

# French involvement in Naturalistic Driving-Related Studies

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French Institute of Science and  
Technology for Transport, Development  
and Networks (IFSTTAR)

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IFSTTAR

# Acknowledgements

- TRB – especially Dr Charles Fay and Carol Ford, TRB
- Abdelmenem Hedhli (IFSTTAR; seconded to the TRB to work on SHRP 2 and other projects)
- Sylvie Proeschel (IFSTTAR; Directrice adjointe Europe & International,)
- French colleagues for their inputs:
  - IFSTTAR - Dr Corinne Brusque; Dr Jacques Ehrlich; Dr Daniel Lechner; Dr Thierry Serre; Arnaud Bonnard
  - Renault - Gérard Ségarra



# Overview

- Me
- IFSTTAR
- NDS, NRS and FOTs involving IFSTTAR
- Conclusion



# Mike Regan



- Research Director, IFSTTAR (LESCOT Laboratory)- since April 2007.
- Head, Human Factors and Simulation Group - Monash University Accident Research Centre (MUARC), Australia – 1997 to 2007
- Australia - Research leader for Australian TAC SafeCar FOT – 2000 to 2005; 23 instrumented vehicles - Intelligent Speed Adaptation, Following Distance Warning and Seat Belt Reminder
- France – FESTA, euroFOT, INTERACTION, 2BESAFE, E-LSNDS (?)





IFSTTAR

Institut français des sciences et technologies des transports, de l'aménagement et des réseaux  
French Institute of Science and Technology for Transport, Development and Networks

Hélène Jacquot-Guimbal



IFSTTAR

# Decree n°2010-1702

- INRETS and LCPC merged on 1 January 2011 to create IFSTTAR
  - LCPC was specialised in civil engineering
  - INRETS was focused on research on transport and transport safety
- IFSTTAR - French state-owned research Institute under the authority of two ministries:
  - Ministry for Higher Education and Research
  - MEDDTL: Ministry of Ecology, Sustainable Development, Transport and Housing



# IFSTTAR's Missions

- Conduct, mandate, steer, evaluate...
- Research, development and innovation activities in the fields of
  - Urban engineering
  - Civil engineering and building materials
  - Natural hazards
  - Mobility of people and goods
  - Transport systems and means and transport safety
  - Infrastructure, their uses and their impacts
- Considered from various angles:
  - Economic, Technology, Society, Health, Energy, Human

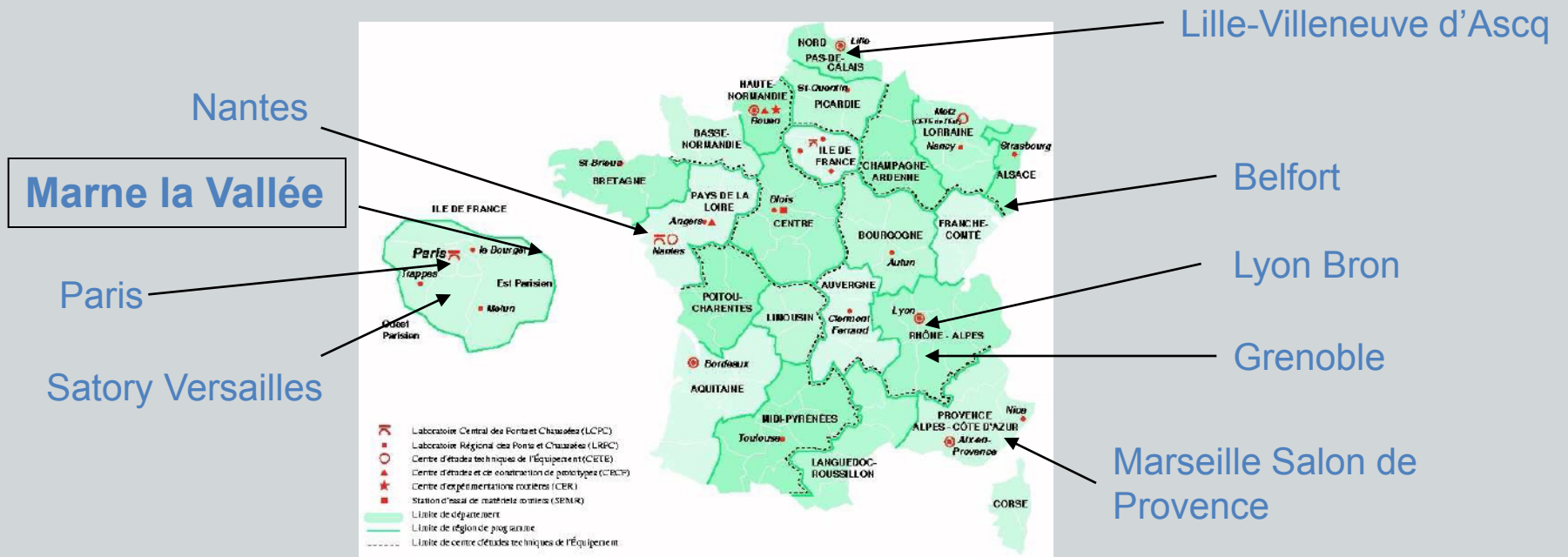


# Key Figures

- 1268 staff as of 1 January 2011
  - Including 250 PhD students
- 25 research units
- Budget: 110 Million EUR (2010)
- 74 patents
- 226 publications in international publications (2010)



# 9 locations



# Research Facilities

- Geotechnical centrifuge & earthquake simulator
- Pavement fatigue carousel and reference track for characterization of pavement surfaces
- Material mixing test facility
- Semi-anechoic room
- Structures laboratory and cable fatigue testing bench
- Magnetic Resonance Imaging device (MRI)
- Block Fall Test Facility
- Driving simulators
- Instrumented vehicles
- Catapults
- Grenoble wheel
- Horizontal crash test facility
- Etc.



