SAFESPOT

Integrated Project
Co-operative Systems for Road Safety
“Smart Vehicles on Smart Roads”

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General figures

**Project type:** Integrated Project (IP)

**Co-funded by:** the European Commission Information Society and Media in the 6th Framework Programme

**Promoted by:** EUCAR

**IP coordinator:** Roberto Brignolo Centro Ricerche FIAT (IT)

**Consortium:** 52 partners (from 12 European countries):

- OEMs (cars, trucks, motorcycles)
- ROAD OPERATORS
- SUPPLIERS
- RESEARCH INSTITUTES
- UNIVERSITIES

**Timeframe:** Feb. 2006, Jan. 2010

**Overall Cost Budget:** 38 M€ (European Commission funding 20,5 M€)
SAFESPOT is working to design cooperative systems for road safety based on vehicle to vehicle and vehicle to infrastructure communication. SAFESPOT will prevent road accidents developing a:

“SAFETY MARGIN ASSISTANT”

to detect in advance potentially dangerous situations and extend, in space and time, drivers’ awareness of the surroundings.
The SAFESPOT Concept 2/2

...from autonomous intelligent vehicles to cooperative systems...
<table>
<thead>
<tr>
<th>TECHNOLOGIES and PLATFORMS</th>
<th>IN VEHICLE SENSING &amp; PLATFORM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>INFRASTRUCTURE SENSING &amp; PLATFORM</td>
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<tr>
<td></td>
<td>INNOVATIVE TECHNOLOGIES</td>
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<table>
<thead>
<tr>
<th>APPLICATIONS</th>
<th>VEHICLES BASED</th>
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<tr>
<td></td>
<td>INFRASTRUCTURE BASED</td>
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<thead>
<tr>
<th>TRANSVERSAL ACTIVITIES</th>
<th>DEPLOYMENT, LEGAL ASPECT, BUSINESS MODEL</th>
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<tbody>
<tr>
<td></td>
<td>CORE ARCHITECTURE</td>
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<tr>
<td></td>
<td>IP MANAGEMENT, DISSEMINATION, EXPLOITATION</td>
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</tbody>
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52 partners from 12 European countries. OEMs (cars, trucks, motorcycles), Road Operators, Suppliers, Research Institutes, Universities.
SAFESPOT Milestones

- **2006 Requirements**
  - Core architecture requirement

- **2007 Specs & development**
  - Specifications & architecture

- **2008 Development & test**
  - Applications

- **2009 Test & evaluation**
  - Results’ outcomes & perspectives

Design of a **common European architecture** for vehicle to vehicle and to infrastructure communication for traffic safety and efficiency

**ETSI Workshop**
Feb, 5 - 2008, Sophia Antipolis
The SAFESPOT Applications

<table>
<thead>
<tr>
<th>Vehicle based</th>
<th>Infrastructure based</th>
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<tbody>
<tr>
<td>(warning strategy on board the vehicle)</td>
<td>(warning strategy decided by the infrastructure. An on-board client display the received message)</td>
</tr>
<tr>
<td>Lateral Collision</td>
<td>Speed Alert</td>
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<tr>
<td>Longitudinal Collision</td>
<td>Road Departure Prevention</td>
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<tr>
<td>Road Departure</td>
<td>Safety Margin for Assistance and Emergency Vehicles</td>
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<tr>
<td>Vulnerable Users Protection</td>
<td>Co-operative Intersection Collision Prevention System</td>
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<td>Hazard and Incident Warning</td>
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**ETSI Workshop**
Feb, 5 - 2008, Sophia Antipolis
# The SAFESPOT Vehicle based application

<table>
<thead>
<tr>
<th>Application</th>
<th>Cluster</th>
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<tbody>
<tr>
<td>Road Intersection Safety</td>
<td>Lateral Collision - LATC</td>
</tr>
<tr>
<td>Lane Change Manoeuvre</td>
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<tr>
<td>Safe Overtaking</td>
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<tr>
<td>Head On Collision Warning</td>
<td>Longitudinal Collision - LONC</td>
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<tr>
<td>Rear End Collision</td>
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<tr>
<td>Speed Limitation and Safety Distance</td>
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<tr>
<td>Frontal Collision Warning</td>
<td></td>
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<tr>
<td>Road Condition Status – Slippery Road</td>
<td>Road Departure - RODP</td>
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<tr>
<td>Curve Warning</td>
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</tr>
<tr>
<td>Vulnerable Road User Detection and</td>
<td>Vulnerable Road Users - VRU</td>
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<tr>
<td>Accident Avoidance</td>
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</tbody>
</table>
SAFESPOT A sample scenario

The nodes generate, store and exchange information about safety critical events.

