C-ITS | MANY TERMS, ONE SYSTEM

- **V2X**: Direct Communication
- **V2V**: Short range radio communication
- **C2X**: No Internet
- **I2V**: No cellular networks

Communication Infrastructure ↔ Vehicle Vehicle ↔ Infrastructure

C-ITS CAR2X
COOPERATIVE INTELLIGENT TRANSPORT SYSTEMS
* My dad works for you. Thanks for paying attention.
C-ITS | OPERATIVE USE CASES

Road Works Warning
Digital warnings

Hazardous Locations
Digital hazard warnings

In-Vehicle Information
Digitale traffic signs

C-ITS Road Works Warning in Volkswagen ID.3

Intelligent equipment for road works localisation

Hazard Warnings (VW)
- Traffic Jam Ahead
- Accident Zone
- Roadworks
- Slippery Road
- Obstacle on the road
- Animal on the road
- Human presence on the road

Source: “Car2X at Volkswagen – The next Steps”, Car2Car week, 2023

Co-funded by the European Union
C-ITS is a data source

**Travel Times**

- Pseudonymisation at the source (GDPR conformant)
- Travel time calculation

**Probe Vehicle Data**

- High quality data (with confidence)
- Trajectory
- Status

**Events**

- Example of messages generated by a vehicle in an emergency braking event

Principle of travel time calculation. Note: our RSUs also collect travel times via WiFi and Bluetooth.

Example content of a Cooperative Awareness Message
ROLL-OUT IN AUSTRIA
ASFINAG DEPLOYS C-ITS ON ALL MOTORWAYS

C-ITS Rollout in Austria

367 C-ITS roadside units installed. Further 100 units in 2024
Final roll-out: ~525 units

One C-ITS roadside unit every ~4 km
AUSTRIA: ASFINAG LAUNCHED C-ITS AT LARGE SCALE
… with three interconnected deployments

1. Stationary roadside units
   - Deployment of 525 C-ITS units on 2,250 km of road network
   - One unit every 4km on average

2. Mobile warning trailers
   - „Intelligent Mobile Information Systems“ (IMIS), which include Video, Radar, Travel time estimation as well as C-ITS
   - Trailers are operational in all regions of Austria

3. Road operator vehicles
   - ASFINAG road operator vehicles are equipped with C-ITS vehicle units
   - 100 operational vehicles until 2025. Further 100 vehicles planned.
FULLY OPERATIONAL ON ALL THREE DEPLOYMENTS

- All operational C-ITS deployments (roadside, trailers, road operator vehicles) are enrolled on a PKI with bilateral trust with Volkswagen vehicles

The following use cases from the harmonized C-ROADS catalogue have been verified on production vehicles (incl. our own Volkswagen ID.3):

- Road Works Warning
- Emergency Vehicle approaching
- Emergency Vehicle in Intervention
- Accident Zone
- Stationary Vehicle

Road Works Warning
Emergency Vehicle approaching
Emergency Vehicle in Intervention
Accident Zone
Stationary Vehicle
WHAT IS „COOPERATIVE“ IN C-ITS?

Everyone can communicate with everyone
C-ITS | BIG PICTURE

- Traffic Control Centre
  - Traffic Management
  - Road works management
  - …

C-ITS Interface

C-ITS central unit

Ad hoc Direct Communication

- Road Works Warning
- Hazard warnings
- Emergency Vehicles
- …

IP-based “Basic Interface”

Cross-border data exchange

- ASFINAG Road operator vehicles
- Other countries

C-ITS Broker A

C-ITS Broker B
C-ITS IN EUROPE
C-ITS INFRASCTURE DEPLOYMENT BY C-ROADS

- C-ROADS is a platform of 18 European states and 6 associated members
- C-ROADS develops harmonised profiles for C-ITS infrastructure deployment
- C-ROADS profiles are aligned with the CAR 2 CAR profile
- **Achievement:** ~ 30 use cases are harmonized, tested and validated → C-ROADS Roadmap
- 20,000 km of European roads has been equipped with ITS-G5 in early 2022

C-ROADS Strategy

Harmonised Profile Specifications

C-ROADS Implementing Bodies (road operators, cities)

18 core members
6 associated members
50+ cities involved
C-ITS DEPLOYMENTS IN EUROPE

ITS-G5 Roadside units in France

Road operator vehicles with ITS-G5 in France

Railway crossing with ITS-G5 in Czech Republic

Road works warning based on ITS-G5 on German Autobahn

Public Transport Vehicles with ITS-G5 in Czech Republic

C-ROADS ROADMAP

VEHICLE DEPLOYMENT: C-ITS IN 1.5 MIO VEHICLES

- Volkswagen introduced "Local Hazard Warning 1.0" in the Golf 8 in 2019
- Awarded by EURO NCAP
- In the meantime several other models, also from Seat and VW Commercial Vehicles.

- „Local Hazard Warning 2.0“ was launched 2024 with new infrastructure-based use cases
DIRECT COMMUNICATION MOVES ON

With new use cases, new messages, and in more vehicle models…

Source: Car2X at Volkswagen – The next Steps, Car2Car Week, March 2023
COEXISTENCE WITH ROAD TOLLING

- CEN DSRC Road Tolling and ITS operate on neighboring frequencies.
- To avoid interference and protect road tolling, **protected zones** have been defined.
- ASECAP maintains the European database of protected zones.

Tolling operators can register their CEN DSRC tolling locations in the ASECAP protected zone database.
QUESTIONS?

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