# IFSTTAR and the USA

- Federal highways administration and RITA
- Formal cooperation with several universities/institutes:
  - Turner Fairbanks Highway Research Institute
  - Volpe center
  - National Institute of Standards and Technology
  - Columbia University
  - University of California, Berkeley
  - Pennsylvania State University
  - Texas Technical University
  - Virginia Polytechnic Institute and State University (Virginia Tech)
  - Georgia Institute of Technology MIT
  - Etc.
- Ifsttar is very active in TRB:
  - Ifsttar's experts are involved in several TRB committees
  - Numerous delegates to the 2011 meeting
  - 8 papers presented at the 2011 meeting



# Understanding Driver Interactions with In-Vehicle Technologies

INTERACTION - FP7 project

Project Coordinator: (IFSTTAR; Dr Corinne Brusque)



# INTERACTION

## DURATION:

- November 2008 to April 2012 (3.5 yrs)

## AIM:

- To understand how drivers interact with in-vehicle technologies that are mature and widely available in Europe.

## RESEARCH ISSUES:

- Why, when, where and how drivers use IVT?
- What are their patterns of IVT use in everyday driving?
- What are the individual factors that explain the adoption/non-adoption of IVT by drivers?
- What are the differences or similarities in system use between countries, and reasons for them?
- What are the actual supports to the driving task given by the systems?
- Is there involuntary or voluntary misuse of the systems?
- Can these systems induce unexpected unsafe behaviours and skills?

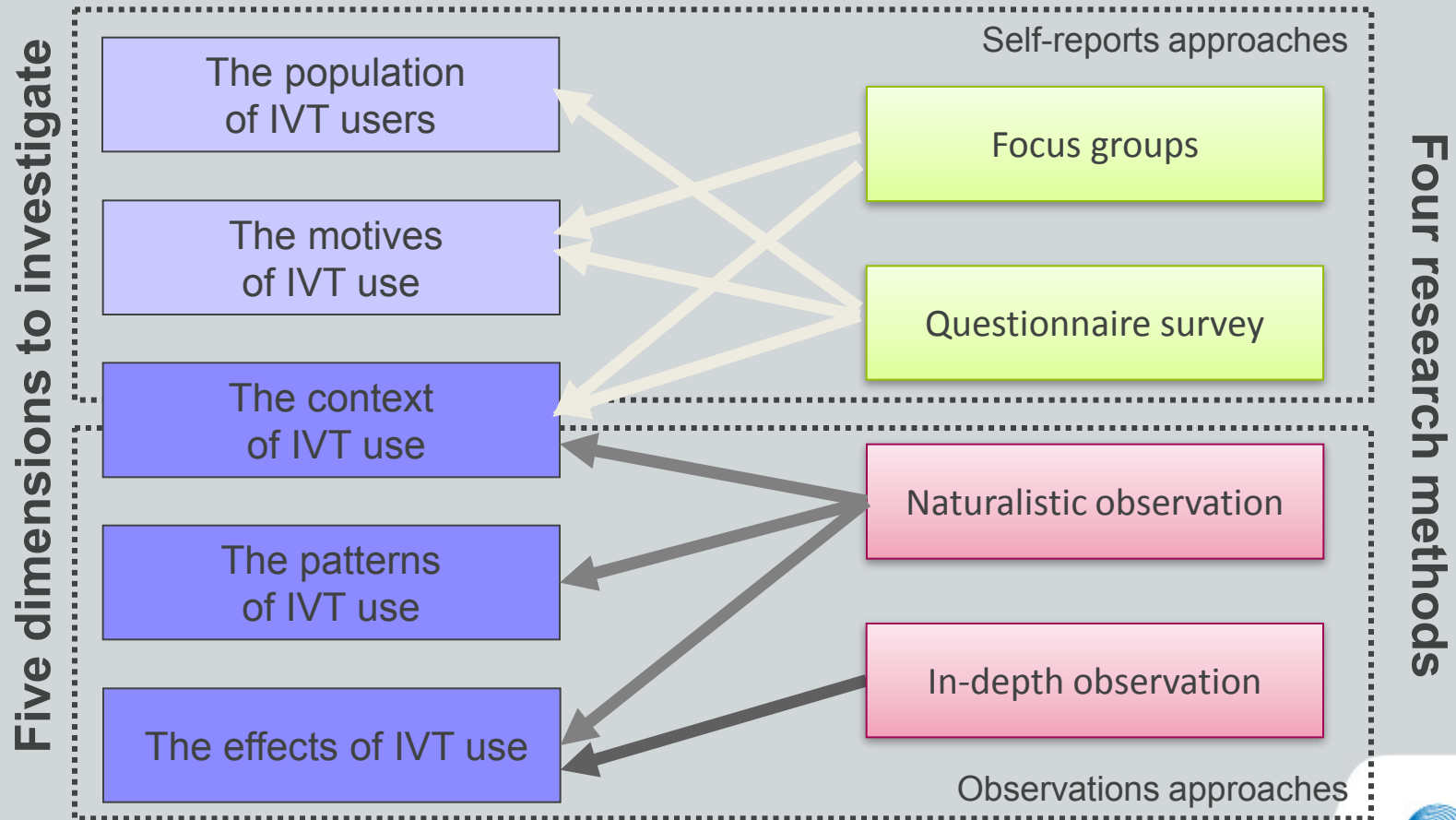


# The Four IVT

- Cruise Control
- Speed Limiter
- Navigation System
- Cell phone



# Using Combination of Research Methodologies



# Using Two Complementary Observation Methods

- Instrumented vehicles

- Behavioural observation

- in naturalistic settings
- in an unobtrusive way
- out of any experimental context
- Instrumented vehicles

- Participants drive

- where and when they want to cover their daily mobility needs
- at the wheel of their own car
- equipped with sensors and cameras

- Expert observers

- Behavioural observation

- of drivers' behaviour and drivers' interactions with other road users
- performed by two observers inside the participants' cars
- using the "Wiener Fahrprobe" method

- Participants drive

- along the same standardized test route
- in real conditions of traffic
- two times for two experimental conditions (with and without IVT use)

