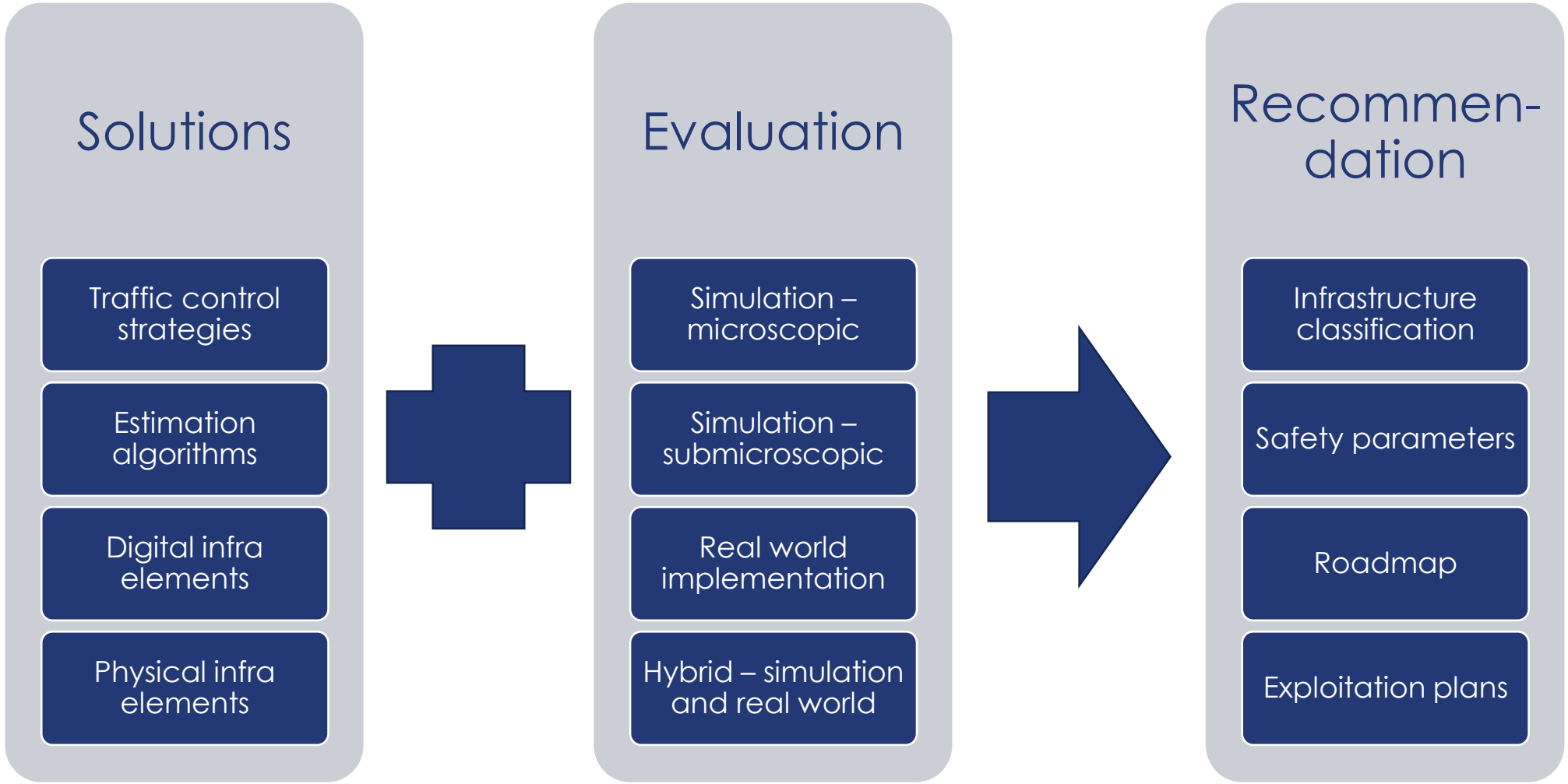
INFRAMIX

# INFRAMIX Press-Conference

Martin Russ / AustriaTech

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723016.

# INFRAMIX in a Nutshell



# INFRAMIX key achievements

- Focus on **3 motorway scenarios** (bottlenecks, workzone, lane assignment)
- Infrastructure **improves efficiency and safety in mixed traffic** environments
  - New traffic control strategies
  - New evaluation toolset (microcopic, sub-microscopic, hybrid – combination of simulation and real world)
- **New Infrastructure elements** tested
  - new (C-)ITS messages,
  - link between TMCs and TSPs,
  - new physical signs
- Infrastructure support (**ISAD) classes** have been defined
- **roadmap** for the next 10 years ahead….

