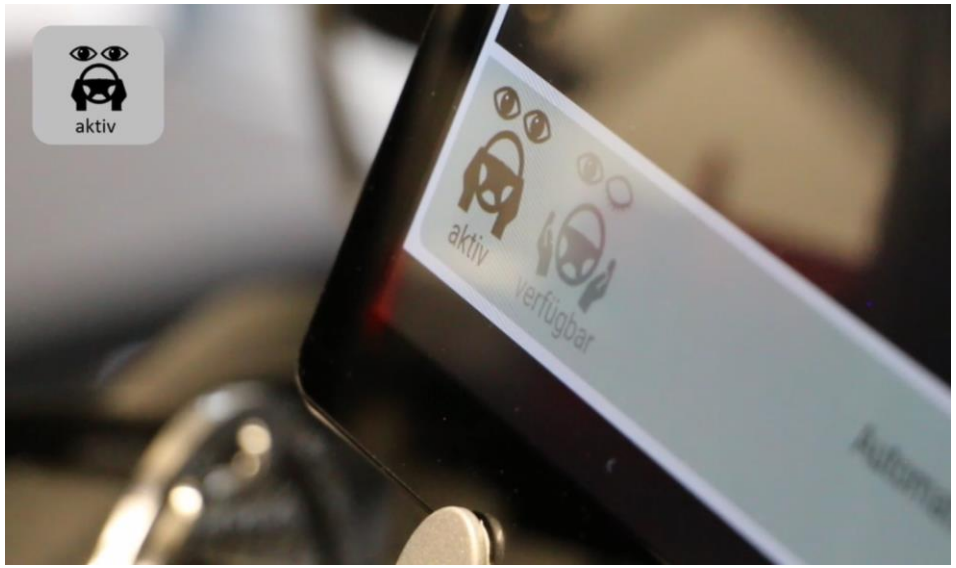
ROAD OPERATOR'S CONCERNS ABOUT ALKS

- **Level 3/partial automation:** This requires very clear agreements on humans as a fallback option (especially for unplanned takeovers)
- **Unplanned Transition of Control (ToC):** It is currently unclear how manufacturers will deal with an unplanned takeover from system to human
- **Minimal Risk Condition (MRC) / Minimal Risk Maneuver (MRM):** It is currently unclear what these two will look like in real life. However: a full stop in lane in running traffic is undesirable
- **Geofencing of ODD:** The vehicle will need to be able to judge whether it is inside or exiting the ODD. At present, it is still unclear how manufacturers will monitor this, what information this will require, and whether they will be able to limit the availability of the system based on geographic location
- **Sensor horizon (forward detection range):** at higher speeds (up to 130 km/h), it become crucial that the system can anticipate the conditions and pro-actively act appropriately or transfer control in time

HERAUSFORDERUNGEN FÜR AUTOMATISIERTES FAHREN

FAHRERÜBERNAHME

Manuelles fahren



SAE level 3 fahren

- Beim automatisierten Fahren Level 3 steht der Mensch im Mittelpunkt
- Technische Lösungen müssen menschliche/psychologische Komponenten berücksichtigen
- Fahrerübernahme muss angenehm für den Fahrer „designed“ werden

HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

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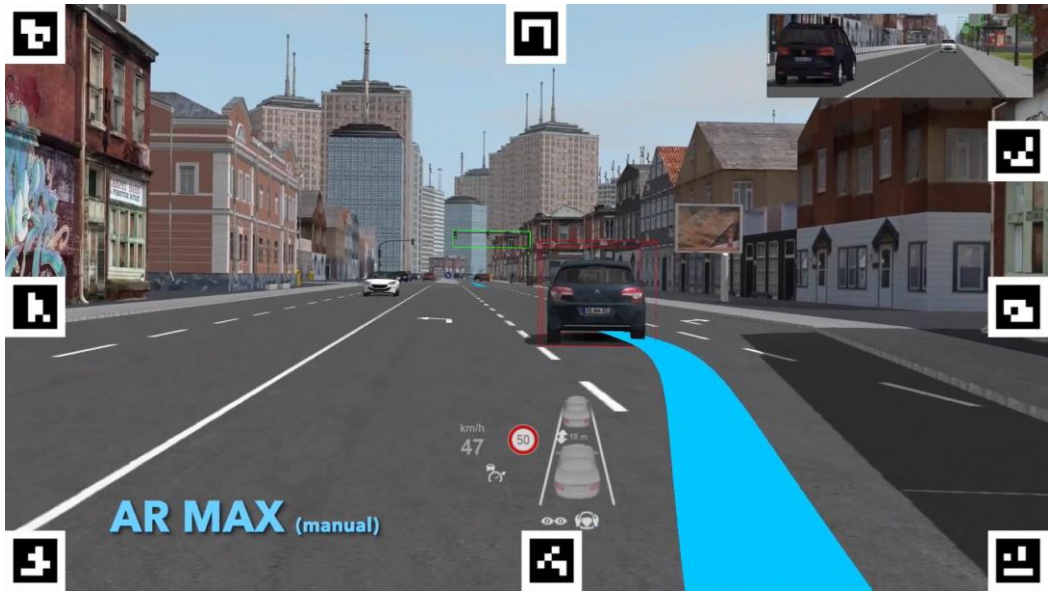
HERAUSFORDERUNGEN FÜR AUTOMATISIERTES FAHREN

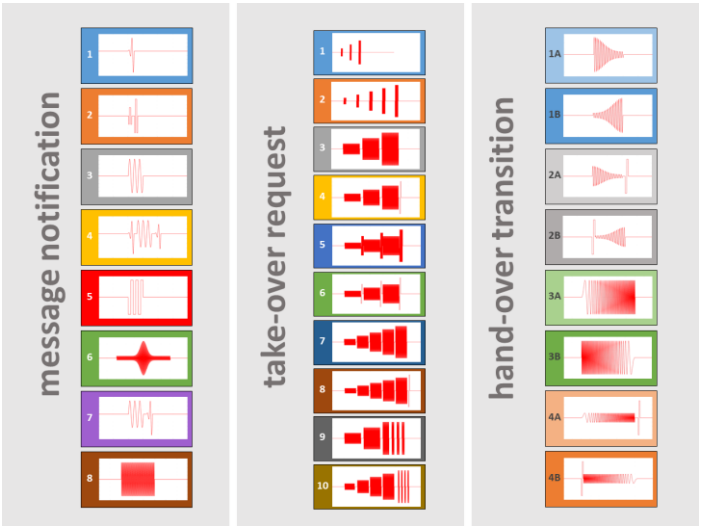
MENSCH MASCHINE SCHNITTSTELLE

- HMI müssen intuitiv sein und die benötigte Information eindeutig übermitteln können

Farbkodierung von AD SAE Levels



Augmented Reality Heads-up Display



Lenkrad mit Haptic Feedback

HADRIAN
Holistic Approach for Driver Role Integration and Automation Allocation for European Mobility Needs

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VERKEHRSSICHERHEIT DURCH VERNETZUNG

PHYSIKALISCHE UND DIGITALE INFRASTRUKTUR

Wenn der Mensch abgelenkt ist oder die Steuerung an das Fahrzeug abgibt bzw. wieder die Steuerung übernehmen soll, müssen die erforderlichen Informationen direkt und sicher in das Fahrzeug kommen!

