C-ITS Corridor - ETSI G5 is reality

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C-ITS-Corridor – Overview
1. **Preliminary development and "proof-of-concept"**
   - with roadworks warning trailers in Hessen around Frankfurt/Main,
   - by extending the Dutch test environment DITCM and
   - within the Austrian project ECO-AT

2. **Introduction of the two first applications in the Cooperative ITS Corridor (NL – DE – AT)**
   - Road Works Warning
   - Improved traffic management by cooperative vehicle data

3. **Introduction at national level**
Day-1-Service in the corridor
Rotterdam – Frankfurt – Vienna
C-ITS-Corridor – Overview

Roll-out (Germany)

- 03/2017: Financing and legal basis for operation
- 05/2017: Operational concept
- 09/2017: Operating manual and operational organisation

10/2016:
- Development
- Economic analysis

2016:
- Trial operation
- Load tests

2017:
- 1. Q/2018

2018:
- 1. Q/2018

2019 ff.

Operation
• Hessen Mobil as the road operator for the Federal State of Hessen has the responsibilities for the development of:
  – The Roadside ITS Station (IRS)
  – The Central ITS Station (ICS)
  – The specifications for the public call for tenders for the national roll out in Germany
  – The operational concept for the German part of the project

• Hessen Mobil was also responsible for the trial operation within the road maintenance service
System architecture
• **Existing ITS Infrastructure**
  - 16 Federal States in Germany with heterogeneous framework requirements
    - Few federal road operators have technical know how regarding cooperative technologies
    - Few federal road operators have dynamic positioning of short term roadworks services in operation
    - Many different types of Traffic Control Center and interfaces in operation

• **Centralized Approach of ICS Development and Decentralized Approach of ICS Operation**
  - Hessen Mobil develops ICS modules on behalf of the Federal Ministry of Traffic and Digital Infrastructure (BMVI)
  - ICS modules shall be vastly transferable to all kinds of Traffic Control Center
  - Modular approach for ICS modules to ease integration in existing TCC architectures
Basic scheme of cooperative system

Legend:
- Subsystem ICS
- Subsystem context

Subsystem C-ITS-S transferable

Several modules
(combining trailers,
determination of closed
lanes, ...)

Existing System TCC (adapt if necessary)

Subsystem TCC proprietary

Several modules
(data plausibility check, data matching
with road works management system, ...)

Interfaces
Development of IRS

• The software version of the IRS for the stand alone operation mode successfully tested in 5 different test cycles.
• The basic mode with a link to the ICS was also tested in the two last test cycles (October 2016 / March 2017)
• The implementation of PKI connection in the trailers for receiving long and short term certificates has been finished and was successfully tested in the fifth test cycle.
  — Messages that are to be sent can be signed.
  — Received messages can be verified.
ITS Roadside Station (IRS)

Antennas (ETSI G5, GPS, cellular)

Communication unit

ETSI-G5 modem

Comm. unit with GPS and cellular network
Trial operation and evaluation
Trial operation and evaluation

01.10.2016

Organisational trial operation
- process design
- identification of participants
- assignment of roles and processes

01.01.2017

Internal trial operation
- preparation of ICS
- equipment of trailers
- testing of functionality

01.04.2017

Open trial operation
- execution of defined use cases
- testing of individual components and the overall system

31.07.2017
• **100 test drives** by Hessen Mobil

• **Further test drives by** Opel and VW, service provider for other OEMs and by the project partner from Austria and the Netherlands
• Evaluation of **53 different use cases**

• Main result: Proof of the full desired functionality of the system under different framework conditions
Communication range

• in most cases of 100 test drives greater than 300 m (demand of the OEM)
• less than 300 m on 12 test drives \(\rightarrow\) event on ramp with no line of sight
• maximum: 1900 m, Minimum: 200 m, Median: 640 m
**Traces**

- One criteria for the receiver to decide if a message is relevant
- Traces form a sufficient course of the trailer route in all use cases
- 29 – 30 trace points in every DENM
- Trace trajectory covers a path length of 740 m (minimum) until 1533 m (maximum)
Evaluation summary

• Communication range was always sufficient for the vehicle applications.

• DENM content was always sent out correct.

• Traces were always correct generated.
Rollout
• **Rollout** of the system in Germany in stages
  – Hessen (in progress)
  – Federal states in the corridor - Baden-Württemberg, Niedersachsen, Bayern, Rheinland-Pfalz, Nordrhein-Westfalen (starting phase)
  – Throughout Germany (until mid-2019)

• **Strategic milestones per stage**
  – Kick-off with federal states
  – Architecture decision (ICS central/decentral)
  – Start rollout
  – Completiion of rollout (nationwide provision)
• The OEMs have announced the start of series production of the C2X system equipment in the vehicles for 2019.

• At this stage, road operators will have completed preparations to introduce the first cooperative services in cooperation with OEMs.

• A further intensified cooperation with the OEMs is necessary on various topics:
  • Coordination of operational interfaces
  • Coordination of the further development of existing services
  • Development and introduction of further cooperative services
  • Harmonisation of services and applications at international level
Vielen Dank für Ihre Aufmerksamkeit
Anregungen oder Fragen?

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