# The future Role of Infrastructure

- **INFRAMIX** = one of many infrastructure related projects dealing with **"automation readiness"**
- Key platforms working on **future infra perspectives** – CEDR, ERTRAC, IRF/ERF, ASECAP, EU-EIP, ITF/OECD, Trilateral WG EU-US-JAP, CCAM Platform …on topics like:
  - Physical and digital elements
  - Data quality
  - HD maps & location referencing
  - Specific scenarios: workzones, merging, handovers,…
  - Cooperative driving & Communication infrastructures
  - Legal requirements and digital road codes
  - A future „systems approach" defining roles of users, vehicles and infrastructure
  - New mobility services (fleet operations) and new infra functionalities
  - …..

→ **Infrastructure as a key question and domain for future research initiatives!!!**

# Next steps

- More **Flexibility** – different situations lead to different requirements
  - *„practical" link to ODDs - Operational Design Domains*
  - *Which (minimum) elements could be combined to obtain the desired functionalities?*
  - *Data needs (maps, positioning, ...) & redundancy of elements/sensors*
- Wider perspective on **impacts & evidence**
  - *„Co-benefits", e.g. Environmental, service-orientation, network effects*
  - *Evaluate related costs & benefits*
- Integrate **legal framework**
  - *Mandatory information/advice?*
  - *Quality & trust*
- **User perspective**: further feedback on user experience – does guidance work?
- **COLLABORATION** (OEMs & Service Providers) & **„vehicle integration"**

→ **Start implementing „no regret measures"** *(along a common Vision & Strategy)*

INFRAMIX

**Martin Russ**

austriatech

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723016.

INFRAMIX

# INFRAMIX
# Press conference

**Dr. Panagiotis Lytrivis / ICCS**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723016.

# Introduction

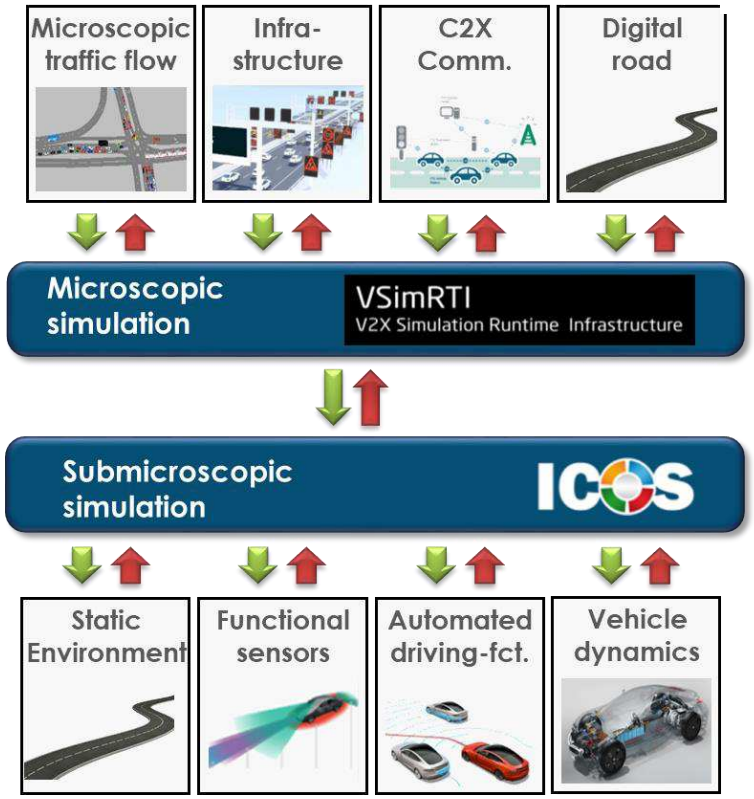
- INFRAMIX implemented **significant innovations** in the area or **road infrastructure** and how this infrastructure can **support** the gradual insertion of **automated vehicles** in existing traffic.

- The introduction of **AVs** is expected to **disrupt** existing traffic so it is important at the beginning of the transition period to focus on **maintaining at least** conventional traffic's **safety** and **efficiency**.

- In the longer term the target is to **enhance safety**, traffic **efficiency** and **comfort**.

# Communication, road signs, simulation

- The project implemented the latest C-ITS **communication** standards, working closely with **standardization** working groups.
- The project surveyed the road signs to see if they cover the needs of the co-existence of conventional and automated vehicles and **proposed a new traffic sign** for indicating the lane dedicated to automated vehicles (AVs).
- Advanced **simulation** tools were implemented:
  - A **co-simulation environment** coupling **microscopic** with **sub-microscopic** simulation
  - **Hybrid testing:** use of a real autonomous vehicle coupled with **virtual mixed-traffic**, giving us the opportunity to emulate critical virtual traffic situations in a **safe testing environment** with the **real hardware**