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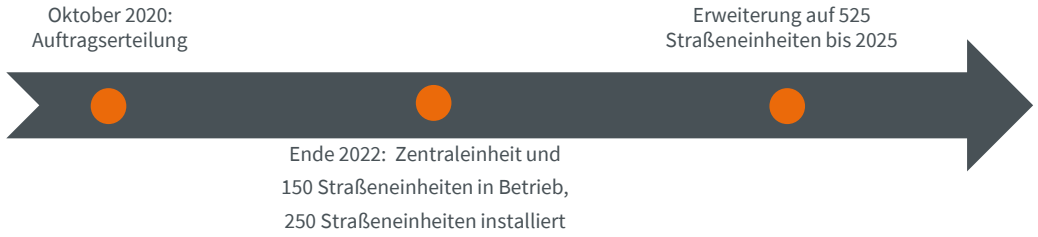
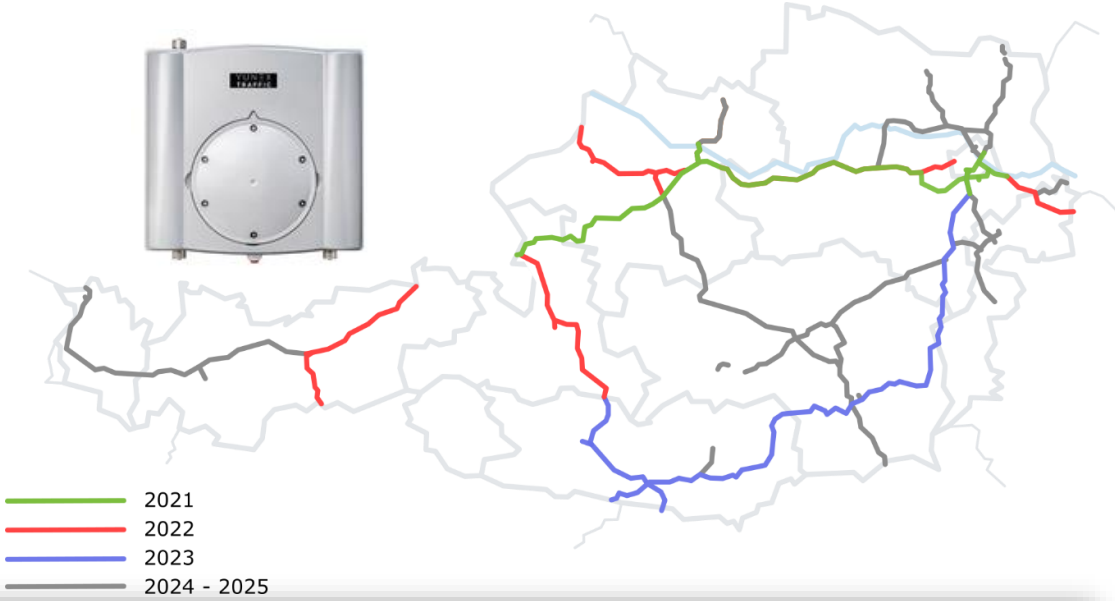
ASFINAG IST DER ERSTE AUTOBAHNBETREIBER IN EUROPA, DER FLÄCHENDECKEND C-ITS AUSROLLT

1. Stationäre Straßeneinheiten

- Errichtung von 525 C-ITS Einheiten auf 2.250 km Straßennetz
- Im Schnitt eine Einheit alle 4km





2. Mobile Warnanhänger

- „Intelligent Mobile Information Systems“ (IMIS), die Video, Radar, Reisezeiterfassung und C-ITS beinhalten
- Die Anhänger sind bereits in ganz Österreich in Betrieb

3. Fahrzeugeinheiten in den Betriebsfahrzuege

- Ausstattung der ASFINAG Betriebsfahrzeuge (Mautaufsicht, Traffic Manager, Streckendienst) mit C-ITS
- 16 Fahrzeuge bis Ende 2022, 100 Fahrzeuge bis 2025