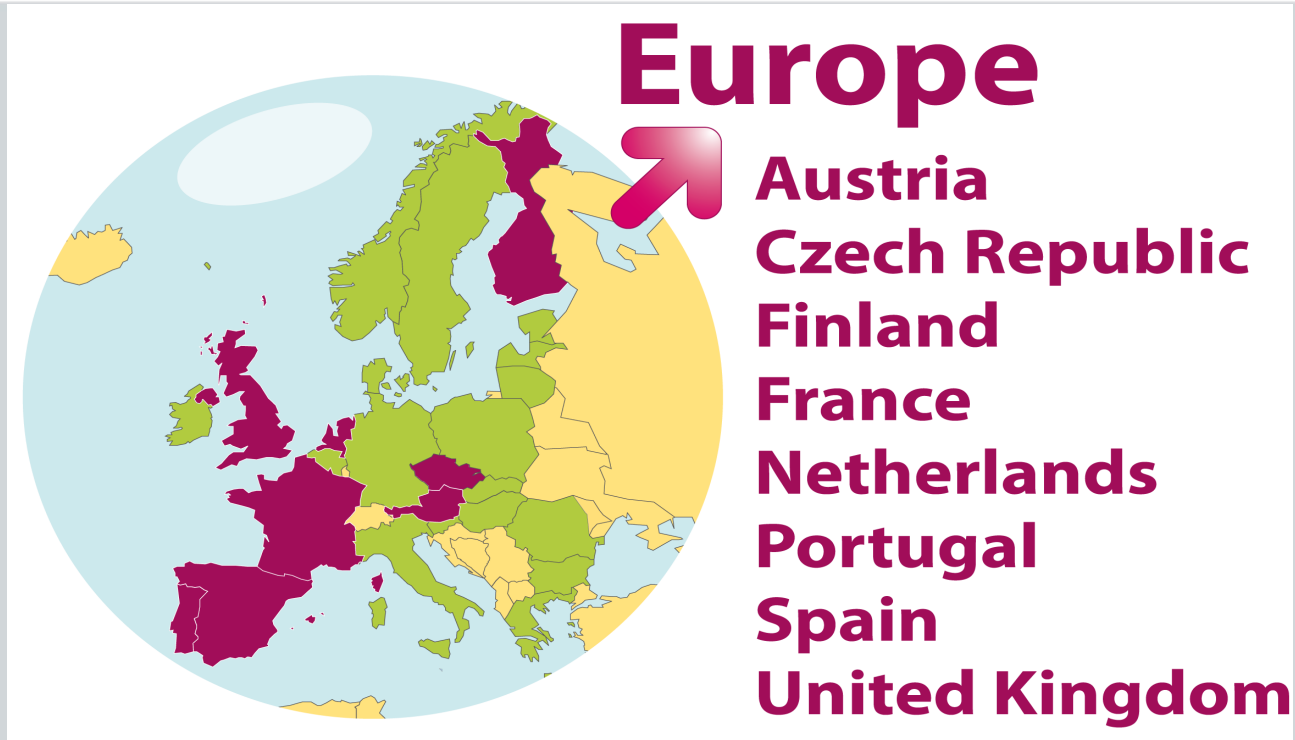


# Experimental design (1/2)

- Participant characteristics
  - IVT use
    - Intensive users of CC/SL
    - > 50% of driving time
  - Travel patterns
    - Experienced drivers
    - At least 2000 km per month
    - Driving on different kinds of roads
  - Sex and age
    - Balanced between male/female
    - 25-50 years old
- Sample size
  - 20 drivers per country
  - In 8 countries



# A comparison between 8 countries



# Experimental design (2/2)

- Timeframe and organisation
  - Participant briefing
  - DAS Installation
  - First in-depth observation ride
  - 4 weeks of naturalistic observation
  - Second in-depth observation ride
  - Participant interview
  - Data retrieval
  - DAS removal



# More Information:

Website: <http://interaction-fp7.eu>

Project Coordinator (IFSTTAR):

corinne.brusque@ifsttar.fr



# 2-BE-SAFE FP7 Project

## Activity 2.3 - Naturalistic Riding Study (NRS)

Project Coordinator (IFSTTAR – Stephane  
Espie):

[stephane.espie@ifsttar.fr](mailto:stephane.espie@ifsttar.fr)



# 2-BE-SAFE

- 2-WHEELER BEHAVIOUR AND SAFETY
- EC-funded – about 5 million Euros
- 26 partners, including Israel and Australia
- 3-year project
- Concludes early 2012
- Research and development project to better understand motorcycle and scooter rider behaviour, attitudes, performance and accident aetiology.



# Activity 2.3 – Naturalistic Riding Study

## Aims:

- conduct a pilot NRS
- use pilot to test a proposed design of a larger-scale naturalistic riding study (NRS) involving instrumented Powered Two-Wheelers (PTWs)
- determine ability to detect and study conflicts (near-crashes and crashes) of riders with other road users



# Methodology (1):

- conducted in 4 European countries (France, Greece, Italy, and United Kingdom)
- 5 PTWs (2 in France, 1 in Greece, 1 in Italy and 1 in United Kingdom)
- 6 month data collection period
- 4 to 6 riders per PTW in each country
- average data acquisition time per rider - 1.0 to 1.5 months
- use instrumented PTWs owned by the research institutes
- data acquisition performed at the minimum frequency of 100Hz, apart from GPS position



# NRS Partners

Country	Partner	Bike
France	INRETS/CEESAR	800cc sports tourer
		1000cc street
Greece	UoT	650cc enduro
	NTUA	...
Italy	UNIFI	300cc scooter
UK	TRL	1000cc sports
Spain	CIDAUT	...



# Methodology (2):

## DAS outputs:

- linear acceleration (three components);
- roll, yaw and pitch angles;
- longitudinal speed;
- brake activation;
- throttle position;
- steering angle;
- GPS position;
- turn signals;
- video: 2 cameras positioned to capture the frontal environment (required a minimum 90° field of view) and the rider's face.
- pressure of the brake circuits;
- rear and front wheel speed.



# Methodology (3):

In addition to the instrumentation, subjective data was collected:

- weekly debriefing interviews
- follow-up questionnaire at end of study
- travel diary which was filled-in daily by the rider and provided details for the incidents he/she encountered during the ride



# Outputs

- a design for a future naturalistic riding study.
- a set of tools which can be used for a future large-scale NRS in Europe.
- preliminary assessment of the density of events per hour ridden.
- important information about practical considerations in the installation and performance (e.g. reliability) of the instrumentation as well as maintenance strategies.
- preliminary data analysis - there are patterns in the riding behaviour of PTWs. The recorded data can yield interesting findings that define aspects of riding behaviour.