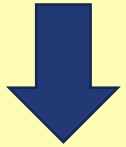
# Traffic control


- **Speed recommendations** had positive impact in terms of safety
- **Time gap adaptions** showed in some scenarios even up to 50% enhancement in traffic efficiency
- The **lane change recommendations** usually led to **under-utilization** of road capacity and created **riskier** traffic situations
- Variable speed limit could **dissolve congestion at bottlenecks** and increase traffic efficiency in average by up to 14%, even with low penetration rate of connected and automated vehicles

Employing connected & automated vehicles will **gradually** result in **less infrastructure equipment** (VMS, spot sensors) leading also to **less costs** (incl. maintenance)

# Infrastructure classification scheme (ISAD)

"E": typical/conventional



"A": most advanced

This scheme will **support** and **guide** road operators and authorities to **target investments** to **support** higher levels of **AVs** especially for mixed traffic in the transition period

| | Level | Name | Description | Digital information provided to AVs | | | |
|---|---|---|---|---|---|---|---|
| | | | | Digital map with static road signs | VMS, warnings, incidents, weather | Microscopic traffic situation | Guidance: speed, gap, lane advice |
| Conventional infrastructure | E | Conventional infrastructure / no AV support | Conventional infrastructure without digital information. AVs need to recognise road geometry and road signs. | | | | |
| | D | Static digital information / Map support | Digital map data is available with static road signs. Map data could be complemented by physical reference points (landmarks signs). Traffic lights, short term road works and VMS need to be recognized by AVs. | X | | | |
| Digital infrastructure | C | Dynamic digital information | All dynamic and static infrastructure information is available in digital form and can be provided to AVs. | X | X | | |
| | B | Cooperative perception | Infrastructure is capable of perceiving microscopic traffic situations and providing this data to AVs in real-time. | X | X | X | |
| | A | Cooperative driving | Based on the real-time information on vehicle movements, the infrastructure is able to guide AVs (groups of vehicles or single vehicles) in order to optimize the overall traffic flow. | X | X | X | X |

# Users' appreciation

- Approximately **170 participants** from ITS stakeholders participated in relevant workshops and demonstrations.
- The majority of the participants believe that INFRAMIX developments will **bring positive changes** in traffic conditions (**safety** and **efficiency**) but they are unsure about the specific characteristics of this improvement.

Behavior change
Willingness to use
Perceived usability
> **70%**

INFRAMIX

# Thank you for your attention!

**Dr. Panagiotis Lytrivis**

**Senior Researcher, ICCS**

**panagiotis.lytrivis@iccs.gr**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723016.


ASFINAG
VERLÄSSLICHKEIT AUF ALLEN WEGEN.
INFRAMIX
A Road Operator's Perspective
Bernd Datler
INFRAMIX Press Conference
May 27, 2020