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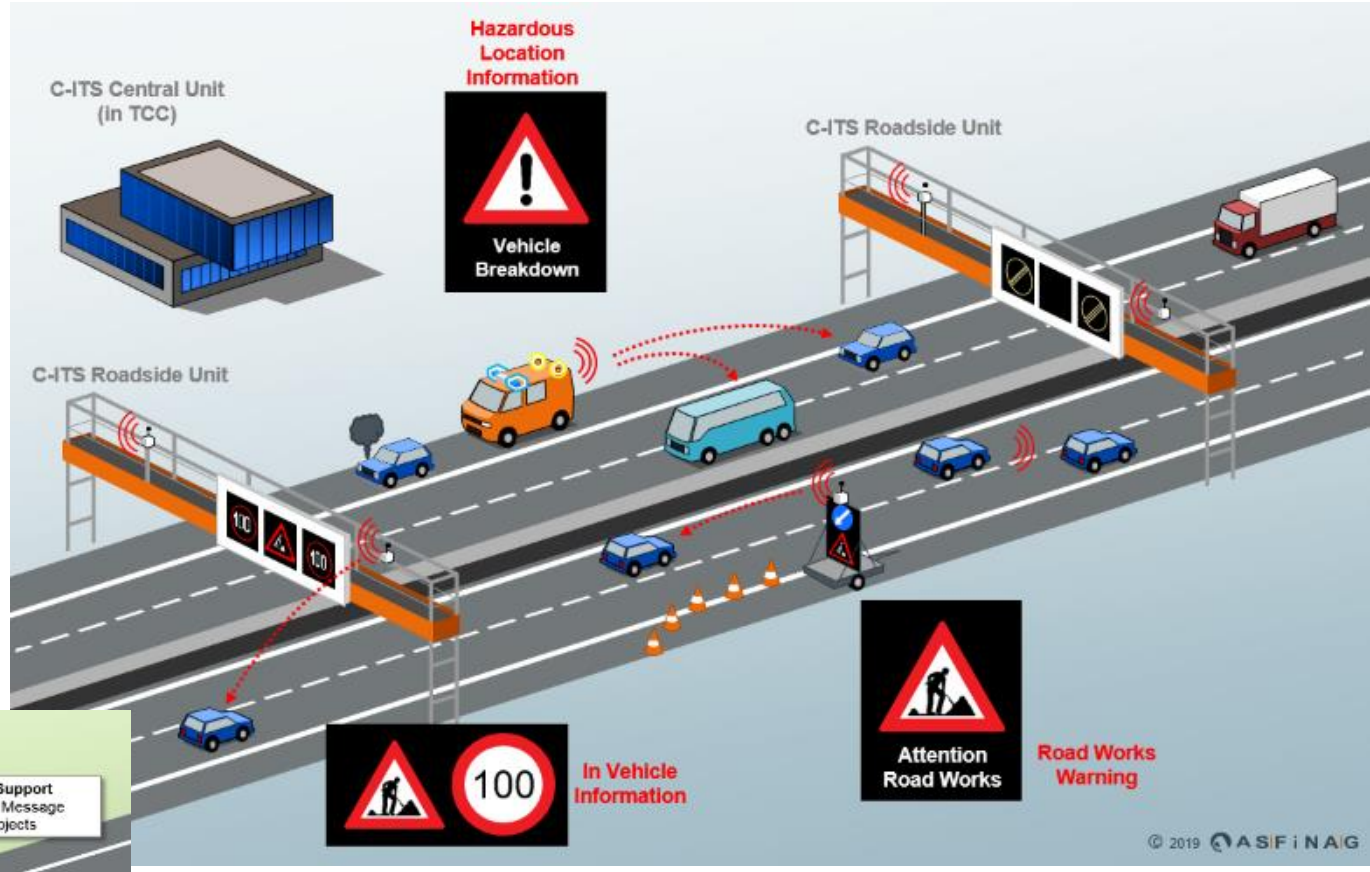
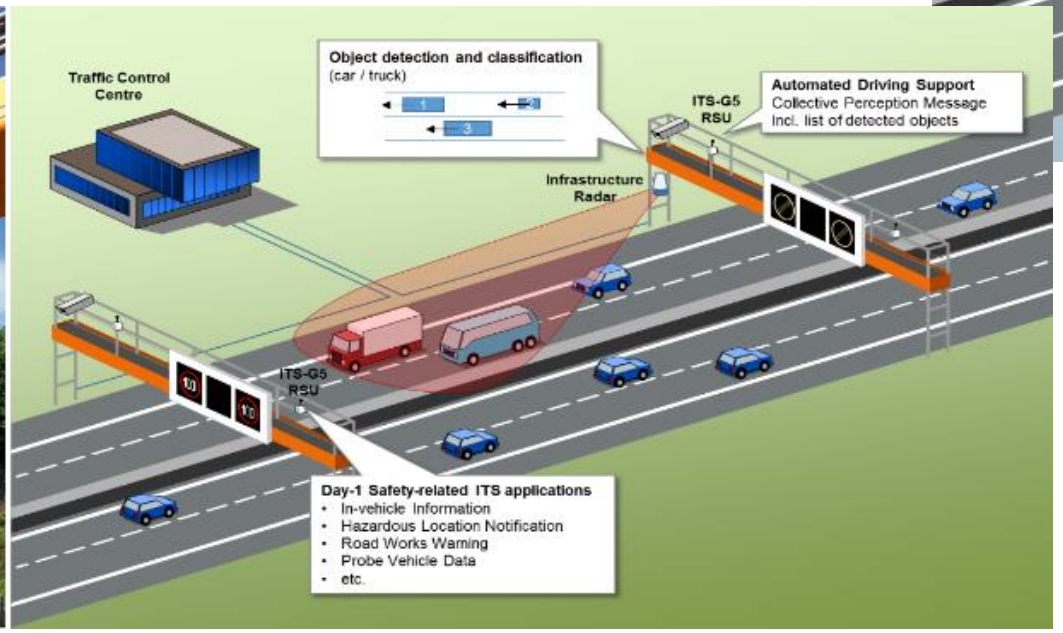
C-ITS SERVICES IN ÖSTERREICH