# Study timescales

Activity	Scheduled worktime
Rider data collection	completed
Data coding and reduction	March – June 11
Data analysis	June – July 11
Reporting	August – September 11



# More information about 2-BE-SAFE NRS:

Dr Alistair Weare

Email: [aware@trl.co.uk](mailto:aware@trl.co.uk)



DaCoTA - FP7 Project

# Road Safety Data, Collection, Transfer and Analysis

Project Leader (Prof. Peter Thomas,  
Loughborough Uni, England)

IFSTTAR contact: (Dr Corinne Brusque)



# Background

- DaCoTA is a Collaborative Project under the Seventh Framework Programme (FP7), co-funded by the European Commission DG Mobility and Transport.
- The project began on 1 January 2010 and will continue to 30 June 2012.
- The six technical Work packages of DaCoTA will work together to provide tools and methodologies to support road European safety policy and further extend and enhance the European Road Safety Observatory (ERSO) developed within the SafetyNet project



# WP6 - Driver Behaviour Monitoring through Naturalistic Driving

Aims to develop an implementation plan for a large-scale activity that uses Naturalistic Driving Observations to continuously monitor relevant road safety data within the framework of the European Road Safety Observatory.



# WP6 Deliverables

- D6.1 Report on Naturalistic Driving observations within ERSO *downloadable*
- D6.2 Report on Study design
- D6.3 Report on Small Scale Naturalistic Driving Pilot
- D6.4 Report on Implementation plan for Large Scale Naturalistic Driving research within ERSO
- D6.5 Final WP report



# Deliverable 6.1 – Report on Naturalistic Driving Observations within ERSO

- reports the outcome of the first task which was to generate an inventory of variables and measurement tools necessary to monitor road safety through Naturalistic Driving Observations.
- this was achieved by performing the following activities:
  1. Generating an inventory of relevant variables to monitor road safety within ERSO.
  2. Generating an inventory of relevant variables to monitor through naturalistic driving observation.
  3. Combining 1 and 2 to define the variables to be measured within ERSO by naturalistic driving observation.



# More information about DaCoTA:

<http://www.dacota-project.eu>

Prof. Pete Thomas

Email: [p.d.thomas@lboro.ac.uk](mailto:p.d.thomas@lboro.ac.uk)



# E-LSNDS - FP7 Project (Call for Proposals)


## European Large-Scale Naturalistic Driving Study

- call for proposals by EC in June 2011
- scaled down version of SHRP 2
- one known consortium established
- IFSTTAR invited to be consortium partner
- all proposals to be submitted to EC in December 2011





- Name of Project : SVRAI – Saving lives through incident analysis
- Funding organisation: French ministry (DSCR)  
- Collaborative partners:   
- 3 phases :

Phase 1	11/2010 01/2013	Small scale experimentation Data analysis tools development		Continuous Development
Phase 2	01/2013 01/2016	Medium scale experimentation Data analysis		Equipment Functionalities
Phase 3	2016 ?	Continuation Larger Scale ?		Data analysis ...

Contact: LEDOUX Vincent – CERTU - [vincent.ledoux@developpement-durable.gouv.fr](mailto:vincent.ledoux@developpement-durable.gouv.fr)  
 LECHNER Daniel – IFSTTAR/MA – [daniel.lechner@ifsttar.fr](mailto:daniel.lechner@ifsttar.fr)



- Objectives of SVRAI:

Improvement of the accidentology knowledge with incident data

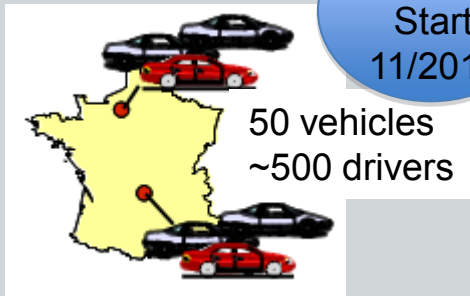
- Focused on the near-crash: recording of data 30s before the incident and 15s after
- Topics of interest: vehicle dynamics, human behaviour, infrastructure evaluation
- All juridical approvals: vehicle regulation, privacy and personal data protection ...

- Sample deployment: French public fleets of vehicles

### Phase 1

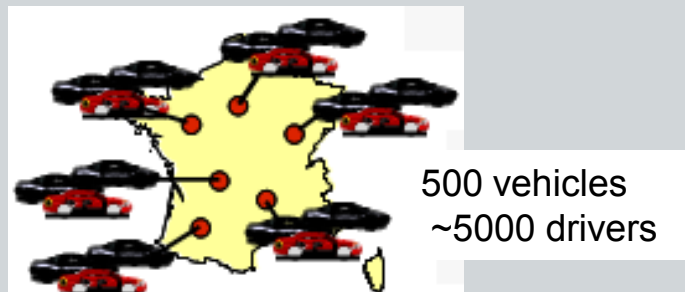
(11/2010 - 01/2013)

Recording  
Start  
11/2011



### Phase 2

(01/2013-01/2016)



### Phase 3

(01/2016- ...)

To be continued  
with other fleets...

- Material: EMMA « Embedded data logger for accident mechanisms »

Automatic data transfer via GSM, CAN bus access, remote control of the trigger parameters (accelerometer threshold, GPS localisation), ...