# ASFINAG operates rural & urban highways with various traffic situations

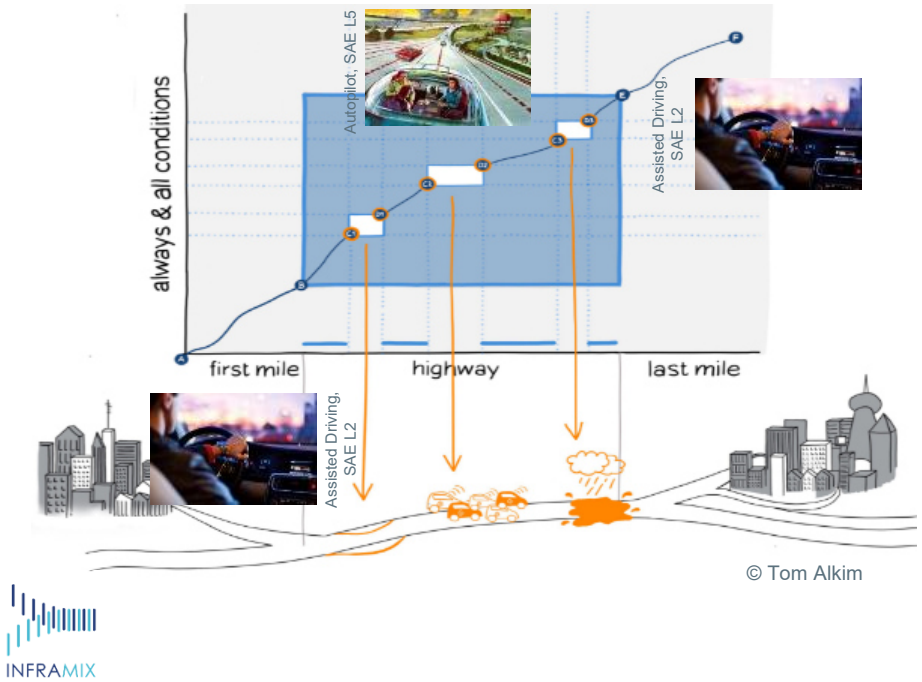
< 20,000 vehicles/day


> 200,000 vehicles/day

INFRAMIX

# Challenges to enable safe and reliable mixed traffic flow

## Operational Design Domains for Automated