The SAFESPOT Integrated Project
Co-operative systems for road safety

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Greener, safer and smarter road transport for Europe

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The SAFESPOT Integrated Project

**Project type:** Integrated Project (IP) 4th IST call of the 6th European Framework Program

**Consortium:** 51 partners (from 12 European countries)
- OEM (trucks, cars, motorcycles)
- ROAD OPERATORS
- SUPPLIERS
- RESEARCH INSTITUTES
- UNIVERSITIES

**Promoted by:** EUCAR

**Timeframe:** 2/2006 - 1/2010

**Overall Cost Budget:** 38 M€ (European Commission funding 20.5M€)

The SAFESPOT Integrated Project aims to understand how intelligent vehicles and intelligent roads can cooperate to produce a **breakthrough for road safety.**

The aim is to **prevent road accidents** developing a “**Safety Margin Assistant**” that:

- detects in advance potentially dangerous situations,
- extends “in space and time” drivers’ awareness of the surrounding environment,

The Safety Margin Assistant will be an **Intelligent Cooperative System** based on **Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) communication**
SAFESPORT specific objectives

- To use both the infrastructure and the vehicles as sources (and destinations) of safety-related information and develop an open, flexible and modular architecture and communication platform.
- To develop the key enabling technologies: ad-hoc dynamic networking, accurate relative localisation, dynamic local traffic maps.
- To test scenario-based applications to evaluate the impacts and the end-user acceptance.
- To define the practical implementation of such systems, especially in the initial period when not all vehicles will be equipped.
- To evaluate the liability aspects, regulations and standardisation issues which can affect the implementation: the involvement of public authorities from the early stages will be a key factor for future deployment.
Main Milestones plan

2006
Requirements

Core architecture requirements

2007
Specs&development

Specifications &architecture

2008
Development&test

Technological Proto&demo Vehicles

2009
Test&evaluation

Integration with CVIS Architecture

Test site in 6 countries: France, Germany, Italy, Spain, Sweden, The Netherlands,
Project Organization Structure

Information Sources
- In Vehicle Sensing & Platform
- Infrastructure Sensing & Platform

Innovative Technologies
- Accurate Cooperative Localisation
- Dynamic Local Maps
- Ad Hoc Communication Networking

Horizontal Activities
- SAFESPOT Core Architecture (Link with CVIS)

Business Models, Legal Aspect & Deployment
- Business Models, Legal Aspects & Deployment
- In Vehicle Sensing & Platform
- Infrastructure Sensing & Platform

Test Beds
- Vehicle Platform
- Infrastructure Platform

Applications/Scenarios
- Cooperative Systems Appl. Vehicle Based
- Freeflow
- Tunnels, Bridges
- Black Spot

Test Sites
- Italy
- Germany
- France
- Spain
- Sweden
- Netherlands

Validation/Evaluation
- Cooperative Systems Appl. Vehicle Based
- Cooperative Safety Systems Infrastructure Based
The Key technologies - communication

Roadside components take part to the vehicle-vehicle-infrastructure communication network as “standing” nodes. This means to use the same communication platform and to be visible and recognisable by any V2V equipped vehicle.

Vehicular Ad-Hoc Networks

- Network Layer Functions
- Stored Geobroadcast
- Channel Usage
- Congestion Control
- Distributed Algorithms

- Candidate technology: IEEE 802.11p
- Need for dedicated frequency band in the 5.9 GHz. range for secure V2V and V2I, avoiding interference with existing consumer links
- Aligned to C2C-C and CALM standardisation groups
The Key technologies - Positioning

A reliable, very accurate (sub-meter), real-time relative positioning:

Use of satellite raw data (pseudo-ranges) onboard of different vehicles resulting in an enhancement of proven differential procedures (DGPS) without the need of stationary reference stations broadcasting correction data.

Combination with other complementary sensors data (sensors fusion), including landmarks registered on digital maps, to bridge the gaps and errors of the satellite based system.
The Key technologies - local dynamic maps

Target → representation of vehicle’s surroundings with all static and dynamic safety relevant elements.

- com nodes, fusion result
- temporary regional info
- landmarks for referencing
- map from provider
- initial view, to be developed during project

- veh id pos vel type ...
- rsu id pos type ...
- congestion id pos length dir ...
- tree id pos ...
- accident id pos ...
- fog id pos a,b ...

The Key technologies – local dynamic maps

Target → representation of vehicle’s surroundings with all static and dynamic safety relevant elements.
SAFESPOT APPLICATIONS based on V2V and V2I communications

SAFESPOT applications will allow the extension of the “Safety Margin” that is the time in which a potential accident is detected before it may occur (e.g. in static and dynamic black spots, in safety critical manoeuvres)

The objectives are:
• to improve the range, quality and reliability of the safety-related information available to 'intelligent vehicles' by providing ‘extended co-operative awareness’ through the real time reconstruction of the driving context and environment;
• to support drivers preventively to the proper manoeuvres in the different contexts;
• to optimise the intervention of vehicle controls with respect to critical situations;
• to manage existing incidents to minimise further negative safety impact;
• to open the development of new safety applications based on the cooperative approach;
• to increase the safety for all road users (including pedestrians and cyclists).
The extended environment awareness provided by V2V & V2I communication.
APPLICATION SCENARIOS: STATIC and DYNAMIC BLACK SPOTS

STATIC BLACK SPOTS or “static risky conditions” road scenarios intrinsically dangerous, whose dangerousness is evident in accidents statistics (e.g. narrow curves, tunnels, bridges).
Static black spots are the first addressed implementation areas for the infrastructure sensing for road safety. Typical V2I applications, V2V multi-hop communication to extend the safety margin to all incoming vehicles.

DYNAMIC BLACK SPOTS or “dynamic risky conditions” driving scenarios that become unexpectedly and suddenly dangerous for adverse environmental conditions or for very critical traffic situations. (e.g. fog, ice conditions, a queue behind a curve, a vehicle that suddenly harshly brakes, presence of vehicles in blind spots, etc.) These scenarios are both addressed by V2V and by V2I based applications.

The scenarios that are presenting “quasi static risky conditions” for most of the time (e.g. ice on the road in Northern countries) will be treated mostly as static risky conditions but with algorithm checking the persistence of the risky situation.

Information are provided to the drivers in a medium time-to-collision when risky situations occur (from 1 to 10s before a potential critical event).
V2V based Safety applications

- Safe Lane Change Maneuvers
- Frontal Collision Warning
- Cooperative Situation Awareness
- Cooperative Tunnel Safety
- Cooperative Vulnerable Road Users Detection
- Road Condition Status Information
- Road Departure in black spots
- Cooperative Obstacles Detection in tunnel
- Predictive Speed Reduction
V2I based Safety applications

- Smart signalling for safety enhancement
- Hazard and incident warning
- Safe urban intersection
- Speed alert and road departure prevention
- Safety margin for assistance and emergency vehicles
Conclusions

The cooperative systems have to face and to overcome highly challenging system, technological, organizational and societal problems.

NEVERTHELESS

In long term they will produce a breakthrough in road safety and sustainable mobility.