Cooperative systems for a safe and efficient mobility

SMART VEHICLES ON SMART ROADS

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Cooperative systems for a safe and efficient mobility

Cooperative systems based on vehicle to vehicle and on vehicle to infrastructure communication complement to:

infrastructure and vehicle based systems

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<th>Cooperative systems for TRAFFIC EFFICIENCY</th>
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TIME

Minutes

Sec. Msec.

CRASH
Concept of cooperative systems for road safety

SAFESPOT Integrated Project co-funded by EC-INFSO, coordinated by CRF. 51 partners: OEMs, automotive and technology suppliers, road operators, research centers and universities.

Communication channel IEEE.802.11p
Cooperative system applications for road safety

**STATIC BLACK SPOTS** or “static risky conditions”
typically addressed by V2I applications, the information will also be propagated via V2V multi-hop communication to extend the safety margin to all incoming vehicles.

**DYNAMIC BLACK SPOTS** or “dynamic risky conditions”
both addressed by V2V and by V2I based applications.
Concept of cooperative systems for efficient mobility
Cooperative system applications for efficient mobility

REFERENCE APPLICATIONS

- Cooperative network management
- Cooperative area routing
- Cooperative local traffic control
- Dynamic bus lanes
- Cooperative travelers' assistance
- Enhanced driver awareness
- Cooperative freight & fleet
- Dangerous goods
- Book and monitor parking zones
- Vehicle access to restricted zones

**CVIS Integrated Project** co-funded by EC-INFSO, coordinated by ERTICO. 60 partners: OEMs, suppliers and other industries, universities, research institutes, national road administrations and representative organizations from the European member states.
Cooperative Systems’ time-critical safety messages

Key requirement to communicate time-critical safety messages among vehicles, infrastructure and traffic centers is to ensure that vehicles promptly receive the messages.

How?

- Reducing latency in transmitting messages
- Limiting the length of data exchange / optimising the communication protocol

Time critical safety messages have stringent requirements.
Cooperative Systems’ time-critical safety messages

Cooperative Systems’ primary mechanism to dispatch time-critical safety messages is:

- V2V communications to other nearby vehicles
- V2I messages to any in-range land-based roadside units

The selected communication technology is IEEE 802.11p as defined by the C2C Consortium.
Cooperative Systems’ time-critical safety messages addresses the integration of vehicle-infrastructure-vehicle communication:

- a vehicle detects a dangerous condition
- it first attempts to use the C2C communication link to vehicles in the vicinity and to any available beacons
- if the message cannot be sent to a vehicle or to a roadside unit, the vehicle selects an available communication channel to send the safety message to a traffic centre

The traffic centre dispatches the message to other vehicles that are approaching the dangerous area.
Towards a common European architecture for communication

**CALM**
Support of ITS and Internet Services based on continuous communication over 802.11, GSM, UMTS, IR, IPv6, etc.

**Car2Car protocol**
For V2V and V2I communication, based on geo-aware multi-hop routing
Comm. technology: IEEE 802.11p
Dedicated frequency band in the 5.9 GHz. range

V2V and V2I communication for road safety and traffic efficiency applications using Car2Car and CALM like technologies
**ACTIONS**

Towards a common architecture for cooperative systems

- **Worldwide harmonization of the basic radio system**
- **Recommendation for and consolidation of work of European projects**
- **Push forward a co-ordinated EU Frequency Allocation Process**
- **Support and co-ordination of Standardization**
- **Support of the eSafety Forum**
ACTIONS
Towards a common architecture for cooperative systems

- The **COMeSafety Support Action** is drafting the architecture framework with consolidated protocols and interfaces. Co-funded by the EC-INFSO. Coordinated by BMW, includes 7 partners.

- The **PRE-DRIVE C2X project** (starting June 08) will establish a pan European architecture framework for cooperative systems ensuring interoperability of all different applications of vehicle to vehicle and to infrastructure communications for safety and mobility. Co-funded by the EC-INFSO. Coordinated by Daimler AG, includes 24 partners.
ACTIONS
Towards a common architecture for cooperative systems

- Projects like SAFESPOT are implementing a local high speed ad hoc network as defined by C2C-CC based on the IEEE.802.11p protocol.

- Other projects (e.g. the COOPERS Integrated Project, coordinated by AustriaTech) are actively contributing to create a common architecture.

- The network will be shared by road safety and traffic efficiency applications and is expected to be integrated with a CALM like architecture (as developed in the CVIS project).

- The integration in an overall architecture will also enable the use of different communication bearers for non-time-critical safety and for other applications (e.g. DSRC, infrared, GSM, ...).
CONCLUSIONS

Cooperative systems for a safe and sustainable mobility will be nothing without a common architecture.

Cooperative systems will be tested in field operational tests held at European level to enable an effective future deployment on a vast scale.
REFERENCE

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RELEVANT Project Links

SAFESPOT Integrated Project www.safespot-eu.org
CVIS Integrated Project www.cvisproject.org
COOPERS Integrated Project www.coopers-ip.eu
COMeSAFETY Support Action www.comesafety.org
PRE-DRIVE C2X Project, Matthias Schulze, Daimler AG
(web site available soon)