# More Information:

- LEDOUX Vincent – CERTU -  
[vincent.ledoux@developpement-durable.gouv.fr](mailto:vincent.ledoux@developpement-durable.gouv.fr)
- LECHNER Daniel – IFSTTAR/MA –  
[daniel.lechner@ifsttar.fr](mailto:daniel.lechner@ifsttar.fr)



euroFOT - FP7 Project  
**European Large-Scale Field  
Operational test on Active Safety  
Systems**

Project Leader (Ford, Germany)  
Ford contact: (Dr Aria Etemad)



# The Consortium



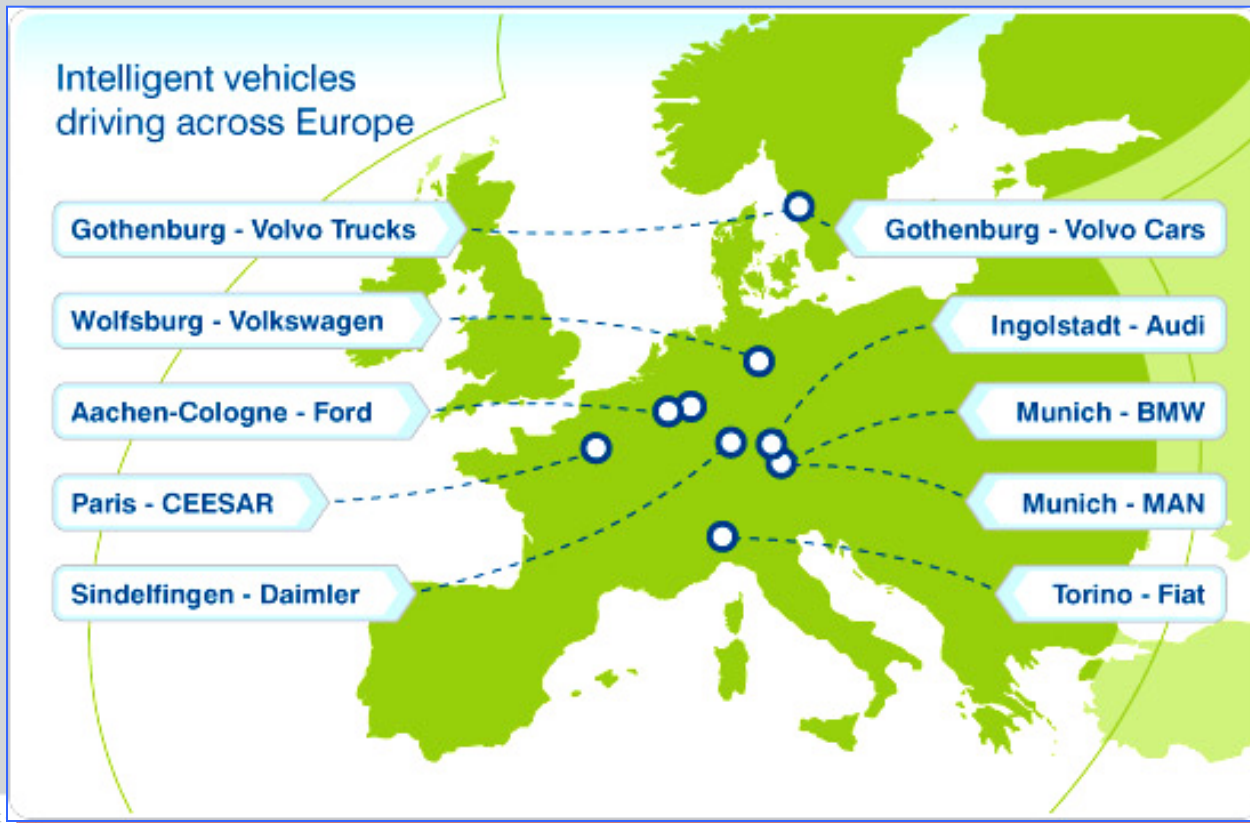
# euroFOT Objectives (1)

- Perform multiple coordinated field operational tests across Europe of advanced driver assistance systems - with ordinary drivers in real traffic
- Investigate performance, driver behaviour and user acceptance
- Assess the impact of systems on safety, efficiency and the environment

