Cooperative systems for road safety
Smart Vehicles on Smart Roads
the SAFESPOT Integrated Project

G. Vivo – SAFESPOT IP
Centro Ricerche FIAT
Background on cooperative systems for a safe and efficient mobility

... Need to cooperate at European level to improve road safety and traffic efficiency.

years 2002 - 2004
- Car2Car Communication Consortium was born to promote the allocation of a dedicated frequency band for inter-vehicle communication.
- The European Commission Information Society and Media opened the call for proposal FP6-ICT-Call4 on cooperative systems.
- The European Council for Automotive R&D settled the Integrated Safety Program Board to support efficient and complementary research activities.

years 2006-2008
- The SAFESPO1 IP, co-funded by the EC INFSO, supported by EUCAR, started in parallel to the CVIS and COOPERS IPs.
- SAFESPO1 & C2C signed a Letter of Intent for cooperation.
Cooperative Systems for road safety
“Smart vehicles on smart roads”
Detection in advance of potentially dangerous situations
to extend in space and time drivers’ awareness of the surroundings.

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

**Time Plan**
2006-2010
The SAFESPOT Enabling technologies: Vehicle ad hoc Dynamic Network

Ad-hoc Dynamic Communication Network for information exchange

At a network level in Europe, C2C and SAFESPOT analysed and experimented protocols to provide a basic periodic message:

Cooperative Awareness Message (CAM)

CAM includes dynamic key parameters, it is broadcast every 500 ms by any node within the network, including the roadside units (RSU).

Messages are also GEO-AWARE ADDRESSING and MULTIHOPPING.

The selected radio technology is IEEE 802.11p.

SAFESPOT generated a complete set of messages as an extension of existing C2C messages.
The SAFESPOT Enabling Technologies: Local Dynamic Maps

Local dynamic maps

Evolution of the standard navigation maps to include and update in real time all safety related information on the traffic and on the environment. The information are acquired from vehicle and road infrastructure sensing platforms and are exchanged via the ad-hoc dynamic network.
The SAFESPOT Enabling Technologies: Relative Positioning

Relative Positioning among vehicles

High accuracy (0.5 m) for the exchange of **SAFETY TIME CRITICAL MSG**: SAFESPOT integrates data from different sources: road data from GPS, road landmark recognition and dead reckoning.

Most promising technique is based on dual-frequency satellite receivers combined with high-performance inertial platforms, technologies that are already available.

The challenge will be in optimisation, bringing down costs until they are comparable with the current GPS.
The SAFESPOT Scenario

The node’s platforms 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!

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the European Approach
The SAFESPOT Integrated Project
The SAFESPOT Applications

SAFESPOT developed reference applications for road safety based on vehicle to vehicle and to infrastructure communications

- safety distance and speed advice
- wrong way driver detection
- obstacle detection and frontal collision prevention
- rear end collision prevention
- safe overtaking & lane change assistance
- road departure prevention
- dangerous curve warning
- vulnerable road user detection
- incident detection and warning
- warning of reduced visibility
- safety margin for emergency vehicles
- intersection collision prevention
The SAFESPOT Test Sites

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The SAFESPOT Italian Site

Locations

Torino-Caselle Airport Expressway

Brescia-Padova Motorway

FIAT Centro Sicurezza Test Track
The SAFESPOT Italian Site

Road Side Equipment

- Wireless node 1
- Wireless Node n
- WSN GW
- MAIN PC
- GPS
- VANET ROUTER
- VANET
- ROAD OPERATOR CONTROL CENTE
- TRAFFIC INFO
- INTERNE
- REMOTE MANAGEMENT

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The SAFESPOT West Test Sides

Locations

- CG 22 rural roads in Brittany: RD8, RD786
- Satory and La Valbonne closed test tracks
- Technological park in Valladolid
- Cofiroute A85 motorway close to Saumur
The SAFESPOT West Test Side

Components

On-Board Units
The SAFESPOT Swedish Test Site

Locations

Gothenburg Test Site Area

Storaholm Closed Test Track

Lundby Tunnel

Urban Area - Lindholmen
The SAFESPOT Swedish Test Site

Components

Test Site Vehicles

RSU:s
The SAFESPOT Swedish Test Site

Applications

- Frontal collision warning
- Road condition status
- Vulnerable road user detection
- Speed limitation and safety distance
The SAFESPOT Dutch Test Site

Locations

N629-Rural Road, Informative Road

Helmond-Urban Intersection

A16-Motorway
The SAFESPOT Dutch Test Site

Vehicles and Road side equipment
The SAFESPOT Dutch Test Site

Applications

- Lane change manoeuvre
- Intersection safety application
- Speed alert
- Static obstacles detection
- Abnormal road conditions
The SAFESPOT German Test Site

Locations

Intersection 61
Hamburger Str. / Gerichtsstr.
in Dortmund, Germany
The SAFESPOT German Test Site

Infrastructure (site plan)

Vehicle (Smart)
The SAFESPOT German Test Site

Applications

- IRIS - Red light violation
- IRIS - Right turn
- IRIS - Left turn
- IRIS - Emergency vehicle
- IRIS - Remaining green time
The SAFESPOT Integrated Project
running activities towards standardisation of ITS applications and LDM

European roadmap for application domains

Cooperative systems
Penetration rate

>10%

Active Safety
- Collision avoidance (including intersection)
- Hazard Warning
- Decentralized floating car data warnings

5%

Traffic Management

2%

Cooperative location based services
- Content download/notification
- Local e-commerce
- Access control

Global Internet services, communities services
- Insurance services
- Fleet management

Standardization
2012
2015
2017
2020
Development
Initial deployment
Large scale deployment

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the European Approach
The SAFESPOT Integrated Project
The SAFESPOT Integrated Project
running activities towards standardisation of ITS applications and LDM

European roadmap for cooperative systems technologies
The SAFESPOT Integrated Project
running activities towards standardisation of ITS applications and LDM

Standardisation efforts ➔ the LDM database

Collective Letter 10_2763
6 January 2010
page 1 of 15

ETSI MEMBERS, OBSERVERS AND COUNSELLORS

Call for Experts for Specialist Task Force UU (ITS WG1-WG2) on Local Dynamic Map standardization scoping and classification/management of applications - SA/ETSI/ENTR/000/2009-13

ETSI World Class Standards

ANNEX

SAFESPOT INTEGRATED PROJECT - IST-4-026963-IP

ETSI

World Class Standards

2nd ETSI TC ITS Workshop
the European Approach
The SAFESPOT Integrated Project

SAFESPOT - COOPERATIVE SYSTEMS FOR ROAD SAFETY

LDM API and Usage Reference

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25th ETSI TC ITS Workshop
the European Approach
The SAFESPOT Integrated Project
CONCLUSIONS

Establishing a common architecture for cooperative systems

SAFESPOT is in the task force led by COMeSafety in cooperation with CVIS, SEVECOM, COOPERS, PRE-DRIVE C2X projects to establish a “Common “European ITS Communication Architecture”.

SAFESPOT implements a local high speed ad hoc network, as defined by C2C-CC, based on the IEEE.802.11p protocol.

SAFESPOT generated a complete set of messages (as an extension of existing C2C messages, together with its applications and the LDM) that is offered as contribution to C2C and ETSI standardization processes.

The SAFESPOT IP, together with CVIS and COOPERS IPs will present its outcomes in the Showcase 2010 (AMS, March 2010).
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