“Day 1” Services ab 2022

- Focus: “Safety Services”
- Roadworks Warning (RWW)
- Hazardous Location Notification (HLN)
- In-Vehicle Signage (IVS)





“Day 2” Services ab 2024 / 2025

- Focus: “Infrastructure Supported Automated Driving”
- Automated Vehicle Guidance (AVG)
- Collective Perception Service (CPS)

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C-ITS Services aus Fahrzeugsicht

1 RSUs

2 Trailer

3 Fahrzeuge

Traffic jam – dangerous end of queue

Safety System Active

Accident

Broken-Down Vehicle

Stationary Vehicle

Work Zone

Stationary Emergency Vehicle

Dynamic Emergency Vehicle

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C-ITS ANWENDUNGSFÄLLE „DAY 1“

C-ITS Day 1 Services können bereits in Serienfahrzeugen genutzt werden!

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DIE ROLLE DER INFRASTRUKTUR

C-ITS ANWENDUNGSFÄLLE „DAY 2“

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DIE ROLLE DER INFRASTRUKTUR

ERWEITERUNG DES „ELEKTONISCHEN HORIZONTS“ DER FAHRZEUGE

A|S|F|i|N|A|G

ASFINAG as a Reliable Partner for AD

ASFINAG enables connected automated vehicles **safe entry and passing** of the numerous **tunnels** on the Austrian motorway network

ASFINAG enables connected automated vehicles **safe and timely driving decisions in case of accidents** and incidents on motorways

ASFINAG enables connected automated vehicles **safe and easy access/exit on motorways**

ASFINAG enables connected automated vehicles a **safe journey and timely driving decisions through roadworks on motorways**