Driving

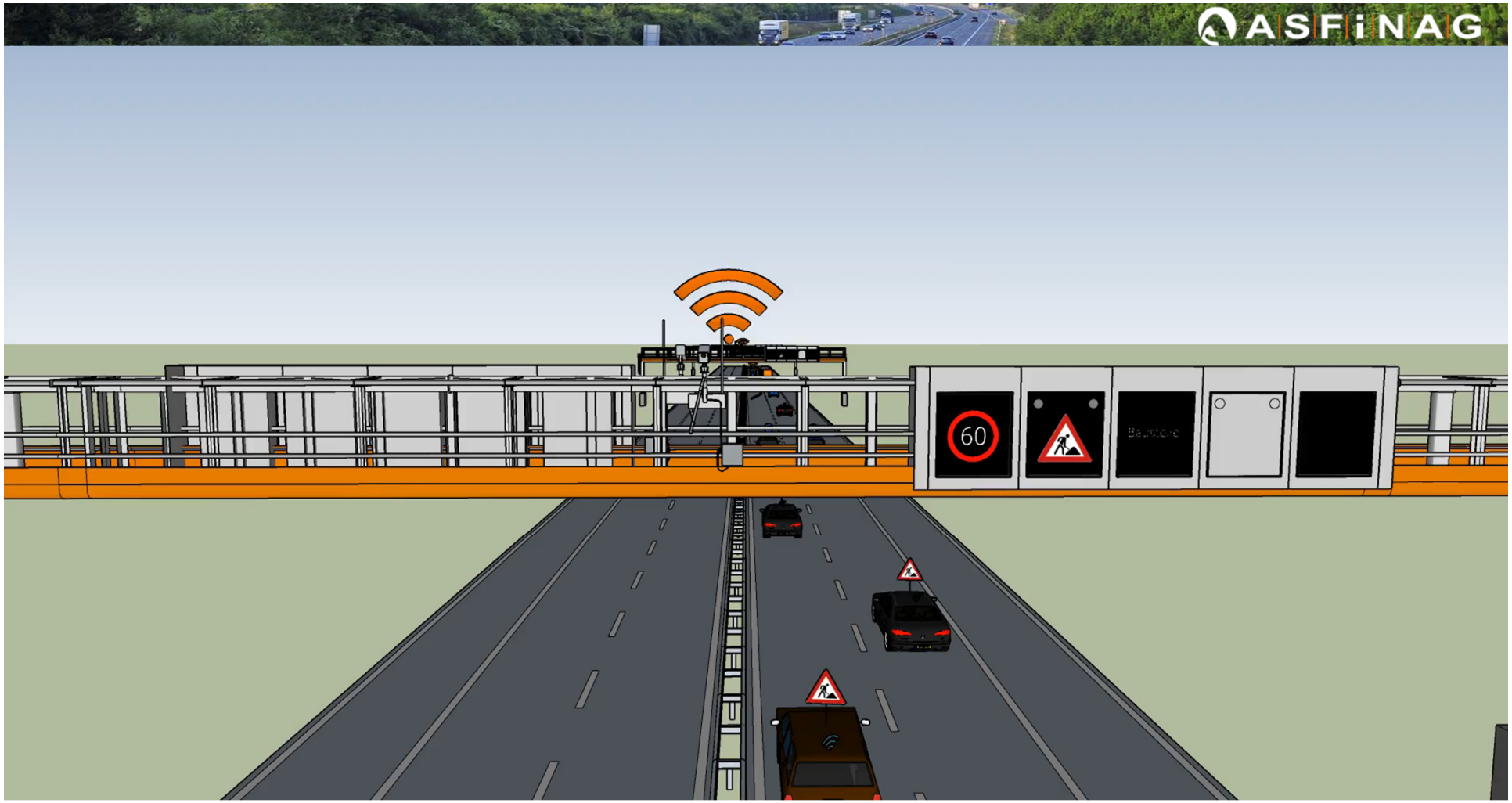



## Different traffic situations

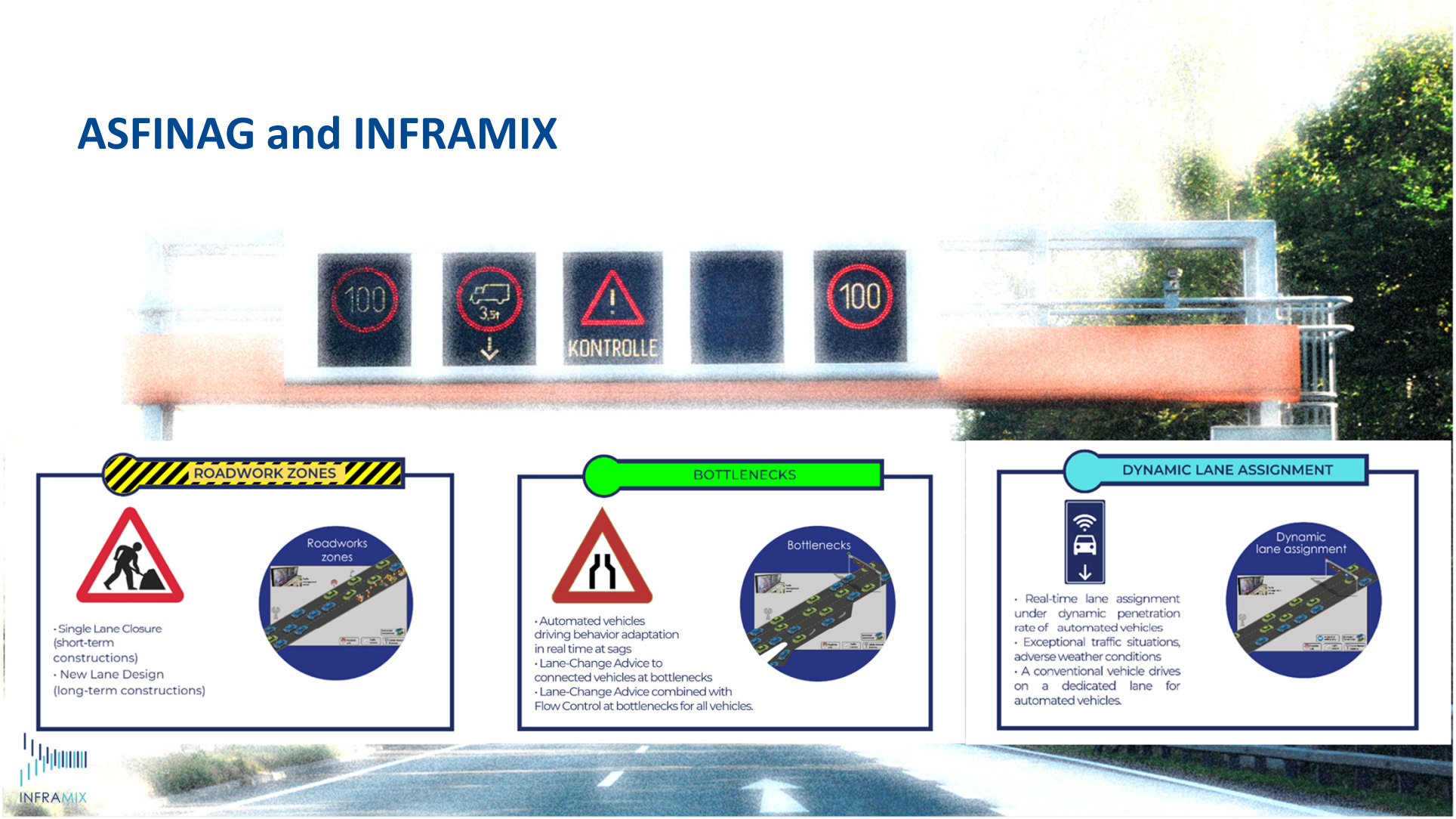
As long as ODD is fullfilled → AV can drive on its own

If ODD breaks down
→ Driver has to take over again -> potential negative effect on traffic flow