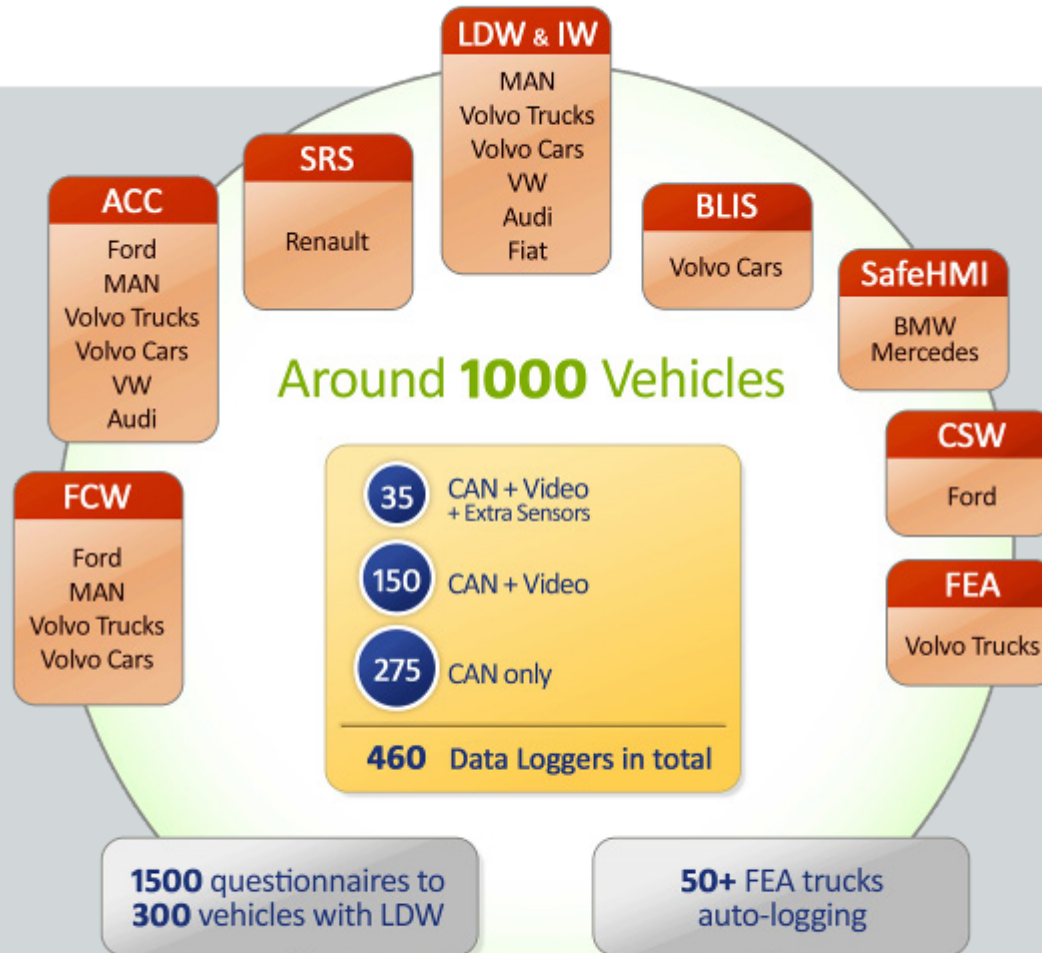


# euroFOT Objectives (2)

- Consolidate a common European approach for FOTs
- Improve public awareness of the benefits of driver support functions



# Functions under test



# Design of FOT

## •Drivers

- Represent as much as possible the population of buyers
- Professional drivers in the case of trucks
- Performance compared with and without the system (Baseline)
- Control group introduced for several functions

## •Vehicles

- According to the present EU market, technical feasibility and interests of manufacturers
- Middle + top class cars, heavy trucks

## Environment

- Specific events defined (e.g: overtaking manoeuvre)
- Situation variables specified (e.g: weather, visibility, driver status)
- Performance indicators are the basis for the overall evaluation (e.g: mean speed, mean time headway, frequency of braking,...)



# The challenges....

- Wide range of driving conditions
- Extraction of meaningful use cases / driving scenarios for the equipment under test
- Evaluating the effects of systems that come with multiple functions
- Transferable and harmonized methods Europe-wide
- Data quality assurance
- Privacy and legal issues





Bringing intelligent vehicles to the road

# For More Information:

Project coordinator:  
Aria Etemad  
FORD Research & Advanced Engineering Europe  
Email: [aetemad1@ford.com](mailto:aetemad1@ford.com)



# SCORE@F

The French FOT for road  
co-operative systems



# Summary

- Duration: 30 months
- Start: 1 September 2010
- Total Budget: 5.6 M€
- Support: 2.7 M€
- Competitiveness Pole: MOV'EO
- 19 Partners
- Experiments on motorways and Urban / Rural environments in the Yvelines department of France.