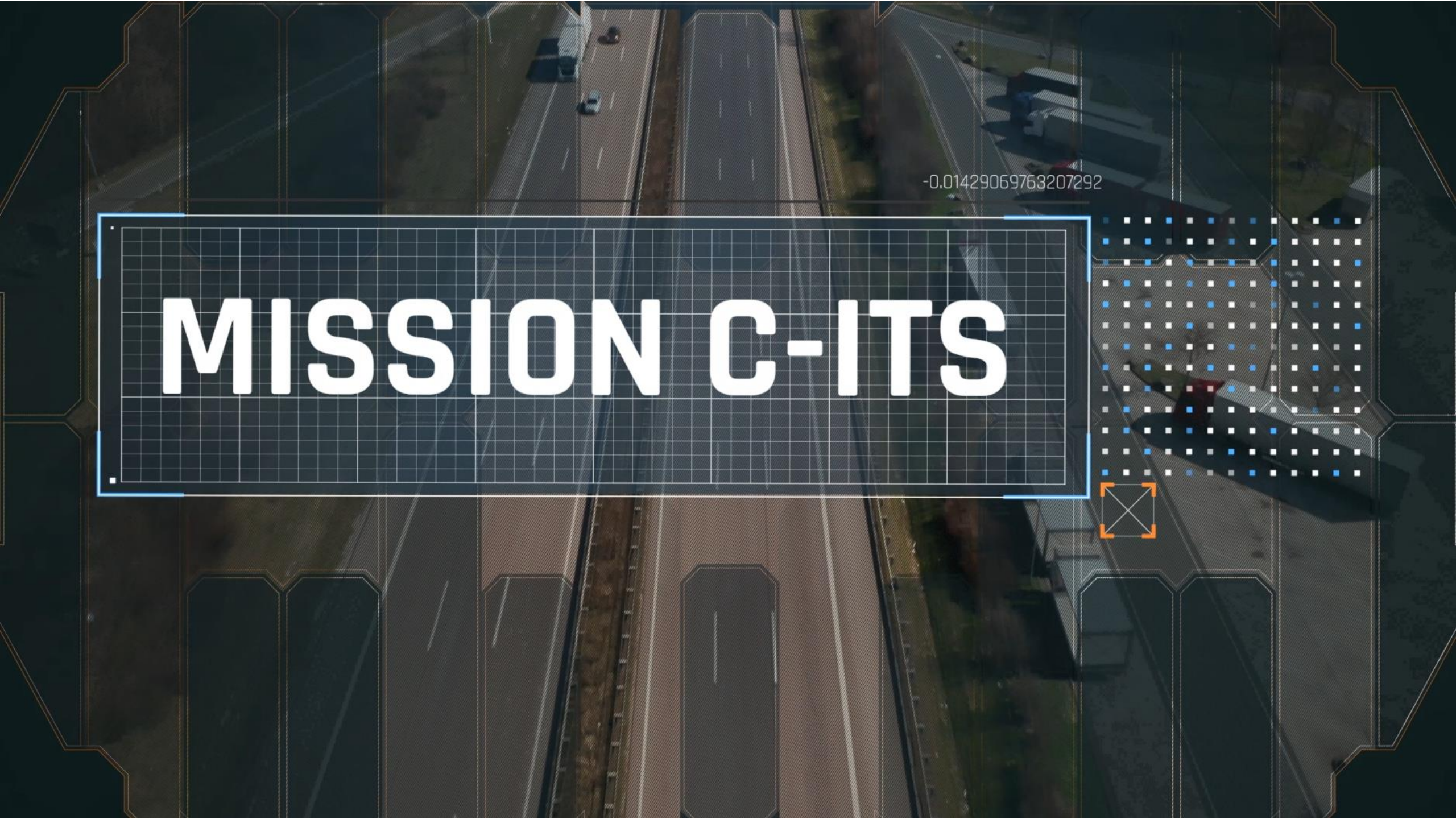
LOS ANGELES
ITS WORLD CONGRESS 2022

In Partnership With:

ITS AMERICA ERTICO ITS EUROPE ASIA-PACIFIC ITS

Built By:

RX In the business of building businesses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MISSION C-ITS

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