Number of ODD breakdowns (e.g. handovers) should be minimized

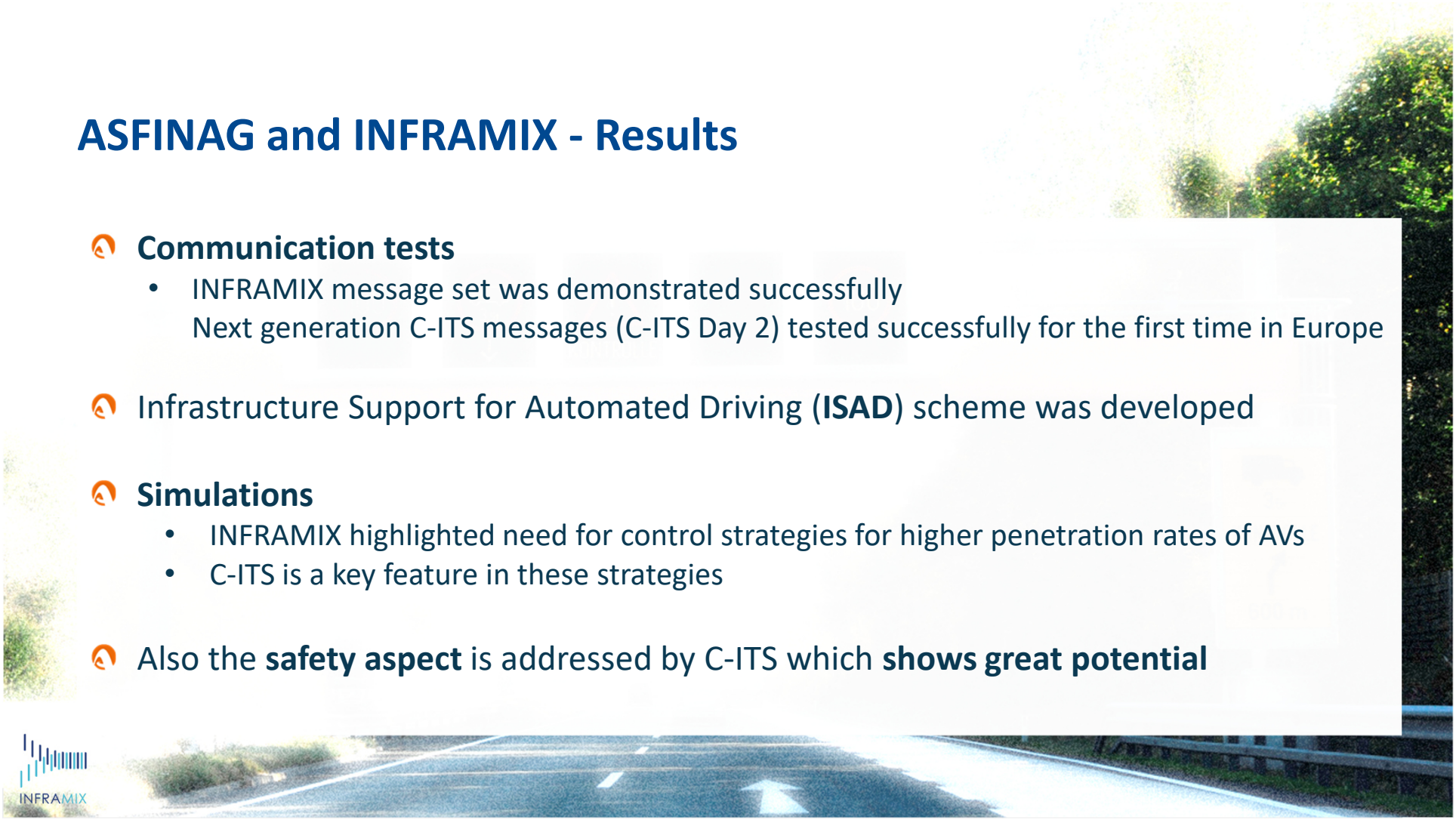

ASFiNAG
60

# ASFINAG and INFRAMIX



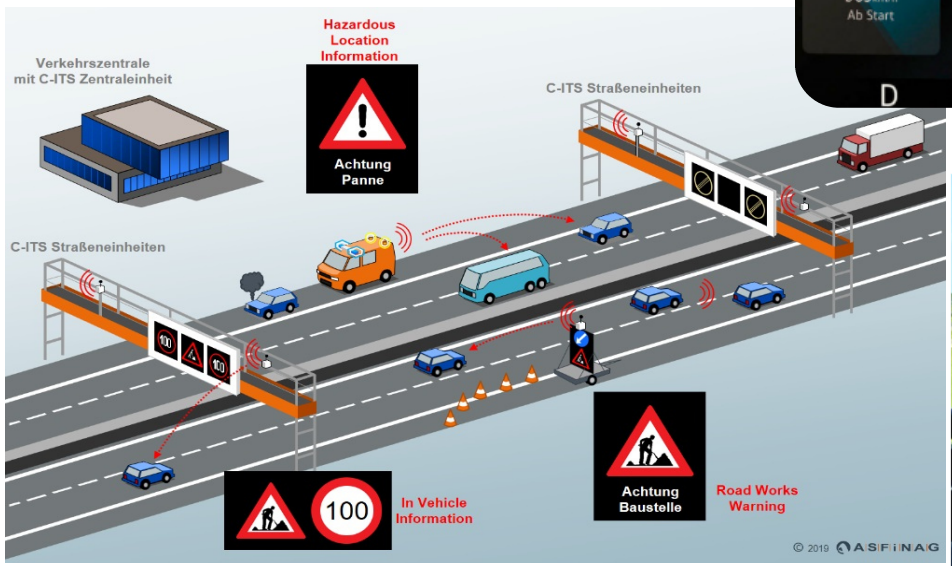
# ASFINAG and INFRAMIX - Results

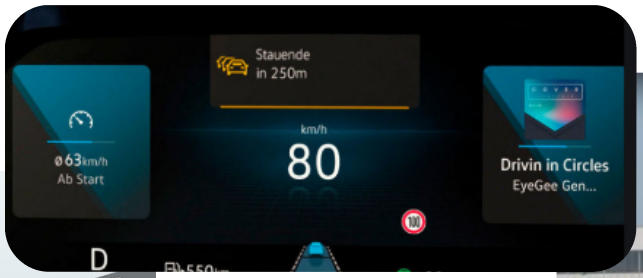
- **Communication tests**
  - INFRAMIX message set was demonstrated successfully
    Next generation C-ITS messages (C-ITS Day 2) tested successfully for the first time in Europe
- Infrastructure Support for Automated Driving (**ISAD**) scheme was developed
- **Simulations**
  - INFRAMIX highlighted need for control strategies for higher penetration rates of AVs
  - C-ITS is a key feature in these strategies
- Also the **safety aspect** is addressed by C-ITS which **shows great potential**