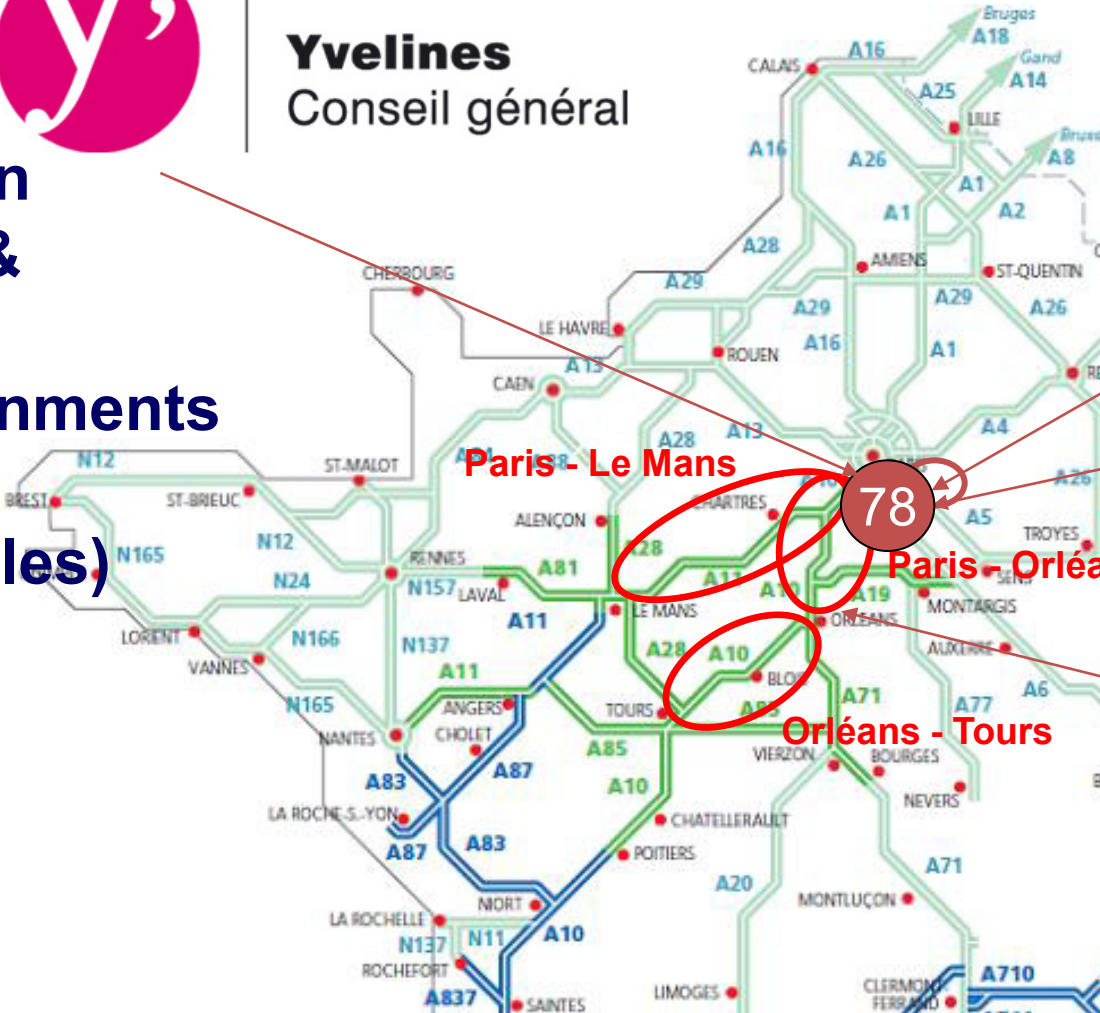


# Experiment



**Yvelines**  
Conseil général

**Tests in  
Rural &  
Urban  
Environments  
(RD91,  
Versailles)**



**Validation /  
Certification  
UTAC**

**Satory  
Tests Circuit  
INRETS**



**Tests on  
Motorway  
(A86, A10)**

# Partnership

## Automobile



LEADER

PSA PEUGEOT CITROËN

**HITACHI**  
Inspire the Next

UTAC



## Road Infrastructure



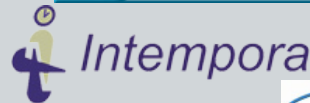
egis mobilité

nevia )))  
technologies

## Research Institutes



## Telecom & Services



**Yvelines**  
Conseil général



# Use Cases Priorities (P1)

<b>ROAD SAFETY</b>	<b>Use Cases</b>	<b>CAA</b>	<b>LCRW</b>	<b>ICRW</b>
	Road work	●	●	
	Traffic Jam	●	●	
	Stationary Vehicle	●	●	
	Human on the road	●		
	Low stability	●	●	
	Signal Violation			●
<b>TRAFFIC MANAGEMENT</b>	<b>Use Cases</b>	<b>Motorway</b>	<b>RD91</b>	
	EFCD	●	●	
	Contextual Speeds	●	●	
	Recommended Itinerary	●	●	
	Stop – Start at traffic Light		●	
<b>COMFORT &amp; MOBILITY</b>	<b>Use cases</b>			
	<b>In-Vehicle Signage</b>			
	<b>Intermodality HUB (POI)</b>			



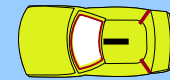
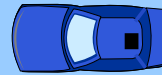
# Use Cases Priorities (P2)

<b>ROAD SAFETY</b>	<b>Use Cases</b>	<b>CAA</b>	<b>LCRW</b>	<b>ICRW</b>
	Approaching Vehicle		●	
	Counter sens Vehicle	●	●	
	Warning from a Third Party		●	●
	Road Obstacle	●		
<b>TRAFFIC MANAGEMENT</b>	<b>Use Cases</b>	<b>Motorway</b>	<b>RD91</b>	
<b>COMFORT &amp; MOBILITY</b>	<b>Use Cases</b>			
	<b>Electric Vehicle Point of Charge Notification (POI)</b>			
	<b>Fleet Management</b>			



# Use Cases : Road Safety

Co-operative Awareness (CAA) (V2V)  
(Info to driver)



ETSI TS 101 539 - 1

CAM & DENM

## Longitudinal Collision Risk Warning (LCRW)



Forward

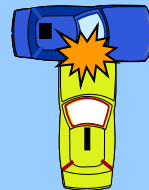


Frontal

ETSI TS 101 539 - 3

Longitudinal Alignment?

## Intersection Collision Risk Warning (ICRW)



Lateral

ETSI TS 101 539 - 2



# Use Cases: Traffic Efficiency

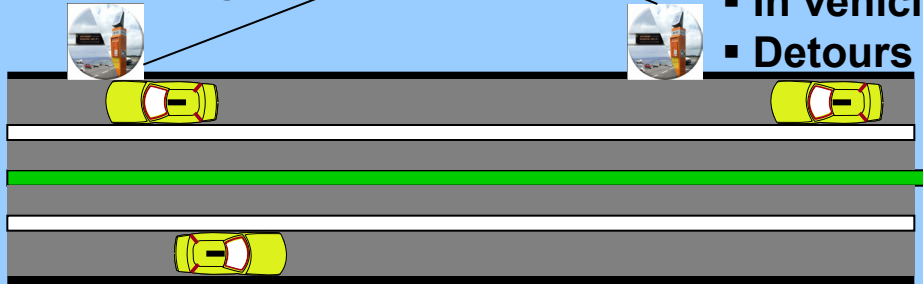
## MOTORWAY

CAM &  
DENM  
Processing



Traffic  
Management  
Centre

- Speed Limits
- In vehicle VMS
- Detours



French CN 16



- Collect of traffic information by the road side units (SCORE@F: from CAM & DENM, CO-DRIVE: Video from cameras).
- Transfer of pre-processed traffic information to traffic management center.
- Adjustment of regulatory speed limits according to traffic context.
- Broadcasting to vehicles by RSU of contextual regulatory speed.
- Broadcasting to vehicles of traffic info and itinerary recommendations (VMS).

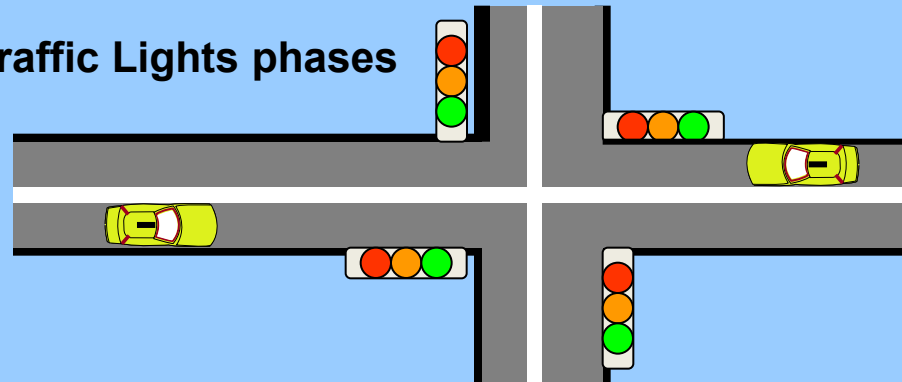


# Use Cases: Traffic Efficiency

- Traffic light violation
- Green light optimal speed advisory
- Engine Stop - Start

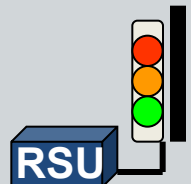
## CG 78 ENVIRONMENT (same motorway +)