- Truck hard braking ahead!
- Slippery road ahead!
- Tilted motorbike on lane ahead!
- Red light runner crossing from the right!
- Red light runner crossing from the left!
- Occluding forest
- Environmental perception
- Wireless short range communication
- Vehicle dynamics control
- Wired or wireless infrastructure network
- Vehicle equipped with SAFEPROBE platform
- Non-equipped vehicle

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AD-HOC DYNAMIC COMMUNICATION NETWORK

• Generated a complete set of messages (as an extension of existing C2C messages) that is offered as contribution to C2C and ETSI standardization processes.
  – The set of messages has been inserted in the ITS European Architecture document produced by COMeSAFETY.
• Routing protocols with multihop forwarding and geo-cast functionalities

Status → under testing finalization
RELATIVE REAL-TIME RELATIVE POSITIONING

- GNSS-based positioning (GPS)
- Communication-based positioning (WLAN)
- Image-based positioning (landmarks recognition)
LOCAL DYNAMIC MAPS

Real time map of vehicle surroundings with static and dynamic safety information.

Two interoperable implementations from TeleAtlas/Bosch and NAVTEQ

ETSI Workshop
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SAFESPO T Functional Blocks

**Platform Domain**
- Local Dynamic map
- Data Fusion
- Ego Positioning
- Ad hoc Communication Network

**Applications Domain**
- Safety Margin Assistant
- Appl. 1
- Appl. N

**External Applications**
- Vehicle Sensors (radars, laser-scanners, cameras, GPS, …)
- Vehicle data (speed, clutch, brake, steering, …)
- Network Data (from vehicles and infrastructure)
The SAFESPOT Station Architecture

Driver Assistant Applications: make scenario analysis and implement the warning strategy

Cooperative Support Applications: define the data to be transmitted according to a specific scenario analysis

(*) Rules defined during the design phase

External Applications (e.g. CVIS)
This Node's Application #1
This Node's Application #N
Application Coordination

LDM
Data Processing & Fusion
Message Generation
Common LDM evaluation, For all SF Applications
Context Relevance Checking
Messages relevant to this node
Messages non relevant to this node
Relevance Checking; e.g. Position based

Message Router
VANET Transmitter
VANET Receiver

Application
Technologies
Platform

Actuator, HMI, VMS

This vehicle /infrastructure node's sensing & data sources

(*) (*)

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Test Sites Location and Applications

**West Test site**
A10 motorway, south west of Paris
A 1.7 km tunnel in Angers (to be opened in 2008)
Rural roads in the Brittany Region operated by Conseil Général des Côtes d'Armor
A14 km test track (VESTA) near Versailles
Sections of the urban roads of Valladolid
A Renault Spain test track in Valladolid

*Applications to be tested:*
- Road intersection safety (V2V)
- Vulnerable road user detection and accident avoidance
- Static obstacles
- Critical speed warning (legal and (dynamic)
- Safety margin for assistance vehicle
- Road departure warning

**Italian Test site**
Torino-Caselle Airport Expressway
Urban intersection in Torino
Rural roads close to Torino
Brescia – Padova Highway
Centro sicurezza FIAT TEST track
*Partially Common with CVIS*

*Applications to be tested:*
- Road departure prevention
- Head on collision warning
- Speed limitation and safety distance
- Safe overtaking
- Lane Change Manoeuvre
- Hazard & Incident warning
- Rear end collision
- Safety margin for assistance vehicle

**German Test site**
Roads and intersections in Dortmund and Ruhr area
*Common with CVIS*

*Applications to be tested:*
- Intelligent Road Intersection Safety
- Hazard warning (road conditions, accidents, obstacles)
- Critical speed warning (static/legal/dynamic)
- Dynamic Black Spots and “Safety Server”
- Safety margin for assistance
- &emergency vehicle

**Swedish Test site**
Management center at Lindholmen Science Park, E6, Lundby tunnel, Volvo closed track, simulator
*Common with CVIS*

*Applications to be tested:*
- Frontal Collision Warning
- Lane Change Manoeuvre
- Tunnel Safety (Safe Speed & Distance)
- Slippery Road (Road Condition Status)
- VRU (Vulnerable Road User Accident Avoidance)

*Applications to tested:*  
Intelligent Road Intersection Safety  
Hazard warning (road conditions, accidents, obstacles)  
Critical speed warning (static/legal/dynamic)  
Dynamic Black Spots and “Safety Server”  
Safety margin for assistance vehicle
SAFESPO T Results and Status

- Alfa Test on V2V & V2I: SAFESPO T 2nd Annual Review, Turin, FIAT Centro Sicurezza, May 2008
- Technologies tasks are under test finalizations
- Applications and Test Sites are under development
- Currently 10 vehicles already equipped, 12 under preparation
SAFESPOT Next steps

- Expected final results are:
  - Technological prototypes of cooperative systems applications based on vehicle ad hoc network and on vehicle to infrastructure communication.
  - Cost benefit analysis & estimation of the impact on traffic safety
  - Definition of sustainable business and service models for all stakeholders

- Challenges are now the integration and testing in the SAFESPOT test sites and the interoperability with solutions implemented by other major projects.

- Extensive field operation tests will be an important step to plan a future sustainable deployment.
SAFESPOT Impacts

- SAFESPOT generated a complete set of messages (as an extension of existing C2C messages) that is offered as contribution to C2C and ETSI standardization processes.
- Results about feasibility and potentiality of complex cooperative applications and technology assessment.
- A clearer roadmap of the steps for the cooperative systems exploitation.
NEXT EVENTS:

• Helmond – May 2009 Joint workshop and demo
• Stockholm – September 2009 ITS Congress

THANK YOU

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