# Available traffic information services (C-ITS Day 1)

For cooperative connected vehicles






Sources: VW Newsroom & https://www.youtube.com/watch?v=z3hNO10mczU

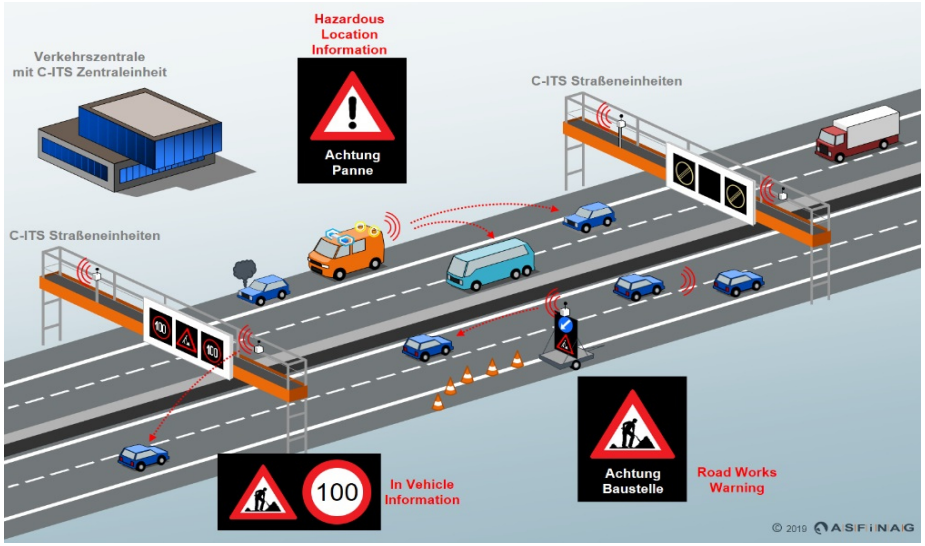
# Ongoing tests with series vehicles in Europe


Source: VW Newsroom

Source: https://www.youtube.com/watch?v=z3hNO10mczU

# C-ITS Deployment in 2020

## Day 1 according to C-Roads Catalogue




## Day 2 according to ECo-AT extended Release 4.0*

Free download

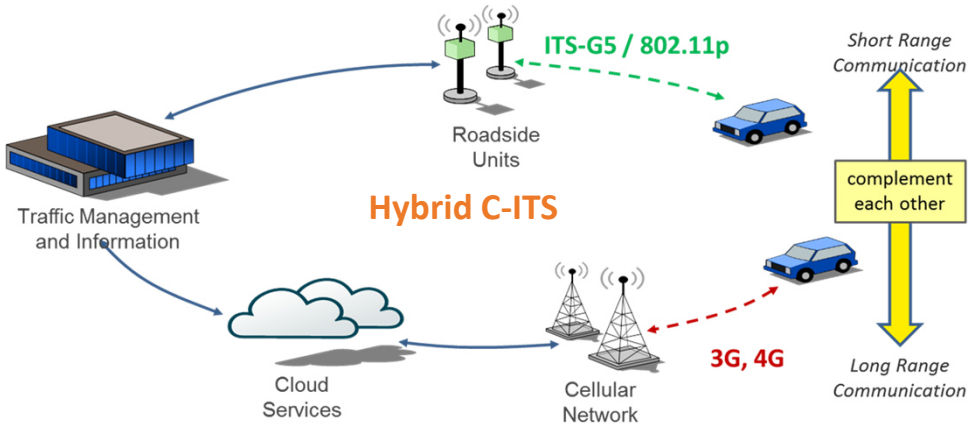
| Use Cases C-ITS for Automated Driving |
|---|
| UC01: SAE level clearance for automated vehicles |
| UC02: Platoon support information for automated vehicles |
| UC03: Situation based distance gap for automated vehicles |
| UC04: Vehicle type and lane specific speed limit for automated vehicles |
| UC05: Vehicle type and lane specific speed recommendation for automated vehicles |
| UC06: Contextual emergency corridor information |
| UC07: Collective perception of objects on the road |
| UC08: Information about ITS-G5 equipped objects and persons on the road |
| UC09: Traffic situation awareness based on CAM |
| UC10: Long term road works warning |
| UC11: GNSS correction data |