Traffic Lights phases



**Traffic Light messages broadcasting (Spat):  
either CAM evolution or new  
Message?**

**Common use case EU – USA?**



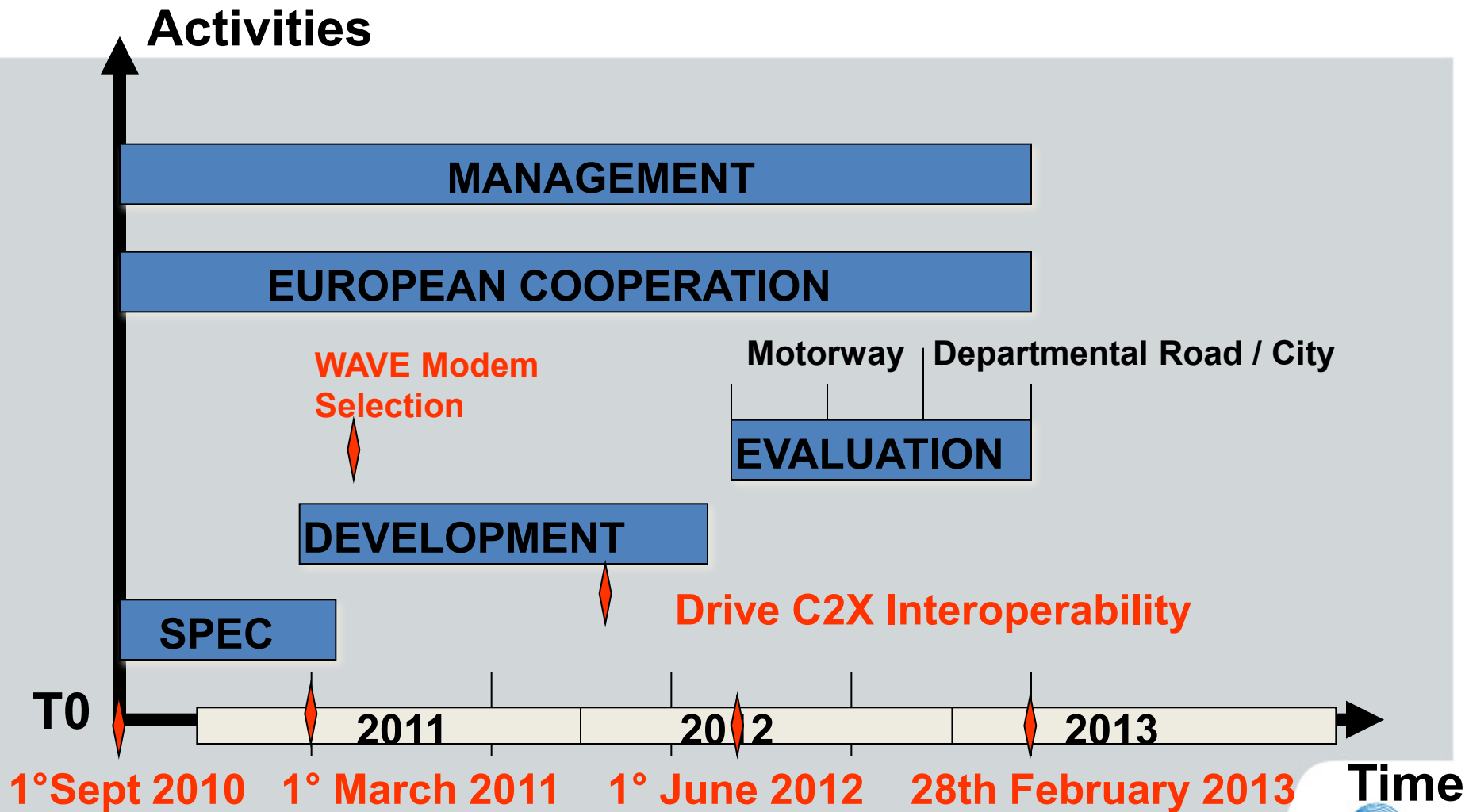
# Use Cases: Comfort & Mobility

## Point of Interest Notification & Electronic Commerce

- EV Charging Spot
- Opportunism Car Pooling (hitchhiking)
- Intermodality Transport Point
- Fleet Management



# Planning



# More Information:

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RENAULT Connectivity  
Advanced Engineering



# FESTA



**FESTA**



# FESTA

- Field Operational Test Support Action
- Standardise the design, running and analysis of future Field Operational Tests (FOTs) of ICT technologies conducted in Europe
- Output – FESTA handbook. A “cookbook” for how to plan and run successful FOTs.
- 19 partners
- first stage of 4 stage EU research program on FOTs.



# FESTA Objectives

- develop a common methodology and guidelines (handbook) for designing, running and analysing data from future European FOTs
- This handbook will allow :
  - Faster setting up of FOTs
  - Robust impact assessment;
  - Comparable results;
  - Save effort by avoid duplication of work;
  - Reuse of tools, equipments, etc.
  - Establish a common European Vision of FOTs



# FOT-Net - 1



## Activity

FOT-Net 1 (2008 - 2010)

## Goal

Bring national and European FOT activities into one international networking platform.

## Main activities

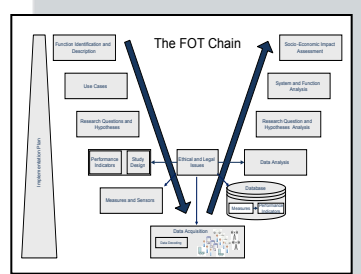
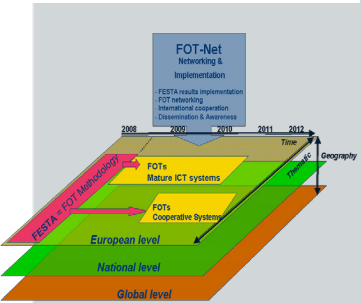
Establishment of a platform for strategic networking of existing and future national, European and Global FOTs. Promotion of the implementation of the FESTA methodology.

## Main outcomes

A European and international network on Field Operational Tests to facilitate the exchange of knowledge and promote the use of the common FOT methodology.

## Web

[www.fot-net.eu](http://www.fot-net.eu)



# Conclusion

- France, and IFSTTAR, are active in designing, running and analysing data from studies using instrumented vehicles – NDS, NRS and FOTs
- The proposed European Large Scale Naturalistic Driving Study, if funded, may provide a further opportunity for participation by IFSTTAR and other French partners.



Thankyou  
Merci

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