DRIVE C2X

Project presentation – Overview

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Vehicular communication in the past

- First serious attempt on vehicular communication in PROMETHEUS (1986 – 1994)

- Project COPDRIVE
  - Radio location and communication.
  - Exchange for intention of maneuvers and of actual maneuvers.
  - No GPS!

- Project focus changed later to registration and communication of warning messages.

Technological deficits unfortunately enforced abandonment of these activities.
What is needed now?

- Evaluation of the common European system in field trials across Europe:
  - Verify proper functioning under real life conditions
  - Prove European-wide interoperability
  - Assess the impact of the various use cases
  - Agree on use cases for early deployment
- Completion of standardisation
- Commonly agreed implementation strategy and realistic business cases
- Common deployment decision of all stakeholders involved
DRIVE C2X objectives

- Carry out a comprehensive assessment of cooperative systems through extensive European Field Operational Tests
- Create and harmonise a European-wide testing environment for cooperative systems
- Coordinate the tests carried out in parallel throughout the DRIVE C2X community
- Evaluate cooperative systems
- Promote cooperative driving
Functions to be evaluated in DRIVE C2X

- The functions to be tested and evaluated on several European test sites for cooperative systems are related to:
  - Traffic flow
  - Traffic management
  - Local danger alert
  - Driving assistance
  - Internet access and local information services and
  - Test site-specific functions to be defined independently by each test site
Seven Test Sites:

- **System Test Site:**
  - Helmond/Eindhoven, The Netherlands

- **Functional Test Sites:**
  - Tampere, Finland,
  - Yvelines, France,
  - Frankfurt, Germany,
  - Brennero, Italy,
  - Gothenburg, Sweden
  - Vigo, Spain
SP2 FOT framework – SP output

• Enhanced DRIVE C2X ITS System for Vehicle- and Roadside-Station (implementation)
  • 11p wireless communication system
  • Middle-layer facilities for network access, vehicle access and LDM
  • Use-case implementation
  • Tested and verified in simulation and in real-life technical tests

• Testing Tools for controlled C2X FOTs
  • Scenario planning
  • Test execution and control
  • Live monitoring
  • Extensive logging for evaluation

• Handbook and Guidelines
  • System specification and technical reference
  • Operational guidelines
The purpose of SP3 is to ensure that the tests carried out in different Test Sites:

- Integrate common DRIVE C2X system in each TS according to FOT System specification (SP2)
  - Implement common ETSI-compliant communication system
  - Implement common test management systems
- Observe the common testing methodology according to FOT Evaluation specifications (SP4)
  - Create test scenarios for assessment of each use case
  - Coordinate the drivers and vehicles in order to run the test scenarios
  - Collect and manage the data for evaluation
- Follow the Time Plan
  - M12 STS ready; M18 FTS Ready; M30 Data collected
Evaluation framework
Research questions, hypotheses, indicators, measurements on the selected functions and use scenarios; experimental design; boundary conditions

Evaluation data and data quality

Piloting

Impacts on driver behaviour
Safety, environment, efficiency, mobility

Projection to EU-level

User acceptance

Technical evaluation

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Cooperative driving promotion – More than dissemination

Dissemination and outreach
push becomes pull

Standardization
harmonization and interoperability

Business models and deployment
validation and initiation

Foundation and setting
Project partners

**Automotive OEMs**
- Adam Opel, Audi, BMW Forschung und Technik *, Centro Ricerche Fiat, Daimler, Ford Forschungszentrum Aachen, Honda Research Institute Europe *, Peugeot Citroen Automobiles, Renault, Volvo Personenvagnar

**Electronics and supplier industry, telcos**
- Continental *, Delphi Delco Electronics Europe, Denso Automotive Deutschland *, FT – Orange Labs *, Hitachi Europe SAS, NEC Europe, Renesas Technology Europe, Robert Bosch *

**Software developers**
- SAP, Vector Informatik *

**Traffic engineers**
- PTV Planung Transport Verkehr

**Research institutes**
- Bundesanstalt für Straßenwesen, Centro Tecnológico de Automoción de Galicia *, Chalmers University, Deutsches Zentrum für Luft- und Raumfahrt, Facit Research, Fraunhofer Gesellschaft FOKUS, Hochschule für Technik und Wirtschaft Saarland *, Institut Nationale de Recherche en Informatique et en Automatique, Interuniversity Microelectronics Centre, Karlsruhe Institute of Technology, Technische Universität Graz, Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek, Universitatea Tehnica Cluj-Napoca, University of Surrey, Technical Research Centre of Finland

**Road Operators**
- Autostrada del Brennero, City of Tampere *, Hessische Straßen- und Verkehrsverwaltung, Rijkswaterstaat *

**Others**
- ERTICO - ITS Europe *, European Center for Information and Communication Technologies, Nokian Renkaat *

* Support member