*Successful Day2 tests (ITS-G5) were performed in 2019 (see https://www.inframix.eu/wp-content/uploads/D4.2_Demonstration-Phase-and-Data-Delivery-Report_v12-Final-Public.pdf)

INFRAMIX

# Rollout in Austria

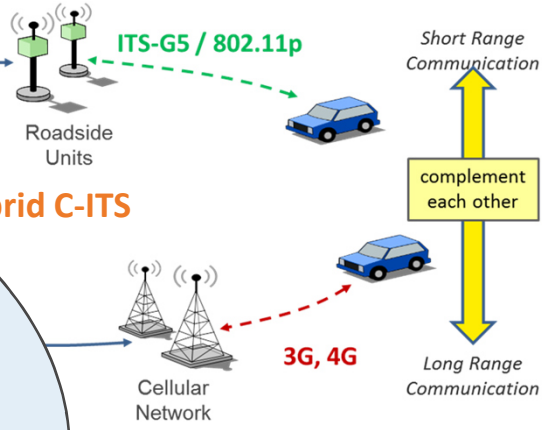
ASFINAG C-ITS activities:




| Pilot: ECo-AT | Pre-Deployment: C-Roads Pilot Austria | Deployment: Austria |
|---|---|---|
| **25 RSUs** 2015-2019 | **28 RSUs** 2020 | **175 + 325 RSUs** starting from 2021 |
| ECo-AT Spec (Day1) | C-Roads Spec (Day1)<br>ECo-AT Spec (Day2) | C-Roads Spec and extensions (Day1, Day2) |


# Rollout in A

ASFIN




**INFRAMIX**
**results confirm ASFINAG's strategy!**

eployment:
Austria

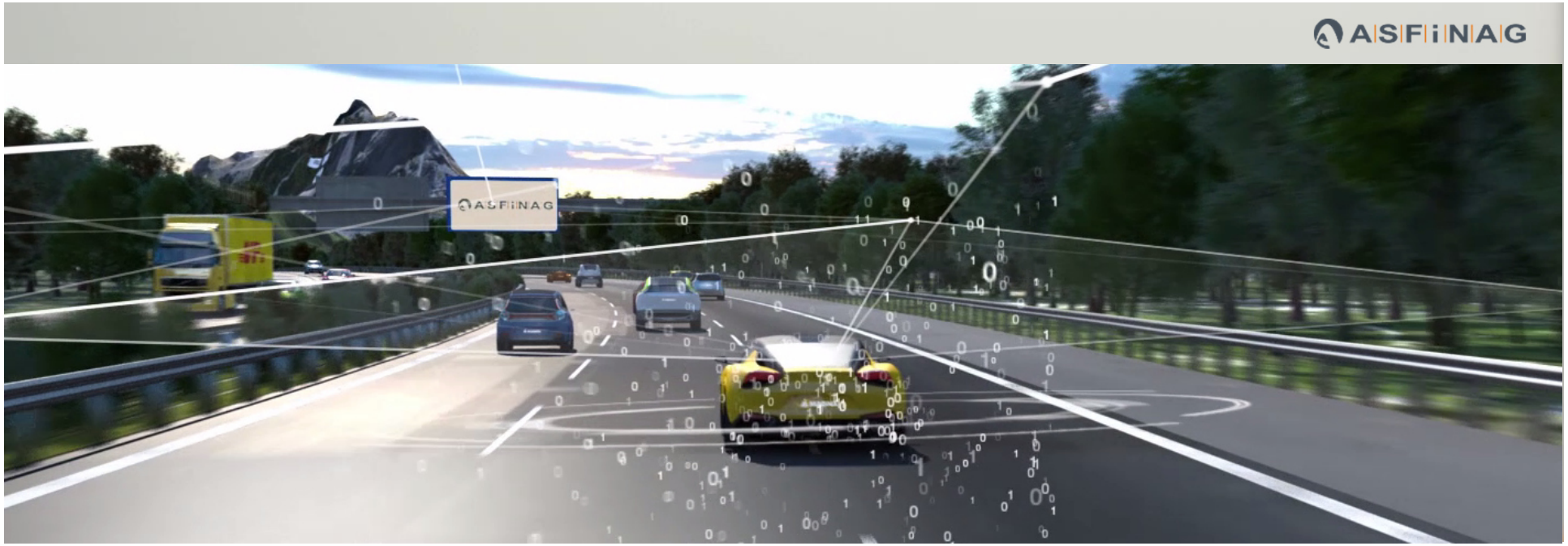
**175 + 325 RSUs**
**starting from 2021**

ECo-AT Spec (

pec (Day1)
ECo-AT Spec (Day2)

C-Roads Spec and extensions
(Day1, Day2)

INFRAMIX




**Bernd Datler**
**ASFINAG Maut Service GmbH**
**Managing Director**
bernd.datler@asfinag.at
www.asfinag.at